COMENIUS UNIVERSITY BRATISLAVA

FACULTY OF PHARMACY

Stanislava Kosírová et al.

SELECTED QUESTIONS FOR THE ANATOMY AND PHYSIOLOGY EXAM

FOR PHARMACY STUDENTS

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FOREWORD

Dear students,

You are now holding the script "Selected questions for the Anatomy and Physiology exam for pharmacy students," which we have prepared for you with the team of authors participating in the lectures and exercises during Anatomy and Physiology at the Faculty of Pharmacy of Comenius University Bratislava. The long-time guarantor of this subject reviewed the script, Associate Professor Tatiana Stankovičová, M.D., CSc., to whom the authors would like to express their gratitude for all the comments and guidance she provided us with.

Human anatomy and physiology are one of the most important aspects of pharmacy. It provides an understanding of the body's normal function, which leads to a general overview of the pathophysiological processes, the mechanism of action of drugs, and, consequently, the application of rational pharmacotherapy in treating patients.

We designed this script to help you prepare more accurately for the final examination in Anatomy and Physiology, as it contains more than 1800 selected questions to test your knowledge gained during the study of this course throughout the semester. We hope you will deepen your knowledge of the subject by finding the answers to the selected questions and discussing the questions with each other.

The script is divided into general and special sections on organ systems. In the first, general part, the questions focus on general knowledge of Anatomy and Physiology, such as basic body structure and terminology, division and characterization of tissues, effects of neurotransmitters, neuromodulators, and hormones, electrical manifestations of the nerve cell, synapses, and mechanisms necessary for maintaining homeostasis, acid-base balance, and water management.

The second part presents a selection of questions on the physiology of organ systems, including the nervous, cardiovascular, musculoskeletal, digestive, respiratory, hormonal, reproductive, excretory, lymphatic, and sensory systems.

The selected questions are designed as multiple-choice questions with at least one correct answer each time.

After thoroughly studying the recommended literature, you will find it easy to answer the selected questions and thus prepare perfectly for the final exam. We also welcome your comments and insights to help us improve this script.

We wish you lots of enthusiasm and energy in your studies.

Bratislava, April 2023 Assoc. Prof. PharmD. Stanislava Kosírová, PhD.

on behalf of the authors

CONTENTS

1 SELECTED QUESTIONS FROM GENERAL ANATOMY AND PHYSIOLOGY

1.1 Anatomy and Physiology introduction, anatomical terminology, topography of the organ systems

1. An example of a serous membrane is

    a. skin
    b. peritoneum
    c. joints
    d. small intestine
    e. pericardium
    f. pleura

2. Blood enters the glomerulus via

    a. efferent arteriole
    b. afferent arteriole
    c. descending arteriole
    d. ascending arteriole
    e. proximal arteriole
    f. distal arteriole

3. Extracellular bone matrix

    a. is formed by osteocytes and osteoblasts
    b. is formed mostly by organic fibers
    c. consists mainly of inorganic constituents
    d. is formed mainly by osteoclasts
    e. consists mainly of calcium and phosphates
    f. consists mainly of sodium and potassium

4. Frontal plane

    a. is horizontal
    b. divides the body into two symmetrical halves
    c. divides the body into left and right parts
    d. divides the body into front and back
    e. divides the body into upper and lower parts
    f. is transversal

5. Histology

    a. describes the macroscopic structure of the organism
    b. explains the functions of the human body
    c. describes biochemical processes
    d. deals with distribution of ions in human body
    e. describes the microscopic structure of the organism
    f. describes functional changes

6. How would you describe the location of the stomach relative to the skin?

    a. superficialis
    b. profundus
    c. externus
    d. internus
    e. frontalis
    f. sagittalis

7. How would you mark the THIGH direction in anatomy? As

    a. radial
    b. ulnar
    c. tibial
    d. femoral
    e. palmar
    f. dorsal

8. How would you name the direction toward or at the body surface?

    a. superficial
    b. external
    c. deep
    d. internal
    e. distal
    f. proximal

9. Mark the correct terms to denote muscle SIZE

    a. deltoid
    b. pectoralis
    c. longus
    d. brevis
    e. triceps
    f. flexor

10. Mark elements that make up more than 95% of body weight

    a. calcium, magnesium, iron, carbon
    b. sodium, chlorine, carbon, hydrogen
    c. oxygen, calcium, iron, carbon
    d. oxygen, carbon, nitrogen, iron
    e. sodium, potassium, calcium, phosphorus
    f. carbon, nitrogen, oxygen, chlorine

11. Mark organs located in abdominal cavity

    a. heart

b. lungs
c. stomach
d. intestines
e. pancreas
f. urinary bladder

12. Mark organs located in thoracic cavity

a. heart
b. lungs
c. stomach
d. intestines
e. pancreas
f. urinary bladder

13. Mark serous membranes

a. pleura
b. peritoneum
c. pericardium
d. joint membranes
e. membranes in the mouth
f. membranes in the airways

14. Mark, what applies to the anatomical description of the hand

a. palmar
b. digital
c. plantar
d. umbilical
e. cervical
f. ventral

15. Mark the organs located in the abdominal cavity

a. heart
b. spinal cord
c. uterus
d. bladder
e. small intestine
f. stomach

16. Mark the organs located in the abdominal cavity

a. heart and lungs
b. brain and spinal cord
c. liver and pancreas

d. spleen and stomach
e. thyroid and parathyroid glands
f. eyes and nose

17. Mark the ventral cavities

a. thoracic
b. abdominal
c. pelvic
d. spinal
e. cranial
f. mediastinum

18. Mediastinum contains

a. heart
b. lungs
c. thymus
d. esophagus
e. trachea
f. aorta abdominalis

19. “Medius” means

a. anterior
b. superficial
c. upper
d. middle
e. right
f. longitudinal

20. Serous membrane

a. is a pleura
b. it consists of a single layer of flat epithelium
c. has a parietal and visceral serosa
d. produces mucin
e. produces synovial fluid
f. covers the joints

21. Supportive nerve cells include

a. neurons
b. microglia
c. ependymal cells
d. neurocytes
e. oligodendrocytes

f. astrocytes

22. The basic organic components of the body include

a. minerals
b. carbohydrates
c. nucleotides
d. hydroxyapatite
e. lipids
f. proteins

23. The designation lateral in anatomy means

a. frontal
b. anteroposterior
c. away from the midline
d. internal
e. deep
f. on the outer side

24. Mark, what applies to hormones

a. act at the place of origin
b. are secreted by the exocrine glands
c. are transmitted by blood to the site of action
d. are produced by endocrine glands
e. act through ion channels
f. act through receptors

25. The frontal plane divides the human body into

a. two symmetrical halves
b. front and back
c. upper and lower part
d. transverse parts
e. cranial and caudal part
f. right and left part

26. The frontal plane is

a. a vertical plane passing from front to back through the center of the body, dividing it into two halves
b. the opposition of the sagittal plane
c. each plane parallel to the frontal
d. a horizontal plane perpendicular to the sagittal plane
e. designation for the anatomical plane
f. running perpendicular to the forehead

27. The kidneys are located

    a. medially
    b. retrograde
    c. retroperitoneal
    d. caudally to the bladder
    e. distally
    f. caudally to the diaphragm

28. The medial plane

    a. is central plane
    b. divides the body into two symmetrical halves
    c. divides the body into left and right parts
    d. divides the body into front and back
    e. divides the body into upper and lower parts
    f. is transverse

29. The patient has a gunshot wound to the epigastrium. Which organs could be affected?

    a. stomach
    b. liver
    c. urinary bladder
    d. aorta
    e. pancreas
    f. uterus

30. The patient has a lower limb fracture located distally to the knee joint. Which bones can possibly be broken?

    a. femur
    b. tibia
    c. radius
    d. os coxae
    e. ossa carpi
    f. fibula

31. The term “ARCUS” in anatomy means

    a. vertebra
    b. hole
    c. arch
    d. opening
    e. grooves
    f. notch

32. The term “SUPERFICIALIS” in anatomy means

a. at the surface
b. deep
c. internal
d. external
e. left
f. rear

33. The total proportion of water in an adult's body is

a. 50%
b. 60%
c. 40%
d. 85%
e. 70%
f. 45%

34. Transversal plane

a. is horizontal plane
b. is vertical plane
c. divides the body into superior and inferior parts
d. divides the body into superior and inferior parts
e. is central plane
f. is rear plane, that divides the body into superior and inferior parts

35. What structure is in the nephron of the kidney?

a. distal tubule
b. basal tubule
c. juxtamedullary tubulus
d. proximal tubule
e. efferent tubule
f. afferent tubule

36. What structure separates the thoracic cavity from the abdominal cavity?

a. diaphragm
b. mediastinum
c. pylorus
d. peritoneum
e. esophagus
f. rectum

37. Which statement best describes the location of most of the musculoskeletal system?

a. it is located in the dorsal cavity

b. it is located in the ventral cavity
c. it is located in the abdominal-pelvic cavity
d. it is not found in any body cavity
e. it is located in the vertebral cavity
f. it is located in the thoracic cavity

38. Which hormones are formed in the kidneys?

a. triiodothyronine
b. erythropoietin
c. adrenaline
d. renin
e. insulin
f. aldosterone

39. Which hormones are responsible for regulating the body fluids volume?

a. oxytocin
b. aldosterone
c. glucagon
d. antidiuretic hormone
e. thyroxine
f. somatostatin

40. Which of the following statements correctly describes position of the body parts?

a. the elbow is proximal to the shoulder
b. the bones of the fingers are distal to the bones of the wrist
c. the chest borders caudally with the abdomen
d. the hip joint is distal to the knee
e. the adrenal glands are cranial from the kidneys
f. the esophagus is caudal to the stomach

41. Which of the following definitions best describes physiology?

a. microscopic study of tissues and cells
b. study of the function of the human body as a whole
c. study of all chemical processes that take place in the organelles of the cell
d. a study of the body's ability to maintain a relatively constant internal environment.
e. study of functional changes in the body during the disease.
f. study of the macroscopic structure of the organism.

42. Which of the following functions are atypical for the liver?

a. bile production
b. maintaining acid-base balance

c. cholesterol metabolism
d. synthesis of precipitation factors
e. regulation of water management
f. metabolism of toxins

43. Which of the following statements are correct?

a. the diaphragm separates the brain and spinal cord
b. the dorsal cavity contains the brain and spinal cord
c. the abdominal cavity contains the male and female reproductive systems
d. the abdominal-pelvic cavity contains the spinal cord
e. the pelvic cavity contains the ovaries and uterus
f. the cranial cavity contains the brain

44. Which of the following terms do describe other than abdominal area?

a. left hypochondrium
b. umbilical region
c. mediastinum
d. right sacral part
e. epigastric region
f. right hypogastrium

45. Which term refers to the "FRONT" direction in anatomy?

a. ventralis
b. internus
c. inferior
d. dorsalis
e. anterior
f. profundus

46. Which term refers to the "LOWER" direction in anatomy?

a. ventralis
b. internus
c. inferior
d. dorsalis
e. caudalis
f. profundus

47. Which term would you use for the description of the position of the ulna relative to the humerus?

a. ventralis
b. internus
c. inferior

d. dorsalis
e. distalis
f. profundus

48. Which term would you use in anatomy to describe "AT THE FRONT OF THE BODY”?

a. anterior
b. ventralis
c. deep
d. caudalis
e. medium
f. intermediate

49. Which term would you use in anatomy to describe "THE BACKWARD DIRECTION OF THE BODY " (at the back of the body)?

a. anterior
b. dorsal
c. deep
d. caudalis
e. posterior
f. intermediate

1.2 TISSUES, DIVISION AND THEIR CHARACTERISTICS

1. The basic characteristics of epithelial tissue include

    a. the cells are spaced apart
    b. the cells are close together
    c. the cells are attached to the basement membrane
    d. there are more cells than the extracellular matrix
    e. there are fewer cells than the extracellular matrix
    f. the cells are freely dispersed, without the basement membrane

2. Basic tissue types according to the main division include

    a. glial cells
    b. epithelial tissue
    c. nervous tissue
    d. cardiomyocytes
    e. strong ligaments
    f. connective tissue

3. Mark the correct statements about the cartilage

    a. the most common type of cartilage in the body is ligamentous cartilage
    b. hyaline cartilage is located on the joints
    c. in cartilage, collagen and proteoglycans are mainly present in the extracellular space
    d. the mature forms of cells in cartilage are called chondroblasts
    e. it has a high regenerative capacity
    f. its amount in the body increases with age

4. Mark the correct statements about connective tissue

    a. these include connective tissue proper, cartilage, bone, blood and lymph
    b. it consists only of bone and connective tissue
    c. it is formed from the mesenchyme during embryogenesis
    d. it contains almost no extracellular matrix
    e. it contains lots of proteins (collagen, reticulin)
    f. it has a protective, metabolic, connecting and supporting function

5. Connective tissue includes

    a. bone
    b. endothelium
    c. cartilage
    d. myometrium
    e. myocardium
    f. adipose tissue

6. Endocrine glands include

    a. salivary glands
    b. adrenal glands
    c. sweat glands
    d. parathyroid gland
    e. mammary glands
    f. pituitary gland

7. Epithelial tissue

    a. is avascular
    b. has high blood perfusion
    c. is characterized by a high regenerative capacity
    d. is well innervated
    e. it consists mainly of the extracellular matrix
    f. it also includes glandular epithelium

8. Esophagus

    a. is physiologically lined by a stratified squamous epithelium
    b. is protected by an epithelium against abrasion
    c. its cells flatten towards the apical end
    d. physiologically it is lined by a stratified cylindrical epithelium
    e. physiologically it is lined by a simple squamous epithelium
    f. has keratinised epithelium

9. In pseudostratified epithelium, the cells are arranged

    a. in one layer and their nuclei are in the same heights
    b. in multiple layers
    c. in one layer and their nuclei are deposited at different heights
    d. right next to each other
    e. far from each other
    f. above themselves

10. In which tissues can we find simple epithelium?

    a. skin
    b. renal tubules
    c. bladder
    d. retina
    e. endothelium of vessels
    f. esophagus

11. Into which types can we classify epithelium according to the cell shape?

    a. squamous

b. covering
c. cuboidal
d. glandular
e. columnar
f. urothelium

12. Label the cells of mesenchymal origin

a. blood elements
b. osteocytes
c. chondrocytes
d. neuron
e. microglia
f. astrocytes

13. Mark the correct statements

a. pancreas is a mixed gland
b. pancreas secretes mainly substances, that the body does not need
c. osteoblasts are mature bone cells
d. chondroitin sulphate and hyaluronic acid are the substances of extracellular matrix
e. chondroitin sulphate and hyaluronic acid are the substances of basal membrane
f. adipose tissue has an endocrine activity

14. Mark the correct statements about connective tissue

a. sarcomere units are a part of connective tissue
b. the main function of osteoclasts is bone resorption
c. the matrix is the smallest part of connective tissue
d. the protein fibers in connective tissue include collagen and elastin
e. glycosaminoglycans such as dermatan or heparan sulfate are included in the matrix
f. structural glycoproteins such as fibrillin are important for mechanical strength and are produced by fibroblasts

15. Mark the correct statements

a. reticular tissue is a connective tissue
b. immature connective tissue cells are referred to as blasts
c. chondroitin sulfate nourishes the cartilage
d. white adipose tissue contains more mitochondria than brown adipose tissue
e. perichondrium does not contain any vessels
f. intervertebral discs are formed from hyaline cartilage

16. Mark the correct statements

a. the character of cartilage is given primarily by the extracellular mass
b. chondrons are groups of chondrocytes
c. chondroblasts are mature cartilage cells
d. elastic cartilage has an extracellular matrix formed exclusively by elastic fibers
e. in the joints there is mainly hyaline cartilage
f. cartilage is characterized by a very good regenerative ability

17. Mark the correct statements

a. reticular fibers are thin, and fine, forming spatial networks
b. collagen fibers are long, straight, and strong, in cartilage and bone
c. amorphous mass consists only of water
d. elastic fibers are flexible and strong, they are in elastic cartilage
e. hyaluronic acid is important for adipose tissue
f. adipose tissue has only a protective function

18. Mark the correct statements

a. the cartilage of outer ear belongs to the hyaline cartilage
b. leukocytes belong to the connective tissue
c. cartilage may be hyaline, fibrous or elastic
d. a typical example of fibrous cartilage is intervertebral discs
e. hyaline cartilage forms, for example, the trachea or rib connections with the sternum
f. white adipose tissue contains more mitochondria than brown

19. Mark the correct statements

a. the pancreas is a mixed gland
b. secretions contain mainly substances unnecessary for the body
c. osteoblasts are mature bone cells
d. chondroitin sulfate and hyaluronic acid are the building blocks of extracellular matrix
e. chondroitin sulfate and hyaluronic acid are the building blocks of basement membrane
f. adipose tissue is endocrine active

20. Mark the correct statements

a. glandular epithelium consists of glands with internal or external secretion
b. simple squamous epithelium is found, for example, in the vessels as an endothelial layer
c. adipose tissue is the primary storage of fatty acids but does not produce any specific hormones
d. visceral fat is is located under the skin and is visible to the eye

e. solid collagen tissue includes, for example, tendon or ligament
f. visceral fat is metabolically more active and consists of white adipose tissue

21. Mark, what applies to simple squamous epithelium?

a. it typically occurs in blood vessels
b. it forms the tubules of kidneys
c. the cells are taller but not wider
d. it changes its size according to the stretching of organ
e. it ensures the transfer or exchange of substances
f. its cells contain keratin

22. Multilayer squamous epithelium is characterized by

a. can be keratinized (epidermis)
b. it forms lining in internal organs such as esophagus, vagina
c. not all cells consist of nucleus
d. it is located on the retina
e. there is a large extracellular space between the cells
f. it forms a lining in the urine bladder

23. Pigmentary epithelium

a. contains pigments in the cytoplasm
b. contains stereocilia
c. is stratified
d. is located in the retina
e. is pseudostratified
f. leans the wall of blood vessels

24. Saliva

a. is produced by their complex tubuloalveolar glands
b. is produced by their simple tubular glands
c. activates digestion in the oral cavity
d. is produced by the mucoid and serous endocrine glands
e. is released by the excretory salivary glands, which are lined by a cubic monolayer epithelium
f. is produced only by the alveolar glands

25. The basement membrane is

a. the lowest continuous layer of muscle cells
b. a continuous layer of renal tubule cells
c. a layer of adhesive proteins on which epithelial cells are attached
d. made mainly of collagen and laminin
e. formed by fibroblasts

f. a part of extracellular matrix

26. The basic cells of cartilage are

a. chondroblasts
b. osteocytes
c. fibroblasts
d. osteoblasts
e. fibrocytes
f. chondrocytes

27. The basic cells of connective tissue proper are

a. chondroblasts
b. osteocytes
c. fibroblasts
d. osteoblasts
e. fibrocytes
f. chondrocytes

28. The basic cells of ligament include

a. chondroblasts
b. osteocytes
c. fibroblasts
d. osteoblasts
e. fibrocytes
f. chondrocytes

29. The basic characteristics of epithelial tissue include

a. the cells are far apart
b. the cells are close together
c. the cells attach to the basement membrane
d. there are more cells than the extracellular matrix
e. there are fewer cells than the extracellular matrix
f. the cells are freely dispersed, without basement membrane

30. The cartilage cells are

a. osteocytes
b. osteoblasts
c. elastins
d. chondrocytes
e. osteoclasts
f. immunoblasts

31. The endothelium is

a. single-layered flat epithelium
b. single-layered cubic epithelium
c. stratified flat epithelium
d. outer lining of blood vessels
e. inner lining of blood vessels
f. inner lining of the stomach

32. The epithelial tissue characteristics are

a. the cells are freely dispersed in extracellular space
b. we distinguish squamous, cubical, cylindrical and transitional epithelium
c. the cells are attached to the basement membrane
d. all epithelial cells have a nucleus
e. in the terms of function, osteocytes, chondrocytes and fibrocytes are epithelial cells
f. it has a low regenerative capacity

33. The epithelial tissues are divided according to the shape of cells into

a. squamous
b. covering
c. cubic
d. glandular
e. cylindrical
f. transitional

34. The extracellular matrix of connective tissue contains

a. collagen fibers
b. basement membrane
c. minerals
d. chondroitin sulfate
e. calcitonin
f. adiponectin

35. The inner lining of trachea is formed by

a. simple squamous epithelium
b. cylindrical simple epithelium
c. cylindrical stratified epithelium
d. squamous stratified epithelium
e. ciliary epithelium
f. transitional stratified epithelium

36. Mark the characteristics of ligaments

a. they contain fixed and mobile cells

b. they have also an immune function
c. they participate in thermoregulation
d. they form the inner lining in the blood vessels
e. unlike bone tissue, they do not arise from the mesenchyme
f. the outer layer of cells can be keratinized

37. The renal ducts are lined with

a. simple squamous epithelium
b. stratified cylindrical epithelium
c. simple cuboidal epithelium
d. stratified squamous epithelium
e. urothelium
f. pseudostratified epithelium

38. The renal tubules are lined with

a. simple squamous epithelium
b. simple cuboidal epithelium
c. simple cylindrical epithelium
d. squamous stratified epithelium
e. cuboidal stratified epithelium
f. cylindrical stratified epithelium

39. The salivary gland ducts are lined by

a. stratified squamous epithelium
b. simple cylindrical epithelium
c. simple squamous epithelium
d. stratified cylindrical epithelium
e. pseudostratified epithelium
f. simple cuboidal epithelium

40. The stratified squamous epithelium is located in

a. skin
b. esophagus
c. bronchi
d. stomach
e. vagina
f. vessels

41. Mark the correct statements about the trabecular (spongy) bone

a. it is stronger than compact bone
b. it is mostly located at the ends of long bones, in joint areas and in irregular and flat bones

c. it contains a yellow bone marrow
d. it consists of basic units - osteons
e. it has a metabolic function
f. it has a porous structure

42. Transient epithelium

a. is a urothelium
b. is an endothelium
c. leans the kidneys
d. is able to adapt to changes in volume
e. is pseudostratified
f. it is not able to adapt to changes in volume

43. Typical characteristics of epithelial tissues are

a. the presence of basement membrane
b. often endocrinal or exocrine active
c. richly perfused with small diameter vessels
d. extracellular matter predominates over cellular
e. tight placement of cells next to each other by means of adhesive connections
f. typical representatives are fibroblasts

44. Typical connective tissue characteristics are

a. the cell mass predominates over the matrix
b. the extracellular mass contains structural proteins and amorphous mass
c. protein fibers include, for example, chondroitin sulfate or heparan sulfate
d. glycosaminoglycans and mucopolysaccharides are part of the amorphous mass
e. the most common protein fibers are the so-called reticular fibers
f. a typical property of amorphous matter and structural glycoproteins is the ability to bind water

45. Urothelium

a. is a transitional epithelium
b. lines the airways
c. contains kinocilia
d. is able to adapt to changes in volume
e. is a stratified squamous epithelium
f. it has mainly a secretory function

46. Mark, what applies to the pseudostratified cylindrical epithelium?

a. it is composed of multinucleated cells
b. it is located in the bronchi
c. it is located in the oral cavity

d. it is always covered by cilia
e. it has no basement membrane
f. it can serve as a respiratory epithelium

47. Mark, what applies to the epithelial tissue?

a. is highly blood perfused
b. has a high regenerative capacity
c. is composed of multinucleated cells
d. it can have a sensory function
e. it contains a high amount of extracellular matrix
f. is impermeable to substances from the external environment

48. What are the main components of amorphous matter in the extracellular matrix?

a. creatine phosphate
b. hydroxyapatite
c. hyaluronic acid
d. phosphoric acid
e. chondroitin sulfate
f. calcium

49. What are the main hormones synthesized by adipose tissue?

a. insulin
b. chymosin
c. leptin
d. renin
e. adiponectin
f. glucagon

50. What does not belong to the endocrine glands?

a. sweat glands
b. thyroid gland
c. adrenal gland
d. salivary glands
e. hypothalamus
f. gonads

51. What forms the inner lining of vessels?

a. simple cuboidal epithelium
b. simple squamous epithelium
c. stratified squamous epithelium
d. endothelium
e. exothelium

f. urothelium

52. What type of epithelium covers the inner lining of blood vessels?

a. pseudostratified
b. simple cuboidal
c. simple squamous
d. urothelium
e. stratified squamous
f. pigmented

53. What type of epithelium covers the esophagus?

a. pseudostratified
b. simple cuboidal
c. simple squamous
d. transitional
e. stratified squamous
f. pigmented

54. What type of epithelium covers the kidney tubules?

a. pseudostratified
b. simple cuboidal
c. simple squamous
d. transitional
e. stratified squamous
f. pigmented

55. What type of epithelium is the retina?

a. pseudostratified
b. simple cuboidal
c. simple
d. urothelium
e. stratified squamous
f. pigmented

56. Which of the following applies to cartilage?

a. it belongs to the connective epithelia
b. it belongs to the connective tissues
c. the volume of e cells is greater than the volume of extracellular matrix
d. it has a good ability to regenerate because it is well perfused
e. it has a weak ability to regenerate because it is weakly perfused
f. it covers the joint heads

g.

57. Mark, which of the following statements about the cartilage is true?

a. it does not contain blood vessels
b. the organic component of cartilage consists almost exclusively of type I collagen
c. cartilage cells are called fibroblasts
d. hyaline cartilage is found e.g. in the trachea
e. it has a high regenerative capacity
f. elastic cartilage is found in the outer ear

1.3 SYNAPSE, NEUROMEDIATORS AND NEUROMODULATORS

1. Mark, what applies to acetylcholine

    a. is formed in synaptic vesicles
    b. it is synthesized by acetylcholinesterase
    c. it is located at the preganglionic junction of the sympathetic nervous system
    d. is located on the neuromuscular junction
    e. binds to alpha receptors on the presynaptic membrane
    f. binds to beta receptors on the postsynaptic membrane

2. Mark, what applies to acetylcholine

    a. is a neurotransmitter of the neuromuscular junction
    b. is hydrolysed by acetylcholinesterase
    c. activates beta-1 receptors in the heart
    d. via alpha-1 receptors causes vasoconstriction
    e. is hydrolysed by butyrylcholinesterase
    f. participates in the transmission of nerve impulses

3. Mark, what applies to acetylcholine. It is

    a. synthesized from acetyl-coenzyme A
    b. synthesised from phenylalanine
    c. synthesised from tyrosine
    d. degraded by acetylcholinesterase
    e. formed by choline acetyltransferase
    f. degraded by choline acetyltransferase

4. Mark, what applies to neurotransmitters

    a. they always activate the postsynaptic membrane
    b. are synthesized in synaptic ending
    c. fusion of vesicles with synaptic membrane is required for their transport to the synaptic cleft
    d. the duration of their action on the synapse depends on their metabolism and re-uptake
    e. we divide them mostly into stimulatory and inhibitory
    f. the reactions they mediate are generally slower than those mediated by neuromodulators or neurotrophins

5. Mark, what applies to G proteins

    a. are composed of 7 subunits
    b. are composed of 3 subunits
    c. they can activate AC
    d. they can activate PLC

e. are part of the Na+/K+ channel
f. GTP is required to activate their alpha subunit

6. In the neurons of the substantia nigra in the mesencephalon is formed

a. acetylcholine
b. norepinephrine
c. adrenaline
d. dopamine
e. serotonin
f. histamine

7. Mark, what applies to dopamine

a. all of its receptors are GPCRs
b. its receptors are ion channels
c. is a precursor to noradrenalin production
d. reduces renal calcium excretion
e. increases the level of calcium in the blood
f. is synthesized from tyrosine

8. Mark inhibitory neurotransmitters

a. GABA
b. glutamate
c. glycine
d. aspartate
e. nitric oxide
f. acetylcholine

9. Mark the correct statements about chemical synapse

a. it is a gap junction connection
b. it allows the heart muscle to work as a syncytium
c. here, the transmission of the impulse is mediated by the transmitter
d. it does not contain a synaptic cleft
e. its occurrence in the body is rare
f. the transmitter is formed in the postsynaptic part of the chemical synapse

10. Mark the correct statements about the synapse

a. glial cells only spread the impulse through chemical synapses
b. neurotransmitter release is provided by exocytosis
c. chloride influx through voltage-dependent channels at axonal end is needed to release neurotransmitter
d. presynaptic transport mechanisms serve to reuptake the neurotransmitter

e. synaptic transmission is ensured by the binding of the neurotransmitter to the postsynaptic receptors
f. synapses can only occur between the axon of one neuron (presynaptic) dendrite of the other (postsynaptic)

11. Mark the correct statements about neurotransmitters and neuromodulators

a. neuromodulators differ from neuromediators by longer or by slower action at the target neuron
b. neurotransmitters may be macromolecules and polymers
c. neuromodulators stimulate metabolic and trophic cascades
d. neurotransmitters can be simple amino acids as well as gases
e. acetylcholine is a whole brain neurotransmitter and a peripheral transmitter as well
f. neurotransmitter is always activator while neuromediator can also be inhibitory

12. Mark the correct statements

a. neural growth factor modifies the neuronal response to neurotransmitters
b. the neuromodulator modifies the neuronal response to neurotransmitters
c. noradrenaline only reacts with ligand-coupled ion channels.
d. acetylcholine reacts with ligand-coupled ion channels and G-protein coupled receptors
e. histamine has inhibitory effects in CNS.
f. serotonin affects mood, memory and sleep

13. Mark, what belongs to the transmitters

a. dopamine
b. neuron
c. ion-controlled channel
d. noradrenaline
e. acetylcholine
f. Gq protein

14. Mark, what applies to muscle type nicotinic receptor Nm

a. is a noradrenaline receptor
b. is an acetylcholine receptor
c. is a GPCR receptor
d. is a sodium channel
e. is a calcium channel
f. is on neuromuscular junction

15. Mark, what applies to neuromodulators

a. affect the sensitivity of the postsynaptic membrane to the mediator

b. are, for example, endorphins
c. are, for example, prostaglandins
d. mediate the direct transmission of action potential
e. they cause exclusively excitation
f. they are located only on the electric synapse

16. Mark, what applies to neurotransmitters

a. is a mediator at the synapse
b. may be acetylcholine
c. may be hemosiderin
d. may be lipofuscin
e. may be norepinephrine
f. may be beta amyloid

17. Mark, what applies to neurotransmitters

a. are transport systems for neurons in the CNS
b. arise and operate exclusively in the CNS
c. are substances that are involved in signal transmission from one neuron to another
d. neurotransmitters include acetylcholine, amino acids, biogenic amines, purines, gases and peptides
e. they all bind to the same receptor
f. they bind to various types of receptors, including e.g. G-protein coupled receptors, ion channels ai

18. Mark, what applies to neurotransmitters

a. they are substances of exclusively amino acid origin such as norepinephrine and acetylcholine
b. they can be amino acids, their derivatives, peptides and even some gases
c. are synthesized in astrocytes and stored in the synaptic terminals of neurons
d. they always depolarize postsynaptic cells
e. they can act presynaptically or postsynaptically
f. their release into the synaptic cleft is mainly dependent on Ca2+

19. Mark, what applies to noradrenaline (= norepinephrine). It is

a. synthesized from acetyl-coenzyme A
b. synthesized from phenylalanine and tyrosine
c. degraded by monoamine oxidase
d. formed by the action of monoamine oxidase
e. degraded by catechol-O-methyltransferase
f. formed by the action of catechol-O-methyltransferase

20. Mark, what applies to presynaptic receptors

a. are located on the presynaptic membrane
b. they are sensors for high level of the respective neurotransmitter
c. these include alpha-1 adrenergic receptors
d. these include alpha-2 adrenergic receptors
e. they inhibit the release of norepinephrine into the synaptic cleft
f. they are located on a neuromuscular junction

21. Mark, what applies to serotonin

a. is a neurotransmitter in the digestive tract
b. it is also found in platelets
c. acts through its receptors
d. acts on cells directly without binding to the receptor
e. it is produced from tryptophan
f. acts on the neuromuscular junction

22. Mark, what applies to synapse

a. is a site of interconnection and communication of microglia and astrocytes
b. is the site of connection and communication of a neuron with another neuron
c. it is always only chemical
d. is the site of connection and communication of the neuron with the effector
e. is found only in the CNS
f. it is used to transfer excitations from cell to cell

23. Mark, what applies to the synapse

a. a presynaptic cell releases a neurotransmitter into the synapse
b. a postsynaptic cell has the ability to endocytose a neurotransmitter
c. synaptic connections are formed only between the axons of neurons
d. synaptic connections are able to form only neurons.
e. the neurotransmitter is released from the presynaptic cell based on the ongoing action potential
f. the neurotransmitter is transported to the postsynaptic cell by specific transporters

24. Mark, what applies to termination of neurotransmission by acetylcholine

a. occurs on presynaptic autoreceptors
b. is catalysed by acetylcholinesterase
c. happens on the neuromuscular junction by reuptake into the presynaptic neuron
d. it is provided by enzymatic degradation in the postsynaptic cell
e. takes place in the synaptic cleft
f. is not necessary because the acetylcholine molecule is unstable and degrades rapidly

25. Mark, what do ligand-gated channels need to open?

a. increasing the concentration of Na+ ions
b. increasing the concentration of K+ ions
c. neurotransmitter binding
d. membrane depolarization
e. membrane repolarization
f. Ca2+ ions decrease

26. Mark, what is necessary for releasing acetylcholine from the axon vesicles

a. Na+
b. K+
c. Ca2+
d. Cl-
e. Mg2+
f. all listed

1.4 ELECTRICAL MANIFESTATIONS OF THE NERVE CELL, ACTION POTENTIAL

1. Absolute refractory phase

    a. is a condition where any intense stimulation does not lead to the triggering of action potential
    b. is a condition where only high-intensity stimulation leads to the triggering of an action potential
    c. is a condition during which Na+ channels are "inactivated" (closed) and cannot be opened immediately
    d. is a condition during which K+ channels are "inactivated" and cannot be opened immediately
    e. corresponds to a threshold stimulus
    f. neither answer is correct

2. An excitatory postsynaptic potential evokes

    a. membrane depolarization
    b. membrane repolarization
    c. hyperpolarization on the membrane
    d. sodium flow into the cell
    e. influx of chloride anions into the cell
    f. calcium leakage from the cell

3. Mark, what applies to neurons

    a. the action potential is generated on the axon
    b. structures other than the axon cannot be depolarized
    c. the myelin sheath is found mainly in nodes of Ranvier
    d. the velocity of the axon conduction depends on the degree of myelination of the axon and on the diameter of the fibre
    e. neurotransmitter release is dependent on calcium entry into the synaptic ending
    f. neurotransmitters are usually synthesized outside the cytoplasm of the neuron and are pumped from the extracellular space

4. Axon

    a. is the body of the neuron
    b. is the protrusion of the neuron
    c. is a specialized nerve cell
    d. is the nucleus of the neuron
    e. is a neuron involved in the synapse
    f. may be covered with myelin

5. Depolarization

    a. initiates relaxation of the transversely striated muscle

b. is associated with increased sodium permeability
c. activates the sodium-potassium pump
d. increases the concentration of potassium in the extracellular environment
e. takes place only on excitable cells
f. leads to a change in polarity on the membrane

6. During the saltatorial conduction of action potential

a. depolarization occurs in the node of Ranvier
b. depolarization occurs in the internode
c. the conduction velocity of the action potential is decreased
d. the conduction velocity is accelerated
e. energy requirements are reduced
f. energy demands are increased

7. Finish the sentence "Motor neurons are ..."

a. interneurons
b. bipolar
c. multipolar
d. unipolar
e. important e.g. for light or touch perception
f. important for activation e.g. skeletal muscle

8. For conduction and action potential applies

a. the presence of a myelin sheath on the axon does not modify the conduction of action potential
b. it is always terminated by a chemical synapse
c. it can be saltatory or continuous
d. the speed of continuous conduction is proportional to the number of nodes of Ranvier
e. the resulting action potential is the summation of all impulses, both inhibitory and activating, received by the dendrites (body) of the neuron
f. postsynaptic potentials can be both inhibitory and excitatory

9. For depolarization applies

a. the membrane potential changes towards zero
b. the membrane potential changes towards more negative values
c. excitation occurs during it
d. inhibition occurs during it
e. K+ ions at rest do not pass through the cell membrane at all
f. the nerve could not trigger an action potential

10. For hyperpolarization applies

    a. the membrane potential increases compared to the resting potential
    b. membrane potential decreases (negativity is less than -70 mV)
    c. irritability is higher (excitation occurs)
    d. irritability is lower (attenuation occurs)
    e. the nerve does not respond to the threshold stimulus
    f. the nerve is in permanent contraction

11. Hyperpolarization

    a. is characterized by increased conductivity for potassium ions
    b. is associated with an inhibitory postsynaptic potential
    c. can be caused by activating of M2 receptors
    d. can be caused by activating of M1 receptors
    e. is characterized by reduced conductivity for chloride ions
    f. leads to triggering of action potential

12. Identify the important mechanisms of the action potential on the neuron

    a. voltage-gated sodium channel
    b. sodium-potassium exchanger
    c. voltage-gated calcium channel
    d. glutamate metabotropic receptor
    e. histamine receptor H1
    f. voltage-gated potassium channel

13. Indicate the ions that dominate the extracellular fluid

    a. sodium
    b. potassium
    c. chlorine
    d. magnesium
    e. calcium
    f. phosphate

14. Indicate the reasons for the one-way propagation of the action potential

    a. refractory period
    b. sodium channels are inactivated
    c. depletion of neurotransmitters
    d. conformational changes of sodium channels
    e. creatine phosphate deficiency
    f. hyperpolarization

15. Internodium

    a. is the length between two nodes of Ranvier

b. the longer it is - the faster the signal propagation speed
c. is the section between two nodes of Ranvier
d. is found in unmyelinated fibres
e. it is found exclusively in the central nervous system
f. is the contact of a neuron with supportive nerve cells

16. Mark, what applies to the action potential of a neuron

a. resting potential is approximately +30mV
b. it is necessary to exceed the threshold potential to start the action potential
c. repolarization is ensured by the inflow of K+ into the cytoplasm of the neuron
d. in hyperpolarization the potential decreases below -70 mV
e. the propagation of the action potential causes the closing of calcium channels at the synaptic end
f. to restore the resting action potential, it is necessary to pump Na+ out and K+ into the cell

17. Mark the correct statements

a. sodium influx to the intracellular space of the axon is required to propagate the impulse along the axon
b. opening of the voltage-gated sodium channels will cause sodium leak into the extracellular space
c. calcium is at a higher concentration in the intracellular space of the axonal ending
d. voltage-gated calcium channels are opened by increasing the extracellular calcium concentration
e. postsynaptic acetylcholine receptors are ligand-coupled ion channels permeable to calcium
f. the action potential is terminated by restoring the equilibrium of sodium and potassium concentrations

18. Mark the correct statements about nerve fibres

a. non-myelinated neurons conduct action potential more quickly
b. myelin is a lipoprotein that is synthesized by the axon of a particular nerve fibre
c. the nodes of Ranvier are areas where ion channels and other excitation mechanisms are located
d. saltatorial conduction is faster than continuous conduction
e. Schwann cells form a myelin sheath for only one axon at a time
f. the thicker the filament, the lower the conduction velocity

19. Mark the correct statements about the neuron

a. unipolar neurons have only one axon

b. an axon can branch to multiple terminals, but synaptically it can only connect to one neuron
c. the synapse is where the impulse spreads further in the form of a chemical neurotransmitter
d. axonal transport is the mechanism by which the necessary substrates reach the distal parts of the axon
e. one neuron can have a maximum of two axons
f. neuron dendrites may release the neurotransmitter into the synaptic cleft of the presynaptic neuron

20. Mark the correct statements about the action potential

a. is initiated by the activation of a postsynaptic neuron
b. the activation signal must be strong enough - above a threshold
c. it may be conducted continuously in myelinated or saltatory non-myelinated nerve fibres
d. a sodium-potassium exchanger is required to restore the equilibrium concentration of ions in the neuron
e. the sodium-potassium exchanger is an ATP-dependent mechanism
f. potassium is at a higher concentration in the extracellular space

21. Mark the correct statement

a. the threshold stimulus is sufficient to generate the action potential of the neuron
b. the refractory period is present only in the hyperpolarization phase
c. during absolute refractory period action potential can be triggered with threshold stimulus
d. prevention of Na+ entry into the cell during the refractory period is ensured by the gating of the channels
e. neurotransmitters can also affect the presynaptic neuron through autoreceptors
f. myelination and fibre diameter are determinative of the amount of neurotransmitter released from the synaptic end

22. Mark the correct statements

a. the semi-permeability of the cell membrane to individual ions is the base for the unequal distribution of ions
b. the potential difference on the membrane is called the membrane potential
c. the energy required for the activity of the sodium-potassium pump is obtained by the oxidation of glucose
d. during repolarization, sodium enters the cell
e. potassium permeability increases during transpolarization
f. the sodium-potassium pump promotes the entry of sodium into the cell

23. Mark the correct statements

a. above-threshold stimuli increase the response mainly because they irritate other neurons
b. an adequate stimulus results from the specific sensitivity of neurons to certain types of energy
c. the lower the intensity of the stimulus, the longer it must act
d. the rate of change of stimulus intensity does not affect the propagation of excitation
e. under natural conditions, excitations on the nerve fibre propagate in both directions
f. the thicker the nerve fibre, the slower the action potential

24. Mark the correct statement about the refractory phase (period). It is

a. a time during which action potential cannot be generated
b. a time during which the action potential is generated even with a minimal stimulus
c. caused by inhibitory neurotransmitters
d. caused by excitatory neurotransmitters
e. caused by the inactivation of voltage-gated Na+ channels
f. caused by the accumulation of inhibitory postsynaptic action potentials

25. Mark the correct statements about the neuron

a. it consists of a body and processes
b. it has many axons
c. the longest processus is called the axon
d. the junction of two neurons is called a sarcomere
e. it is able to generate and spread action potential
f. the signal propagation between two neurons most often occurs by chemical transmission

26. Mark the correct statements about slow voltage-gated potassium channels

a. they open during the transpolarization phase
b. they open during the repolarization phase
c. they provide resting membrane potential
d. their opening is due to the binding of acetylcholine
e. their opening causes a decrease in membrane potential
f. they are coupled to G proteins

27. Mark the correct statements about neurons

a. they are able to proliferate (divide) throughout life
b. after birth they are no longer able to divide
c. sensory neurons are efferent

d. motor neurons conduct action potential in an efferent manner
e. they are found exclusively in the CNS
f. myelinated neurons are located exclusively on the periphery

28. Mark the correct statements

a. the resting membrane potential on the nerve cell is -70 mV
b. hyperpolarization is associated with increased permeability to chloride anions
c. during hyperpolarization, the action potential on a nerve cell spreads faster
d. Na+/K+ ATP pump is also responsible for maintaining the resting membrane potential
e. repolarization is a return to resting membrane potential values
f. during depolarization, sodium passes through the sodium channel due to ATP

29. Mark the correct statements

a. potassium leakage from the cell leads to repolarization
b. inhibitory synapse causes depolarization on the neuron
c. the sodium-potassium pump is important for maintaining the resting membrane potential
d. the resting membrane potential is given by the equal distribution of ions on the membrane
e. permanently opened potassium channels are important for repolarization
f. transpolarization is exceeding the value of the membrane potential to positive values (more than 0)

30. Mark the correct statements

a. the influx of sodium into the cell leads to depolarization of the membrane on the neuron
b. excitatory synapse causes depolarization on the neuron
c. permanently opened potassium channels are important for maintaining resting membrane potential
d. the resting membrane potential is given by the equal distribution of ions on the membrane
e. permanently opened potassium channels are important for repolarization
f. the strength of smooth muscle contraction depends on the calcium concentration

31. Mark the correct statements

a. the smaller the axon diameter, the faster the action potential spreads on it
b. on unmyelinated axons, the action potential spreads faster than on myelinated axons
c. the thicker the nerve fibre, the faster the action potential spreads
d. motor neurons propagate action potential faster than sensory neurons
e. sympathetic nerve fibres conduct the action potential the fastest

f. sodium channels are deposited in the Ranvier nodes

32. Mark the correct statements

a. the concentration of sodium ions is higher in the extracellular space than in the intracellular
b. the membrane potential represents an electrical gradient allowing the transfer of ions
c. calcium and not sodium cations are important in the saltatory propagation of excitation
d. myelinated nerve fibres conduct action potential more slowly than unmyelinated nerves
e. the individual nerve fibres on the periphery form bundles covered with a membrane - nerves
f. There are 3 main types of synapses - chemical, electrical and mixed

33. Mark the correct statements

a. the more myelin on the axon, the faster the action potential spreads
b. the more myelin on the axon, the slower the action potential spreads
c. the thicker the unmyelinated fibre, the faster the action potential spreads
d. the thicker the unmyelinated fibre, the slower the action potential spreads
e. the longer the unmyelinated fibre, the faster the action potential spread
f. the longer the unmyelinated fibre, the slower the action potential spread

34. Mark the correct statements for fast voltage-gated Na+ channels

a. they are non-selective cation channels
b. they open after binding of acetylcholine
c. they open after exceeding the threshold membrane potential
d. they are responsible for depolarisation
e. they are responsible for the refractory phase
f. in the myelinated part of the neuron, they are located denser than in the unmyelinated part

35. Mark the correct statements for neurotransmitters. They

a. mediate signal transduction at chemical synapses
b. mediate signal transmission at electrical synapses
c. include angiotensin
d. include acetylcholine
e. bind exclusively to ligand-directed ion channels
f. bind to receptors that may be located on the postsynaptic or the presynaptic membrane

36. Mark the correct statements. Speed of propagation of action potential

a. decreases with distance from the body of the neuron
b. increases with distance from the body of the neuron
c. increases with decreasing neuron diameter
d. is lower in unmyelinated fibres
e. decreases with decreasing neuron diameter
f. may be affected by an external condition

37. Mark the correct statements. The action potential

a. begins with the activation of a postsynaptic neuron
b. the activation signal must be strong enough - above the threshold
c. it is conducted continuously in myelinated nerve fibres
d. a sodium-potassium pump is needed to restore the equilibrium concentration of ions in the neuron
e. the sodium-potassium pump is dependent on ATP
f. potassium is in a higher concentration in the extracellular space

38. Mark, what applies to absolute refractory period

a. it allows nerve impulses to spread in one direction
b. during this, the cardiomyocyte cannot be depolarized by any stimulus
c. it is caused by a voltage-controlled K+ channel
d. it is caused by the activation of M2 receptors
e. it is caused by inactivation of HCN channels
f. it activates the sympathetic nervous system

39. Mark the correct statements about the absolute refractory period

a. it is the interval when an action potential can be evoked by a supramaximal stimulus
b. sodium channels are closed in this phase
c. the membrane is hyperpolarised in this phase
d. action potential generation is possible in this phase
e. it represents the interval at which the excitability of the nerve fibre has been restored
f. it is the interval when the generation of action potential is excluded

40. Mark, what is responsible for nerve cell depolarization

a. Na+ ions
b. K+ ions
c. channel inactivation
d. voltage-gated channel
e. threshold stimulus
f. sodium channel

41. Mark, which of the following will increase the speed of action potential propagation?

a. thin, unmyelinated axon
b. thin, myelinated axon
c. thicker, unmyelinated axon
d. thicker, myelinated axon
e. 98% insolation of myelinated fiber
f. 20% insolation of myelinated fiber

42. Myelin

a. belongs to lipoproteins
b. can slow down the spread of action potential
c. is responsible for the saltatory propagation of excitation on the nerve fibre
d. is responsible for the bidirectional propagation of the action potential on the nerve fibre
e. is produced by astrocytes
f. is important for the ability of nerve cells to regenerate

43. Myelin sheath on a neuron

a. is made up of Schwann cells
b. is formed by oligodendrocytes
c. is formed by astrocytes
d. accelerates the propagation of excitation on the neuron
e. slows the spread of action potential on the neuron
f. causes a saltatory spread of action potential on the neuron

44. Myelination

a. increases the speed of propagation during excitation on the neuron
b. the thicker the myelin sheath the higher the speed of propagation of the action potential
c. is present on both peripheral and central nerves
d. is most intense in nodes of Ranvier
e. plays a crucial role in reducing the speed of conduction of excitation on the neuron
f. is present only in the brain

45. Neuron

a. is the basic functional unit of the nervous system
b. is the basic structural unit of the nervous system
c. is an excitable cell
d. can trigger action potential once a life
e. has a different structure in the central nervous system and in the periphery
f. the axon is always myelinated

46. Propagation of action potential without decrement

a. means spreading the action potential without loss
b. is characteristic of the spread of action potential on the nerve cell
c. results from the structure of the neuron's membrane
d. takes place only on myelinated fibres
e. is typical for an electrical synapse
f. it is defined by the density of nodes of Ranvier on the membrane

47. Propagation of the action potential on the nerve

a. is recorded by an electroneurogram
b. is faster on myelinated fibres
c. is slower if the internodes are shorter
d. decreases with the distance transmitted
e. occurs only in the central nervous system
f. occurs by saltatorial way only in the autonomic nervous system

48. Response to the impulse "all or nothing"

a. occur on the membrane of nerve cells
b. occur in an area with a predominance of voltage-gated channels
c. means that the cell responds with excitement or, conversely, does not respond at all
d. occur mainly in the area of receptor-controlled channels
e. is typical exclusively for motor neurons
f. characterizes the release of the mediator into the synaptic cleft

49. Resting membrane potential on a neuron

a. has a value of -70 mV
b. has a value of -90 mV
c. is given by the equal distribution of ions on the membrane
d. is given by the unequal distribution of ions on the membrane
e. is maintained by permanently opened potassium channels
f. is maintained by voltage-gated potassium channels

50. Schwann cells form myelin sheaths

a. in the central nervous system
b. in the peripheral nervous system
c. in the hippocampus
d. in the neocortex
e. in the limbic system
f. in the temporal lobe

51. The absolute refractory period of the sodium channel on a neuron

a. is given by conformational changes of activation and inactivation gates on the channel
b. is typical for permanently opened sodium channels
c. is typical for voltage-gated sodium channels
d. means that the sodium channel opens only with a supramaximal stimulus
e. means that the sodium channel is not opened even by a supramaximal stimulus
f. is important for the one-way propagation of the action potential on the neuron

52. The action potential is spreading

a. by axon
b. on the body of a nerve cell
c. with decrement
d. to the main dendrites strains
e. always in both directions
f. only in myelinated fibres

53. The excitatory postsynaptic potential causes on the membrane of the neuron

a. hyperpolarization
b. transpolarization
c. increased permeability to sodium
d. increased permeability to chlorine
e. depolarization
f. increase in membrane potential

54. Mark, what applies to neurons

a. they do not contain a nucleus and are therefore not able to divide in adulthood
b. they are excitable
c. each neuron has at most two synapses
d. an afferent neuron conducts excitement from the CNS to the sensor
e. calcium is required to flush the neurotransmitter into the synaptic cleft of the neuron
f. myelination of neuronal axons is necessary for the conduction of nerve impulses

55. The inhibitory postsynaptic potential causes on the neuronal membrane

a. hyperpolarization
b. transpolarization
c. increased permeability to sodium
d. increased permeability to chlorine
e. depolarisation
f. change of potential towards more negative values

56. The Ranvier nodes

a. are the places with the highest layer of myelin
b. do not contain myelin
c. are located on the body (soma) of the neuron
d. are located on the axon of the neuron
e. are located on dendrites
f. are located on the presynaptic membrane

57. Threshold stimulus

a. is strong enough to trigger an action potential
b. is stronger than needed to trigger an action potential
c. is weaker than necessary to trigger an action potential
d. on the neuron represents a change of 15 mV towards the trigger level
e. is a stimulus that activates myelin production
f. is a stimulus that induces phagocytosis in microglia

58. Voltage-gated ion channels

a. are proteins in the cell membrane through which ions flow freely into the cell so that the ion concentrations are the same on both sides of the membrane
b. are proteins in the cell membrane that open and close depending on the membrane's potential
c. do not participate in signal transduction along the cell membrane
d. participate in signal transmission along the cell membrane (so-called action potential)
e. include e.g. Na+ and K+ channels
f. they need a ligand for their activity - they are called ligand-gated ion channels

59. What applies to communication between two neurons?

a. has the character of chemical communication
b. has the character of electrical communication
c. is implemented through tight junctions
d. is realized through neuromediators
e. takes place at the synapse
f. spreads from the first to the second neuron always saltatorial

60. What applies to the myelin sheath?

a. it has insulating properties and therefore reduces the conduction velocity of excitation
b. in the peripheral nervous system is formed by Schwann cells
c. in the central nervous system is formed by astrocytes
d. is important for the regeneration of damaged axons

e. its basic component, myelin, contains glycolipids, sphingolipids, cholesterol and proteins
f. it propagates action potential in a saltatorial way

61. What changes in conductivity are associated with the ascending phase of the action potential?

a. activation of voltage-gated chloride channels
b. activation of voltage-gated potassium channels
c. activation of voltage-gated sodium channels
d. activation of chemically controlled sodium channels
e. inhibition of Na+/K+ ATPase
f. G-protein inhibition

62. What is responsible for maintaining the resting membrane potential?

a. sodium voltage-gated channel
b. potassium voltage-gated channel
c. chloride voltage-gated channel
d. ryanodine receptor
e. potassium permanently opened channel
f. sodium permanently opened channel

63. Which channels are necessary for the action potential?

a. permanently opened potassium
b. permanently opened sodium
c. voltage-gated sodium
d. voltage-gated potassium
e. chloride
f. chemically controlled sodium-potassium

1.5 HOMEOSTASIS, ACID-BASE BALANCE, WATER MANAGEMENT

1. ADH

    a. is an atrial diuretic hormone
    b. is an antidiuretic hormone
    c. is vasopressin
    d. is released from the cardiomyocytes of the atria of the heart
    e. is washed out with increased tension in the walls of the atria of the heart
    f. is released from the pituitary gland

2. ADH

    a. is produced by the adenohypophysis
    b. is produced by the neurohypophysis
    c. is produced by the hypothalamus
    d. causes an increase in diuresis
    e. causes a decrease in diuresis
    f. increases urinary water loss

3. Among the basic mechanisms maintaining a constant pH of body fluids do not belong

    a. hemoglobin
    b. phosphate buffer
    c. bicarbonate buffer
    d. calcium buffer
    e. protein buffer
    f. sodium buffer

4. An abnormally elevated level of potassium in the blood is called

    a. hypernatremia
    b. hyponatremia
    c. hyperkalaemia
    d. tetany
    e. hypercalcaemia
    f. hypochloraemia

5. An abnormally elevated level of sodium in the blood is called

    a. hypernatremia
    b. hyponatremia
    c. hyperkalaemia
    d. tetany
    e. hypercalcemia
    f. hypochloraemia

6. Antidiuretic hormone affects water permeability

    a. in the Bowman capsule
    b. in the proximal tubule
    c. in the descending limb of loop of Henle
    d. in the collecting duct
    e. in the distal tubule
    f. in the ascending limb of loop of Henle

7. Carbonate dehydratase

    a. is an enzyme
    b. catalyses the conversion of carbonic acid
    c. is active in renal tubule cells
    d. is especially active in the liver
    e. its activation causes alkalization of the urine
    f. is an important part of the phosphate buffer system

8. Carbonate dehydratase

    a. is a carbon dioxide-bound to hemoglobin
    b. actively contributes to the maintenance of homeostasis in the body
    c. releases carbon dioxide in the lungs
    d. is a carbon monoxide-bound to hemoglobin
    e. binds carbon dioxide in the lungs
    f. is an enzyme

9. Carbonate dehydratase is

    a. an enzyme that catalyses the conversion of CO_2 and H_2O to H_2CO_3
    b. an enzyme that catalyses the conversion of PO_3 and H_2O to H_2PO_4
    c. an enzyme that catalyses the conversion of NH_3 and H^+ to NH_4
    d. an enzyme by which an unstable intermediate is formed, and it immediately decomposes into HCO_3^- and H^+
    e. an enzyme by which an unstable intermediate is formed, and it immediately decomposes into HPO_4^- and H^+
    f. the enzyme by which the stable product is formed

10. Chemical buffer systems include

    a. bicarbonate system
    b. phosphate system
    c. hemoglobin system
    d. sulphite system
    e. hormonal system
    f. gastrointestinal system

11. Compensatory mechanisms for reduced blood pressure are

a. cardiac output increases
b. cardiac output is reduced
c. vasoconstriction occurs
d. vasodilation occurs
e. there is a reduced renal excretion of salts
f. there is increased renal excretion of salts

12. Diagnostic urine strips detect the presence of which substances?

a. cholesterol
b. leukocytes
c. glucose
d. protein
e. creatine kinase
f. calcium

13. Electrolytes are lost mostly through

a. saliva
b. kidneys
c. urine
d. faeces
e. respiration
f. sweat

14. Extracellular fluid

a. represents blood plasma
b. represents tissue fluid
c. represents the total water in the body
d. contains mainly sodium
e. contains mainly potassium
f. has an osmolality of 280 mmol / kg

15. Glutaminase

a. is an enzyme
b. catalyses the conversion of glutamine
c. is part of the phosphate buffer system
d. catalyses the conversion of glutamate
e. when there are many acidic substances in the body, it promotes the excretion of alkaline urine
f. is part of the ammonium buffer system

16. Homeostasis is regulated by

    a. the nervous system
    b. the kidneys
    c. the respiratory system
    d. the cardiovascular system
    e. the skin
    f. none of the answers is correct

17. Homeostasis means

    a. blood clotting process
    b. maintaining the constant osmotic pressure
    c. maintaining the stability of the internal environment
    d. maintaining the constant pH
    e. maintaining the stability of the external environment
    f. development of action potential in the ear

18. How is excessive fluid intake regulated in the body? There is an activation of

    a. reduction of ADH
    b. reduction of water resorption
    c. increased water excretion
    d. increase of ADH
    e. increase of water resorption
    f. reduced of water excretion

19. How soon after drinking a large glass of water (e.g. 400 ml) will a person start increasing their urine output?

    a. 5 minutes
    b. 30 min
    c. 1 hour
    d. 3 hours
    e. 10 minutes
    f. 60 minutes

20. Hypernatremia

    a. represents an increased amount of sodium
    b. represents a reduced amount of sodium
    c. represents a reduced amount of potassium
    d. represents an increased amount of potassium
    e. leads to thirst
    f. causes fluid retention

21. Identify possible causes of elevated sodium concentrations in the body

a. increased renin production
b. increased production of antidiuretic hormone
c. increased production of atrial sodium uretic peptide
d. reduced angiotensin I production
e. reduced aldosterone production
f. reduced angiotensin II production

22. Identify systems that are involved in the balance of body fluids and electrolytes

a. breathing system
b. cardiovascular system
c. excretory system
d. nervous system
e. digestive system
f. musculoskeletal system

23. Identify the organs involved in the stability of the indoor environment

a. hypothalamus
b. kidneys
c. stomach
d. small intestine
e. liver
f. esophagus

24. Identify the causes of low osmolality

a. hypotension
b. activation of the renin system angiotensin aldosterone
c. low secretion of antidiuretic hormone
d. the production of atrial sodium uretic peptide is increased
e. the activation of the renin system by angiotensin aldosterone is reduced
f. NaCl retention

25. Important buffer systems in the body are

a. sulphite buffer system
b. bicarbonate buffer system
c. hemostasis buffer system
d. biliverdin buffer system
e. protein buffer system
f. ammonium buffer system

26. In addition to the bicarbonate buffer system, which system is important to maintain the blood pH?

    a. the ratio between potassium and calcium
    b. ratio between albumin and globulin
    c. hemoglobin
    d. calcium citrate
    e. the ratio between creatine and creatinine
    f. the ratio between sodium and potassium

27. In case of excess water in the body

    a. breathing slows
    b. heart activity slows down
    c. the release of antidiuretic hormone is reduced
    d. the osmolality of the extracellular fluid is reduced
    e. diuresis occurs
    f. there is a feeling of thirst

28. In case of lack of water in the body

    a. the extracellular fluid becomes hypertonic
    b. breathing accelerates
    c. the extracellular fluid becomes hypotonic
    d. the secretion of antidiuretic hormone is increased
    e. the secretion of antidiuretic hormone is reduced
    f. there is a feeling of thirst

29. In situation of hyponatremia

    a. ADH secretion decreases
    b. water excretion increases
    c. plasma volume increases
    d. water excretion decreases
    e. the patient urinates more
    f. the activity of the renin angiotensin aldosterone system is suppressed

30. Mark the body's reactions to fluid deficiency

    a. vasoconstriction
    b. increase in antidiuretic hormone levels
    c. thirst
    d. onset of edema
    e. increase in blood pressure
    f. hyperexcitation

31. Mark the hormones and paracrine agents which stimulate reabsorption in the tubules

a. renin
b. aldosterone
c. angiotensin II
d. vasopressin
e. parathyroid hormone
f. corticotropin

32. Mark the correct statements

a. the pH of urine in a healthy person is around 6
b. cloudy urine speaks of the presence of bacteria
c. the pH of urine in a healthy person is less than 4
d. the pH of urine in a healthy person is more than 8
e. high urine pH can occur with a vegetarian diet
f. evening urine is used for urine analysis

33. Mark the correct statements

a. newborns have the highest percentage of fluids
b. volume receptors in the atria of the heart respond to decreased blood volume in the atria by retaining fluids
c. antidiuretic hormone is secreted in response to decreased blood flow to the lungs
d. the daily urine volume of a healthy adult should not exceed one litre
e. deep breathing is a reaction to a lack of fluids
f. fluid expenditure in a healthy human body must be on average 10% higher than intake

34. Mark the correct statements

a. active conversion of CO_2 and H_2O is mediated by the enzyme carbonate dehydratase
b. an increased concentration of ammonia is usually associated with an increased breakdown of sugars
c. glutamine from tubular cells is cleaved to glutamate and ammonia
d. alkalization of urine increases H^+ retention in hemoglobin blood
e. acidosis is associated with an increase in pH
f. hemoglobin is an important component of alkalies protein buffering

35. Mark the correct statements

a. tubular mass of secretion is an expression of the gradient of excreted and filtered PAH
b. the normal value of the filtration fraction is 25% of the plasma filtered into tubules

c. effective renal plasma flow is an expression of total hematocrit
d. paraaminohipuric acid is excreted into the renal arteries
e. stress and physical activity increase diuresis and creatinine clearance
f. vasoconstriction of the renal arteries reduces glomerular filtration and water retention

36. Mark the correct statements

a. the walls of the renal tubules are made of urothelium
b. the bladder walls are formed by urothelium
c. vasopressin is not involved in the regulation of osmolarity
d. creatinine clearance indicates the filtering ability of the kidneys
e. hemoglobin is involved in the regulation of acid-base balance
f. glucose is commonly found in trace amounts in urine

37. Mark the correct statements

a. the osmolality decrease together with an increased fluid intake makes the cell swell
b. the regulation of renal homeostasis is fast and is under nervous regulation
c. the osmolality increases together with an decrease fluid intake makes the cell shrink
d. in the absence of water in the body, vasopressin is decreased, and urination occurs
e. excess water in the body decreases vasopressin output and promotes urination
f. the atrial natriuretic peptide is released from the kidneys

38. Mark the correct statements

a. the physiological pH of the blood is 7.4 ± 0.04
b. alkalosis is an increase in H^+ concentration
c. the hemoglobin buffer system is a chemical buffer system
d. the enzyme carbonate dehydratase catalyses the reversible conversion of H^+ and HPO_4^- to H_2PO_4
e. the enzyme carbonate dehydratase catalyses the reversible conversion of carbon dioxide and water to carbonic acid
f. regulation of acid-base balance with chemical buffers and the respiratory system is slow and slowly depleted

39. Mark the correct statements. What could be present in the urine of a healthy person?

a. urea
b. glucose
c. protein
d. creatinine
e. sodium
f. hydrogen protons

40. Mark the correct statements

a. the physiological pH of urine is in the range of 1-3
b. increased urea metabolism may lead to reddening of the urinary sediment
c. rotten apple odour can be a sign of diabetic ketoacidosis
d. cataracts are usually present in infectious diseases
e. the proximal tubules are those through which the final urine is drained into the collecting duct
f. in the descending part of loop of Henle, Na^+ and water reabsorption

41. Osmolality expresses

a. amount of solute by weight
b. volume of solute
c. amount of protein by weight
d. amount of protein by volume
e. substance amount of hormones based on weight
f. amount of hormones by volume

42. Osmolarity expresses

a. amount of solute by weight
b. volume of solute
c. amount of protein by weight
d. amount of protein by volume
e. substance amount of hormones based on weight
f. amount of hormones by volume

43. Plasma osmolality

a. is the amount of solute in a unit mass of the solvent
b. is the amount of solute in a unit volume of solvent
c. reflects the state of hydration
d. if it increases, the cell shrinks
e. if it increases, the cell swells
f. reflects heart function

44. Regulation of acid-base balance in the kidneys

a. takes place by exchanging two H^+ ions for one Ca^{2+} cation
b. takes place by exchanging one H^+ ion for one Na^+ cation
c. hydrogen ions are excreted in the urine and bicarbonate anions are absorbed into the blood
d. bicarbonate anions are excreted in the urine and hydrogen ions are absorbed into the blood
e. is called metabolic regulation
f. an enzyme carbonate dehydratase is involved in it

45. Regulation of acid-base balance in the kidneys involved

a. H^+ ions
b. enzyme carbonate dehydratase
c. enzyme alcohol reductase
d. ammonium cations
e. bicarbonate cations
f. chloride anions

46. The body's responses to low blood pressure are

a. increase in cardiac output
b. reduction of cardiac output
c. vasoconstriction
d. vasodilation
e. aldosterone release
f. release of ADH

47. The body's responses to high blood pressure are

a. increase in cardiac output
b. reduction of cardiac output
c. vasoconstriction
d. vasodilation
e. aldosterone release
f. release of ADH

48. The body's water output is directly impacted by

a. the skeletal muscles
b. the excretory system
c. the liver
d. the cardiovascular system
e. the skin
f. the respiratory system

49. Mark, what applies to the buffering ability of the kidneys

a. HCO_3^- is excreted in the urine and H^+ is reabsorbed into the blood
b. the product of phosphate buffer in urine is Na_2PO_4
c. H^+ is responsible for alkalizing urine
d. HCO_3^- is reabsorbed from urine into the blood and H^+ is excreted in the urine
e. the physiological pH of urine ranges from 4.0 to 8.0
f. an important component of the carbonate buffer is the enzyme carbonate dehydratase

50. The interstitial fluid is

a. fluid in the cytosol of cells
b. liquid component of blood
c. fluid found in all cells of the body except blood cells
d. intracellular fluid located between membranes
e. plasma
f. tissue fluid

51. The kidneys are involved in regulation of the pH of the extracellular fluid by

a. adjusting glomerular filtration
b. excretion of H^+
c. Ca^{2+} resorption
d. increasing the water permeability of the distal nephron
e. glucose excretion
f. inulin resorption

52. The osmolality is controlled by

a. the sympathetic nervous system
b. the CNS (hypothalamus)
c. the parasympathetic nervous system
d. antidiuretic hormone
e. dopamine
f. the kidney

53. The protein buffer system includes

a. plasma proteins
b. biliverdin
c. intracellular proteins
d. leukocytes
e. plasminogen
f. albumin and globulins

54. The role of the kidneys in water management

a. depends on the ability of glomerular filtration
b. it varies depending on the osmolarity of the extracellular environment
c. the kidneys actively replenish the bloodstream
d. the kidneys recycle water into the bloodstream
e. the kidneys retain water in the event of a lack of water in the body
f. the kidneys always filter a constant amount of water regardless of the situation

55. The weight ratio of the components of the bicarbonate buffer in the plasma is

a. 1:2
b. 1:10

c. 1:20
d. 1:40
e. 1:50
f. 1:60

56. Total intake and output of water in the body in 1 day is

a. 1.5 l / day
b. 2.5 l / day
c. 4.8 l / day
d. 5.6 l / day
e. 1.0 l / day
f. 2.8 l / day

57. Water intoxication

a. is formed by an excess of salt in water
b. is formed when a large amount of water is drunk quickly
c. causes nausea, vomiting and shock
d. causes muscle pain, brain edema
e. arises because the attenuation of ADH expenditure cannot be applied
f. arises because large amounts of ADH are rapidly excreted

58. Mark, what applies to water management of the body

a. osmolality is controlled only by baroreceptors and osmoreceptors
b. central osmoreceptors are located in the hypothalamus
c. with a decrease in osmolality, there is an increased secretion of antidiuretic hormone
d. the hypertonicity of the extracellular fluid leads to reduced water excretion
e. vasopressin is secreted due to increased ECT osmolality
f. the volume of extracellular fluid is also regulated by the RAAS system

59. What are the mechanisms of kidney water management?

a. glomerular titration
b. tubular secretion
c. glomerular filtration
d. tubular reabsorption
e. Henle's osmosis
f. loop diffusion

60. What can be found in the urine of a healthy adult

a. glucose
b. proteins
c. urea

d. hemoglobin
e. sodium chloride
f. leukocytes

61. What contains urine in a physiological state?

a. sodium cations
b. chloride anions
c. glucose
d. ketone bodies
e. leukocytes
f. erythrocytes

62. Mark, which substances do not participate in the regulation of acid-base balance in the kidneys?

a. ammonium cations
b. hydrogen phosphate cations
c. ANP
d. carbonate anions
e. tubular cells
f. lymphatic vessels

63. What is the effect of antidiuretic hormone on the renal tubules?

a. it causes the absorption of Na^+ from the filtrate into tubular cells
b. it causes a decrease in urine concentration
c. it causes the walls of the collecting channel to become permeable to water
d. it causes an increase in the volume of the filtrate
e. it causes an increase in H^+ concentration and acidification of urine
f. it causes potassium to leach into the blood

64. What provide direct regulation of body fluid homeostasis?

a. respiratory system
b. cardiovascular system
c. kidney
d. muscular system
e. sensor system
f. gastrointestinal system

65. What roles does ANP play in urine production?

a. stimulates Na^+ reabsorption
b. stimulates Ca^{2+} reabsorption
c. stimulates water reabsorption
d. inhibits Na^+ reabsorption

e. inhibits renin
f. inhibits erythropoietin

66. Which hormone causes an increase in water permeability in the collecting ducts in the kidney?

a. adrenaline
b. aldosterone
c. antidiuretic hormone
d. angiotensin II
e. atrial natriuretic peptide
f. erythropoietin

67. Which hormone causes increased sodium reabsorption in the kidneys?

a. adrenaline
b. antidiuretic hormone
c. aldosterone
d. calcitriol
e. atrial natriuretic peptide
f. erythropoietin

68. Which hormones / agents are directly involved in the regulation of extracellular fluid?

a. aldosterone
b. atrial natriuretic peptide
c. antidiuretic hormone
d. renin
e. adrenaline
f. cortisol

69. Which ions are involved in maintaining acid-base balance?

a. phosphate ions
b. chloride ions
c. magnesium ions
d. bicarbonate ions
e. potassium ions
f. calcium ions

70. Which part of the brain is responsible for regulating thirst

a. pons Varoli
b. medulla oblongata
c. cerebellum
d. thalamus
e. hypothalamus

f. midbrain

71. Which reactions are catalysed by carbonate dehydratase?

a. $HPO_4^{2-} + H^+ \leftrightarrow H_2PO_4^-$
b. $CO_2 + H_2O \leftrightarrow H_2CO_3$
c. $HCO_3^- + H^+ \leftrightarrow H_2CO_3$
d. $H_2PO_4^- + OH^- \leftrightarrow HPO_4^{2-} + H_2O$
e. $NH_3 + H^+ \leftrightarrow NH_4^+$
f. $HPO_4^{2-} + H^+ \leftrightarrow H_2PO^{4-}$

72. Which receptors are involved in maintaining homeostasis as body fluid volume decreases?

a. volume receptors in the atria
b. volume receptors in the hypothalamus
c. volume receptors in carotid arteries
d. baroreceptors in the aorta
e. baroreceptors in the kidney
f. baroreceptors in the hypothalamus

73. Which regulatory mechanisms are in place during thirst?

a. hypothalamic activation
b. increase in ADH secretion
c. reduction of ADH secretion
d. adrenal activation
e. hypothalamic attenuation
f. increase water resorption

74. Which of the following chemical buffer systems participate in pH maintaining?

a. phosphate
b. protein
c. glucose-fructose
d. hydrocarbonate
e. hemoglobin
f. carbohydrate

2 SELECTED QUESTION FROM THE PHYSIOLOGY OF ORGAN SYSTEMS

2.1 NERVOUS SYSTEM

Part 1

1. Cortico-spinal pathways cross-over from one side of the brain to the other side. Where does this cross-over occur?

    a. in the cerebellum
    b. in the medulla oblongata
    c. in the reticular formation
    d. in the limbic system
    e. in the hypothalamus
    f. in the basal ganglia

2. Astrocytes

    a. are involved in the function of the blood-brain barrier
    b. they form Schwann's sheath
    c. they form a myelin sheath
    d. remove cellular waste
    e. form cerebrospinal fluid
    f. none of the answers are correct

3. The brainstem does NOT contain

    a. thalamus
    b. pons
    c. medulla oblongata
    d. hypothalamus
    e. midbrain
    f. pituitary gland

4. Descending brain pathways

    a. are sensory pathways with the beginning in the frontal lobe
    b. are formed by the so-called large pyramidal neurons
    c. they branch towards the periphery - they are divergent
    d. we call them extra-pyramidal pathways and they originate in the substantia nigra
    e. the death of dopaminergic neurons can lead to Parkinson's disease
    f. their only neurotransmitters are acetylcholine and dopamine

5. Ependymal cells

    a. are involved in the function of the blood-brain barrier
    b. they form Schwann's sheath
    c. they form a myelin sheath
    d. remove cellular waste

e. form cerebrospinal fluid
f. none of the answers are correct

6. Extrapyramidal pathways include

a. tr. reticulospinalis
b. tr. vestibulospinalis
c. tr. rubrospinalis
d. tr. nigrostriatalis
e. tr. cochlearis
f. tr. occulomotorius

7. Extrapyramidal system

a. participates in motion control
b. participates in creating a memory track
c. is a cardioregulation center
d. it includes substantia nigra
e. it includes the amygdala
f. it includes to the corpus striatum

8. How many lobes does each hemisphere have

a. 3
b. 4
c. 5
d. 6
e. 7
f. 8

9. In the diencephalon is located

a. thalamus
b. pons
c. hypothalamus
d. the medulla oblongata
e. cerebellum
f. spinal cord

10. Indicate what applies to nociceptors

a. are located in the joints or muscles
b. are found in the skin
c. are located in the walls of the arteries
d. their irritation is associated with a sense of reward
e. their irritation is associated with a feeling of pain
f. their irritation is associated with a feeling of hunger

11. Indicate what applies to nociceptors. They are activated by

a. light
b. acids
c. histamine
d. cholesterol
e. heat
f. pressure

12. Mark cell types of the nerve tissue

a. cardiomyocytes
b. chondrocytes
c. ependymal cells
d. oligodendrocytes
e. megakaryocytes
f. Schwann cells

13. Mark the correct statements

a. astrocytes conduct nerve impulses
b. oligodendrocytes envelop axons of peripheral neurons
c. microglia are phagocytic cells
d. a neuron always has only one axon
e. dendrites are a type of glial cells
f. ependymal cells are involved in the production and transport of cerebral-spinal fluid

14. Mark structures that belong to the central nervous system?

a. brain, spinal cord
b. cerebellum, brainstem
c. autonomic nerves
d. medulla oblongata, special sensory organs
e. motor neurons, cerebellum
f. sensory neurons, pons

15. Mark the correct statements

a. astrocytes are important for the formation of the cell membrane
b. microglia are capable of phagocytosis
c. satellite cells are important for ganglion cell metabolism
d. oligodendrocytes are found only in the peripheral nervous system
e. ependymal cells are important for phagocytosis and the immune system of the nervous system
f. satellite cells are a modification of Schwann cells

16. Mark the correct statements about cerebrospinal fluid

a. all the ventricles of the brain are filled with it
b. it is a clear, colorless fluid
c. it forms a mechanical barrier against concussions
d. maintains homeostasis in the central nerve system
e. it is formed only in newborns, not during the life
f. renews itself once a week

17. Mark the correct statements for astrocytes

a. they form a specific type of synapse with neurons
b. they are able to differentiate into neurons
c. they are part of hyaline cartilage
d. they form synapses on the neuromuscular plaque
e. they form a support network for neurons
f. their protrusions encapsulate the capillaries of the blood-brain barrier

18. Mark the correct statements

a. ependymal cells are responsible for lining of the brain ventricles and may have cilia on the surface
b. microglia are phagocytic cells and are involved in tissue reparation
c. oligodendrocytes form connections between capillaries and neurons
d. Schwann cells form the myelin sheath for one axon of a particular neuron
e. astrocytes are responsible for transferring the action potential from one synapse to another
f. the blood-brain barrier is also formed by protrusions of astrocytes

19. Mark the correct statements. Dura mater

a. it represents the tough membrane of the brain
b. it is the outer layer adjacent to the bones of the skull
c. it is the arachnoid
d. it is the middle covering of the brain
e. it is the inner layer
f. it represents the choroid

20. Mark the correct statements. Pia mater

a. it represents the tough membrane of the brain
b. it is the outer layer adjacent to the bones of the skull
c. it is the arachnoid
d. it is the middle covering of the brain
e. it is the inner layer
f. it represents the choroid

21. Mark the true statement about the cranial nerves

a. the cranial nerves arise from the brain
b. they provide innervation to the limbs
c. they provide innervation of the head and neck
d. the cranial nerve X. is the nervus vagus
e. they are denoted by Roman letters
f. the cranial nerve VII. is the nervus vagus

22. Mark the true statement about the spinal cord

a. the spinal cord is formed by grey and white matter
b. the grey matter is surrounded by a sheath of white matter
c. the white matter is surrounded by a sheath of grey matter
d. the grey matter forms butterfly wings in cross-section
e. the white mass forms butterfly wings in cross section
f. there are the anterior and posterior horns

23. Mark what constitutes the hindbrain

a. Pons Varoli
b. cerebellum
c. mesencephalon
d. prosencephalon
e. diencephalon
f. telencephalon

24. Mark what is true about medulla oblongata

a. a grey mass on the surface, white inside
b. there is a defence centre (sneezing, coughing, vomiting)
c. there is a control centre (respiration, heartbeat, BP)
d. all the cranial nerves emerge from it
e. it is the most developmentally advanced part of the brain
f. it houses the visual and olfactory analyzers

25. Microglia

a. are phagocytic cells in CNS
b. produce myelin
c. remove cellular waste
d. provide communication between neurons
e. they are important for the leadership of excitement
f. they form cerebrospinal fluid

26. Microglia

a. are immature neurons

b. are hypoplastic neurons
c. are phagocytes in the CNS
d. are found exclusively in the peripheral nervous system
e. form the spinal cord
f. are the protrusions of the neuron

27. Preganglionic parasympathetic fibres leave the brainstem via the cranial nerves

a. IV., VII., IX., X.
b. III., V., IX., X
c. III., VII., IX., XI
d. III., VII., IX., X
e. II., VII., IX., X
f. II., III., IX., X

28. Pyramidal tract

a. is part of the limbic system
b. is a path of pain
c. is a path of motion
d. is a path of memory and perception
e. leads without interruption from the cortex to the spinal cord
f. is a dual neuronal pathway with an interruption in the nerve ganglia

29. Sympathetic fibres originate in the

a. cephalic portions of the spinal cord
b. sacral portions of the spinal cord
c. thoracic portions of the spinal cord
d. lumbar portions of the spinal cord
e. sacral portions of the spinal cord
f. cranial portions of the spinal cord

30. The brainstem contains

a. midbrain
b. pons
c. medulla oblongata
d. hypothalamus
e. II. cranial nerve
f. pituitary gland

31. The cerebellum is related to which basic somatic functions?

a. to the control of muscle tone
b. to postural reflexes
c. intentional movements

d. respiratory deceleration
e. activation of sensory perception
f. decision-making ability

32. Mark, what applies to ascending pathways

a. they are terminated at the thalamus level
b. they lead only painful stimuli
c. they are formed up of both myelinated and unmyelinated neurons
d. pain pathways are always two-neuronal pathways
e. sensory stimuli can be processed both at the level of the spinal cord and at the level of somatosensory cortex
f. the pathways for gentle touch, vibration, and proprioception intersect in the medulla oblongata

33. Mark, what applies to cranial nerves

a. they leave CNS in the area of the basal ganglia
b. are composed of unmyelinated type C fibers
c. they can have a mixed function - to conduct both motor and sensory sensations
d. we distinguish 6 main cranial nerves and 7 branches
e. they are also important for conducting sensory information from the vestibule-cochlear apparatus of the ear
f. they do not transmit sensations from chemo- and baroreceptors in blood vessels

34. Mark, what applies to the CNS organization

a. the lower cerebral centers also include the gray cortex
b. at the level of the spinal cord, there are interneuronal connections between the sensory and motor pathways
c. the basal ganglia and limbic system are also part of the brain
d. the brain plays an important role in planning and performing of movement
e. the spinal cord is part of the peripheral nervous system
f. the hypothalamus and pituitary gland are parts of the elongated spinal cord

35. The motor nerve that innervates the diaphragm is the

a. nervus vagus
b. nervus spinalis
c. nervus phrenicus
d. nervus diaphragmis
e. nervus cervicalis
f. nervus bronchialis

36. The pain enters the CNS through nerve fibers

a. which are myelinated
b. which are unmyelinated
c. type Aγ
d. type Aδ
e. type B
f. type C

37. The top layer of the CNS cover is made up of

a. dura mater
b. subarachnoid space
c. soft mater
d. pia mater
e. cranial nerves
f. spinal nerves

38. What applies to meninges?

a. the dura mater adheres to the brain surface and includes blood vessels
b. sagittal sinuses are a system of blood drainage from the brain to the veins
c. arachnoid is a membrane that separates the subarachnoidal and subdural space
d. the soft membrane (pia mater) is found only in the brain and does not pass into the spinal canal
e. the central canal of the spinal cord is lined with dura mater
f. the subarachnoid space is filled with arterial blood

39. What applies to oligodendrocytes?

a. they are a major defense component against infection and neoplastic cells
b. they form the lining of the cerebral ventricles and spinal canal
c. they form myelin
d. have several protrusions that wrap around axons (creates segments of myelin)
e. they are large glial cells that form a support network in the CNS
f. their damage leads to the development of demyelinating diseases

40. What applies to the central nerve system (CNS)?

a. it consists only of the brain
b. it consists of the brain and spinal cord
c. it consists mainly of white matter (neuron bodies) and gray matter (axons)
d. the brain is responsible for conscious control of the body and higher brain activity, but it does not control autonomous activities
e. the brain does not process stimuli from peripheral tissues, these are processed only at the level of the reflex arc
f. from the CNS, axons of efferent neurons lead to the periphery

41. What are the meninges and spaces that surround the brain, in order from superficial to deep (outermost to innermost)?

    a. epidural space, dura mater, arachnoid, subarachnoid space, pia mater
    b. pia mater, arachnoid, dura mater, epidural space, septum
    c. pia mater, arachnoid space, arachnoid, dura mater
    d. arachnoid, epidural space, dura mater, pia mater, subarachnoid space
    e. arachnoid, subarachnoid space, pia mater, epidural space, dura mater
    f. dura mater, epidural space, arachnoid, dura, subarachnoid space

42. Where does the spinal cord start and finish? It extends from

    a. the foramen magnum to sacral part of the spinal cord
    b. C7 to L5
    c. the foramen magnum to L1 – L2
    d. C5 to Th5
    e. the foramen magnum to thoracic part of the spinal cord
    f. C1 to S5

43. Where is the vasomotor center located? In the

    a. medulla oblongata
    b. neocortex
    c. limbic system
    d. middle ground
    e. midbrain
    f. reticular formation

44. Which cranial nerve does not control activity of organs in the head and neck?

    a. n. vagus
    b. n. olfactorium
    c. n. trochlearis
    d. n. facialis
    e. n. opticus
    f. n. glossopharyngeus

45. Which cranial nerves form the parasympathetic compartment

    a. olfactory nerve
    b. optic nerve
    c. oculomotor nerve
    d. trigeminal nerve
    e. facial nerve
    f. statoacustic nerve

46. Which cranial nerves have nuclei in the midbrain?

a. I. (olfactory)
b. II. (optic)
c. III. (oculomotor)
d. IV. (trochlear)
e. V. (trigeminal)
f. VI. (abducens)

47. Which lobes are in the hemispheres

a. frontal
b. parietal
c. occipital
d. temporal
e. ethmoidal
f. posterior

48. Which of the following parts of the brain are not part of the cerebral cortex?

a. motor areas and sensory areas
b. thalamus, hypothalamus
c. precentral gyrus and postcentral gyrus
d. white matter and basal nuclei
e. cerebellum, pons
f. medulla oblongata

49. Which part of the brain provides precise, coordinated skeletal muscle movements and posture?

a. cerebellum
b. midbrain
c. hypothalamus
d. medulla oblongata
e. pons
f. basal ganglia

50. Which structures are located in the diencephalon?

a. midbrain (mesencephalon), pons, spinal cord
b. sympathetic system, parasympathetic system
c. pons, cerebellum
d. medulla oblongata, brain
e. thalamus, hypothalamus, retina
f. arachnoid, dura mater

51. Which structures of the brain belong to the limbic system?

a. substantia nigra
b. vagus nerve
c. amygdala
d. basal ganglia
e. hippocampus
f. gyrus cinguli

52. Pulmonary artery begins at the

a. right atrium
b. right ventricle
c. left atrium
d. left ventricle
e. mitral valve
f. tricuspid valve

53. Aorta begins at the

a. right atrium
b. right ventricle
c. left atrium
d. left ventricle
e. mitral valve
f. semilunar valve

54. Diaphragm

a. is a smooth muscle
b. covers the lungs
c. is a skeletal (striated) muscle
d. separates the thoracic cavity from the abdominal cavity
e. vessels and e.g. esophagus pass through it
f. the bronchi and trachea pass through it

55. Diaphragm

a. it extends across the bottom of the thoracic cavity
b. is a smooth muscle
c. is activated during sleep
d. is the main respiratory muscle
e. is located on the back
f. is serous membrane

56. Mark the arteries, involved in blood supply of the brain

a. arteria carotis interna
b. arteria carotis externa

c. arteria vertebralis
d. arteria mesenterica superior
e. arteria facialis
f. arteria basilaris

57. Jaw

a. in Latin, it is called maxilla
b. has an irregular shape
c. the upper teeth are fixed in it
d. in Latin it is called mandible
e. isa bone of the skull
f. the lower teeth are fixed in it

58. Mandible

a. is upper jaw
b. it is the lower jaw
c. is a flat bone
d. the masticatory muscles are attached to it
e. is important for breathing
f. has the shape of letter D

59. Mark the correct statements about the nasal bone

a. in Latin, it is called os lacrimale
b. in Latin, it is called os nasale
c. it is a paired bone
d. it is an unpaired bone
e. forms the upper part of the outer nose
f. forms the posterior part of the nasal septum

60. Mark muscles of the back

a. m. trapezius
b. m. latissimus dorsi
c. m. pectoralis major
d. m. rectus abdominis
e. m. subclavius
f. m. rhomboideus major

61. Mark the muscles that enable movement of the knee joint

a. m. biceps femoris
b. m. quadriceps femoris
c. m. gluteus maximus
d. m. gastrocnemius

e. m. deltoideus
f. m. brachialis

62. Musculi abdominis

a. are the muscle of the abdomen
b. support the abdominal organs
c. are involved in active exhalation
d. are involved in active inspiration
e. are shortened during pregnancy
f. are the muscles of the chest

63. Musculus gluteus maximus

a. is the thigh muscle
b. is a large back muscle
c. is the sciatic muscle
d. is two-headed muscle
e. is three-headed muscle
f. is four-headed muscle

64. Musculus quadriceps femoris

a. is located on the upper limb
b. ensures the movement of the arm
c. is located on the lower limb
d. ensures the movement of the thigh
e. ensures the movement of the ankle
f. extends the leg at the knee joint and flex the thigh at the hip joint

65. Musculus sternocleidomastoideus

a. belongs to the muscles of the abdomen
b. is involved in active inspiration
c. plays an important role during passive expiration
d. arises at the sternum and attaches to the temporal bone
e. binds the skull to the sternum
f. arises at the cervical vertebrae and attaches to the ribs

66. Os occipitalis

a. contains an oval opening through which the spinal cord exits the cranial vault
b. articulates with two parietal bones
c. articulates with the cheekbone
d. articulates with sphenoid bone
e. is a perforated bone
f. articulates with the first cervical vertebra - atlas

67. Os parietale is the

a. frontal bone
b. parietal bone
c. sphenoid bone
d. is a paired bone
e. temporal bone
f. olfactory bone

68. Jugular vein

a. transports deoxygenated blood
b. collects blood from the neck, brain and face returning it to the heart
c. is paired
d. is the same as arteria saphena magna
e. collects blood from the oral cavity
f. collects blood from the nasal cavity

69. Platysma muscle is located at the

a. hand
b. neck
c. chest
d. abdomen
e. back
f. leg

70. Shoulder bone

a. is in Latin scapula
b. is a flat bone
c. is roughly triangular in shape
d. is part of the skull
e. is in Latin clavicle
f. is a short bone

71. Superior mesenteric artery

a. transports oxygenated blood and nutrients to the intestines
b. transports deoxygenated blood nutrients to the intestines
c. arises from the abdominal aorta
d. is major vein of the abdomen
e. supplies blood to the liver
f. supplies blood to the intestine and pancreas

72. The paranasal sinuses include

a. sinus maxillaris

b. sinus frontalis
c. sinus parietalis
d. sinus ethmoidales
e. sinus sphenoidalis
f. sinus orbitalis

73. The thighbone

a. is the humerus
b. is the ulna
c. is the femur
d. is flat bone
e. is long bone
f. has a diaphysis

74. The trapezius muscle

a. is located on the lower limb
b. allows turning of the head
c. extends from the cervical to thoracic region on the posterior aspect of the neck and trunk
d. supports the spinal cord mainly during sleep
e. is crucial for optimal shoulder joint function
f. is located on the lower back

75. Vena cava inferior

a. carries deoxygenated blood to the right atrium
b. carries oxygenated blood to the right atrium
c. carries oxygenated blood to the left atrium
d. carries deoxygenated blood to the left atrium
e. is located at the posterior abdominal wall on the right side of the aorta
f. is responsible for blood supply of the abdominal cavity

76. Vena portae

a. is the portal vein
b. is the hepatic artery
c. carries blood to the liver
d. drains blood from the liver
e. is also called the venae hepaticae
f. mediates the transport of blood between the stomach and intestines

77. The big saphenous vein (vena saphena magna) is located

a. on the head
b. in the face

c. on the back
d. on the hand
e. on the leg
f. on the fingers

78. The soleus muscle is located

a. on the head
b. in the face
c. on the back
d. on the hand
e. on the leg
f. on the fingers

79. Mark arteries, which branch from the aortic arch

a. brachiocephalic artery
b. arteria axillaris dextra
c. aorta abdominalis
d. arteria carotis
e. arteria subclavia sinistra
f. thoracic aorta

80. Mark bones, which form the elbow joint

a. humerus
b. tibia
c. radius
d. clavicula
e. ulna
f. femur

81. Mark bones, which form the knee joint

a. humerus
b. tibia
c. patella
d. clavicula
e. fibula
f. femur

82. Mark muscle, which is responsible for mydriasis

a. m. sphincter pupillae
b. m. ciliaris
c. m. lateral rectus
d. m. platysma

e. m. orbicularis oculi
f. m. dilatator pupillae

83. Mark the muscle, which is important for accommodation

a. frontal muscle
b. brachial muscle
c. ciliary muscle
d. major pectoral muscle
e. musculus serratus anterior
f. musculus superior rectus

84. Mark muscles, which are involved in breathing

a. m. sternocleidomastoideus
b. m. saphenus
c. m. pectoralis minor / major
d. diaphragm
e. cardiac muscles
f. mm. external intercostals

85. Which of the following bones are paired bones?

a. maxilla
b. os spheinoidale
c. os temporale
d. clavicula
e. sternum
f. os sacrum

86. Which of the following bones form shoulder joint?

a. femur
b. scapula
c. humerus
d. tibia
e. radius
f. ulna

87. Which of the following bones are part of splanchnocranium?

a. os temporale
b. os frontale
c. os zygomaticum
d. os palatinum
e. vomer
f. maxilla

Part 2

1. The device for measuring an electrical activity of the brain is referred to as

    a. electroencephalograph
    b. electrocardiograph
    c. electromyograph
    d. cephalometer
    e. coagucheck
    f. craniometer

2. Receptor on the neuromuscular junction is

    a. α1
    b. β1
    c. Nn
    d. Nm
    e. M1
    f. M2

3. Basal ganglia

    a. are involved in the control of voluntary movements
    b. are involved in verbal communication
    c. provide basic reflexes
    d. the most important are the putamen and the n. caudatus
    e. they are connected to the motor and premotor cortex
    f. they include the substantia nigra and the striatum

4. The blood-brain barrier

    a. is permeable in both directions
    b. is characterized by tight junctions between endothelial cells in capillaries
    c. is lipophilic
    d. is more permeable to water permeable substances
    e. its permeability depends exclusively on the presence of passive transport systems
    f. it is more permeable to larger molecules

5. The cerebrospinal fluid

    a. is involved in synaptic transmission
    b. exhibits phagocytic activity
    c. circulates in the cerebral ventricles
    d. protects brain and spinal cord tissue in contact with cranial bones and vertebrae
    e. circulates in the central spinal canal
    f. is found in the neuroglia

6. During the REM sleep

    a. the heart rate is higher
    b. the respiratory rate is higher
    c. the muscle tone is lower
    d. the muscle tone is higher
    e. the respiratory rate is lower
    f. the heart rate is lower

7. Endogenous opioid system

    a. mediates the feeling of pain
    b. is a centre for emotions
    c. is a centre for long - term memory
    d. is the central analgesic system
    e. is the motor centre
    f. is the centre of speech

8. Ependymal cells

    a. exhibit phagocytic activity
    b. line the brain cavities
    c. provide support for neurons
    d. maintain homeostasis by maintaining potassium concentration
    e. participate in synaptic transmission
    f. form myelin

9. Mark the structures of the brain that are involved in maintaining alertness

    a. reticular formation
    b. medulla oblongata
    c. pons
    d. limbic system
    e. midbrain
    f. cortex

10. Mark, what applies to serotonin

    a. activates 5-HT receptors
    b. is a mediator on the neuromuscular junction
    c. activates H1 receptors
    d. is synthesized from tyrosine
    e. is synthesized from histidine
    f. is synthesized from L-tryptophan

11. Mark, what types of rhythms can be identified in the electroencephalographic record of brain activity

    a. alpha
    b. beta
    c. theta
    d. delta
    e. gamma
    f. omicron

12. The limbic system

    a. is responsible for sleep
    b. is responsible for memory
    c. it is involved in instinctive behaviour
    d. also affects somatic vegetative functions (e.g. chewing, swallowing, breathing)
    e. is composed of pyramidal and extrapyramidal pathways
    f. includes the amygdala

13. Mark the correct answers for parasympathetic system

    a. it is called craniosacral
    b. it is called thoracolumbar
    c. the preganglionic fiber is long and the postganglionic fiber is short
    d. preganglionic neurons are located in the cephalic and sacral regions
    e. postganglionic endings release noradrenaline
    f. preganglionic fibres release acetylcholine at their terminals

14. Mark the correct answers for sympathetic system

    a. it is called craniosacral system
    b. it is called thoracolumbar system
    c. the preganglionic fiber is long and the postganglionic fiber is short and terminates in the innervated organ
    d. preganglionic neurons are located in the cephalic and sacral regions
    e. postganglionic endings release noradrenaline
    f. preganglionic fibres release acetylcholine at their terminals

15. Mark the correct statements for parasympathetic system

    a. it is activated at resting conditions
    b. it accelerates the heart rate
    c. it increases the motility of the digestive tract
    d. it inhibits secretion in the stomach
    e. it induces mydriasis
    f. it induces bronchiolar constriction

16. Mark the correct statements for sympathetic system

a. it induces bronchiolar dilatation
b. it is activated at resting conditions
c. it accelerates the heart rate
d. it increases the motility of the digestive tract
e. it increases secretion of digestive juices in the stomach
f. it induces mydriasis

17. Mark the brain structures that are involved in the memory process

a. cerebellum
b. reticular formation
c. thalamus
d. pituitary gland
e. neocortex
f. hippocampus

18. Mark the cholinergic receptors

a. alpha-1 receptors
b. beta-1 receptors
c. nicotinic receptors
d. muscarinic receptors
e. beta-2 receptors
f. alpha-2 receptors

19. Mark the correct answers about paradoxical sleep (desynchronized sleep)

a. man does not move his eyes quickly during it
b. is important for the physical health of the body
c. there is a complete disappearance of muscle tone, an increase in heart and respiratory rate
d. it accounts for 80-85% of the total duration of sleep
e. is important for memory and learning
f. dreams arise during it

20. Mark the correct answers about slow-wave sleep (deeps sleep)

a. is referred to as REM sleep
b. also referred to as non-REM - sleep
c. is important for the physical health of the body
d. is important for the mental health of the body
e. man does not move his eyes quickly during it
f. man moves his eyes quickly during it

21. Mark the functions of the reticular formation

a. regulates smooth muscle activity
b. regulates respiration and blood circulation
c. maintains the ability to concentrate and pay attention
d. regulates endothelial activity
e. regulates leptin excretion
f. regulates the alternation of vigilance and sleep

22. Mark the functions of the limbic system

a. controls social and emotional behaviour
b. participates in short-term memory processes
c. controls sleep
d. there is a centre of speech
e. controls the feeling of anxiety and fear
f. controls homeostasis

23. Mark the receptors for pain

a. mechanoreceptors
b. nociceptors
c. chemoreceptors
d. photoreceptors
e. thermoreceptors
f. telereceptors

24. Paradoxical sleep

a. is called REM sleep
b. is called NREM sleep
c. it is repeated in regular cycles
d. there is only one period during sleeping
e. it accounts for most of the total sleep
f. it accounts for a smaller part of total sleep

25. REM sleep

a. is paradoxical sleep
b. is orthodox sleep
c. is slow-wave sleep
d. is fast-wave sleep
e. represents 20% of the total sleep duration
f. represents 80% of the total sleep duration

26. Reticular activating system

a. is a part of the reticular formation

b. controls behavioural activities
c. controls the sleep-wake cycle
d. controls respiration
e. controls digestion
f. is a part of the neocortex

27. Mark the glutamate receptors

a. GABA-A
b. NMDA
c. Gs
d. M3
e. kainate
f. ryanodine

28. Somatosensory cortical area

a. is the primary sensory area
b. integrates sensory and motor inputs
c. forms the so-called sensory homunculus
d. forms the so-called motor homunculus
e. is located in the gyrus postcentralis
f. has a uniform projection of the periphery

29. Mark, what applies to the functions of individual brain lobes

a. the parietal lobe contains the so-called primary somatosensory cortex
b. within the temporal lobe there is an auditory cortex and olfactory cortex (smell)
c. the occipital lobe contains the site of crossing (chiasm) of the optic nerves
d. part of the frontal lobe is the amygdala, which controls stress responses
e. the primary motor cortex is located in the frontal lobe
f. the connection between the individual hemispheres is ensured by the so-called corpus callosum

30. Mark which neurons or cells have the ability to recover

a. neurons in the thalamus
b. neurons in the hippocampus
c. sensory cells
d. no CNS cells
e. olfactory neurons
f. only afferent nerve pathways

31. The structure responsible for maintenance of balance is

a. reticular formation

b. limbic system
c. cerebellum
d. the prefrontal cortex in the frontal lobe
e. thalamus
f. hypothalamus

32. Tractus corticospinalis

a. is a single-neuron
b. is the extrapyramidal pathway
c. leads from the primary motor cortex to the spinal cord
d. is synaptically interrupted several times
e. leads without synaptic interruption
f. is a multisynaptic pathway

33. Vigility is

a. waking
b. sleeping
c. mobility
d. memory
e. learning
f. alertness

34. Mark, what applies to the GABA-A receptor

a. it is activated by acetylcholine
b. it is activated by serotonin
c. it is activated by endorphin
d. it is a chloride channel
e. it is a sodium channel
f. it is a potassium channel

35. What are the functions of the prefrontal cortex (frontal lobe area)?

a. helps us to predict the consequences of our actions (think rationally)
b. helps us make conscious decisions and think in the abstract
c. controls function of skeletal muscle
d. allows us to recognize words
e. allows us to integrate sensory information
f. allows us to control endocrine glands

36. What is the function of the thalamus?

a. integrates and converts signals from the lower sections of the nervous system into the cerebral cortex
b. connects the two cerebral hemispheres

c. connects the brain with the midbrain
d. connects areas within the same hemisphere
e. controls the feeling of thirst and hunger
f. controls skeletal muscle function

37. What is the primary function of the cerebellum?

a. coordinates skeletal muscle movements
b. regulates the body temperature
c. regulates emotions
d. regulates the heart and vascular function
e. creates our thoughts, intellectual functions
f. urges the body to escape and attack

38. Mark, what applies for the area of postrema

a. it is part of the limbic system
b. the part responsible for storing the non-volatile memory track
c. is outside the blood-brain barrier
d. belongs to motor neurons
e. is the central chemoreceptive region
f. is associated with vomiting

39. Which answer best describes the function of the temporal lobe?

a. perceives movement
b. processes auditory sensations
c. processes visual perceptions
d. during the night it processes information obtained during the day
e. processes information from muscle spindles
f. processes information from all the senses

40. Which neuromediators belong to excitatory ones?

a. GABA
b. aspartate
c. adrenaline
d. glutamate
e. vasopressin
f. glycine

41. Which neurotransmitters are inhibitory?

a. GABA
b. Aspartate
c. adrenaline
d. glutamate

e. vasopressin
f. glycine

42. Which of the following roles is NOT performed by the hypothalamus?

a. body posture
b. coordinates skeletal muscle movements
c. controls the vegetative functions of the body
d. regulates homeostasis
e. regulates the feeling of thirst and hunger
f. regulates body temperature

43. Which of the following substances cannot cross the blood-brain barrier?

a. metabolic waste
b. toxins
c. alcohol
d. nicotine
e. fat soluble substances
f. oxygen, carbon dioxide, water

Part 3

1. Mark the correct statements about peripheral nervous system

    a. it's one neuronal system and its nerves come out the brain stem
    b. is divided into somatic and autonomous part, which is further divided into sympathetic and parasympathetic nervous system
    c. the neuromediator in the ganglia of the autonomous NS is always noradrenaline
    d. the acetylcholine is a ligand for ion channels as well as G-protein coupled receptors
    e. the neuromuscular junction is part of the autonomic nervous system
    f. noradrenaline is a neuromediator of the postganglionic neuron of the sympathetic system

2. Mark which receptors can acetylcholine bind to

    a. muscarinic on sympathetic effector
    b. muscarinic on parasympathetic effector
    c. muscarinic in the sympathetic and parasympathetic ganglia
    d. muscarinic on a neuromuscular plate
    e. nicotine in the CNS
    f. nicotine in the vegetative ganglia

3. Acetylcholine is the neurotransmitter at the following synapses

    a. neuromuscular junction
    b. parasympathetic ganglia
    c. sympathetic ganglia
    d. sympathetic effector
    e. parasympathetic effector
    f. central nervous system

4. Mark, what is the effect of activation of beta1 adrenergic receptors

    a. increase in heart rate
    b. uterine muscle relaxation
    c. bronchial constriction
    d. increased renin release
    e. reduction of insulin secretion
    f. sphincter contraction

5. Mark, what applies to adenylate cyclase

    a. is involved in the production of ATP required for the interaction of actin with myosin
    b. is a cytoplasmic enzyme

c. is a membrane protein
d. is activated by Gq-associated receptors
e. is activated by norepinephrine in the heart
f. is activated by nicotinic receptors

6. Adenylate cyclase is an enzyme that mediates formation of

a. diacylglycerol
b. inositol triphosphate
c. cAMP
d. phospholipase B
e. G protein
f. tropomyosin

7. Mark, what applies to beta-1 receptors

a. their activation leads to tachycardia
b. are coupled to Gs protein
c. their ligand is norepinephrine
d. their ligand is acetylcholine
e. are coupled to Gq protein
f. their activation leads to bradycardia

8. Mark, what applies to beta receptor

a. is coupled to G protein
b. is an ion channel
c. is presynaptic
d. its ligand is acetylcholine
e. its ligand is norepinephrine
f. its ligand is adrenaline

9. Mark, what applies to calmodulin

a. is a regulatory protein that prevents the interaction of actin and myosin
b. can act as a second messenger
c. is a contractile protein in smooth muscle cells
d. binds calcium, leading to a conformational change
e. activates myosin phosphatase, which leads to smooth muscle relaxation
f. it is found in the skeletal muscle cells

10. Mark, what applies to caveolae:

a. are transverse tubules in skeletal muscles
b. they contain a large number of ion channels and receptors
c. their function is to facilitate the transport of substances into the cell
d. they are binding the actin fibres in smooth muscle cells

e. are regulatory proteins in smooth muscle
f. are regulatory proteins in the striated muscle

11. Mark the correct statements

a. the postganglionic fibres of the parasympathetic are shorter than the sympathetic fibres
b. the sympathetic compartment comes out in the thoraco-lumbar region of the spine
c. sympathetic system is active during sleep, digestion and recovery
d. parasympathetic system is activated under stress and physical exertion
e. preganglionic receptors are always muscarinic receptors
f. sympathetic system has a more pronounced effect on the heart and blood vessels than parasympathetic

12. Mark the correct statements

a. the postganglionic fibres of the parasympathetic system are shorter than in the sympathetic system
b. the sympathetic section resigns in the thoracolumbar region of the spine
c. The sympathetic nervous system is active during sleep, digestion and recovery
d. the parasympathetic system is activated by stress and physical exertion
e. preganglionic receptors are always M receptors
f. the sympathetic system has a more pronounced effect on the heart and blood vessels than the parasympathetic

13. G proteins are called G proteins because

a. their molecule includes the alpha subunit
b. they were discovered by Alfred G. Lilman
c. can decompose GTP
d. were first discovered in taste receptors
e. part of their molecule is the beta subunit
f. part of their molecule is the gamma subunit

14. Mark, what applies to G-proteins

a. are proteins in the cell that are part of the cytoskeleton
b. are key for signal transmission to the cell and for the formation of so-called the second messengers
c. a conformational change in the alpha subunit of the G protein triggers a signalling pathway
d. act as the first messengers
e. are important for contraction of striated muscles
f. there is only one species - the so-called G stimulatory protein that leads to an increase in the concentration of secondary messengers in the cell

15. Mark, what applies to Gi protein

a. reduces the amount of cAMP
b. reduces the concentration of Ca in the cell
c. its activation increases blood flow to the skeletal muscles
d. it is found exclusively postsynaptically
e. is coupled to the M2 receptor
f. closes potassium channels

16. Mark, what applies to Gq protein

a. is coupled to the M1 receptor
b. activates phospholipase C
c. is coupled to the alpha-1 receptor
d. activates the secondary messenger inositol triphosphate
e. is located on the outside of the cell membrane
f. is an inhibitory protein

17. How does the parasympathetic nervous system affect the eye? It causes

a. mydriasis
b. itching
c. accommodation at close range
d. accommodation at a distance
e. tearing
f. miosis

18. How does the sympathetic nervous system affect the eye? It causes

a. mydriasis
b. miosis
c. accommodation at close range
d. accommodation at a distance
e. tearing
f. itching

19. Mark the correct statements about the sympathetic ganglia

a. the neurotransmitter is epinephrine
b. the neurotransmitter is acetylcholine
c. there are N receptors
d. there are M receptors
e. there are alfa receptors
f. there are beta receptors

20. Mark the correct statements about the sympathetic ganglia

a. the neuromediator is norepinephrine

b. the neurotransmitter is acetylcholine
c. there are N receptors
d. there are M receptors
e. there are alpha receptors
f. there are beta receptors

21. Mark, what applies to inositol triphosphate (IP3)

a. is formed by the action of phospholipase C
b. is formed by the action of adenylate cyclase
c. occurs after activation of the Gq protein
d. occurs after activation of the Gs protein
e. leads to an increase in cAMP concentration
f. leads to an increase in Ca2+ concentration

22. Mark, what applies to innervation mediated by a sympathetic system

a. acetylcholine is a ligand for adrenergic receptors on smooth muscle
b. activation of alpha-1 adrenoreceptors via the Gq subunit leads to the formation of IP3 and DAG
c. activation of beta-2 adrenoreceptors is associated with an increase in cAMP
d. the ligands for beta-1 adrenoreceptors are noradrenaline and adrenaline
e. activation of beta-2 adrenoreceptors leads to bronchodilation
f. alpha-2 presynaptic receptors are found only in the CNS

23. Mark, what applies to parasympathetic mediated innervation

a. ligand binding to the M receptor may also lead to the opening of K+ channels via the Gi subunit
b. M1 receptors are coupled to Gq protein
c. M receptors can mediate both contraction and dilatation of smooth muscle
d. parasympathetic-mediated vasodilation is mediated indirectly through nitric oxide
e. parasympathetic activity leads to a reduction in peristaltic movements
f. M2 receptors increase heart rate through inactivation of K+ channels

24. Mark, what applies to sympathetic nervous system

a. is active during digestion
b. represents the craniosacral section
c. is active during work and stress
d. represents the thoracolumbar section
e. represents the cholinergic system
f. represents an adrenergic system

25. Mark, what applies to sympathetic nervous system

a. the neurotransmitter in the ganglia is acetylcholine
b. comes from the craniosacral section of the CNS
c. the main neurotransmitter on effector organs is adrenaline
d. its activation results in vasoconstriction
e. its activation results in bronchodilatation
f. all adrenergic receptors are associated with G protein

26. Mark, what applies to parasympathetic nervous system

a. is active during digestion
b. represents a craniosacral division
c. is active during work and stress
d. represents a thoracolumbar division
e. represents a cholinergic system
f. represents an adrenergic system

27. Mark, what applies to the sympathetic nervous system

a. is active during digestion
b. represents a craniosacral division
c. is active during work and stress
d. represents a thoracolumbar division
e. represents a cholinergic system
f. represents adrenergic system

28. Label the receptors of the autonomic nervous system dominating the bronchi

a. α1
b. β1
c. β2
d. M2
e. M3
f. M1

29. Mark the correct statements about M receptors

a. are located on the postsynaptic membrane
b. are found in the CNS
c. are ion channels controlled by a ligand
d. are G protein-coupled receptors
e. their ligand is norepinephrine
f. their ligand is acetylcholine

30. Mark the correct statements about M1 receptors. They are

a. located in the heart
b. located in the skin

c. located in the stomach
d. activated by acetylcholine
e. activated by norepinephrine
f. activated by adenylate cyclase

31. M1 receptors are the most present

a. in the stomach
b. at heart
c. in bronchi
d. in the uterus
e. in the kidneys
f. in the CNS

32. Mark the correct statements about M2 receptors

a. their activation leads to bronchoconstriction
b. are coupled to the Gi protein
c. their ligand is acetylcholine
d. their ligand is norepinephrine
e. are coupled with Gq protein
f. their activation leads to bronchodilation

33. Mark organs activated by parasympathicus

a. uterus
b. thyroid
c. pancreas
d. heart
e. bronchy, leads to bronchodilation
f. sphincters

34. Mark the characteristic features of the parasympathetic nervous system

a. is activated in peace, during digestion and wound healing
b. is activated during the stress response
c. the neurotransmitter in the ganglion is acetylcholine
d. the neurotransmitter on the effector is acetylcholine
e. the neurotransmitter on the effector is adrenaline
f. the neuromediator on the effector is norepinephrine

35. Mark the characteristic features of the sympathetic nervous system

a. is activated in peace, during digestion and wound healing
b. is activated during the stress response
c. the neurotransmitter in the ganglion is acetylcholine
d. the neurotransmitter on the effector is nicotine

e. the neuromediator on the effector is muscarinic
f. the neuromediator on the effector is norepinephrine

36. Mark the correct statements

a. smooth muscles, unlike striated muscles, do not contain actin fibres
b. dense bodies are clusters of anchoring proteins on the sarcolemma or in the cytoplasm
c. sarcomere units of smooth muscle consist of calmodulin and caldesmon
d. caveolae are depressions on the smooth muscle membrane
e. multiunit smooth muscle is innervated as a group of muscle cells
f. troponin G is responsible for inhibiting contraction

37. Mark the correct statements

a. the final component of the reflective arc is the effector
b. afferent pathways conduct a pulse from the sensor to the receptor
c. exteroceptor reflexes are not exhaustible
d. efferent pathways conduct the impulse from the CNS to the effector
e. visceral reflexes are in principle identical to proprioceptor reflexes, they differ at the beginning of the pathway
f. vestibular or visual reflexes are classified as visceral reflexes

38. Mark the correct statements

a. by stimulating alpha-1 receptors on the smooth muscles of the skin vessels, dilatation occurs
b. stimulation of M1 receptors leads to activation of Gq protein and formation of inositol triphosphate and diacylglycerol
c. stimulation of the parasympathetic on bronchi results in bronchodilation
d. by stimulating M1 receptors of the parasympathetic nervous system, the production of gastric juices is reduced
e. sympathetic stimulation constricts the radial muscles of the eye and causes mydriasis
f. stimulation of the parasympathetic nervous system results in a reduction in the heart rate

39. Mark the correct statements

a. activation of the sympatho-adrenergic system will reduce digestion
b. the preganglionic mediator in sympathetic nervous system is acetylcholine
c. the parasympathetic nerves withdraw from the brain and sacral spinal cord
d. catechol-O-methyltransferase is an enzyme important for the degradation of acetylcholine
e. during the contraction of the multiple unit muscle, all cells are contracted at once
f. SERCA is important for calcium accumulation in sarcoplasmic reticulum (SR)

40. Mark the correct statements

a. somatic nerves are direct nerves from the spinal cord to the target organ
b. somatic nerves are connected in the ganglion
c. sympathetic nerves are connected in the autonomic ganglion
d. parasympathetic nerves are straight
e. the parasympathetic nerves recede in the thoracic and lumbar spinal cord
f. the sympathetic nerves move away from the cranial and sacral areas

41. Mark the correct statements

a. acetylcholine is released from the preganglionic fibres of the sympathetic nervous system
b. acetylcholine in particular is released from the postganglionic sympathetic fibres
c. acetylcholine is released from the preganglionic fibres of the parasympathetic
d. acetylcholine is released from the postganglionic fibres of the parasympathetic
e. norepinephrine is released from the preganglionic fibres of the parasympathetic system
f. norepinephrine is released from the postganglionic fibres of the parasympathetic nervous system

42. Mark the correct statements

a. digestion is reduced by activating the sympathetic nervous system
b. the mediator of sympathetic nervous system is noradrenaline
c. the parasympathetic nerves depart from the cranial and sacral spinal cord
d. catechol-O-methyltransferase is an enzyme important for the degradation of acetylcholine
e. when a multi-unit muscle is contracted, all cells contract at once - as a whole
f. the ATPase SERCA is important for carrying out the concentration of calcium in the sarcoplasmic reticulum

43. Mark the correct statements

a. parasympathetic ganglia are located near the spinal cord
b. sympathetic pathways originate from the thoracolumbar spinal cord
c. the peripheral nerve is made up of only one nerve fiber
d. the mediator on the preganglionic fibres is acetylcholine
e. the ligand for muscarinic receptors are catecholamines
f. the nicotinic receptor (Nn) is coupled to G proteins

44. Mark the correct statements

a. prolongation of uterine smooth muscle cells can be up to tenfold
b. the tension in the bladder wall is not directly proportional to the volume of the bladder

c. the critical amount of calcium for smooth muscle contraction comes from the extracellular space
d. cytoplasmic phosphatase is important for phosphorylation of the myosin head and formation of the actomyosin complex
e. sodium is exclusively involved in the depolarization of smooth muscle cells
f. gap junctions are important for the chemical propagation of the action potential on the smooth muscle cell membrane

45. Mark the correct statements about the Gq protein. The second messenger is

a. cAMP
b. inositol trisphosphate
c. cGMP
d. diacylglycerol
e. calcium
f. MLCK

46. Mark the correct statements

a. sympathetic nervous system is called adrenergic system and its postganglionic neuromediator is noradrenaline
b. adrenergic receptors are always G-protein coupled receptors
c. The M (muscarinic) receptors are sodium permeable ion channels
d. acetylcholine is a ligand for both α (alpha) and β (beta) adrenergic receptors
e. alpha adrenergic receptors may have both pre- and post-synaptic localization
f. some receptors can bind both noradrenaline and acetylcholine

47. Mark the correct statements

a. activation of the parasympathetic system causes an increased heart rate and the strength of the heart contraction
b. vascular smooth muscle contains only adrenergic receptors
c. the activity of the gastrointestinal system is stimulated by sympathetic activation
d. secretion from the glands is increased by parasympathetic activation
e. presynaptic alpha-2 receptors are found only on the CNS neurons
f. beta-2 receptors stimulation induces airway smooth muscle relaxation

48. Mark the correct statements

a. caveolae are important for calcium homeostasis of muscle cells
b. more unit smooth muscles are innervated separately
c. intermediate filaments interconnect the dense bodies
d. the contractile apparatus floats freely in the cytoplasm of the smooth muscle
e. the only smooth muscle neurotransmitter is acetylcholine
f. activation by a neurotransmitter is essential for contraction

49. Mark the correct statements

a. sympathetic nervous system is called adrenergic system and its postganglionic neuromediator is noradrenaline
b. adrenergic receptors are always G-protein coupled receptors
c. M (muscarinic) receptors are ion channels permeable to sodium ions
d. acetylcholine is a ligand for α (alpha) etc. β (beta) adrenergic receptors
e. alpha adrenergic receptors may have pre- and postsynaptic localization
f. some receptors may have both the acetylcholine ligand and noradrenaline

50. Mark the correct statements

a. parasympathetic activation causes an increase in heart rate and cardiac contraction force
b. vascular smooth muscle contains only adrenergic receptors
c. the activity of the gastrointestinal system is stimulated by activation of the sympathetic nervous system
d. secretion from the glands is increased by parasympathetic activity
e. presynaptic alpha-2 receptors are found only on CNS neurons
f. beta-2 receptors stimulate airway smooth muscle release

51. Mark the correct statements about the heart

a. activation of M2 receptors causes a decrease in heart rate
b. activation of beta 3 receptors causes an increase in heart rate
c. activation of beta-1 receptors activates the Gs protein, leading to an increase in c AMP
d. activation of beta-1 receptors activates the Gq protein, leading to an increase in IP3 and DAG
e. activation of beta-1 receptors leads to a reduction in the force of contraction
f. activation of beta-1 receptors increases the strength of heart contraction

52. Mark the correct statements about G-protein-coupled receptors

a. they are found in the cytoplasm
b. they have 7 transmembrane segments
c. are activated exclusively by neurotransmitters
d. they can activate or inhibit adenylate cyclase
e. they cause the production of second messengers
f. are activated by the second messengers

53. Mark the correct statements about the second messengers

a. they bind to membrane receptors and stimulate intracellular cascades
b. they are small cytoplasmic molecules
c. they are formed upon activation of G-protein coupled receptors
d. they include adenylate cyclase

e. they include phospholipase C
f. they include inositol trisphosphate

54. Mark the correct statements about Gq protein activation

a. it activates the PLC
b. it inhibits PLC
c. it is located on the nerve-muscle plate
d. it leads to an increase in cAMP
e. it is connected to the sodium channel
f. it leads to the formation of DAG

55. Mark the main receptors of the autonomic nervous system that are on the bronchi

a. α1
b. β1
c. β2
d. M2
e. M3
f. M1

56. Mark the second messengers

a. noradrenaline
b. acetylcholine
c. cAMP
d. IP3
e. Gq
f. Gs

57. Mark the second messengers

a. G-protein
b. RYR1
c. inositol-3-phosphate
d. diacylglycerol
e. acetylcholine
f. cAMP

58. Mark the correct statements

a. internal organs do not have a reflexive response
b. the proprioceptor reflex cannot be suppressed by will
c. exteroceptor reflexes are mostly defensive reflexes with a longer reaction time and are tired over time
d. a type of polysynaptic reflex is activation of the muscle spindle
e. visceral reflexes come from the CNS, not the effector organ

f. reflex responses are always shifted and processed at the level of the brainstem

59. Mark what applies to beta-2 receptors

a. are located on adipose tissue
b. are located on the bronchi
c. are located on the uterus
d. are located on the peripheral vessels of the skin
e. are activated by norepinephrine
f. are activated by acetylcholine

60. Mark the correct statements about muscarinic receptors

a. noradrenaline binds to them, so they are subject to sympathetic innervation
b. they bind acetylcholine, so they undergo parasympathetic innervation
c. are found only in the CNS
d. otherwise they are also referred to as voltage-controlled ion channels
e. we distinguish several subtypes (M1, M2, M3), which are associated with G-proteins
f. the M3 receptor is important for smooth muscle contraction

61. Mark the correct statements about N receptors

a. are found mainly on the presynaptic membrane
b. are found in the CNS
c. are ion channels controlled by a ligand
d. are G protein-coupled receptors
e. their ligand is norepinephrine
f. their ligand is acetylcholine

62. Mark the correct statements about nervous system

a. it is divided into central and peripheral
b. also form somatic fibres on the periphery that carry the signal to the smooth muscles
c. also form visceral fibres at the periphery that carry the signal from the smooth muscles to the CNS
d. also form motor sympathetic neurons that carry the signal from the smooth muscles to the CNS
e. also form motor parasympathetic neurons that carry signals to smooth muscle at the periphery
f. also form the motor fibres of the somatic system, which carry signals from skeletal muscle to the CNS

63. Mark which receptors can noradrenaline bind to

a. alpha and beta on the parasympathetic effector

b. beta1 receptors on the heart
c. muscarinic 3 on bronchi
d. alpha2 presynaptic receptors
e. alpha1 and alpha2 receptors in the sympathetic ganglia
f. beta2 receptors on the bronchi

64. Mark the effects of parasympathetic activation on the bronchi

a. bronchoconstriction
b. bronchodilatation
c. activation of beta-2-adrenergic receptors
d. activation of M3-cholinergic receptors
e. increase in cAMP levels
f. reduction in cAMP levels

65. Mark the correct statements about sympathetic nerve fibres

a. they are formed only by adrenergic neurons
b. the major neurotransmitter in effector organs is acetylcholine
c. the main neurotransmitter in effector organs is norepinephrine
d. preganglionic neurons of the sympathetic nervous system are located in the thoracic and lumbar region of the spinal cord - thoracolumbar system
e. innervates skeletal muscles
f. they are part of the motor efferent part of the peripheral nervous system

66. Mark the correct statements about sympathetic nervous system

a. controls in particular the activity of the heart and blood vessels
b. is activated in the relax state
c. is activated when the body prepares for exercise - the so-called fight or flight reaction
d. the major mediator on effector organs is acetylcholine, which binds to M receptors
e. the main mediator of effector organs is norepinephrine, which binds to alpha- and beta-adrenergic receptors
f. its activation increases blood pressure in blood vessels and increases heart function

67. Sympathetic stimulation leads to

a. salivation
b. lacrimation
c. perspiration
d. tachycardia
e. bronchoconstriction
f. reduction of peristalsis

68. Mark the correct statements about the first messenger

a. it is also called a ligand
b. it is also called a neurotransmitter
c. it is located extracellularly
d. e.g. cAMP
e. e.g. cGMP
f. e.g. IP3

69. Mark the correct statements about beta2 receptors:

a. they are located predominantly in adipose tissue
b. they are located predominantly in the bronchi
c. they are activated after acetylcholine binding
d. they are activated after noradrenaline binding
e. they are coupled to the Gs protein, thus leading to the activation of adenylate cyclase
f. they are coupled to the Gi protein, thus leading to inhibition of adenylate cyclase

70. The tone of parasympathetic predominates

a. in sleep
b. under stress
c. during digestion
d. in anabolic processes in the body
e. in illness
f. during muscle work

71. Mark, what applies to parasympathetic system

a. is active during digestion
b. represents the craniosacral section
c. is active during work and stress
d. represents the thoracolumbar section
e. represents the cholinergic system
f. represents an adrenergic system

72. Mark, what applies to the parasympathetic system

a. mainly affects the GIT
b. forms a thoracosacral compartment
c. is active in sleep, digestion and recovery
d. forms alpha and beta receptors
e. is active in muscle work, illness, stress
f. forms a craniosacral section

73. Mark, what applies to the peripheral nervous system

a. it acts with the mononeural system, whose nerves recede from the brainstem
b. it is divided into a somatic and an autonomous part, which is further divided into a sympathetic and parasympathetic section
c. noradrenaline is always a neurotransmitter in the ganglia of autonomic NS
d. acetylcholine is a ligand for ion channels as well as G-protein coupled receptors
e. the neuromuscular junction is part of the autonomic nervous system
f. noradrenaline is a neurotransmitter secreted from the sympathetic postganglionic neuron

74. Mark, what applies to the sympathetic system

a. mainly affects the GIT
b. forms a thoracolumbar compartment
c. is active in sleep, digestion and recovery
d. affects heart, blood vessels
e. is active in muscle work, illness, stress
f. forms a craniosacral section

75. What is the name of the enzyme that is involved in the synthesis of acetylcholine?

a. choline acetyltransferase
b. acetylcholinesterase
c. monoamine oxidase
d. catechol-O-methyltransferase
e. phospholipase
f. adenylate cyclase

76. What is the product of the action of phospholipase C on phosphatidylinositol?

a. only adenylate cyclase
b. only inositol trisphosphate and diacylglycerol
c. only inositol triphosphate and adenylate cyclase
d. inositol triphosphate, diacylglycerol and adenylate cyclase
e. G-protein
f. calmodulin

77. Mark, which neuromediator is located in preganglionic endings of parasympathetic system

a. gamma aminobutyric acid
b. adrenaline
c. serotonin
d. acetylcholine
e. dopamine

f. noradrenaline

78. Mark, which neuromediator is located in preganglionic endings of sympathetic system

a. gamma aminobutyric acid
b. adrenaline
c. serotonin
d. acetylcholine
e. dopamine
f. noradrenaline

79. Mark, which neuromediator is located on the effector organs of the parasympathetic system

a. adrenaline
b. noradrenaline
c. acetylcholine
d. serotonin
e. dopamine
f. adenosine

80. Mark, which neuromediators are located on the effector organs of the sympathetic system

a. gamma aminobutyric acid
b. adrenaline
c. serotonin
d. glutamate
e. dopamine
f. noradrenaline

81. Which of these receptors is predominantly deposited on the presynaptic membrane?

a. N
b. M1
c. M4
d. alpha-1
e. alpha-2
f. beta-1

82. Mark the INCORRECT statements

a. activation of beta-2 receptors increases cAMP as well as renin release
b. activation of alpha-1 receptors increases IP3 and constriction of blood vessels in the skin occurs
c. activation of beta-1 receptors increases cAMP and cardiac activity
d. activation of M2 receptors increases cAMP as well as heart rate

e. activation of M1 receptors increases IP3 as well as gastric function
f. activation of beta-1 receptors increases cAMP as well as cardiac activity

83. While writing the test, the sympathetic nervous system is activated, which is manifested

a. by reducing the heart rate
b. by increasing the heart rate
c. formation of sparse watery saliva
d. by activating the sweat glands
e. vasoconstriction
f. by increasing GIT peristalsis

2.2 CARDIOVASCULAR SYSTEM

Part 1

1. Cardiac muscle tissue is

    a. a special type of epithelial tissue
    b. striated muscle type
    c. a special subtype of connective tissue
    d. striated skeletal muscle
    e. combine endocrine tissue
    f. smooth muscle tissue

2. How many valves could be identified in the heart?

    a. 2x cuspid
    b. 2x semilunar
    c. 1 bicuspid
    d. 2 double valves
    e. 4 semilunar bicuspid forms
    f. 1 tricuspid

3. Mark the correct statements about the conduction speed of excitement in the heart

    a. the atrio-ventricular node excites the slowest
    b. the slowest leads to the excitement of Hiss bundle
    c. the slowest leads to the excitement of muscle ventricles
    d. the slowest lead to the excitement of right and left bundle branches
    e. the slowest leads to the excitement of the atria muscles
    f. there are no differences in the conduction speed between the compartments of heart

4. The second heart sound is created

    a. when closing the atrioventricular valves
    b. when closing the semilunar valves
    c. in the filling phase
    d. when opening the atrioventricular valves
    e. in atrial systole
    f. when opening the semilunar valves

5. The adrenergic stimulation of heart causes

    a. increase in coronary flow
    b. increase blood flow in the skin
    c. general vasodilation
    d. inotropy increase
    e. no answer is correct

f. weakening of cardiac cycle

6. Mark the characteristic features of the heart muscle

   a. many nuclei at the edges of the cell
   b. intercalary disks
   c. actin fibres anchored in dense bodies
   d. cross-striations
   e. the basic unit consists of muscle fibre
   f. the basic unit is the cardiomyocyte

7. Mark, what applies to the baroreceptor reflex in the regulation of blood pressure

   a. it responds to changes in blood pressure
   b. it has receptors located in the carotid artery and aortic arch
   c. it activates in seconds
   d. it activates gradually and slowly
   e. the receptors are located in the vena cava superior and inferior
   f. the receptors are located in the pulmonary artery

8. Baroreceptors are

   a. receptors that detect changes in nitric oxide levels
   b. receptors that detect changes in pO2 levels
   c. receptors that detect changes in vessel wall tension
   d. located mainly in peripheral vessels
   e. located mainly in the vena cava
   f. located mainly in the aorta and carotid arteries

9. Bicuspid valve is located between

   a. the right and left atrium
   b. the left atrium and the left ventricle
   c. the right atrium and the right ventricle
   d. the left ventricle and the aorta
   e. the right ventricle and the lungs
   f. the right and left atrium

10. Mark, which phase begins by closing the semilunar valves

    a. isovolumic relaxation
    b. filling phase
    c. isovolumic contraction
    d. ejection phase
    e. plateau phase
    f. absolute refractory phase

11. Cardiac output

a. is ejected volume is 5.25-6L per min
b. depends on the number of cardiac cycles
c. is a quantity of blood pumped by one ventricle in one minute
d. does not depend on stress conditions
e. is determined by multiplying heart rate and endsystolic volume
f. does not depend on the function of thyroid gland

12. Cardiac output equals

a. the sum of systolic volume of left and right ventricles in 1 minute
b. the sum of final systolic and final diastolic volume of left ventricle over 1 minute
c. by a volume fraction of blood expelled in 1 min from the total volume of blood in left ventricle
d. the product of heart rate and systolic volume
e. the pressure in the right ventricle during systole and diastole
f. the myocardial action potential

13. Coronary arteries

a. branch from the lungs
b. branch from the aorta
c. are responsible for transporting blood to the lungs
d. are responsible for cardiac nutrition
e. are responsible for oxygenating the heart
f. branch from the left ventricle

14. Dominant oxidation substrate in the adult heart under physiological conditions is

a. glucose
b. bile acids
c. fatty acids
d. basic high energy compound ATP
e. adrenaline
f. carboxylic acids

15. During the ejection phase the valves are

a. semilunar open and atrioventricular closed
b. semilunar closed and atrioventricular open
c. both semilunar and atrioventricular are closed
d. both semilunar and atrioventricular are open
e. the valves have no role in the ejection phase
f. no answer is correct

16. During the filling phase the valves are

a. semilunar open and atrioventricular closed
b. semilunar closed and atrioventricular open
c. both semilunar and atrioventricular are closed
d. both semilunar and atrioventricular are open
e. the valves have no role in the filling phase
f. no answer is correct

17. During the isovolumic relaxation phase, the valves are

a. semilunar open and atrioventricular closed
b. semilunar closed and atrioventricular open
c. both semilunar and atrioventricular are closed
d. both semilunar and atrioventricular are open
e. valves have no role during isovolumic relaxation
f. no answer is correct

18. Factors supporting atria refilling are

a. positive intrathoracic pressure
b. remaining kinetic energy
c. muscle pump of left arm
d. contraction of ventricles
e. valves
f. negative intrathoracic pressure

19. Frank-Starling law characterizes

a. systolic pressure increase with increasing end diastolic volume
b. resulting tension decreases with more cross bridges till the optimal length
c. pressure-volume (P-V) relationship
d. systolic pressure decline with very high end diastolic volume
e. changes in pressure-volume relationship could be induced by inotropic or lusitropic intervention
f. by increasing the muscle length beyond, the optimum very high cross-bridges can be formed

20. Heart activity can be regulated by

a. vegetative nervous system
b. insulin and glucagon
c. parasympathicus
d. epinephrine which is released by the adrenal gland
e. the adrenal medulla releases norepinephrine
f. sympathicus

21. Heart automation is the ability of heart

a. automatically adjust the minute volume of heart to the size of venous return
b. adjust the size of coronary flow to the energy requirements of myocardium
c. increase the force of contraction in proportion to the lengthening of sarcomere
d. rhythmically generate electrical excitement
e. transfer excitement from one heart cell to another
f. to contract

22. Heart rate control is provided

a. predominantly by sympathetic nerves
b. predominantly by parasympathetic nerves
c. partly by motor nerves from the spinal area
d. via M2 receptors
e. via beta-1 receptors
f. via beta-2 receptors

23. In physiological conditions unoxygenated blood from the body returns to

a. the left ventricle
b. the right atrium
c. the coronary circulation
d. the right ventricle
e. the lungs
f. the left atrium

24. In which CNS area is the cardio excitation center located?

a. in the elongated spinal cord
b. in reticular formation
c. in the hypothalamus
d. in the brain
e. in medulla oblongata
f. in the frontal lobe

25. Mark the factors influencing the return of blood to the heart

a. erythrocytes
b. muscle pump
c. pressure gradient
d. platelets
e. the power of heart
f. leukopenia

26. Mark, what applies to the excitation-contraction connection of the heart

a. sodium is released from the sarcoplasmic reticulum (SR) to initiate contraction

b. it is an expression of the excitation transmission by the AV node to cardiomyocytes
c. describes events from the depolarization of sarcolemma to the mechanical contractions
d. calcium-induced calcium release represents calcium influx through L-type calcium channels and calcium stores release from the SR
e. calcium refilling back to the SR is by Na+/K+-ATPase
f. calcium binds to actin heads, providing cross-bridges between myosin and actin

27. Mark. what applies to the morphology of heart

a. the pericardium is an inner layer that contains mainly cardiomyocytes
b. between the parietal and visceral pericardium there is a space filled with serous fluid
c. the mitral valve separates the left atrium from the left ventricle
d. the tricuspid valve separates the right atrium from the right ventricle
e. the pulmonary valve belongs to the tricuspid valves
f. the tendons are attached to the papillary muscles and atrioventricular valves

28. Mark the correct statements

a. the thickest layer of heart is the endocardium
b. cardiomyocytes are found in the atria and ventricles of the heart
c. the SA node is formed by nerve fibres of the sympathetic nervous system
d. T-tubules mediate the spread of action potential to muscle fibres
e. sarcolemma is a term for the membrane of cardiomyocytes and muscle cells
f. calcium release from SR is induced by calcium influx through dihydropyridine channels (LTCC)

29. Mark the correct statements

a. heart output is an expression of ejection volume and heart rate
b. the cardioregulation center is located in the elongated spinal cord
c. after stimulation of baroreceptors with an increase in blood pressure there is an increase in the activity of sympathetic nervous system
d. epicardium is also a term for fibrous pericardium
e. the mitral valve prevents blood from returning from the aorta to the left ventricle
f. pulmonary valve is a tricuspid valve that prevents relapse between the pulmonary arteries and the right ventricle

30. Mark the correct order of the valves through which blood flows from the upper vena cava to the aorta

a. tricuspid, pulmonary semilunar, bicuspid, aortic semilunar
b. bicuspid, pulmonary semilunar, tricuspid, aortic semilunar

c. pulmonary semilunar, bicuspid, tricuspid, aortic semilunar
d. aortic semilunar, pulmonary semilunar, bicuspid, tricuspid
e. tricuspid, sinoatrial, atrioventricular, bicuspid
f. aortic tricuspid, mitral bicuspid, pulmonary bicuspid, bicuspid

31. Mark the correct statements

a. an ECG record indicates the contractility of heart
b. the heart is able to contract spontaneously
c. the ejection volume of heart affects the blood pressure
d. peripheral resistance increases under the influence of sympathetic system
e. peripheral resistance increases under the influence of parasympathetic system
f. blood pressure is independent of cardiac activity

32. Mark the correct statements

a. the increase in peripheral vascular resistance is due to the activation of M3 receptors in peripheral vessels
b. nitric oxide acts to increase cGMP in arterial smooth muscles
c. calcium binds to troponin C and is critical for altering the conformation of tropomyosin
d. troponin T has a high affinity for calcium ions
e. phosphorylation of myosin regulatory regions is required for the onset of contraction in cardiomyocytes
f. preload expresses the force or load against which the heart has to contract to eject the blood

33. Mark the correct statements about the excitation-contraction coupling in cardiomyocytes

a. sodium cations play a key role
b. potassium cations play a key role
c. calcium cations play a key role
d. calcium required for cardiomyocyte contraction enters the cytoplasm from extracellular sources
e. calcium required for cardiomyocyte contraction enters the cytoplasm from intracellular sources
f. calcium is only needed for the action potential; it does not play a role in the contraction itself

34. Mark, which properties DO NOT BELONG to the specific properties of heart

a. chronotropy
b. dromotropy
c. cardiotropy
d. vasotropy
e. lucitropy

f. batmotropy

35. Mark the specific properties of heart

a. automaticity
b. chronotropy
c. dromotropy
d. batmotropy
e. inotropy
f. distensibility

36. Mark the correct statements about the morphology of-heart

a. the muscle cells of heart contain sequential sarcomere units
b. cardiomyocytes are morphologically similar to skeletal striated muscle
c. cardiomyocytes are a specialized type of smooth muscle
d. the electrical conduction system of heart is made up of nodal, transient and muscle cells
e. cardiomyocytes connect at their ends with the surrounding cells through the so-called intercalary disks
f. the interventricular septum closes only after birth

37. Papillary muscles

a. are found in the renal papilla
b. are important for heart valve mechanics
c. are on semilunar valves
d. are on bi- and tricuspid heart valves
e. are formed by the endothelium
f. are damaged especially during tachycardia

38. Parasympathetic fibres in the heart

a. are located mainly around the SA and AV node
b. are found mainly in the atria
c. are found mainly in the ventricles
d. mainly affect the formation and conduction of action potential
e. mainly affect the contractility of heart
f. mainly affect the metabolism of heart

39. Pericardium

a. forms the heart muscle
b. forms the cavities of heart
c. is the membrane that separates the heart from other mediastinal structures
d. consists of two leaves, between which the cavity is filled with a clear viscous liquid

e. covers the valves
f. is lined with smooth epithelial cells

40. Semilunar valves prevent blood from flowing

a. back from the aorta / lungs to the ventricles
b. back from the aorta / lungs to the atria
c. back from the left atrium to the left ventricle
d. back from the right atrium to the left ventricle
e. back from the right atrium to the right ventricle
f. back from the left atrium to the right ventricle

41. Sinus rhythm of the heart

a. is the physiological rhythm of heart
b. is the pathological rhythm of heart
c. has a value from 60-100 beats/min (average approx. 72 beats/min)
d. has a value from 40-60 beats / min (average approx. 55 beats / min)
e. originates in the AV node
f. originates in the SA node

42. Starling 's law expresses the relationship between the force of cardiac contraction and

a. the volume of venous return
b. heart rate
c. peripheral resistance
d. sympathetic stimulation
e. inhibition of parasympathetic stimulation
f. diastolic pressure

43. Stimulation of beta-1 receptors on the heart

a. is mediated by sympathetic system
b. is mediated by parasympathetic system
c. causes a positive inotropic effect
d. causes a negative inotropic effect
e. causes a positive chronotropic effect
f. causes a negative chronotropic effect

44. Sympathetic stimulation of the myocardium causes

a. heart rate increase
b. strength of contraction increase
c. conduction velocity in a conductive system increase
d. slowing of the heart rate
e. weakening of the contraction
f. slowing down the conduction of excitation by a conductive system

45. The apex

a. is on the base of heart
b. is at the tip of heart
c. is located to the left of sternum
d. is located at the entrance of pulmonary veins
e. consists of the cells of electrical conduction system
f. does not participate in myocardial contraction

46. The cardiac conduction system of heart consists of

a. working myocardium
b. bundle of His
c. SA node
d. Purkinje fibres
e. AV node
f. R/L bundle branches

47. The cells of the conduction system of heart are responsible for

a. electrical activity
b. mechanical activity
c. pumping function
d. creation and transfer of action potential
e. the automaticity of heart
f. the resting potential of ventricles

48. The contractile proteins in the heart are

a. actin and myosin
b. calmodulin and caldesmon
c. electrical conduction system
d. arranged in sarcomeres
e. SERCA and NCX
f. phospholamban

49. The contraction cycle of heart consists of

a. binding of myosin to actin
b. ATP synthesis by subsarcolemmal mitochondria
c. rigor mortis
d. activation of sarcoplasmic ATPase - SERCA2 on tropomyosin
e. hydrolysis of ATP at myosin heads and cleavage of inorganic phosphate
f. reactivation and removal of myosin from actin bond through the binding of new ATP to myosin head

50. The effect of parasympathetic system on the heart is

a. via acetylcholine stimulation
b. via noradrenaline stimulation
c. via beta-1 receptors
d. via M2 receptors
e. is positively inotropic
f. is negatively chronotropic

51. The first heart sound is created

a. when closing the atrioventricular valves
b. when closing the semilunar valves
c. in the filling phase
d. when opening the atrioventricular valves
e. during atrial systole
f. when opening the semilunar valves

52. The heart is a hollow organ containing following parts

a. left ventricle
b. right ear
c. left atrium
d. left ear
e. right ventricle
f. right atrium

53. The heart is covered by

a. myocardium
b. endocardium
c. epicardium
d. pericardium
e. endothelium
f. pleura

54. The innervation of heart by the autonomic vegetative system takes place mostly via

a. beta-1 receptors
b. beta-2 receptors
c. M1 receptors
d. M2 receptors
e. M3 receptors
f. alpha-1 receptors

55. The muscle tissue of heart is

a. the special type of epithelial tissue
b. transversely striped

c. the special subtype of connective tissue
d. skeletal striated
e. combined endocrine tissue
f. smooth muscle tissue

56. The myocardium gains energy for its activity

a. predominantly by anaerobic glycolysis
b. by other anaerobic processes
c. exclusively by oxidative metabolism
d. aerobically in peace, anaerobically under exertion
e. by aerobic metabolism
f. from fatty acids and glucose

57. The proteins that make up the cardiomyocyte contractile apparatus include

a. troponins T, C and I
b. myosin light chain kinase
c. myosin light chain phosphatase
d. tropomyosin
e. myosin-binding protein C
f. dihydropyridine receptors

58. The regulatory proteins in the heart are

a. troponin
b. tropomyosin
c. actin
d. myosin
e. caldesmon
f. phospholamban

59. The tricuspid valve is located between

a. the right and left atrium
b. the left atrium and the left ventricle
c. the right atrium and the right ventricle
d. the left ventricle and the aorta
e. the right ventricle and the lungs
f. the right and left atrium

60. To induce and spread a contraction in the myocardium, the following are needed

a. T-tubules
b. actin and myosin
c. spontaneous depolarization
d. sarcoplasmic reticulum

e. caveolae
f. neuromuscular junction

61. Troponin and tropomyosin located in myocardial cells have

a. stimulating effect on the binding of actin and myosin in the myocardial fibre
b. stimulating effect on myocardial fibre shortening
c. bathmotropic effect
d. high affinity for calcium ions
e. dromotropic effect
f. high affinity for sodium ions

62. Mark, what applies to the heart muscle cell

a. is called a cardiomyocyte
b. communication between cardiac cells is provided by intercalary disks
c. resembles a striated muscle cell
d. resembles a smooth muscle cell
e. is called a rhabdomyocyte
f. communication between cardiac cells is provided by ion channels

63. What enters the left atrium?

a. vena cava superior
b. vena cava inferior
c. pulmonary artery
d. aorta
e. hepatic veins
f. pulmonary veins

64. What enters the right atrium?

a. pulmonary arteries
b. vena cava superior
c. vena cava inferior
d. aorta
e. 4 pulmonary veins
f. pulmonary artery

65. What forms the heart muscle?

a. epicardium
b. endocardium
c. myocardium
d. pericardium
e. smooth muscle
f. pleura

66. What separates the left atrium from the left ventricle?

a. aortic valve
b. tricuspid valve
c. mitral valve
d. atrioventricular valve
e. semilunar valve
f. bicuspid valve

67. Which of the following parts comes out of the left ventricle?

a. vena cava superior
b. vena cava inferior
c. aorta
d. pulmonary arteries
e. hepatic artery
f. pulmonary vein

68. Which of the following parts comes out of the right ventricle?

a. vena cava superior
b. vena cava inferior
c. aorta
d. pulmonary artery
e. hepatic artery
f. pulmonary vein

69. Which of the following parts of heart are not important in preventing the return flow of blood in the heart?

a. mitral valve
b. tricuspid
c. myocardium
d. papillary muscle
e. atrioventricular node
f. endocardium

70. Which of the following statements about heart are correct?

a. the vena cava superior and the vena cava inferior enters in the right atrium
b. between right atrium and right ventricle is mitral valve
c. between left atrium and left ventricle is tricuspid valve
d. the oxygenation of heart is provided by the aorta
e. the oxygenation of heart is provided by coronary arteries
f. the coronary arteries begin from the aorta, just above the valve

71. Which part of the heart receives blood from the body first?

a. left atrium
b. right atrium
c. right ventricle
d. left ventricle
e. lung
f. four pulmonary veins

72. Which valve is located between the right ventricle and the right atrium?

a. aortic valve
b. tricuspid valve
c. mitral valve
d. atrioventricular valve
e. semilunar valve
f. bicuspid valve

73. Inotropy

a. is the automaticity of cardiac activity
b. affects the irritability of heart muscle
c. affects the strength of muscle contraction
d. is the speed of propagation of excitation by the cardiac transmission system
e. is the effect on the heart rate
f. is the effect of myocardial relaxation

74. Inotropy is the ability

a. to respond to a stimulus by contraction
b. of heart to generate excitement automatically and at a regular rhythm
c. of cardiomyocyte to excite
d. to transmit excitement to all other myocardial cells
e. of heart to beat automatically without the involvement of CNS
f. of heart to pump blood

Part 2

1. What is the electrocardiogram?

    a. a device for ECG recording
    b. the electrical potential recorded from body surface
    c. the electrical potential recorded from intestinal smooth muscle tissue
    d. the flow of current from area of depolarized myocardium to surrounding cells
    e. the electrical potential recorded from cardiac surface
    f. the electrical potential recorded from head surface

2. The passing of the action potential is possible through the following structure

    a. myocardial cells
    b. cuspid valves
    c. papillary muscle
    d. chordae
    e. intercalated disks
    f. semilunar valves

3. Which electrodes/leads are used for ECG recording?

    a. cephalic
    b. quadrupolar
    c. limb
    d. chest
    e. unipolar
    f. bipolar

4. The rapid 0 phase of ventricular action potential is due to

    a. opening of voltage dependent sodium channels and movement of sodium ions
    b. opening of voltage dependent potassium channels and movement of sodium ions
    c. opening of voltage dependent calcium channels and movement of sodium ions
    d. opening of voltage dependent chloride channels and movement of positive chloride ions
    e. opening of voltage dependent sodium channels and movement of magnesium ions
    f. opening of voltage dependent calcium channels and movement of calcium ions

5. QRS complex involves the signal due to

    a. depolarization of both ventricles
    b. depolarization of both atria
    c. depolarization of apex
    d. repolarization of auriculas

e. depolarization of ears
f. repolarization of atria

6. The fourth phase of SA nodal action potential is due to

    a. increased permeability for calcium ions
    b. Na/Ca ATPase
    c. decreased permeability for potassium ions
    d. increased permeability for sodium ions
    e. Na/H exchanger
    f. Ca-ATPase

7. Mark, what applies to the action potential in the electrical conduction system

    a. has a spike shape (similar to a nerve)
    b. depolarization depends on calcium
    c. depolarization depends on sodium
    d. can be generated by every cell of the heart
    e. can be generated only by cells of the electrical conduction system
    f. can be generated only by myocardial working muscle cells

8. Action potential in the heart

    a. is identical to the action potential of the neuron
    b. differs from the neuronal action potential by the value of resting membrane potential
    c. is the same in the electrical conduction system and in the working myocardium
    d. is different in the electrical conduction system and in the working myocardium
    e. includes calcium inflow
    f. spreads first in the electrical conduction system, then in the working myocardium

9. Action potential of the working myocardium

    a. does not differ from the action potential of a neuron
    b. resembles the action potential of a striated myocyte
    c. does not differ from the action potential in the electrical conduction system
    d. has a plateau phase
    e. has a depolarization phase
    f. has a repolarization phase

10. An ECG record is a record of how many leads?

    a. 3
    b. 6
    c. 9
    d. 12

e. 15
f. 18

11. At the time when the electrocardiograph writes PQ interval what takes place in the heart?

a. transfer of excitation from the atria to the ventricles
b. electrical activity of atria
c. Hiss bundle repolarization
d. electrical activity of the ventricles
e. atrial repolarization
f. repolarization of Tawara branches

12. Bathmotropy is the heart's ability to

a. respond to a stimulus by contraction
b. generate excitement automatically and at a regular rhythm
c. excite its cardiomyocyte
d. transmit excitement to all other myocardial cells
e. beat automatically without the involvement of the CNS
f. pump blood

13. Bathmotropy is

a. the automaticity of cardiac activity
b. characterized as the strength of muscle contraction
c. the effect on heart rate
d. characterized as the irritability of the heart muscle
e. the effect of myocardial relaxation
f. the speed of propagation of excitation by the cardiac transmission system

14. Ca2 + ions enter the myocardial cell mainly during

a. depolarization
b. trans polarization
c. phase plateau
d. final repolarization
e. initial repolarization
f. hyperpolarization

15. Mark the correct statements about chronotropy

a. is the frequency of heart activity
b. is the spontaneous ability to depolarize and form AP
c. is contractility
d. is the force of heart contraction
e. negative chronotropy induces bradycardia of the heart

f. positive chronotropy causes tachycardia of the heart

16. Chronotropy is the heart's ability to

a. respond to a stimulus by contraction
b. generate excitement automatically and at a regular rhythm
c. excite its cardiomyocyte
d. transmit excitement to all other myocardial cells
e. beat automatically without the involvement of the CNS
f. pump blood

17. Dromotropy is the heart's ability to affect the

a. irritation of the heart muscle
b. speed of propagation of excitation by the cardiac transmission system
c. heart rate
d. relaxation
e. strength of muscle contraction
f. automaticity of cardiac activity

18. During phase 2 of the myocardial action potential,

a. Na+ / K+ exchanges to stabilize the membrane potential
b. flow of Ca2+ across the membrane into the cell occur
c. flow of Ca2+ across the membrane from the cell occur
d. inflow of K+ into the cell
e. activation of the Na+/ Ca2+ exchanger
f. no ion transfer across the membrane

19. During which phase on the ECG do the atria repolarize?

a. P wave
b. U wave
c. QRS complex
d. ST segment
e. T wave
f. only in children during the U wave

20. ECG

a. is the sum of all the electrical potentials of the heart
b. shows how the heart contracts over time
c. shows cardiac systole over time
d. shows cardiac diastole over time
e. shows the gradual depolarization and repolarization of individual parts of the heart
f. helps determine the contractility of the heart

21. ECG

a. measures electric current
b. measures electrical voltage
c. monitors heart depolarization and repolarization
d. allows us to determine the thickness of the cardiac compartments
e. informs us about blood pressure
f. uses bipolar Goldenberg leads

22. ECG measurement can be realized using

a. 4 electrodes
b. 12 electrodes
c. 2 electrodes
d. unipolar Wilson chest leads
e. Goldberg leads
f. 16 bipolar leads

23. Mark the correct statements about the “funny channels”

a. they open spontaneously
b. are active at the end of repolarization
c. are important for the development of depolarization on myocardial cells
d. are slow channels
e. are merry channels
f. they are activated at the end of depolarization

24. Goldberger's leads are referred to as

a. I., II., III.
b. VR, VL, VF
c. aVR, aVL, aVF
d. V1-V2
e. V3-V4
f. V5-V6

25. Influx of which ions represents the plateau phase?

a. sodium
b. potassium
c. calcium
d. chloride
e. magnesium
f. both sodium and potassium

26. Intercalary disks in the heart

a. contain tight junctions

b. contain gap junctions
c. allow direct passage of ions
d. allow indirect passage of ions
e. they are permeable to ions and small molecules
f. it is a microfilament connection

27. Intercalary disks

a. are longitudinal cell connections
b. are found, for example, in the heart
c. provide a synchronous muscle response
d. are transverse intercellular connections
e. are very tight cell connections
f. are connections of T tubules with sarcoplasmic reticulum

28. Mark, what applies to the heart's conduction system

a. is dependent on somatic nerve stimulation
b. the SA node is the main pacemaker
c. it consists of the following 2 parts: Bundle of His and Purkinje fibers
d. stimulation of β1 adrenergic receptors accelerates the propagation through conductive system
e. it starts at the AV node, which stimulates the valves
f. has the same action potential curve as cardiomyocytes

29. List the components of the heart's electrical conduction system in the correct order

a. AV node, SA node, Tawara branches, Hiss bundle, Purkinje fibers
b. AV node, SA node, Hiss bundle, Tawara branches, Purkinje fibers
c. SA node, AV node, Hiss bundle, Tawara branches, Purkinje fibers
d. SA node, AV node, Tawara branches, Hiss bundle, Purkinje fibers
e. AV node, gear pacemaker, SA node, Hiss bundle, Tawara branches, Purkinje fibers
f. SA node, AV node, Hiss bundle, Tawara branches, Purkinje fibers, working myocardium

30. Mark the correct statements

a. inotropy is an expression of the ability to conduct action potential
b. the cells of the electrical conduction system are capable of spontaneous depolarization
c. cholinergic stimulation leads to an increase in the conductivity of the electrical conduction system and thus to an increase in chronotropy
d. norepinephrine by acting on β2 receptors increase cAMP levels and contribute to increased calcium channel opening
e. tissue factors such as atrial natriuretic peptide are produced directly by cardiac muscle cells

f. depolarization in cardiac contractile cell is mediated by Na+ ions

31. Mark the correct statements

a. positive inotropic effect on the heart is caused by the sympathetic system
b. positive chronotropic effect on the heart is caused by the sympathetic system
c. parasympathetic system has a negative chronotropic effect on the heart via M2 receptors
d. the cells of the electrical conduction system have a plateau phase action potential
e. the AV node is primarily responsible for the generation of action potentials in healthy people
f. the superior vena cava opens into the left atrium

32. Mark the correct statements

a. during the plateau phase in the heart, sodium flows into the cardiomyocyte
b. during the plateau phase in the heart, calcium flows into the cardiomyocyte
c. the instability of the resting membrane potential in the cells of the electrical conduction system is due to spontaneous depolarization
d. during heart contraction there is a calcium-controlled leaching of calcium from the sarcoplasmic reticulum
e. heart systole represents the relaxation of the ventricles
f. the heart rate of a healthy person is 120/80 mmHg

33. Mark the correct statements

a. increased salt intake increases blood pressure
b. systolic pressure is the pressure in the veins during contraction of the ventricles
c. diastolic pressure is the blood pressure in the arteries during the filling of the atria
d. Purkinje cells are pacemakers
e. depolarization of the SA node takes place with calcium
f. during the QRS complex, atrial repolarization and ventricular depolarization occur

34. Mark the correct statements

a. cardiomyocytes are cells of the working myocardium as well as of the cardiac conduction system
b. the sinoatrial node and the atrioventricular node are pacemakers
c. working myocardial cells make up about 1% of cardiomyocytes
d. the cells of the transmission system make up about 99% of cardiomyocytes
e. the cells of the transmission system are capable of spontaneous depolarization
f. working myocardial cells are capable of spontaneous depolarization

35. Mark the correct statements about the resting membrane potential (RMP)

a. in cardiac RMP, the major extracellular ions are Na^+, Cl^-
b. in cardiac RMP, the major extracellular ions are Na^+, Ca^{2+}
c. in RMP of the heart, the major extracellular ions are Ca^{2+}, Cl^-
d. in cardiac RMP, the major intracellular ions are Na^+, Cl^-
e. in RMP of the heart, the major intracellular ions are K^+, Ca^{2+}
f. in cardiac RMP, the major intracellular ions are K^+, Cl^-

36. Mark the correct statements

a. the ECG informs about the position of the heart
b. bradycardia is a decrease in heart rate below 60 beats per minute
c. the ECG allows us to identify the thickness of the cardiac wall
d. the T wave is a manifestation of delayed repolarization of the atria
e. the ECG records cardiac activity only in cells of the cardiac conduction system
f. the QRS complex is identical in each ECG lead

37. Mark the correct statements

a. the P wave represents depolarization of the atria
b. the QRS complex is a representation of ventricular contraction
c. the T wave represents the repolarization of the atria
d. the QRS complex is an illustration of ventricular depolarization
e. U wave can represent the repolarization of papillary muscles
f. the ST segment is a record of ventricular contraction

38. Mark the correct statements

a. a positive inotropic effect means that the force of the contraction increases
b. a negative chronotropic effect means that the heart rate increases
c. under physiological conditions, SA node is referred to as a pacemaker
d. potassium ions are involved in the plateau phase
e. calcium ions are involved in the depolarization of the SA node
f. under physiological conditions, AV nodes are referred to as a pacemaker

39. Mark the correct statements

a. the ECG records all action potentials of each heart cell
b. on the ECG, all the action potentials of only the ventricular cells of the heart are recorded
c. the designation bipolar means that the electrocardiogram is recorded from two electrodes on the body
d. chest leads are referred to as Goldberg's
e. the RR interval is an indicator of heart rate
f. the QRS complex expresses depolarization of both atria

40. Mark the correct statements

a. the automaticity of the heart is mediated by the autonomic nervous system
b. the SA node represents the main pacemaker of the heart
c. in the AV node, the velocity of action potential to the ventricular part is accelerated
d. cardiomyocytes are also interconnected by electrical synapses, so-called Gap junctions
e. activation of the sympathetic system increases the force of the contraction as well as the speed of conduction
f. the parasympathetic system does not have a significant effect on heart function

41. Mark the correct statements

a. cardiomyocytes contain sarcomere units
b. ryanodine receptors mediate the release of sodium required for contraction
c. myosin light chain phosphatase mediates contraction in cardiomyocytes
d. myosin ATPase mediates the cleavage of ADP to ATP and phosphate
e. voltage-dependent L-type calcium channels are localized on cardiomyocyte's sarcolemma
f. pumping calcium back into the sarcoplasmic reticulum is a passive process

42. Mark the correct statements about the pacemaker cells in the heart

a. it is a cluster of specialized myocardial cells that initiates a sinus rhythm
b. it is a cluster of specialized myocardial cells that initiates diastole
c. it is a cluster of cells in the SA node
d. it is a cluster of cells in the His bundle
e. in a healthy person, it produces excitements about 72 beats / min
f. in a healthy person, it produces excitements about 55 beats / min

43. Mark the correct statements about the action potential in ventricular cardiomyocytes

a. it is identical to the action potential in the skeletal muscle myocytes
b. it is identical to the action potential in the neuron
c. it is identical to the action potential in the smooth muscle cell
d. there is no depolarization phase
e. in addition to the repolarization and depolarization phases, there is also a plateau phase
f. the inflow of potassium cations is interrupted by a plateau phase

44. Mark the correct statements about the ECG

a. is a record of the contractile activity of the heart
b. is a record of the conduction activity of the heart
c. is a record of the electrical activity of the heart
d. allows arrhythmias to be identified

e. allows to identify the thickness of the cardiac wall
f. allows to identify only a healthy myocardium

45. Stimulation of the parasympathetic system results in

a. negative chronotropic effect
b. negative inotropic effect
c. only positive chronotropic effect, other effects (inotropic, bathmotropic and dromotropic) are negatively affected
d. only negative chronotropic effect, other effects (inotropic, bathmotropic and dromotropic) are not affected
e. increase in blood pressure
f. reduction of peripheral resistance

46. Sympathetic activation has the following effects on the heart

a. positive inotropic effect
b. negative chronotropic effect
c. negative dromotropic effect
d. activation of beta2-adrenergic receptors
e. increase in cAMP levels
f. reduction in cAMP levels

47. Mark the correct statements about the "plateau phase"

a. it indicates the ECG phase between two contractions
b. it is phase of action potential in the ventricular cardiomyocytes
c. it is the action potential phase in the transmission system
d. it corresponds to the phase of calcium entry into the cell from extracellular sources
e. it corresponds to the phase of calcium entry into the cell from intracellular sources
f. it corresponds to the phase of calcium output from the cell via ryanodine receptors

48. Phospholamban

a. is a protein
b. is a substrate for protein kinase A
c. is important for diastolic heart function
d. is important for systolic heart function
e. controls calcium-controlled calcium release in the working myocardium
f. activates dihydropyridine receptors

49. Positive inotropic effect means that the

a. contact of the heart is reduced

b. contractility of the heart will increase
c. conductivity of the heart cells increases
d. rhythm of the heart is reduced
e. heart rate decreases
f. heart rate is increased

50. Positive inotropic effect on the heart

a. is caused by the action of acetylcholine on M2 receptors
b. represents an increase in heart rate
c. represents an increase in the contraction force of the heart
d. is caused by sympathetic system
e. leads to an increase in cardiac output
f. is reflected in QT prolongation

51. QRS complex on ECG recording corresponds to

a. depolarization of the atria
b. atrial repolarization
c. the relaxation of the atria
d. the depolarization of the ventricles
e. the systole of the ventricles
f. the diastole of the ventricles

52. QT interval

a. talks about ventricle activation
b. talks about activating the atria
c. may affect different medicines
d. its prolongation can lead to arrhythmias
e. is not affected by mineral balance
f. it is also affected by mineral balance

53. Rhythm of the heart can be affected by

a. melanin
b. autonomic innervation
c. length of sarcomeres
d. baroreceptors
e. chemoreceptors
f. electrolytes

54. Sodium "funny" channels

a. participate in spontaneous diastolic depolarization
b. are important for the plateau phase
c. are found mainly in working myocardial cells

d. cause the potential to shift to the trigger value
e. are involved in myocardial repolarization
f. are important for maintaining resting membrane potential in the working myocardium

55. Spontaneous myocardial activity

a. is given by the instability of the resting membrane potential
b. pacemakers are responsible for it
c. the working muscle of the myocardium is responsible for it
d. Purkinje cells are responsible for it
e. is different in the working myocardium of the atria and in the ventricles
f. is dependent on body temperature activity

56. Mark, what applies to the action potential (AP) in the heart

a. it starts at the SA node
b. the AV node may take over AP generation under pathological circumstances
c. conduction of AP accelerates from the SA node to the AV node
d. calcium is a critical element for depolarization in the cardiac conduction system
e. Na + pumping into the sarcoplasmic reticulum is required to terminate AP
f. freely permeable potassium channels are responsible for the formation of AP in the conduction system

57. The action potential of the working ventricular myocardial cells lasts for about

a. 2 - 4 ms
b. 30 - 50 ms
c. 100 - 200 ms
d. 200 - 400 ms
e. 400 - 600 ms
f. 550 - 1000 ms

58. Dromotropy is the heart's ability to

a. respond to a stimulus by contraction
b. generate excitement automatically and at a regular rhythm
c. excite cardiomyocytes
d. transmit excitement to all other myocardial cells
e. beat automatically without the involvement of the CNS
f. pump blood

59. The electrocardiogram is

a. an ECG recorder
b. a record of electrical potentials from the surface of the body

c. a record of electrical potentials from the smooth muscle of the intestines
d. the flow of current from the depolarized myocardium to the environment
e. a record of electrical potentials from the surface of the heart
f. a record of electrical potentials from the surface of the head

60. The fast 0 phase of the action ventricular potential is caused by opening

a. voltage-gated sodium channels and passing sodium ions
b. voltage-gated potassium channels and passing sodium ions
c. voltage-gated calcium channels and passing sodium ions
d. voltage-gated chloride channels and passing through positive chloride ions
e. voltage-gated sodium channels and passing magnesium ions
f. voltage-gated calcium channels and passing calcium ions

61. The fourth phase of the SA nodal action potential is caused by

a. increased permeability for slow Ca ions
b. Na+ / Ca2+ ATPase
c. decreased permeability to potassium ions
d. increased permeability to sodium ions
e. Na+ / H+ pump
f. Ca2+-ATPase

62. The heart

a. is located in the mediastinum behind the sternum
b. is located in the thoracic cavity
c. is formed by the left and right part
d. is located in the left part of the thoracic cavity
e. consists of the epicardium, myocardium and endocardium
f. is supplied with oxygen through coronary veins

63. The heart's conduction system includes

a. troponin
b. tropomyosin
c. SA node
d. AV node
e. aorta
f. coronary arteries

64. The limb bipolar lead I records the potential difference between the electrodes placed on

a. right hand and left hand
b. right hand and left foot
c. left hand and left foot

d. left leg and right leg
e. right hand and lead V1 on the chest
f. left hand lead V6 on the chest

65. The limb bipolar lead II records the potential difference between the electrodes placed on

a. right hand and left hand
b. right hand and left foot
c. left hand and left foot
d. left leg and right leg
e. right hand and a V5 lead on the chest
f. left hand lead V3 on chest

66. The limb bipolar lead III records the potential difference between the electrodes placed on

a. right hand and left hand
b. right hand and left foot
c. left hand and left foot
d. left leg and right leg
e. right hand and lead V2 on the chest
f. left hand lead V4 on the chest

67. The lusitropic effect on the heart means

a. increase of conductivity
b. conductivity reduction
c. acceleration of the relaxation phase
d. increase of heart rate
e. slowing down the spread of action potential
f. contraction slowing

68. The P wave on the ECG displays

a. ventricular repolarization
b. atrial depolarization
c. depolarization of both ventricles
d. only left ventricular depolarization
e. only depolarization of the right ventricle
f. ventricular hyperpolarization

69. The phase that begins with the opening of semilunar valves is called

a. isovolumic relaxation
b. filling phase
c. isovolumic contraction

d. push phase
e. plateau phase
f. absolute refractory phase

70. The plateau phase is

a. a phase of the action potential of the cells of the cardiac electrical conduction system
b. associated with a massive release of calcium from the sarcoplasmic reticulum
c. a phase of action potential on the working muscle of the myocardium
d. associated with a massive release of chloride from the sarcoplasmic reticulum
e. associated with rapid sodium depolarization
f. a phase during which calcium entering the cell is used to contract the heart

71. The plateau phase of the action potential of the working myocardial cell

a. is caused by the influx of sodium into the cell
b. is caused by the influx of calcium into the cell
c. arises due to the opening of membrane sodium channels
d. is caused by the inflow of calcium from intracellular reserves
e. is caused by the release of calcium from the cell
f. arises due to the opening of membrane calcium channels

72. The plateau phase of the working myocardial cells is primarily associated with the

a. opening of Ca2+ channels
b. opening of voltage-controlled Na+ channels
c. closure of chemically controlled K+ channels
d. opening of voltage-controlled K+ channels
e. closure of ryanodine channels
f. closure of dihydropyridine channels

73. The QRS complex displays

a. only ventricular repolarization
b. only depolarization of the atria
c. depolarization of both ventricles
d. only left ventricular depolarization
e. only depolarization of the right atrium
f. repolarization of the SA node

74. The QT interval on the electrocardiogram corresponds with

a. atrial ventricular transmission
b. the duration of electrical activity of the atria
c. the duration of electrical activity of the ventricles
d. inside the ventricular repolarization gear

e. the duration of action potential of the whole heart
f. the duration of action potential of the Hiss beam

75. The QT interval on the electrocardiogram corresponds with

a. atrial ventricular transmission
b. the duration of electrical activity of the atria
c. the duration of electrical activity of the ventricles
d. inside the ventricular repolarization gear
e. the duration of action potential of the whole heart
f. the duration of action potential of the Hiss bundle

76. The resting membrane potential of working myocardial cells is about

a. -30 mV
b. -10 mV
c. -90 mV
d. -70 mV
e. -80 mV
f. -100 mV

77. The sinus node is normally an indicator of the heart rhythm (pacemaker) for the following reason

a. transmits excitations at a constant frequency
b. sends the strongest stimuli
c. has the longest spontaneous depolarization
d. has the fastest spontaneous depolarization
e. because it is part of the heart's electrical conduction system
f. because it activates the potassium channel

78. The T wave on the ECG displays

a. ventricular repolarization
b. atrial depolarization
c. depolarization of both ventricles
d. only depolarization of the left atrium
e. only depolarization of the right atrium
f. hyperpolarization of the atria

79. The transition of the action potential is possible through the following structures

a. myocardial cells
b. bicuspid valve
c. papillary muscle
d. chordae tendineae
e. intercalary disks

f. semilunar valves

80. What can be recognized from an ECG record?

a. P wave, which speaks of depolarization of the ventricles
b. P wave, which speaks of depolarization of the atria
c. QRS complex, which speaks of depolarization of the ventricles
d. QRS complex, which also talks about repolarization of the atria
e. QRS complex, which speaks of repolarization of the ventricles
f. T wave, which speaks of repolarization of the atria

81. Mark, what applies to the ECG

a. is a record of the change in membrane potential over time and expresses the electrical activity of the heart
b. the ST segment is an indicator of ventricular depolarization
c. prolonged QT interval is a risk factor for cardiac arrhythmias
d. the T wave corresponds with atrial repolarization
e. the T wave corresponds with ventricular repolarization
f. the RR interval describes one cardiac cycle

82. Mark, what applies to the action potential of the heart

a. it starts at the SA node
b. the AV node can take over the formation of AP under certain circumstances
c. the AP line accelerates from the SA node to the AV node
d. calcium is a critical element for depolarization in the cardiac conduction system
e. Na+ pumping into the sarcoplasmic reticulum is required to terminate AP
f. freely permeable potassium channels are responsible for the formation of APs in the electrical conduction system

83. What are involved in restoring the membrane potential in the heart

a. T-tubules
b. SERCA
c. Na / Ca exchanger
d. Na+ / K+ pump
e. DHP channels
f. RYR2

84. Mark, what belongs to the electrical conduction system of the heart

a. vena cava superior
b. SA node
c. vena cava inferior
d. muscle of the atria and ventricles

e. bicuspid valve
f. left Tawara branch

85. What ensures the innervation of the heart?

a. the sympathetic system in the heart is controlled via alpha-receptors
b. the sympathetic system in the heart is controlled via M-receptors
c. the parasympathetic system in the heart is controlled via beta-receptors
d. the parasympathetic system in the heart is controlled via M-receptors
e. the sympathetic system in the heart is controlled via beta-receptors
f. the parasympathetic system in the heart is controlled via alpha-receptors

86. What indicate the individual waves/ sections of the ECG recording

a. P wave - repolarization of atria
b. P wave - depolarization of atria
c. QRS complex - depolarization of ventricles
d. T wave - depolarization of atria
e. T wave - repolarization of ventricles
f. ST interval - refractory phase

87. What serves as a pacemaker (under physiological conditions) for the heart

a. atrio-ventricular node
b. sino-atrial node
c. Hiss bundle
d. apex
e. left ventricle
f. septum

88. Which electrodes can be used for ECG recording

a. head
b. quadrupolar
c. limb
d. thoracal
e. unipolar
f. bipolar

89. Which ion is responsible for spontaneous diastolic depolarization of the heart?

a. Na
b. Ca
c. K
d. Mg
e. Cl
f. Mn

90. Which of the following ECG statements are correct?

a. red and yellow electrodes are placed on the upper limbs
b. the ECG measures both chemical and electrical activity on the heart
c. electrocardiogram is a record of electrical activity of the heart
d. electrocardiograph is a device for recording electrical activity of the heart
e. the ECG can monitor all the action potentials in the heart
f. red and yellow electrodes are placed on the lower limbs

91. Mark, what applies to the action potential in the heart

a. pacemaker current is generated in the SA node by the “funny current”
b. depolarization in the conductive system is ensured by calcium influx
c. cardiomyocyte depolarization is mediated by sodium influx
d. activation of the neuromuscular junctions is required for depolarization of cardiomyocytes
e. the plateau phase of cardiomyocytes is important for calcium influx
f. the ventricle action potential is independent of potassium

Part 3

1. Blood vessels are divided into

    a. arteries
    b. arterioles
    c. capillaries
    d. epicardies
    e. conductives
    f. venules

2. Aorta

    a. is a large elastic artery
    b. has a very thin layer of tunica media
    c. originates from the left ventricle
    d. its rupture can have fatal consequences
    e. originates from the right ventricle and is directed towards the lungs
    f. is a small elastic artery

3. Arteries are

    a. conducting vessels
    b. resistance vessels
    c. distributing vessels
    d. capacitance vessels
    e. elastic vessels
    f. muscular vessels

4. Arteries that are closer to the heart will have a higher percentage of

    a. endothelium
    b. smooth muscle
    c. elastic fibres
    d. collagen fibres
    e. valves
    f. capillaries

5. Arterioles

    a. have a wall composed mainly of elastic fibres, thanks to which they are the main regulators of peripheral resistance
    b. have significant sympathetic innervation
    c. are able to regulate the blood flow to individual organs by changing the luminal diameter
    d. are the primary capacitance vessels
    e. are found only in the systemic circulation

f. can be connected directly to the venules by arteriovenous shunts

6. Blood supply of the brain tissue is ensured

    a. by the system of arteries and anastomoses named Willis's circle
    b. by the system of veins named Willis's circle
    c. by vertebral arteries
    d. by the portal artery
    e. by carotid arteries
    f. by veins and capillaries

7. Capillaries

    a. are distributing vessels
    b. are the main participants of microcirculation
    c. are capacitance vessels
    d. are elastic vessels
    e. are exchange vessels
    f. transport blood from arteriole to venule

8. Capillary endothelium

    a. is the same throughout the body
    b. is non-permeable in the brain
    c. is non-permeable in the kidneys
    d. is very permeable in the liver
    e. varies according to the age of person, being more permeable in children than in adults
    f. varies according to the age of person, being more permeable in adults than in children

9. Endothelial relaxation factor

    a. is nitric oxide
    b. leads to vasodilation
    c. leads to a decrease in blood pressure
    d. leads to vasoconstriction
    e. leads to an increase in blood pressure
    f. acts in the heart

10. Endothelin

    a. is mainly produced by the liver
    b. is formed by the endothelium
    c. has vasodilatory effects
    d. has vasoconstrictive effects
    e. is formed by an endothelin converting enzyme

f. acts mainly by the effect of hemoglobin

11. Endothelium

a. is a thin layer of cells that lines blood vessels
b. creates a barrier between the vessel and tissues
c. has both metabolic and synthetic functions
d. is formed by cylindrical cells
e. is found mainly in the bones
f. regulates brain activity

12. Mark the correct statements about veins

a. the more distal located veins ~~the~~ more valves they have
b. they are also called resistance vessels
c. they are thinner than arteries
d. the vena cava has no valves
e. they are separated from the capillaries by a pre-capillary sphincter
f. they are also called capacitance vessels

13. Mark the correct statements

a. arteries are more elastic than veins
b. arterioles regulate blood flow
c. veins serve as capacitive vessels
d. capillaries regulate blood flow
e. veins do not have flaps
f. there is less pressure in the arteries than in the veins

14. Mark the correct statements about arteries and veins

a. the walls of arteries are more flexible and have more smooth muscle than the veins
b. the arteries carry oxygenated blood, the veins deoxygenated
c. the veins have three different "tunics" in their walls, while the arteries have only two
d. blood flows in the veins pulsatingly, in the arteries continuously
e. the walls of veins are more flexible and have more smooth muscles than the walls of arteries
f. there is higher pressure in the veins than in the arteries

15. Mark the correct statements about capillaries

a. their structure is the same in every organ
b. they always contain smooth muscles and endothelium
c. they actively influence peripheral resistance
d. they are responsible for the exchange and transfer of substances

e. the capillary wall is permeable to low molecular weight substances
f. the velocity of blood flow in capillaries is the lowest compared to other vessels

16. Mark the correct statements about capillaries

a. they allow the exchange of nutrients, gases and waste products between the tissue and blood because they do not have a basement membrane
b. due to high dense network of tight junctions, the brain capillaries have a very limited possibility of paracellular transport of substances
c. they are formed by a single layer of squamous epithelium
d. the wall of the liver capillaries (sinusoids) is permeable to plasma proteins
e. capillary blood flow decreases with increasing postcapillary resistance
f. compared to other bloodstream parts, they have the lowest pressure

17. Mark the correct statements about pulmonary circulation

a. the pulmonary arteries have a thicker wall compared to the systemic ones
b. in contrast to the systemic circulation, the pressure in the pulmonary veins is higher than the pressure in the pulmonary arteries
c. in contrast to the systemic circulation, hypoxia in the pulmonary system leads to vasoconstriction
d. capillaries have many anastomoses
e. the blood pressure is lower compared to the systemic circulation
f. it begins in the left atrium

18. Which vessels participate in microcirculation?

a. aorta
b. veins
c. arterioles
d. capillaries
e. venules
f. arteries

19. Mark the correct statements about arterioles

a. they represent a capacitated conduit
b. they represent a resistance conduit
c. their constriction increases blood pressure
d. they are responsible for the elastic function
e. they do not contain smooth muscles, only endothelium and a connective tissue sheath
f. they contain valves

20. Nitric oxide

a. is mainly produced by the liver
b. is formed by the endothelium
c. has vasodilatory effects
d. has vasoconstrictive effects
e. is formed from L-arginine by NO synthases
f. acts mainly by the action of angiotensin I

21. Peripheral vascular resistance is

a. the resistance of vascular elastic fibres preventing the elongation of blood vessels
b. the resistance imposed by the peripheral vessels
c. the resistance of muscular blood vessels that prevents excessive exertion
d. the peripheral contraction of skeletal muscle that impedes blood flow
e. the dilatation of large blood vessels leading to blood pooling
f. the factor affecting blood pressure

22. The largest volume of blood can be found in the

a. heart
b. pulmonary circulation
c. arteries
d. arterioles
e. capillaries
f. veins

23. The word “lumen” in vessel anatomy represents

a. an inner space of the vessels in which the blood flows
b. a space that separates the vessel from the surrounding tissue
c. a translucence of vessels
d. a muscle layer of blood vessels
e. a cross section of vessels
f. an endothelial layer of blood vessels

24. Tunica adventitia

a. consists of connective tissues and elastic fibres
b. consists of endothelial cells
c. sympathetic nerves pass through it
d. forms a thinner layer than the tunica intima
e. is not found in arteries
f. forms the inner lining of the vessel

25. Tunica media

a. is located between tunica intima and tunica adventitia
b. is formed by a layer of smooth muscles
c. its thickness is the same in all vessels
d. consists of endothelial cells
e. is not found in arteries
f. forms the outer layer of the vessel

26. What do the walls of the capillaries contain?

a. endothelium
b. elastic fibres
c. collagen fibres
d. smooth muscle
e. flaps
f. basement membrane

27. Mark the correct statements about arteries

a. they carry only oxygenated blood
b. they carry only deoxygenated blood
c. they carry blood to the heart
d. they carry blood from the heart
e. is e.g. the aorta
f. is e.g. the carotid

28. Mark the correct statements about arterioles. They

a. form an exchange area
b. form the distribution area
c. form a collection area
d. form a resistance stream
e. form a capacitive stream
f. contain valves

29. Which vessels belong to the portal circulation?

a. a. vertebral
b. v. internal jugularis
c. v. portae
d. a. common. carrot. dextra
e. v. hepatitis
f. v. brachialis

30. Why do the veins have a larger lumen diameter than the arteries?

a. because there is more blood than in the arteries (they are a reservoir of blood)
b. because there is higher pressure than in the arteries
c. because it allows them to return blood to the heart faster
d. because their vasoconstriction causes a larger change on average blood pressure compared to the arteries
e. because they have flaps
f. because they lead blood to the lungs

Part 4

1. Hemodynamics describes the physical behaviour of blood

    a. flow
    b. pressure gradient
    c. resistance
    d. area of cross section
    e. flow velocity
    f. as a fluid

2. Mark the correct statements about the mean arterial pressure

    a. is the time average pressure in the arteries
    b. can be approximated as difference between systolic and diastolic pressure
    c. it is product of ejection volume and peripheral resistance
    d. value is closer to systolic pressure value
    e. is calculated as the sum of the diastolic pressure values and one third of the pulse pressure
    f. varied during the daily cycle

3. Mark the correct statements about arterial blood pressure

    a. represents the cyclic changes of the blood in the arteries
    b. is a function of the volume of blood inflow into the arteries
    c. is a function of the blood volume persisted within the arteries
    d. systolic is the highest pressure in veins
    e. could be measured directly or indirectly
    f. indirect measurement makes use of a sphygmomanometer

4. Mark the correct statements about blood pressure

    a. is the ratio of peripheral vascular resistance to ejection volume
    b. it is not affected by the volume of circulating blood
    c. factors such as angiotensin II or endothelin 1 increase peripheral vascular resistance
    d. as the heart rate increases, so does the blood pressure
    e. diastolic pressure expresses the minimum pressure in the ventricle during relaxation
    f. the main determinant is cardiac output

5. Mark the correct statements about baroreceptors

    a. are receptors that detect changes in nitric oxide levels
    b. are receptors that detect changes in pO2 levels
    c. are receptors that detect changes in vessel wall tension
    d. they are located mainly in peripheral vessels

e. they are located mainly in the vena cava
f. they are located mainly in the aorta and carotid arteries

6. Blood flow through the coronary arteries

    a. increases during ventricular systole
    b. increases during ventricular diastole
    c. decreases during the filling phase
    d. does not change during the cardiac cycle
    e. increases during spinning diastole
    f. decreases during Hiss bundle activation

7. Blood pressure in circulation is

    a. the velocity which the blood exerts on the vascular wall
    b. the highest in aorta
    c. in the hollow veins
    d. in increased with decreasing cross-sectional area
    e. affecting blood flow
    f. depending on the peripheral vascular resistance

8. Mark the correct statements about blood pressure

    a. it depends on a circadian rhythm
    b. it depends on neuronal regulation
    c. it depends on hormonal regulation
    d. it does not depend on circadian rhythm
    e. it does not depend on neuronal regulation
    f. it does not depend on hormonal regulation

9. Blood pressure is regulated by

    a. lymph system
    b. kidney
    c. baroreceptors
    d. chemoreceptors
    e. rheologic blood properties
    f. gravitation and muscles

10. Blood pressure regulation includes

    a. sympathetic nerves such as nervus vagus that stimulate mainly vasoconstriction in internal organs via β2 receptors
    b. chemoreceptors which are also located in the respiratory centre of the brainstem and detect pO2 and pCO2 levels
    c. the parasympathetic system does not affect vasodilation by any mechanism

d. the response to an increase in pCO2 levels in the brainstem is also an increase in arterial pressure
e. baroreceptors are located in the aorta and carotid arteries and detect changes in vessel wall tension
f. the entry of blood into the capillary cannot be affected by any mechanism

11. Mark the correct statement about chemoreceptors in the vascular system

a. detect changes in arterial pressure
b. detect changes in pO2 in arterial blood
c. detect changes in arterial blood pH
d. detect changes in pCO2 in arterial blood
e. they are located only on the periphery
f. are located only in the CNS

12. Coronary arteries are the main vessels

a. collecting blood from the hollow veins
b. divided into 2 main branches
c. filling retrogradely when semilunar valves are opened
d. filling during the cardiac cycle
e. that supplies myocardium by blood
f. filling during the systole

13. Correct measurement of blood pressure includes

a. the patient must eat before the measurement
b. physical exercise does not affect the measured pressure values
c. it is measured in a sitting position
d. it is measured only with an empty stomach
e. the patient must be at rest for a few minutes before the measurement
f. it is measured in a standing position

14. Mark the correct statement about diastolic blood pressure

a. maximum pressure at the top of the systole
b. average pressure during the cardiac cycle
c. maximum pressure at the top of the diastole
d. difference between pulse and diastolic pressure
e. minimum pressure at the diastole
f. pressure measured during expiration

15. Factors that affect blood pressure include

a. ejection volume
b. blood volume
c. gravity

d. peripheral resistance
e. intrabdominal pressure during childbirth
f. no answer is correct

16. In a blood pressure measurement of 110/70, the number 70 is the

a. systolic pressure
b. pulse pressure
c. diastolic pressure
d. mean arterial pressure
e. moderate venous pressure
f. average capillary pressure

17. Korotkoff sounds

a. arise during blood pressure measurement
b. they are formed by a pressure wave
c. they are formed by a pulse wave
d. they are caused by intermittent turbulent blood flow
e. they are caused by heart sounds
f. they occur during the alternation of systole and diastole

18. Label substances that lower blood pressure

a. nitric oxide
b. histamine
c. bradykinin
d. angiotensin
e. thromboxane
f. serotonin

19. Main functions of circulation are

a. transport blood from one part of the body to another
b. maintain homeostasis
c. transport only nutrients and bile acids
d. maintain exchange between blood groups
e. maintain blood pressure and flow
f. transport nutrients, blood gases, waste products

20. Mark normal systolic blood pressure values [mm Hg]

a. less than 120
b. 120 - 129
c. 130 - 139
d. 140 - 159
e. 160 - 179

f. more than 180

21. Mark the correct statements

a. the term microcirculation includes arterioles, capillaries and venules
b. most of the blood is located in the peripheral vascular bed
c. tunica adventitia is formed by a layer of smooth muscle
d. tunica intima mainly includes connective tissues, elastin and fibrinogen
e. the return of blood is also mediated by skeletal muscle
f. venous valves are used to regulate flow in the microcirculation

22. Mark the correct statements

a. most blood is found in the venous system
b. arterioles have fewer elastic fibres than arteries
c. the highest permeability of capillaries is in the small intestine
d. veins react strongly to even the smallest pressure changes
e. the lowest permeability of capillaries is in the large intestine
f. arterioles have the largest proportion of smooth muscle

23. Mark the correct statements

a. we also refer to the smooth muscle of the arteries as the tunica media
b. the capillaries are formed by a layer of endothelium
c. capillaries of the blood-brain barrier have the lowest permeability
d. arteries are more flexible than veins
e. the inner lining of the vessels is called the tunica adventitia
f. vasodilation increases vascular tone

24. Mark the correct statements

a. angiotensin II increases the blood pressure
b. the highest blood pressure is in the aorta
c. the ejection fraction is the amount of blood that the heart ejects during systole
d. the highest blood pressure is in the inferior vena cava inferior
e. the pressure gradient rises from the vena cava inferior toward the aorta
f. blood pressure increases with decreasing blood viscosity

25. Mark the correct statements

a. an increase in heart rate leads to an increase in blood pressure
b. an increase in ejection volume leads to an increase in blood pressure
c. with inspiration the blood pressure rises
d. as the temperature rises, the blood pressure rises
e. in sleep, blood pressure rises physiologically
f. with orthostasis, blood pressure rises

26. Mark the correct statements

a. signals from chemo- and baroreceptors are processed at the brainstem level
b. sympathetic activation leads to a reduction in the release of catecholamines from the adrenal glands
c. endothelium does not affect vasodilation
d. activation of the sympathetic nervous system leads to an increase in arterial pressure
e. an increase in vascular resistance leads to an increase in blood pressure
f. nitric oxide contributes to vasoconstriction

27. Mark the correct statements

a. blood pressure is not affected by hormones and local factors, but only by the autonomic nervous system
b. constriction of resistance vessels leads to a decrease in blood pressure
c. endothelium is important for the production of nitric oxide and endothelin
d. angiotensin II is formed by the activity of an angiotensin-converting enzyme
e. a fall in blood pressure leads to a reduced release of catecholamines
f. an increase in volume in the arterial system does not result in a change in blood pressure

28. Mark the correct statements

a. systolic blood pressure is the highest pressure during systole
b. diastolic pressure is the highest pressure during diastole
c. laminar blood flow is associated with murmur sounds
d. the higher the cardiac output, the higher the blood pressure
e. the more elastic the blood vessel, the higher the blood pressure
f. the highest pressure is in the aorta

29. Mark the correct statements

a. sympathetic system acts on vascular smooth muscle via adrenergic α1 receptors
b. the parasympathetic system acts on vasodilation indirectly through M3 receptors and increased nitric oxide production
c. regulation of blood flow through the vascular bed is mediated only by the autonomic nervous system
d. angiotensin II is a strong vasodilator produced by angiotensin-converting enzyme
e. nitric oxide (NO) is an important vasodilating substance
f. histamine is not a vasoactive molecule

30. Mark the correct statements. Blood pressure is affected by

a. the autonomic nervous system only

b. sympathetic and parasympathetic systems
c. baroreceptors
d. the RAAS
e. angiotensin II in terms of decrease pressure
f. angiotensin II in terms of increased pressure

31. Mark the correct statement about arterioles

a. they represent a resistance vessels
b. represent a capacity vessels
c. represent elastic vessels
d. regulate blood pressure
e. determine the peripheral resistance of the arterial system
f. they change the discontinuous flow to a continuous one

32. Mark where endothelium is located in the vessels

a. tunica intima
b. tunica media
c. tunica adventitia
d. in the lumen
e. only in veins
f. only in the arteries

33. Mark which statement best describes veins

a. they have a thick wall and a small lumen, there is low pressure in them, they have no valves
b. they have a thin wall and a large lumen, there is low pressure in them, they have valves
c. they have a thin wall and a small lumen, there is high pressure in them, they have valves
d. they have a thick wall and an irregular lumen, there is high pressure in them, they do not have flaps
e. they have only a wall formed by the endothelium, they have moderately low pressure, they transmit oxygenated blood
f. they have a thick wall, there is a very high pressure in them, they transmit deoxygenated blood

34. Peripheral vascular resistance is

a. resistance of muscle vessels, which prevents excessive muscle strain
b. resistance to the systemic peripheral bloodstream
c. resistance of vascular elastic fibres preventing the elongation of vessels
d. none of the above answers is correct

e. peripheral skeletal muscle contraction that prevents blood flow
f. dilatation of large vessels causing blood accumulation

35. Peripheral vascular resistance produces mainly

a. tension of capillary muscle fibres
b. tension of arterial muscle fibres
c. elasticity of the vessel wall
d. tone of large arteries
e. work of the right ventricle
f. lymphatic vessels

36. Portal circulation is

a. present in endocrine system
b. present in gastrointestinal tract
c. present in the heart
d. present in the brain
e. present in kidneys
f. organization of 2 capillary networks in a row

37. Pulmonary and systemic circulation are involved in the adult

a. side by side
b. in series
c. independently
d. parallel
e. are not involved
f. neither answer is correct

38. Mark the correct statement about Ruffier's test

a. assesses a person's physical fitness
b. evaluates pressure changes during the night
c. uses heart rate to calculate
d. uses systolic pressure to calculate
e. uses diastolic pressure to calculate
f. evaluates the magnitude of peripheral resistance after exercise

39. Substances involved in the hormonal regulation of blood pressure are

a. adrenocorticotropic hormone
b. antidiuretic hormone
c. follicle stimulating hormone
d. catecholamines
e. growth hormone
f. aldosterone

40. Systolic blood pressure is characterized as

a. minimum pressure at the diastole
b. average pressure during the cardiac cycle
c. maximum pressure at the top of the diastole
d. difference between pulse and diastolic pressure
e. maximum pressure at the top of the systole
f. pressure measured during expiration

41. The blood from the pulmonary circulation returns to the heart

a. into the right atrium
b. into the left atrium
c. via superior vena cava
d. via inferior vena cava
e. through the four pulmonary veins
f. through the pulmonary artery

42. The blood from the systemic circulation returns to the heart

a. into the right atrium
b. into the left atrium
c. via superior vena cava
d. via inferior vena cava
e. through the four pulmonary veins
f. through the pulmonary artery

43. The blood pressure in the ventricles decreases during isovolumic relaxation

a. to a value lower than that in the atria
b. to a value only slightly higher than in the atria
c. to its lowest value
d. to a value lower than the diastolic pressure in the large arteries
e. to a value higher than that in the atria
f. to its greatest value

44. The blood pressure inside the ventricle reaches the lowest values

a. during isovolumic relaxation
b. at the end of the filling phase
c. at the end of isovolumic contraction
d. at the beginning of the filling phase
e. during the plateau phase
f. during the relative refractory phase

45. The high-pressure resistance system consists of

a. capillaries

b. veins and capillaries
c. veins
d. arteries
e. all answers are incorrect
f. all answers are correct

46. The innervation of the vascular bed through the autonomic nervous system involves

a. stimulation of vasoconstriction in peripheral vessels via α1 adrenergic receptors
b. activation of phospholipase C after stimulation of α1 adrenergic receptors via the Gq subunit
c. vasodilation in muscle and liver through stimulation of β2 adrenergic receptors
d. reduction of renin-angiotensin-aldosterone system activity by sympathetic activation
e. increased renin release following increased sympathetic activity via β1 adrenergic receptors
f. stimulation of vasodilation via sympathetic activation

47. The largest pressure drop is in the system circuit at the level of

a. arterioles
b. capillaries
c. elastic arteries
d. capillaries
e. precapillaries
f. veins

48. The long-term blood pressure control provides

a. baroreceptors
b. chemoreceptors
c. aldosterone
d. RAAS
e. bradykinin
f. histamine

49. The mercury sphygmomanometer is

a. a medical device for measuring lung capacity
b. a medical device for measuring blood pressure
c. a medical device for measuring abdominal pressure
d. an electronic device
e. an equipment that uses the Korotkoff method
f. an equipment that uses the Langendorff method

50. The microcirculation is formed by

    a. arterioles
    b. venule
    c. capillaries
    d. artery
    e. vein
    f. heart

51. The pressure drops in the venous stream and the return of blood to the right heart increase

    a. by cough
    b. by inhalation
    c. when exhaling
    d. when sneezing
    e. in inspiration
    f. blood return is not dependent on respiration

52. Mark the correct statement about the pulse

    a. is an alternating tension and releasing of the arteries during heartbeats
    b. is venous valve activity indicator
    c. is heart rate indicator
    d. is rhythmic coronary artery contraction
    e. "wave" of the vessel walls during blood flow
    f. bidirectional contraction of capillary endothelial cells

53. Mark the correct statement about arterial system

    a. we also call it capacitance system
    b. arteries are stronger than veins
    c. in front of the capillary stream arteries are regulated by precapillary sphincters
    d. elastic arteries are referred to as conduction vessels
    e. arterioles are involved in peripheral vascular resistance
    f. they use valves to propagate the pulse wave further

54. Mark, what applies to arterial system

    a. we also call it capacitance system
    b. arteries are stronger than veins
    c. in front of the capillary stream arteries are regulated by precapillary sphincters
    d. elastic arteries are referred to as conduction vessels
    e. arterioles are involved in peripheral vascular resistance
    f. they use valves to propagate the pulse wave further

55. Mark, what applies to venous system

a. at the end of the vena cava, the pressure in the venous system is highest
b. are part of the capacitance bloodstream
c. an increase in blood volume in the arteries is reflected in a lower increase in pressure than in the veins
d. an increase in blood volume in the veins results in a lower increase in pressure than in the arteries
e. the veins have a smaller layer of smooth muscle than the arteries
f. the heart does not contain veins only arteries

56. Which factors have a vasodilating effect on smooth muscle?

a. nitric oxide
b. prostacyclin
c. thromboxane
d. endothelin
e. leukotrienes
f. histamine

57. When regulating blood pressure, chemoreceptors respond to

a. decrease in oxygen partial pressure
b. increasing the partial pressure of carbon dioxide
c. pH drop
d. increase in ADH concentration
e. reduced renin production
f. increased angiotensinogen production

58. Where are baroreceptors located?

a. in the aortic arch
b. in sinus caroticus
c. in the hypothalamus
d. in the paravertebral ganglia
e. in the kidneys
f. in the liver

Part 5

1. B lymphocytes

    a. are formed in the bone marrow
    b. mature in the thymus
    c. are responsible for the humoral immunity
    d. mature in the bone marrow
    e. are responsible for cell-mediated immunity
    f. destroy tumor cells

2. Biconcave shape of erythrocytes

    a. reduces the surface of erythrocytes by 30% compared to spheroidal shape
    b. reduces its oxygen diffusion surface
    c. is important for erythrocytes' ability to change shape
    d. increases the surface of erythrocytes by 30% compared to spheroidal shape
    e. increases the surface for oxygen diffusion
    f. supports erythrocytes' function in blood clotting

3. Blood sedimentation increases physiologically in following conditions

    a. anemia
    b. inflammation
    c. menstruation
    d. pregnancy
    e. viral diseases
    f. bacterial diseases

4. Erythropoiesis is NOT stimulated by

    a. stay in alpine environment
    b. erythropoietin
    c. tissue hypoxia
    d. higher pO_2
    e. vitamin B12
    f. vitamin C

5. Except from oxygen hemoglobin has the ability to bind

    a. neither carbon dioxide nor carbon monoxide
    b. both carbon dioxide and carbon monoxide
    c. only carbon dioxide
    d. only carbon monoxide
    e. lipids
    f. glucose

6. Ferritin

    a. is important indicator of plasma iron status
    b. is bound to the protein apoferritin
    c. hemosiderin degradation product
    d. is the end product of erythrocyte degradation
    e. is an indicator of the iron concentration in hemoglobin
    f. no answer is correct

7. Hematocrit expresses

    a. the volume of newly formed erythrocytes per day expressed as a percentage
    b. the ratio of erythrocyte volume to blood volume
    c. specific blood density
    d. the ratio of blood volume to extracellular fluid
    e. the ratio of erythrocyte volume to plasma volume
    f. no answer is correct

8. If a blood sample is taken for DNA testing, which of the following would be examined?

    a. leukocytes
    b. platelets
    c. erythrocytes
    d. plasma proteins
    e. fibrinogen
    f. erythropoietin

9. Leukocytes can be correctly described as

    a. hemoglobin-containing nucleated cells
    b. as white blood cells with granules in the cytoplasm
    c. cells with nuclei that do not contain hemoglobin
    d. cells that have the ability to diapedesis and amoeboid movement
    e. cells that have agglutinogens on their surface
    f. cells that are also involved in allergic reactions

10. Lymphocytes are blood cells that

    a. mature and proliferate in the bone marrow
    b. contain hemoglobin
    c. are involved in the body's immune response
    d. mature on macrophages
    e. do not contain specific granules in the cytoplasm
    f. have fragmented, polymorphonuclear nucleus

11. Mark the correct statements about the stem cells

    a. they are constantly renewed

b. they are unable to recover
c. they do not contribute to tissue recovery
d. they are found in all tissues in all humans
e. they have not been used for any medical application yet
f. they are able to differentiate

12. Mark the correct statements

a. iron transported in the blood is always bound
b. freely dissolved oxygen is sufficient to fuse tissues for about 20 minutes
c. albumin is important for maintaining oncotic blood pressure
d. the hormone that stimulates erythropoiesis is called renin
e. hematocrit refers to the blood fraction formed by erythrocytes
f. the first phase of haemostasis is coagulation

13. Mark the correct statements

a. the pH of blood is regulated by the so-called carbonic anhydrase, which is present on erythrocytes and endothelium
b. an increase, in the partial concentration of HCO_3- in the blood, conditions the development of metabolic acidosis
c. erythrocytes are also able to buffer free H^+
d. the binding of carbon monoxide to hemoglobin produces carbaminohemoglobin
e. 4 binding sites for O_2 and 2 sites for CO_2 are present on the hemoglobin molecule
f. vitamin B12 - Cyanocobalamin is important for the heme part synthesis of hemoglobin

14. Mark the correct statements about the neutrophils

a. they participate in the body's non-specific immune responses
b. they have no nucleus
c. they contain hemoglobin
d. they are important in the body's defenses
e. eosinophils are one type of neutrophils
f. they are important for platelet activation

15. Mark which of the following substances do not have a protein character

a. ferritin
b. hemoglobin
c. keratin
d. aldosterone
e. aldosterone
f. albumin

16. Mark which roles during blood clotting DO NOT make platelets

    a. to convert prothrombin to thrombin
    b. activation of factor X to Xa
    c. to form a plug in the hole of damaged blood vessel
    d. to release chemicals to attract other platelets
    e. to adhere to exposed collagen fibers in damaged blood vessels
    f. change of platelet's shape and releasing other substances needed to stop bleeding

17. Mark, what belongs to the formed blood elements

    a. erythrocytes
    b. platelets
    c. leukocytes
    d. plasma
    e. serum
    f. precipitation factors

18. Physiological derivatives of hemoglobin are

    a. oxyhemoglobin
    b. deoxyhemoglobin
    c. fetal hemoglobin
    d. carboxyhemoglobin
    e. methemoglobin
    f. carbaminohemoglobin

19. Plasma proteins

    a. maintain plasma volume
    b. are involved in the transport of fats
    c. are nutritionally important in times of starvation
    d. are not involved in blood clotting
    e. do not affect immune responses
    f. do not affect blood viscosity

20. Platelet functions include

    a. haemostasis
    b. immunity
    c. participation in the wound healing
    d. participation in the inflammatory reaction
    e. blood gas transmission
    f. immune response against parasites

21. Platelets

a. are formed in the blood vessels
b. are formed from myelocytes
c. are formed in the bone marrow
d. are formed from megakaryocytes
e. upon activation, they associate with leukocytes
f. involved in the formation of primary haemostatic plug

22. Platelets in blood clotting

a. are involved in the formation of primary plug
b. release the content of dense granules
c. change their shape
d. are involved in fibrinolysis
e. their activation leads to the activation of plasminogen
f. release ATP, ADP, serotonin, calcium

23. Serum does not contain

a. fibrinogen
b. water
c. albumines
d. fats
e. immunoglobulins
f. glucose

24. Stem cells can be applied

a. in regenerative medicine
b. in the treatment of viral influenza
c. in anticancer therapy
d. in the treatment of chronic wounds (eg pressure ulcers)
e. in the treatment of bacterial diseases
f. as a supportive therapy for fractures

25. T lymphocytes

a. are formed in the bone marrow
b. mature in the thymus
c. are responsible for the humoral immunity
d. mature in the bone marrow
e. are responsible for cell-mediated immunity
f. destroy tumor cells

26. The colloid osmotic pressure of blood is affected by which of the following?

a. proteins in the interstitial fluid

b. sodium and chloride ions dissolved in the blood
c. aqueous component of blood
d. plasma proteins
e. albumins, globulins in blood plasma
f. hemoglobin

27. Mark the main energy source for erythrocytes

a. glucose
b. fructose
c. fatty acids
d. glycerol
e. iron
f. glycogen

28. The term “formed elements” used in relation to the blood include which of the following?

a. erythrocytes
b. leukocytes
c. platelets
d. albumin
e. electrolytes
f. thrombin

29. The value of adult male hematocrit is

a. 0,44 ± 0,05
b. 0,38 ± 0,03
c. 0,51 ± 0,05
d. 0,45 ± 0,08
e. 0,42 ± 0,01
f. 0,25 ± 0,04

30. The value of adult woman hematocrit is

a. 0,44 ± 0,07
b. 0,41 ± 0,03
c. 0,58 ± 0,02
d. 0,45 ± 0,01
e. 0,39 ± 0,04
f. 0,25 ± 0,04

31. Transferrin cannot bind iron derived from

a. resorption in the small intestine
b. decayed erythrocytes
c. decayed platelets
d. liver, spleen macrophages

e. bone marrow macrophages
f. colonic resorption

32. Vitamin B12 (cobalamin)

a. is important for blood clotting, its deficiency causes a lack of coagulation factors
b. is important for the proper development of nervous system
c. is needed to form red blood cells and DNA
d. is important for blood clotting
e. for its absorption there is important a so-called intrinsic factor produced in the stomach
f. is mainly found in animal products such as meat, fish, eggs, dairy products

33. What helps the absorption of iron in the digestive tract?

a. hydrochloric acid
b. bacteria present in the gut
c. ascorbic acid
d. vitamin C
e. intrinsic factor
f. bile

34. What are the red blood cells primarily composed of?

a. hemoglobin
b. immunoglobulin
c. albumin
d. fibrinogen
e. mitochondria
f. dense granules filled with serotonin

35. What are the functions of plasma proteins in the blood?

a. maintaining a constant volume of blood
b. oxygen transport
c. maintaining a constant blood viscosity
d. regulation of electrolyte balance
e. leukocytes
f. participation in the mechanisms of nonspecific body immunity

36. What constitutes blood plasma?

a. water, organic and inorganic substances
b. blood without red blood cells
c. whole blood without platelets and blood clotting factors
d. blood without blood cells and proteins
e. whole blood without blood elements

f. whole blood without leukocytes

37. What is found in blood serum and also in blood plasma?

a. erythrocytes
b. leukocytes
c. platelets
d. plasma proteins
e. fibrinogen
f. albumin

38. What is the major task of red blood cells?

a. haemostasis
b. immunity
c. oxygen transport
d. carbon dioxide transport
e. factor X activation
f. ensuring hemocoagulation

39. Which blood cells are involved in protecting the body from pathogens and foreign cells?

a. leukocytes
b. erythrocytes
c. platelets
d. platelets
e. hemoglobin
f. thrombin

40. Which cells in the list below are the most common white blood cells?

a. eosinophils
b. basophils
c. neutrophils
d. monocytes
e. lymphocytes
f. NK cells

41. Which characteristic of blood refers to the concentration of solutes?

a. sedimentation
b. pH
c. osmolality
d. viscosity
e. salinity
f. erythrocyte "foaming"

42. Which is the least common type of white blood cell? (in %)?

a. erythrocytes
b. lymphocytes
c. basophils
d. neutrophils
e. eosinophils
f. platelets

43. Which is the most abundant plasma protein?

a. hemoglobin
b. fibrinogen
c. alpha and beta globulin
d. plasminogen
e. albumin
f. fibrin

44. Which of the following blood elements is important in the formation of blood clots?

a. leukocytes
b. platelets
c. erythrocytes
d. albumin
e. lymphocytes
f. monocytes

45. Which of the following is not a type of white blood cell?

a. leukocytes
b. erythrocytes
c. platelets
d. lymphocytes
e. NK cells
f. eosinophils

46. Which of the following three proteins are known as “plasma proteins”?

a. albumin, globulin, hemoglobin
b. insulin, glucagon, hemoglobin
c. albumin, fibrinogen, globulin
d. fibrin, globulin, albumin
e. insulin, kaolin, bilirubin
f. cholesterol, urea, glucagon

47. Which type of white blood cell is responsible for engulfing pathogens during phagocytosis?

    a. neutrophils
    b. platelets
    c. erythrocytes
    d. basophils
    e. eosinophils
    f. NK cells

48. The physiological number of platelets is

    a. 150-300 x 10^3 / l
    b. 150-300 x 10^6 / l
    c. 200-400 x 10^6 / l
    d. 150-300 x 10^9 / l
    e. 150-300 x 10^{12} / l
    f. 250-300 x 10^6 / l

Part 6

1. A newborn with blood group A has agglutinogen A and

    a. neither agglutinins anti A nor anti B
    b. only agglutinin anti A
    c. only agglutinin anti B
    d. anti A and anti B agglutinins
    e. no agglutinins
    f. no antigens

2. A newborn with blood group B has agglutinogen B and

    a. neither agglutinins anti A nor anti B
    b. only agglutinin anti A
    c. only agglutinin anti B
    d. anti A and anti B agglutinins
    e. no agglutinins
    f. no antigens

3. A patient with blood group A^+ has

    a. agglutinin A on the erythrocyte membrane
    b. B antigen in blood plasma
    c. agglutinogen A on the erythrocyte membrane
    d. anti-A antibody in blood plasma
    e. anti-B agglutinin in blood plasma
    f. antigen D in blood plasma

4. Agglutination after cross tests

    a. is a manifestation of incompatibility between the donor and recipient blood
    b. means compatibility between the blood of donor and recipient
    c. is an aggregation of erythrocytes as a result of reaction between agglutinogen and agglutinin
    d. is a process of blood clotting that is activated in the event of damage to the vascular endothelium
    e. in case of transfusion, an acute or delayed transfusion reaction may occur in the recipient
    f. only occurs if the donor is Rh^+

5. Antigen D

    a. is present in Rh positive individuals
    b. is present in Rh negative individuals
    c. has a low sensitizing ability
    d. is present in most individuals

e. induces the production of anti-agglutinins
f. has no ability to agglutinate

6. Mark, what applies to blood transfusions

a. AB0 incompatibilities are more severe than Rh system incompatibilities
b. group A and B are the least immunogenic blood groups
c. whole blood transfusion is most suitable for administration to different or unknown blood groups
d. a universal blood plasma donor is group 0
e. acute or delayed haemolysis may occur with poor blood transfusion
f. acute haemolysis occurs more frequently when the wrong AB0 blood group is administered

7. Blood group antigens are

a. agglutinins
b. agglutinogens
c. gammaglobulines
d. haptens
e. immunoglobulins
f. antibodies

8. Blood type 0

a. has agglutinogens A and B on the erythrocyte membrane
b. has anti-A and anti-B agglutinins in blood plasma
c. is a universal erythrocyte donor
d. is a universal recipient of erythrocytes
e. has agglutinogen A on the erythrocyte membrane and anti B agglutinin in plasma
f. is a rare blood type

9. During blood clotting

a. soluble fibrin is converted to insoluble fibrinogen
b. soluble fibrinogen is converted to insoluble fibrin
c. insoluble plasminogen is converted to soluble plasmin
d. soluble prothrombin changes to insoluble thrombin
e. thrombin activates fibrinogen
f. thrombin activates plasminogen

10. Mark, what applies to a patient with blood group 0^-

a. its erythrocytes have AB and Rh antigens on their surface
b. its erythrocytes have no antigen on their surface
c. is not a universal erythrocyte donor, only blood group 0^-

d. is a universal donor for blood plasma because it has no antibodies (agglutinins) in plasma
e. blood plasma can only be received from a donor with blood group 0^-
f. is a universal recipient for blood plasma

11. Haemocoagulation

a. requires the presence of coagulation factors and phospholipids
b. involves several events that result in the formation of a definitive blood thrombus
c. includes vasoconstriction, platelets adhesion and fibrinolysis
d. is a set of enzymatic reactions that result in the conversion of fibrinogen to insoluble fibrin
e. can start with an external pathway that is activated by a contact of blood with collagen in the damaged vessel wall
f. can only take place in the presence of calcium ions

12. If erythrocyte agglutination occurs after addition to plasma containing anti-A antibodies, which blood group it may be?

a. only A
b. only B
c. A or AB
d. B or AB
e. only AB
f. only 0

13. If erythrocyte agglutination occurs after addition to plasma containing anti-B antibodies, which blood group it may be?

a. only A
b. only B
c. A or AB
d. B or AB
e. only AB
f. only 0

14. Important clinical parameters of blood clotting are

a. INR value, which increases with the risk of bleeding
b. endothelial thrombin concentration
c. haemolytic test
d. major cross test
e. prothrombin time, which normal values are between 12-15 seconds
f. Quick's test

15. In the process of blood clotting

a. the internal and external blood coagulation pathways are connected
b. factor VIII and fibrin combine into the fibrin network
c. coagulation factors are activated
d. thrombin is activated
e. plasminogen is activated
f. tissue factor activation occurs

16. In which blood type there are no antibodies in the plasma?

a. A^+
b. B^-
c. 0^-
d. 0^+
e. AB^-
f. AB^+

17. Incompatibility between mother and fetus in the Rh system can occur when

a. mother is Rh^+ and baby is Rh^-
b. mother is Rh^- and baby is Rh^+
c. mother is A Rh^- and baby is B Rh^+
d. mother is Rh^- and baby is Rh^-
e. mother is d^+ and baby is d^-
f. mother is d^- and baby is d^+

18. Indicate the factors required for fibrinolysis

a. plasminogen
b. streptokinase
c. thrombin
d. tissue factor
e. kallikrein
f. tissue thromboplastin

19. Individuals who have antigen D on the erythrocyte membrane are referred to as

a. Rh positive
b. D positive
c. Rh negative
d. D negative
e. d positive
f. d negative

20. INR value

a. is the ratio of prothrombin time of the patient to the plasma of healthy individual
b. increases with increased clotting
c. its low value means a high probability of thrombus formation
d. is also used to monitor anticoagulant therapy
e. can only be detected from venous blood
f. indicates disorders of internal haemocoagulation pathway

21. INR value

a. is the international unit determining the number of erythrocytes
b. is linked to blood mineral levels
c. is linked to prothrombin time
d. its optimal values are above 6.5
e. at high values, the chance of blood clots forming increases
f. at high values, the bleeding time is prolonged

22. INR value for blood tests

a. talks about the ability of blood to clot
b. is based on prothrombin time
c. is measured in patients with suspected bleeding conditions
d. expresses about the number of erythrocytes in the blood
e. expresses erythrocyte sedimentation
f. expresses about the rate of fibrinolysis

23. INR value

a. informs about the patient's blood type
b. informs about the rate of patient's blood clotting
c. is calculated based on the prothrombin time
d. is calculated based on the agglutination rate
e. reflects the agglutination capacity of the patient's blood
f. is an important for determination of the blood groups

24. Mark, what applies to blood clotting

a. vasoconstriction is one of the main mechanisms of haemostasis
b. endothelial exposure due to damage increases platelets adhesion
c. endothelial damage leads to thrombocyte activation and aggregation
d. fibrin degrades spontaneously without the activity of other enzymes
e. whole endothelium prevents platelets adhesion and thrombus formation
f. vascular collagen reduces platelets aggregation

25. Mark, what applies to the coagulation factors

a. they consist only of platelets

b. factors II, VII, IX and X are activated by vitamin K
c. prothrombin is important for the breakdown of fibrin network
d. the common coagulation factor for the extrinsic and intrinsic cascade is factor X
e. plasmin is important for cross-linking the fibrin network
f. fibrinogen is the active form of fibrin

26. Mark plasminogen activators

a. thrombin
b. streptokinase
c. urokinase
d. fibrinogen
e. thrombin
f. prothrombin

27. Major cross-test is performed as part of the pre-transfusion examination by mixing

a. donor erythrocytes and recipient plasma
b. recipient erythrocytes and donor plasma
c. donor erythrocytes and recipient erythrocytes
d. donor plasma with recipient plasma
e. recipient platelets and donor erythrocytes
f. recipient agranulocytes and donor eosinophils

28. Mark process important for blood clotting (haemocoagulation)

a. platelets aggregation
b. vasoconstriction
c. converting soluble fibrinogen to insoluble fibrin
d. the activation of plasminogen
e. the conversion of prothrombin to thrombin
f. sympathetic activation

29. Mark the correct answers

a. the exposure of vascular collagen triggers the external clotting pathway
b. the release of tissue thromboplastin is important for the activation of external clotting pathway
c. plasminogen activators are important for increased blood clotting
d. the common aim of internal and external clotting cascade is the formation of active fibrin and the fibrin network
e. calcium is necessary for the conversion of prothrombin to thrombin
f. when the endothelium is damaged, substances are released and activate platelets and increase their aggregation

30. Mark the correct statements

a. agglutination is the reaction of antigen with antibody
b. the cross-test is performed before each blood transfusion
c. we perform a minor cross test if we administer plasma
d. blood transfusion means the administration of whole blood, not separately as a part of it
e. the evidence of acute haemolytic reaction is the presence of blood in the faeces
f. the delayed haemolytic response threatens the patient's life with heart failure

31. Mark the correct statements

a. blood group 0 does not contain agglutinogens A and B
b. agglutinogen D induces antibody production in Rh^-positive individuals
c. splenomegaly is a liver enlargement due to haemolysis
d. plasminogen is dissolved by fibrin
e. the principle of cross-test is agglutination
f. an acute haemolytic reaction occurs within 24 hours of blood transfusion

32. Mark the correct statements

a. the greatest importance of blood groups is in the field of transfusiology and transplantology
b. the blood group of individual does not change
c. a transient change in blood type may occur after a bone marrow transplant
d. the AB0 system is the only blood grouping system
e. AB blood transfusion to a blood group A recipient leads to delayed haemolysis
f. erythrocyte surface antigens are exclusively proteins

33. Mark the correct statements

a. the antigen on the surface of erythrocytes is called agglutinogen
b. agglutination is the reality reaction of antigen with antibodies
c. agglutination is the clumping of red blood cells due to the introduction of antibody
d. the function of agglutinogens is exclusively to determine blood groups
e. anti-agglutinin is found in the blood plasma of blood group A
f. agglutinin is an antigen on the surface of erythrocytes

34. Mark the correct statements

a. the fibrin fibres are dissolved by fibrinogen
b. thrombin is a proteolytic enzyme
c. fibrinogen is converted to fibrin by polymerization
d. plasminogen cleaves fibrin fibres
e. plasminogen activates thrombin
f. urokinase is activated in the kidney

35. Mark the correct statements

a. blood transfusions are mainly administered to the venous system
b. blood plasma is never given during bleeding alone
c. the AB^+ blood group is considered to be the universal erythrocyte recipient
d. blood groups are divided by the presence of specific glycoproteins on erythrocytes
e. the presence of Rh factor is not decisive when administered in blood plasma
f. Rh factor itself is weak in inducing an immune response and producing antibodies

36. Mark the correct statements

a. anti-B agglutinogens are present in the patient's blood of a with blood group A^+
b. patient with blood group AB is a universal donor
c. patient with blood group 0 is a universal plasma recipient
d. Rh^+ patient has D antigen present on the erythrocytes
e. contact of anti-B agglutinin with agglutinogen B results in agglutination
f. upon contact of anti-A agglutinogen with agglutinin A, agglutination occurs

37. Mark the correct statements

a. the trigger for blood clotting is exclusively endothelial damage
b. the prothrombin time reflects the rate at which the blood plug dissolves
c. upon blood clotting, soluble fibrinogen is converted to insoluble fibrin
d. in fibrinolysis, fibrin is cleaved by thrombin
e. fibrin is cleaved by plasmin
f. tissue factor causes the conversion of plasminogen to plasmin

38. Mark the correct statements

a. haemostasis refers to the process of blood clotting
b. the primary haemostatic plug is formed by aggregated blood clotting factors
c. platelets are involved in the formation of primary haemostatic plug
d. an insoluble fibrin network is formed during the haemocoagulation process
e. haemocoagulation factors are formed in the bone marrow
f. the secondary haemostatic plug is dissolved by plasmin

39. Mark the correct statements

a. vascular vasoconstriction and platelets aggregation are important for haemostasis
b. fibrinolysis is an event in which a secondary haemostatic plug is formed
c. calcium is important for the conversion of prothrombin to thrombin
d. vascular collagen reduces platelets aggregation
e. endothelium damage leads to the activation of platelets and their aggregation
f. fibrin breaks down spontaneously without the activity of other enzymes

40. Mark the correct statements

a. agglutinins are found on the surface of erythrocytes
b. agglutinins are found on the surface of leukocytes
c. agglutinins are found freely in plasma
d. agglutinogens are found on the surface of erythrocytes
e. agglutinogens are found on the surface of leukocytes
f. agglutinogens are found freely in plasma

41. Mark the correct statements

a. erythrocyte surface antigens are termed agglutinins
b. erythrocyte surface antigens are termed agglutinogens
c. blood group AB does not contain any agglutinins in the blood plasma
d. blood group 0 has agglutinogen AB on the surface of erythrocytes
e. the antibody binding to the antigen and the subsequent aggregation is called the agglutination
f. erythrocyte agglutination leads to haemolysis

42. Mark the correct statements

a. blood group 0 is a universal donor of erythrocytes
b. blood group AB is a universal donor of erythrocytes
c. blood group 0 is a universal recipient of erythrocytes
d. blood group AB is a universal recipient of erythrocytes
e. blood group A is a universal erythrocyte donor
f. blood group B is a universal plasma recipient

43. Mark, what applies to haemocoagulation

a. the extrinsic and intrinsic pathways converge to activate factor XII
b. the extrinsic and intrinsic pathways converge to activate factor X
c. the extrinsic and intrinsic pathways converge to activate thrombin
d. the extrinsic pathway is triggered when the endothelium is damaged
e. thrombin is the active form of thrombinogen
f. Ca2+ ions are needed for proper process of haemocoagulation

44. Mark the correct statements about women with Rh^- factor

a. they have D antigen on the surface of erythrocytes
b. they have anti-D antigen on the surface of erythrocytes
c. a potential problem for their baby is their first pregnancy with a Rh^+ man
d. a potential problem for their baby is the second and subsequent pregnancy with an Rh^+ man
e. the immune response against Rh^+ fetus arises immediately after conception

f. the immune response against Rh^+ fetus arises after a contact of fetus with mother's blood

45. Mark the correct statements about haemostasis

a. it is the formation of blood elements
b. it includes platelets activation
c. it denotes the activation of clotting factors
d. a primary haemostatic plug is formed
e. it describes blood clot dissolving
f. it depicts the conversion of soluble fibrinogen to insoluble fibrin

46. Mark the elements present in the blood of people with blood type B^+

a. agglutinogen B
b. anti-A agglutinogen
c. agglutinin B
d. anti-A agglutinin
e. antigen D
f. anti-D antigen

47. Mark the plasminogen activators

a. thrombin
b. streptokinase
c. urokinase
d. plasmin
e. fibrinogen
f. fibrin

48. Mark, what applies to blood clotting

a. it is always initiated by factor Xa
b. plasminogen activation is required to resolve the clot
c. clotting factors are formed in the spleen
d. vitamin K is an essential factor for activating clotting factor X
e. activated thromboplastin time is an expression of active thrombin production
f. thrombin time is an expression of the fibrinogen conversion to plasmin

49. Mark, what applies to blood groups

a. the AB group contains antibodies against both A and B antigen
b. blood group 0 Rh^- is a so-called universal erythrocyte donor
c. the presence of Rh factor in fetus may cause antibodies to form if mother is Rh negative
d. agglutinogens are type E immunoglobulins
e. blood group 0 does not contain any agglutinogens

f. the wrong blood type administration can lead to antibody production and haemolysis in the donor

50. Mark, what applies to haemostasis

a. primary haemostatic plug is formed before haemocoagulation is activated
b. haemocoagulation is a set of reactions in which platelets activation and aggregation occurs
c. extrinsic clotting pathway is activated when the endothelium is damaged
d. secondary haemostatic plug is formed by a fibrin network into which blood elements and plasma are trapped
e. calcium is an important cofactor in blood clotting
f. fibrin fibres are cleaved by plasmin

51. Minor cross-test is performed as a part of pre-transfusion examination by mixing

a. donor erythrocytes and recipient plasma
b. recipient erythrocytes and donor plasma
c. donor erythrocytes and recipient erythrocytes
d. donor plasma with recipient plasma
e. recipient platelets and donor erythrocytes
f. recipient agranulocytes and donor eosinophils

52. Natural antibodies against blood antigens are

a. haptens
b. agglutinogens
c. gammaglobulines
d. agglutinins
e. immunoglobulins
f. antigens

53. Which of the following events is enough to stop bleeding from the capillaries?

a. platelets aggregation
b. prothrombin activation
c. vasodilation
d. haemocoagulation
e. fibrinolysis
f. thrombolysis

54. Patient with blood group A+

a. is a universal blood donor
b. is a universal recipient of blood
c. can only donate blood to a patient with the same blood type
d. can donate blood to a patient with AB^+ blood type

e. can donate blood to a patient with blood group A^-
f. has anti-B agglutinin and agglutinogen A in his blood

55. Primary haemostatic plug

a. is formed by a fibrin network and reinforced by platelets
b. is formed by a thrombin network and reinforced by platelets, erythrocytes and lymphocytes
c. is made up of platelets aggregated to collagen
d. arises exclusively from the extrinsic coagulation pathway
e. arises exclusively from the intrinsic clotting pathway
f. occurs before haemocoagulation itself

56. Prothrombin time

a. monitors the extrinsic pathway of haemocoagulation
b. indicates in particular the intrinsic pathway of haemocoagulation
c. it is not affected by pathological conditions
d. is referred to as INR
e. its normal value is 12-15 minutes
f. varies in patients with liver disease

57. Rh incompatibility

a. occurs if fetus is Rh negative, mother is Rh positive
b. occurs when the fetus is Rh positive and mother is Rh negative
c. does not occur in blood group 0
d. leads to sensitization due to the semipermeability of placental barrier
e. leads to haemolysis in repeated pregnancies without administration of anti-D antibodies
f. manifests itself in anemia, hypoxia, jaundice, the risk of brain damage and even spontaneous abortion

58. The A^+ blood cell antigen contains erythrocytes on the surface

a. agglutinogen A
b. Rh factor
c. antigen D
d. agglutinin anti A
e. agglutinogen B
f. no antigen

59. The agglutination

a. is a special allergic reaction in a patient with increased blood clotting
b. is the recognition of incompatible blood type

c. is the aggregation of red blood cells in the presence of antibody that recognizes the antigen present on their surface
d. occurs when anti-A agglutinins is added to blood group A
e. occurs when anti-A antigen is added to blood group A
f. occurs when the patient's blood with Rh^+ is added to the patient's blood with Rh^-

60. The agglutinogen

a. is an antibody on the erythrocyte membrane
b. is an antigen on the erythrocyte membrane
c. is a protein
d. induces an immune response
e. found only on platelets
f. induces blood clotting on contact with the antibody

61. The antigen

a. is located on the erythrocyte membrane
b. is located in the plasma
c. is located on the platelet´s membrane
d. is also referred to as an agglutinogen
e. is also referred to as an agglutinin
f. is also referred to as an antibody

62. The blood type is

a. inborn feature of red blood cells
b. given by the characteristic properties of red blood cells
c. acquired feature of red blood cells
d. given by the characteristic properties of platelets
e. changing during life due to inflammation
f. changing during life due to leukaemias

63. The essence of blood clotting is

a. platelets aggregation
b. vasoconstriction
c. the conversion of soluble fibrinogen to insoluble fibrin
d. plasminogen activation
e. conversion of prothrombin to thrombin
f. sympathetic activation

64. The patient developed an acute haemolytic reaction after transfusion. What symptoms does he suffer from?

a. none, often asymptomatic

b. anemia and jaundice caused by erythrocytes' destruction
c. hypotension, shock
d. tachycardia
e. haemorrhage
f. hypertension

65. The presence of antigen D

a. is congenital
b. is obtained
c. represents Rh^+
d. represents Rh^-
e. is common in the population
f. is rare in the population

66. The process of blood clotting

a. results in the formation of fibrin fiber
b. its result is the formation of thrombin fiber
c. is due to the detection of collagen fibres beneath the endothelium
d. is caused only by mechanical damage to the vessels
e. is triggered by erythrocyte aggregation
f. is triggered by platelets aggregation

67. The term “haemocoagulation” means

a. the activation of thrombin
b. the blood clotting
c. the platelets aggregation
d. the process of fibrinogen conversion to fibrin
e. the stopping of bleeding
f. the activation of blood clotting factors

68. The term “haemostasis” means

a. the activation of thrombin
b. the blood clotting
c. the platelets aggregation
d. the process of fibrinogen conversion to fibrin
e. the stopping of bleeding
f. the activation of blood clotting factors

69. Thrombin is

a. the plasminogen activator
b. the coagulation factor IIa
c. the proteolytic enzyme

d. the factor responsible for the conversion of fibrin to fibrinogen in the process of fibrinolysis
e. the serine protease
f. the enzyme that catalyses the activation of factor XI to XIa

70. Thromboplastin

a. is important for leukocyte formation
b. is important in blood clotting
c. is formed in platelets
d. is also found in the brain and lungs
e. is important for erythrocyte maturation
f. is activated during vascular spasm

71. To which blood group you could give blood to a patient with blood type A according to the MAJOR cross test?

a. group A
b. group B
c. group AB
d. groups 0
e. none of the above
f. all of the above

72. Vitamin K

a. is synthesized in the liver
b. is stored in the liver
c. its deficiency leads to increased blood clotting
d. its deficiency may be manifested by increased bleeding
e. is involved in the synthesis of coagulation factors in the liver
f. is important for creation of coagulation factors II, VII, IX and X

73. What can be theoretically given to a patient with blood group AB during a blood transfusion?

a. blood group erythrocytes AB
b. blood group AB plasma
c. blood group erythrocytes 0
d. blood group plasma 0
e. whole blood group A
f. whole blood group B

74. Which of the following will you find in the patient's blood with blood group A^+?

a. agglutinogen A
b. anti-A agglutinin

c. agglutinogen B
d. anti-B agglutinin
e. antigen D
f. IgG anti-D

75. Which of the following you will find in the patient's blood with blood group B^-?

a. agglutinogen A
b. anti-A agglutinin
c. agglutinogen B
d. anti-B agglutinin
e. antigen D
f. IgG anti-D

76. Which substances, released upon activation from platelets, promote vasoconstriction?

a. serotonin
b. thromboxane
c. fibrin
d. plasmin
e. von Willebrand factor
f. vitamin K

77. Woman with antigen d

a. is Rh positive
b. is Rh negative
c. she is at risk of any pregnancy
d. every pregnancy with a partner with D antigen is at risk
e. she is at risk for the second and subsequent pregnancies with a partner with antigen D
f. receives blood transfusion during pregnancy to prevent abortion

2.3 MUSCULOSKELETAL SYSTEM

Part 1

1. Bone strength is

    a. the same throughout the life
    b. reduced with age
    c. the highest in the direction of the short axis of the bone
    d. the highest in the direction of the long axis of the bone
    e. the highest in tension
    f. the highest in torsion

2. Bones are divided according to their shape into

    a. long
    b. compact
    c. short
    d. spongy
    e. metaphyseal
    f. irregular

3. Calcitonin

    a. increases the level of calcium in the blood
    b. decreases blood calcium levels
    c. increases renal calcium excretion
    d. reduces renal calcium excretion
    e. increases the absorption of calcium in the small intestine
    f. reduces the absorption of calcium in the small intestine

4. Mark the substances that are important for metabolism of bones

    a. parathyroid hormone
    b. glucose
    c. growth hormone
    d. vitamin D
    e. fat
    f. vitamin B12

5. The metabolism of bones is regulated by

    a. parathyroid hormone
    b. growth hormone
    c. vitamin D
    d. thyroid hormones
    e. vasopressin
    f. calcitonin

6. Mark the factors that lead to bone mass increase

    a. estrogens
    b. androgens
    c. parathyroid hormone
    d. calcitonin
    e. lack of physical activity
    f. growth hormone

7. Mark the correct statements

    a. the bone marrow is present only in irregular bones
    b. bone is a major reservoir for important ions such as calcium or phosphates
    c. the bone marrow is located in both: the epiphysis and the diaphysis of long bones
    d. osteoprogenitor cells are not capable of further division
    e. alkaline phosphatase is required for bone mineralization
    f. calcitonin stimulates osteoclast maturation and their activity

8. Osteocytes are found in

    a. osteons
    b. lacunae
    c. isogenic groups
    d. canaliculi
    e. lamellae
    f. periosteum

9. Mark the factors that are necessary for calcium absorption

    a. protein-rich food
    b. acidic environment of the stomach
    c. insulin
    d. vitamin D
    e. competition with phosphates
    f. food rich in sugars

10. Mark the factors that increase bone formation

    a. androgens
    b. growth hormone
    c. calcitonin
    d. parathyroid hormone
    e. vitamin E
    f. glucocorticoids

11. Isogenic group

a. is typical for bone
b. is typical for muscle
c. is typical for cartilage
d. is formed by the chondrocytes dividing and staying together
e. has a spherical or oval shape
f. is formed by osteocytes constantly dividing and depositing in the bone lamellae

12. Mark the correct statements about the cartilage

a. it does not contain blood vessels
b. the organic component of the cartilage consists almost exclusively of collagen type I
c. cartilage cells are called fibroblasts
d. hyaline cartilage is found at the end of bones that form joints
e. it protects the joints a bones
f. fibrocartilage is the most flexible and least strong of the three types of cartilage

13. Mark the hormones that affect bone structure

a. glucocorticoids
b. growth hormone
c. insulin
d. antidiuretic hormone
e. testosterone
f. dopamine

14. Lordosis of the spine is

a. the natural curvature of the spine
b. naturally located in the cervical and lumbar spine
c. the anteroposterior curvature of the spine
d. naturally located in thoracic area of the spine
e. tenderness of the spine
f. stiffness of the spine

15. Mark the correct statements about intramembranous ossification

a. ossification centres arise from mesenchymal cells
b. mesenchymal cells differentiate into chondrocytes
c. primary, secondary, and tertiary ossification centres are formed
d. osteoblasts are transformed to osteocytes
e. trabecular matrix and periosteum are formed
f. the cartilage of the future bone is first formed and then ossified

16. Mark the bones that form the elbow joint

a. scapula
b. humerus
c. radius
d. fibula
e. ulna
f. tibia

17. Mark the bones, that form the shoulder joint

a. tibia
b. clavicle
c. humerus
d. ulna
e. scapula
f. fibula

18. Mark the bones, that form the knee joint

a. fibula
b. thighbone
c. tibia
d. patella
e. os zygomaticum
f. vertebral bone

19. Mark the bones, that form the shoulder joint

a. clavicula
b. scapula
c. humerus
d. fibula
e. radius
f. ulna

20. Mark the correct statements

a. the active form of vitamin D3 is 1,25-dihydroxyvitamin D3
b. the bone marrow in adults produces more platelets
c. osteoblasts produce type I collagen
d. compact bone contains basic subunits - trabeculae
e. calcitonin reduces osteoclast activity
f. osteoclasts promote bone formation

21. Mark the correct statements

a. osteocytes are inactive osteoblasts

b. osteoclasts break down bone matrix through phagocytosis
c. calcium hydroxyapatite gives bone its strength and rigidity
d. osteoblasts are important for waste disposal
e. the hematopoietic bone marrow is located on the diaphysis of the bones
f. the cartilage is located on the diaphysis of the bones

22. Mark the correct statements

a. flat bones protect vital organs
b. vitamin D has a steroid structure
c. the ribs attach to the sternum by cartilage
d. glucocorticoids promote bone formation
e. parathyroid hormone reduces the excretion of calcium and phosphates
f. the higher the phosphate absorption, the higher the calcium absorption

23. Mark the correct statements about osteoblasts. Osteoblasts

a. are located on the surface of the bone
b. are responsible for bone formation
c. are responsible for bone resorption
d. form osteogenic cells
e. are located on growing parts of the bone
f. form bone mass

24. Mark the correct statements

a. the bone mass is of a purely inorganic composition
b. osteocytes migrate to the osteon via Haversian canals
c. long bones contain bone marrow in their diaphysis
d. most of the calcium, phosphate or magnesium is stored in the bones
e. Haversian canal contains the nerves, blood vessels, and lymphatic system of the bone
f. osteoclast activity is mainly bone formation

25. Mark the correct statements about spongy bone

a. it is porous, without osteons
b. it is formed by concentrically arranged lamellae
c. it is formed by Haversian canals
d. it is found at the ends of long bones and in the middle of other bones such as vertebrae
e. it contains blood marrow responsible for blood cells production
f. it forms the diaphysis of long bones

26. Mark hormones, that affect bone structure

a. glucocorticoids

b. growth hormone
c. insulin
d. antidiuretic hormone
e. testosterone
f. leptin

27. Osteons

a. differ from Haversian system
b. are structural units of spongy bone
c. contain bone marrow
d. are structural and functional units of compact bone
e. undergo remodelling during their lifetime
f. are composed of concentrically arranged lamellae, lacunae and osteocytes

28. Parathyroid hormone

a. increases the level of calcium in the blood
b. lower blood calcium levels
c. increases renal calcium excretion
d. reduces renal calcium excretion
e. increases the absorption of calcium in the small intestine
f. reduces the absorption in small intestine

29. Periosteum

a. is the part of the cells in the cartilage that form clusters
b. represents a complication of osteoarthritis - growth on the joint
c. covers the bone and nourishes it
d. represents two layers of connective tissue
e. is a type of epithelial tissue
f. contains blood vessels and nerves, that wrap around the bones

30. Synchondrosis

a. represents the direct connection of two bones by a piece of cartilage
b. is a type of joint in which the ends of the bones are covered with hyaline cartilage and connected by a synovial sheath
c. is for example, the junction of the first rib with the sternum
d. allows sliding movement of the connected bones
e. is, for example, the elbow joint
f. allows rotational movement of the connected bones

31. Synostosis represents

a. the joining of bones
b. cartilage connection

c. connection of bones in the sacrum
d. a connection of bones via ligament
e. connection of the bones in the skull
f. shoulder joint

32. Synovial membrane

a. is located in the joints
b. produces mucin
c. represents the pericardium
d. produces synovial fluid that has lubricating function
e. forms the peritoneum
f. is found in the urinary tract

33. The bone cells are

a. osteocytes
b. osteoblasts
c. elastins
d. chondrocytes
e. osteoclasts
f. immunoblast

34. The bones in the elbow joint are

a. radius, ulna, humerus
b. radius, clavicula, humerus
c. radius, ulna, scapula
d. clavicula, scapula, humerus
e. clavicula, ulna, humerus
f. clavicula, scapula, radius

35. Mark the correct statements

a. compact bone is the area of bone to which ligaments and tendons attach
b. trabecular, spongy bone has main metabolic function
c. diaphysis of the bone contains bone marrow
d. osteocytes produce more osteoid compared to osteoblasts
e. osteocytes produce more osteoid compared to osteocytes
f. Haversian systems are created by osteoclasts

36. The epiphyseal plate is

a. the central part of the bone
b. composed exclusively of osteoclasts
c. the terminal part of the bone
d. composed exclusively of osteoblasts

e. in adults replaced by epiphyseal line, known as epiphyseal closure
f. a hyaline cartilage plate at the end of long bones

37. The facial area of the skull includes the

a. nasal bone
b. parietal bone
c. maxilla
d. temporal bone
e. lacrimal bone
f. olfactory bone

38. The function of osteoclasts is

a. bone resorption
b. cartilage formation
c. bone destruction
d. cartilage resorption
e. elastin formation
f. matrix degradation

39. The main organic protein in bone structure is

a. collagen
b. elastin
c. reticulin
d. hydroxyapatite
e. osteocalcin
f. calcitonin

40. The osteon consists of

a. isogenic groups of chondrocytes
b. concentric lamellae
c. vessels and nerves
d. collagen fibers
e. reticular ligaments
f. fibroblasts

41. Vitamin D is

a. a water-soluble vitamin
b. a liposoluble vitamin
c. activated in the kidneys
d. important for calcium absorption and bone mineralization
e. produced by the liver
f. a hormone that activates ß1 receptors

42. Mark the function of the skeletal system, that is important if you had e.g. a car accident

    a. protection of internal organs
    b. production of blood elements
    c. mineral storage
    d. fat storage
    e. facilitation of movement
    f. postural stability

43. Mark the bones joined by a cartilage - synchondrosis

    a. skull
    b. sternum
    c. pelvic bone
    d. sacrum
    e. shoulder joint
    f. ears

44. Mark the area of the spine that has the largest range of rotation

    a. cervical
    b. thoracic
    c. lumbar
    d. femoral
    e. sacrum
    f. coccyx

45. Mark the cell types of the connective tissue

    a. osteoblasts
    b. chondrocytes
    c. ependymal cells
    d. fibroblasts
    e. glandular epithelium
    f. plasma cells

46. Mark the hormones that are primarily responsible for calcium and phosphates release from the bones

    a. parathyroid hormone
    b. calcitonin
    c. calcitriol
    d. estrogen
    e. phosphatonin
    f. cortisol

47. Mark the correct statements that apply to bone tissue

a. osteoblasts are responsible for new bone formation
b. osteoblasts are responsible for bone resorption
c. osteoclasts are responsible for new bone formation
d. osteoclasts are responsible for bone resorption
e. the compact bone grows along its entire length
f. the compact bone forms epiphysis

48. Low level of calcium in the blood

a. increases calcitonin secretion
b. increases parathyroid hormone secretion
c. activates osteoclast
d. stimulates calcitriol production in the kidneys
e. decreases tubular reabsorption of calcium in the kidneys
f. increases reuptake of vitamin D from urine

49. Mark the correct statements

a. osteoblasts are responsible for the formation of new bone tissue
b. osteoblasts are responsible for the bone resorption
c. osteoclasts are responsible for the formation of new bone tissue
d. osteoclasts are responsible for the bone resorption
e. long bones grow due to activity in the medullary cavity
f. epiphysis of a long bone is predominantly made of compact bone

50. Mark the substances that involved in the regulation of bone metabolism

a. acetylcholine
b. estrogen
c. calmodulin
d. adenylate cyclase
e. glucocorticoids
f. desmosome

Part 2

1. After binding of acetylcholine to Nm (nicotinic muscular) receptors, in skeletal muscle occur

    a. the reduction of intracellular Ca2+ concentration
    b. the release of Ca2+ from the sarcoplasmic reticulum
    c. SERCA activation and Ca2+ reuptake into the sarcoplasmic reticulum
    d. Ca2+ binding to troponin C
    e. Ca2+ binding to calmodulin
    f. no answer is correct

2. Alpha-motoneurons

    a. innervate extrafusal muscle fibres
    b. end in a nerve-muscle plate
    c. cause muscle contraction
    d. are rough and fast
    e. end in the plate of the muscle spindle
    f. are thin and slow

3. Anisotropic bands of myofilaments

    a. are dark
    b. contain only actin fibres
    c. are composed of myosin fibres
    d. represent I-band in sarcomere
    e. are unidirectional
    f. represent A-band in sarcomere

4. Anisotropic section on the sarcomere

    a. contains both actin and myosin fibres
    b. contains only actin fibres
    c. is located in the striated muscles
    d. is located in smooth muscle
    e. actin filaments are anchored in it
    f. passes through the centre of the sarcomere

5. Calcium enters the sarcoplasm of the myocyte

    a. from the mitochondria
    b. from intracellular stocks
    c. from the sarcoplasmic reticulum
    d. via ryanodine receptors
    e. via the SERCA pump
    f. from other sources because it is sufficient in the sarcoplasmic reticulum

6. Calcium release from the sarcoplasmic reticulum to the sarcoplasm in skeletal muscle

    a. is mediated by SERCA activity
    b. is mediated by RYR1 activation
    c. is essential for muscle relaxation
    d. is dependent on T-tubule membrane depolarization
    e. results in the activation of voltage-gated sodium channels
    f. causes calmodulin activation

7. Calsequestrin

    a. binds calcium
    b. is a protein
    c. is found in the sarcoplasmic reticulum
    d. adheres to T tubules
    e. releases calcium
    f. is the active form of calcium

8. Contraction of the striated muscle

    a. is governed by the "all or nothing" law
    b. it is controlled by parasympathetic fibres
    c. is under the control of 2 motor neurons - 1) corticospinal and 2) motoneuron
    d. depends on the calcium levels in the sarcoplasm
    e. depends on the number of muscle groups involved in the contraction
    f. depends on the amount of calmodulin

9. During an isometric contraction muscle

    a. shortens
    b. does not change its tone
    c. does not change its length
    d. increases its tension
    e. regenerates
    f. weakens

10. During contraction of the striated muscle

    a. there is an irreversible interaction of actin and myosin
    b. actin-myosin bridges are formed
    c. the concentration of calcium in the myocyte is temporarily reduced
    d. actin binds in tropomyosin C
    e. shifting actin relative to myosin shortens the sarcomere
    f. ATP is formed by the enzymatic activity of the myosin head

11. Epimysium

    a. envelops muscle bundles

b. envelops actin
c. envelops the surface of the muscle
d. gradually passes into the tendon
e. gradually passes into the mitochondria
f. is part of myosin

12. Excitability is

a. the ability to contract a cell
b. the ability to answer stimuli
c. the ability to relax a cell
d. typical for nervous tissue
e. typical for muscle tissue
f. typical for epithelia

13. Excitation on muscle cells occurs

a. chemically (e.g. by acetylcholine)
b. electrically
c. spontaneously
d. by increasing the permeability to potassium
e. by activating the sodium-potassium pump
f. by closing permanently opened channels

14. Excitation-contraction coupling

a. is terminated by cell contraction
b. is a designation for a cascade of events from depolarization to relaxation of the striated muscle
c. is an indicative event in which the action potential spreads along the axon of the motor neuron and the release of noradrenaline
d. is associated with the spread of depolarization through sarcolemma, the release of calcium through ryanodine receptors and the contraction
e. applies only to striated and cardiac muscle cells
f. also includes the termination of the contraction associated with pumping calcium back into the sarcoplasmic reticulum

15. Fast (white) muscle fibres

a. are thicker
b. have more sarcoplasm, mitochondria and myoglobin
c. contain many capillaries
d. have myofibrils regularly arranged in bundles
e. ensure a gentle, dexterous movement
f. are adapted to a long, slow, contraction-maintaining position

16. Fast-twitch (white) muscle fibres

a. are thicker
b. have more sarcoplasm, mitochondria and myoglobin
c. contain many capillaries
d. cannot be easily fatigued
e. provide gentle, precise movement
f. are adapted to a long slow contraction to maintain body posture

17. For contraction of the skeletal muscle, it is necessary to

a. increase in intracellular calcium concentration
b. bind ATP to myosin
c. bind calcium to troponin C
d. activate MLCK by calmodulin
e. change the conformation of tropomyosin
f. reuptake of calcium into the sarcoplasmic reticulum

18. Gamma-motoneurons

a. maintain muscle tone
b. end in a nerve-muscle plate
c. cause muscle contraction
d. are rough and fast
e. end in the plate of the muscle spindle
f. are thin and slow

19. In isotonic contraction

a. the muscle shortens but does not change the tone
b. is a shortening proportional to the number of excited motor units
c. the muscle does not respond to supramaximal stimuli
d. the length of a muscle does not change but its tone changes
e. the muscle does not respond to subthreshold stimuli
f. the amplitude on the record is proportional to the shortening of the muscle

20. In skeletal muscle contraction

a. calcium binds to the myosin head
b. calcium binds to troponin C
c. calcium binds to calmodulin
d. calcium originates mainly from the extracellular environment
e. calcium originates mainly from the sarcoplasmic reticulum
f. the DHP receptor is important for the release of calcium from the sarcoplasmic reticulum

21. In the practical exercise, you tried to lift dumbbells in the time horizon. Why did you feel muscular fatigue at the end of the exercise with dumbbells? It was due to

a. muscle damage has occurred
b. a lack of oxygen in the muscles
c. the depletion of energy reserves
d. muscle dehydration
e. neurotransmitters have been depleted
f. an increase of temperature in the muscle

22. Incomplete tetanus appears

a. when the frequency of muscle irritation increases
b. when muscle resistance increases
c. when stimuli come after the maximum contraction
d. as a wavy line on the myographic curve
e. as a straight rising line on the myographic curve
f. when stimuli arrive at the contracting time

23. Indicate the characteristics related to the striated (skeletal) muscle

a. intercalary disks
b. spindle-shape cells
c. rich sarcoplasmic reticulum
d. troponin and tropomyosin
e. calmodulin and caldesmon
f. neuromuscular junction

24. Indicate the correct statements about the morphology of striated (skeletal) muscle

a. it has multinucleated cells, capable of contracting, which are arranged in muscle bundles
b. the muscle fibre has a short, ellipsoidal shape
c. the contractile apparatus is separated by two A-bands that rotate the plane of polarized light
d. sarcolemma is a supply of calcium for muscle fibre
e. T-tubules are invaginations between the muscle fibres, on whose surface the action potential is conducted
f. sarcomere is the name for the basic functional unit of the contractile apparatus

25. Indicate the differences between skeletal and smooth muscle

a. skeletal muscle has more myosin
b. skeletal muscle has less calcium in the sarcoplasmic reticulum
c. smooth muscle has poorly developed sarcoplasmic reticulum
d. skeletal muscle has gap junctions
e. smooth muscle has caveolae
f. smooth muscle has a rapid contraction

26. Indicate what is needed for the contraction of striated (skeletal) muscles

a. caveolae
b. actin and myosin
c. calmodulin and caldesmon
d. troponin and tropomyosin
e. calcium and magnesium
f. AC and PLC

27. Isotonic muscle contraction

a. is when the length of a muscle changes, but not the tension of the muscle
b. is when the muscle tension changes, but not the length
c. is when both the length and the tension of the muscle change
d. is a condition after a person's death when the muscles contract
e. is on the muscle when we lift a 2 kg barbell
f. is when we try to lift a 300 kg weight

28. Isotropic bands of myofilaments

a. are bright
b. contain only actin fibres
c. are composed of myosin and actin fibres
d. are formed by a lighter H band
e. represents I-band in sarcomere
f. represent A-band in sarcomere

29. Mark, what applies to muscle cells

a. smooth muscles are interconnected by intercalating discs
b. cardiomyocytes contain mainly 1-2 nuclei and propagate action potential further through electrical synapses
c. sarcomere units consist of actin, myosin and calmodulin
d. troponin complexes contain both skeletal and cardiac muscle cells
e. the sarcomere units are interconnected by dense bodies containing titin
f. T-tubules are receptors through which calcium ions enter the sarcoplasm

30. Mark, what applies to skeletal muscles

a. we divide them into slow, fast and mixed type
b. slow muscle fibres are thinner and have less endurance than fast ones
c. tetanisation is a process in which muscle cells cannot completely contract
d. fast muscle fibres can develop more contraction force than slow ones, but they have lower endurance
e. the isotonic contraction can be concentric - shortening or eccentric - lengthening
f. in tetanic contraction, the number of simultaneously contracting motor units is reduced

31. Mark the correct statements about striated (skeletal) muscle

a. myofibril is a functional unit of sarcolemma that conducts action potential
b. contractile proteins include actin and myosin
c. the active sites on actin are blocked by tropomyosin fibres prior to contraction
d. for contraction a release of calcium from the sarcomere is required
e. the troponin complex regulates the conformation of tropomyosin
f. actin forms A-bands and myosin I-bands of sarcomere

32. Mark possible sources of energy for a striated (skeletal) muscle

a. ATP
b. fructose in the anaerobic metabolic pathway
c. glucose in the aerobic metabolic pathway
d. glycogen
e. lactic acid
f. acetyl-coenzyme A

33. Mark the correct statements for the striated (skeletal) muscle

a. sarcolemma forms the membrane of the sarcoplasmic reticulum
b. T-tubules are sarcoplasm incisions inside the muscle unit
c. the action potential spreads through the sarcolemma and activates calcium channels
d. after the contraction subsides, most of the calcium is pumped out of the cell
e. the actin heads are inserted under the myosin in the direction away from the Z-line
f. magnesium is required for ATP dissociation and contraction

34. Mark the correct statements

a. excitation always precedes the contraction
b. the neuromuscular junction is a chemical synapse
c. the neuromuscular junction is an electrical synapse
d. motor neurons are afferent neurons
e. sensory neurons conduct excitement from muscle at the periphery to the CNS
f. the basic functional unit of a transversely striated muscle is the muscle fibre

35. Mark the correct statements

a. complete tetanus is caused by muscle irritation during contraction
b. white muscle fibres are important for endurance
c. with isometric contraction, the tone of the muscle does not change
d. acetylcholinesterase is an enzyme important for the degradation of acetylcholine
e. the neuromuscular plate is an electrical synapse

f. the sarcotubular system of skeletal muscle is important for the release of calcium needed for skeletal muscle contraction

36. Mark the correct statements about the skeletal muscle

a. the sarcomere is the basic functional and structural unit
b. the actin fibres are anchored in the structure of the Z disks
c. creatine kinase is important for contraction energy
d. tropomyosin binds calcium
e. sarcosomes are muscle cell desmosomes
f. titin is a regulatory protein of skeletal muscle

37. Mark the correct statements

a. the neuromuscular junction is the junction of motoneurons with skeletal muscles
b. calcium is required for the interaction of actin with myosin
c. the nicotinic receptors of the skeletal muscle directly control sodium channels
d. binding of acetylcholine to nicotinic receptors in the neuromuscular junction leads to a decrease in sodium permeability
e. activation of the Ca/Mg pump leads to a massive release of calcium from the sarcoplasmic reticulum
f. actin has ATPase activity

38. Mark the correct statements applying to the nicotinic receptor of the muscular type. It is

a. a voltage-gated ion channel
b. a ligand-gated ion channel
c. a G protein-coupled receptor
d. activated by acetylcholine
e. selective only for cations
f. permeable for sodium cations

39. Mark the correct statements for the innervation of striated muscles

a. it is provided by two neurons
b. the motoneuron projects from the ventral spinal horns into the skeletal muscle
c. the junction of the motoneuron and skeletal muscle is called the neuromuscular plate
d. the motoneuron projects from the cortex directly to the neuromuscular plate
e. each motoneuron innervates one muscle fibre
f. motoneurons conduct excitations afferently

40. Mark the correct statements for the neuromuscular plate

a. the neurotransmitter is acetylcholine

b. it is an electrical synapse
c. the neurotransmitter is norepinephrine
d. the neurotransmitter binds to muscarinic receptors
e. the neurotransmitter binds to nicotinic receptors
f. the neurotransmitter binds to ligand-gated ion channels

41. Mark the correct statements

a. excitation-contraction coupling is another designation for the neuromuscular junction (motor end-plate)
b. to create the cross-bridge between myosin and actin, ATP must be hydrolyzed to ADP + P
c. myosin head thrust may occur after phosphate cleavage
d. a new ATP molecule is needed to terminate the link between myosin and actin
e. to expose the active sites on actin, it is necessary for calcium to bind to troponin C and change in the conformation of tropomyosin
f. actin as a myofilament is found in the sarcoplasmic reticulum

42. Mark the correct statements

a. muscle fatigue is associated with the hydrolysis of acetylcholine and a reduction in its effect on the nerve-muscle plate
b. to reduce muscle fatigue, it is more efficient to utilize adrenaline than acetylcholine
c. the rate of muscle contraction decreases with increasing load
d. the most permanent source of energy for myofibrils is free ATP
e. creatine phosphate is a source of energy for the muscle for several seconds
f. upon degradation of glycogen, cleavage to pyruvate and lactate occurs

43. Mark, what applies to the innervation of skeletal muscles

a. they are innervated by alpha-motoneurons
b. one axon innervates multiple muscle fibres
c. innervation takes place on the neuromuscular plate
d. one axon always innervates only one muscle fibre
e. innervation takes place on the vesicles and gap junctions
f. they are innervated by the autonomic nerves

44. Motor nerves

a. are centripetal
b. are afferent
c. lead from the periphery to the centres
d. are centrifugal
e. are efferent
f. lead from the centre to the periphery

45. Motor neurons

a. transmit signal from CNS to neuromuscular junctions
b. one motor neuron can innervate only one muscle fibre
c. are divided into upper and lower motor neurons
d. can not transmit the signal, they are "helper" cells
e. transport the signal via a corticospinal pathway to the spinal cord and from the spinal cord to the effector
f. their main function is to transmit signal from the effector cells to CNS

46. Motor unit

a. consists of one efferent motoneuron and a set of muscle fibres that it innervates
b. consists of two afferent motoneurons and a set of muscle fibres that they innervate
c. consists of a neuromuscular plate
d. consists only of the fibres of the vegetative nervous system
e. is a basic functional unit of skeletal muscle
f. the smaller it is, the more accurate the movement of the muscle

47. Muscle fatigue is caused by

a. accumulation of ATP
b. depletion of energy reserves and accumulation of lactic acid
c. accumulation of ATP and pyruvic acid
d. depletion of neurotransmitters
e. accumulation of ADP
f. accumulation of metabolites

48. Muscle fibres in skeletal muscles

a. have only one nucleus in the middle of the cell
b. have multiple nuclei at the edges of the cell
c. form a muscle fascicle
d. can NOT perform contraction
e. can be several centimetres long
f. contain T-tubules which speed up signal transmission

49. Muscle relaxation occurs when

a. calcium ions are actively transported from the sarcoplasmic reticulum and extracellular space to sarcoplasm
b. calcium ions diffuse only from the sarcoplasmic reticulum
c. calcium ions are actively transported into the sarcoplasmic reticulum and into the extracellular space
d. the myosin head is detached from the actin
e. calcium ions diffuse freely into the sarcoplasmic reticulum

f. the actin head is detached from myosin

50. Muscle tetanus

a. is always a life-threatening state
b. is a continuous muscle contraction without relaxation
c. corresponds to the sum of supra-threshold stimuli on the transversely striated muscle
d. corresponds to the sum of subthreshold stimuli on the transversely striated muscle
e. means, that there is no muscle relaxation
f. it is performed only by antagonistic muscles

51. Muscles

a. can receive an impulse and react to it
b. are excitable cells
c. provide tension and movement
d. respond only to direct irritation
e. have a shorter action potential compared to nerve cells
f. their contraction is provided by voltage-gated sodium channels

52. Myocyte contractile proteins include

a. actin
b. myosin
c. tropomyosin
d. troponin C
e. ryanodine receptor
f. SERCA

53. Myocyte regulatory proteins include

a. actin
b. myosin
c. tropomyosin
d. troponin C
e. ryanodine receptor
f. caveolae

54. Myofibrils are

a. actin
b. myosin
c. troponin
d. tropomyosin
e. calmodulin

f. caldesmon

55. Neuromuscular plate

a. is an electrical synapse
b. has nicotinic receptors on the postsynaptic membrane
c. has muscarinic receptors on the postsynaptic membrane
d. is a chemical synapse
e. none of the above answers is correct
f. is a mixed synapse

56. Neuromuscular plate

a. it consists only of an ion channel
b. on the presynaptic membrane has nicotinic receptors Nm
c. transmits a signal through a mediator nicotine
d. transmits a signal through a mediator acetylcholine
e. is the junction of a nerve cell and a striated muscle cell
f. is the connection of the autonomic nervous system with smooth muscle

57. Platysma muscle

a. is the masticatory muscle
b. is cutaneous neck muscle
c. is a flat muscle
d. is a pectoral muscle
e. moves the mandible
f. helps to breathe

58. Red muscle fibres

a. are a little tiring
b. are quickly tiring
c. ensure long-term performance
d. have a lot of glycogen
e. have a lot of mitochondria
f. have a lot of myoglobin

59. Rigor mortis

a. is a designation for premortal skeletal muscle spasms
b. is a designation for post-mortem stiffening of skeletal muscles
c. occurs due to calcium deficiency
d. occurs due to uncoordinated entry of calcium into the cytoplasm of muscle cells
e. occurs due to the inability of myosin to hydrolyse ATP
f. occurs due to the inability to disrupt actin-myosin bridges

60. Rigor mortis

a. is post-mortem stiffness
b. occurs due to the depletion of ATP energy
c. depends on the ambient temperature
d. arises due to the accumulation of calcium in the sarcoplasmic reticulum
e. can not be destroyed by body manipulation
f. it arises only at natural death

61. Ryanodine channel

a. is located on the membrane of the sarcotubular system
b. splits into energy
c. calcium passes through it
d. magnesium passes through it
e. is activated by calmodulin
f. is activated by calsequestrin

62. Sarcomere

a. is a basic functional unit of the skeletal muscle
b. is a type of myofibril
c. is a skeletal muscle cell's membrane
d. contains thick and thin filaments
e. is a part of the sarcoplasmic reticulum
f. is a part of smooth muscle, which is under voluntary control

63. Sarcomere

a. is the basic structural unit of the striated muscle
b. is the basic functional unit of the striated muscle
c. is made up of muscle fibres
d. is made up of proteins
e. has a spindle shape
f. shortens during contraction

64. Sensory neurons

a. are afferent
b. conduct action potential from the muscle to the CNS
c. are efferent
d. conduct action potential from the CNS to the muscle
e. inform about the length of the muscle
f. cause mechanical work and movement

65. Skeletal muscle is innervated

a. spontaneously, has pacemaker activity

b. it is controlled by the will, through a parasympathetic autonomous system
c. through motor nerve fibres that release norepinephrine on the neuromuscular plaque
d. through the neuromuscular plate
e. via nicotinic receptors that are permeable to sodium ions
f. via dihydropyridine calcium channels that are part of the neuromuscular plaque

66. Skeletal muscle myocytes

a. are mononuclear cells
b. are multinucleated cells
c. are characterized by alternating actin and myosin
d. do not have a sarcoplasmic reticulum
e. have a spindle shape
f. have T-tubules

67. Slow (red) muscle fibres

a. are thinner
b. have few sarcoplasm, mitochondria and myoglobin
c. contain many capillaries
d. are less supplied with blood and O2
e. ensure a gentle, dexterous movement
f. are adapted to a long, slow, contraction-maintaining position

68. T-tubules

a. are formed by the membrane of the sarcoplasmic reticulum
b. are formed by sarcolemma
c. are found in cardiomyocytes
d. their function is to improve the energy supply to the cell
e. their function is to streamline the excitation-contraction connection
f. their function is to mediate the transfer of action potential to the deeper parts of the cell

69. T-tubules in skeletal muscle

a. are near the cisterns of the sarcoplasmic reticulum
b. are invaginations of sarcolemma
c. their function is to rapidly spread the action potential to myofibrils
d. their function is to slow down the action potential in order to flush out calcium
e. are protrusions on the sarcoplasm
f. are close to the nucleus and form triads with it

70. Tetanus

a. is the result of multiple skeletal muscle irritation in a short time

b. occurs when a muscle does not have enough energy in the form of ATP
c. occurs when a muscle does not have enough time to relax
d. occurs when the irritations occur immediately after each other
e. is complete when all the muscles of one limb are cramped
f. is the name of a disease and has nothing to do with muscle contraction

71. The agonist in muscles is

a. a muscle that realizes movement in a certain direction
b. a muscle that performs the opposite movement
c. triceps during flexion
d. biceps during flexion
e. triceps during extension
f. biceps during extension

72. The basic contractile unit of skeletal muscle is

a. a muscle bundle
b. a myocyte
c. a myofibril
d. a sarcomere
e. a neuromuscular plate
f. a sarcolemma

73. The basic functional unit of the striated muscle is

a. spindle-shaped cell
b. sarcomere
c. caveolae
d. actin and myosin
e. calmodulin and caldesmon
f. neuromuscular junction

74. The cell membrane of a muscle fiber is called

a. myofibril
b. sarcolemma
c. sarcoplasm
d. myofilament
e. cytoplasm
f. T-tube

75. The direct source of energy for muscle contraction is

a. ATP
b. ADP
c. triglycerides

d. phospholipids
e. insulin
f. glucagon

76. Mark, what applies to the innervation of muscle cells

a. cardiomyocytes are dependent on innervation mediated by the autonomic nervous system
b. skeletal muscle contraction is ensured by innervation through the parasympathetic system
c. the neuromediator for cardiomyocytes activation is always adrenaline
d. neuromuscular junction is the connection between skeletal muscle sarcolemma and the synaptic end of a motor neuron
e. post-synaptic neuromuscular receptors are ligand-gated sodium channels
f. acetylcholine is the only mediator controlling depolarization in muscle cells

77. The main source of calcium for contraction of the striated muscle is

a. external environment
b. nerve end vesicles
c. mitochondria
d. sarcomere
e. sarcoplasmic reticulum
f. T-tubules

78. The muscle tone

a. is at a time when the muscles are out of contraction
b. means that the muscles are in a state of complete relaxation
c. means that the muscles have no tension
d. is constantly changing
e. is constant
f. is the lowest during sleep

79. The muscles "levators" are

a. abductors
b. expanders
c. adductors
d. lifters
e. masseters
f. pullers

80. The muscles of the shoulder include

a. m. biceps brachii
b. m. brachialis

c. m. triceps brachii
d. m. palmaris longus
e. m. digitorum profundus
f. m. glutaeus maximus

81. The regulatory proteins of the transverse striated muscle are

a. actin
b. myosin
c. troponin
d. tropomyosin
e. myoglobin
f. calmodulin

82. The right order in the organization of muscle tissue from the smallest to the largest unit is

a. actin and myosin fiber, myofibrils, muscle fiber, muscle bundle
b. muscle bundle, muscle fiber, myofibrils, actin and myosin fiber
c. muscle fiber, myofibrils, muscle bundle, actin and myosin fiber
d. myofibrils, sarcolemma, T-tubule, muscle bundle, actin and myosin fiber
e. myofibrils, muscle bundle, muscle fiber, T-tubule
f. sarcolemma, mitochondria, Z-line, sarcomere, actin and myosin fiber

83. The sarcomere contains

a. actin filaments
b. myosin filaments
c. calsequestrin
d. ryanodine receptors
e. sarcoplasmic reticulum
f. titin

84. The sarcomere is

a. the basic structural unit of the striated (skeletal) muscle
b. the basic functional unit of the striated (skeletal) muscle
c. is the basic functional unit of smooth muscle
d. is the basic structural unit of smooth muscle
e. it is composed of actin and myosin filaments
f. it is composed of actin, calmodulin and myosin

85. The sprinter would feel muscle fatigue earlier than a marathon runner due to

a. anaerobic metabolism in his muscles
b. anaerobic metabolism in the muscles of a marathon runner
c. aerobic metabolism in his muscles

d. glycolysis in the muscles of a marathon runner
e. glycolysis in his muscles
f. less mitochondria in the muscle fibers of the marathon runner

86. The term "calcium from intracellular sources" refers to calcium

a. coming from the extracellular space and used for cardiomyocytes contraction
b. pumped into the cell nucleus after contraction
c. released into the cytoplasm from binding to troponin C
d. released from the sarcoplasmic reticulum and triggers contraction
e. released from the sarcoplasmic reticulum after the initial entry of calcium from the extracellular environment
f. recycled in the body and without supplementation from food

87. The term "orbicular" in muscle terminology refers to

a. rhombic
b. triangular
c. circular
d. thoracic
e. transverse
f. levator

88. The troponin is

a. one of the major contractile proteins in the striated muscle
b. a regulatory protein that allows the interaction of actin and myosin
c. formed by subunits C, T and I
d. neuromediator on the neuromuscular junction
e. important for smooth muscle contraction
f. bound to tropomyosin

89. Triads in skeletal muscle

a. are the site of contact of the sarcoplasmic reticulum with T-tubules
b. help faster function of skeletal muscles
c. is the site of contact of the sarcoplasmic reticulum cisterns with sarcolemma invagination
d. are important for the release of potassium
e. are sarcomeres found in isotropic regions
f. are invaginations of sarcolemma

90. What anatomical name would you use for “straight” muscle?

a. rectus
b. transversal
c. orbicular

d. pectoral
e. sphincter
f. flexor

91. What applies to muscle contraction?

a. with isometric contraction, muscle length does not change
b. its essence is the formation of actin-myosin bridges
c. the required ATP can be obtained in the short term by regeneration of ADP from creatine phosphate
d. there is a shortening of the A strip of sarcomere
e. the condition for contraction is the binding of calcium to tropomyosin
f. its strength depends on the initial length of the sarcomere

92. What applies to sarcomere?

a. is a membrane of muscle cells
b. is the basic contractile unit of all types of muscles
c. is made up of contractile proteins in a precise arrangement
d. consists exclusively of actin and myosin
e. each myocyte contains exactly 10 sarcomeres
f. contains contractile and regulatory proteins

93. What applies to skeletal muscle?

a. its characteristic feature is the formation of cell syncytia
b. voluntary control of skeletal muscles is ensured by innervation of the sympathetic and parasympathetic nervous system
c. depolarization of the sarcolemma leads to calcium influx via muscarinic acetylcholine receptors
d. Z-discs delimit individual sarcomeres
e. the main reservoir of calcium ions for muscles are T-tubules
f. caveolae are the main reservoir of calcium ions for muscles

94. What applies to skeletal muscle?

a. in anaerobic physical activity, muscles can use fats/fatty acids as a source of energy but at the cost of producing lactic acid
b. each myofibril is covered with a membrane, so-called sarcolemma
c. Ca2+ binding to the troponin complex leads to activation of sarcomere contraction
d. each skeletal muscle contains a muscle spindle that responds to muscle stretching
e. the T-tubule membrane contains Ca2+-sensitive ryanodine receptors
f. unlike myocardial cycling, Ca2+ between the cytoplasm and the sarcoplasmic reticulum is not essential for skeletal muscle function

95. What applies to skeletal muscle?

a. the thin filament consists of tropomyosin and actin, which generate movement through ATP consumption
b. muscle fibres are hierarchically organized into groups, so-called motor units
c. leakage of K+ from the cytoplasm during the action potential is necessary for the onset of myocyte contraction
d. in the case of an eccentric contraction, it is always shortened or at least does not change in length
e. they are always effectors of the reflex arc because smooth muscle is not subject to innervation by motor neurons
f. we recognize 2 main subtypes of muscle fibres, glycolytic and oxidative

96. What applies to skeletal muscle contraction?

a. it begins by activating voltage-gated ion channels
b. it begins with the activation of ligand-gated ion channels
c. during it, the Z-disks move apart
d. thick filament pulls the anchored thin filament
e. the thick filament is attracted to the Z-disk, thereby expanding the H-zone
f. the following relaxation is a passive process

97. What applies to the contraction of the striated muscles?

a. primary energy sources include ATP and creatine phosphate
b. tetanus is an example of isometric contraction
c. motor innervation is not necessary to initiate the contraction cycle
d. the ligand at neuromuscular receptors is mainly noradrenaline
e. the sarcoplasmic reticulum is the major source of calcium for contraction
f. ATP is needed to release myosin heads from actin

98. What applies to the neuromuscular junction?

a. transmits a signal from a sensory neuron to the skeletal muscle
b. it is a specific type of synapse between the motoneuron and the myocyte
c. the neurotransmitter is mainly acetylcholine
d. the neurotransmitter binds to postsynaptic receptors, which are potassium channels
e. upon activation of postsynaptic receptors, acetylcholine is degraded directly in the synaptic cleft
f. upon activation of postsynaptic receptors, acetylcholine is taken up by the presynaptic cell

99. What applies to the neuromuscular plate?

a. it is a specialized type of electrical synapse

b. it is the site of the transfer of action potential from alpha-motoneuron to muscle fibre
c. it is found in all types of muscle tissue
d. the neurotransmitter acetylcholine ensures the transfer of the action potential
e. activation of muscarinic receptors on the sarcolemma results in the opening of Cl- channels
f. the action potential spreads through gap junctions

100. What is located on the sarcolemma in the neuromuscular plate?

a. voltage-gated calcium channel
b. sodium-potassium channel controlled by acetylcholine
c. nicotine muscular channel
d. alpha 1 receptor for acetylcholine
e. alpha 1 receptor for noradrenaline
f. muscarinic receptor M1 for acetylcholine

101. What type of receptors are on the postsynaptic membrane on the neuromuscular plate?

a. nicotinic
b. muscarinic
c. neuronal
d. voltage-controlled
e. alpha
f. beta

102. When relaxing striated muscle

a. SERCA pumps Ca2+ ions into the sarcoplasmic reticulum
b. zone I is extended
c. binding of ATP to actin causes dissociation of actin-myosin bridges
d. nicotinic receptors are activated
e. tropomyosin blocks the binding sites on actin by altering the conformation
f. sarcolemma depolarization occurs

103. Which neurotransmitter is needed to excite the striated muscle on the neuromuscular junction?

a. calcium
b. noradrenaline
c. sodium
d. acetylcholine
e. adrenaline
f. potassium

104. Which of the following statements are correct? Fast fibres

a. have a small diameter
b. contain many glycolytic enzymes
c. have large stores of glycogen
d. have many mitochondria
e. do not ensure smooth movement
f. have little calcium supply in the SR

105. Why does the calcium concentration in the sarcoplasm increase during excitation on the striated muscle? Because

a. RYR1 is opened, and calcium follows its chemical gradient
b. SERCA is activated
c. troponin is bound to calcium
d. DHP is activated, and calcium goes against the chemical gradient
e. acetylcholine opens voltage-gated calcium channels
f. tension opens calcium channels

Part 3

1. Mark the correct statements about the single-unit smooth muscle

    a. the muscle cells are connected through a gap junction
    b. the muscle cells form a functional syncytium
    c. represents a type of muscle mainly in the digestive system
    d. represents a type of muscle mainly in the eye
    e. contraction is practically not propagated in it
    f. is similar to striated muscle

2. Actin filaments in smooth muscle are

    a. anchored in dense bodies
    b. anchored in Z-discs
    c. arranged in sarcomeres
    d. irregularly distributed
    e. localized only around the edges
    f. much shorter as in the striated muscle

3. Mark the correct statements about reflexes

    a. most reflexes involve processing at the level of brain and spinal cord
    b. an association (interneuron) neuron is located between the motor fibre and effector
    c. most reflexes are mediated at the level of spinal cord
    d. the monosynaptic reflex usually involves brain involvement
    e. an association (interneuron) neuron is located between the sensory and motor fibres
    f. a polysynaptic reflex (flexural) involves processing at the brain level (e.g. pain)

4. Mark the correct statements about bicipit reflex

    a. it is monosynaptic
    b. it is bisynaptic
    c. it is polysynaptic
    d. it belongs to the proprioceptor reflexes
    e. it is fast
    f. it cannot be suppressed by will

5. Mark the correct statements about bicipit reflex

    a. it is a reflex on the upper limb
    b. the effector is the muscle - biceps brachii
    c. it is a proprioceptor reflex
    d. it is a reflex on the palm

e. it has the centre in a lumbar spinal cord
f. it belongs to exteroceptor reflexes

6. Ca2 + channels on smooth muscle can be activated by

a. neuromediators
b. ATP
c. oxytocin
d. 5HT
e. adrenaline
f. histamine

7. Calcium can be removed from the cytosol of cell

a. out of the cell via membrane ATPase
b. out of the cell via the RYR receptor
c. out of the cell via NCX
d. into the sarcoplasmic reticulum via RYR receptor
e. into the sarcoplasmic reticulum via SERCA2
f. into the sarcoplasmic reticulum via IP3 receptor

8. Mark the correct statements about calcium in smooth muscle contraction

a. it causes depolarization
b. it causes repolarisation
c. it has no role in the action potential
d. it enters from the extracellular environment
e. it is released from the sarcoplasmic reticulum
f. it binds to phosphatase

9. Mark the correct statements about caldesmon

a. it is an intracellular mediator
b. it is a regulatory protein of myocardium
c. it is a smooth muscle regulatory protein
d. it is a modulator of signal transmission in neuromuscular junction
e. it is an elastic component of sarcolemma
f. it is a part of sarcomere

10. During muscle contraction, calcium enters the cytosol

a. via the dihydropyridine receptor
b. from ribosomes
c. via RYR receptor
d. from the sarcoplasmic reticulum
e. via M2 receptor
f. via ß1 receptor

11. Mark the correct statements about exteroceptor reflexes

a. they are usually bisynaptic or polysynaptic
b. they can be partially controlled by will
c. the patellar reflex belongs to the exteroceptor reflex
d. the stimulus is a signal from visceral organs
e. they are not controllable by will
f. they usually have a defensive function

12. Mark the correct statements about single unit muscle

a. all cells contract simultaneously
b. the cells contract each separately
c. an example is the intestine
d. an example is the trachea
e. an example is the iris
f. an example is the blood vessel

13. Mark the correct statements about the structure of smooth muscle

a. myosin is anchored
b. fibres are arranged in sarcomeres
c. sarcomeres are absent
d. myosin is dispersed
e. cells are mononuclear
f. cells are multinucleated

14. For the termination of smooth muscle contraction is responsible

a. myosin kinase
b. myosin phosphatase
c. actin kinase
d. actin phosphatase
e. calmodulin phosphatase
f. caldesmon phosphatase

15. How is smooth muscle different from cardiac and skeletal muscle?

a. it is not striated
b. it does not have intercalary disks
c. it has more nuclei
d. it is autonomously innervated
e. it can be controlled by will
f. it creates network

16. Mark the correct statements about the mechanism of contraction in smooth muscle

a. the mechanism is triggered by an increase in Ca2+ concentration

b. Ca2+ forms a complex with calmodulin
c. Ca2+ complex with caldesmon activates myosin light chain kinase
d. myosin heavy chain kinase phosphorylates the myosin head
e. the contraction process is terminated by the activation of myosin phosphatase
f. caldesmon is responsible for the activation of myosin heavy chain kinase

17. Mark the correct statements about interoreceptors

a. they perceive signals from the internal environment
b. they are distinguished into proprioceptors and visceroreceptors
c. they are mainly nociceptors
d. they are sensitive only to pressure, tension and touch
e. they are exclusively non-neuronal receptors
f. they can not return to their original state after the complaint has ended

18. Mark the correct statements about single-unit smooth muscle

a. it is located in the trachea or iris
b. it forms the limbic musculature
c. it contains gap junction connections
d. the cells have collagen and glycoprotein insulation
e. the cells work independently
f. the cells work as a syncytium

19. Mark the correct statements about smooth muscle cells

a. they are spindle-shaped
b. they are multinucleated
c. they have fewer mitochondria than striated muscle cells
d. they have a more developed sarcoplasmic reticulum than striated muscle cells
e. they are Y-shaped
f. their membrane is called sarcoplasm

20. Mark the characteristics related to the smooth muscle

a. intercalary disks
b. spindle-shaped cells
c. rich sarcoplasmic reticulum
d. caveolae
e. calmodulin and caldesmon
f. neuromuscular junction

21. Mark the correct statements about smooth muscle.

a. it is located in the walls of arteries
b. it cannot be controlled by the will
c. it has a lot of nuclei in the cell

d. it has a calmodulin
e. it has the intercalary disks between the cells
f. it has a transverse striping

22. Mark the correct statements about smooth muscle contraction

a. it is shorter than the contraction of transverse striated muscle
b. it is longer than the contraction of transverse striated muscle
c. its duration is in seconds
d. its duration is in milliseconds
e. it is initiated by the phosphorylation of myosin light chains
f. it is initiated by the dephosphorylation of myosin light chains

23. Mark the correct statements about the arrangement of actin and myosin in a smooth muscle cell

a. actin and myosin are arranged in sarcomere
b. actin and myosin cross the smooth cell in all directions
c. actin fiber junction is found in the caveolae
d. actin fiber junction is located in the desmosomes
e. actin fiber junction is located in the caldesmon
f. their arrangement ensures the contraction of smooth muscle cell in all directions

24. Mark the correct statements about monosynaptic reflex

a. it has a simple reflective arc
b. it consists of two neurons connected by a synapse
c. it is also formed by the spinal interneuron
d. the patellar reflex belongs here
e. receptors and effectors are not located in the same organ
f. this includes the flexor reflex

25. Mark the correct statements about smooth muscles' innervation

a. it is regulated through a type of synapse known as the neuromuscular junction
b. the initiation of membrane depolarization is provided by calcium
c. sympathetic stimulates smooth muscle relaxation in all tissues
d. the activation of M3 receptors leads to smooth muscle contraction
e. muscarinic receptors promote vasodilation through increased calcium levels
f. some smooth muscles are also capable of spontaneous depolarization

26. Mark the organs formed by the smooth muscles

a. stomach wall
b. bladder sphincter
c. eye muscles

d. myocardium
e. diaphragm
f. uterus

27. Mark the correct statements about smooth muscle

a. there are intercalated discs
b. it has fusiform or spindle-shaped cells
c. there is rich sarcoplasmic reticulum
d. there are caveolae
e. there are calmodulin and caldesmon
f. there is troponin C

28. Mark the correct statements

a. the increase in peripheral vascular resistance is due to the activation of M3 receptors in peripheral vessels
b. nitric oxide acts to increase cGMP in arterial smooth muscle
c. calcium binds to troponin C and is critical for altering the conformation of tropomyosin
d. actin in smooth muscle cells is bound in dense bodies
e. the phosphorylation of myosin regulatory regions is required for the onset of contraction in cardiomyocytes
f. preload expresses the resistance of heart against which blood is pumped during ejection

29. Mark the correct statements about smooth muscle

a. actin is bound in Z-lines
b. actin is bound in dense bodies
c. myosin is freely dispersed
d. myosin is parallel to actin
e. it contains many T-tubules
f. it contains caveolae

30. Mark the correct statements about smooth muscle

a. it forms the muscle of the heart
b. it is not under will control
c. it contracts continuously
d. it has Nm receptors on the neuromuscular junction
e. it contracts after alpha 1 receptor activation
f. it contracts after M2 receptor activation

31. Mark where the smooth muscle is located

a. in capillaries

b. in the aorta
c. in the brain
d. in the small intestine
e. in the stomach
f. in the eye

32. Mark, which protein binds calcium after entering the cytoplasm during the excitation-contraction coupling in smooth muscle

a. calmodulin
b. troponin
c. tropomyosin
d. protein kinase A
e. myosin light chains
f. actin heavy chains

33. Mark, what is needed for smooth muscle relaxation

a. calcium binding with calmodulin
b. the phosphorylation of MLCK
c. the activation of myosin phosphatase
d. myosin head dephosphorylation
e. myosin kinase activation
f. increase in calcium concentration

34. Mark the correct statements about monosynaptic reflex

a. it forms two neurons connected by a synapse
b. it forms three neurons connected by four synapses
c. it forms a receptor and an effector that are the parts of same organ
d. it forms receptors and effectors located in two organs
e. it is made up of several interneurons
f. they are also referred to as proprioceptive

35. Mark, what is placed on the membrane of smooth muscle

a. T-tubules
b. caveolae
c. receptors
d. proteins
e. blood vessels
f. varicosities

36. Mark the correct statements about pacemaker cells

a. they rhythmically create action potential
b. they are depolarized by sodium ions

c. they are missed on arterioles
d. they are characteristic for skeletal muscle cells
e. they are depolarized by potassium
f. they are important for muscle cell depolarization

37. Mark the correct statements about patellar reflex

a. it is monosynaptic
b. it is polysynaptic
c. it is defensive
d. it is tiring
e. it is fast
f. it cannot be suppressed by will

38. Mark the correct statements about patellar reflex

a. it is a myotatic reflex
b. it is a polysynaptic reflex
c. it is a visceroreceptor reflex
d. it can be controlled by will
e. it is found only in newborns, it disappears with age
f. it is a defensive reflex preventing organ damage

39. Mark the correct statements about reflex

a. it is a functional manifestation of neuronal activity
b. it is polysynaptic if it contains multiple interneurons
c. it is proprioceptor if it has receptors stored in the wall of internal organs
d. it is the basic morphological unit of nervous system
e. conditioned reflexes are exclusively autonomous
f. axonal reflexes are low-stimulus reflexes

40. Reflexes that have only one synapse between an afferent and an efferent neuron are referred to as

a. monosynaptic
b. bisynaptic
c. bicipit
d. excitatory
e. inhibitory
f. none of the answers is correct

41. Reflexes with interneurons included are called

a. monosynaptic
b. polysynaptic
c. excitatory

d. inhibitory
e. multiplicative
f. bisynaptic

42. Regulation of smooth muscle contraction is ensured by

a. calcium
b. troponin C
c. calmodulin
d. myosin light chain kinase
e. caldesmon
f. myosin light chain phosphatase

43. Mark the regulatory proteins in smooth muscle

a. actin
b. myosin
c. troponin
d. calmodulin
e. lymph
f. caldesmon

44. Mark the regulatory proteins in smooth muscle

a. actin
b. myosin
c. dense bodies
d. calmodulin
e. caldesmon
f. troponin

45. Mark the correct statements about Sarcoendoplasmatic-reticulum-calcium-ATPase (SERCA)

a. it is a pump
b. it is important for the storage of calcium in muscle cells
c. it is found, for example, in the myocardium
d. it is a sodium pump
e. it does not need energy
f. it exchanges calcium for chlorine

46. Mark the correct statements about single-unit smooth muscle

a. it acts as a syncytium
b. it occurs in the stomach
c. the action potential is promoted in it through the gap junctions
d. it occurs in the GIT

e. each cell in it is controlled by the nervous system
f. it occurs in the arterioles and in the eye

47. Mark the correct statements about smooth muscle

a. it is under autonomic nervous system control
b. it contracts after the activation of calcium channel
c. it contracts after the activation of potassium channel
d. it contracts after the activation of dihydropyridine receptor
e. it contracts after M2 receptor activation
f. it contracts after alpha receptor activation

48. Mark the correct statements about smooth muscle cells

a. they are mononuclear cells
b. they are multinucleated cells
c. they are characterized by alternating actin and myosin
d. actin is anchored on dense bodies
e. they are formed by spindle cells
f. they contain richly developed sarcotubular system

49. Mark the correct statements about smooth muscle contraction

a. in general, the smooth muscles of internal organs contract more slowly, and the contraction is less energy intensive than in skeletal muscles
b. it is controlled by the will
c. it is controlled by both the sympathetic and parasympathetic nervous systems
d. it is the same as for striated muscles
e. it is initiated by Ca2+ ions, which bind to calmodulin to activate myosin light chain kinase (MLCK)
f. myosin phosphatase, which dephosphorylates myosin, is required for relaxation

50. Mark the correct statements about smooth muscle contraction

a. it always precedes excitation by the autonomic nervous system
b. it is initiated by the binding of calcium to calmodulin
c. it is initiated by the binding of calcium to troponin
d. the calcium calmodulin complex activates the kinase of myosin light chains
e. it triggers anaerobic metabolism
f. it is always isotonic

51. Smooth muscle contraction is affected by

a. the spontaneous electrical activity of muscle cell
b. the releasing mediators of autonomic nervous system
c. hormones

d. α-motoneurons
e. β-motoneurons
f. glutamate

52. Smooth muscle contraction provides

a. the interaction of actin and myosin
b. calcium binding to the regulatory protein troponin C
c. smooth muscle irritation by a motoneuron
d. formation of actin-myosin bridges based on myosin light chain kinase activation
e. calcium release from intracellular sources
f. autonomic nerve stimulation

53. Mark smooth muscle regulatory proteins

a. actin
b. myosin
c. troponin C
d. troponin I
e. myoglobin
f. calmodulin

54. Smooth muscles are controlled by

a. upper and lower motor neurons
b. spino-thalamic efferent neuron
c. vegetative nerves
d. efferent fibres from the cortex
e. nerve fibres that are not controlled by the will
f. exclusively by bisynaptic reflex pathways

55. Smooth muscles differ from skeletal and cardiac muscles in that

a. they do not have myofibrils
b. you cannot control them by yourself
c. they do not have actin
d. they do not have myosin
e. they have faster contractions
f. they are untiring

56. Mark the correct statements about smooth muscle

a. it is located in the walls of blood vessel
b. it forms the muscle of heart
c. it forms the walls of uterus
d. it is in the walls of GIT

e. it is in the conduction system of heart
f. it contracts after the activation of neuromuscular junction

57. Mark the correct statements about somatic reflex

a. it arises in skeletal muscle
b. it arises in smooth muscles
c. this includes the patellar reflex
d. it cannot be controlled by will
e. it is monosynaptic
f. it is polysynaptic

58. Mark the contractile proteins in smooth muscle

a. actin
b. myosin
c. troponin
d. calmodulin
e. tropomyosin
f. caldesmon

59. Mark the correct statements about smooth muscle contraction

a. it may be caused by hormones
b. it is regulated by autonomic nervous system
c. it consumes more energy than skeletal muscle contraction
d. it is faster than skeletal muscle
e. it may take up to a few seconds
f. it is not affected by the calcium concentration in the cell

60. The function of troponin C in smooth muscle is replaced by

a. calmodulin
b. troponin T
c. caldesmon
d. actinin
e. myosin
f. dense bodies

61. Mark the correct statements about the monosynaptic reflex

a. it is influenced by will
b. it is e.g. patellar reflex
c. it is proprioceptor reflex
d. it is exhaustible
e. it is e.g. Achilles tendon reflex
f. it has a long reaction time

62. Mark the regulatory proteins in smooth muscle

a. troponin I
b. calcium
c. calmodulin
d. G protein
e. caldesmon
f. troponin T

63. The simplest reflex arc is formed by

a. one neuron
b. two neurons
c. three neurons
d. four neurons
e. five neurons
f. six neurons

64. Mark the smooth muscle contractile proteins

a. tropomyosin
b. troponin T
c. caldesmon
d. actin
e. myosin
f. calmodulin

65. The stimulus for smooth muscle contraction may be

a. voluntary decision
b. hormone release
c. chlorine ions influx
d. the activation of autonomic nervous system
e. the activation of sympathetic system
f. the activation of parasympathetic system

66. Under physiological conditions, calcium enters the sarcoplasm via

a. ryanodine receptors
b. nicotinic acetylcholine receptors
c. L-type calcium channels
d. alpha-adrenergic receptors
e. sodium-calcium exchanger
f. muscarinic receptors

67. Mark the correct statements about smooth muscle

a. it has a higher rate of contraction than cardiac muscle

b. its cells are connected through gap junctions in the intercalary disks
c. it contains the regulatory proteins calmodulin, calponin and caldesmon
d. some types are capable of spontaneous depolarization
e. its activity can be controlled not only by neurons but also by hormonal or mechanical tension
f. it has a higher maximum contraction force than the transverse striated muscle

68. Mark the correct statements about smooth muscles

a. they contain repeating sarcomere units
b. calcium ions are not required for contraction
c. myosin phosphorylation is required for contraction
d. in organs such as intestines or bladder they form a functional syncytium
e. we divide them into a single unit and a multiple unit
f. they do not contain contractile filaments such as an actin and myosin

69. Mark the correct statements about the single-unit muscle

a. depolarization spreads to cells through the gap junctions
b. the cells contract each separately
c. e.g. the intestine
d. e.g. the trachea
e. e.g. the iris
f. e.g. blood vessels

70. Mark the correct statements about the structure of smooth muscle

a. myosin is anchored
b. the fibers are arranged in sarcomeres
c. sarcomeres are not present
d. myosin is dispersed
e. the cells are mononuclear
f. cells are multinucleated

71. What is the function of calmodulin in smooth muscle?

a. it binds magnesium
b. it binds calcium
c. it activates the PLC
d. it activates MLCK
e. it opens the sodium channel
f. it provides anchoring for actin

72. What is the role of myosin light chain kinase in smooth muscle?

a. it binds to calcium ions and thus initiates excitation-contraction coupling

b. phosphorylate transverse bridges, leading to their connection with thin filaments
c. it splits ATP to release energy for muscle contraction
d. it dephosphorylates the light chains of bridge myosin, thereby relaxing the muscle
e. it pumps calcium from the cytosol back into the sarcoplasmic reticulum
f. it pumps calcium from the cytosol out of the cell

73. What type of stimuli can induce smooth muscle contraction?

a. action potential via α-motoneurons
b. action potential via β-motoneurons
c. the activation of muscle spindle
d. spontaneous depolarization
e. bisynaptic reflex
f. monosynaptic reflex

74. Which enzyme is responsible for phosphorylating the myosin head in smooth muscle?

a. myosin phosphatase
b. myosin light chain kinase
c. PLC
d. AC
e. SERCA
f. MLCK

75. Which ion is responsible for smooth muscle depolarization?

a. sodium
b. potassium
c. calcium
d. magnesium
e. chlorine
f. hydrogen

76. Which ion is responsible for smooth muscle repolarization?

a. sodium
b. potassium
c. calcium
d. magnesium
e. chlorine
f. hydrogen

77. Which of the following answers best describes smooth muscle properties?

a. it is not transversely striated, it cannot be controlled by will, it has one nucleus

b. myofilaments are arranged in a network
c. it is transversely striated, it can be controlled by will, it has a lot of nuclei
d. it contracts and releases slowly and constantly
e. contraction is energy efficient
f. it is not transversely striated, it cannot be controlled by will, it has not any nucleus

78. Which of the following mechanisms in smooth muscle cells do not start contract?

a. depolarization from a neighbouring cell, it spreads through connexon channels
b. binding acetylcholine to nicotinic receptors
c. moving food through the small intestine
d. binding of norepinephrine to α1-adrenergic receptors
e. binding, for example, prostaglandins to their uterine receptors
f. ß1 receptor activation

79. Which of the following processes are not involved in increasing intracellular Ca2+ during contraction in smooth muscle?

a. inflow of Ca2+ from extracellular stores through voltage-activated Ca2 + channels
b. Ca2+ influx from extracellular stores through ryanodine receptors
c. Ca2+ influx from the sarcoplasmic reticulum via IP3 receptors
d. influx of Ca2 + from extracellular stores through ligand-gated Ca2+ channels
e. Ca2+ influx from extracellular stores through M2 receptors
f. inflow of Ca2+ extracellular stores through G protein

80. Mark the correct statements about smooth muscle

a. it does not need ATP and therefore smooth muscle cannot be fatigued
b. myosin light chain phosphatase phosphorylates myosin light chains
c. the sarcomere is shortened during contraction
d. its contraction is initiated by binding of intracellular calcium to calmodulin
e. its contraction is initiated by the activation of muscular nicotinic receptor
f. its contraction can also be initiated by tissue hormones or metabolism products

81. Mark the correct statements about smooth muscle cells

a. they are resistant to fatigue
b. they have a rapid onset of contractions
c. they cannot have tetanus
d. they are spindle shaped
e. they are not plastic
f. their resting membrane potential is constant, unchanged

82. Mark the correct statements about smooth muscle

a. its cells are mononuclear
b. its cells are multinucleated
c. it is organized into muscle bundles
d. it is organized in longitudinal and circular layers
e. it is innervated by alpha-motoneurons
f. it is innervated by the autonomic nervous system

2.4 GASTROINTESTINAL SYSTEM

Part 1

1. Hepatic sinusoids receive blood flow from the

    a. renal artery
    b. portal vein
    c. hepatic artery
    d. v. cava inferior
    e. gallbladder
    f. aorta

2. Mark the correct statements about gastric juice

    a. its secretion depends on food intake
    b. its pH is 1-2
    c. its pH is 3-4
    d. it also contains water
    e. its secretion is independent of food intake
    f. contains only enzymes

3. Mark the correct statements about absorption of water and electrolytes

    a. water and sodium are absorbed along the entire length of the intestines
    b. water resorption occurs mostly in the large intestine
    c. sodium passes into enterocytes by diffusion, symport with aminoacids and glucose
    d. intestinal water resorption is 50 percent or less
    e. stool in the rectum has high content in sodium
    f. the large intestine is less permeable to water than the small intestine

4. According to the shape of the teeth we distinguish

    a. incisors, canines, milk teeth, molars
    b. incisors, canines, premolars, molars
    c. dentins, canine, molars, premolars
    d. milk teeth and permanent teeth
    e. tooth enamel, tooth dentin, dental pulp
    f. tooth enamel, dental pulp, dental cement

5. Mark the correct statements about carbohydrate digestion

    a. they are absorbed in the small intestine in the form of oligosaccharides
    b. carbohydrates are degraded by salivary enzyme ptyalin and pancreatic enzyme α-amylase
    c. fructose is not metabolized in enterocytes

d. glucose and galactose are transferred by SGLT 1 and SGLT 2 into enterocytes together with sodium
e. the GLUT2 transporter transports glucose to the capillaries further leading into the portal vein
f. GLUT 5 is a major transporter of fructose into enterocytes

6. Cholesterol

a. is the main component of chromatin
b. is the main component of cell membranes
c. is the main component of plasma
d. can be produced in the body
e. can be obtained only from nutrients
f. is lipophilic

7. Mark the correct statements about the liver

a. the liver anatomically consists of 4 lobes: lobus dexter, lobus sinister, lobus quadratus, and lobus caudatus
b. the liver does not play a role in the thermoregulation of the organism
c. synthesis of plasma proteins, cholesterol, phospholipids, coagulation factors take place in the liver
d. the liver does not belong to the parenchymal organs
e. the hepatic sinusoid connects the portal venule and the hepatic arteriole with the central vein
f. the liver does not have detoxifying role in the human body

8. Mark the correct statements about the salivary glands

a. three main salivary glands are glandula sublingualis, glandula submandibularis, glandula parotis
b. we recognize serous and mucinous types of salivary glands
c. activation of sympathetic nervous system stimulates salivary glands
d. increased saliva secretion is caused by dehydration, fatigue, fear
e. decreased saliva secretion is caused by visual, olfactory, taste stimuli
f. the parotid gland is the main mucinous gland

9. Mark the correct statements about the gastric juice

a. its pH is in the range of 1.8 to 4
b. the acidic environment stimulates the conversion of pepsinogen to pepsin
c. gastrin and histamine reduce HCl production
d. a maximum of 800 ml is formed daily
e. secretin and cholecystokinin increase HCl production
f. the receptors which stimulate HCl production are muscarinic M3 and histamine H2 receptors

10. HCl in stomach

a. facilitates calcium absorption
b. facilitates iron absorption
c. decreases deactivation of vitamin C
d. decreases deactivation of vitamin D
e. is produced by chief cells
f. is responsible for peristalsis

11. HCl is produced by the

a. parietal cells of the stomach
b. melanocytes of the stomach
c. chief cells of the stomach
d. Langerhans cells of the stomach
e. secretory cells of the stomach
f. Sertoli cells of the stomach

12. HMG-CoA-reductase is an enzyme involved in the synthesis of

a. the proteins
b. glucose
c. cholesterol
d. surfactant
e. noradrenaline
f. acetylcholine

13. Mark the layer of the digestive tract in which is located the Meissneri plexus

a. submucosa
b. mucosa
c. circular muscle
d. serosa
e. lumen
f. lamina basalis

14. Mark the parts of the digestive tract where the most intensive digestion takes place

a. duodenum
b. jejunum
c. stomach
d. large intestine
e. ileum
f. liver

15. Mark the parts of the stomach where mainly chemical digestion takes place

a. fundus

b. body
c. pylorus
d. cardia
e. duodenum
f. column

16. Mark the salivary glands

a. nasal gland, sublingual gland, submandibular gland
b. parotid gland, lacrimal gland, sublingual gland
c. parotid gland, submandibular gland, sublingual gland
d. parotid gland, temporal gland, parotid gland, palatine gland
e. nasal gland, temporal gland, parotid gland, palatine gland
f. parotid gland, submandibular gland, palatine gland

17. Mark the enzymes, located in the small intestine

a. enteropeptidases
b. lysozyme
c. alpha-amylase
d. lactase
e. lipase
f. sucrase

18. Mark the enzymes, located in the saliva

a. mucin
b. lysozyme
c. alpha-amylase
d. nucleases
e. lipases
f. sucrase

19. Intrinsic factor

a. enables pepsinogen activation
b. facilitates iron absorption in the small intestine
c. facilitates the absorption of vitamin C by forming a complex with it
d. is necessary for the absorption of vitamin B12
e. forms a complex with vitamin B12 and facilitates its absorption in the small intestine
f. is located in the stomach

20. Large intestine

a. is the longest part of the digestive tract
b. consists of the cecum, colon, and rectum

c. has a segmented appearance due to a series of saccules called haustra
d. contains villi in its mucosa
e. plays a major role in absorption of foods and nutrients
f. is the last part of gastrointestinal tract, where the water is absorbed

21. Mark the enzymes, involved in the lipid digestion

a. amylase
b. lipase
c. trypsin
d. chymotrypsin
e. biliary acids
f. glucagon

22. Mark the correct statements about lipid digestion

a. lipases are secreted by the tongue, stomach and pancreas
b. emulsification is essential for optimal lipase activity
c. micelles are a prerequisite for normal fat absorption
d. lipids are absorbed from the small intestine into enterocytes in the form of VLDL lipoproteins
e. absorbed lipids in enterocytes are transformed into chylomicrons
f. pancreatic juice is responsible for fat emulsification

23. Lipid digestion is provided by

a. lingual lipase
b. trypsin
c. carboxypeptidase
d. pancreatic lipase
e. pepsin
f. gastric lipase

24. Mark liver functions

a. bile production
b. maintaining the volume of body fluids
c. detoxification
d. cholesterol synthesis
e. homeostasis
f. iron storage

25. Mark the correct statements about the bile

a. daily production of the bile is about 500 ml
b. its main function is protein denaturation
c. it is synthesized in the gallbladder

d. bile salts are recycled in the body
e. bile emulsifies large lipid droplets into smaller ones
f. it is excreted into the duodenum

26. Mark the correct statements about the stomach

a. is composed of three parts: fundus, corpus and antrum
b. cardia is the entrance of the stomach closest to the esophagus
c. contains three layers of smooth muscle
d. contains two layers of smooth muscle
e. it is innervated exclusively by the sympathetic nervous system
f. its lower sphincter connects to the pharynx

27. Mark the functions of salivary amylase

a. cleans teeth and oral cavity
b. helps to break down starch
c. moisturizes, softens the bite in the mouth
d. activates peristaltics
e. helps break down fats
f. it is produced by the sublingual gland

28. Mark the terms related to the large intestine (colon)

a. colon sigmoideum
b. Lieberkuhn's crypts
c. ileum
d. caecum
e. resorption of vitamin B1 and K
f. water resorption

29. Mark the terms related to the small intestine

a. plexus Meissneri
b. Lieberkuhn's crypts
c. ileum
d. caecum
e. haustration
f. water resorption

30. Mark substances, formed in the liver

a. sugars
b. fats
c. proteins
d. aminoacids
e. vitamins

f. neurotransmitters

31. Pancreatic juice contains

a. trypsin
b. chymotrypsin
c. carboxypeptidase
d. elastase
e. pepsin
f. chymosin

32. Peristaltic movements

a. provide chemical processing of food
b. ensure the movement of food
c. are rhythmically repetitive contractions of the circular musculature of the intestine
d. are rhythmically repetitive contractions of the longitudinal musculature of the intestine
e. are triggered by hunger
f. are triggered by stretching of the intestine

33. Protective factors in the stomach are

a. prostaglandins
b. HCl
c. mucin
d. bicarbonate
e. pepsin
f. the regenerative capacity of the gastric mucosa itself

34. Mark the correct statements about protein digestion

a. protein digestion is the least energy intensive process of all macromolecules
b. acidic lysis of proteins is catalysed by gastric pepsin
c. absorption of proteins into enterocytes uses simple diffusion
d. alkaline proteases are trypsin, chymotrypsin and elastase
e. proteins are absorbed mainly in the form of aminoacids, less as dipeptides and tripeptides
f. sodium cotransport is often used to transport aminoacids from the intestinal lumen to enterocytes

35. Protein digestion is provided by

a. salivary amylase
b. trypsin
c. carboxypeptidase

d. pancreatic lipase
e. pepsin
f. pepsinogen

36. Saccharides are absorbed

a. primarily in the duodenum
b. primarily in the stomach
c. primarily in the large intestine
d. in the form of glucose, galactose and fructose
e. only in the form of glucose
f. by active sodium cotransport

37. Saliva production is activated through receptors

a. M1
b. M2
c. M3
d. alpha1
e. beta1
f. beta2

38. Mark the correct statements about small intestine

a. goblet cells are responsible for nutrient uptake
b. the main task of small intestine is the reabsorption of water
c. small intestine is the organ with the largest surface in the digestive system
d. the mucosa of small intestine contains a single-layer cylindrical epithelium with cilia
e. enterocytes with microvilli are responsible for nutrient uptake
f. mucosal M cells are a part of the defence mechanisms, they crossbridge with the lymphatic system

39. The digestive tract generally consists of these layers

a. endothelium
b. tunica mucosa
c. tunica muscularis externa
d. tunica externa
e. tunica submucosa
f. tunica intima

40. The epiglottis is located between

a. pharynx and the trachea
b. nasopharynx and oropharynx
c. larynx and pharynx

d. larynx and the esophagus
e. pharynx and nasopharynx
f. nasopharynx and oropharynx

41. The esophagus is

a. pharynx
b. larynx
c. lined with stratified flat epithelium
d. formed by the striated muscle in the upper third
e. formed only by smooth muscle
f. lined by stratified cuboidal epithelium

42. The formation of gastric HCl is stimulated by

a. stimulation of nervus vagus
b. noradrenaline stimulation
c. proton pump activity
d. inflow of calcium ions
e. carbonic anhydrase activity
f. entry of chloride anions into the parietal cell from the luminal side

43. The formation of gastric HCl is stimulated by

a. adrenaline
b. noradrenaline
c. acetylcholine
d. histamine
e. gastrin
f. secretin

44. The function of the liver is

a. regulation of plasma amino acid levels
b. gluconeogenesis from lactate and glycerol
c. synthesis and degradation of plasma proteins
d. depot of water-soluble vitamins
e. conversion of cholesterol into the bile acids
f. negative thermoregulation, lowering the temperature

45. The innermost lining of the digestive tube wall is formed by

a. serosa
b. longitudinal musculature
c. circular musculature
d. oblique musculature
e. submucosa

f. mucosa

46. The neuronal control of the digestive process is provided by

a. autonomic nervous system
b. sensory nerves
c. parasympathetic nervous system
d. enteric nervous system
e. plexus Auerbachi
f. excentric nervous system

47. The part of the esophagus that is closest to the stomach is called

a. fundus
b. antrum
c. cardia
d. pylorus
e. pharynx
f. hepar

48. The physiologic pH of the saliva is

a. 1-2
b. 2-3
c. 3-4
d. 4-5
e. 6-7
f. 8-9

49. The role of the large intestine is

a. absorption of water and electrolytes
b. storing undigested residues
c. forming stools
d. excretion of faeces
e. digestion of starches
f. moistening and softening of food

50. The secretion of gastric juice is stimulated by

a. alpha1 receptors
b. beta1 receptors
c. H1 receptors
d. H2 receptors
e. M2 receptors
f. M3 receptors

51. The secretion of gastric juice is stimulated by

a. noradrenaline via alpha1 receptors
b. adrenaline via beta2 receptors
c. acetylcholine via nicotinic receptors
d. acetylcholine via muscarinic receptors
e. histamine via M3 receptors
f. histamine via H2 receptors

52. Mark the correct statements about the gastrointestinal hormones

a. we recognize two groups: gastrin and secretin groups
b. mainly secretin and cholecystokinin are produced in the stomach
c. they are predominantly peptides in nature
d. ghrelin is responsible for suppressing the feeling of hunger
e. cholecystokinin reduces the secretion of bile and pancreatic juice
f. gastric HCl secretion is increased by gastrin and decreased by secretin

53. Mark the correct statements about the pancreas

a. it has no endocrine function
b. anatomically it consists of three parts, the body, the head, and the tail
c. pancreatic enzymes have the optimum of their activity in an acidic environment
d. pancreas secretes trypsinogen, chymotrypsinogen, various lipases and amylase into the duodenum
e. it is a mixed gland
f. pancreatic juice is secreted into the ileum

54. Mark the correct statements about the stomach

a. the composition of its wall corresponds to the general composition of the wall of the digestive tract
b. the structure of the wall differs significantly from the rest of the digestive tract because it contains transient epithelium
c. it is innervated only by the sympathetic nervous system
d. stomach produces acidic gastric juice with a pH value of 5 to 6
e. pepsinogen is produced by the chief cells of the stomach mucosa
f. goblet cells produce mucus and secrete HCl into the stomach

55. What are peristaltic waves

a. electromagnetic waves followed by EEG
b. alternating calcium currents in myocytes
c. waves characterizing the action potential
d. regular bowel movements during digestion
e. backward movements of the stomach during vomiting
f. no answer is correct

56. Mark the components of the saliva

a. lysozyme
b. trypsin
c. amylase
d. water
e. ptyalin
f. pepsin

57. Propulsion is

a. movement of the action potential along the nerve fiber
b. limb movement during sleep
c. movement of food in the digestive tract
d. excretion of food residues through the anus
e. reflux of digested food into the esophagus
f. none of proposed options is correct

58. Mark the processes, that take place in the large intestine

a. lipid cleavage
b. cleavage of complex carbohydrates
c. absorption of aminoacids
d. lipid absorption
e. water absorption
f. formation of digestive gas

g. Mark the property of the small intestine, that increases its ability to absorb digested food

h. its large surface
i. gaps between adjacent epithelial cells
j. trypsin secretion
k. its longer length compared to the large intestine
l. its peristaltic movements
m. presence of bacteria

59. Mark the enzymes, that are responsible for protein digestion

a. trypsin
b. sucrase
c. pepsin
d. HMG-CoA-reductase
e. enteropeptidase
f. chymotrypsin

60. Mark the cells, that produce hormones in the digestive tract

a. parietal cells
b. cells located in the pharynx
c. chief cells
d. enteroendocrine cells
e. goblet cells
f. Kupffer cells

61. Mark the components in the saliva, that are responsible for activating salivary amylase

a. mucus
b. phosphate ions
c. chloride ions
d. urea
e. chymotrypsin
f. pepsin

62. Mark the additional organs of the digestive system

a. salivary glands
b. esophagus
c. mouth
d. pancreas
e. liver
f. large intestine

63. Mark the bacteria, that are physiologically a part of the intestinal microflora

a. Escherichia coli
b. Candida albicans
c. Lactobacillus bulgaricus
d. Streptococcus pneumoniae
e. Enterococcus faecalis
f. Clostridium sp.

64. Auerbach's plexus

a. located in the submucosa of the digestive system
b. is part of the enteric nervous system
c. ensures the movement of food through the gastrointestinal tract
d. is located in the mucosa
e. controls only the circular musculature of the digestive system
f. is fully dependent on sympathetic and parasympathetic

65. Esophagus

a. is made up of striated but also smooth muscle

b. is capable of peristaltic movements
c. separated from the stomach by the cardiac sphincter - the lower esophageal sphincter
d. does not pass through the diaphragm
e. it is lined by a single-layered cylindrical epithelium
f. its wall consists of three layers of smooth muscle

66. Identify factors that can induce vomiting by a central mechanism

a. hypoxia
b. increased intracranial pressure
c. irritation of the vestibular apparatus
d. irritation of the digestive system
e. hyperacidity
f. hypoacidity

67. Identify factors that stimulate gastric production of hydrochloric acid

a. gastrin
b. histamine
c. acetylcholine
d. norepinephrine
e. secretin
f. somatostatin

68. Identify pancreatic juice enzymes that break down fats

a. pancreatic lipase
b. cholesterol esterase
c. phospholipase
d. trypsin
e. pancreatic alpha amylase
f. chymotrypsin

69. Identify pancreatic juice enzymes that break down proteins

a. pancreatic lipase
b. cholesterol esterase
c. phospholipase
d. trypsin
e. pancreatic alpha-amylase
f. chymotrypsin

70. Identify the organic components of gastric juice that are involved in the digestion of dairy products

a. gastric lipase

b. chymosin
c. gastropherin
d. gelatinase
e. mucin
f. intrinsic factor

71. Intrinsic factor

a. is glycoprotein in nature
b. is formed in the parietal cells of the stomach
c. enables the resorption of vitamin B12 in the terminal ileum
d. is formed in the main cells of the stomach
e. enables the resorption of vitamin B12 in the pyloric part of the stomach
f. denatures proteins

72. Mark the correct statements

a. chewing is a reflex movement
b. ptyalin is an alpha amylase that breaks down starches
c. mucin acts protectively on the oral mucosa
d. lysozyme is a bactricide
e. sucking is a conditioned reflex
f. saliva is composed primarily of organic substances

73. Mark the correct statements

a. acidic environment of the stomach improves iron absorption
b. calcium is more easily absorbed from the stomach in the form of chloride
c. hydrochloric acid of gastric juice is bacteriocidal and bacteriostatic
d. gastric amylase is a key enzyme for the absorption of sugars
e. gastropherin is a peptide important for iron absorption
f. the proteolytic activity of pepsin increases with pH

74. Mark the correct statements

a. production of hydrochloric acid takes place in the cover cells of the stomach
b. the enzyme carbodehydratase is responsible for the synthesis of carbonic acid from carbon dioxide and water
c. urine and plasma are more alkaline when hydrochloric acid production is increased
d. the proton pump transports hydrogen and sodium during hydrochloric acid synthesis
e. potassium is transported exclusively by active transport systems during hydrochloric acid synthesis
f. chloride anions for hydrochloric acid synthesis in the stomach are actively transported from the interstitium to the parietal cells of the stomach by the chloride pump

75. Mark the correct statements

a. the cephalic phase of hydrochloric acid production occurs when food is viewed
b. hydrochloric acid production is reduced by feedback if the pH in the stomach drops below 3
c. the enterogastric reflex inhibits the secretion of gastric juices
d. the gastric phase of gastric juice production starts with the distension of the duodenum
e. no gastric juices are produced in the duodenum
f. carbohydrate food stays in the stomach the longest

76. Mark the correct statements

a. most pancreatic juice is released during the intestinal phase
b. parasympathetic increases pancreatic juice production
c. the passage of acidic chyme into the duodenum stimulates the release of pancreatic juice
d. chymotrypsin activates the conversion of trypsinogen to trypsin
e. pancreatic juice carboxypeptidases cleave proteins into peptides
f. sympathetic increases pancreatic juice production

77. Mark the correct statements about the stomach

a. the wall of the stomach consists of three layers of smooth muscle
b. the main cells of the stomach produce pepsinogen and gastric lipase
c. the plexus myentericus is responsible for the movements of the stomach
d. antrum refers to the upper part of the stomach
e. parietal cells of the stomach produce endocrine active substances such as somatostatin
f. the pylorus is located at the entrance to the stomach, on the side of the esophagus

78. Mark the layers of the wall of the digestive system

a. mucosa
b. submucosa
c. smooth muscle
d. extracellular matrix
e. mucus
f. blood vessels

79. Mark the substances produced by the main cells of the stomach

a. intrinsic factor
b. hydrochloric acid
c. pepsinogen
d. mucin

e. somatostatin
f. gastric lipase

80. Mark the substances produced by the parietal cells of the stomach

a. intrinsic factor
b. hydrochloric acid
c. pepsinogen
d. mucin
e. somatostatin
f. gastric lipase

81. Mark the vessels of the splanchnic circulation

a. vena portae
b. arteria mesenterica
c. arteria coeliaca
d. arteria carotis
e. arteria axilliaris
f. arcus aortae

82. Meissner's plexus

a. is located in the submucosa of the digestive system
b. is part of the enteric nervous system
c. ensures the movement of food through the gastrointestinal tract
d. is located in the mucosa
e. controls only the circular musculature of the digestive system
f. is fully dependent on sympathetic and parasympathetic

83. Mucus

a. it is produced by the by-products of the gastric mucosa
b. has a protective effect
c. prevents the gastric mucosa from self-digesting
d. allows iron resorption
e. acts mainly in the terminal ileum
f. mainly causes milk coagulation

84. Pepsin

a. formed from pepsinogen by the action of hydrochloric acid
b. is the main enzyme of gastric juice
c. proteolytic
d. is active at pH greater than 5
e. it is important for carbohydrate digestion
f. is part of pancreatic juice

85. The myenteric plexus regulates

a. motor activity of the gastrointestinal system
b. peristalsis
c. tone in the digestive system
d. secretion in the digestive system
e. feeling of satiety
f. leptin release

86. Villi and microvilli

a. increase the absorptive capacity of the gastrointestinal system
b. have a lymphatic vessel in the center of the jejunum
c. are characterized by increasing osmolarity from the base to the apex of the cusp
d. are characterized by increasing osmolarity from the apex to the base of the villi
e. are important for peristalsis in the gastrointestinal system
f. ensure the mixing of food

Part 2

1. Mark the type of reaction when a monosaccharide is formed from a polysaccharide

    a. catabolic
    b. anabolic
    c. anaplerotic
    d. oxidation–reduction
    e. biosynthetic
    f. energetic

2. Mark the nutrients, which should be mostly present in healthy human diet

    a. proteins in general
    b. proteins of vegetable origin
    c. vegetable fats
    d. animal fats
    e. carbohydrates
    f. polysaccharides

3. Amino acids in diet are needed to

    a. build new proteins
    b. proteolysis
    c. serve as fat stores
    d. supply energy for the cell
    e. create red blood cells
    f. generate heat

4. Amphibolic metabolic reactions

    a. have the character of both anabolic and catabolic reactions
    b. take place, for example, during the Krebs cycle
    c. are important for the synthesis of substances
    d. are characteristic by the fact that they only consume energy
    e. are characteristic by the fact that they only generate energy
    f. do not need to supply energy

5. Anabolic processes are

    a. processes that require energy
    b. processes that do not require energy
    c. degradative reactions
    d. synthetic reactions
    e. pathways that produce simple products
    f. pathways that produce molecules of higher molecular weight

6. Anabolic reactions

    a. are the reactions of the Krebs cycle
    b. consume energy
    c. their substrate may be acetyl-coenzyme A
    d. are refundable
    e. have low molecular weight substances as source
    f. they are only oxidation reactions

7. Basal energy expenditure is

    a. the highest energy expenditure of the body in basal conditions
    b. the lowest energy expenditure of the body in basal conditions
    c. defined as the minimum production of heat in the body
    d. defined as the maximum heat production in the body
    e. defined as the maximum heat expenditure in the body
    f. defined as the maximum cold expenditure in the body

8. Basal metabolism is

    a. defined as the minimum production of heat in the body
    b. defined as the maximum production of cold in the body
    c. affected by work activity, age, body temperature and gender
    d. the lowest e.g. in the morning after waking up
    e. the lowest in sports
    f. not affected by hormones

9. Basal metabolism

    a. is the amount of energy needed to provide basic life functions
    b. is influenced by human work activity
    c. depends on weight, age and gender
    d. represents the highest energy expenditure of the organism
    e. is constant throughout the day
    f. does not change with age

10. Basal metabolism

    a. indicates the amount of energy required for physical work
    b. changes according to gender
    c. indicates the amount of energy needed to maintain vital functions
    d. changes with age
    e. can be calculated out of body mass index
    f. measurement should be taken one hour after physical activity

11. Catabolic processes are the set of metabolic pathways, that

    a. break down molecules to release energy

b. builds up the molecules to create energy
c. break down for example polysaccharide to monosaccharides
d. synthesize new molecules
e. create more complex products
f. produce higher molecular weight molecules

12. Catabolic reactions

a. convert high molecular weight substances from food into fission products
b. are irreversible
c. transform simple molecules to more complex molecules
d. complement intermediates into major metabolic processes
e. often use acetyl-coenzyme A as a substrate
f. are unregulated

13. Essential nutrients

a. are those, that the organism can not synthesize
b. include amino acids, fatty acids, vitamins and minerals
c. include, for example, tryptophan
d. include, for example, glucose
e. are energy sources
f. are exclusively vitamins

14. Essential nutrients do not include

a. glucose
b. arginine
c. linoleic acid
d. histidine
e. valine
f. isoleucine

15. Mark, essential nutritional factors

a. valine
b. vitamin C
c. phenylalanine
d. fatty acids (linoleic acid)
e. glucose
f. HDL

16. Mark essential nutritional factors

a. linoleic acid
b. glucose
c. glycogen
d. vitamin D

e. minerals
f. amino acids valine and leucine

17. Food intake is increased by

a. increased oxytocin production
b. hyperglycaemia
c. decreased hemoglobin production
d. hypoglycaemia
e. reduced leptin levels
f. increased body temperature

18. Food intake is not significantly affected by

a. the centre of satiety and the centre of hunger in the hypothalamus
b. decrease in glycaemia
c. hungry stomach contractions
d. estrogen production
e. surfactant production
f. tyrosine production

19. Food pyramid

a. presents recommendations on how to eat healthier
b. means, that foods that contain the same type of nutrients are grouped on one floors
c. represents also the frequency of food intake of every floor
d. means that with increasing floor the food intake should be increased
e. represents foods according they are essential or non-essential
f. represents recommendations for obese patients how to lose weight

20. Mark the correct statement about glycemic index

a. the higher it is, the easier it is to digest the food
b. the higher it is, the harder the food is digested
c. the higher it is, the faster glucose gets from the food into the blood
d. the higher it is, the slower glucose enters the blood from the food
e. foods with a low glycemic index have a positive effect on human health
f. has a value from 0-100, the value of glycemic index 100 is set for glucose

21. Mark the correct statement about glycemic index (GI)

a. it is a dimensionless number
b. it is given as a percentage
c. the higher the GI of certain food, the easier it is digested and the faster the glycemia decreases (hunger attack)

d. the higher the GI of certain food, the more slowly glucose is released from it and the more stable its blood level is
e. foods with low GI have a positive effect on human health
f. foods with high GI have a positive effect on athletes and people with type 2 diabetes

22. Healthy eating includes

a. intake of fruits, vegetables, legumes, nuts and whole grains
b. increased intake of fats such as fatty meat, butter, cheese (unsaturated)
c. unsaturated fats (fish, avocado, sunflower, soybean and olive oil)
d. increased NaCl uptake
e. reduced sugar intake
f. increased intake of caloric fluids

23. Basal metabolism is increased by

a. relaxing
b. starvation
c. thyroid hormones
d. sleep
e. exercising
f. cycling

24. If anabolic reactions exceed catabolic reactions, the result will be

a. weight loss
b. metabolic rate change
c. fever
d. weight gain
e. for example - the formation of new proteins
f. cleavage of ATP

25. Mark the factors that increase basal metabolism

a. food intake
b. body weight (muscle mass) increase
c. older age 65+
d. sleep
e. higher body temperature e.g. 39
f. female gender

26. Indicate the sources of polysaccharides - foods in which polysaccharides dominate

a. leguminous plants
b. bread, pastry
c. rice

d. cottage cheese
e. oat flakes
f. yogurt

27. Information from the food pyramid

a. distinguish food components into 4 basic groups
b. means that we should prefer simple carbohydrates over polysaccharides
c. means that red meat intake should be higher than fish and seafood intake
d. means that the intake of fruit and vegetables should outweigh the intake of cereal products
e. means that nuts are an important source of unsaturated fatty acids
f. means that fiber is an essential component of food

28. Mark the statements, that apply to body water

a. it is located in the interstitium as well as in the intracellular space
b. body water comes only from the diet
c. most of the water forms blood plasma
d. it also arises as a product of metabolism
e. the largest fraction is excreted by the kidneys
f. women have a lower body water percentage than men

29. Label "super healthy foods - superfoods"

a. avocado
b. nuts
c. milk
d. potato
e. fish
f. honey

30. Label essential nutrients

a. valine
b. leucine
c. tryptophan
d. glucose
e. sorbitol
f. pyruvate

31. Label micronutrients

a. proteins
b. carbohydrates
c. lipids
d. vitamins

e. minerals
f. enzyme cofactors

32. Label essential amino acids

a. GABA
b. phenylalanine
c. ornithine
d. lysine
e. linolenic acid
f. acetyl-coenzyme A

33. Lipophilic vitamins include

a. riboflavin
b. tocopherol
c. folic acid
d. calciferol
e. vitamin K
f. retinol

34. Macronutrients are

a. vitamins
b. carbohydrates
c. lipids
d. minerals
e. proteins
f. trace elements

35. Macronutrients include

a. proteins
b. vitamins
c. minerals
d. carbohydrates
e. trace elements
f. fats

36. Mark anabolic hormones

a. adrenaline
b. insulin
c. cortisol
d. testosterone
e. glucagon
f. estrogen

37. Mark catabolic hormones

a. growth hormone
b. insulin
c. cortisol
d. adrenaline
e. glucagon
f. estrogen

38. Mark the physiological functions of vitamin D

a. ensures homeostasis of calcium and phosphorus
b. increases the absorption of calcium in the kidneys
c. stimulates the expression of alkaline phosphatase in the bone matrix
d. induces bone resorption
e. reduces osteoblast formation
f. increases the absorption of calcium in the stomach

39. Mark the correct statements

a. the energy value of fats is more than twice the energy value of carbohydrates
b. micronutrients are important for metabolic processes in the body
c. methionine belongs among the essential amino acids
d. trace elements are received in a dose that must not exceed 100 micrograms
e. the daily dose of folic acid during pregnancy is 400 milligrams
f. linoleic acid is an essential fatty acid

40. Mark the correct statements

a. basal metabolism decreases with age
b. metabolic reactions in the human body are irreversible
c. the rate of metabolic pathways is affected by the activity of key enzymes
d. 1 kilocalorie is the amount of energy needed to heat 1 g of water by 1 Celsius degree
e. 1 kilojoule is the amount of energy needed to heat 1 g of water by 1 degree Celsius
f. the daily energy balance does not take into account energy reserves

41. Mark the correct statements

a. vitamin D is produced in the skin due to the stimulation by sunlight
b. calcitonin increases calcium excretion
c. intrinsic factor is needed for absorption of vitamin B 12
d. human breast milk contains more calcium compared to cow milk
e. the source of vitamin B12 is mainly in green plants
f. plants and fungi can synthesize vitamin D3

42. Mark the correct statements

a. glandular epithelium forms glands with internal or external secretion
b. a simple squamous epithelium is found, for example, in the vessels as an endothelial layer
c. adipose tissue is a major reservoir of fatty acids, but it does not produce any specific hormones
d. visceral fat produces hormones
e. strong collagen tissue includes, for example, tendons or ligaments
f. visceral fat is located mainly in the thoracic cavity

43. Mark the correct statements

a. catabolic reactions are involved in obtaining energy from fats, sugars and proteins
b. basal metabolism is the amount of energy needed to maintain all vital functions
c. basal metabolism does not take into account gender and age
d. the energy needed to process nutrients is not included in the metabolism
e. in sleep the body does not consume energy
f. resting energy is another parameter to count basal metabolism

44. Mark the correct statements

a. essential fatty acids can not be synthesized by the body itself
b. fats, sugars and proteins are among the macronutrients
c. glucose is an essential source of carbohydrates
d. vitamin D is one of the most important macronutrients
e. amino acids are non-essential sources of nutrients in the human body
f. the human body gets the most energy from carbohydrates

45. Mark the correct statements

a. trans fats belong to the group of healthy fats
b. the source of carotenoids, isoflavonoids, terpenoids and polyphenols is mainly fruits and vegetables
c. a healthy diet requires a reduction in the potassium content of the food
d. the largest source of NaCl are semi-finished products
e. proteins should prevail in the healthy diet
f. animal proteins should prevail in a healthy diet

46. Mark the correct statements

a. a healthy plate consists mainly of foods containing a lot of ketones and aldehydes
b. polysaccharides have a higher dynamic effect on basal metabolism than monosaccharides
c. red meat should be consumed the least according to the food pyramid

d. high intake of meat and cheese leads to over-acidification of the body
e. NaCl intake should not exceed 5g / day
f. simple sugars should be consumed at a rate of less than 10% of energy intake

47. Mark the correct statements

a. in general, women have more percent of fat tissue in the body than men
b. subcutaneous fat is stored in the blood vessels and around the vital organs of the thoracic and abdominal cavity
c. normal body mass index ranges from 18.50 to 24.99
d. waist circumference is not an important parameter in weight assessment
e. body mass index takes into account the body weight a eight of the assessed person
f. muscle mass shows only skeletal muscle content

48. Mark the correct statements

a. the energy source of the cell is NADP or NADPH
b. daily salt intake in a healthy person should not exceed 5 g per day
c. the largest part of a healthy plate daily food intake should be vegetables
d. there is red meat at the top of the food pyramid, which means we should eat it the most
e. fruit yogurts should be preferred over plain yogurts
f. healthy plate prefers fruits over vegetables

49. Mark the correct statements

a. body weight is a parameter that is constantly changing and has a certain telling value about our health
b. body weight is a parameter that does not change
c. body fat is essential for metabolism and also serves as an energy store
d. in the body, fat occurs only in the subcutaneous tissue
e. visceral fat is stored in the blood vessels and around the vital organs of the chest and abdomen
f. the body mass index represents the content of skeletal muscle and water contained in these muscles

50. Mark the macronutrients

a. Na
b. Mg
c. Cl
d. Se
e. Zn
f. Fe

51. Mark trace elements

a. sodium
b. phosphor
c. iron
d. nickel
e. selenium
f. cobalt

52. Metabolic reactions

a. convert essential nutrients
b. are regulated
c. take place in an organized manner
d. are not regulated
e. take place in a disorganized way
f. do not need enzymes for their activity

53. Micronutrients include

a. proteins
b. vitamins
c. minerals
d. fats
e. trace elements
f. carbohydrates

54. Micronutrients used by the human body are

a. iron
b. cobalt
c. magnesium
d. lead
e. bromine
f. phosphorus

55. Non-essential nutritional factors include

a. valine
b. vitamin C
c. phenylalanine
d. arachidonic acid
e. glucose
f. HDL

56. Part of the energy daily balance is

a. only power supply

b. basal metabolism
c. dynamic effect of food
d. energy supplies
e. work metabolism
f. only energy expenditure

57. Riboflavin is

a. a coenzymes
b. a carbohydrate
c. of big importance in elderly
d. B2 vitamin
e. lipophilic vitamins
f. B 12 vitamin

58. Mark the macroelements

a. zinc
b. iron
c. cobalt
d. calcium
e. sodium
f. selenium

59. Mark the micronutrients

a. proteins
b. trace elements
c. vitamins
d. lipids
e. carbohydrates
f. water

60. Mark the correct statement about the food pyramid

a. as the floor increases, the frequency of food intake decreases
b. fruits and vegetables should be taken daily
c. poultry and fish are less suitable for consumption than red meat
d. eggs should be consumed more often than yogurts or cheeses
e. rice is a cereal that should be consumed the least often
f. the recommended source of lipids is olive oil

61. Mark the correct statement about the food pyramid

a. it defines the recommendation on the number of times each food group has to be consumed
b. it defines the food groups

c. as the floor increases, the frequency of intake decreases
d. as the floor increases, the amount of food intake decreases
e. as the floor increases, the frequency of intake increases
f. as the floor increases, the amount of food intake increases

62. The highest energy value in relation to the weight of the nutrient (1g) is in

a. essential amino acids
b. vitamins
c. micronutrients
d. proteins
e. fats
f. carbohydrates

63. The main basic product of metabolic pathways is

a. water
b. acetyl-coenzyme A
c. FADH2
d. ADP
e. glucose
f. glycogen

64. The part of metabolic pathways is

a. enzymatic digestion of food in the antrum of the stomach
b. formation of biogenic macromolecules
c. a series of reversible reactions
d. ATP gain
e. O2 synthesis
f. CO2 and H2O formation

65. Mark the correct statements

a. catabolism is the formation of high-energy macromolecules from smaller molecules
b. in amphibolic reactions, new compounds are degraded and synthesized at the same time
c. proteins increase the basal metabolism of most foods
d. in anabolic reactions, high molecular weight substances decompose into smaller ones
e. metabolic synthesis is ATP independent
f. in the respiratory chain, the output is oxidative phosphorylation and ATP formation

66. The total daily energy demand depends on

a. energy from anaplerotic processes
b. basal metabolism
c. indigestion
d. dynamic effect of food
e. rates of oxidative phosphorylation in smooth muscle cells
f. direct dietary intake of ATP

67. In the lateral part of the hypothalamus is a centre of

a. satiety
b. hunger
c. fluid intake
d. glycemic control
e. regulation of urination
f. glucose uptake

68. In the ventral part of the hypothalamus is a centre of

a. satiety
b. hunger
c. fluid intake
d. glycemic control
e. regulation of urination
f. glucose uptake

69. Vitamin K is

a. one of the fat-soluble vitamins
b. important for blood clotting
c. important for the amount of fibrinogen
d. important for the synthesis of factors II, VII, IX, X
e. plasminogen activator
f. found mainly in beef

70. Water in the body comes from

a. ingested fluids
b. food received
c. kidneys
d. the lungs during exhalation
e. metabolic processes
f. the bone marrow

71. Mark the correct statements about anabolic processes

a. during anabolic processes are formed complex molecules

b. during anabolic processes complex molecules are broken down into simple ones
c. the aim of anabolic processes is to release energy
d. anabolic processes require energy
e. anabolic processes take place in the blood plasma
f. anabolic processes take place in the liver

72. Mark the correct statements about basal metabolism. It

a. is individual
b. depends on the weight
c. does not depend on gender
d. depends on the profession of the individual
e. determines energy requirement during maximum daily activity
f. does not include maintenance of vital functions

73. Mark the correct statements about calciferol. It is

a. macronutrient
b. involved in the incorporation of calcium into bones
c. formed thanks to the ultraviolet light
d. hydrophilic
e. important for calcium and phosphorus absorption
f. obtained mainly from vegetables

74. Mark the correct statements about catabolic processes

a. during them, complex molecules are formed from simple precursors
b. during them, complex molecules are broken down into simple ones
c. during them energy is released
d. during them energy is stored
e. they take place in the blood plasma
f. they take place in the liver

75. Mark the correct statements about daily water intake

a. it is necessary to drink as much water as possible, the limit is unlimited
b. daily intake should be up to 1.5 l
c. daily intake should be up to 2.5 l
d. daily intake should be up to 3.5 l
e. metabolic water is also included in the daily intake
f. metabolic water is not included in the daily intake

76. Mark the correct statements about fibres intake. It is

a. absorbed in the small intestine
b. absorbed in the large intestine

c. not absorbed from the GIT and is therefore an integral part of the diet
d. obtained from fresh vegetables and fruits
e. obtained from legumes
f. obtained from mainly from fish and seafood

77. Mark the correct statements about salt intake

a. the maximum sodium intake should be higher than 10 g per day
b. the maximum sodium intake should be less than 5 g per day
c. potassium intake is insignificant
d. high sodium intake increases the amount of circulating liquids
e. low sodium intake decreases the amount of circulating liquids
f. sodium intake does not affect the amount of circulating liquids

78. Mark the correct statements about water in the human body. It is

a. the most important biological solvent
b. involved in metabolic processes in the body
c. most excreted by the kidneys, lungs and skin
d. mostly excreted in the faeces
e. mostly found in the urogenital tract
f. independent of daily fluid intake

79. Mark the correct statements about water management in the body

a. the highest water expenditure is mediated by renal activity
b. water has a high heat capacity
c. metabolic water is the product of intracellular reactions
d. the hydrating water is bound to the lipophilic colloids
e. free water is a solvent especially for non-polar substances
f. water intake in an adult should be 1-1.5 l / day

80. Mark the correct statements about the principles of healthy nutrition. It prefers

a. reduced amount of salt
b. reduced potassium intake
c. increased intake of simple sugars
d. reduced fat intake
e. increased intake of fruits and vegetables
f. increased intake of sweet drinks

81. Mark actions important for rational diet

a. divide your daily food intake into 5 meals
b. divide your daily intake into 3 meals
c. do not miss breakfast, lunch or dinner
d. skip lunch

e. do not eat in the late evening (especially meals containing carbohydrates)
f. prefer diet rich in simple carbohydrates

82. What is necessary for measurement of the basal energy consumption. The person must be

a. at complete body rest
b. awake
c. fasting
d. shortly after eating
e. in cold environment
f. in thermoneutral environment

83. Which of the following minerals/vitamins are important for bone mass

a. phosphorus
b. calcium
c. thiamine
d. folic acid
e. vitamin C
f. riboflavin

84. Mark the correct statements about the daily energy balance. It

a. is relationship between your energy input and your energy output
b. takes into account basal metabolic rate
c. is increasing with the age
d. is independent on the gender
e. takes into account digestion processes
f. is higher during sleep

Part 3

1. Adiponectin

    a. is a hormone
    b. acts against insulin resistance
    c. is a protein
    d. has an anti-inflammatory effect
    e. controls the feeling of hunger
    f. participates in the regulation of puberty

2. Adipose tissue

    a. it is a type of connective tissue
    b. it is a type of epithelial tissue
    c. depending on the circumstances, it is able to increase in size
    d. it is not metabolically active
    e. it contains adipocytes, which, depending on the structure, form white or brown adipose tissue
    f. it has only a thermoregulatory function

3. BMI

    a. means the body mass index
    b. is the value of basal metabolism
    c. value 18 - 25 represents normal body weight
    d. value over 30 represents obesity
    e. is calculated from the waist circumference
    f. is calculated from body weight and body height

4. BMI

    a. means body mass index
    b. is a measure body surface divided by body weight
    c. measures the percentage of muscles
    d. measures body fat based on height and weight
    e. is applicable only in women
    f. is applicable only in adults

5. Brown adipose tissue

    a. is important for thermoregulation
    b. surrounds the internal organs
    c. is important for burning energy
    d. is most represented in newborns
    e. increases with both hypertrophy and hyperplasia
    f. the hormone irisin is needed for its formation

6. Consuming which types of food will help the most with weight loss?

    a. vegetables
    b. red meat
    c. fruits
    d. fats
    e. plant-based foods
    f. sweets

7. Healthy sources of lipids include

    a. fats of animal origin
    b. vegetable fats
    c. omega-unsaturated acids
    d. bound cholesterol
    e. red meat
    f. walnuts

8. How would you determine the presence of obesity in a patient?

    a. by measuring the waist circumference
    b. by BMI calculation
    c. by the use of bioimpedance analysis
    d. by measuring oGTT
    e. by using of urine test strips
    f. by Ruffier's test

9. Mark the statements, which apply to adipose tissue

    a. we differentiate three types of adipose tissue white, beige, and brown type
    b. it is an endocrinal and paracrinal active tissue
    c. insulin is an important product of adipose tissue
    d. epicardial fat is an important energy substrate for the myocardium
    e. brown adipose tissue occurs mainly in older individuals
    f. insulin stimulates lipogenesis in adipose tissue

10. Mark hormones which are produced by adipose tissue

    a. insulin
    b. leptin
    c. adiponectin
    d. lipoprotein lipase
    e. hydroxymethyl coenzyme A reductase
    f. lipase

11. Leptin

    a. is a hormone

b. acts against insulin resistance
c. is a protein
d. has an anti-inflammatory effect
e. controls the feeling of hunger
f. controls the feeling of thirst

12. Leptin

a. regulates the feeling of hunger and satiety
b. is produced by adipocytes
c. is produced by the pancreas
d. reduces food intake
e. increases food intake
f. increases LDL cholesterol levels

13. Lipids

a. can be used as a source of energy for the body
b. are stored in the form of triglycerides for further use of the body
c. are stored as acetyl coenzyme A
d. are also synthesized in the liver
e. are also synthesized in the intestine
f. they are only of animal origin

14. Mark the correct statements about adipose tissue

a. adipose tissue cells are called adipocytes
b. epicardial fat covers up to 80% of the heart surface
c. visceral fat surrounds the internal organs in the abdominal cavity
d. white fat is found only in the abdominal cavity and subcutaneous tissue
e. beige fat has the disadvantage of burning energy, so it is not beneficial for athletes
f. adipose tissue produces hormones

15. Mark the correct statements about adipose tissue

a. brown adipose tissue is more metabolically active than white adipose tissue
b. brown adipose tissue is important for thermoregulation
c. beige adipose tissue is found only in newborns
d. white adipose tissue is responsible for the metabolic processes of hormones, enzymes, cytokines
e. white adipose tissue is found subcutaneously, viscerally, or epicardially
f. white adipose tissue has no function in the body

16. Mark the correct statements about brown adipose tissue

a. it is located around the internal organs

b. it is very vascularized
c. it is univacuolar
d. it is multi vacuolar
e. it is innervated only by the parasympathetic nervous system
f. it does not contain cells of the immune system

17. Mark the correct statements about leptin

a. regulates the feeling of hunger
b. induces angiogenesis
c. regulates the feeling of cold
d. its plasma concentration depends on the amount of adipose tissue
e. has an anti-inflammatory effect
f. in lean patients its level is high

18. Mark the hormones that are produced by adipose tissue

a. insulin
b. leptin
c. adiponectin
d. lipoprotein lipase
e. hydroxymethylglutaryl coenzyme A reductase
f. lipase

19. Mark the correct statements about white adipose tissue

a. it is well vascularized
b. it is mainly located in the neck area
c. it forms subcutaneous fat
d. it is typical for newborns
e. it forms visceral fat
f. is metabolically active

20. Mark which of following are used to determine obesity

a. belt circumference measurement
b. BMI calculation
c. measurement of skinfold thickness
d. measuring glucose levels
e. wrist thickness measurement
f. calculation of glycemic index

21. Mark the functions of adipose tissue

a. energy storage
b. thermal isolation
c. sensoric function

d. endocrine function
e. detoxification
f. protection

22. The types of adipose tissue from a metabolic point of view are

a. white, red, beige
b. red, white, brown
c. brown, beige, red
d. white, brown, beige
e. white, yellow, beige
f. yellow, brown, red

23. Visceral fat

a. consists of white adipose tissue
b. is made up of brown adipose tissue
c. is important in terms of heat generation
d. is metabolically active
e. is mainly present in newborns
f. surrounds the organs in the abdominal cavity

24. Mark the correct statements about adipokines

a. adiponectin increases tissue sensitivity to insulin
b. are produced mainly in brown adipose tissue
c. leptin resistance can result in increased food intake
d. resistin lowers LDL and improves insulin sensitivity
e. activate hydroxymethylglutaryl coenzyme A reductase
f. dysregulation of adipokine production can lead to obesity

25. Mark the correct statements about adipokines

a. adiponectin reduces tissue sensitivity to insulin
b. they are produced mainly in white adipose tissue
c. leptin resistance may result in decreased food intake
d. resistin increases LDL levels and worsens insulin sensitivity
e. they may affect the level of coagulation factors
f. dysregulation of adipokine production can lead to obesity

26. Mark the correct statements about adipose tissue

a. it is a specific type of connective tissue
b. it is a specific type of stratified epithelium because it covers the internal organs
c. it performs exclusively a thermoregulatory function
d. it has an endocrine function
e. the brown adipose tissue is located just below the skin in the abdominal area

f. visceral adipose tissue is a source of energy

27. Mark the correct statements about lipid intake in human

a. dietary advice should put the emphasis on optimizing types of dietary fat and not reducing total fat
b. the origin of the lipids does not matter
c. lipids of plant origin are more valuable
d. lipids of animal origin are more valuable
e. omega-unsaturated acids are valuable
f. cholesterol is essential

28. What applies to white adipose tissue

a. is well vascularly supplied
b. is located in the neck area
c. forms subcutaneous fat
d. is typical for newborns
e. produces visceral fat
f. provides thermal insulation

29. Mark the correct statements about the functions of adipose tissue

a. insulation
b. endocrine function
c. maintain acid-base balance
d. protection
e. glycemia
f. energy storage

30. Mark the hormones, that are produced by adipose tissue

a. insulin
b. chymosin
c. leptin
d. renin
e. adiponectin
f. glucagon

31. White adipose tissue

a. includes subcutaneous, visceral and epicardial fat
b. is metabolically active
c. produces cholesterol
d. is typical for newborns
e. releases adiponectin
f. has no relevance for fat metabolism

32. White adipose tissue

a. is predominant type of fat in human
b. surrounds the internal organs
c. is important for burning energy
d. is at the most represented in newborns
e. increases with both hypertrophy and hyperplasia
f. the hormone irisin is needed for its formation

2.5 RESPIRATORY SYSTEM

Part 1

1. Mark the correct statements about the innervation of lower respiratory tract

    a. smooth muscle cells contain adrenergic β2 receptors
    b. smooth muscle cells contain adrenergic β1 receptors
    c. smooth muscle cells contain cholinergic M1 receptors
    d. smooth muscle cells contain cholinergic M3 receptors
    e. sympathetic system has a bronchodilatory effect
    f. the parasympathetic system causes bronchoconstriction

2. Mark the correct statements about lung ventilation

    a. it only takes place when the patient is connected to the breathing device
    b. the normal cycle is 30-40 breaths per minute
    c. the muscles help air and mucus expel from the alveoli by squeezing the parenchyma
    d. inspiration represents inhalation
    e. air flow is enabled through pressure changes in the lungs
    f. muscle work is necessary only for the exhalation

3. Activation of beta-2 receptors on the bronchi leads to

    a. increasing in adenylate cyclase activity
    b. decreasing in cAMP concentration
    c. increasing in IP3 formation
    d. decreasing in PLC activity
    e. bronchial dilatation
    f. bronchoconstriction

4. Anatomical dead space is

    a. the volume of air that is inhaled but remains in the higher parts of the respiratory tree and is not exchanged in the alveoli
    b. the volume that can be exhaled after normal exhalation
    c. the sum of expiratory reserve volume and residual volume
    d. the amount of air ventilated in the alveoli
    e. the sum of vital capacity and residual volume
    f. the sum of expiratory reserve volume and residual volume

5. Mark the correct statements about respiratory mechanics

    a. the lungs are dilated while resting
    b. negative pulmonary pressure is necessary for a decrease in lung pressure
    c. there is a liquid between the parietal and pleural layers
    d. a key factor is the difference in tensions between the parietal and pleural layers

e. only the smooth muscles of the airways are involved in respiration
f. during inhalation the chest compresses

6. At what stage of life does the human respiratory system (especially the alveoli) fully mature?

    a. within 72 hours after birth
    b. during puberty
    c. in early childhood, between 3-8 years of age
    d. within 37 weeks after birth
    e. up to 18 years of age
    f. within 20 weeks after birth

7. By activating ß2 receptors in lung smooth muscles

    a. vasoconstriction occurs
    b. bronchoconstriction occurs
    c. bronchodilation occurs
    d. bronchial smooth muscle relaxes
    e. smooth muscle contraction occurs
    f. pulmonary surfactant is formed

8. Carbonic anhydrase

    a. contains zinc in its active site
    b. contains chromium in its active site
    c. catalyses the decomposition of carbonic acid in erythrocytes
    d. is indirectly involved in pH maintenance
    e. catalyses the reaction of carbon dioxide with water
    f. delays the formation of carbonic acid

9. During expiration

    a. the external intercostal muscles contract
    b. chest capacity increases
    c. the pressure between the pleuras increases
    d. alveolar pressure is greater than atmospheric pressure
    e. the lungs expand into the thoracic cavity
    f. the diaphragm relaxes upwards

10. Effective air warming in the pharynx and larynx occurs because

    a. they are dichotomously branched
    b. they are richly innervated
    c. they are wide and long
    d. they are richly vascularised
    e. there are blood vessels able to dissipate heat

f. they regulate thermoreceptors

11. Factors affecting ventilation are

a. perfusion
b. distribution
c. elasticity of lungs
d. muscle work
e. diffusion of gases
f. pressure changes in the alveoli

12. In the structure of lower respiratory tract, we can find

a. ciliated cylindrical epithelium
b. chondrocytes
c. nasopharyngeal macrophages
d. pneumocytes
e. Clara cells
f. ciliated squamous epithelium

13. In upper airways are present

a. alveolar macrophages
b. goblet cells
c. pneumocytes
d. epithelial cells with cilia
e. Clara cells
f. glycoprotein progenitors

14. In venous blood

a. the O2 dissociation curve is the same as in arterial blood
b. the O2 dissociation curve is different from that of arterial blood
c. the O2 dissociation curve has a sigmoidal shape
d. the dissociation curve is shifted to the right and upwards compared with that in arterial blood
e. the dissociation curve is shifted to the right and downwards compared to the curve in arterial blood
f. the dissociation curve depends on the partial pressure of CO2

15. In which of these processes in the lungs does atmospheric pressure play an important role?

a. pulmonary ventilation
b. pulmonary surfactant production
c. increasing resistance
d. surface tension reduction

e. movement of cilia
f. internal respiration

16. Heme

a. is chemically formed by purine ring
b. is chemically formed by porphyrin ring
c. can bind CO2
d. can bind O2
e. contains centrally bound Mg atom
f. contains centrally bound Cu atom

17. Bronchoconstriction can be caused by

a. the parasympathetic system
b. the sympathetic system
c. bradykinin
d. histamine
e. nitric oxide
f. adrenaline (epinephrine)

18. Bronchodilation can be caused by

a. the parasympathetic system
b. the sympathetic system
c. bradykinin
d. histamine
e. nitric oxide
f. adrenaline (epinephrine)

19. Mark the correct statements about gases in the blood

a. CO2 binds with higher affinity to deoxygenated hemoglobin than to oxygenated hemoglobin
b. 98% of oxygen is dissolved in the blood
c. carbonic anhydrase activity is required to maintain acid-base balance
d. upon decomposition of H2CO3, H + is transported back into the blood and HCO3- is bound to hemoglobin
e. the most abundant form of CO2 in the blood is carbaminohemoglobin, about 85%
f. protons are taken up by deoxygenated hemoglobin

20. Mark the correct statements about breathing mechanics

a. the diaphragm relaxes during inhalation
b. the diaphragm contracts during inhalation
c. the diaphragm contracts during exhalation

d. the outer intercostal muscles contract during inhalation
e. the internal intercostal muscles always contract
f. the diaphragm always relaxes during exhalation

21. Mark the correct statements about mucociliary transport

a. it is a vesicular transport from airway epithelial cells
b. it is secured by ciliated respiratory epithelium
c. mucus consists of two layers, gel, and sol layer
d. the particles are trapped in the top layer of mucus, which is more viscous
e. the mucus reaches the alveoli by ciliary movement
f. does not occur in the lower respiratory tract

22. Mark the correct statements about the regulation of respiration

a. it is a spontaneous process based on Fick's laws
b. is coordinated from the integration centre in the brainstem
c. the input sensations come from the olfactory area of the frontal lobe and eyes
d. chemoreceptors are also found in the brainstem
e. mechanoreceptors are not involved in respiratory regulation
f. pressure receptors in lungs stimulate the dorsal centres in the brainstem

g.

23. Mark the correct statements about alveolar pressure

a. it is negative to atmospheric pressure during inspiration
b. it is positive to atmospheric pressure during inspiration
c. it is negative to atmospheric pressure during expiration
d. it is positive to atmospheric pressure during expiration
e. at the end of inspiration, alveolar and atmospheric pressures equalize
f. at the end of inspiration, alveolar and atmospheric pressures do not equilibrate

24. Mark the correct statements about the distribution of air in the respiratory system

a. the inspired air is distributed evenly
b. the inspired air is distributed first to one side of the lungs and then to the other
c. inhaled air is distributed unevenly
d. depends on the morphological arrangement of the respiratory system organs
e. it is influenced by the elasticity of the lungs
f. is not affected by gravity

25. Mark the correct statements about the surfactant

a. is formed in type II pneumocytes
b. reduces the surface tension of alveoli
c. contains lipids and proteins
d. contains mainly carbohydrates and nucleic acids

e. it is lining liver tissue
f. is important for iron absorption

26. Mark the correct statements

a. during inhalation tidal volume increases
b. during exhalation the intra-alveolar pressure drops above atmospheric pressure
c. inhalation decreases lung volume
d. during exhalation the pleura relaxes
e. during inhalation the intrapleural pressure decreases
f. during exhalation the pleura contracts

27. Mark the correct statements

a. the visceral pleura covers the chest wall, and the parietal pleura covers the lungs
b. there is a vacuum between the parietal and visceral pleura
c. the innervation of lungs is ensured by the autonomic nerves
d. the lungs and their associated structures are called pneumothorax
e. the hilus is a serous membrane that surrounds the lungs
f. the right side of lungs is smaller than the left, due to the heart

28. The respiratory centre

a. is located in the medulla oblongata
b. is also located in the pons
c. contains expiratory and inspiratory neurons
d. is localised in the substantia nigra
e. controls sleep in addition to respiration
f. does not develop until 6 months after birth

29. The factors that affect the association/dissociation binding curve of oxygen and hemoglobin are

a. temperature
b. pCO2
c. surfactant
d. respiratory rate
e. pH
f. 2,3 diphosphoglycerate

30. Mark the inspiratory respiratory muscles

a. diaphragm
b. m. intercostales externi
c. m. soleus
d. m. intercostales interni

e. m. brachialis
f. m. femoralis

31. During respiration, what happens in the conductive zone?

a. gas exchange
b. transport of gases
c. humidification of air
d. surfactant formation
e. heating of air
f. dehydration

32. Mark the correct statements about the physiological dead space

a. it is the sum of anatomical and alveolar dead space
b. it is the sum of expiratory reserve volume and residual volume
c. it is the volume of air that is inhaled but remains in the higher parts of respiratory tree and is not exchanged in the alveoli
d. its volume (in ml) is approximately twice the body weight (in kg)
e. it is the sum of expiratory reserve volume and residual volume
f. it is the volume that can be exhaled after normal exhalation

33. Mucin in the airways

a. has a protective function
b. has a metabolic function
c. its secretion is stimulated by the sympathetic
d. its secretion is stimulated by the parasympathetic
e. filters and treats inhaled air
f. emits only O2 but not CO2

34. Mark the correct statements about muscle work during breathing

a. the diaphragm contracts during expiration
b. the diaphragm contracts during inspiration
c. the abdominal muscles help with inspiration
d. the intercostal muscles help with inspiration
e. no muscles need to be contracted during expiration
f. all muscles must contract during expiration

35. Normal expiration in a person at rest is due to

a. contraction of the abdominal muscles
b. contraction of the expiratory muscles
c. elastic tissue in the lung
d. diffusion
e. diaphragm relaxation

f. contraction of the inspiratory muscles

36. Pleural cavity

a. prevents lungs´ collapse
b. an increase in intrapleural pressure disrupts ventilation
c. the accumulation of fluid in it is called pleural effusion
d. is filled with liquid
e. is filled with air
f. is filled with fat

37. Process of diffusion of gases through the alveocapillary membrane does not depend on

a. the diffusion area
b. the physicochemical properties of gas
c. the gradient of partial pressures on both sides of membrane
d. the transfer of hemoglobin
e. the rate of H2CO3 formation
f. the thickness of alveocapillary membrane

38. Pulmonary mucus

a. contains a large proportion of phospholipids and other lipid substances
b. contains a large proportion of glycoproteins such as mucins
c. is produced by endothelium
d. is produced by submucosal glands
e. is produced by goblet cells
f. contains a large amount of minerals

39. Pulmonary ventilation

a. is based on achieving a positive transpulmonary pressure
b. represents the exchange of respiratory gases
c. represents the exchange of gas between the external environment and the airways
d. skeletal muscles play the key role in it
e. alveolar perfusion is crucial for it
f. its key regulator is blood density

40. Residual volume

a. is the volume of air that remains in the lungs at maximum exhalation
b. cannot be influenced
c. is also referred to as residual
d. is the maximum amount of air that can be inhaled after a normal breath
e. is the amount of air that passes through the lungs in one inhale and exhale at rest

f. is the amount of air we exchange at maximum exhalation after maximum inhalation

41. The respiratory centre

a. perceives the plasma concentrations of oxygen and carbon dioxide
b. perceives the acidity of cerebrospinal fluid
c. its damage may lead to disruption in breathing pattern
d. is located in the spinal cord
e. is located in the brainstem
f. is located in the paravertebral ganglia

42. The respiratory dead space

a. is the space of airways where is no gas exchange
b. is the airway space in which large particles are taken up
c. is divided into anatomical, alveolar and total
d. has a volume of approximately 2 litres
e. cannot be measured in humans
f. occurs only in bronchoconstriction

43. Respiratory epithelium

a. is stratified
b. is pseudostratified
c. is cuboidal
d. is cylindrical
e. excretes mucus
f. is transitional

44. Respiratory gas exchange

a. depends on the concentration gradient
b. depends on the alveolar perfusion
c. depends on the physicochemical properties of the blood
d. runs through the pneumocyte membrane type II
e. takes place through the active transport
f. runs through the smooth muscles of lungs

45. Respiratory gas exchange

a. takes place in the alveolocapillary network
b. includes the diffusion of respiratory gases through the alveolocapillary membrane
c. is secured by pressure / concentration gradients
d. utilizes the process of passive diffusion
e. the gas flow depends on diffusion surface

f. gas exchange depends on lungs perfusion

46. Respiratory gas exchange takes place in the

a. trachea
b. bronchi
c. bronchioles
d. alveoli
e. along the entire length of lower respiratory tract
f. the entire respiratory system

47. Respiratory system

a. is involved in the regulation of body temperature
b. is involved in the regulation of acid-base balance
c. is divided into conduction and respiratory part
d. is involved in the exchange of respiratory gases
e. is involved in the regulation of blood pressure
f. is involved in the regulation of body weight

48. Smooth muscles of the respiratory system

a. regulate the diameter of alveolar canals
b. are located in the trachea and bronchi
c. are found in the bronchioles and alveolar canals
d. are under the control of autonomic nervous system
e. are a part of alveolocapillary network
f. are found exclusively in the alveoli

49. Surfactant

a. is synthesized in pneumocytes II. type
b. is synthesized in bronchi
c. its production increases shortly before birth
d. reduces the surface tension of alveoli
e. increases the penetration of oxygen through the alveolar-capillary membrane
f. its excess causes atelectasis

50. Surfactant

a. is a simple ciliary cuboidal epithelium
b. is located on the surface of long bones
c. covers the surface of alveoli
d. consists of phospholipids, lipids, and proteins
e. its task is to increase the surface tension
f. its function is to reduce the surface tension

51. Surfactant

a. increases the surface tension at the alveolar-air interface
b. decreases the surface tension at the liquid-air interface
c. prevents alveolar collapse
d. reduces the activity of lung macrophages
e. can be reutilized
f. suppresses phagocytosis in alveoli

52. The alveocapillary membrane consists of

a. a layer of surfactant, alveolar epithelium, capillary endothelium and a layer of plasma
b. alveolar epithelium, capillary endothelium and a layer of plasma
c. surfactant layer, alveolar ciliated epithelium, capillary endothelium and plasma layer
d. surfactant layer, capillary endothelium and plasma layer
e. surfactant layer, alveolar epithelium layer and plasma layer
f. alveolar epithelium, capillary endothelium, muscle cells and plasma layer

53. The alveolocapillary network applies

a. a so-called small circulation between the right ventricle and the lungs
b. the limiting element of gas exchange is the solubility of gases
c. the fusion of the pneumocyte membrane and the endothelium forms an alveolocapillary membrane
d. the diffusion area of this network is relatively low, so the gas is bound
e. fibrosis, i.e., the formation of hyaline membrane accelerates the diffusion of gases
f. even a smaller difference ΔP for CO2 is sufficient for rapid equilibration between dissolved CO2 in the blood and alveolar air

54. The auxiliary expiratory muscles include

a. m. sternocleidomastoideus
b. m.scalenus
c. m. pectoralis minor
d. external intercostal muscles
e. diaphragm
f. deep abdominal muscles

55. The basic parameters of respiration are

a. tidal volume, which is about 500 ml
b. residual volume that is exhalable under exertion
c. vital capacity of the lungs, which is about 4.5-4.7 l
d. static parameters that do not change with the functional state of the organism

e. forced vital capacity of the lungs, which increases with obstruction
f. the FEV1 parameter, which can be measured by spirometry

56. The exchange of dissolved gases between capillary blood and tissues is called

a. external respiration
b. ventilation
c. internal respiration
d. distribution
e. cellular respiration
f. restriction

57. Mark the correct statements about pressure changes during breathing

a. in the relaxed state there is zero alveolar pressure
b. during inhalation there is an increase in alveolar pressure +1 mm Hg
c. during inhalation the transpulomary pressure increases by approx. + 5.5 mmHg
d. during inhalation the intrapleural pressure decreases by about -6.5 mm Hg
e. during exhalation the alveolar pressure increases by +1 mm Hg
f. atmospheric pressure is always higher than the alveolar pressure in the lungs

58. The inspiratory part of the respiratory centre is located in

a. the lower part of the pons
b. the upper part of the pons
c. the dorsal region of the medulla oblongata
d. the ventral region of the medulla oblongata
e. cerebellum
f. limbic system

59. The respiratory system is involved in

a. maintaining acid-base balance
b. blood formation
c. respiration
d. thermoregulation
e. venous blood return
f. osteogenesis

60. The shift of the oxygen dissociation curve to the right is not caused by

a. higher temperature
b. acidosis
c. higher pH
d. higher pCO2
e. lower pH
f. higher amount of 2,3-diphosphoglycerate

61. Surfactant

a. is a monolayer of ciliary cubic epithelium
b. is located on the surface of long bones
c. covers the surface of alveoli
d. consists of phospholipids, lipids and proteins
e. increases the surface tension
f. reduces surface tension

62. The volume of air that can be exhaled after normal expiration is called

a. tidal volume
b. inspiratory reserve volume
c. expiratory reserve volume
d. residual volume
e. expiratory capacity
f. functional expiratory capacity

63. Mark the correct statements about humoral effects on the airways

a. all hormones and paracrine agents are bronchoconstrictors
b. histamine acts via H1 receptors and causes bronchoconstriction
c. adrenaline acts on bronchial dilation through β2 receptors
d. bradykinin acts through the sympathetic nervous system on β2 receptors
e. prostaglandin E2 is a strong bronchodilator
f. inflammatory cytokines generally have a bronchodilatory effect

64. Mark the correct statements about the lung surfactant

a. it is a liquid composed mainly of water and proteins
b. it contains many phospholipids and lipid substances
c. it increases the surface tension in the alveoli, preventing their collapse
d. it is produced by II. type pneumocytes
e. it is produced by Clara cells
f. it reduces surface tension in the alveoli

65. Mark the correct statements about the submucosal glands

a. they secrete only serous fluid
b. they contain both serous and mucinous cells
c. they are arranged in exocrine glands
d. they are scattered individually between epithelial cells
e. they are innervated especially by the sympathetic nerves
f. the parasympathetic nerves stimulate their secretion

66. Mark the correct statements about the transfer of carbon dioxide through the blood

a. efficient carbon dioxide transfer is supported by the Bohr effect

b. efficient carbon dioxide transfer is supported by the Haldane effect
c. in peripheral tissues, carbonic anhydrase catalyses the conversion of bicarbonate anion to carbon dioxide
d. in peripheral tissues, carbonic anhydrase catalyses the conversion of carbon dioxide to bicarbonate anion
e. the highest amount of carbon dioxide is found in the blood plasma
f. the lowest amount of carbon dioxide is found in the blood plasma

67. Transpulmonary pressure

a. must be negative for ventilation functionality
b. is the difference between alveolar pressure and external pressure
c. is the difference between alveolar pressure and intrapleural pressure
d. increases during inspiration
e. is the difference in oxygen partial pressures between blood and inhaled air
f. decreases during inspiration

68. Type I pneumocytes

a. form the wall of bronchi
b. form the alveolar wall
c. secrete surfactant, which prevents the collapse of alveoli
d. have membrane connections with endothelial cells
e. are cuboidal cells guaranteeing alveolar stability
f. are transition cells that change shape according to the amount of oxygen

69. What causes the contraction of external intercostal muscles?

a. the movement of diaphragm downwards
b. the compression of chest
c. the movement of ribs and sternum upwards
d. the chest volume reduction
e. the movement of ribs and stern downwards
f. the chest volume increase

70. What is the function of cilia on the cells that line the bronchial tree?

a. they help mix the inhaled fresh air with the residual air contained in the bronchial tree
b. they produce surfactant
c. they slow the movement of air to allow efficient exchange of gases
d. they move the mucus on the cell surface up out of bronchial tree
e. they filter microbes from exhaled air
f. they regulate blood flow in the lungs

71. Surfactant in the lower airways

a. prevents the collapse of alveoli
b. adjusts the temperature of inhaled air
c. allows the capture of foreign particles
d. decreases surface tension of alveoli at the liquid-air interface
e. its main component are phospholipids
f. allows the creation of speech and sounds

72. What prevents the collapse of alveoli?

a. residual volume
b. tidal volume
c. expiration reserve volume
d. inspiratory reserve volume
e. functional residual capacity
f. vital capacity of the lungs

73. When barometric pressure is suddenly reduced

a. there is an increase in the partial pressure of nitrogen
b. there is a release of large amounts of physically dissolved nitrogen
c. clogging of small blood vessels with gas bubbles can occur
d. person can suffer from decompression sickness
e. sudden formation of erythrocytes occurs
f. increase in saturation occurs

74. Where are the respiratory control centres?

a. in the limbic system
b. in the substantia nigra
c. in the midbrain
d. in the bridge
e. in the elongated spinal cord
f. in the brain

75. Where is the respiratory control centre?

a. in the medulla oblongata
b. in the pons
c. in the hypothalamus
d. in the brain
e. in the cerebral cortex
f. in the frontal lobe

76. Which answer best describes "external respiration"?

a. the exchange of gases between alveolar air and blood in pulmonary capillaries

b. the exchange of dissolved gases between blood in tissue capillaries and body tissues
c. the production of CO2 from organic molecules in t cells by using O2
d. the inhalation of atmospheric air into the lungs followed by exhalation
e. O2 and CO2 exchange between parietal pleura and visceral pleura
f. supply of CO2 to tissues

77. Which cells can be found in the lower respiratory tract?

a. microglia
b. immune cells
c. chondrocytes
d. osteocytes
e. epithelial cells
f. smooth muscle cells

78. Which cells produce a pulmonary surfactant?

a. chondrocytes
b. smooth muscle cells
c. type I pneumocytes
d. pneumocytes II. type
e. goblet cells
f. submucosal cells

79. Which substances´ chemical reaction produces oxyhemoglobin?

a. carbonate anhydrase and oxygen
b. hemoglobin and carbon dioxide
c. carbonate anhydrase and carbon dioxide
d. hemoglobin and oxygen
e. carbaminohemoglobin and carbon dioxide
f. methemoglobin and oxygen

80. Mark, which structure is not lined with cartilage?

a. trachea
b. bronchioles
c. bronchi
d. lungs
e. larynx
f. nose

Part 2

1. Dynamic parameters of respiration include

    a. functional residual capacity
    b. vital capacity of the lungs
    c. alveolar ventilation
    d. forced one-second vital capacity
    e. inspirational capacity
    f. peak expiratory flow

2. FEV 1 is/means

    a. the maximum amount of air exhaled per second
    b. the forced one-second vital capacity
    c. the maximum amount of air inhaled per second
    d. an important data for diagnosis of e.g. chronic bronchitis
    e. a functional one-second vital capacity
    f. an important data for determining pulmonary embolism

3. In a healthy person, which of these lung volumes should be the largest?

    a. tidal volume
    b. vital capacity
    c. expiratory reserve volume
    d. residual volume
    e. tidal volume
    f. inspiratory capacity

4. Inspiratory capacity is/means

    a. the volume of air that can be inhaled maximally after a normal exhalation
    b. the total amount of air that the lungs may contain
    c. the volume of air that remains in the lungs even after maximum exhalation
    d. the amount of air ventilated in the lungs per minute
    e. the amount of air ventilated in the alveoli
    f. the average air flow rate in the middle of the exhalation

5. Inspiratory reserve volume is/means

    a. the volume that can be exhaled after normal exhalation
    b. the sum of expiratory reserve volume and residual volume
    c. the amount of air ventilated in the alveoli
    d. the sum of vital capacity and residual volume
    e. the volume that can be inhaled after a normal breath
    f. the amount of air ventilated in the alveoli

6. Mark the correct statements

    a. in adults, the normal ventilation frequency is in the range of 10-18 cycles/min
    b. vital capacity is the sum of tidal, inspiratory, and expiratory reserve volume
    c. functional residual capacity refers to the amount of air that remains in the lungs even after maximum exhalation
    d. forced expiratory flow is the average air flow rate in the middle part of breath
    e. the spirometry record is a curve that shows the relationship between flow rate and air volume during exhalation and inspiration
    f. during muscle activity, minute ventilation is reduced due to bronchoconstriction

7. Mark the correct statements

    a. in adults, the normal ventilation frequency is in the range of 10-18 cycles/min
    b. vital capacity is the sum of tidal, inspiratory, and expiratory reserve volume
    c. functional residual capacity refers to the amount of air that remains in the lungs even after maximum exhalation
    d. forced expiratory flow is the average air flow rate in the middle part of inhalation
    e. the spirometry record is a curve that shows the relationship between flow rate and air volume during exhalation and inspiration
    f. during muscle activity, minute ventilation is reduced due to bronchoconstriction

8. Residual volume is/means

    a. the volume of air that remains in the lungs even after maximum exhalation
    b. the sum of expiratory reserve volume and residual volume
    c. the amount of air that we can exhale with maximum effort (forced) after maximum inhalation
    d. the amount of air ventilated in the lungs per minute
    e. the amount of air ventilated in the alveoli
    f. the average air flow rate in the middle of the exhalation

9. Spirometry

    a. tests lung anatomy
    b. tests lung function
    c. it only measures the amount of exhaled CO2
    d. measures the volume and flow of air in the inspiration or expiration
    e. is the basic diagnostic method for determining lung disease
    f. is a diagnostic method for determining asthma

10. Spirometry

    a. is an examination method used to determine pneumonia

b. is an examination method by which we can determine the basic volumes and air flows through the lungs
c. is used to diagnose bronchial asthma
d. is an invasive method in which a small amount of lung tissue is removed by biopsy
e. works with parameter FEV1
f. allows you to calculate the vital capacity of lungs

11. The greatest amount of air which can be moved in and out of the respiratory system is

a. the tidal volume
b. the vital capacity
c. the ventilatory volume
d. the pulmonary capacity
e. the alveolar ventilation
f. the Tiffenea's index

12. Spirometry

a. is an examination method used to determine pneumonia
b. is an examination method by which we can determine the basic volumes and air flows through the lungs
c. is used to diagnose bronchial asthma
d. is an invasive method in which a small amount of lung tissue is removed by biopsy
e. works with parameter FEV1
f. allows you to calculate the vital capacity of lungs

13. The vital capacity of lungs

a. is the sum of expiratory, inspiratory reserve volume and tidal volume
b. is the amount of air we can exhale at maximum breath
c. is the amount of air that remains in the lungs at maximum exhalation
d. represents 6 - 7 litres
e. is the amount of air we can breathe with maximum effort
f. represents tidal volume plus anatomical dead space

14. The vital capacity of lungs

a. is the sum of expiratory, inspiratory reserve volume and tidal volume
b. is the amount of air we can exhale at maximum breath
c. is the amount of air that remains in the lungs at maximum exhalation
d. represents 6 - 7 litres
e. is the amount of air we can breathe with maximum effort
f. represents tidal volume plus anatomical dead space

15. The vital capacity of lungs is characterized as

a. the volume of air that is exchanged in one breathing cycle
b. the maximum amount of air exhaled per second
c. the sum of inspiratory reserve volume and expiratory reserve volume
d. the maximum amount of air inhaled per second
e. the sum of tidal volume, inspiratory reserve volume and expiratory reserve volume
f. the volume of air exchanged in one minute

16. The vital capacity of lungs is the sum of

a. inspiratory pulmonary capacity and expiratory pulmonary capacity
b. inspiratory lung volume and expiratory lung volume
c. tidal volume, inspiratory reserve volume and expiratory reserve volume
d. tidal volume, inspiratory lung capacity and expiratory lung capacity
e. inspiratory capacity of lungs and expiratory reserve volume
f. tidal volume, inspiratory reserve volume, expiratory reserve volume and residual volume

17. The vital capacity of lungs is the sum of

a. inspiratory pulmonary capacity and expiratory pulmonary capacity
b. inspiratory lung volume and expiratory lung volume
c. tidal volume, inspiratory reserve volume and expiratory reserve volume
d. tidal volume, inspiratory lung capacity and expiratory lung capacity
e. inspiratory capacity of lungs and expiratory reserve volume
f. tidal volume, inspiratory reserve volume, expiratory reserve volume and residual volume

18. The vital capacity of lungs reaches a volume in a healthy adult of

a. approximately 3.5 l
b. about 4 l
c. about 4.7 l
d. approximately 5.5 l
e. about 6 l
f. it can only be detected after death

19. Tidal volume

a. is the volume of air in bronchi
b. its value is 0.5 l
c. is the total amount of air that lungs may contain
d. is the volume of air that an adult exchanges with one breath and exhale
e. its value is 1000 ml
f. is the volume of air that remains in lungs even after maximum exhalation

20. Tidal volume has a value of

a. 1 l
b. 0.8 l
c. 0.5 l
d. 500 ml
e. 1200 ml
f. 1500 ml

21. Mark the correct statements about spirometry

a. is suitable for measuring static and dynamic parameters of respiration
b. height, weight and sex must also be entered for correct execution
c. we cannot evaluate the peak expiratory flow (PEF) by spirometry
d. forced expiration should be maintained for at least 2 seconds
e. typical parameter is FEV1, which is the forced expiratory volume in 1s
f. we cannot use it to distinguish asthma from lung fibrosis

22. Total lung capacity

a. is the sum of vital capacity and residual volume
b. is the amount of air we can exhale at maximum breath
c. is the amount of air that remains in the lungs at maximum exhalation
d. represents 6 - 7 litres
e. is the amount of air we can breathe with maximum effort
f. represents tidal volume plus anatomical dead space

23. Total lung capacity is/means

a. the sum of the tidal volume and the inspiratory reserve volume
b. the sum of expiratory reserve volume and residual volume
c. the volume that can be exhaled after normal exhalation
d. the sum of vital capacity and residual volume
e. the amount of air ventilated in the alveoli
f. the amount of oxygen in the lungs

24. What is the number of breaths per minute called?

a. respiration rate
b. respiratory speed
c. pulmonary index
d. tidal volume
e. pulmonary capacity
f. pulmonary flow

25. What term is applied to the volume of air that moves into the lungs while breathing at rest?

    a. anatomical dead space
    b. tidal volume
    c. inspiratory reserve capacity
    d. residual volume
    e. alveolar volume
    f. forced vital capacity

26. Mark the correct statements

    a. tidal volume is the maximum volume that can be inhaled and exhaled
    b. FEV1 is the maximum volume of air that can be forcefully exhaled in 1 second
    c. alveolar ventilation is the volume of air ventilated in the alveoli
    d. expiratory reserve volume is the maximum volume of air that can be exhaled after a deep inhalation
    e. vital capacity is the expiratory reserve volume added to the inspiratory reserve volume
    f. physiological dead space is the volume of air that is inhaled, but remains in the higher parts of respiratory tree and is not exchanged in the alveoli

27. Regarding lung ventilation, what does “dead space” refer to?

    a. the air in the conducting zone of bronchial tree
    b. the air remaining in the alveoli after exhalation at maximal effort
    c. the air between the parietal and visceral pleura
    d. the difference between the volume of maximum inhalation and tidal volume
    e. the volume of air that is inhaled into the airways but does not reach the alveoli
    f. the volume of air ventilated in the alveoli

2.6 ENDOCRINE SYSTEM

Part 1

1. Blood glucose is controlled by

    a. simple feedback
    b. by stimulating proteolysis in cells
    c. by binding to receptors in the cell nucleus
    d. by activating cAMP in cells
    e. by affecting the expression of genes encoding enzymes
    f. none of the above answers is correct

2. Blood glucose is regulated by hormones

    a. insulin
    b. glucagon
    c. calcitonin
    d. adrenaline
    e. cortisol
    f. dopamine

3. C-peptide

    a. is part of the insulin molecule
    b. is an indicator of insulin secretion
    c. serves to determine the level of insulin in the blood
    d. is part of a glycogen molecule
    e. serves to reduce inflammation in the body
    f. is an indicator of liver function

4. Effects of insulin

    a. occur within minutes of its secretion
    b. they appear after 12-24 hours as they bind to the nuclear receptor
    c. include anabolic effects
    d. include lowering of blood glucose
    e. include an increase in glycaemia
    f. include glycogen production

5. For the entry of glucose into a muscle cell

    a. insulin is required
    b. the GLUT2 transporter is required
    c. the GLUT4 transporter is required
    d. a K+ / ATP dependent channel is required
    e. a calcium channel is required
    f. an insulin receptor is required

6. For the entry of glucose into the pancreatic beta cell

    a. insulin is required
    b. the GLUT2 transporter is required
    c. the GLUT4 transporter is required
    d. a K+ / ATP dependent channel is required
    e. a calcium channel is required
    f. an insulin receptor is required

7. Mark the correct statements about the regulation of lipid metabolism

    a. leptin levels are higher in obese patients than in normal patients
    b. adiponectin counteracts the development of insulin resistance
    c. leptin reduces the feeling of hunger
    d. adiponectin has a pro-inflammatory effect and reduces beta-oxidation of fatty acids
    e. leptin stimulates insulin secretion, which may contribute to the development of insulin resistance
    f. insulin reduces the uptake of free fatty acids into adipose tissue

8. Glucagon

    a. increases blood glucose
    b. lowers blood glucose
    c. it is formed in the alpha cells of the pancreas
    d. arises in pancreatic beta cells
    e. acts directly on tissues
    f. acts through adenylate cyclase-coupled receptors

9. Glucagon

    a. stimulates glycogenolysis
    b. stimulates lipolysis
    c. stimulates gluconeogenesis
    d. is an amino hormone
    e. it is formed only in the liver
    f. has the same functions as insulin

10. Glucagon stimulates

    a. glycogenolysis in the liver
    b. glycogenolysis in muscles
    c. lipogenesis
    d. glycogenesis in the liver
    e. lipolysis in the liver
    f. calcium excretion in the kidneys

11. Glucose

a. is the only source of energy for tissues
b. is a simple carbohydrate
c. is a polysaccharide
d. is chained to glycogen
e. is chained to glucagon
f. is stored in the glycogen form in the liver

12. Glucose enters in the absence of insulin to

a. brain
b. erythrocytes
c. skeletal muscle
d. adipose tissue
e. neurons
f. pancreas

13. Glucose transport between blood and tissues is ensured

a. by insulin-dependent GLUT2 transporters
b. by insulin-independent GLUT2 transporters
c. by insulin-independent GLUT4 transporters
d. by insulin-dependent GLUT4 transporters
e. from blood to the liver from an insulin-independent transport
f. from the blood to the pancreas by insulin-dependent transport

14. Glucose transporters

a. are referred to as Glc-TRANS proteins
b. are referred to as GLUT
c. for the division between insulin-dependent and insulin-independent
d. are divided into glucagon-dependent and glucagon-independent
e. are stored in liver cells in the form of storage polymers together with glycogen
f. they are not present on enterocytes

15. GLUT is

a. an insulin transport protein
b. a transport protein for glucocorticoids
c. a glucose transport protein
d. a glucagon transport protein
e. a glucose transport protein
f. a glucose transport protein

16. GLUT2 glucose transporter

a. is found e.g. in the liver and in pancreatic beta cells

b. is non-insulin dependent
c. is found in erythrocytes and skeletal muscle
d. is insulin dependent
e. is important for insulin secretion
f. is important for fat metabolism

17. GLUT4

a. is an insulin receptor
b. is an insulin transporter
c. is located on pancreatic beta cells
d. has tyrosine kinase activity
e. is insulin dependent
f. is located in skeletal muscle cells

18. GLUT4 glucose transporter

a. is found e.g. in the heart, adipose tissue and skeletal muscle
b. is non-insulin dependent
c. is found in erythrocytes and neurons
d. is insulin dependent
e. is important for insulin secretion
f. is important for the effect of insulin

19. Glycemia

a. is the level of glucose in the blood
b. varies depending on food intake
c. is always higher in children than in adults
d. is not affected by glucagon
e. depends solely on carbohydrate intake
f. increases with physical activity

20. Glycemia

a. there is an increase in blood glucose
b. it is precisely regulated in healthy patients
c. the determination is made from capillary and arterial blood
d. the determination is made from capillary and venous blood
e. it is the level of glucose in the blood
f. it is not precisely regulated in healthy patients

21. Insulin

a. is a peptide hormone responsible for the entry of glucose from the gut into the blood

b. is a peptide hormone responsible for the entry of glucose from the blood into cells
c. is a steroid hormone responsible for the entry of glucose from the blood into cells
d. is formed in the alpha-cells of the islets of Langerhans
e. is formed in pancreatic acini cells
f. is formed in the form of a precursor

22. Insulin

a. is secreted from the beta-cells of the pancreatic islets of Langerhans
b. the precursor is an insulinogen that is cleaved into insulin
c. the precursor is pre-pro-insulin
d. there are disulphide bridges in the insulin molecule
e. there is a sulphate residue in the insulin molecule
f. there is a glutathione residue in the insulin molecule

23. Insulin

a. is a peptide hormone
b. is an amino hormone
c. it consists of A and B chains connected by disulphide bridges and a C-peptide
d. stimulates proteosynthesis
e. it consists of A, B and C chains linked by a C-peptide
f. stimulates proteolysis

24. Insulin binds

a. to its receptor present exclusively on beta-cells in the pancreas
b. to a receptor with intrinsic enzyme activity
c. to a receptor that is associated with a G-protein
d. to the nuclear receptor
e. to a receptor with tyrosine kinase activity
f. to a ligand-driven ATP-sensitive ion channel

25. Insulin causes

a. storage of glucose
b. activation of gluconeogenesis
c. suppression of gluconeogenesis
d. raising blood glucose
e. lowering blood glucose
f. activation of glycogenolysis in the liver

26. Insulin causes

a. glucose storage in tissues

b. reduction of glycaemia
c. glycolysis support
d. promotion of gluconeogenesis
e. suppression of gluconeogenesis
f. suppression of glycogenogenesis

27. Insulin is released

a. from pancreatic beta cells
b. in parasympathetic activation
c. by activating alpha receptors
d. due to increased blood glucose levels
e. after GLUT4 activation
f. from pancreatic alpha cells

28. Insulin-dependent GLUTs are found in

a. small intestine
b. brain
c. heart
d. pancreas
e. skeletal muscle
f. adipose tissue

29. Insulin-independent GLUTs are found in

a. small intestine
b. brain
c. liver
d. pancreas
e. skeletal muscle
f. adipose tissue

30. Mark insulin-dependent tissues

a. brain
b. retina
c. heart (partially)
d. liver
e. kidney
f. transverse striated muscles

31. Mark the correct statements about glucose

a. physiological glucose level preprandially is 4.4-6.1 mmol/l
b. physiological glucose level preprandially is 3-7 mmol/l
c. physiological glucose level postprandially is up to 7.8 mmol/l

d. pathologically elevated glucose levels is called normoglycemia
e. pathologically elevated glucose level preprandially is up to 7 mmol/l
f. pathologically elevated glucose level preprandially is above 7 mmol/l

32. Mark the correct statements about insulin

a. insulin is released from the β-cells of the islets of Langerhans
b. insulin is released from the α-cells of the islets of Langerhans
c. diagnosis of insulin levels in the blood is performed by determining the C-peptide
d. C-peptide is not excreted into the blood together with insulin
e. insulin is released from the pancreas by binding of glucose to a specific GLUT2 transporter
f. all organs in the body are insulin dependent

33. Mark the effects of glucagon

a. glycogen degradation
b. degradation of glucose
c. glycogenogenesis
d. glycogenolysis
e. glycolysis
f. gluconeogenesis

34. Mark the correct statements

a. the basic diagnostic test for the determination of glycaemia is the oral glucose tolerance test
b. to perform oGTT, 75 g of fasting glucose is administered
c. in healthy individuals, blood glucose values must fall below 7.0 mmol/l after 120 min
d. in 45 min after administration of 75 g of fasting glucose, blood glucose should not exceed 7.8 mmol/l
e. the intervals for measuring blood glucose in oGTT are 30, 60, 120 and 180 min
f. patients with diabetes have glycemic levels after administration of 75 g of glucose to 7.8 mmol/l

35. Mark the correct statements

a. glycogenolysis is the synthesis of glycogen
b. glycolysis is the breakdown of glucose
c. with increasing glycogenolysis, glycemia increases
d. with increasing gluconeogenesis, glycemia decreases
e. normoglycemia of a healthy individual ranges from 4.4 to 6.1 mmol / l
f. hyperglycaemia means increased levels of glycogen in the blood

36. Mark the correct statements

a. GLUT2 and GLUT4 are insulin-dependent carriers found in the pancreas
b. GLUT2 mediates the rapid transfer of glucose into pancreatic cells
c. the heart and skeletal muscle have insulin-dependent regulation of GLUT4 transporters
d. intracellular increases in glucose levels lead to increased glycogen production
e. insulin has catabolic effects on adipose tissue, leading to lipolysis
f. proteosynthesis and glycogen production in peripheral tissues is increased by glucagon

37. Mark the correct statements

a. the GLUT2 transporter is important for the entry of glucose into the pancreatic beta cell
b. glucose administered orally results in the same amount of insulin being released as intravenous administration
c. glucose enters a muscle cell by passive diffusion
d. the GLUT2 transporter has tyrosine kinase activity
e. the GLUT4 transporter has autophosphorylation activity
f. autophosphorylation of tyrosine residues at the insulin receptor is required for GLUT4 translocation

38. Mark the correct statements

a. insulin is excreted when the blood glucose level is elevated
b. insulin is excreted when the blood glucose level decreases
c. glucagon has the opposite effect on the levels of glucose, fats and proteins as insulin
d. the brain and erythrocytes do not need glucose as a source of energy
e. glycogen is a storage polysaccharide in the liver
f. the pancreas is solely an endocrine gland

39. Mark the correct statements

a. insulin is a hormone
b. insulin is secreted together with C-peptide, which is a good indicator of its secretion
c. insulin binds to a receptor with tyrosine kinase activity.
d. insulin is a protein
e. insulin binds to GLUT4
f. insulin is excreted in the blood by pinocytosis

40. Mark the correct statements

a. the GLUT2 transporter is important for the entry of glucose into the pancreatic beta cell
b. glucose administered orally results in the release of the same amount of insulin as intravenous administration

c. glucose enters a muscle cell by passive diffusion
d. the GLUT2 transporter has tyrosine kinase activity
e. the GLUT4 transporter has autophosphorylation activity
f. autophosphorylation of tyrosine residues at the insulin receptor is required for GLUT4 translocation

41. Mark the correct statements about glycaemia

a. it is the level of glucagon in the blood
b. normoglycemia after food represents values up to 7.8 mmol/l
c. postprandially pathologically elevated glycemia is above 11.0 mmol/l
d. insulin administration increases blood glucose levels
e. for the diagnosis of diabetes mellitus, an elevated fasting blood glucose level above 6.1 mmol/l is required
f. increased glucagon release increases blood glucose levels

42. Mark the correct statements about the OGTT

a. the test is performed mainly in patients at the risk of developing gestational diabetes
b. a solution of 75 grams of glucose is drunken within 1 hour
c. a solution of 75 grams of glucose is drunken over 5 min
d. glucose level is measured from capillary blood (finger)
e. blood glucose levels are measured at 0, 30, 45, 60, 90 and 120 min after drinking the solution.
f. if the patient is healthy, the glucose level should stabilize after 120 min

43. Mark the hormones that regulate glycemia

a. prolactin
b. insulin
c. follicle-stimulating hormone
d. glucagon
e. luteinizing hormone
f. growth hormone

44. Mark the correct statements

a. GLUT2 and GLUT4 are insulin-dependent carriers found in the pancreas
b. GLUT2 mediates the rapid transfer of glucose into pancreatic cells
c. the heart and skeletal muscle have insulin-dependent regulation of GLUT4 transporters
d. intracellular increases in glucose levels lead to increased glycogen production
e. insulin has catabolic effects on adipose tissue, leading to lipolysis
f. proteosynthesis and glycogen production in peripheral tissues is increased by glucagon

45. Normoglycemia

a. is the fasting blood glucose level of a healthy person
b. is the blood glucose level of a healthy person after a meal
c. is not affected by insulin or glucagon
d. in fasting condition it is 4.4 - 6.1 mmol/l
e. in fasting condition is up to 7.8 mmol/l
f. in fasting condition it is higher than 7.8 mg/l

46. Oral glucose test (oGTT) is used for

a. blood pressure monitoring
b. monitoring of the glucose levels in the blood after a glucose bolus
c. monitoring of lipid profile after a glucose bolus
d. determination of glucose transporter activity
e. monitoring of gastrointestinal tract function
f. diagnosis of diabetes mellitus

47. Oral glucose test (oGTT)

a. informs about the regulation of blood glucose
b. used to monitor blood glucose
c. informs about glucagon excretion
d. used to monitor glycosuria
e. is used mainly in children
f. is used in pregnant women to test pregnancy diabetes

48. Oral glucose tolerance test (oGTT)

a. is used to diagnose diabetes mellitus and gestational diabetes
b. must be done when patient is hungry
c. is always done after eating
d. if his blood glucose is above 11 mmol/l after 120 min, we speak about diabetes
e. if his blood glucose is above 8 mmol/l after 120 min, we speak about diabetes
f. is used to diagnose diabetes in children only

49. Oral glucose tolerance test (oGTT)

a. measures the course of glycemia during 2 hours
b. measures the course of glycemia during 24 hours
c. begins with fasting glucose level measurement
d. the maximum blood glucose level after bolus ingestion of glucose should not exceed 11 mmol/l
e. the maximum blood glucose level should be reached approximately 2 hours after exercise
f. the blood glucose value returns to the original fasting blood glucose value 1 hour after exercise

50. Oral glucose tolerance test (oGTT)

a. is used to diagnose diabetes
b. is used for diagnosis of gestational diabetes
c. is used to determine de novo glucose levels
d. its result improves with glycogenolysis
e. can detect hidden diabetics
f. its result improves with increasing gluconeogenesis

51. Oral glucose tolerance test (oGTT)

a. is used to diagnose type 1 diabetes mellitus
b. lasts two hours
c. reaches its maximum value after 45 min
d. depends on the amount of fluid in which the glucose has been dissolved
e. after 120 min, the blood glucose level reaches a preprandial level
f. the better the result, the faster the blood glucose level adjusts to pre-test values

52. Oral glucose tolerance test (oGTT)

a. measures blood glucose for 2 hours after exercise
b. measures glycemia after bolus ingestion of glucose
c. measures glucose only on in fasting condition
d. is used to diagnose diabetes mellitus
e. is used for standard blood glucose measurements during preventive medical examinations
f. is used to determine gestational diabetes

53. Pancreas

a. is an exocrine gland
b. is an endocrine gland
c. is a gland with both endocrine and exocrine function
d. its endocrine function is localized in acins
e. synthesizes only 2 hormones - insulin and glucagon
f. secretes insulin and glucagon from the islets of Langerhans via the ductus pancreaticus into the jejunum

54. Physiological fasting blood glucose levels are

a. 2.5-3.3 mmol/l
b. 3.4-4.3 mmol/l
c. 4.4-6.1 mmol/l
d. 6.2-7.0 mmol/l
e. 7.1-7.8 mmol/l
f. 7.9-11 mmol/l

55. Postprandial glycaemia

a. is the fasting glucose level
b. is the glucose level after meal
c. is the level of glycogen after a meal
d. normalizes to healthy people within 2 hours
e. normalizes to healthy people within 5 hours
f. in healthy people it corresponds to 4.4-6.1 mmol/l

56. Random blood glucose should be in healthy individuals

a. ≤ 6.0 mmol/l
b. < 7.8 mmol/l
c. ≤ 11.1 mmol/l
d. <3.3 mmol/l
e. ≥ 6.7 mmol/l
f. ≥ 10 mmol/l

57. The effects of insulin

a. includes ATP-sensitive K+ channel
b. involves the expression of GLUT4 transporters on the cell membrane
c. involves the expression of GLUT2 transporters on the cell membrane
d. includes a G-protein coupled insulin receptor
e. involves insulin receptor tyrosine kinase activity
f. involves the expression of insulin-dependent glucose transporters on the cell membrane

58. Mark the correct statements about the production and function of insulin

a. it is synthesized as proinsulin in the liver and in the pancreas is broken down into the active metabolite
b. the effects of insulin are mediated through receptors with kinase activity
c. ATP-dependent depolarization and opening of Ca2 + channels in pancreatic B-cells is required for insulin secretion
d. C-peptide is an active fragment of insulin that has high metabolic activity
e. measurement of the pre-pro fragment of insulin is used to diagnose insulin levels in the blood
f. the brain or kidneys have glucose transfer to cells independent of the effects of insulin

59. The insulin receptor belongs to the group of

a. nuclear receptors
b. receptors with tyrosine kinase activity
c. G protein-coupled receptors
d. receptors with intrinsic enzymatic activity

e. receptors with external enzymatic activity
f. ATP sensitive channels

60. The physiological value of fasting blood glucose (preprandial) in healthy people is

a. up to 7.8 mmol/l
b. ≤ 11.1 mmol/l
c. ≤ 6.1 mmol/l
d. <3.3 mmol/l
e. ≥ 6.7 mmol/l
f. ≥ 2.1 mmol/l

61. The physiological values of blood glucose are

a. fasting levels between 3.4-7.1 mmol / l
b. fasting levels stomach between 4.4 - 6.1 mmol/l
c. after meal up to 7.8 mmol/l
d. after meal up to 8.8 mmol/l
e. 2 hours after taking 75 g of glucose less than 8.8 mmol/l
f. 2 hours after taking 75 g of glucose less than 9.8 mmol/l

62. The stimulus for release of the insulin

a. are nutrients absorbed from the digestive tract
b. is stimulation of the vagus nerve in the islets of the pancreas Langerhans
c. is the inhibition of the vagus nerve in the islets of the pancreas Langerhans
d. is the stimulation of beta receptors in the pancreatic islets of Langerhans
e. is the stimulation of alpha receptors in the islets of the pancreas Langerhans
f. is the inhibition of nicotinic receptors in B cells of the pancreatic islets of Langerhans

63. Mark the correct statements about insulin

a. its effects are mediated through insulin receptors with tyrosine kinase activity
b. it is synthesized in the liver as a prohormone and is further cleaved in the pancreas to the active form
c. its effects are mediated through insulin receptors, which are ion channels for sodium
d. secretion of vesicles with insulin is dependent on sodium influx
e. it is excreted into the blood together with C-peptide, which reflects insulin production
f. activation of insulin receptors leads to the degradation of GLUT4 transporters from cell membranes

64. To release insulin out of the pancreatic beta cell

a. insulin is required

b. the GLUT2 transporter is required
c. the GLUT4 transporter is required
d. a K+ / ATP dependent channel is required
e. a calcium channel is required
f. an insulin receptor is required

65. Mark the correct statements about the production and function of insulin

a. is synthesized as proinsulin in the liver and in the pancreas is broken down into the active metabolite
b. the effects of insulin are mediated through receptors with kinase activity
c. ATP-dependent depolarization and opening of Ca2 + channels in pancreatic B-cells is required for insulin secretion
d. C-peptide is an active fragment of insulin that has high metabolic activity
e. measurement of the pre-pro fragment of insulin is used to diagnose insulin levels in the blood
f. the brain or kidneys have glucose transfer to cells independent of the effects of insulin

66. What is glyconeogenesis?

a. glycogen synthesis
b. glucose synthesis
c. it takes place in the liver
d. the main product is glycogen as a storage form of carbohydrates
e. the antagonistic process is glycogenolysis
f. glyconeogenesis occurs when the blood glucose level is low

67. Mark the correct statements about insulin secretion

a. its trigger is reduced blood glucose
b. its trigger is elevated blood glucose
c. insulin-independent glucose transporter is GLUT4
d. insulin-independent glucose transporter is GLUT2
e. ATP-sensitive K+ channel is present on skeletal muscle cells
f. ATP-sensitive K+ channel is present on beta-cells

68. Which of the following are important for insulin exocytosis?

a. K+ ATP -dependent channel
b. Ca2+ voltage-gated channel
c. permanently opened K+ channel
d. slow Calcium L-channel
e. GLUT2
f. GLUT4

69. Which of the following pairs are MISMATCHED?

a. A-cells - glucagon
b. B-cells - insulin
c. D-cells - somatostatin
d. F-cells - gastrin
e. B-cells - glucagon
f. A-cells - insulin

70. Mark the correct statements about insulin

a. insulin acts as a transport protein, carrying glucose across the cell membrane
b. insulin facilitates the movement of intracellular glucose transporter into the cell membrane
c. insulin stimulates gluconeogenesis
d. insulin promotes glycolysis
e. insulin stimulates the kidneys to reabsorb glucose into the bloodstream
f. insulin prevents the storage of amino acids as proteins in the muscles

Part 2

1. Adenosine

    a. acts through G protein-coupled receptors
    b. causes vasoconstriction
    c. has negative chronotropic and dromotropic effects
    d. has stimulatory effects on CNS
    e. inhibits platelet aggregation
    f. is produced throughout the body by dephosphorylation of extracellular ADP

2. Adrenaline receptors

    a. are G protein coupled receptors
    b. are receptors with tyrosine kinase activity
    c. are nuclear receptors
    d. are associated with ligand-gated ion channels
    e. are transcription factors
    f. are transmembrane proteins

3. Atrial natriuretic peptide

    a. may increase blood pressure
    b. may lower blood pressure
    c. its receptor is associated with adenylate cyclase activation
    d. its receptor is associated with guanylate cyclase activation
    e. is synthesized in the adrenal glands
    f. is synthesized in the pituitary gland

4. Catecholamines include

    a. histamine
    b. serotonin
    c. acetylcholine
    d. cortisol
    e. noradrenaline
    f. adrenaline

5. Mark the hormones produced in the hypothalamus

    a. adrenocorticotropic hormone
    b. somatostatin
    c. oxytocin
    d. thyrotropin-releasing hormone
    e. antidiuretic hormone
    f. prolactin

6. Mark the hormones produced in the pituitary gland

    a. vasopressin
    b. thyroid-stimulating hormone
    c. luteinizing hormone
    d. gonadotropin-releasing hormone
    e. melanostatin
    f. oxytocin

7. Mark the hormones produced in the pituitary gland

    a. melanostatin
    b. antidiuretic hormone
    c. corticotropin-releasing hormone
    d. oxytocin
    e. growth hormone
    f. thyroid-stimulating hormone

8. Mark the hormones secreted by the pituitary gland

    a. adrenocorticotropic hormone
    b. somatostatin
    c. oxytocin
    d. thyrotropin-releasing hormone
    e. antidiuretic hormone
    f. prolactin

9. Gastrin

    a. stimulates bile secretion
    b. stimulates gastric acid and pepsinogen secretion
    c. inhibits secretion of pancreatic juice
    d. promotes the growth of the gastric mucosa
    e. inhibits gastric secretion
    f. stimulates pepsinogen synthesis

10. Histamine is released

    a. from mast cells
    b. from platelets
    c. from pneumocytes
    d. from Kuppfer cells
    e. from microglia
    f. from ECL cells of the stomach

11. Hormone receptors include

    a. ligand-gated ion channels

b. voltage-gated ion channels
c. G protein-coupled receptors
d. receptors with tyrosine kinase activity
e. nuclear receptors
f. receptors with intrinsic enzymatic activity

12. Hormones can be substances of the following chemical nature

a. proteins
b. peptides
c. amino acids
d. phospholipids
e. lipids
f. steroid substances

13. Hormones can be synthesized by the following tissues

a. thyroid gland
b. kidneys
c. adrenal glands
d. adipose tissue
e. bone marrow
f. cardiomyocytes

14. Hormones can produce their effect

a. in the tissue where they are synthesized
b. in the tissue where they are secreted
c. only locally
d. only in a paracrine manner
e. in distant tissues
f. in the hypothalamo-pituitary complex

15. Hormones synthesized in the hypothalamus and secreted by the neurohypophysis are

a. adrenocorticotropic hormone
b. melatonin
c. oxytocin
d. luteinizing hormone
e. gonadoliberin
f. vasopressin

16. Hormones synthesized in the hypothalamus and secreted by the neurohypophysis are

a. prolactin
b. melanostatin
c. antidiuretic hormone

d. follicle-stimulating hormone
e. oxytocin
f. thyroliberin

17. Insulin receptors

a. belong to G protein-coupled receptors
b. belong to receptors with tyrosine kinase activity
c. belong to nuclear receptors
d. belong to ligand-gated ion channels
e. belong receptors with intrinsic enzyme activity
f. belong to membrane proteins

18. Leukotrienes

a. are metabolites of arachidonic acid
b. cause bronchodilation
c. are produced by cyclooxygenase 2 (COX2)
d. increase bronchial secretion
e. unlike prostaglandins, they have an anti-inflammatory effect
f. are produced in leukocytes

19. Mark the hormones that bind to nuclear receptors

a. insulin
b. cortisol
c. triiodothyronine
d. estrogens
e. thymulin
f. parathyroid hormone

20. Mark the hormones that bind to nuclear receptors

a. aldosterone
b. glucagon
c. thyroxine
d. testosterone
e. progesterone
f. calcitonin

21. Mark the correct hormone-receptor pairs

a. thyroid hormones - receptors with tyrosine kinase activity
b. thyroid hormones - nuclear receptors
c. mineralocorticoids - G protein-coupled receptors
d. mineralocorticoids - nuclear receptors
e. glucocorticoids - G protein-coupled receptors

f. glucocorticoids - receptors with tyrosine kinase activity

22. Mark the correct statements about the pituitary gland

a. it is a part of the limbic system
b. it is located in the sella turcica
c. it communicates with the hypothalamus
d. it is irrigated by the portal circulation from the hypothalamus
e. it produces liberins and statins
f. it is the superior centre of the immune system

23. Mark the correct statements about the adrenal cortex hormones

a. they participate in the regulation of bone growth
b. they are involved in the regulation of the rapid cellular immune response
c. they are involved in the regulation of salt, carbohydrate and lipid metabolism
d. they participate in the stress response
e. their secretion is regulated by feedback loop by the HPA axis
f. their secretion is not regulated by feedback loop by the HPA axis

24. Mark the correct statements about the adrenal medulla hormones

a. they participate in a rapid stress response
b. they participate with a slow stress response
c. their secretion is regulated by the HPA axis
d. their secretion is regulated by the sympathetic nerve terminals
e. the main hormone is norepinephrine
f. they are referred to as catecholamines

25. Mark the correct statements about calcitonin

a. it is synthesized and secreted in the thyroid gland
b. it is synthesized and secreted in the parathyroid glands
c. it activates osteoclasts
d. it reduces calcium resorption in the renal tubules
e. it reduces the absorption of calcium in the intestine
f. it increases the level of calcium in the blood

26. Mark the correct statements about the hypothalamus

a. it is located in the medulla oblongata
b. it is located in close proximity to the pituitary gland
c. it regulates body temperature
d. it regulates circadian rhythm
e. it is part of the limbic system
f. it is the most superior centre of the endocrine system

27. Mark the correct statements about the parathyroid hormone

a. it is synthesized and secreted in the thyroid gland
b. it is synthesized and secreted in the parathyroid glands
c. it activates osteoclasts
d. it reduces calcium resorption in the renal tubules
e. it reduces the absorption of calcium in the intestine
f. it increases the level of calcium in the blood

28. Mark the correct statements about the adrenal gland

a. it is a part of the HPA axis
b. it is involved in the regulation of metabolism
c. it participates in the immune response
d. it consists of a homogeneous glandular epithelium
e. it consists of a cortex and medulla
f. it consists of 2 lobes

29. Mark the correct statements

a. darkness stimulates melatonin production
b. melatonin scavenges reactive oxygen species
c. melatonin acts through G protein-coupled receptors
d. melatonin does not cross the blood-brain barrier
e. with increasing amounts of melatonin, the sleep time increases
f. serotonin is formed from melatonin

30. Mark the correct statements about endothelin

a. can be produced by endothelial cells
b. its secretion is stimulated by angiotensin II and vasopressin
c. induces vasoconstriction
d. has no function besides vasoconstriction
e. has mainly vasodilatatory effects
f. is produced exclusively by the adipose tissue

31. Mark the correct statements about EDRF

a. represents nitric oxide
b. is endothelin
c. causes vasodilation of blood vessels
d. leads to vasoconstriction of blood vessels
e. is produced in the endothelium after stimulation by e.g. acetylcholine
f. is formed in response to stimulation by angiotensin II

32. Mark the correct statements about the ADH

a. is synthesized and secreted in the hypothalamus
b. is synthesized and secreted in the adenohypophysis

c. is synthesized and secreted in the neurohypophysis
d. is synthesized in the hypothalamus and secreted in the neurohypophysis
e. acts in the adrenal gland
f. acts in the kidney

33. Mark the correct statements about aldosterone

a. is secreted by the adrenal cortex
b. is secreted by the adrenal medulla
c. controls salt metabolism
d. controls glucose metabolism
e. is responsible for to body temperature maintenance
f. controls circadian rhythms

34. Mark the correct statements about cortisol

a. is secreted by the adrenal cortex
b. is secreted by the adrenal medulla
c. controls salt metabolism
d. controls glucose metabolism
e. is responsible for to body temperature maintenance
f. controls circadian rhythms

35. Mark the correct statements about histamine

a. is a metabolite of arachidonic acid
b. is an inflammatory mediator
c. is mainly produced by T-lymphocytes
d. is mainly produced by mast cells
e. causes bronchoconstriction
f. causes bronchodilation

36. Mark the correct statements about the “liberin hormones”

a. they are synthesized and secreted in the hypothalamus
b. they are synthesized and secreted in the adenohypophysis
c. they are synthesized and secreted in the neurohypophysis
d. they are synthesized in the hypothalamus and secreted in the neurohypophysis
e. they increase the secretion of hormones in the target gland
f. they reduce the secretion of hormones in the target gland

37. Mark the correct statements about the “statin hormones”

a. they are synthesized and secreted in the hypothalamus
b. they are synthesized and secreted in the adenohypophysis
c. they are synthesized and secreted in the neurohypophysis
d. they are synthesized in the hypothalamus and secreted in the neurohypophysis

e. they increase the secretion of hormones in the target gland
f. they reduce the secretion of hormones in the target gland

38. Mark the correct statements about the effect of hormones

a. they act in paracrine manner
b. they act in endocrine manner
c. they act in autocrine manner
d. they affect specific receptors
e. they affect specific receptors on autosecretory cells
f. they affect non-specific receptors

39. Mark the correct statements about the thyroglobulin

a. it is a thyroid hormone
b. it binds iodine atoms
c. it is a precursor of thyroid hormones
d. it is formed in the parathyroid glands
e. it controls calcium metabolism
f. it controls iodine metabolism

40. Mark the correct statements about the “tropic hormones”

a. they are synthesized and secreted in the hypothalamus
b. they are synthesized and secreted in the adenohypophysis
c. they are synthesized and secreted in the neurohypophysis
d. they are synthesized in the hypothalamus and secreted in the neurohypophysis
e. they increase the secretion of hormones in the target gland
f. they reduce the secretion of hormones in the target gland

41. Mark the gonadal hormones

a. glucocorticoids
b. DHEA
c. testosterone
d. estradiol and estrone
e. progesterone
f. prolactin

42. Mark the hormones secreted by the thyroid

a. calcitonin
b. triiodothyronine
c. thyroxine
d. parathyroid hormone
e. somatostatin
f. thymulin

43. Mark the hormones synthetized and secreted in the parathyroid glands

a. calcitonin
b. triiodothyronine
c. thyroxine
d. parathyroid hormone
e. somatostatin
f. thymulin

44. Mark the local hormones

a. prolactin
b. prostaglandin
c. progesterone
d. histamine
e. parathyroid hormone
f. corticoliberin

45. Mark the second messengers

a. G-protein
b. RYR1
c. inozitol-3-phosphate
d. diacylglycerol
e. acetylcholine
f. cAMP

46. Mark the vasodilating substances

a. endothelin 1
b. thromboxane A2
c. nitric oxide
d. endothelium-derived hyperpolarising factor (EDHF)
e. unstable endoperoxides
f. prostaglandin I2

47. Mark the correct statements about the parathyroid hormone

a. is a thyroid hormone
b. is involved in regulating the concentration of Ca in the blood
c. is excreted in hypercalcaemia (an increased concentration of Ca in the blood)
d. is a pancreatic hormone
e. stimulates the synthesis of the active form of vitamin D3
f. increases the reabsorption of phosphates in the kidneys

48. Mark the correct statements about prostaglandins

a. are formed from arachidonic acid

b. are formed from eicosatetraenoic acid
c. cause vasoconstriction
d. cause vasodilatation
e. include e.g. prostacyclin
f. include e.g. PGE2

49. Prostaglandins are involved in

a. stimulating inflammation
b. protection of the gastric mucosa
c. blood clotting
d. leukocyte formation
e. uterine contractions
f. lymph formation

50. Receptors for corticosteroids are

a. G protein-coupled receptors
b. receptors with tyrosine kinase activity
c. nuclear receptors
d. ligand-gated ion channels
e. transcription factors
f. membrane proteins

51. Receptors for T3 and T4 are

a. G protein-coupled receptors
b. receptors with tyrosine kinase activity
c. nuclear receptors
d. ligand-gated ion channels
e. transcription factors
f. membrane proteins

52. Mark the correct statements about the "HPA axis"

a. hydroxy-propyl-adrenaline is the precursor of adrenaline in the axis of catecholamines synthesis
b. this regulatory axis includes the hypothalamus-pituitary-adrenal gland organ group
c. this regulatory axis includes the hypothalamus-pituitary-kidney organ group
d. this regulatory axis describes hypothalamic-pancreatic activity
e. this endocrine axis consists of hierarchically arranged glands capable of feedback regulation
f. this regulatory axis consists of the Havers canals-periost-adherent tendon

53. The roles of the endocrine system include

a. blood pressure regulation
b. maintenance of homeostasis
c. regulation of sensory functions
d. regulation of the body's immune response
e. regulation of basal metabolism
f. regulation of circadian rhythm

54. The thyroid gland

a. consists of 2 lobes and parathyroid glands
b. is located on the thyroid cartilage
c. produces the hormones thyroxine and triiodothyronine
d. regulates uterine contractions at the onset of labour
e. regulates psychomotor development
f. regulates basal metabolism

55. Thyroid hormones

a. are produced in parafollicular cells
b. bind iodine atoms
c. act through nuclear receptors
d. are involved in negative feedback regulation
e. do not engage in negative feedback regulation
f. are referred to as T3 and T4

56. What is the name of an enzyme involved in acetylcholine degradation?

a. acetylcholine transferase
b. acetylcholine esterase
c. monoaminoxidase
d. catechol-O-methyltransferase
e. phospholipase
f. adenylyl or adenylate cyclase

57. What is the name of an enzyme involved in acetylcholine synthesis?

a. acetylcholine transferase
b. acetylcholine esterase
c. monoaminoxidase
d. catechol-O-methyltransferase
e. phospholipase
f. adenylyl or adenylate cyclase

58. What is the name of the enzyme that is involved in the degradation of acetylcholine?

a. choline acetyltransferase

b. acetylcholinesterase
c. monoamine oxidase
d. catechol-O-methyltransferase
e. phospholipase
f. adenylate cyclase

59. Which of the following substances will the mast cell release after irritation?

a. collagen
b. histamine
c. myelin
d. hyaluronic acid
e. niacinamide
f. carotene

2.7 REPRODUCTIVE SYSTEM

1. At what stage of life does a woman have the most oocytes?

    a. during intrauterine development
    b. during menstruation
    c. during pregnancy
    d. during fertilization
    e. during ovulation
    f. before birth

2. Chorionic gonadotropin

    a. promotes the disappearance of the corpus luteum
    b. promotes the function of the corpus luteum
    c. its concentration is highest in early pregnancy
    d. its concentration is highest at the end of pregnancy
    e. relaxes the ligaments of the pelvis and birth canal
    f. is a growth hormone

3. Dihydrotestosterone (DHT)

    a. belongs to amino acid-derived hormones
    b. activates α1 adrenergic receptors in the prostate
    c. does not play a significant role in the normal physiology of adult men
    d. acts on G-protein coupled receptors
    e. plays a critical function in the sexual development of males beginning early in prenatal life
    f. is formed by the action of the enzyme 5α-reductase

4. Eggs are produced in

    a. testes
    b. ovaries
    c. lien
    d. urethra
    e. uterus
    f. glandulae pinealis

5. Ejaculate contains

    a. sperm
    b. alkaline prostate secretion
    c. fructose
    d. insulin
    e. vas deferens secretion

f. seminal vesicle secretion

6. Estrogens

    a. are steroid hormones
    b. are glycoproteins
    c. cause changes to the uterus
    d. cause the growth of the mammary gland
    e. they have an anabolic effect
    f. they do not affect gonadotropins secretion

7. From which of below listed the corpus luteum arises?

    a. from Graaf's follicle
    b. from the uterus
    c. from the fallopian tube
    d. from corpus albicans
    e. from the placenta
    f. from gamete

8. In the erection of the penis is involved

    a. parasympathetic system
    b. sympathetic system
    c. nitric oxide
    d. increase in cGMP concentration
    e. an increase in the concentration of noradrenaline
    f. bradykinin

9. In the follicular phase of a woman's cycle occurs

    a. maturation of follicles
    b. formation of the corpus luteum
    c. disappearance of the corpus luteum
    d. thickening of the endometrium
    e. secretion in the endometrium
    f. endometrial vascularisation

10. Mark, where most of the male ejaculate volume is located

    a. epididymis
    b. prostate
    c. penis
    d. ureter
    e. sacs in the testicles
    f. Leydig cells

11. Leydig cells

a. ensure the transport of sperm
b. are under the influence of testosterone and follicle-stimulating hormone
c. produce testosterone
d. produce estrogen
e. produce gonadotropins
f. produce luteinizing hormone

12. Luteinizing hormone

a. is secreted only in women
b. is also secreted in men
c. acts on Leydig cells
d. stimulates testosterone secretion
e. acts on Sertoli cells
f. stimulates the formation of the corpus luteum

13. Mark the correct statements about testes

a. they are a paired organ
b. there is a higher temperature than in the liver
c. in Latin they are called ovaria
d. they are located in the scrotum
e. spermatogenesis does not take place here
f. oogenesis takes place here

14. Mark the functions of human chorionic gonadotropin (hCG) during pregnancy

a. promotes oocyte nidation
b. supports the entry of sperm into the oocyte
c. increases the mother's blood pressure
d. prevents the menstruation process
e. stimulates the growth of the corpus luteum
f. helps the development of the male genitals in the foetus

15. Nutrition for maturing sperm is provided by

a. Sertoli cells
b. Leydig cells
c. sperm do not need nutrition during maturation
d. Kupffer cells
e. Meissner's cells
f. Merkel cells

16. Ovulation during a woman's menstrual cycle of 28 days usually occurs

a. between days 1-3rd

b. between days 5-7th
c. between days 8-10th
d. between days 12-14th
e. between days 17-20th
f. between days 21-24th

17. Steroid hormones include

a. adrenaline
b. vasopressin
c. cortisol
d. estrogen
e. testosterone
f. progesterone

18. Substance secreted in the luteal phase of the cycle is

a. estradiol
b. estrone
c. progesterone
d. estriol
e. testosterone
f. gonadotropin

19. Testosteron

a. causes the development of primary sexual characteristics
b. causes the development of secondary sexual characteristics
c. produced by Sertoli cells
d. conditions erythropoiesis
e. has anabolic effects
f. has catabolic effects

20. Testosterone

a. is the main hormone of the ovaries
b. is responsible for the development of the external genitalia in girls
c. is involved in the maintenance of muscle and skeletal mass in men
d. has anabolic effects
e. underlies male aggressive behaviour
f. promotes sperm production and maturation

21. The menstrual cycle can be divided into 3 phases. Mark the correct sequence of phases, starting on the first day of the menstrual cycle

a. menstrual, secretory, proliferative
b. proliferative, secretory, menstrual

c. menstrual, proliferative, secretory
d. secretory, proliferative, menstrual
e. proliferative, menstrual, secretory
f. secretory, menstrual, proliferative

22. The reproductive system is controlled

a. by the hypothalamus
b. by cerebellum
c. by gonadotropins
d. by follicle-stimulating hormone
e. by luteinizing hormone
f. by calcitonin

23. Through what structure does sperm penetrate (first) into the oocyte during fertilization?

a. acrosome
b. corona radiata
c. sperm binding receptors
d. pellucid zone
e. endometrium
f. morula

24. Mark, what applies to the production and function of testosterone

a. his work begins around the onset of puberty
b. is produced by Leydig cells in the testes
c. stimulation with luteinizing hormone is required for testosterone production
d. luteinizing hormone stops the production of testosterone
e. testosterone signals to Sertoli cells and stimulates spermatogenesis upon binding to ABP
f. dihydrotestosterone is a metabolite that is involved in the maturation of spermatogonia

25. Mark, what applies to the production of hormones and the function of the female reproductive system

a. estrogens are involved in the growth of female sex hormones and inhibit osteoresorption
b. granulocytes in the corpus luteum are hormonally inactive, providing only lipids
c. the production of luteinizing hormone receptors in the follicle is stimulated by estrogens and FSH
d. progesterone stimulates endometrial growth after menstruation and its deficiency is one of the causes of endometrial degradation

e. the influx of luteinizing and follicle-stimulating hormone is highest 24 hours before ovulation
f. increased estrogen production is an important factor in the prevention of female genital cancer

26. What are the names of the male germ cells?

a. oocytes
b. sperm
c. testicles
d. testosterone
e. progesterone
f. zygotes

27. What functions do both testosterone and FSH contribute to in men?

a. stimulation of metabolic rate
b. maintain secondary sexual characteristics
c. stimulation of muscle growth
d. stimulation of spermatogenesis
e. testicle growth
f. stimulation of bone growth

28. What hormones does the placenta produce?

a. estrogen
b. testosterone
c. progesterone
d. human chorionic gonadotropin
e. prolactin
f. human chorionic somatotropin

29. What is involved in the regulation of estrogen secretion?

a. hypothalamus
b. pituitary gland
c. FSH
d. prolactin
e. cortisol
f. gonadotropins

30. What is the function of Leydig cells?

a. produce testosterone
b. they activate the tail of sperm
c. promote spermatogenesis
d. promote ejaculate excretion

e. support the nitric oxide needed for erection
f. support prostate function

31. What is the function of the epididymis?

a. maturation and storage of sperm
b. produces ejaculate
c. spermatogenesis
d. supports the production of nitric oxide needed for erection
e. produces testosterone
f. supports prostate function

32. What is the name of the female gonads?

a. ovaries
b. oocytes
c. myometrium
d. fallopian tubes
e. uterus
f. zygote

33. Mark the correct statements about estrogens

a. causes the development of primary sexual characteristics
b. causes the development of secondary sexual characteristics
c. produced by Sertoli cells
d. conditions erythropoiesis
e. has anabolic effects
f. has catabolic effects

34. Mark the correct statements about estrogens

a. they are formed in the ovaries
b. they are formed in the hypothalamus
c. cause the proliferative phase of the endometrium
d. cause the secretory phase of the endometrium
e. affect calcium metabolism
f. these are steroid hormones

35. Mark the correct statements about testosterone

a. it is produced by Leydig cells
b. it is produced by Sertoli cells
c. it is produced by Purkinje cells
d. inhibins stimulate testosterone secretion
e. inhibins inhibit testosterone secretion
f. its reduced form is dihydrotestosterone

36. What process does sperm have to complete to fertilize an oocyte?

a. capacitation
b. acrosomal response
c. cortical response
d. fast block
e. decidualization
f. nidation

37. Where is the hormone progesterone produced?

a. in the corpus luteum
b. in corpus albicans
c. in the cells surrounding the follicles
d. in the hypothalamus
e. in the anterior lobe of the pituitary gland
f. in the emerging follicle

38. Which hormones are involved in the regulation of the reproductive system?

a. aldosterone
b. gonadotropins
c. vasopressin
d. angiotensin
e. luteinizing hormone
f. follicle stimulating hormone

39. Which of the following are true about the secretory phase of the menstrual cycle?

a. it begins during ovulation and continues as long as the corpus luteum is active
b. it occurs when uterine epithelium grows under estrogen stimulation.
c. the endometrium is hypertrophied and vascularized
d. during this, the corpus luteum begins to produce progesterone
e. during this phase, a follicle develops before ovulation
f. during this, the surface layers of the endometrium are ischemic and peeled

40. Why do estrogen levels fall during menopause?

a. because all follicles disappear
b. because ovaries atrophy
c. because endometrial cells die
d. because the pituitary gland begins to secrete a menopause-specific hormone
e. because the fallopian tubes narrow
f. as the number of yellow bodies begins to increase

2.8 EXCRETORY SYSTEM

1. Activation of the renin-angiotensin-aldosterone system at low pressure leads to

    a. increase of sodium retention in the kidneys
    b. reduction of sodium retention in the kidneys
    c. water reabsorption increase
    d. water reabsorption is reduction
    e. vasoconstriction of arterioles
    f. vasodilation of arterioles

2. Aldosterone supports

    a. K^+ reuptake in kidney tubules
    b. Na^+ reuptake in kidney tubules
    c. memory
    d. renal phosphate re-uptake
    e. secretion of K^+ in tubules
    f. glucose reuptake

3. Angiotensin II

    a. is formed from bradykinin
    b. is formed from angiotensin I by the action of renin
    c. is formed from angiotensin I by ACE
    d. acts vasoconstrictive on arterioles
    e. leads to thirst through the hypothalamus
    f. causes vasodilation of arterioles

4. Angiotensin II

    a. increases blood pressure
    b. reduces aldosterone secretion
    c. makes a human feel thirsty
    d. lowers blood pressure
    e. increases heart contraction
    f. increases urinary excretion

5. Antidiuretic hormone

    a. raises the feeling of thirst
    b. increases the permeability of the collecting duct in kidney to water
    c. reduces glomerular filtration
    d. is formed in the neurohypophysis
    e. increases permeability of the distal tubule in kidney to water
    f. none of the other answers is correct

6. Antidiuretic hormone has the major effect on

    a. glomerular filtration
    b. the ascending limb of loop of Henle
    c. the collecting duct walls
    d. the initial part of the distal tubule
    e. the descending arm of loop of Henle
    f. the proximal tubules

7. Atrial natriuretic peptide

    a. stimulates the excretion of potassium ions
    b. suppresses RAAS
    c. stimulates vasopressin release
    d. lowers blood pressure
    e. increases glomerular filtration
    f. increases diuresis

8. Catecholamines cause in the kidneys

    a. vasoconstriction
    b. increase the blood pressure
    c. calcium release
    d. vasodilatation
    e. have no effect on blood vessels
    f. renin release

9. Choose the nephron parts in the correct order. Nephron consists of

    a. glomerulus - proximal tubule - loop of Henle - distal tubule
    b. proximal tubule - glomerulus - distal tubule - loop of Henle
    c. distal tubule - proximal tubule - glomerulus - loop of Henle
    d. loop of Henle - distal tubule - proximal tubule - glomerulus
    e. glomerulus - distal tubule - loop of Henle - proximal tubule
    f. distal tubule - glomerulus - loop of Henle - proximal tubule

10. Clearance

    a. indicates the volume of plasma that will be cleared by the kidneys from the test substance over time
    b. creatinine is used to determine it
    c. is a good indicator of glomerular filtration
    d. renin is used to determine it
    e. express of the glomerular filtration rate
    f. informs about tubular secretion

11. Clearance

a. is the amount of plasma that is completely cleared of the test substance over time
b. is the amount of urine in which a given amount of test substance is excreted per unit
c. is the amount of blood that is removed from the test substance in a given unit of time
d. it is used as an indicator of glomerular filtration
e. it is used as an indicator of plasma volume parameters
f. has no clinical use

12. Clearance denotes

a. the volume of plasma that is completely cleared of the substance of interest over a period of time by the kidney flow
b. the volume of urine that is completely cleared of the substance of interest over a period of time by the kidney flow
c. volume of glomerular filtrate that is completely cleaned of the substance of interest in a certain period of time through kidney flow
d. volume of tubular fluid that is completely cleaned of the substance of interest over a period of time through the kidney flow
e. the volume of the glomerular filtrate that is filtered by the kidneys over a period of time
f. the volume of intracellular fluid that is completely cleared of the substance of interest over a period of time by the kidney flow

13. Mark the correct statements about angiotensin II

a. increases the reabsorption of potassium from the glomerular filtrate
b. increases renal vitamin D excretion
c. stimulates the adrenal glands to release aldosterone
d. stimulates the feeling of thirst
e. increases blood pressure
f. decreases heart rate

14. Definitive urinary modification takes place in

a. collecting duct
b. distal tubule
c. the descending limb of loop of Henle
d. in Bowman's case
e. in the proximal tubule
f. the ascending limb of loop of Henle

15. Diuresis

a. indicates sodium excretion by the kidneys
b. is increased during parasympathetic activation

c. is reduced in high blood pressure
d. is affected by aldosterone
e. is affected by ADH
f. is affected by hemoglobin concentration

16. Facultative reabsorption takes place in

a. the proximal tubule
b. the ascending limb of loop of Henle
c. the descending limb of loop of Henle
d. the distal tubule
e. the collecting duct
f. the vasa recta

17. Mark, what applies to the renal clearance

a. indicates the change in urine pH per unit time
b. is the main indicator of the filtering ability of the kidneys
c. inulin is a critical component for the filtering ability of the kidneys
d. creatinine binds plasma proteins like albumin and thus reduces oncotic pressure
e. the diagnostic physiological parameter is creatinine clearance
f. the main unit of clearance is mmol/l

18. Glomerular filtration

a. is higher in pregnancy
b. is lower when changing body position
c. is regulated by the action of the lungs
d. is lower in physical exertion
e. is not under the influence of the vegetative nervous system
f. is the highest in newborns

19. Glomerular filtration

a. consists of the diffusion of fluid from the Bowman´s capsule into the proximal tubule
b. depends also on the blood pressure in the glomerular capillaries
c. means the selective permeability of the glomerular filtrate for waste materials
d. its value does not change throughout the day
e. is a biophysical process provided by the work of the heart
f. consists of the diffusion of fluid from the proximal tubule to the distal tubule

20. Glomerular filtration

a. is the filtration of plasma
b. is urine filtration

c. it produces primary urine
d. is influenced by capillary pressure
e. is influenced by the area of the glomerular filter
f. it is not altered by blood flow

21. Glomerulus

a. is a complex system of capillaries
b. the vas afferens enters it
c. the vas efferens emerges from it
d. the multiple vessels enter it
e. the multiple vessels exit it
f. is connected to the distal tubule

22. Loop of Henle is the place of

a. the countercurrent multiplier system
b. the countercurrent exchange system
c. the glucose resorption
d. the amino acid resorption
e. the acidification of urine
f. the drug resorption

23. If the glomerular filtration (GF) rate is too high, the macula densa sends a messageto the afferent arteriole. What will be the effect of this message?

a. renin is released, and blood pressure rises
b. arterial dilatation occurs, blood flow decreases and thus GF velocity decreases
c. arteriole constriction occurs, blood flow and thus GF velocity decrease
d. the action of ATP and adenosine on the afferent arterioles is inhibited
e. vasopressin and water excretion are released
f. sodium absorption will increase

24. In which parts of the renal tubule are the electrolytes and water reabsorbed from the filtrate at least?

a. the proximal tubule
b. the ascending limb of loop of Henle
c. the collecting duct
d. the distal tubule
e. the descending limb of loop of Henle
f. the macula densa

25. In which part of the kidneys are the glomeruli located?

a. in the cortex
b. in the medulla

c. in the pyramids
d. in the hilum
e. in the capsule
f. in the ureter

26. In which part of the nephron is water reabsorbed?

a. the descending limb of the loop of Henle
b. the ascending limb of the loop of Henle
c. proximal tubule
d. distal tubule
e. collecting duct
f. Bowman's capsule

27. Mark, what is actively reabsorbed from the filtrate in the renal tubule

a. water
b. Na^+
c. Cl^-
d. HCO_{3-}
e. amino acids
f. vitamin K

28. Mark, which substances are involved in the regulation of glomerular filtration

a. keratin
b. acetylcholine
c. sympathetic nervous system
d. smooth muscle in the wall of the renal vessels
e. adenosine
f. angiotensin II

29. Mark, which substances are involved in the regulation of glomerular filtration

a. adrenaline
b. acetylcholine
c. GABA
d. glutamine
e. prostaglandins
f. aldosterone

30. Inulin clearance is used for measurement of

a. kidney plasma flow
b. the amount of urine produced
c. transport maximum of inulin
d. glomerular filtration

e. tubular secretion
f. diuresis

31. Mark, what is used in practice as the indicators of renal function

a. glucose clearance
b. proton clearance
c. clearance of the drug used by the patient
d. creatinine clearance
e. inulin clearance
f. protein clearance

32. Juxtamedullary nephrons

a. are found in the superficial layer of the renal cortex
b. bring oxygen and important energy substances to tubular cells
c. are found in the cortex near the renal medulla
d. are located just below the kidney flow
e. their efferent arterioles form vasa recta
f. they are deep in the renal medulla

33. Kidneys

a. are located in the thoracic cavity
b. consist of renal cortex and renal medulla
c. are located retroperitoneally
d. their only task is to remove waste products
e. they are also involved in the regulation of blood pressure and metabolism of vitamin D
f. their basic functional unit is sarcomere

34. Mark the correct statements about the antidiuretic hormone

a. it is synthesized in the neurohypophysis
b. it is secreted when blood pressure is elevated
c. it acts on vasopressin V2 receptors
d. it has a strong vasoconstrictor effect
e. it is synthesized in the hypothalamus
f. it reduces reverse resorption of water from the collecting ducts

35. Mark the correct statements about the clearance

a. the volume of plasma that is completely cleared of the test substance over time during renal flow
b. the volume of whole blood into which the test substance is excreted over time
c. it is the volume of blood that passes through the lungs
d. used to determine renal filtration capacity

e. used to determine renal blood flow
f. used in the assessment of respiratory abilities

36. Mark the correct statements

a. angiotensin converting enzyme is produced in the lungs
b. angiotensin II leads to vasoconstriction
c. aldosterone causes reabsorption of sodium
d. angiotensinogen II is produced in the lungs
e. the stimulus for the activation of the renin angiotensin aldosterone system is an increase in blood pressure
f. atrial natrium uretic peptide increases blood pressure

37. Mark the correct statements

a. renin is one of the catecholamines
b. renin cleaves angiotensinogen to angiotensin I
c. renin cleaves endothelin to aldosterone
d. angiotensin II is a potent vasoconstrictor
e. catecholamines are formed in the adrenal glands
f. endothelin provides vasodilation

38. Mark the correct statements about the kidney medulla

a. is darker
b. is lighter
c. it consists of pyramids
d. it consists of calyxes
e. is radially striped
f. has a grainy structure

39. Mark the correct statements

a. tubular mass of secretion is an expression of the gradient of excreted and filtered PAH
b. the normal value of the filtration fraction is 25% of the plasma filtered into tubules
c. effective renal plasma flow is an expression of total hematocrit
d. paraaminohipuric acid is excreted into the renal arteries
e. stress and physical activity increase diuresis and creatinine clearance
f. vasoconstriction of the renal arteries reduces glomerular filtration

g. Mark the correct statements about the resorption in the proximal tubules

h. water is reabsorbed passively there
i. 80% of water is reabsorbed there
j. glucose is actively reabsorbed there

k. inulin is resorbed there
l. creatinine is reabsorbed there
m. sodium is reabsorbed there

40. Mark, what applies to the kidney medulla

a. it is the uppermost part of the kidney
b. contains glomeruli
c. contains tubules
d. produces adrenaline and norepinephrine
e. it consists of pyramids
f. is bright

41. Mark, what determines the quality of the glomerular filter

a. endothelial cells
b. basal lamina
c. the epithelium of the Bowman's capsule
d. inulin
e. oncotic pressure
f. renin

42. Which substances are not produced by the kidneys?

a. aldosterone
b. renin
c. antidiuretic hormone
d. erythropoietin
e. calcitriol
f. angiotensinogen

43. Mesangial cells

a. control glomerular filtration
b. are important for tubular resorption
c. are capable of e.g. phagocytosis
d. release dopamine
e. their contraction leads to the reduction of the filtration area
f. involved in maintaining the contents of the bladder

44. Mark in which part of the nephron the most absorption and secretion occurs

a. in the proximal tubule
b. the ascending limb of loop of Henle
c. the descending limb of loop of Henle
d. distal tubule
e. collecting duct

f. in Bowman's case

45. Obligatory reabsorption takes place in

a. the proximal tubule
b. the ascending limb of loop of Henle
c. the descending limb of loop of Henle
d. the distal tubule
e. the collecting duct
f. the vasa recta

46. Prostaglandins cause in the kidneys

a. vasoconstriction
b. antidiuretic function
c. calcium release
d. vasodilatation
e. have no effect on blood vessels
f. renin release

47. RAAS is activated

a. in hypovolemia
b. in hyperkalaemia
c. during sleep
d. in hypotension
e. in hyponatremia
f. in pregnancy

48. The countercurrent multiplier system depends on

a. the hypertonic fluid flow from the proximal tubule
b. the active transport of Na^+ and Cl^- from interstitial to loop of Henle
c. the impermeability of the ascending arm of the loop of Henle
d. the impermeability of the descending limb of the loop of Henle
e. the activity of antidiuretic hormone
f. the plasma volume

49. The effects of angiotensin II include

a. increase in glomerular filtration
b. reduction in blood pressure
c. increase in blood pressure
d. positive inotropic effect
e. increased Na retention
f. increased calcium excretion

50. The filtration fraction is

a. the ratio between the amount of primary urine and excretion of definite urine
b. the ratio between the amount of fluid in all glomeruli and tubules
c. the ratio between the amount of glomerular filtrate formed and the amount of blood plasma
d. the ratio between fluid intake and urine output
e. the ratio between the amount of fluid that is absorbed in the tubules and the work of the heart
f. the ratio between the amount of fluid in the interstitium and the fluid in the glomeruli

51. The glomerular filtration rate is

a. is the same in all people
b. does not change during the day
c. is reduced during sleep
d. decreased during more physical activity
e. by the first year of life it is reduced
f. with insufficient heart activity it is increased

52. The human body reacts to increased blood pressure by

a. reducing of volume of fluids
b. vasoconstriction
c. secretion of antidiuretic hormone
d. increasing of cardiac output
e. increasing of production of final urine
f. vasodilatation

53. The human body responds to the lower blood pressure by

a. reducing of volume of fluids
b. vasoconstriction
c. secretion of vasopressin
d. increasing of cardiac output
e. increasing of production of final urine
f. vasodilatation

54. The physiological capacity of the urine bladder is

a. 1000 - 1 500 ml
b. 200 - 300 ml
c. 800 - 1 000 ml
d. 100 - 150 ml
e. 50 - 100 ml
f. 600 - 800 ml

55. The right kidney is slightly lower because

a. due to the heart
b. because it is smaller
c. due to the liver
d. it must be protected by ribs
e. due to the uterus
f. due to the prostate

56. The substance used to measure glomerular filtration must

a. have a significantly lower concentration in the primary urine than in the plasma
b. bound to plasma proteins
c. reabsorbed quantitatively in the tubule
d. have the same concentration in primary urine as in plasma
e. be freely filterable
f. be completely excreted in the urine during one passage

57. The threshold substances for tubular reabsorption include

a. urea
b. glucose
c. insulin
d. creatinine
e. carbonic acid
f. glutamine

58. The volume of the cardiac volume that flows through the kidneys is

a. 800 ml / min
b. 1000 ml / min
c. 1300 ml / min
d. 1800 ml / min
e. 2300 ml / min
f. 500 ml / min

59. Mark, what applies to renin-angiotensin-aldosterone system (RAAS)

a. responds to changes in flow through the afferent arteries of the kidneys
b. decreased renal blood flow reduces renin secretion
c. angiotensin II acts as a vasodilator
d. RAAS activation reduces sodium retention
e. renin is a proteolytic enzyme that cleaves angiotensinogen to angiotensin I
f. lowering blood pressure increases RAAS activity

60. Typical kidney function tests are

a. detection of low back pain
b. measurement of creatinine clearance
c. measurement of proteins and albumin in urine
d. culture microbial tests
e. glomerular filtration rate (GFR) measurement
f. measurement of inulin clearance

61. Urine bladder detrusor

a. is the muscle of the urine bladder
b. its ligand is acetylcholine
c. by activating the sympathetic nervous system, it relaxes
d. it is activated by sympathetic receptors coupled to the Gq protein
e. activation of the beta 2 receptor leads to urine release
f. it is activated by alpha 2 receptors

62. Vasoconstriction of renal vessels can be triggered by

a. hypoxia
b. catecholamines
c. adenosine
d. renin-angiotensin-aldosterone system
e. bradykinin
f. nitric oxide

63. Mark the correct statements about the vasopressin

a. is formed in the hypothalamus
b. forms in the pituitary gland
c. increases water excretion
d. reduces water excretion
e. acts through its V receptors
f. acts through its AT receptors

64. Mark, what applies to renal clearance

a. indicates the change in urine pH per unit time
b. is a major indicator of renal filtration capacity
c. inulin is a critical component for the filtering ability of the kidneys
d. creatinine binds plasma proteins like albumin and thus reduces oncotic pressure
e. the diagnostic physiological parameter is creatinine clearance
f. the main unit of clearance is mmol/l

65. What are the names of the capillaries following the efferent arteriole?

a. arched and marrow
b. interlobar and interlobular
c. peritubular and vasa recta
d. tubular and marrow
e. intercorporeal and interstitial
f. cortical and juxtamedullary

66. What does not contain urine in a physiological state?

a. sodium cations
b. chloride anions
c. glucose
d. ketone bodies
e. leukocytes
f. erythrocytes

67. What is the name of the first urine production process that takes place in Bowman's capsule?

a. osmosis
b. dialysis
c. filtration
d. secretion
e. excretion
f. exocytosis

68. What is the renal entry site called for nerves, blood vessels, ureters, and lymphatic vessels?

a. minor calyx
b. hilum
c. renal pelvis
d. pyramid
e. vasa recta
f. macula densa

69. Mark the correct statements about the proximal tubule in the kidney

a. the fluid in the proximal tubule has a lower osmotic pressure than plasma
b. the fluid in the proximal tubule has the same osmotic pressure as the plasma
c. the fluid in the proximal tubule has a higher osmotic pressure than plasma
d. water is reabsorbed here
e. water is secreted here
f. HCO_{3^-} is reabsorbed here

70. What part of the nephron does the blood enter from the afferent arterioles?

a. peritubular capillaries
b. collecting duct
c. ureter
d. vasa recta
e. glomerulus
f. Bowman's capsule

71. Where is renin formed?

a. in the kidneys
b. in the lungs
c. in the liver
d. in the brain
e. in the small intestine
f. in the stomach

72. Which components form the glomerular filter?

a. Clare cells
b. loop of Henle
c. Bowman's case
d. Pukyn cells
e. podocytes
f. endothelium

73. Which molecule catalyses the production of angiotensin I?

a. renin
b. calcitriol
c. erythropoietin
d. carbonate dehydratase
e. glutamine
f. urea

74. Which part of the nephron is impermeable to water?

a. the proximal tubule
b. the distal tubule under the influence of ADH
c. the ascending limb of loop of Henle
d. the descending limb of loop of Henle
e. the glomerulus
f. the Bowman's capsule

75. Mark the correct statements

a. tubular mass of secretion is an expression of the gradient of excreted and filtered PAH
b. the normal value of the filtration fraction is 25% of the plasma filtered into tubules
c. effective renal plasma flow is an expression of total hematocrit
d. paraaminohipuric acid is excreted into the renal arteries
e. stress and physical activity increase diuresis and creatinine clearance

76. Substance that is perfectly excreted in the urine

a. is paraaminohipuric acid (PAH)
b. is glucose
c. can be used to determine renal blood flow
d. can be used to determine liver function
e. has zero concentration in the v. renalis
f. has a 100% concentration in the v. renalis

77. The substance used to measure glomerular filtration must

a. have a significantly lower concentration in primary urine than in plasma
b. be bound to plasma proteins
c. be absorbed quantitatively in the tubule
d. have the same concentration in primary glomerular filtrate and in plasma
e. be completely filtered in the glomerulus
f. be completely excreted in the urine during one passage by the kidneys

78. Mark, what applies to the glomerular filtration and tubular reabsorption

a. proteins are not absorbed in the proximal tubule
b. in the distal tubule, aldosterone acts to increase the reabsorption of Na+ and H_2O
c. parathyroid hormone stimulates Ca^{2+} reuptake in the distal tubule
d. antidiuretic hormone stimulates the absorption of H_2O in the collecting duct
e. vasoconstriction of the afferent arteriole leads to increased reabsorption in the tubules
f. angiotensin II inhibits Na^+ reabsorption in tubules

2.9 LYMPHATIC SYSTEM

1. Lymphatic system

    a. is a tubing system
    b. flows directly into the heart
    c. does not begin in the interstitium
    d. has valves
    e. flows into arteries
    f. is an open system

2. Bone marrow

    a. is primary lymphoid organ
    b. contains the precursors of all blood elements
    c. contains only erythrocyte and macrophage precursors
    d. is active only during childhood
    e. the red bone marrow is the active one
    f. the yellow bone marrow is the active one

3. Central lymphoid tissues include

    a. bone marrow
    b. thymus
    c. spleen
    d. lymph nodes
    e. liver
    f. pancreas

4. Compared to veins and arteries, lymphatic vessels are

    a. thinner
    b. thicker
    c. more numerous
    d. less numerous
    e. only afferent
    f. only efferent

5. Functions of the lymphatic system include

    a. transport of substances and fluids from the intercellular space into the bloodstream
    b. participation in blood clotting
    c. participation in immunological processes
    d. participation in blood gas transmission
    e. participation in blood pressure regulation

f. participation in breathing regulation

6. In addition to resorption and filtration pressures, the following are important for lymph flow

    a. rhythmic contraction of collecting vessels
    b. pulmonary activity
    c. heart activity
    d. CNS activity
    e. muscle pump
    f. kidney activity

7. In which organ do the immature T cells become mature and then are released into the circulation?

    a. thymus
    b. liver
    c. spleen
    d. bone marrow
    e. hypothalamus
    f. heart

8. Mark, which lymphoid organ is located in the ventral cavity and at the same time in the thoracic cavity and mediastinum?

    a. thymus
    b. spleen
    c. tonsils
    d. pharyngeal tonsils
    e. liver
    f. duodenum

9. Initial lymphatic vessels begin in

    a. epithelium of the skin
    b. intercellular spaces of tissues
    c. osteocytes
    d. mucous membranes
    e. cardiomyocytes
    f. lymph nodes

10. Interstitial fluid and lymph movement are affected by

    a. muscle contraction of organs
    b. contraction of arterioles and venules
    c. contraction of skeletal muscles
    d. negative intrathoracic pressure during inspiration

e. suction effect of high-velocity flow of blood in the veins
f. negative intrathoracic pressure during expiration

11. Mark the lymphatic organs

a. tonsils
b. spleen
c. pancreas
d. bone marrow
e. thymus
f. liver

12. “Lien” is the Latin name for

a. thymus
b. spleen
c. eye
d. lymph
e. vertebra
f. torso

13. Lymph

a. contains many antibodies during the infection
b. contains less protein than plasma
c. contains more protein than plasma
d. contains more lipids than plasma
e. contains less lipids than plasma
f. is white-yellow clear liquid

14. Lymph contains

a. erythrocytes
b. platelets
c. lymphocytes
d. immunoglobulins
e. chylomicrons
f. albumins

15. Lymph flow allows

a. contractions of larger lymphatic vessels
b. muscle pump
c. spleen
d. heart activity
e. tissue pressure
f. kidney activity

16. Lymph from the right hand and the right side of head and chest drains into

a. the main thoracic duct
b. the inferior vena cava
c. the right lymphatic duct
d. the subclavian vein
e. the left ventricle
f. the right atrium

17. Lymph nodes

a. contain macrophages
b. antigen presentation by T-lymphocytes takes place in them
c. contain reaction centres in which the formation of new B-lymphocytes takes place
d. are an important part of the adaptive immune response
e. are the site of lymph formation
f. are sites where lymph flows into the venous bloodstream

18. Lymphatic capillaries

a. are formed only by endothelial cells
b. are formed by endothelial cells and smooth muscle
c. are formed by endothelial cells, smooth muscle and valves
d. also occur in the skin epithelium and in the cornea
e. have a discontinuous basement membrane
f. form lymphatic vessels

19. Lymphatic capillaries

a. are impermeable to proteins
b. contain a large number of tight junctions between endothelial cells
c. contain interendothelial valves
d. start in the lymph nodes
e. are made up of a single layer of endothelial cells
f. are capable of rhythmic contractions and thus help lymph flow

20. Lymphatic organs include

a. liver
b. spleen
c. pancreas
d. thymus
e. bone marrow
f. thyroid gland

21. Lymphatic system is formed by

    a. spleen
    b. lymphatic vessels
    c. tonsils
    d. lymph nodes
    e. thymus
    f. superficial veins

22. Lymphatic vessels

    a. contain valves
    b. are lined by the endothelium
    c. are found in all tissues of the body except skeletal muscles
    d. afferent lymphatic vessels supply lymph to individual organs
    e. are connected to the venous system in the lymph nodes
    f. they start in the tissues as “blind” lymphatic capillaries

23. Mark the functions of lymphatic system

    a. participation in the adaptive immune response
    b. transport of proteins from the interstitium into the bloodstream
    c. regulation of acid-base balance
    d. transport of chylomicrons from the liver to tissues
    e. transport of enzymes and hormones into the blood
    f. interstitial fluid pressure regulation

24. Mark the factors that increase the formation and flow of lymph in the lymphatic vessels

    a. increased interstitial pressure
    b. reduced capillary pressure
    c. decreased plasma protein concentration
    d. increased permeability of blood capillaries
    e. reduced osmotic pressure in the interstitium
    f. physical activity

25. Mark the functions of the spleen

    a. platelets storage
    b. erythrocyte maturation
    c. blood filtration
    d. metabolism of substances
    e. formation of coagulation factors
    f. fibrin formation

26. Mark the correct statements about the lymph

a. it is a white-yellow fluid
b. it is a dark-yellow fluid
c. its composition is similar to plasma
d. its composition is similar to bile
e. lymph from the intestines may be rich in fat
f. contraction of the skeletal muscles is necessary for the movement of lymph

27. Spleen

a. is the largest lymphatic organ
b. is the store of platelets
c. is the site of reticulocyte maturation
d. belongs to the secondary lymphatic organs
e. is an organ necessary for life
f. in adulthood takes on the function of the liver

28. Spleen

a. serves as a filter to remove damaged and old erythrocytes
b. is essential for life
c. serves as a reservoir for platelets and lymphocytes
d. its lymphoid tissue forms a white pulp
e. is the site of B-cell formation
f. is located in the area of the right hypochondrium

29. The functions of lymph include

a. protein transport
b. lipid transport
c. enzyme activity
d. synthesis of coagulation factors
e. provision of immune function
f. removal of toxic substances

30. The functions of lymphatic system include

a. lipid transporting
b. removing bacteria and toxins from the body
c. participating in the maintenance of homeostasis
d. carrying oxygenated blood away from the heart
e. producing hormones
f. participating in the body's defensive reactions

31. The primary lymphatic organs are

a. bone marrow
b. spleen

c. small intestine
d. thymus
e. lymph nodes
f. liver

32. The secondary lymphatic organs are

a. bone marrow
b. spleen
c. small intestine
d. thymus
e. lymph nodes
f. brain

33. The thymus is

a. the gland of infants
b. formed predominantly by fatty connective tissue
c. a lymphatic organ with endocrine function
d. a lymphatic organ without endocrine function
e. located under the sternum
f. most active at puberty

34. Thymus

a. is a specialized primary lymphoid organ
b. is located in the throat
c. is located in the upper mediastinum behind the sternum
d. its main role is the production of antigens
e. it decreases during puberty
f. its main task is the maturation of T-lymphocytes

35. Thymus

a. is localized in the peritoneal cavity
b. it shrinks with advancing age
c. is the same throughout life
d. it matures T-lymphocytes
e. erythrocytes are formed in it
f. is stored in the thoracic cavity

36. Mark, what applies to lymphatic vessels. They

a. carry the serum
b. may contain valves
c. are found in the CNS
d. have a transport function

e. have a building function
f. have a thermoregulatory function

37. What are the functions of lymphatic system?

a. fat transport
b. carbohydrate transport
c. protein transport
d. immune function
e. homeostasis
f. CNS protective function

38. What draws lymph from the right lower limb into the bloodstream?

a. main thoracic duct
b. right lymphatic duct
c. right lymphatic duct
d. left lymphatic canal
e. portal vein
f. vena cava inferior

39. What happens in the lymph nodes when lymph flows through them?

a. impurities are filtered off
b. foreign substances are destroyed
c. T cells mature
d. white blood cells are formed
e. antibodies are formed
f. plasma is formed from it

40. What helps lymph flow in the body?

a. gravity
b. heart activity
c. rhythmic vascular contractions
d. muscle pump
e. chest breathing movements
f. smooth muscles contractions

41. Mark the correct statements about fats

a. they are transported by blood
b. they are transported by lymph
c. from the small intestine they are transported in the form of chylomicrons after absorption
d. in the small intestine they enter the lymphatic system
e. they are absorbed into the blood in unchanged form

f. the enzyme chymotrypsin is involved in lipid digestion

42. Mark the correct statements about lymph

a. it flows through the lumen of small intestine
b. it flows through lymphatic vessels
c. the typical red coloration of lymph is caused by hemoglobin
d. milky coloration causes fat content
e. it is formed from capillary ultrafiltrate
f. it has a composition similar to blood plasma

43. Where does lymph come from?

a. liver
b. spleen
c. intercellular space
d. lymph node
e. lymphatic vessels
f. main lymphatic strain

44. Which components form the lymphatic system?

a. thymus
b. lymphatic vessels
c. lymphatic net
d. lymphatic tubules
e. lymph nodes
f. lymphatic alveoli

45. Which components form the lymphatic system?

a. lymph nodes
b. spleen
c. thoracic duct
d. lymphatic root
e. lymphoceptors
f. lymphatic vessels

46. Which of the following terms is described the best by - partially encapsulated lymph nodes in the throat?

a. spleen
b. liver
c. tonsils
d. thymus
e. epiglottis
f. esophagus

2.10 Sensory system

Part 1

1. A device for measuring the range of the visual field is called

    a. optometer
    b. ophthalmometer
    c. perimeter
    d. stereoscope
    e. phonendoscope
    f. otoscope

2. A healthy eye is

    a. refractory
    b. dioptric
    c. emmetropic
    d. myotropic
    e. presbyotropic
    f. hypertropic

3. Accommodation is

    a. a change in the shape of an elastic lens
    b. responsible for colour vision
    c. matching of the sense of sight and balance
    d. caused by contraction of the m. ciliaris
    e. a change in the curvature of the cornea
    f. regulated via the parasympathetic nerve

4. Aqueous humour

    a. is produced in Schlemm's canal
    b. is drained into the venous system
    c. nourishes the lens
    d. flows from the anterior chamber to the posterior chamber of the eye
    e. a ray of light passes through it when it strikes the retina
    f. is involved in the generation of arterial pressure

5. Aqueous humour

    a. drains through Schlemm's canal
    b. nourishes the retina
    c. drains through the lacrimal duct
    d. is continuously renewed
    e. is produced in the corpus ciliaris
    f. is produced in the choroidea

6. Aqueous humour fills the

    a. anterior chamber of the eye
    b. corpus vitreum
    c. vitreous body
    d. lens
    e. cornea
    f. posterior chamber of the eye

7. At which location of the basilar membrane in the inner ear are high notes detected?

    a. near the oval window
    b. at the end of the basilar membrane
    c. along the length of the basilar membrane
    d. at the junction of the scala vestibuli and scala tympani
    e. in the middle of the basilar membrane
    f. in the Eustachian tube

8. Chiasma opticum is

    a. part of the eye where the optic nerve disconnects from the retina
    b. blind spot
    c. part of the brain where visual sensations are projected
    d. the part of the brain where the visual projection pathways cross
    e. localized in the cerebral part of the skull
    f. localised on the retina

9. Cones are primarily responsible for

    a. colour vision
    b. black and white vision
    c. twilight vision
    d. daytime vision
    e. for blurred vision
    f. distance focusing

10. Corti's organ is

    a. the part of the olfactory pathway connecting the olfactory receptors to the amygdala
    b. the part of the retina where images are projected in the twilight
    c. the pheromone-sensitive olfactory organ of vertebrates, which is non-functional in humans
    d. part of the gonads in the male
    e. receptor organ of hearing
    f. localized in the inner ear

11. Endolymph

a. is located in the middle ear
b. is located in the inner ear
c. is involved in the transmission of sound waves to hair cells
d. fills the semicircular canals
e. is located in the scala vestibuli
f. is identical to the perilymph

12. Fovea centralis

a. is the site of sharpest vision
b. has the highest density of capillaries nourishing photoreceptor cells
c. contains almost exclusively cones
d. is the point at which the optic nerve diverges from the retina
e. is thinner than most of the retina
f. is located in the centre of the macula

13. Hearing receptors are

a. rods
b. cones
c. hair cells of the organ of Corti
d. Meissner's corpuscles
e. otoliths
f. Ruffini bodies

14. Identify the molecules that participate in the mechanism of photoreception

a. PDE
b. rhodopsin
c. adenylate cyclase
d. cAMP
e. cGMP
f. transducin

15. In a healthy person, vision is

a. scotopic
b. photopic
c. trichromatic
d. myopic
e. monochromatic
f. tetrachromatic

16. In humans, which colours are the individual cone photopigments sensitive to?

a. yellow, blue, red

b. blue, red, green
c. white, red, green
d. cyan, magenta, yellow
e. cyan, yellow, green
f. yellow, red, green

17. Mark the correct statements about the senses

a. receptors for static balance are located in the utricle and saccule
b. the organ of Corti is located in the inner ear
c. opsins are distinguished from each other by their different pigment absorption spectra
d. elevated cGMP levels in the darkness close sodium channels in the rod membrane
e. adaptation of rods to darkness is faster than that of cones
f. the auditory pathway consists of two neurons

18. Mark the components of the inner ear

a. eardrum
b. anvil
c. stirrup
d. cochlea
e. vestibule
f. three semicircular canals

19. Mark the correct statements about auditory and sense of balance

a. an adequate stimulus for the auditory sense is a pressure wave of strength 16 - 20,000 Pa
b. the inner ear consists of the anvil, the hammer and the stirrup
c. the endolymph and perilymph are separated by the so-called Reissner's membrane
d. auditory signals are transmitted by bipolar neurons using one of the cranial nerves - n. vestibulocochlearis
e. otoliths are the ossicles of the middle ear through which sound vibrations are transmitted to the inner ear
f. the movement of hair cells is important for the perception of dynamic balance

20. Mark the correct statements about hearing

a. the projection area of the auditory system is in the temporal lobe
b. the receptors of hearing are mechanoreceptors
c. the perilymph vibrates the stereocilia of the middle ear
d. the Eustachian tube enters the inner ear
e. the organ of Corti is located in the inner ear
f. the endolymph of the inner ear is rich in potassium

21. Mark the correct statements about hearing

a. its organ is the vestibular apparatus and 3 semicircular canals
b. the receptors of hearing are the hair cells of the organ of Corti
c. protection from hearing damage is provided by the eardrum reflex
d. endolymph in the scala media conducts vibrations to the tectorial membrane
e. transmission of vibrations takes place through 3 media - air → bone → fluid
f. a healthy ear hears sound transmitted by bone for longer time than a sound transmitted by air

22. Mark the correct statements about hearing and sense of balance

a. receptors of hearing are called hair cells and are located in the organ of Corti
b. vibrations of basilar membrane due to endolymph flow result in depolarization of the hearing receptors
c. the sense of balance is provided by the movement of otoliths and kinocilia in the cochlear apparatus of the inner ear
d. the perilymph and endolymph are involved in the transmission of vibrations
e. the crista ampullaris, containing hair cells, is located in a system of 3 semicircular canals
f. the projection area of the auditory pathway is located in the frontal lobe

23. Mark the correct statements about the aqueous humour in the eye

a. it is formed by epithelial cells in the corpus ciliaris
b. it is formed in the anterior chamber of the eye and is drained through the corneal canal
c. it provides normal intraocular pressure in the range of 20-40 mmHg
d. contraction of the musculus sphincter pupillae increases aqueous humour outflow
e. parasympathetic activation increases aqueous humour production
f. sympathetic activation increases aqueous humour production by acting on β receptors

24. Mark the correct statements about the ear

a. balance receptors are localized in the middle ear
b. otoliths are located in the crista ampullaris
c. utriculus and sacculus are responsible for the perception of dynamic balance
d. the deflection of the kinocilia of the utriculus and sacculus is important for the awareness of static balance
e. the semicircular canals are filled with endolymph
f. the endolymph of the inner ear is rich in potassium

25. Mark the correct statements about the ear as a sensory organ

a. the inner ear converts vibrations of air into vibrations of liquid

b. contains receptors in the outer ear that pick-up vibrations
c. has an eardrum reflex to protect the ear from intense sound stimuli
d. the inner ear is a system of canals that is localized in the temporal bone
e. in the inner ear is the organ of Corti, which is responsible for maintaining balance
f. the Eustachian tube is a part of the middle ear which connects the middle ear and the nasopharynx

26. Mark the correct statements about the equilibrium sense

a. the sensory organ of the equilibrium sense is the vestibular apparatus
b. the organs of static balance are 2 vesicles containing kinocilia and otoliths
c. the organs of dynamic balance are 3 semicircular canals containing the crista ampullaris
d. signals from the balance sense reach the CNS via the n. vestibulocochlearis
e. perception of rotational movements is provided by the organ of Corti
f. the primary cortical centre of balance is the cerebellum

27. Mark the correct statements about the mechanism of photoreception

a. when a photon strikes the retina, there is a change in the conformation of 11-cis-retinal to all-trans retinal, which is unable to bind with opsin
b. it is mediated by the presence of special visual pigments in rods and cones
c. activation of rhodopsin results in the opening of cGMP-dependent sodium channels
d. melanopsin is a pigment in ganglion cells that sends a signal directly to the circadian rhythm control centre in the hypothalamus
e. photon absorption results in depolarization of the photoreceptor cell membrane
f. the principle of dark adaptation is the regeneration of 11-cis-retinal from all-trans retinal

28. Mark the correct statements about vision

a. visual pathways terminate in the brain in the so-called chiasmatic centre
b. pseudoisochromatic charts are used to examine colour vision
c. cGMP hydrolysis and photoreceptor membrane hyperpolarization occur in the darkness
d. Snellen optotypes are used to examine visual acuity
e. adaptation to darkness is faster than adaptation to light, because no resynthesis of rhodopsin is required
f. visual acuity is defined through the so-called visus

29. Mark the correct statements about vision

a. the signal is transmitted to the occipital lobe via the n. facialis
b. the retina is referred to as the sclera in Latin
c. macula lutea is the site with the highest concentration of cones

d. melanopsin is involved in the regulation of circadian rhythms
e. the principle of photoreception is the transformation of all-trans retinal to 11-cis-retinal
f. a healthy person has 3 types of cones - trichromatic vision

30. Mark the correct statements about vision

a. the visual pathway is a 4-neuronal pathway
b. the afferent nerve fibres of the visual pathway terminate in the occipital lobe
c. the aqueous humour of the eye originates in the corpus ciliaris and is eventually drained into the venous system
d. the macula is the point on the retina where the optic nerve exits from it
e. cones are responsible for black and white vision
f. absorption of a photon causes depolarization of the membrane of light-sensitive cells

31. Mark the correct statements about vision

a. receptors are light-sensitive cilia located on the iris
b. the incidence and refraction of light on the iris determines the colour of the eye pigment
c. photoreceptors are sensitive to visible light with a wavelength of 400-700 nm
d. photon impact on visual pigments activates G-receptors and cGMP-specific phosphodiesterase, which cause closure of Na+ channels
e. activation of M3 receptors on the musculus ciliaris results in accommodation of the eye to a near object
f. sympathetic activation causes mydriasis via activation of α receptors

32. Mark the correct statements about visual adaptation to darkness

a. it is faster than adaptation to light
b. its component is mydriasis
c. is requires regeneration of 11-cis retinal to all-trans retinal
d. cones adapt to darkness more slowly than rods
e. it involves the pupillary reflex
f. it requires sufficient levels of vitamin A

33. Mark true statements about the sense of balance

a. it is localized in the middle ear
b. it is localized in the vestibular apparatus of the inner ear
c. the organ of static balance that responds to changes in head position is a set of three semicircular canals
d. movement of the body causes movement of the semicircular canals, which leads to the generation of a receptor potential
e. vision and proprioceptors are also involved in the perception of balance
f. the centre for balance and posture is located in the cerebellum

34. Mark, what contributes most to the overall refractive power of the eye

a. ventricular aqueous
b. lens
c. cornea
d. vitreous
e. macula densa
f. corpus vitreum

35. Opsins are

a. receptor cells of the olfactory epithelium
b. photosensitive proteins that are part of the visual pigments
c. bodies, which are located in the inner ear and are involved in the recording of body position
d. receptors that recognise painful stimuli
e. G-protein coupled receptors
f. receptor cells on the retina

36. Organ of Corti

a. is located in the skin and senses perpendicular pressure
b. is located in the inner ear
c. contains hair cells
d. contains mechanoreceptors
e. contains receptors that recognise substances dissolved in mucus
f. is connected to the n. olfactorius

37. Organ of dynamic balance

a. is a set of three semicircular canals
b. is formed by two saccules - utriculus and sacculus
c. is filled with endolymph
d. contains hair cells
e. detects head movement by means of the change in position of the otoliths
f. transmits information to the CNS via the n. opticus

38. Organ of static balance

a. resides in the inner ear
b. resides in the cochlea
c. resides in the ducti semicirculares
d. resides in the central cavity of the labyrinth (vestibulum)
e. senses the position of the body thanks to cells with cilia
f. senses the position of the body based on changes in the position of the otoliths

39. Otoliths are

a. calcium carbonate crystals
b. potassium chloride crystals
c. located in the middle ear
d. located in the inner ear
e. important for maintaining static balance
f. important for maintaining dynamic balance

40. Photoreceptor cells

a. containing rhodopsin are called cones
b. may contain melanopsin
c. ensure synchronisation of circadian rhythms
d. are located in the pigment layer of the retina
e. provide colour vision
f. provide vision in darkness and twilight

41. Photoreceptors respond to light by

a. depolarization of the membrane
b. reducing the intracellular concentration of cGMP
c. membrane hyperpolarization
d. opening sodium channels
e. release of acetylcholine from the synapse
f. activation of G-protein transducin

42. Pupil dilation

a. occurs during sympathetic activation
b. is called mydriasis
c. occurs when the M3 receptor is activated
d. is mediated by contraction of the m. dilator pupillae
e. occurs when the β 3 receptor is activated
f. is called myopia

43. Receptor potential of the hair cells of the organ of Corti and the vestibular apparatus

a. is always manifested by depolarization of the receptor membrane
b. is always manifested by hyperpolarization of the receptor membrane
c. has the character of depolarization or hyperpolarization depending on the direction of bending of stereocilia
d. is determined by Na+ influx into the cell
e. is determined by the influx of K+ into the cell
f. is always manifested by repolarization of the receptor membrane

44. Retina

a. is richly innervated
b. contains only one layer, which is made up of photoreceptors
c. is inverted in mammals, photoreceptors are located under layers of blood vessels and neurons
d. contains yellow spot, which is the exit site of the optic nerve and does not contain photoreceptors
e. contains several types of nerve cells, including amacrine and bipolar
f. is avascular

45. Retina

a. is avascular
b. is subject to accommodation
c. is formed by light-sensitive cells only
d. contains a part called macula lutea
e. contains part called fovea centralis
f. contains bipolar neurons

46. Retina

a. contains a pathway composed of three neurons
b. contains light-sensitive cells, which include cone, rod, and amacrine cells
c. provides the sharpest vision by neurons localized at its edge
d. contains 4 types of cones mediating colour recognition (blue, red, green and yellow)
e. has a centre-surround organization of the ganglion cells, which is essential for contrast vision
f. transmits signals through the optic nerve to the prefrontal cortex

47. Retina

a. is the optical part of the eye
b. transmits information about visual stimuli through ganglion cell axons to the corpus geniculatum laterale
c. is formed by the glandular epithelium
d. is dominated by cones
e. the optic nerve branches off from it
f. contains bipolar, amacrine and ganglion cells

48. Rhodopsin

a. is a visual pigment
b. is found in cones
c. is found in rods
d. vitamin D is important for its function

e. vitamin A is important for its function
f. is a G-protein

49. Rhodopsin is

a. one of the G protein-coupled receptors
b. an ion channel
c. a type of second messenger
d. a type of first messenger
e. a molecular receptor for visual sense
f. a molecular receptor for the sense of smell

50. Rinne's tuning fork test determines the difference in duration of

a. bone conduction in both ears
b. bone conduction in the ear of the subject and the examiner
c. air conduction in the right ear
d. bone conduction in the left ear
e. bone and air conduction in one ear
f. bone conduction of sound at the top of the head

51. Select the components of the ear in the correct order

a. outer ear, external ear canal, hammer, anvil, stirrup, eardrum, cochlea
b. outer ear, external ear canal, eardrum, hammer, anvil, stirrup, cochlea, cochlea
c. auricula, external ear canal, stirrup, anvil, hammer, eardrum, atrium, cochlea
d. outer ear, external ear canal, tympanic membrane, hammer, anvil, stirrup, atrium, Eustachian tube
e. auricula, external ear canal, tympanic membrane, hammer, anvil, stirrup, cochlea
f. outer ear, external ear canal, tympanic membrane, stapes, malleus, incus, atrium, semicircular canals, cochlea

52. Signals from which receptor cell types are involved in maintaining balance (the ability to maintain an upright posture)?

a. photoreceptors
b. mechanoreceptors
c. nociceptors
d. chemoreceptors
e. proprioceptors
f. baroreceptors

53. The aqueous humour fills the

a. lens
b. anterior eye chamber

c. posterior eye chamber
d. vitreous body
e. iris
f. white of the eye

54. The axons of which retinal cells make up the optic nerve?

a. amacrine cells
b. ganglion cells
c. bipolar cells
d. photoreceptors
e. macula cells
f. rod cells

55. The inner ear consists of

a. the eardrum
b. the Eustachian tube
c. the cochlea
d. semicircular canals
e. auricle
f. atria

56. The middle ear consists of

a. eardrum
b. Eustachian tube
c. cochlea
d. semicircular canals
e. auricle
f. atria

57. The middle layer of the eye consists of

a. the white of the eye
b. cornea
c. choroid
d. ciliary body
e. iris
f. retina

58. The optical part of the eye consists of

a. cornea
b. retina
c. lens
d. iris

e. yellow spot
f. cones and rods

59. The organs of dynamic balance are

a. utriculus and sacculus
b. hammer, stirrup, anvil
c. three semicircular canals
d. eardrum and Eustachian tube
e. stereocilia of the organ of Corti
f. auricle and nasopharynx

60. The organs of static balance are

a. utriculus and sacculus
b. hammer, stirrup, anvil
c. three semicircular canals
d. eardrum and Eustachian tube
e. Stereocilia of the organ of Corti
f. auricle and nasopharynx

61. The organs of static balance include

a. utriculus
b. sacculus
c. 3 semicircular canals
d. organ of Corti
e. Ruffini's corpuscles
f. Merkel discs

62. The perception of contrast is

a. mediated by horizontal cells
b. mediated by cerebellum
c. key for object recognition
d. mediated by the blind spot
e. determined by the eye's accommodation
f. dependent on lateral inhibition in the retina

63. The projection area of the optic nerve in the CNS is

a. frontal lobe
b. temporal lobe
c. occipital lobe
d. limbic lobe
e. cerebellum
f. parietal lobe

64. The receptors of hearing are

a. Ruffini bodies
b. hair cells of the Corti apparatus
c. Meissner's corpuscles
d. cones and rods
e. kinocilia
f. auditory cups

65. The rods are used for

a. colour vision
b. black and white vision
c. twilight vision
d. day vision
e. blurred vision
f. focusing to near object

66. The rods of the eye provide

a. black and white vision
b. colour vision
c. twilight vision
d. scotopic vision
e. photopic vision
f. regulation of circadian rhythms

67. The value of intraocular pressure in a healthy person is

a. 10 - 20 mmHg
b. 25 - 45 mmHg
c. 0.5 - 5 mmHg
d. 45 - 65 mmHg
e. 80 - 120 mmHg
f. 100 - 200 mmHg

68. The vibrations of the tympanic membrane are transferred by the ossicles in the middle ear directly to the

a. membrane of the oval window of the cochlea
b. membrane of the round window of the cochlea
c. auricle
d. organ of Corti
e. entrance to the Eustachian tube
f. otoliths

69. The visual cortex is localized in the

a. frontal lobe
b. prefrontal part of the frontal lobe
c. temporal lobe
d. occipital lobe
e. parietal lobe
f. limbic lobe

70. Utriculus

a. is the larger sac in the inner ear
b. is the smaller sac in the inner ear
c. is important for maintaining static balance
d. is located in the middle ear
e. is located in the inner ear
f. contains the endolymph

71. Visual pigments

a. are G-protein coupled receptors
b. are ligand-gated ion channels
c. are receptors with tyrosine kinase activity
d. are localized in the retina
e. are localized in the optic nerves
f. detect light with a wavelength of 20-2000 nm

72. Visual receptors are

a. stimulated by electromagnetic waves with a wavelength of 200-400 nm
b. stimulated by electromagnetic waves with a wavelength of 400 - 800 nm
c. stimulated by electromagnetic waves with a wavelength of 600 - 950 nm
d. G-protein coupled receptors
e. rhodopsin and iodopsins
f. transducins

73. What is accommodation?

a. change in the shape of the lens by contraction of the m. ciliaris
b. the process of signal processing from multiple rods in a single ganglion cell
c. pupillary reflex
d. change in the curvature of the lens
e. signal transmission from the n. opticus to the chiasma opticum
f. process of adaptation to darkness

74. Which events are part of the mechanism of photoreception in rods?

a. breakdown of activated rhodopsin into scotopsin and all-trans retinal
b. depolarization of the cell membrane

c. increase in intracellular cGMP
d. activation of G-protein transducin
e. activation of phosphodiesterase 6
f. breakdown of vitamin A to beta-carotene

75. Which processes happen when looking at near object?

a. accommodation
b. convergence of the eyeballs
c. miosis
d. improvement of aqueous humour outflow
e. dilation of the musculus dilator pupillae
f. activation of M3 receptors on the musculus ciliaris

76. Which structures are found inside the eyeball?

a. choroid
b. cornea
c. sclera
d. aqueous humour
e. lens
f. vitreous body

77. Which structures belong to the vestibular apparatus?

a. hammer
b. anvil
c. stirrup
d. ducti semicirculares
e. vestibulum
f. sacculus

Part 2

1. "Reception" at the level of sensory perception is understood as

    a. the conversion of a receptor potential into an action potential
    b. the process by which an organism perceives a stimulus
    c. the process by which the brain interprets information
    d. stimulation of a receptor by an adequate stimulus
    e. the conversion of a stimulus in a receptor cell into a receptor potential
    f. processing of sensory information in the CNS

2. The process of "transformation" in sensory perception means

    a. receptor irritation by an adequate stimulus
    b. conversion of the stimulus in the receptor cell to a generator potential
    c. conversion of receptor potential into action potential
    d. transmission of information to the CNS
    e. processing of sensory information in the CNS
    f. the organism's response to the stimulus

3. The process of sensation in sensory perception means

    a. receptor irritation by an adequate stimulus
    b. conversion of the stimulus in the receptor cell to a generator potential
    c. conversion of receptor potential into action potential
    d. process of acquiring raw sensory information and relaying them to the CNS
    e. process by which the body receives and represents stimuli
    f. the organism's response to the stimulus

4. Somatovisceral sensitivity

    a. has specialized organs
    b. receives information only from the mucous membranes and from the surface of the body
    c. has a primary projection cortical centre in the postcentral gyrus
    d. records stimuli via mechano-, chemo- and thermoreceptors
    e. uses somatic neurons as afferent fibers
    f. has specialized nerves

5. Which of the following statements about taste are true?

    a. there are 4 basic tastes
    b. umami taste is the taste of spicy foods
    c. acid taste is detected by an ion channel coupled receptor
    d. the gustatory pathway has only one neuron
    e. receptors for salty taste are mostly on the tip of the tongue
    f. the gustatory pathway ends in the gustatory cortex in insula

6. Meissner corpuscles

    a. are found in hair follicles
    b. respond to weak pressure and gentle touches
    c. mediate the feeling of itching
    d. belong to the encapsulated nerve endings
    e. are also found in joint capsules
    f. are important for the proprioceptive reflex

7. Which of the following statements about smell are true?

    a. the olfactory epithelium cannot be regenerated
    b. the smell of glutamate is called umami
    c. its receptors are sensory neurons
    d. the olfactory pathway has 3 neurons
    e. the olfactory pathway is connected to the amygdala
    f. the adequate stimuli are chemical substances dissolved in nasal mucus

8. Adequate stimuli for taste sensation

    a. can induce the perception of 4 basic tastes
    b. can induce the perception of 5 basic tastes
    c. are complemented by olfactory sensation
    d. irritates the taste receptors found in the taste buds
    e. may irritate salty taste receptors, which are sodium channels
    f. they activate the projection pathway into the parietal lobe

9. Mark, what applies to thermoreceptors

    a. they do not have the ability to adapt
    b. too intense stimuli are perceived by nociceptors as pain
    c. these include the TRPM8 channel, which is located at nerve endings in the skin
    d. they are activated only by temperature changes, not by chemicals
    e. they can be activated by temperature changes or chemicals
    f. information about the change in temperature is led by nerve pathways to the centre for thermoregulation in the hypothalamus

10. Examples of mechanoreceptors are

    a. goblet cells
    b. hair cells in the inner ear
    c. olfactory receptors
    d. retinal receptors in the eye
    e. tactile receptors in the skin
    f. nociceptors

11. Mark, what applies to proprioception

a. it is also secured by free nerve endings in the skin
b. one of the important functions is to ensure the reflex response of the transversely striated muscle
c. the reception part are muscle spindles or Golgi tendon organs, which are mainly osmo- and thermosensitive
d. the Pacini's bodies are also proprioceptors
e. an important connection between sensory and motor pathways is the brain, where there is a fine-tuning of movement and proper timing
f. signals from the vestibular-cochlear apparatus are part of proprioception

12. Mark, what applies to the sense of smell

a. the sensory organ is the olfactory nerve
b. the projection area of the sense is the frontal lobe
c. their receptors are ion channels associated with the G protein
d. receptor cells have cilia on the surface
e. receptor activation results in a cascade associated with cAMP production
f. types of odours are divided into 5 basic categories - salty, sweet, resinous, putrefactive and floral

13. Mark, how the receptor potential differs from the action potential

a. it spreads without decrement
b. the amplitude is always the same - the principle of all or nothing
c. stimulation of the dendrites or body of the neuron is required to begin
d. the potential is graded - the amplitude depends on the final sum of all stimuli
e. over time, adaptation occurs
f. there is always a refractory period when the potential cannot begin under any circumstances

14. Interoceptors

a. receive impulses from the internal environment
b. receive impulses from the external environment
c. communicate only with the somatic nervous system
d. are divided into proprio and viscероreceptors
e. thanks to them we are aware of the position of the body
f. communicate only with the autonomic nervous system

15. Mark the correct statements about receptor adaptation

a. manifests itself with an increase in the amplitude of the receptor potential
b. manifests itself with a decrease in the amplitude of the receptor potential
c. manifests itself with an increase in the frequency of the action potentials
d. manifests itself with a longer endurance than central adaptation
e. is typical for nociceptors
f. Pacinian corpuscles belongs to the quickly adapted receptors

16. Mark the true statements about the taste

a. a chemical coated in fat is important for the taste
b. the dissolved chemical in the saliva is important for the taste
c. the sweet and spicy taste is due to the activation of G-protein coupled receptors
d. there is also a fifth taste - umami
e. the salty and sour taste is due to the activation of G-protein coupled receptors
f. there is also a fifth taste - capsaicin

17. Mark the true statements about the sense of smell

a. the essence of an adequate olfactory stimulus is a chemical dissolved in nasal mucus
b. we recognize 6 basic odours
c. receptor cells are formed by the cranial nerve I. - n. olfactorius
d. the best recognizable odour is the burn odour
e. the formation of the receptor potential is preceded by the binding of the ligand to the G-protein followed by the opening of the Na + channels
f. olfactory receptor ligands are mineral salts e.g. NaCl dissolved in mucus

18. Mark the correct statements about the taste

a. the taste buds are distributed in the taste peel of the frontal lobe
b. the receptors contain algae on their surface
c. acid taste is mediated through H + signalling through ion channels and not through G-protein coupled receptors
d. there are receptors for several types of flavours in the taste buds
e. the smell or consistency of the food does not affect the perception of taste
f. the final projection area for the sense of taste is located in the hypothalamus because appetite is governed here

19. Meissner bodies

a. they are found in the deeper layers of the skin and are sensitive to higher pressures
b. they are located at the interface of the skin, and they are sensitive to gentle touches
c. they are used to assess the surface roughness
d. are located on non-hairy parts of the body, such as palms, feet, lips, etc.
e. they are located in muscles, tendons and articular ligaments
f. they react to chemicals, so they are chemoreceptors

20. Meissner bodies respond to

a. higher pressure
b. vibration
c. light touches

d. surface roughness
e. to vertical, lateral pressure
f. persistent touches

21. Meissner's corpuscles

a. are in the deeper subcutaneous tissue
b. they respond to higher pressure
c. are at the epidermis-skin interface
d. serve to distinguish surface roughness
e. respond to light touch
f. inform about persistent touch

22. Merkel's disks respond to

a. higher pressure
b. vibration
c. light touches
d. surface roughness
e. to vertical, lateral pressure
f. lingering touches

23. Muscle spindle

a. records the level of tension in the muscle
b. participates in the regulation of muscle tone
c. records pressure and vibration
d. is located in hinged housings
e. is formed by kinocilia
f. is part of the vestibular apparatus

24. Muscle spindles

a. respond to changes in the length of muscle fibers
b. they are used to perceive deep pain
c. are located in tendon attachments
d. they are connected in series with respect to the extrafusal fibers
e. they adapt slowly
f. they are used to perceive a change in temperature

25. Nociceptors

a. are photoreceptors
b. are receptors for pain
c. are receptors for circadian changes
d. they perceive excessively strong, damaging stimuli
e. are hair cells

f. they can be, for example, free nerve endings

26. Nociceptors

a. are pain receptors
b. are receptors for strong stimuli
c. they are activated, for example, by capsaicin
d. they cannot adapt
e. they are inhibited, for example, by menthol
f. they include, for example, the reflex of the Achilles tendon

27. Pacini's corpuscles

a. are in the deeper subcutaneous tissue of the hands
b. they respond to higher pressure
c. are at the epidermis-skin interface
d. serve to distinguish surface roughness
e. respond to light touch
f. respond to vibration

28. Proprioceptors

a. bring impulses from the external environment
b. bring impulses from the internal environment
c. are located in muscles and tendons
d. are located in the walls of internal organs
e. inform about body position and movement
f. inform about changes in the internal environment of the institutions

29. Proprioceptors record information about

a. coordination of chemical changes in internal organs
b. accumulation of urine in the bladder
c. coordination of mechanical changes in internal organs
d. body position and movement
e. thermal changes
f. pain

30. Receptor potential

a. it is caused by local irritation of a sensory neuron or sensory cell
b. it spreads saltatorial along myelinized nerve cell axons
c. after reaching the threshold value, the amplitude is always the same regardless of the intensity of the stimulus - "all or nothing"
d. is subject to adaptation, which reduces the amplitude and frequency of potential generation

e. is reversible - after the stimulus disappears, the ion channels return to the quiescent state
f. it is transmitted to the CNS in the form of an action potential

31. Receptor potential

a. spreads without decrement
b. spreads with decrement
c. is transmitted without summation
d. a summation of stimuli is present
e. it is not the refractory period present but the adaptation
f. an absolute and relative refractory period is present

32. Receptor potential

a. spreads with decrement
b. its amplitude depends on the strength of the stimulus
c. it does not have a refractory period
d. it spreads according to the principle of "all or nothing"
e. spreads without summation
f. it is the transmission of a signal over an axon

33. Sense of smell

a. an adequate stimulus is the concentration of substances dissolved in nasal mucus
b. activates G protein-coupled receptors
c. the receptors are hair cells
d. distinguishes 8 basic scents
e. may vary in humid and dry environments
f. is formed by a three-neuron path

34. Mark, what applies about sense of taste

a. an adequate stimulus is the concentration of substances dissolved in saliva
b. activates G protein-coupled receptors
c. the receptors are hair cells
d. we distinguish 5 basic tastes
e. may vary in humid and dry environments
f. is formed by a two-neuron orbit

35. Sensory organs

a. belong to the peripheral nervous system
b. belong to the central nervous system
c. belong to the nervous system
d. they do not belong to any of them, they form a separate system

e. anatomically they are located in the cranium
f. are located on the surface of the body

36. Sensory receptors include

a. pigment rhodopsin
b. beta2-adrenergic receptor
c. Pacini's body
d. cones
e. insulin receptor
f. mechanoreceptor

37. Smell receptors belong to

a. photoreceptors
b. chemoreceptors
c. nociceptors
d. mechanoreceptors
e. thermoreceptors
f. stereocilia

38. Somatosensory cortex

a. is located in the elongated spinal cord
b. is located in the parietal lobe
c. is responsible for the integration of sensory perceptions
d. the individual bodies are represented proportionally here
e. high-sensitivity organs are represented over a larger area
f. is important for motor functions

39. Mark the correct statements about the taste

a. is recognized by taste buds, with one taste cup containing receptor cells for only one type of taste
b. the most intense is the taste registered at the tip of the tongue, where most taste buds are located
c. the amount of taste buds does not change with age
d. signals from the receptors are transported to the projection regions of the CNS, specifically to the frontal lobe and the limbic system
e. can start an adaptation
f. the spicy "taste" is recognized by the capsaicin TRPV1 receptor

40. Mark, what applies to taste buds

a. for specific taste (flavour) are very specifically localized to the tongue areas
b. contain sensory cells
c. are localized also on the roof of the mouth

d. recognize 4 tastes
e. are capable of regeneration
f. are able to recognize several flavours within one taste bud

41. Taste receptors are located in

a. nasal mucus
b. endolymph
c. perilymph
d. taste buds
e. in saliva
f. in the retina

42. Taste receptors belong to

a. photoreceptors
b. chemoreceptors
c. nociceptors
d. mechanoreceptors
e. thermoreceptors
f. stereocilia

43. The 6 basic odours include

a. forestry
b. flowery
c. fruit
d. vegetable
e. spice
f. sweet

44. Thermoreception

a. ensures response to cold
b. ensures response to heat
c. uses G-protein coupled receptors
d. uses ion channels
e. it can be activated, for example, by capsaicin
f. thermoreceptors are located exclusively in the subcutaneous tissue

45. Thermoreceptors

a. are receptors for light
b. are receptors for pain
c. are receptors for cold and heat
d. perceive excessively strong, damaging stimuli
e. are adaptive

f. respond more intensely to light changes than to constant luminance

46. Mark, what applies to taste

a. the receptors are taste buds that recognize multiple tastes
b. the receptors are taste buds with cilia each recognizing one taste
c. all taste receptors are ligand-gated ion channels
d. taste stimuli are derived from 5 basic tastes
e. taste pathways include the glossopharyngeal (n. glossopharyngeus) and the facial nerve (n. facialis)
f. to examine the taste we can use solutions of NaCl, sucrose, citric acid, quinine, or soy sauce

47. Mark, what applies to TRP ion channels

a. they can be activated by rhodopsin
b. they can be activated by capsaicin
c. their activation causes a feeling of warmth or cold
d. they are found only in the oral cavity
e. they are activated by salty and sour foods
f. respond to changes in pressure and vibration

48. What applies to proprioception?

a. it is also secured by free nerve endings in the skin
b. one of the important functions is to ensure the reflex response of the transversely striated muscle
c. the reception part is the so-called muscle spindles or Golgi tendon organs, which are mainly osmo- and thermosensitive
d. Pacini's bodies are also proprioceptors
e. an important connection between sensory and motor pathways is the brain, where there is a fine-tuning of movement and proper timing
f. signals from the vestibular-cochlear apparatus are part of proprioception

49. What applies to smell?

a. the stimulus is substances dissolved in nasal mucus
b. olfactory sense is not subject to adaptation
c. signal transduction into the CNS occurs through the activation of G-protein coupled receptors, leading to the formation of AP
d. a person can recognize only three types of smells / odours: floral, rotting, burnt
e. the signal from the receptors on the nasal mucosa is routed to the CNS by fibres II. cranial nerve - nervus opticus
f. olfactory stimuli are processed in the limbic system, which is also responsible for creating the memory trace

50. What applies to taste receptors?

a. salty and sour taste is recognized by G-protein coupled receptors
b. the taste buds are located only on the mucosa of the tongue
c. the sense of taste is connected with the sense of smell
d. the signal is routed to the CNS via n. facialis a n. glossopharyngeus
e. each person has the same number of taste buds
f. taste buds have a good regenerative ability that lasts a lifetime

51. What applies to the receptor potential?

a. spreads with decrement
b. is reversible
c. is induced by depolarization and hyperpolarization
d. is irreversible
e. it is induced only by depolarization
f. it spreads without decrement

52. What applies to the receptor potential?

a. it is the transmission of action potential along the axon of a neuron
b. is graded
c. the amplitude is always the same after reaching the threshold potential
d. it can cause also hyperpolarization
e. it adapts over time
f. it never adapts

53. What applies to visceral receptor sensitivity?

a. provides information on stretching the joint bushes
b. provides information on internal bodies
c. includes exclusively mechanoreceptors
d. includes exclusively thermoreceptors
e. includes exclusively nociceptors
f. includes mechanoreceptors, thermoreceptors and nociceptors

54. Mark, what belongs to mechanoreceptors

a. nociceptors
b. Ruffini bodies
c. Paccini's bodies
d. chemoreceptors
e. thermoreceptors
f. Merkel's disks

55. Mark, what belongs to sensory receptors

a. motor neurons that innervate skeletal muscle

b. sensory neurons with free nerve endings
c. specialized receptor cells associated with the sensory neuron by chemical synapse
d. voltage-controlled potassium channels
e. eye, ear, nose, mucous membrane of the tongue and climate, internal organs, skin, musculoskeletal system
f. sensory neurons with encapsulated ends (bodies)

56. Where are taste stimuli processed?

a. in the temporal lobe
b. in the temporal lobe
c. in the head lobe
d. in the frontal lobe
e. in the larynx
f. in the nasopharynx

57. Which cranial nerves process taste information?

a. I. (Olfactory)
b. II. (Optical)
c. X. (Vagus)
d. IX. (Glossopharyngeal)
e. VII. (Facial)
f. IV. (Trochlear)

58. Which of the following statements about hair are true?

a. they are composed predominantly of collagen
b. they are coloured due to the content of melanin
c. they are found on the entire surface of the body
d. the activity of hair follicles is regulated hormonally
e. hair follicles are cyclically active
f. they are erected by means of a pilosebaceous unit

59. Which of the following statements about skin adnexa are true?

a. hairs are keratinized adnexa
b. modified sebaceous glands on the nipples are called the pilosebaceous unit
c. we do not find keratinized adnexa in humans
d. they may have an exocrine function
e. they are evenly distributed in the skin
f. their function is regulated only hormonally

60. Which of the following statements about sweat glands are true?

a. eccrine glands have a thermoregulatory function

b. modified sweat glands include e.g. ceruminous glands
c. ducts of the apocrine glands open into the hair follicles
d. the activity of the eccrine sweat glands is stimulated by the parasympathetic nervous system
e. apocrine glands are simple tubular glands
f. hyperhidrosis is caused by excessive activity of predominantly apocrine glands

61. Which of these cranial nerves are part of the gustatory system?

a. trochlearis
b. olfactory
c. facialis
d. glossopharyngeus
e. opticus
f. trigeminus

62. Which sensitive bodies on the body surface are at the highest amount? Bodies for

a. heat
b. cold
c. contact
d. pain
e. vibration
f. pressure

63. Which type of taste is sensitive to the pH of saliva?

a. umami
b. sweet
c. salty
d. tart
e. sour
f. bitter

Part 3

1. What are the functions of human skin?

    a. thermoregulatory
    b. motor
    c. sensory
    d. endocrine
    e. neurointegrative
    f. immune

2. Mark the correct statements about the stratum corneum

    a. it is a place where melanocytes and keratinocytes divide rapidly
    b. it is richly supplied with blood capillaries
    c. there are "fingerprints"
    d. it consists of cells containing keratin and glycolipid between cells
    e. there are located apocrine glands
    f. it prevents excessive loss of water from the body

3. Which type of afferent nerve fibers conducts deep pain from skin nociceptors?

    a. Aα
    b. Aß
    c. Al
    d. Aδ
    e. B
    f. C

4. Mark the correct statements about epidermis

    a. it contains blood and lymphatic vessels
    b. it contains keratinocytes
    c. fat cells are stored here
    d. it contains cells that turn horny on the surface
    e. it protects the body from mechanical influences
    f. it contains a lot of water

5. Keratinocytes

    a. make up the majority of skin cells
    b. are created in the stratum corneum
    c. ensure skin elasticity by producing elastin and collagen
    d. are responsible for skin colour by creating melanin
    e. ensure the relative water resistance of the skin by producing alpha-keratin
    f. are constantly restored by the mitotic activity of Langerhans cells

6. Keratinocytes

    a. are formed in the stratum corneum
    b. are part of the dermis
    c. create skin pigment
    d. lose nucleus and cell organelles during their terminal differentiation
    e. are sensory cells responsible for sensing touch
    f. are part of the epidermis

7. Corneocytes

    a. are the final stage of keratinocyte differentiation
    b. are specialized keratinocytes that protect the cornea
    c. are consistently eliminated from the skin by desquamation
    d. form the physical, chemical and immunological barrier of the skin
    e. are located in the stratum basale
    f. are located in the stratum corneum

8. Sebum

    a. is released by holocrine secretion
    b. its secretion is stimulated by estrogens
    c. its secretion is stimulated by androgens
    d. is another name for earwax
    e. is produced by sudoriferous glands
    f. is secreted into hair follicles

9. Which substances are stored in the skin and subcutaneous tissue as part of its storage function?

    a. water
    b. triglycerides
    c. vitamin D
    d. hydroxyapatite
    e. sodium
    f. urea

10. Which of the following are skin sensory receptors?

    a. Meissner bodies
    b. apocrine glands
    c. root hair plexus
    d. Merkel cells
    e. nociceptors
    f. keratinocytes

11. Langerhans cells in the skin

a. have endocrine function
b. have the ability to present antigen to immune cells
c. are responsible for the production of collagen and elastin in the skin
d. are specialized mechanoreceptor cells responding to gentle touch
e. are capable of phagocytosis
f. are sensory cells connected to neurons by a serotonergic synapse

12. Sebaceous glands

a. include ceruminous glands
b. are exocrine glands
c. are holocrine glands
d. together with sweat glands form a pilosebaceous unit
e. produce an oily substance called cerumen
f. are regulated by sex hormones

13. Keratinized skin derivatives include

a. head hair
b. body hair
c. pigment spots
d. nails
e. sebaceous glands
f. sweat glands

14. Melanocytes

a. are capable of phagocytosis
b. produce eumelanin and pheomelanin
c. are located in the stratum lucidum
d. do not contain nucleus and organelles
e. are activated by infrared radiation
f. can produce proinflammatory cytokines

15. Which of the following statements about apocrine glands are true?

a. they include sebaceous glands
b. they include mammary glands
c. their secretion is released from the cells by exocytosis
d. their secretion is released by separation of the apical part of the cell
e. their secretion is released by the breakdown of the cell itself
f. they include some sweat glands

16. Which of the following statements about skin are true?

a. it is called dermis
b. its thickness decreases as it ages

c. it has a sensory function
d. it consists of 5 layers
e. its average thickness without subcutaneous adipose tissue is 0.5 cm
f. its thickness is the same on all body parts

17. Which of the following statements about skin adnexa are true?

a. hair is a type of keratinized adnexa
b. modified sebaceous glands on the nipples are called the pilosebaceous unit
c. humans do not have keratinized adnexa
d. they may have an exocrine function
e. they are evenly distributed in the skin
f. their function is regulated only hormonally

18. Which of the following statements about hair are true?

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b. modified sweat glands include e.g. ceruminous glands
c. ducts of the apocrine glands open into the hair follicles
d. the activity of the eccrine sweat glands is stimulated by the parasympathetic nervous system
e. apocrine glands are simple tubular glands
f. the activity of the eccrine sweat glands is regulated via M3 receptor

20. Mark the correct statements about sweat glands

a. they are present in the skin of the whole body except for the palms and soles of the feet
b. holocrine sweat glands produce aqueous sweat with a slightly acidic pH
c. their secretion is controlled by acetylcholine via the M3 receptor
d. apocrine sweat glands are activated under stress
e. apocrine sweat glands are important for thermoregulation
f. they are activated by the sympathetic nervous system

21. Mark the cells that are involved in the immune function of the skin

a. melanocytes
b. Merkel cells

c. Langerhans cells
d. dermal dendritic cells
e. myoepithelial cells
f. keratinocytes

22. Which of the following statements are true?

a. the pH of the skin is about 7.4 - 6.5
b. melatonin provides the protective function of the skin against UV radiation
c. macrophages are the only immune cells found in the skin
d. the skin acts as a storage of water, fats and salts
e. skin can most easily absorb lipophilic molecules
f. mechanoreceptors are evenly distributed in the skin

23. Mark the structures that are located in the dermis

a. blood capillaries
b. free nerve endings
c. elastin and collagen fibers
d. α-keratin fibers
e. stratified squamous epithelium
f. dermal papillae

24. Mark the structures that are located in the hypodermis

a. white adipose tissue
b. glandular part of sweat glands
c. Meissner bodies
d. glandular part of sebaceous glands
e. dermal papillae
f. connective tissue

25. Epidermis

a. is the upper layer of the skin
b. is composed of a papillary and a reticular layer
c. contains a dense network of capillaries
d. contains Langerhans cells
e. is constantly renewed by the formation of new keratinocytes in the stratum basale
f. fulfils its barrier function due to its high collagen content

26. Body temperature

a. is constant throughout the day
b. fluctuates throughout the day
c. is lowest in the morning

d. is lowest around 6 pm
e. is the same throughout the body
f. is highest in the mouth

27. Skin temperature

a. is higher than the temperature in the brain
b. depends on the ambient temperature
c. is lower than the temperature in the liver
d. does not change during the day
e. changes according to the circadian rhythms
f. is not affected by ambient temperature

28. The thermoregulation centre is located in

a. posterior hypothalamus
b. anterior pituitary
c. cerebral cortex
d. medulla oblongata
e. left hemisphere
f. cerebellum

29. What happens in the body in a cold environment?

a. vasodilation of arteriovenous anastomoses in the subcutaneous tissue
b. blood flow to the skin is reduced
c. vasoconstriction of blood vessels in the skin occurs by activating the sympathetic nervous system
d. perspiration is activated
e. blood is redistributed to the skin
f. blood flow to the acral parts of the body increases

30. The sensation of gentle touches on the skin is mediated by

a. Merkel discs
b. Meissner's corpuscles
c. Pacinian bodies
d. thermoreceptors
e. nociceptors
f. Vater-Pacini corpuscles

31. Heat is released from the body

a. by radiation
b. at regular intervals
c. by the conduction
d. by respiration

e. by evaporation
f. only during physical activity

32. Corium

a. is called the dermis
b. is predominantly composed of keratinocytes
c. is made of keratinized stratified squamous epithelium
d. contains mechano-, thermo- and nociceptors
e. is important for wound healing
f. contains immune cells

33. The increase in body temperature of the body is carried out through

a. muscle tremors
b. an increase in metabolism
c. peripheral vasoconstriction
d. peripheral vasodilatation
e. activation of white fat
f. evaporation of water

34. Keratinocytes

a. form protective keratinized layer in epidermis
b. can be found in bone tissue
c. contain the protein called keratin
d. form inner lining of blood vessels
e. form pseudostratified epithelium in bronchi
f. have cubic shape in the lower layers of epidermis

3 REFERENCES USED AND RECOMMENDED

AMERMAN, Erin, 2018. *Human Anatomy & Physiology*. 2nd edition. NY, NY: Pearson. ISBN 978-0-13-455351-1.

BARRETT, Kim, Susan BARMAN, Scott BOITANO a Heddwen BROOKS, 2015. *Ganong's Review of Medical Physiology, Twenty-Fifth Edition*. 25th edition. New York, NY: McGraw-Hill Education / Medical. ISBN 978-0-07-182510-8.

CAROLA, Robert, John P. HARLEY a Charles R. NOBACK, 1992. *Human Anatomy & Physiology*. 2nd edition. New York: McGraw-Hill College. ISBN 978-0-07-010964-3.

MARIEB, Elaine a Katja HOEHN, 2018. *Human Anatomy & Physiology*. 11th edition. Hoboken, New Jersey: Pearson. ISBN 978-0-13-458099-9.

PEATE, Ian a Suzanne EVANS, ed., 2020. *Fundamentals of Anatomy and Physiology: For Nursing and Healthcare Students*. 3rd edition. Hoboken, NJ: Wiley-Blackwell. ISBN 978-1-119-57648-8.

SEMBULINGAM, K. a Prema SEMBULINGAM, 2012. *Essentials of Medical Physiology*. 6th edition. B.m.: Jaypee Brothers Medical Pub. ISBN 978-93-5025-936-8.

SILBERNAGL, S. a A. DESPOPOULOS, 2004. *Atlas fyziologie člověka*. 6. Praha: Grada Publishing. ISBN 80-247-0630-X.

SOLOMON, Eldra Pearl, 2015. *Introduction to Human Anatomy & Physiology - Text and Elsevier Adaptive Learning Package*. 4th edition. B.m.: Saunders. ISBN 978-0-323-40176-0.

WIDMAIER, Eric, Hershel RAFF a Kevin STRANG, 2018. *Vander's Human Physiology*. 15th edition. New York, NY: McGraw Hill. ISBN 978-1-259-90388-5.

YOUNG, Kelly A., James A. WISE, Peter DESAIX, Dean H. KRUSE, Brandon POE, Eddie JOHNSON, Jody E. JOHNSON, Oksana KOROL, J. Gordon BETTS a Mark WOMBLE, 2013. *Anatomy and Physiology by OpenStax*. First edition. B.m.: XanEdu Publishing Inc. ISBN 978-1-938168-13-0.

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