МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ
КЫРГЫЗСКОЙ РЕСПУБЛИКИ
ОШСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ
МЕЖДУНАРОДНЫЙ МЕДИЦИНСКИЙ ФАКУЛЬТЕТ

Кафедра анатомии, гистологии и нормальной физиологии

РАССМОТРЕНО
на заседании кафедры протокол № 1
от «29» 08 2025 года

Зав. кафедрой _____ Джолдубаев С.Ж.

УТВЕРЖДАЮ_____

Председатель УМС ММФ,
к.э.н доц., Базиева А.М.
"_____"_____2025г.

ФОНД ТЕСТОВЫХ ЗАДАНИЙ
для итогового контроля по дисциплине
«Histology and cytology»
на 2025-2026 учебный год
Направление: 560001 – лечебное дело (GM)

курс –1 , семестр – 1

Наименование дисциплины	Кредит	Аудиторные занятия		СРС
		Лекции	Практические	
Предмет	**4 кр**	**20ч**	**28ч**	**72ч**
Кол-во тестовых вопросов	**400**			

Составители:
К.б.н., доцент, Ташматова Н.М. _____
Ст.преподаватель: Тороев Д.И._____
Преподаватель: Алимбекова А.А._____
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Преподаватель: Бакиров С.Б._____
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Ош-2025

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Выписка из протокола № 1
заседания кафедры анатомии, гистологии и нормальной физиологии
международного медицинского факультета Ошского государственного университета

от «29» 08 2025 г.

Всего членов: 22
Присутствовали: 22
Отсутствовали: 0

ПОВЕСТКА ДНЯ:

3. **Утверждение экзаменационных тестовых вопросов по дисциплинам кафедры за 2 семестр 2025-2026 учебного года.**

Слушали: зав. кафедрой к.м.н., доцента Джолдубаева С.Ж., который ознакомил присутствующих количеством, структурой и содержанием экзаменационных тестовых вопросов за зимний семестр текущего учебного года.

Подробно остановился на каждый предмет отдельно:

1.1. Об утверждении экзаменационных тестов по предметам кафедры для студентов ближнего и дальнего зарубежья:

Сетка часов по учебному плану:

Дисциплина	Всего час	Количество часов			СРС	Отчетность
		Аудиторные занятия				
		Ауд. зан.	Лекция	Практ.		
предмет						
I сем.		4 кр	20ч	28ч	72ч	Экзамен
Количество экзаменационных тестов		400 (в т.ч. в формате TF)				

Выступили: ст. препод., Нуруев М.К., доцент, Ташматова Н.М., ст.препод. Пайзилдаев Т.Р., которые единогласно поддержали количество, структуру и содержание экзаменационных тестовых вопросов по предметам кафедры.

Решили:

1. Утвердить экзаменационные тестовые вопросы по предметам кафедры за зимний семестр 2025-2026 учебного года.
2. Утвердить обращение кафедры на имя УМС факультета.

Постановили:

1. Принять к сведению выступление зав. Кафедрой, доцента Джолдубаева С.Ж.
2. Рекомендовать обращение кафедры на рассмотрения УМС факультета.

Председатель: доцент, Джолдубаев С.Ж. _____

Секретарь: преп. Ташимбетова У. _____

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Examination tests in histology, cytology and embryology for students from abroad for the academic year 2025-2026

1. In preparing tissue for routine light microscopic study, which procedure immediately precedes clearing the specimen with an organic solvent?
- Dehydration;
- b. Fixation;
- c. Staining;
- d. Clearing;
- e. Embedding.

2. Which of the following staining procedures relies on the cationic and anionic properties of the material to be stained?
- Enzyme histochemistry;
- b. Periodic acid-Schiff reaction;
- c. Hematoxylin & eosin staining;
- d. Metal impregnation techniques.

3. In a light microscope used for histology, resolution and magnification of cells are largely dependent on which component?
- Condenser;
- b. Objective lens;
- c. Eyepieces or ocular lenses;
- d. Specimen slide;
- e. The control for illumination intensity.

4. Cellular storage deposits of glycogen, a free polysaccharide, could best be detected histologically using what procedure?
- Autoradiography;
- b. Electron microscopy;
- c. Enzyme histochemistry;
- d. Hematoxylin & eosin staining;
- e. Periodic acid-Schiff reaction

5. Adding heavy metal compounds to the fixative and ultrathin sectioning of the embedded tissue with a glass knife are techniques used for which histological procedure?
- Scanning electron microscopy;
- Fluorescent microscopy;
- Enzyme histochemistry;
- Confocal microscopy;
- Transmission electron microscopy

6. Resolution in electron microscopy greatly exceeds that of light microscopy due to which of the following?
- The wavelength of the electrons in the microscope beam is shorter than that of the beam of light.
- The lenses of an electron microscope are greatly improved quality.
- For electron microscopy the tissue specimen does not require staining.
- An electron microscope can be much more finely controlled than a light microscope.

7. Microscopic autoradiography uses radioactivity and can be employed to study what features in a tissue section?
- The types of enzymes found in various cell location;
- Cellular sites where various macromolecules are synthesized;
- c. The sequences of mRNA made in the cells;
- d. The dimensions of structures within cells;
- e. The locations of genes transcribed for specific mRNA.

8. To identify and localize a specific protein within cells of the extracellular matrix one would best use what approach?

- Autoradiography;
- Enzyme histochemistry;
- Immunochemistry;
- Transmission electron microscopy;
- Polarizing microscopy.

9. In situ hybridization is a histological technique used to visualize what type of macromolecule?

- Proteins;
- Carbohydrates;
- Certain enzymes;
- Nucleic acids;
- Lipids

10. Hospital laboratories frequently use unfixed, frozen tissue specimens sectioned with a cryostat for rapid staining, microscopic examination, and diagnosis of pathological conditions. Besides saving much time by avoiding fixation and procedures required for paraffin embedding, frozen sections retain and allow study of what macromolecules normally lost in the paraffin procedure?

- Carbohydrates;
- b. Small mRNA;
- c. Basic proteins;
- d. Acidic proteins;
- e. Lipids.

11. What is the resolution of a modern electron microscope?

- 0,002 nm;
- b. 2 – 5, 0 nm;
- c. 10, 0 nm;
- d. 0, 02 nm.

12. Which microscopy increases the contrast of structures and studies living, unpainted cells?

- luminescence;
- polarization;
- phase-contrast;
- light microscopy.

13. When and by whom was the microscope improved, which made it possible to study the structure of tissues?

- M.Malpigi, 1674y;
- R. Huck, 1665;
- N. Grew, 1772;
- A. Levenguk, 1668.

14. Basophilia of the cytoplasm is characteristic of cells:

- actively secreting mucus;
- accumulating lipids;
- having cilia;
- having microvilli;
- actively synthesizing proteins

15. At what stage of preparation of histological preparations the intravital structure of a tissue is preserved by rapid coagulation of its proteins:

- dehydration;
- pouring into special media;

- fixation;
- manufacture of sections;

16. Indicate the correct alternation of the main steps in the preparation of histological preparations:
- fixation, dehydration, sectioning, embedding, staining, and incision of slices;
- dehydration, fixation, embedding, sectioning, staining slices and concluding slices;
- fixation, dehydration, embedding, staining of slices and conclusion of slices;
- fixation, dehydration, embedding, sectioning, staining of slices and conclusion of slices;
- fixation, dehydration, sectioning, staining of slices, embedding and conclusion of slices.

17. Which step of the preparation of histological preparations the lifetime structure of tissue is preserved by rapid coagulation of it's proteins:
- dehydration;
- embedding;
- fixation;
- sectioning;
- staining and incision of slices.

18. In which step of the preparation of histological preparations is contrast given to tissue structures:
- fixation;
- dehydration;
- embedding;
- sectioning;
- staining and imaging of slices.

19. In which step of the preparation of histological preparations is given density and homogeneity of the taken material:
- fixation;
- dehydration;
- embedding;
- sectioning;
- staining and imaging of slices.

20. At which stage of preparation of histological preparations a certain thickness of the taken material is achieved:
- fixation;
- dehydration;
- embedding;
- sectioning;
- staining and imaging of slices.

History of the development of histology as a science.

21. Specify the branch of medicine that studies the structure of human tissues.
a) General histology
b) Human histology
c) Private histology
d) Tissue histology
e) No correct answer

22. The first descriptions of fabrics are found in the works...
a) Ibn Sina
b) Einstein
c) R. Hooke
d) Haeckel
e) Aristotle

23. Specify who introduced the concept of a cell?

a) Haeckel
b) Aristotle
c) Hook
d) Hippocrates
e) Virchow

24. When was histology a full-fledged academic discipline?
a) 19th century
b) XX century
c) XII century
d) XI century
e) XV century

25. Indicate the microscopic period
a) 1900-2001
b) 1655-1950
c) 1665-1950
d) 1656-1950
e) 1655-1905

26. Specify the smallest unit of a living organism?
a) granule
b) Epithelium
c) Cell
d) Core
e) Chromosome

27. Specify when the cell center is open?
a) In 1875 by Hertwig
b) in 1605 Hooke
c) 1995 Semenov
d) 1892 by Haeckel
e) 1605 Virchow

28. Name the year when the modern stage of development of histology begins?
a) 1905
b) 1995
c) 1955
d) 1805
e) 1950

29. Define oxyphilia
a) The ability of histological structures to stain in different colors;
b) The ability of histological structures to stain with acidic dyes;
c) The ability of histological structures to stain in a color that differs from the color of the dye in solution;
d) The ability of histological structures to stain with basic dyes;
e) The ability of histological structures for selective staining

30. Ultraviolet microscopy allows you to:
a) increase the resolution of the microscope;
b) determine the amount of a substance in cells;
c) detect substances of various chemical nature in cells and tissues;
d) determine the nature of the arrangement of molecules in cells;
e) determine the intensity of biochemical processes in cells

31. Indicate when the first microscope was designed:
a) Galileo Galilei in 1609-1610;
b) Cornelius Drebbel in 1617-1619;
c) Robert Hooke in 1665;
d) Ernst Abbe in 1873;
e) Johann Farber in 1625.

32. Specify the main provisions of the cell theory:
a) Developed by M. Schleiden and T. Schwann, supplemented by A. Keliker;
b) Developed by M. Schleiden and T. .schwann, supplemented by J. Purkyne;

c) Developed by M. Schleiden and T. Schwann, supplemented by R. Virchow;
d) Developed by M. Schleiden, supplemented by R. Virchow;
e) Developed by T. Schwann, supplemented by R. Virchow

Cytology

33. The spesifity of biological membranes functions is possible due to:
a) the presence of pors;
b) the surface charge;
c) receptirs;
d) the pH of the medium;
e) oxygen saturation of the medium.

34. The glycoliprotein complex which is the external part of the cell membrans is called:
a) a villus;
b) a desmosome;
c) a flagellum;
d) the glycocalyx;
e) an ion channel.

35. The intercellular junction where ionic channels pierce the adjacent membranes is called:
a) desmosome;
b) nexus;
c) tight junction;
d) synapse;
e) lateral interdigitations.

36. The disk-shaped intercellular junction where a dense plaque with filaments is present on the cytoplasmic surface of each opposing plasma membrane is called:
a) desmosome:
b) nexus;
c) tight junction;
d) synapse;
e) lateral interdigitations.

37. The intercellular junction that blocks the substance access to the intercellular space is called:
a) desmosome:
b) nexus;
c) tight junction;
d) synapse;
e) lateral interdigitations.

38. Cytoplasm basophilia is inherent in the cells that:
a) have cilia;
b) accumulate lipids;
c) actively synthesize proteins;
d) accumulate glycogen;
e) synthesize mucus.

39. Basophilia of the cytoplasm is characteristic of the following kind of cells:
a) shrinking cells;
b) cell which contain a lot of RNA in the cytoplasm;
c) cell which contain Hgb;
d) cell which accumulate lipids;
e) aging cell.

40. The proteins of intracellular membranes are syntehesised in:
a) the smoth ER;
b) the rougt ER;
c) mitochondria;
d) lysosomes;
e) peroxisomes

41. New mitochondria of a cell are formed:
a) in the Golgi apparatus;
b) in the rougt ER;
c) in the smooth ER;
d) as a result of mitochondria division by procariotic binary fission;
e) in the nucleus.

42. Microfilaments are composed of the following proteins:
a) actin;
b) desmin;
c) keratin;
d) vimentin;
e) integrin.

43. Ribosomal subunits are formed in:
a) the smoth ER;
b) the rougt ER;
c) the Golgi apparatus;
d) nucleoli;
e) mitochondria.

44. The function of peroxisomes is:
a) protein sinthesis;
b) ATP sinthesis;
c) deactivation of hydrogen peroxide;
d) digestion of absorbed substances;
e) RNA sinthesis.

45. As a result of ionising radiation some cell organelles are destroyed in some cells. How will their residues be utilised by the cell?
a) an autophagy;
b) phagocytosis;
c) endocytosis;
d) exocytosis

46. The following is synthesised in the nucleous:
a) mRNA;
b) rRNA;
c) DNA;
d) ATP;
e) Proteins

47. The following structures are correspond to the zones of primary strangulations (centromeres) of mitotic chromosomes:
a) telomeres;
b) nucleolar organisers;
c) kinetochores;
d) nucleosomes;
e) pores.

48. Heterochromatin is:
a) an actively working part of chromosomes;
b) an inactive part of chromosomes
c) a nucleolar organizer;
d) an artifact;
e) a carbohydrate.

49. If the cell, have a villa, performs the following function:
a) provides passive diffusion of water;
b) promotes the movement of substances near its surface;
c) transmits a nerve impulse;
d) participates in phagocytosis;
e) absorbs substances.

50. Protein involved in the formation of bordered endocytotic vesicles:
a) calmodulin;
b) myosin;
c) tubulin;
d) dynein;
e) clathrin.

51. Violation of cytotomy in mitosis leads to:
a) the appearance of polyploid nuclei;
b) transfer substances through death;
c) the appearance of abnormal cells
d) the formation of giant single-nucleated cells;
e) the appearance of binary and multinuclear cells

52. Tell us, cilia can perform the following function:
a) the plasmolemma;
b) participates in the reabsorption of water;
c) transmit nerve impulses;
d) absorbs organic substances;
e) promotes the movement of substances on the cell surface.

53. Tell us, what is endocytosis?
a) the transport of substances within the cell;
b) synthesis of substances inside the cell;
c) changing the shape of the cell
d) transport of substances from the cell;
e) transport of substances inside the cell

54. Which organelle takes part in the processes of intracellular digestion:
a) the Golgi complex;
b) cilia;
c) mitochondria;
d) ribosomes;
e) lysosomes

55. What is the programmed cell death?
a) paranecrosis;
b) endomitosis;
c) cytokinesis;
d) necrosis;
e) apoptosis.

56. One cell has a well-defined Golgi apparatus. The rough endoplasmic reticulum is abundant, there are mitochondria and a centrosome. The other cell contains many mitochondria, a large number of lysosomes and a few membranes of the rough and smooth endoplasmic reticulum. What are the functions of these cells? Does protein synthesis take place in them?
a) 1st – formation of secretion, active synthesis of intracellular digestion; 2nd – the process of protein is going on.
b) 1st – formation of lipids, active synthesis of fat is going on; 2nd – the process of intracellular supply.
c) 1st – formation of secretion, active synthesis of protein is going on; 2nd – the process of intracellular digestion.
d) 1st – formation of secretion, active synthesis of protein is going on; 2nd – the process of extracellular digestion

57. At the lesson a student is examining a microscopic slide under the microscope with the magnification of the lens 40 times and of the eyepiece – 15 times. How many times is the visible image of the structures bigger than the real one?
a) 200 times;
b) 400 times;
c) 600 times;
d) 300 times;
e) 55 times

58. On the free surface of the cells there are structures where 9 peripheral pairs and 2 central pairs of microtubules are visible under the electron microscope. What are the names of these structures?
a) cilia;
b) villi;
c) invagination;
d) cell center;
e) dendrite.

59. In a histological specimen we can see neurons with large light-colored nuclei and nucleoli. Evaluate the activity of protein synthesis in these sells.
a) active synthesis of lipids is going on
b) active cell division is going on
c) active synthesis of myelin is going on
d) active synthesis of protein is going on

60. Forensic examination of a blood smear determined that the blood belongs to a woman. How could they come to such a conclusion?
a) by the presence of Hb in red blood cells
b) by the presence of Barr bodies in white blood cells
c) by the presence of eosinophil granules in white blood cells
d) by the presence of basophil granules in white blood cells

61. Which cytoplasmic components are the main constituents of the dark precipitate that forms in reticulocytes upon staining with the dye cresyl blue?
a) Golgi complexes;
b) Hemoglobin;
c) Nucleoli;
d) nuclear fragments;
e) Polyribosomes

62. Which process occurs during granulopoiesis but not during erythropoiesis?
a) Cells lose their capacity for mitosis
b) Euchromatin content increases
c) Nucleus becomes increasingly lobulated

d) Overall cell diameter decreases
e) Overall nuclear diameter decreases

Cell nucleus. Cell division

63.The following is synthesised in the nucleous:
- mRNA
- rRNA
- DNA
- ATP
- Proteins

64.The following structures are correspond to the zones of primary strangulations (centromeres) of mitotic chromosomes:
- telomeres
- nucleolar organisers
- kinetochores
- nucleosomes
- pores

65.The shortest mitosis phase is:
- a prophase
- a metaphase
- an anaphase
- a telophase
- interphase

66.Heterochromatin is:
- an actively working part of chromosomes
- an inactive part of chromosomes
- a nucleolar organiser
- an artifact
- a carbohydrate

67.Duplication of DNA quantity occurs in the following phase of the cell cycle:
- G1
- G2
- S
- G0
- D

68.Daughter chromosomes move to the poles of the dividing cell during the following phase:
- prophase
- metaphase
- anaphase
- telophase
- cytokinesis

69. In a histological specimen we can see neurons with large light-colored nuclei and nucleoli. Evaluate the activity of protein synthesis in these sells.
- active synthesis of lipids is going on
- active cell division is going on
- active synthesis of myelin is going on

- active synthesis of protein is going on

70.. Forensic examination of a blood smear determined that the blood belongs to a woman. How could they come to such a conclusion?

- by the presence of Hb in red blood cells
- by the presence of Barr bodies in white blood cells
- by the presence of eosinophil granules in white blood cells
- by the presence of basophil granules in white blood cells

71. Determine the strongest type of cell contact:
a) nexus;
b) desmosome;
c) synapse;
d) adhesion.

72. In the interphase nucleus, euchromatin predominates, determine the functional activity of the cell:
a) it is at one of the stages of mitosis;
b) there is an active synthesis of the substance;
c) functionally poorly loaded;
d) apoptosis

Human embryology.

73.Indicate the duration of a normal pregnancy in a person -
a) 45 weeks
b) 35 - 36 weeks
c) 25 weeks
d) 39-40 weeks

74. The embryo is represented by amniotic and yolk sacs surrounded by chorion, in time
a)7 days
b) 14 days
c) 17 days
d) 21 days

75. Rudiment, represented by cellular material, plunging through the Hensen knot into the endoderm before the elements of the middle are formed germ layer is called
a) neuroectoderm
b) axial mesoderm
c) prechordal plate
d) chord

76. Separation of the body of the embryo from the provisional organs leads to the formation
a) amniotic folds
b) axial mesoderm
c) in - trunk folds
d) cytotrophoblast

77. Specify the terms of the fetal period in embryogenesis -
a) 20 - 40 weeks
b) 9 - 40 weeks
c) 2 - 8 weeks
d) the first two weeks

78. Specify, the embryonic period in human embryogenesis is called
a) the first day

b) the first week
c) 2 - 8 weeks
d) the first 15 weeks

79. A cavity has formed in the human embryo and blastomere differentiation is taking place. Blastomeres in the result of this differentiation in the second week of gestation is the appearance of
a) placenta
b) embryoblast
c) cyto- and symplastotrophoblast
d) amniotic and yolk sacs

80. The most active laying of all organs and systems of the body is
a) in the first week of development
b)up to 14 days
c) from 2 to 8 weeks
d) from 2 to 20 weeks

81. Specify, the first phase of gastrulation occurs in the human embryo.
a) from 4 to 7 days
b) from 8 to 14 days
c) from 15 to 21 days
d) from 21 to 40 days

82. Select the first fetal organ that is included in hematopoiesis - this is
a) intestines
b) thymus
c) liver
d) bone marrow

83. Allantois performs functions in humans
a) a conductor along which blood vessels sprout from the body of the embryo to the placenta
b) respiration and excretion
c) endocrine secretion
d) formation of hematopoietic cells and gonoblasts

84. The composition of the umbilical cord (umbilical cord) includes all of the listed components, except
a) mucous connective tissue (Wharton's jelly)
b) two arteries and one vein
c) rudiments of the yolk sac and allantois
d) two veins and one artery

85. Specify what is involved in the formation of the maternal part of the placenta?
a) the basal part of the decidua
b) capsular part of the decidua
c) parietal part of the decidua
d) myometrium

86. Cleavage of a human egg
a) full uniform synchronous
b) full non-uniform asynchronous
c) incomplete uniform synchronous
d) incomplete non-uniform asynchronous

87. Specify the normal location of the human embryo, consisting of 3 blastomeres
a) implantation in the endometrium
b) fixation to the wall of the uterus
c) in the uterine cavity

d) in the cavity of the fallopian tube

88. The human embryo in embryogenesis becomes two-layered
a) by the end of the first week
b) by the end of the second week
c) by the end of the third week
d) by the end of the second month

89. In the upper, outer layer of the embryo, after the start of the second phase of gastrulation, there will be
a) intestinal endoderm and prechordal plate
b) Mesenchyme and neuroectoderm
c) Skin ectoderm and neuroectoderm
d) Mesoderm and chord

90. Embryonic physiological hernia of the umbilical cord disappears
a) by three weeks of intrauterine life
b) by three months of intrauterine life
c) by six months of intrauterine life
d) to the neonatal period

91. The formation of the human amnion begins with the formation
a) amniotic folds
b) trunk folds
c) yolk sac
d) extraembryonic mesenchyme

92. The composition of the secondary villi of the chorion includes all of the listed elements, except
A) fetal blood vessels
b) maternal blood vessels
c) extra-embryonic mesenchyme
d) cyto- and symplastotrophoblast

93. The composition of the placental barrier in humans includes all of the above structures, except
a) walls of hemocapillaries of the uterus
b) Walls of hemocapillaries of the villi
c) Connective tissue of the villi
d) symplasto- and cytotrophoblast

94. Specify, the most critical periods in the development of the human embryo and fetus are all of the indicated,
Besides
a) gastrulation
b)Implantation
c) The timing of the laying of each system of the body
d) Late pregnancy

95. The human embryo is made up of 8 blastomeres.
a) on the 1-2 day of pregnancy
b) on the 3rd-4th day of pregnancy
c) on the 7th-8th day of pregnancy
g) on the 10-14th day of pregnancy

96. Indicate, blastomeres are the source of trophoblast development.
a) small dark
b) small light
c) large dark
g) large light

97. In the early phase of gastrulation, the cellular material of the epiblast moves predominantly by type
a) intussusception and epiboly
b) migrations and delaminations
c) invaginations and delaminations
d) migration and epiboly

98. From the second week of embryogenesis until the moment of birth, the normal development of the human embryo and fetus goes
a) in the uterine cavity
b) in the functional layer of the endometrium
c) in the basal layer of the endometrium
d) in the myometrium

99. After the beginning of the second, late phase of gastrulation, in the middle layer of the embryo are located
a) ectoderm and neuroectoderm
b) endoderm and mesenchyme
c) mesoderm and chord
d) epiblast and hypoblast

100. What is the anatomical structure of the human placenta?
a) discoidal
b) belt
c) cotyledon
d) diffuse

101. Amnion, containing amniotic fluid, performs all functions in the embryo and fetus, Besides
a) ensuring nutrition and gas exchange of the fetus
b) preventing adhesion of the fetus to the surrounding tissues
c) providing the ability to make movements
d) protection of the fetus in case of concussion, trauma to the mother

102. Name the histological structure of the human placenta?
A) hemochorial
b) endotheliochorial
c) desmochorionic
d) epitheliochorial

103.The placenta performs all of the following functions in the human fetus except
a) the exchange of substances between the blood of the mother and the fetus
b) hematopoietic
c) detoxifying and protective
d) endocrine

104. The human egg is
a) alecithal
b) telolecithal
c) primary isolecithal
d) secondary isolecithal

105. Trophoblast is part of
a) epiblast
b) inner cell mass
c) hypoblast

d) blastocysts

106. Specify the usual number of blastomeres at the time of implantation
a) 3
b) 8
c) 56
d) over 100

107. Implantation of the embryo into the wall of the uterus usually occurs at the age
a) 1-2 days
b) 3-4 days
c) 6-8 days
g) 10-14 days

108.Implantation of the human embryo begins at the stage
a) zygotes
b) morula
c) blastulae
d) gastrula

109. In the construction of the body of the embryo in the second week of development will participate
a) the roof of the yolk sac and the roof of the amniotic sac
b) the bottom of the yolk sac and the roof of the amniotic sac
c) the bottom of the amniotic sac and the roof of the yolk sac
d) the bottom of the amniotic sac and the bottom of the yolk sac

110. Indicate whether the formation of a two-layer embryo from epiblast cells is carried out basically the way
a) invaginations
b) epiboly
c) migration
d) delamination

111. In the lower, inner layer of the embryo, after the beginning of the second phase of gastrulation, there are
a) endoderm and chord
b) notochord and prechordal plate
c) axial mesoderm and ectoderm
d) endoderm and prechordal plate

112. Secondary villi of the chorion include
a) cytotrophoblast and symplastotrophoblast
b) trophoblast, extra-embryonic mesenchyme and fetal blood vessels
c) trophoblast, extra-embryonic mesenchyme and maternal blood vessels
d) allantois and amnion

113. Fertilization normally occurs in the:
a) Uterus
b) Cervix
c) Ampulla of uterine tube
d) Ovary

114. The fusion of male and female pronuclei is called:
a) Cleavage
b) Implantation
c) Syngamy
d) Gastrulation

115. The morula consists of approximately:
a) 4 cells
b) 8 cells
c) 16 cells
d) 64 cells

116. Blastocyst implantation occurs around day:
a) 3
b) 5
c) 7
d) 14

117. The trophoblast forms the:
a) Embryo
b) Placenta
c) Yolk sac
d) Amnion

118. Gastrulation results in formation of:
a) Two germ layers
b) Three germ layers
c) Four germ layers
d) Neural tube

119. Mesoderm gives rise to:
a) Epidermis
b) Nervous system
c) Muscles
d) Intestinal epithelium

120. The notochord induces formation of the:
a) Heart
b) Neural tube
c) Gut
d) Liver

121. Neurulation leads to formation of the:
a) Somites
b) Neural crest
c) Neural tube
d) Placenta

122. Somites differentiate into:
a) Dermatomes, myotomes, sclerotomes
b) Endoderm
c) Neural crest
d) Placental tissue

123. The amniotic cavity is filled with:
a) Blood
b) Mucus
c) Amniotic fluid
d) Lymph

124. The yolk sac is important for:
a) Neural development

b) Early hematopoiesis
c) Placental exchange
d) Lung development

125. The placenta allows:
a) Mixing of maternal and fetal blood
b) Gas and nutrient exchange
c) Fetal digestion
d) Hormone breakdown

126. The umbilical cord contains:
a) One artery and one vein
b) Two arteries and one vein
c) Two veins and one artery
d) Three arteries

127. Neural crest cells give rise to:
a) Skeletal muscle
b) Melanocytes
c) Hepatocytes
d) Neurons of CNS only

128. The primitive streak appears during:
a) Cleavage
b) Blastulation
c) Gastrulation
d) Neurulation

129. Endoderm forms the epithelium of:
a) Skin
b) CNS
c) Digestive tract
d) Muscles

130. The allantois is involved in:
a) Nervous system development
b) Blood vessel formation
c) Muscle differentiation
d) Brain development

131. Chorionic villi increase:
a) Hormone synthesis
b) Surface area for exchange
c) Amniotic fluid volume
d) Neural induction

132. The embryonic period lasts until week:
a) 4
b) 6
c) 8
d) 12

133. Fetal period is characterized by:
a) Organogenesis
b) Growth and maturation
c) Germ layer formation
d) Neural tube closure

134. Closure of the neural tube begins in the:
a) Cervical region
b) Caudal region
c) Cranial region
d) Thoracic region

135. Failure of neural tube closure leads to:
a) Spina bifida
b) Cleft palate
c) Hernia
d) Atresia

136. The embryonic disc is initially:
a) Trilaminar
b) Bilaminar
c) Unilaminar
d) Multilaminar

137. Epiblast forms:
a) Trophoblast
b) Amnion and embryo
c) Yolk sac only
d) Placenta only

138. Hypoblast contributes to the:
a) Amnion
b) Yolk sac
c) Neural tube
d) Somites

139. The chorion is formed from:
a) Mesoderm only
b) Trophoblast only
c) Trophoblast and mesoderm
d) Endoderm

140. Cardiac development begins in week:
a) 1
b) 2
c) 3
d) 6

141. Limb buds appear during week:
a) 3
b) 4
c) 6
d) 8

142. The most critical period for teratogenesis is:
a) Pre-embryonic period

b) Embryonic period
c) Fetal period
d) Postnatal period

Epithelial tissue.

143. The epithelia are simple if:
a) their cells are polarized;
b) their cells form sheets;
c) all their cells rest on the basement membrane;
d) not all their cells reach the apical surface;
e) their cells are continuously sloughed.

144. The epithelia are stratified if:
a) their cells are continuously sloughed;
b) their cells form sheets; c) their cells are polarized;
d) all their cells can divide;
e) not all their cells are in contact with the basement membrane.

145. The main difference between stratified epithelium and simple epithelium is:
a) the presence of the basement membrane
b) borderline location;
c) the contact of all the cells in the epithelial layer with the basement membrane;
d) the contact of only one layer of cells (the basal layer) with the basement membrane
e) considerable thickness of the epithelial layer;

146. In an epithelium all cells of a cylindrical form and all lie on a basal membrane. What is a type of an epithelium?
a) pseudostratified columnar epithelium
b) the simple columnar epithelium;
c) stratified squamous transitional;
d) stratified squamous cylindrical;

147. A histological specimen presents an artery. One of the membranes of its wall has flat cells lying on the basal membrane. What type of cells is it?
a) mesothelium;
b) fibroblasts;
c) macrophages;
d) endothelium;
e) smooth myocytes

148. The epithelial layer is formed by cells which nuclei are located at different height in relation to the basement membrane. At the same time all the cells in contact with the basement membrane. What type of epithelium is this?
a) simple squamous;
b) simple cuboidal;
c) pseudostratified;
d) stratified;
e) transitional

149. In the specimen of a gland we can see that its acinus consists of several layers of cells in which the following processes occur with distance from the basement membrane: accumulation of secretion, shrinkage of the nuclei and destruction of cells. What type of secretion is characteristic of this gland?
a) holocrine type of secretion, a sebaceous gland;
b) merocrine type of secretion, a salivary gland;
c) apocrine type of secretion, a sweat gland;

d) exocrine type of secretion, a mammary gland;
e) holocrine type of secretion, a salivary gland

150. The electronogram shows a secretory cell with a good developed Golgi apparatus, a large number of vacuoles and small vesicles in the apical pole. The plasmalemma is not broken. Determine what type of cell is secreted?
a) merocrine;
b) apocrine;
c) holocrine;
d) endocrine;
e) diffusion

151. A histological preparation is presented, on which the gland with round end sections and branched excretory ducts is determined. What type of gland is it?
a) simple unbranched alveolar;
b) simple branched alveolar;
c) complex branched alveolar;
d) complex branched tubular;
e) simple unbranched tubular;

152. Certain antibiotic therapies slow the replacement of the cells lining the small intestine. This may cause the loss of what tissue type?
a) ciliated pseudostratified columnar epithelium
b) simple cuboidal epithelium
c) simple columnar epithelium
d) pseudostratified columnar epithelium with stereocilia
e) stratified squamous, nonkeratinized tract wall

153. Functions of the basement membrane include which of the following?
a) contractility;
b) molecular filtering;
c) active ion transport;
d) excitability;
e) modification of secreted proteins;

154. Using immunohistochemistry a population of cells is shown to be positive for the protein connexin. From this we can infer that the cells are connected by what type of junction?
a) Tight (occluding) junctions;
b) zonula adherens;
c) Gap junctions;
d) Hemidesmosomes;
e) Desmosomes (macula adherens)

155. An individual genetically unable to synthesize normal occludin is likely to have epithelia with defective regulation in which of the following?
a. material crossing the epithelium between the cells (paracellular movement)
b. communication between the cells
c. attachment to the basement membrane
d. strong attachment to neighboring cells
e. movement of membrane proteins in the apical domains of cells

156. An intermediate filament protein found in cytoplasm of most epithelial cells in which of the following?
a) actin;
b) vimentin;
c) laminin;
d) myosin;

e) keratin

157. Which of the following cellular features is used is naming types of epithelia?
a) shape of cells in the basal layer
b) number of cell layers;
c) presence of a basal lamina
d) size of the nuclei;
e) nature of the cell junctions that are present

158. The release of lipid droplets from cells is which type of secretion?
a) merocrine;
b) serous;
c) apocrine;
d) mucous;
e) holocrine;

159. Exocrine glands in which the acini all produce a secretion of heavily glycosylated, hydrophilic proteins are an example of which type of gland?
a) serous gland;
b) mixed gland;
c) mucous gland;
d) tubuloacinar gland; e) simple gland;

160. With a 5-year history of chronic respiratory infections, a 23-year-old, non-smoking man is referred to an otolaryngologist. A bronchial biopsy indicates altered structures in the epithelial cells. Which of the following, if altered to reduce function, is most likely involved in this patient's condition?
a) hemidesmosomes;
b) cilia;
c) basolateral cell membrane folds;
d) microvilli;
e) tight junctions;

161. An 11-month girl is referred to a pediatric gastroenterology clinic due to a history of generalized weakness, slow growth, and refractory diarrhea. For the past month she has been hospitalized regularly to receive parenteral nutrition. Examination of the epithelium lining her small intestine confirms that the failure to absorb nutrients is most likely due to a significant decrease in which of the following?
a) microvilli;
b) gap junctions;
c) cilia;
d) cell layers;
e) basement membrane thickness;

162. A 42-year-old woman of Mediterranean descent presents with multiple oral blisters and a few cutaneous blisters on her back and buttocks. The superficial bullae are fragile, some have unroofed to form ulcerated lesions, and there is a positive Nikolsky sign. Blood tests reveal antibodies to a subfamily of cadherins and immunohictochemical staining of a biopsy from the oral mucosa shows distribution of the antigen throughout the epithelium. In what structures is the defect that is causing this patient's condition?
a) desmosomes;
b) tight junctions;
c) hemidesmosomes
d) gap junctions;
e) reticular lamina

163. In the histopreparation of the small intestine, villi are identified, covered with a tissue consisting only of cells forming a layer that is located on the basement membrane. The tissue does not contain blood vessels. What kind of fabric covers the surface of the villi?

a) loose connective tissue;
b) smooth muscle tissue;
c) reticular tissue;
d) epithelial tissue;

164. Morphological analysis of the biopsy material of the esophagus mucosa taken from the patient revealed the process of keratinization of the epithelium. Which of the following types of epithelium covers the mucosa of this organ in normal?
a) stratified squamous keratinized epithelium;
b) stratified squamous nonkeratinized epithelium;
c) pseudostratified columnar epithelium;
d) simple columnar epithelium;

165. When the child falls, they squeeze the skin of the palm. What epithelium was damaged in this?
a) simple cuboidal epithelium;
b) stratified squamous nonkeratinized epithelium;
c) stratified squamous keratinized epithelium;
d) simple squamous epithelium;

166. During the intubation, the tracheal wall was damaged. Integrity of what kind of epithelium was broken in this case?
a) stratified squamous keratinized epithelium;
b) simple squamous epithelium;
c) simple cuboidal epithelium;
d) stratified nonkeratinized epithelium;
e) Pseudostratified columnar epithelium;

167. A male 48 years old had a benign epithelial tumor of the visceral pleura of the upper lobe of the right lung. What epithelium is the source of tumor development?
a) simple squamous epithelium;
b) pseudostratified columnar epithelium;
c) stratified squamous keratinized epithelium;
d) transitional epithelium;
e) stratified nonkeratinized epithelium;

168. A defect in which epithelial junction would most likely result in increased paracellular permeability to ions and water?
a) Desmosomes
b) Adherens junctions
c) Tight junctions (zonula occludens)
d) Hemidesmosomes

169. Which molecular component is essential for anchoring epithelial cells to the basal lamina?
a) Actin filaments
b) Integrins
c) Keratin filaments
d) Cadherins

170. Failure of epithelial polarity would most directly impair which cellular process?
a) ATP synthesis
b) Directional secretion and absorption
c) Cell division
d) DNA replication

171. In the small intestine, loss of microvilli would lead to:
a) Impaired mucus transport
b) Decreased surface area for absorption

c) Reduced epithelial protection
d) Increased diffusion rate

172. Which epithelial tissue shows nuclei at different levels but all cells contact the basement membrane?
a) Stratified squamous epithelium
b) Simple columnar epithelium
c) Pseudostratified columnar epithelium
d) Transitional epithelium

173. The basal lamina is primarily secreted by:
a) Fibroblasts
b) Endothelial cells
c) Epithelial cells
d) Macrophages

174. Which change best characterizes epithelial metaplasia caused by chronic irritation (e.g., smoking)?
a) Increased mitotic rate with dysplasia
b) Replacement of pseudostratified epithelium with stratified squamous epithelium
c) Transformation of epithelial cells into connective tissue
d) Loss of basement membrane integrity

175. Which epithelial specialization is most dependent on microtubules?
a) Microvilli
b) Desmosomes
c) Cilia
d) Tight junctions

176. Why is diffusion across simple squamous epithelium particularly efficient?
a) High metabolic activity
b) Thick cytoplasm
c) Minimal diffusion distance
d) Presence of keratin

177. Which epithelial feature most directly prevents tumor invasion into underlying tissues?
a) High mitotic activity
b) Basement membrane integrity
c) Cell polarity
d) Avascularity

178. A patient with bullous pemphigoid has antibodies against hemidesmosomes. Which function is primarily impaired?
a) Cell-to-cell communication
b) Intercellular adhesion
c) Attachment of epithelium to connective tissue
d) Ion transport

179. Transitional epithelium differs from stratified squamous epithelium because it:
a) Is avascular
b) Contains ciliated cells
c) Can change cell shape in response to stretching
d) Lacks a basement membrane

180. Which epithelial tissue is most likely to undergo rapid pathological transformation into carcinoma?
a) Nervous epithelium
b) Glandular epithelium
c) Mesenchymal tissue
d) Cartilage

181. The permeability of epithelial tissue is MOST influenced by:
a) Type of connective tissue underneath
b) Type and number of cell junctions
c) Presence of blood vessels
d) Rate of epithelial turnover

182. Which feature allows epithelial tissue to function as a selective barrier rather than a simple physical wall?
a) Keratinization
b) Stratification
c) Specialized cell junctions and polarity
d) Continuous cell division

183. A 58-year-old chronic smoker presents with persistent cough. Histological examination of the trachea shows replacement of pseudostratified ciliated columnar epithelium with stratified squamous epithelium.
This change is best described as:
a) Dysplasia
b) Hyperplasia
c) Metaplasia
d) Neoplasia

184. A patient develops severe skin blistering due to autoantibodies against hemidesmosomal proteins. Which epithelial function is primarily compromised?
a) Cell-to-cell adhesion
b) Attachment of epithelial cells to the basement membrane
c) Paracellular transport
d) Cellular communication

Blood.

185. In the punctate of the myeloid tissue of a 6-year-old child, cells are found in which pycnosis and nucleus removal occurs during differentiation. Name the type of hemopoiesis for which these morphological changes are characteristic.
a) granulocytopoiesis;
b) thrombocytopoiesis;
c) erythrocytopoiesis;
d) lymphocytopoiesis;
e) monocytopoiesis;

186. Live vaccine is injected into the human body. Increasing activity of what cells of connective tissue can be expected?
a) macrophages and fibroblasts;
b) adipocytes and adventitious; cells
c) fibroblasts and labrocytes;
d) plasmocytes and lymphocytes
e) pigmentocytes and pericytes.

187. Neutrophils are present in the blood flow for:
a) a year;
b) 8-12 hours;
c) a month;
d) 120 days;
e) 1 hour

188. Granular and reticular structures in reticulocytes are:
a) residues of ribonucleoproteins and organelles;
b) residues of DNA;
c) haemoglobin granules;
d) microtubules;
e) microfilaments;

189. Heparin and histamine are contained in the granules of:
a) neutrophils;
b) basophils;
c) eosinophils;
d) monocytes;
e) platelets;

190. Which of the following properties is not characteristic of all the leukocytes:
a) motility;
b) participation in protective reactions;
c) ability to function in tissues;
d) capacity for phagocytosis;
e) the presence of the nucleus;

191. Blood serum differs from blood plasma by the absense of:
a) erythrocytes;
b) platelets;
c) antibodies;
d) albumins;
e) fibrinogen;

192. In course of an experiment a big number of stem cells of red bone marrow was in some way destructed. Regeneration of which cell populations in the loose connective tissue will be inhibited?
a) of pigment cells;
b) of fibroblasts;
c) of microphages;
d) of lipocytes;
e) of pericytes.

193. A 24-year-old woman presents with fatigue and pale skin. Laboratory tests show low hemoglobin and reduced RBC count.
The most likely diagnosis is:
a) Polycythemia
b) Anemia
c) Leukemia
d) Thrombocytosis

194.A patient develops spontaneous bleeding and prolonged clotting time due to vitamin K deficiency. Which process is primarily affected?
a) Platelet aggregation
b) Fibrin formation
c) RBC production
d) Leukocyte activation

195.A blood smear shows increased eosinophils. This finding is MOST commonly associated with:
a) Viral infection
b) Bacterial infection
c) Allergic reaction or parasitic infection
d) Autoimmune disease

196.A patient with liver disease has low plasma albumin.
Which complication is most likely?
a) Increased blood clotting
b) Edema
c) Leukocytosis
d) Polycythemia

197.A trauma patient experiences massive blood loss.
Which immediate physiological response occurs FIRST?
a) Increased erythropoiesis
b) Vascular spasm
c) Antibody production
d) Platelet destruction

198. In the study of histology slide connective tissue neutrophils are determined. What is the function of these cells, penetrates from the blood into the tissue?
a) dilates blood vessels;
b) phagocytosis of microorganisms;
c) supporting;
d) trophic;
e) regulate the contraction of smooth myocytes;

199. In the blood of a 26-year-old man it was revealed 18% of erythrocytes of the spherical, ball-shaped, flat and thorn-like shape. Other eritrocytes were in the form of the concavo-concave disks. How is such phenomenon called?
a) pathological poikilocytosis;
b) Pathological anisocytosis;
c) Erytrocytosis;
d) Physiological poikilocytosis;
e) Physiological anisocytosis;

200. In the analysis of blood found reduced levels of hemoglobin. What is the function of the blood in this case?
a) transport of hormones;
b) clotting;
c) transport of nutrients;
d) transport of gases;
e) provision of immunity

201. In the patient with pneumonia, a general analysis of the blood showed an increase in the total number of leukocytes. What is the name of this phenomenon?
a) leukocytosis;
b) leukopenia;
c) poikilocytosis;
d) anisocytosis;
e) anemia;

202. In the blood of a man of 26 years 18% of erythrocytes were found spherical, flattened, spherical and spiny. Other erythrocytes were in the form of biconcave disks. What is the name of this phenomenon?
a) pathological poikilocytosis;
b) pathological anisocytosis;
c) erythrocytosis;
d) physiological poikilocytosis;
e) physiological anisocytosis;

203. In the patient's blood, 12.5% of erythrocytes with a diameter greater than 8 μm, 12.5% of erythrocytes less than 6 μm were detected, the remaining erythrocytes had a diameter of 7.1-7.9 μm. What is the name of this phenomenon?
a) pathological poikilocytosis;
b) pathological anisocytosis;
c) erythrocytosis;
d) physiological poikilocytosis;
e) physiological anisocytosis;

204. When analyzing the blood in a patient with parasitic disease (helminthic invasion), a rise in blood was detected:
a) the basophilus;
b) lymphocytes;
c) monocytes;
d) eosinophils;

205. To determine the functional activity of blood cells in a tube containing leukocyte mass, a suspension of microorganisms was introduced. Specify cells in the cytoplasm of which phagocytosed microbes will be detected:
a) lymphocytes and basophils;
b) monocytes and lymphocytes;
c) lymphocytes and neutrophils;
d) neutrophils and monocytes;
e) lymphocytes and eosinophils.

206. In a blood smear stained by Romanovsky-Giemsa, 20% of large (20 μm in diameter), rounded cells with a pale basophilic cytoplasm and a bean-like nucleus are observed. Clinically, this phenomenon is characterized as:
a) lymphocytosis;
b) neutrophilia;
c) reticulocytosis;
d) monocytosis;
e) leucopenia;

207. In the red bone marrow, the blood cells that develop are located by the islets. Some of the islets are associated with macrophages. What uniform elements of blood develop in these islets?
a) basophilic granulocytes;
b) erythrocytes;
c) monocytes;
d) precursors of T-and B-leukocytes;
e) platelets;

208. What blood cells contain the granules having affinity to sour dyes?
a) platelets
b) eosinophils
c) basophiles
d) erythrocytes
e) lymphocytes

209. What blood cells provide humoral immunity?
a) erythrocytes
b) monocytes
c) B-lymphocytes
d) T-lymphocytes
e) neutrophils

210. Form of a nucleus of young granulocytes.

a) round;
b) bean-shaped;
c) the segmented;
d) rhabdoid;
e) the flat;

211. Which cell provide cellular immunity?
a) erythrocytes;
b) eosinophils;
c) B-lymphocytes;
d) T-lymphocytes;
e) monocytes;

212. Mature erythrocytes contains
a) nucleus;
b) an endoplasmic network;
c) mitochondria
d) hemoglobin;
e) lamellar complex;

213. Form of nucleus of mature granulocytes?
a) round;
b) bean-shaped;
c) the segmented;
d) rhabdoid;
e) the flat;

214. Specify indicators with aberrations in the provided analysis of blood of the adult patient
a) neutrophil of 75%;
b) an eosinophil – 12%;
c) basophils – 1%;
d) lymphocytes – 35-40%;

215. During embryogenesis blood develops from?
a) from a mesoderm; b) from ectoderm; c) from endoderm;
d) from a mesenchyme; e) from leaves splanchnotoma;

Connective tissue.

216. In embryogenesis, the all types of connective tissue originate from:
a) neural tube;
b) mesenchyme;
c)ectoderm;
d) endoderm;
e) notochord.

217. The derivatives of neural crest are:
a) mast cells;
b) melanocytes;
c) adipocytes;
d) fibroblasts;
e) plasma cells

218. Which of the following properties is not characteristic of dense fibrous regular connective tissue:
a) it forms ligaments and tendons;

b) fibres are the main component of its extracellular matrix;
c) collagen fibres are aranged in regular patterns;
d) the basic differon is represented by fibroblasts;
e) an amorphous component prevails in its extracellular matrix;

219. Mucous connective tissue is part of:
a) the umbilical cord;
b) the chorion;
c) the amnion
d) the yolk sac;
e) the allantois

220. After treatment of the damaged Achilles tendon, the patient regained his function. How did the tendon regenerate?
a) adipose tissue formation;
b) synthesis of hyaline cartilage;
c) collagen fiber synthesis;
d) fibrous cartilage synthesis;
e) muscle tissue replacements;

221. The following type of tissue participates actively in heat production of newborn babies:
a) white adipose tissue;
b) reticular connective tissue;
c) pigmented tissue;
d) mucous connective tissue;
e) brown adipose tissue;

222. Reticular connective tissue:
a)forms fasciae and aponeuroses
b) underlies surface epithelia;
c) forms the storma of the red bone marrow;
d) goes along with blood vessels;
e) participates in heat production.

223. Define a cell which is capable to synthesize fibrous proteins (collagen, elastin) GAG.
a) plasma cell
b) fibrocyte
c) fibroblast
d) chondroblast

224. There was a skin injury with damage to the mesh layer. Due to the activity of which the cell spheroid will regenerate this layer?
a) Fibroblastic;
b) Lymphoblastic;
c) Neuroblastic;
d) Macrophagic;
e) chondroblast;

225. In forensic practice, there is a periodic need to perform identification of a person. For this purpose, the fingerprinting method is used. Explain, the peculiarities of the structure of which layer is determined by an individual drawing of the skin of the fingers
a) epidermis, dermis and hypodermis;
b) the epidermis;
c) papillary layer of the dermis;
d) the mesh layer of the dermis;
e) the epidermis and dermis;

226. Patient A., 12 years old, has white spots on the skin that do not have a pigment. The spots appeared after 10 years, constantly increasing in size. The absence of any skin cells led to the appearance of such spots.
a) fibrocytes;
b) adipocytes;
c) melanocytes;
d) plasmocytes;
e) monocytes

227. Three amino acids, the first one, the second proline and the third glycine, are involved in the construction of the fiber. Name this fiber
a) muscle tissue;
b) elastic fiber;
c) nerve fiber;
d) collagen fiber;

228. Define tissue where fibers are presented in a large number and are closely located. Contain insignificant quantity of cells and the main substance.
a) cartilage;
b) bone;
c) dense connecting tissue;
d) nervous tissue;

229. Specify connective tissue which meets only at a germ.
a) mesenchyme;
b) mucous;
c) pigmented;
d) brown fat tissue;

230. Cell where organelles are well developed, especially granular endoplasmic reticulum, the nucleolus is located eccentrically, about a nucleolus there is a light zone?
a) basophil;
b) plasmacell;
c) chondrocyte;
d) lymphocyte;

231. What tissue meets in skin sites in nipples, a scrotum, birthmarks, and also in a vascular cover of an eye?
a) nervous tissue;
b) mucous tissue;
c) pigmented tissue;
d) cartilagenous tissue;

232. Specify what cell has a spherical form, the nucleus is located on the periphery, the center is occupied with a big vacuole of triglycerides.
a) adipocyte;
b) pericyte;
c) plasmacyte;
d) lymphocyte;

233. The weakening of the blood supply of the organ causes the development of hypoxia, and it activates the function of fibroblasts. What kind of elements are being built up in this situation?
a) nerve elements;
b) microvasculature vessels;
c) lymphatic vessels;
d) intercellular substance;
e) parenchymal organ elements;

234. Which of the following connective tissue components is located in the ECM but not in the ground substance.
a) collagen bundles;
b) fibronectin;
c) GAGs;
d) hyaluronan;
e) proteoglecans;

235. What cell numerous in loose connective tissue are filled with secretory granules and stain with metachromasia?
a) fibrocytes;
b) active fibroblasts;
c) mast cell;
d) leukocytes;
e) macrophages;

236. What is the first step of collagen production that occurs after the undergoes exocytosis?
a) cross-linking of collagen fibrils with a short linking collagen;
b) removal of the terminal nonhelical domains by peptidases;
c) hydroxylation of lysine and prolin;
d) assembly of subunits to form a larger structure;
e) disulfate bond formation;

237. Sulfated GAGs are important constituents of what extracellular structures?
a) hyaluronan;
b) elastic fibers;
c) type II collagen;
d) proteoglecans;
e) multiadhesive glycoproteins

238. Which of the following contains binding sites for integrins and is an important part of the ECM in both loose connective tissue and dence irregular connective tissue?
a) aggrecan;
b) fibronectin;
c) perlecan;
d) fibrillin;
e) most type of collagen;

239. Dence regular connective tissue typically involves which of the following features?
a) contains mostly synthetically active fibroblasts
b) contains much ground substance;
c) contains a similar cell populationas areolar connective tissue;
d) predominant tissue type in the stroma of most organs;
e) predominantly located intendons and ligaments;

240. Specify the protein secreted by fibroblasts
1) collagen;
2) elastin;
3) glycosaminoglycans;
4) immunoglobulins
a) 1, 2, 3; b) 1 and 3; c) 2 and 4; d) 4; e) 1, 2, 3 and 4;

241. One of the rules of surgery is making cuts along the so-called Langer lines (skin tension lines). Which of the following tissues forms a reticular, durable layer of the dermis?
a) loose connective tissue;
b) reticular connective tissue;

c) dense irregular connecting tissue;
d) epithelial tissue;
e) dense regular connective tissue;

Skeletal tissues.

242. The embryonic origin of bone tissue is:
a) notochord;
b) mesenchyme;
c) ectoderm;
d) endoderm;
e) neural crest.

243. Woven bone tissue can be found in adults only as part of:
a) the epiphysis of tubular bones;
b) the sutures of the skull;
c) intervertebral discs;
d) the surface of joints;
e) the diaphysis of tubular bones;

244. The structural and functional unit of compact bone is:
a) an osteon;
b) a collagen fibre;
c) an osteocyte;
d) an osteoblast;
e) a bone lamella

245. A structural and functional unit of compact bone is:
a) an osteon;
b) a collagen fibre;
c) an osteocyte;
d) an osteoblast;
e) a bone lamella

246. The elongation of a bone is provided by:
a) the periosteum;
b) the endosteum;
c) the epiphyseal plate;
d) the epiphysis;
e) the diaphysis;

247. The formation of bone on the site of the cartilage begins with:
a) perichondrial ossification;
b)destruction of the cartilage model;
c) endochondral ossification;
d) ossification of epiphysis;
e) calcification of the cartilage model;

248. The preparation is diagnosed with a tissue in which the cells are arranged singly and with isogroups, and fibrous structures are not visible in the extracellular substance. What tissue is present in the preparation? a) bone;
b) hyaline cartilage;
c) epithelial tissue;
d) smooth muscle tissue;
e) fibrous cartilage;

249. In course of indirect histogenesis of tubular bone tissue a plate is formed between epiphyseal and diaphyseal ossification centres that provides further lengthwise growth of bones. What structure is it?
a) layer of interior general plates;

b) metaphyseal plate;
c) osseous plate;
d) osseous cuff;
e) osteon;

250. In the histological preparation of the tubular bone at the fracture site, signs of the regenerative process (callus) are detected. What tissue forms this structure?
a) reticular;
b) loose connecting;
c) spongy bone;
d) epithelial;
e) compact bone

251. In contrast to the perichondral bone, the endochondral bone contains:
a) residues of calcified cartilage;
b) bone matrix;
c) osteo-blasts;
d) osteocytes;
e) osteoclasts.

252. The function of the epiphyseal plate is:
a) formation of the perichondral collar;
b) formation of periosteal buds;
c) formation of the cartilage model;
d) calcification of the bone matrix;
e) bone growth.

253. The patient was admitted to the clinic with a diagnosis: fracture of the clavicle. What cellular elements will take part in the regeneration of bone tissue?
a) osteoblasts;
b) osteocytes;
c) fibroblasts;
d) chondrocytes;
e) osteoclasts;

254. When analyzing the patient's radiographs, the doctor drew attention to the local resorption of the solid tissues of individual bones. With the increased activity of which cells can these changes be related?
a) chondroblasts;
b) osteoclasts;
c) osteocytes;
d) hondoblasts;
e) osteoblasts;

255. At clinical examination of the patient of 70 years violations of motor functions are revealed, it is connected with age changes in hyaline cartilage. What age changes caused the limitation of movements in the joints?
a) increased number of cartilage cells;
b) increase in the number of isogenic groups;
c) deposition of calcium salts in the intercellular substance;
d) thickening cartilage;
e) increase in the hydrophilicity of the basic substance;

256. In a patient with severe trauma to the upper limb, there is a disturbance in the processes of regeneration of the cartilaginous tissue due to damage to the little differentiated cells of the cartilaginous differon. Which cells were damaged?

a) cells that come from blood vessels;
b) cells of the inner layer of the perichondrium;
c) cells in the composition of isogenic groups;
d) cells of the outer layer of the perichondrium
e) cells of the zone of young cartilage;

257. The student was offered two drugs. On the first-elastic cartilage (stained with orsein), on the second-hyaline (stained with hematoxylin-eosin). On what grounds can they be distinguished?
a) If there is a zone of young cartilage;
b) In the presence of isogenic groups of cells;
c) In the presence of elastic fibers;
d) In the presence of an amorphous substance;

258. In what of the listed tissue in intercellular substance, the main (amorphous) substance has identical coefficient of a refractive index with collagenic fibers because of that fibers aren't visible?
a) hyaline cartilage;
b) fibrocartilage;
c) elastic cartilage;
d) bone tissue;

259. Which of the listed tissues settles down in a throat, in pneumatic ways, in junctions of edges with a breast?
a) elastic;
b) hyaline;
c) fibrous;
d) the bone;

260. Which cells are present in cartilage tissue?
a) fibroblast;
b) osteoblast;
c) osteocytes;
d) chondrocyte;

261. On a preparation one of connective tissues in which there are no vessels of microcirculation. Tissue is:
a) pigment;
b) cartilage;
c) bone;
d) the fat;

262. In which tissues never happens calcifications?
a) hyaline cartilage;
b) an elastic cartilage;
c) in a fibrous cartilage;
d) bone tissue;

263. What do we call intercellular substance of bone tissue?
a) elastic fibers;
b) chondrin fibers;
c) collagenic fibers;
d) ossian fibers;

264. To what of the listed cells there corresponds the description: the cell has an irregular form, a compact relative large nucleus, centrioles are absent, cytoplasm poorly basophilic, lies in a cavity repeating it a form.
a) fibroblast;
b) chondroblast;

c) osteoblast;
d) an osteocyte;

265. In which layer of compact lamellar bone tissue settle down haversian canals:
a) endosteum;
b) periosteum;
c) osteon;
d) an inside layer general elastin;

267. One of basic tissues consists of three layers: external, Osteonic and inside layer. Called:
a) coarse-fibered;
b) compact lamellar bone;
c) spongy lamellar bone;
d) collagenous cartilage;

Muscular tissues.

268. Which of the following properties is not characteristic of striad skeletal muscle tissue:
a) the presence of a basement membrane;
b) the ability to contract;
c) the presence of triads;
d) cellular composition;
e) the presence of myosatellite cells;

269. Which of the following properties helps to differentiate between cardiac muscle and skeletal muscle?
a) the presence of myofibrils;
b) extensive vascularization;
c) striation;
d) cellular composition;
e) acidophilic cytoplasm;

270. Sensory nerve endings in muscles are:
a) neuromuscle spindles;
b) free endings;
c) motor end plates;
d) tactile corpuscles;
e) lamellar corpuscles;

271. A sarcomere is a segment of myofibril between two neighbouring:
a) M-lines;
b) H-bands;
c) Z-lines;
d) I-discs;
e) A-discs;

272. Patient with injured muscles of the lower extremities was admitted to the traumatological department. Due to what cells is reparative regeneration of the muscle fibers and restoration of the muscle function possible?
a) Myoepithelial cells;
b) Satellite-cells;
c) Myofibroblasts;
d) Myoblasts;
e) Fibroblasts;

273. In course of a conditional experiment the development of mesenchyma cells was completely inhibited. Development of the following muscular tissue will be disturbed:

a) skeletal muscular tissue;
b) smooth muscular tissue;
c) epidermal muscular tissue;
d) neural muscular tissue;
e) cardiac muscular tissue.

274. The basal lamina of a muscle fiber is part of which structure?
a) perimysium;
b) epimysium;
c) fascia;
d) endomysium;
e) sarcoplasmic reticulum;

275. With the transmission EM skeletal muscle fibers can be seen to contain structures called triads. What do the two laterial components of triad represent?
a) attachment sites for thick myofilaments;
b) sites for calcium sequestration and release;
c) sites for impulse conduction into the fiber;
d) sites for ATP production;
e) sites for synthesis of proteins to be secreted outsite the cell;

276. Which characteristic is unique to cardiac muscle?
a) contain centrally located nuclei;
b) striated;
c) often branched;
d) multinucleated;
e) lack T-tubules;

277. In smooth muscle calcium released by the smooth ER initiates contraction by binding to what protein?
a) actin;
b) calmodulin;
c) desmin;
d) myosin light chain kinase;
e) tropomyosin;

278. Which feature typifies T-tubules?
a) evaginations of the sarcoplasmatic reticulum;
b) sequester calcium during muscle relaxation, relasing it during contraction;
c) carry depolarization to the muscle fiber interior;
d) overlie the A-I junctions in cardiac muscle cells;
e) rich supply of acetylcholine reseptors;

279. Which characteristic is unique to smooth muscle?
a) T-tubules lie across Z lines;
b) each thick filament is surrounded by six thin filaments;
c) thin filaments attach to dence bodies;
d) cells are multinucleated;
e) cells have centrally located nuclei;

280. In one type of muscle. Numerous gap junctions, desmosomes, and adherens junctions are specifically localized in which structures?
a) myofilaments;
b) dence bodies;
c) sarcomeres;
d) neuromuscular spindles;
e) intercalated discs;

281. The main property of smooth muscular tissue is:
a) a variety of cell forms;
b) existence of satellite cells;
c) ability to long (without noticeable exhaustion) to reduction;
d) well developed intercellular substance;
e) ability to carry out exchange reactions and to support a homeostasis;

282. Under the influence of negative environmental factors, the function of myosatelliteocytes was initiated. The change in which the functions of the whole muscle fiber should be expected in this case?
a) Reduction of contractive thermogenesis;
b) Muscle fiber regeneration;
c) Trophy of muscle fiber;
d) Reduction of muscle fiber;
e) Increase in contractive thermogenesis;

283. A 66-year-old man who lives alone has a severe myocardial infarction and dies during the night. The medical examiner's office is calledthe following morning and describes the man's body as being in rigor mortis. This state of rigor mortis is due to which one of the following?
a) inhibitions of Ca^{2+} leakage from the extracellular fluid and ER;
b) enhance retrieval Ca^{2+} by the sarcoplasmic reticulum ;
c) failure to disengage tropomyosin and troponin from the myosin active sites;
d) absence of ATP preventing detachment of the myosin heads from actin;
e) increased lactic acid production;

284. A 5-year-old boy sustains a small tear in his gastrocnemius muscle when he is involved in a bicycle accident. Regeneration of the muscle will occur through which of the following mechanisms?
a) dedifferentiation of muscle cells into myoblasts;
b) differentiation of muscle satellite cells;
c) fusion of damaged myofibers to form new myotubes;
d) hyperplasia of existing muscle fibers;
e) differentiation offibroblasts to form myoblasts;

285. A healthy 32-year-old man lifts weights regulary as part of his work-out. In one of his biceps muscle fibers at rest, the length of the I band is 1,0m and the A band is 1,5m. Contraction of that muscle fiber results in a 10% shortening of the length of the sarcomere. What is the length of the A band after the shortening produced by muscle contraction?
a) 1,50m;
b) 1,35m;
c) 1,00m;
d) 1,90m;
e) 0,45m;

286. A patient with a lower limb muscle injury was delivered to the trauma center. Due to what cells is possible reparative regeneration of muscle fibers and restoration of muscle function?
a) Fibroblasts;
b) Myoepithelial cells;
c) Myoblast;
d) Myofibroblasts;
e) Myosatellite cytotoxic cel;

287. Smooth muscle tissue of inner organs and vessels is developed from:
a) ectoderm;
b) neural tube;
c) mesenchyme;
d) entoderm;
e) mesoderm;

288. Skeletal muscle tissue is developed from:
a) ectoderm;
b) neural tube;
c) mesenchyme;
d) entoderm;
e) myotomes of mesodermal somites

289. Cardiac muscle tissue is developed from:
a) ectoderm;
b) neural tube;
c) mesenchyme;
d) entoderm;
e) visceral layers of mesodermal splanchnotomes

290. Sarcoplasmic reticulum of muscle tissues structures is:
a) smooth EPR;
b) rough EPR;
c) Golgi complex;
d) lysosomes;
e) mytochondria

291. The structures called muscle triads are characteris-tic for:
a) smooth myocytes;
b) myoepithelial cells;
c) myofibroblasts;
d) symplasts;
e) cardiac myocytes

292. Endomysium, separating muscle fibers is a tissue:
a) dense irregular connective tissue;
b) fat tissue;
c) dense regular connective tissue;
d) mucous tissue
e) loose connective tissue;

293. A patient suffers a spinal cord injury and loses voluntary control of limb movement.
Which muscle tissue is primarily affected?
a) Cardiac muscle
b) Smooth muscle
c) Skeletal muscle
d) Visceral muscle

294. A drug blocks calcium channels in smooth muscle cells.
What is the most likely effect?
a) Increased contraction
b) Inhibition of contraction
c) No effect
d) Muscle hypertrophy

295. Histology shows branched muscle fibers with central nuclei and intercalated discs.
Which tissue is observed?
a) Skeletal muscle
b) Smooth muscle
c) Cardiac muscle
d) Myoepithelium

296. A patient experiences muscle fatigue after prolonged endurance exercise. Which fiber type was predominantly used?
a) Type IIb
b) Type IIa
c) Type I
d) Type III

297. A newborn has defective dystrophin protein.
Which structure is most affected?
a) Sarcomere integrity
b) Sarcolemma stability
c) Neuromuscular junction
d) Mitochondrial function

298. Loss of gap junctions in cardiac muscle would result in:
a) Increased force of contraction
b) Loss of synchronized contraction
c) Faster heart rate
d) Enhanced ATP production

299. .Microscopy reveals muscle cells without striations forming the wall of the intestine.
This tissue is:
a) Skeletal muscle
b) Cardiac muscle
c) Smooth muscle
d) Myoepithelial tissue

300. After death, muscles become rigid due to ATP depletion.
This condition is called:
a) Muscle atrophy
b) Muscle fatigue
c) Rigor mortis
d) Tetany

301. A toxin prevents release of acetylcholine at the neuromuscular junction.
Which event fails to occur?
a) Action potential propagation
b) Cross-bridge cycling
c) Calcium binding to troponin
d) All of the above

302. A patient with heart failure shows impaired contraction spreading between cardiac cells.
Which structure is damaged?
a) Desmosomes
b) T-tubules
c) Gap junctions
d) Sarcoplasmic reticulum

303. Which feature is unique to skeletal muscle fibers?
a) Involuntary contraction
b) Presence of intercalated discs
c) Multinucleated fibers with peripheral nuclei
d) Lack of striations

304. Smooth muscle contraction is primarily regulated by:
a) Troponin
b) Tropomyosin

c) Calmodulin
d) Actin

305. The functional unit of striated muscle is the:
a) Myofilament
b) Sarcolemma
c) Sarcomere
d) Myofibril

306. Which muscle type is capable of spontaneous rhythmic contraction?
a) Skeletal muscle
b) Smooth muscle
c) Cardiac muscle
d) All muscle types

307. The T-tubule system in skeletal muscle functions to:
a) Store calcium ions
b) Conduct action potentials into the muscle fiber
c) Synthesize ATP
d) Bind actin and myosin

308. Which protein blocks the myosin-binding site on actin in resting skeletal muscle?
a) Troponin
b) Tropomyosin
c) Titin
d) Nebulin

309. Damage to intercalated discs would MOST directly impair:
a) Voluntary muscle contraction
b) Electrical coupling between muscle cells
c) Calcium storage
d) ATP synthesis

310. Which type of muscle lacks striations due to irregular arrangement of actin and myosin?
a) Skeletal muscle
b) Cardiac muscle
c) Smooth muscle
d) All muscle types

311. Calcium required for smooth muscle contraction primarily enters from:
a) Sarcoplasmic reticulum only
b) Mitochondria
c) Extracellular space
d) T-tubules

312. The sliding filament mechanism results in:
a) Shortening of actin filaments
b) Shortening of myosin filaments
c) Increased overlap between actin and myosin
d) Degradation of sarcomeres

313. Which muscle fiber type is most resistant to fatigue?
a) Type IIb (fast glycolytic)
b) Type IIa (fast oxidative)
c) Type I (slow oxidative)
d) All fiber types equally

314. The H zone of a sarcomere contains:
a) Actin filaments only
b) Myosin filaments only
c) Both actin and myosin
d) Neither actin nor myosin

315. Which neurotransmitter initiates contraction at the neuromuscular junction?
a) Dopamine
b) Norepinephrine
c) Acetylcholine
d) Serotonin

316. Which muscle tissue is under autonomic nervous system control?
a) Skeletal muscle only
b) Cardiac and smooth muscle
c) Skeletal and smooth muscle
d) Cardiac muscle only

317. Which structural feature allows cardiac muscle to function as a syncytium?
a) Multiple nuclei
b) Long cylindrical fibers
c) Intercalated discs with gap junctions
d) Lack of sarcomeres

318. The sarcoplasmic reticulum is specialized for:
a) ATP synthesis
b) Calcium storage and release
c) Glucose metabolism
d) Protein synthesis

319. Which muscle tissue shows spindle-shaped cells with a single central nucleus?
a) Skeletal muscle
b) Cardiac muscle
c) Smooth muscle
d) None

320. In rigor mortis, muscle stiffness occurs due to:
a) Excess calcium release
b) Lack of ATP preventing cross-bridge detachment
c) Increased acetylcholine
d) Muscle fiber degeneration

321. Which protein helps return the sarcomere to its resting length after contraction?
a) Actin
b) Myosin
c) Titin
d) Troponin

322. Cardiac muscle differs from skeletal muscle because it:
a) Is voluntary
b) Has multiple peripheral nuclei
c) Contains intercalated discs
d) Lacks mitochondria

Nervous tissue.

323. Neurons and glial cells of the central nervous system organs develop from:
a) neurogenic placodes;
b) the neural crest;
c) the neural tube;
d) the myotome;
e) the dermatome;

324. The neurons and glial cells of the spinal and autonomic ganglia are the derivatives of:
a) neurogenic placodes;
b) the neural crest;
c) the neural tube;
d) the myotome;
e) the dermatome;

325. The cytoplasm of an axon doesn't contain:
a) microtubules;
b) mitochondria;
c) the smooth endoplasmic reticulum;
d) the rough endoplasmic reticulum;
e) vesicles;

326. The morphological classification doesn't include the following types of neurons:
a) unipolar neurons;
b) bipolar neurons;
c) pseudounipolar neurons;
d) multipolar neurons;
e) interneurons;

327. A nerve impulse is transmitted in only one direction across the synapse, which is conditioned by:
a) the system of myofibrils and neurotubules
b) the presence of mitochondria
c) axoplasmic transport of substances
d) the presence of a receptor protein on the postsynaptic membrane
e) the presence of glial cells

328. A neurotransmitter typical for a neuromuscular junction is:
a) acetylcholine;
b) noradrenaline;
c) serotonin;
d) gamma-aminobutyric acid;
e) histamine;

329. A sensory nerve ending associated with the perception of pain is:
a) Phater-Pacini's lamellar corpuscle;
b) Meissner's (tactile) corpuscle;
c) a free nerve ending;
d) Ruffini's (bulbous) corpuscle;
e) neurotendon spindles;

330. The following is a non-free, non-encapsulated nerve ending:
a) Ruffini's (bulbous) corpuscle;
b) Phater-Pacini's lamellar corpuscle;
c) the axial cylinder of a nerve fibre;
d) Meissner's (tactile) corpuscle;
e) a dendrite surrounded by the cytoplasm of a Schwann cell;

331. What is the minimum number of neurons found in the complex reflex arc?

a) 2 neurons;
b) 3 neurons;
c) 4 neurons;
d) 5 neurons;
e) 6 neurons and more;

332. Where are motor nerve endings located?
a) in epithelia;
b) in connective tissues;
c) in neurotendon spindles;
d) in motor end plates;
e) in nueromuscle spindles;

333. The Nissl bodies seen by light microscopy as basophilic clumps are:
a) sER;
b) the Golgi apparatus;
c) mitochondria;
d) microtubules;
e) rosettes of polysomes and rER.

334. The neurofibrils seen by light microscopy are a fixation artefact and represent aggregated;
a) mitochondria;
b) Golgi apparatus;
c) microtubules and microfilaments;
d) rER; t) sER.

335. The glial cells arising from blood monocytes are:
a) microglia;
b) oligodendrocytes;
c) potoplasmic astrocytes;
d) fibrous astrocytes;
e) ependymal cells.

336.The glial cells lining the brain ventricles and the spinal canal are:
a) microglia;
b) oligodendrocytes;
c) protoplasmic astrocytes;
d) fibrous astrocytes;
e) ependymal cells.

337.The glial cells forming sheaths around the neuronal processes in nerve fibres are:
a) protoplasmic astrocytes;
b) fibrous astrocytes;
c) microglia;
d) oligodendrocytes (lemmocytes);
e) ependymal cells.

338. In case of traumatic injury of the upper extremities, it is possible to develop degeneration of the nerve fibers, which is accompanied by a breakdown of the axial cylinders, the breakdown of the myelin. Due to which nerve structures is myelin regeneration during regeneration?
a) Perinewrites;
b) Mezaxone;
c) Neurolematocyte (Schwann cells)
d) Endoneuritis;
e) Astrocytes;

339. Neurons vegetative ganglia develop from:
a) mesoderms
b) nervous tube
c) ganglionic plate
d) endoderm

340. Structures of a myelin cover of nervous tissue are formed by:
a) ependymal cells;
b) astrocytes;
c) oligodendrocytes;
d) microglia;

341 . nervous excitement on nervous cells, which component takes part:
a) neurofibrills ;
b) lysosomes ;
c) mitochondrions ;
d) synoptic bubbles ;

342. Which ultrastructural feature best distinguishes a neuron from neuroglial cells?
a) Presence of mitochondria
b) Presence of rough endoplasmic reticulum in Nissl bodies
c) Presence of intermediate filaments
d) Presence of Golgi apparatus

343. Nissl substance is typically absent in which part of the neuron?
a) Perikaryon
b) Dendrites
c) Axon hillock
d) Proximal dendritic segments

345. The axon hillock is functionally important because it:
a) Synthesizes neurotransmitters
b) Initiates action potentials
c) Forms synapses
d) Produces myelin

346. Which cytoskeletal element is most responsible for maintaining axonal diameter?
a) Microtubules
b) Actin microfilaments
c) Neurofilaments
d) Intermediate filaments of glial cells

347. Which type of neuron is characterized by a single process that bifurcates into peripheral and central branches?
a) Multipolar
b) Bipolar
c) Pseudounipolar
d) Anaxonic

348. Which neuron type is most commonly found in the anterior horn of the spinal cord?
a) Bipolar sensory neuron
b) Pseudounipolar neuron
c) Multipolar motor neuron
d) Anaxonic interneuron

349. Dendritic spines are functionally associated with:
a) Action potential conduction
b) Neurotransmitter synthesis
c) Synaptic plasticity
d) Myelin formation

350. Which neurotransmitter is most commonly associated with excitatory synapses in the CNS?
a) GABA
b) Glycine
c) Dopamine
d) Glutamate

351. In electron microscopy, synaptic vesicles are most concentrated in which region?
a) Axon hillock
b) Node of Ranvier
c) Presynaptic terminal
d) Postsynaptic density

352. Which feature distinguishes axons from dendrites histologically?
a) Presence of microtubules
b) Uniform diameter along length
c) Presence of mitochondria
d) Presence of ribosomes

353. Which organelle is most abundant in the neuronal perikaryon?
a) endoplasmic reticulum
b) Rough endoplasmic reticulum
c) Lysosomes
d) Peroxisomes

354. Which transport mechanism carries synaptic vesicle precursors from the cell body to the axon terminal?
a) Retrograde axonal transport via dynein
b) Anterograde fast axonal transport via kinesin
c) Passive diffusion
d) Slow retrograde transport

355. The main function of neurotubules in neurons is to:
a) Generate action potentials
b) Maintain electrical insulation
c) Support axonal transport
d) Form synaptic clefts

356. Which neuronal inclusion is considered a marker of aging or neurodegeneration?
a) Nissl bodies
b) Lipofuscin pigment
c) Neurofilaments
d) Glycogen granules

357. Which neuron type lacks a clearly defined axon?
a) Multipolar neuron
b) Bipolar neuron
c) Pseudounipolar neuron
d) Anaxonic neuron

358. The postsynaptic density is best described as:
a) A cluster of synaptic vesicles

b) Thickened protein layer beneath the postsynaptic membrane
c) A gap between synaptic membranes
d) A specialization of the presynaptic terminal

359. Which cytoskeletal component is primarily involved in slow axonal transport?
a) Neurofilaments
b) Microtubules
c) Actin filaments
d) Microvilli

Nervous system

360. From a morphological point of view, there are departments in the nervous system (NS):
a) central NS (CNS), vegetative NS (VNS);
b) CNS, somatic NS (SNS);
c) somatic NS, VNS;
d) CNS and peripheral NS (PNS);

361. The organs of the central nervous system include:
a) spinal ganglia;
b) peripheral nerves;
c) intramural ganglia;
d) brain.

362. The cytoarchitectonics of the cerebral cortex is:
a) the regular arrangement of Betz cells;
b) the regular arrangement of the nerve fibers of the cortex ;
c) the regular arrangement of cortical neurocytes;
d) the natural location of the neuroglia.

363. The column (module) of the cerebral cortex is:
a) a structural element of the cortex;
b) functional element of the bark
c) structural and functional element of the cortex;
d) part of the hemato-encephalic barrier.

364. The layer of Betz cells (ganglionic) is formed by neurons:
a) pear-shaped;
b) pyramidal;
c) stellate;
d) basket-shaped.

365. The layer of the cerebral cortex containing large pyramid-shaped neurons:
a) molecular;
b) ganglionic;
c) granular;
d) polymorphic.

366. A layer of the cerebral cortex containing cells of various shapes:
a) granular;
b) pyramidal;
c) ganglionic;
d) polymorphic.

367. The ventricles of the brain and the central canal of the spinal cord are lined with cells:
a) astrocytes;
b) ependymocytes;

c) oligodendrogliocytes;
d) microglia.

368. The outer layer of the cerebellar cortex is called:
a) polymorphic;
b) molecular;
c) pyramidal;
d) granular.

369. Axons of basket neurocytes of the cerebellum form synapses with cells:
a) Betsa;
b) Purkinje;
c) stellate;
d) grains.

370. The efferent inhibitory pathways of the cerebellum are formed by cells:
a) pyramidal;
b) pear-shaped;
c) basket-shaped;
d) stellate.

371. Climbing nerve fibers in the cerebellum end in:
a) pear-shaped cells;
b) basket cells;
c) grain cells;
d) Golgi cells.

372. Motor neurons of the spinal cord are located in:
a) the posterior horns;
b) front horns;
c) side horns;
d) rear ropes.

373. Through the posterior roots of the spinal cord pass:
a) afferent nerve fibers;
b) efferent nerve fibers.
c) preganglionic nerve fibers;
d) postganglionic nerve fibers.

374 The posterior horns of the spinal cord contain:
a) motor neurons;
b) sensory neurons;
c) associative neurons;
d) autonomic nuclei.

375. Clark's nucleus (thoracic nucleus) of the spinal cord is located in:
a) anterior horns;
b) lateral horns;
c) side ropes;
d) rear horns.

376. The autonomic nerve centers are located in the following structure of the spinal cord:
a) in the posterior horns of gray matter;
b) in the lateral horns of gray matter;
c) in the anterior horns of gray matter;
d) in white matter.

377. The centers of the sympathetic division of the autonomic nervous system are located:
a) in the brain stem;
b) in the paravertebral ganglia;
c) in the prevertebral ganglia;
d) in the lateral horns of the thoracolumbal spinal cord.

378. The arachnoid membrane of the spinal cord is formed by:
a) reticular tissue
b) loose fibrous unformed connective tissue;
c) dense fibrous shaped tissue;
d) dense fibrous unformed tissue.

379. The shell adjacent to the white matter of the spinal cord is called:
a) arachnoid;
b) dura mater;
c) perineurium;
d) soft brain.

380. Where are the bodies of sensitive neurons located?
a) in the spinal nodes;
b) in the posterior horns of the spinal cord;
c) in the anterior horns of the spinal cord;
d) in the lateral horns of the spinal cord.

381. Where are the sensitive neurocytes innervating skeletal
muscles?
a) in the anterior horns of the spinal cord;
b) in the posterior horns of the spinal cord.
c) in the anterior roots of the spinal cord;
d) in the spinal ganglia.

382. Pseudounipolar neurons are located:
a) in the cerebellum;
b) in the cerebral cortex;
c) in the vegetative ganglion;
d) in the spinal ganglion.

383. Spinal ganglia neurocytes are surrounded by:
a) fibrous astrocytes;
b) plasma astrocytes;
c) oligodendrogliocytes;
d) microglia.

384. Which cells of the neuroglia are surrounded by neurons of the spinal nodes?
a) astrocytes;
b) microglia;
c) ependymocytes;
d) satellite oligodendrogliocytes.

385. The function of perception of excitation in the spinal ganglia is performed by:13. Excitation from mossy fibers to pear-shaped cells is transmitted by:
a) basket cells;
b) Golgi cells;
c) grain cells;
d) large pyramidal cells.

386. The anterior horns of the spinal cord contain neurons:
a) sensitive;
b) motor;
c) secretory;
d) afferent.

387. The anterior horns of the spinal cord contain:
a) motor neurons;
b) sensory neurons;
c) associative and commissural neurons;
d) autonomic nuclei.

388. Which connective tissue layer of a peripheral nerve is primarily responsible for maintaining the blood–nerve barrier?
a) Epineurium
b) Endoneurium
c) Perineurium
d) Neurolemma

389. The perineurium is mainly composed of:
a) Loose connective tissue with fibroblasts
b) Multiple layers of flattened perineurial cells with tight junctions
c) Collagen type I fibers only
d) Myelinating Schwann cells

390. Which cell type is responsible for myelination in peripheral nerves?
a) Oligodendrocyte
b) Astrocyte
c) Schwann cell
d) Microglia

391. A single Schwann cell in the PNS typically:
a) Myelinates multiple axons
b) Myelinates a single axon segment
c) Does not form myelin
d) Forms nodes of Ranvier independently

392. Nodes of Ranvier are best described as:
a) Gaps in the endoneurium
b) Regions lacking myelin between adjacent Schwann cells
c) Areas of axonal degeneration
d) Synaptic junctions between neurons

393. Which feature distinguishes a myelinated axon from an unmyelinated axon in the PNS histologically?
a) Presence of neurofilaments
b) Presence of Schmidt–Lanterman clefts
c) Axonal diameter
d) Presence of mitochondria

394. Schmidt–Lanterman clefts represent:
a) Breaks in the axolemma
b) Cytoplasmic channels within the myelin sheath
c) Synaptic vesicles
d) Areas of axonal branching

395. Unmyelinated axons in the PNS are typically:

a) Enclosed individually by Schwann cells
b) Grouped within the cytoplasm of a single Schwann cell
c) Surrounded by oligodendrocytes
d) Found only in sensory nerves

396. Which connective tissue layer contains the vasa nervorum?
a) Endoneurium only
b) Perineurium only
c) Epineurium primarily
d) Neurolemma

397. The endoneurium mainly consists of:
a) Dense irregular connective tissue
b) Loose connective tissue with reticular fibers
c) Stratified squamous epithelium
d) Elastic cartilage

398. Which structural component is essential for saltatory conduction?
a) Neurofibrils
b) Nodes of Ranvier
c) Nissl bodies
d) Synaptic boutons

399. A cross-section of a peripheral nerve stained with H&E shows empty circular profiles. These spaces represent:
a) Lost axons
b) Shrinkage artifacts of the myelin sheath
c) Blood capillaries
d) Degenerating Schwann cells

400. Which protein is most abundant in the peripheral myelin sheath?
a) Myelin basic protein
b) Proteolipid protein
c) P0 glycoprotein
d) Neurofilament protein