INTRODUCTION TO MEDICAL BIOLOGY

PRACTICAL BOOK

FOR STUDENTS OF THE PRE-UNIVERSITY DEPARTMENT STUDYING IN ENGLISH

Minsk BSMU 2025

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА БИОЛОГИИ

ВВЕДЕНИЕ В МЕДИЦИНСКУЮ БИОЛОГИЮ

INTRODUCTION TO MEDICAL BIOLOGY

Практикум
для слушателей подготовительного отделения, обучающихся на английском языке

4-е издание, исправленное

Минск БГМУ 2025

УДК 57(076.5)(075.8)-054.6
ББК 28.70я73
В24

Рекомендовано Научно-методическим советом университета
в качестве практикума 15.10.2025 г., протокол № 2

А в т о р ы: канд. мед. наук, доц. В. Э. Бутвиловский; ст. преп. В. В. Григорович; канд. биол. наук, доц. В. В. Давыдов; канд. мед. наук, доц. А. В. Бутвиловский; ст. преп. Е. А. Черноус

Р е ц е н з е н т ы: канд. биол. наук, доц. А. В. Колб; канд. мед. наук, доц. О. Н. Ринейская

Введение в медицинскую биологию = Introduction to Medical
В24 Biology : практикум для слушателей подготовительного отделения, обучающихся на английском языке / В. Э. Бутвиловский, В. В. Григорович, В. В. Давыдов [и др.]. – 4-е изд., испр. – Минск : БГМУ, 2025. – 132 с.

ISBN 978-985-21-2097-5.

Включены основные термины и понятия, закрытые и открытые тесты для самоконтроля, тексты задач по цитологии и генетике, схемы и контуры рисунков, контрольные и экзаменационные вопросы. Первое издание вышло в 2019 году.

Предназначен для слушателей подготовительного отделения иностранных учащихся, обучающихся на английском языке.

УДК 57(076.5)(075.8)-054.6
ББК 28.70я73

ISBN 978-985-21-2097-5

Plan of the course and current grades

Name of the student _____

№	Topics	Grade	Teacher's signature
1.	Biology as a science. Basic properties of living matter		
2.	Chemistry of life		
3.	The structure of plasma membrane. Transport across the plasma membrane		
4.	Organelles of the cell and their role in metabolism		
5.	The structure of the nucleus and chromosomes		
6.	Cell cycle and mitosis		
7.	Meiosis		
8.	**Test in the topics 1–7: Biology of the cell**		
9.	Genetics as a science. Nucleic acids. Proteins synthesis		
10.	Monohybrid cross. The Law of Hybrid Uniformity. The Law of Segregation		
11.	Dihybrid cross. The Law of Independent Assortment		
12.	Solving the problems in monohybrid and dihybrid cross		
13.	Genetic linkage. The Chromosome Theory of Inheritance		
14.	Genetics of sex		
15.	Variation		
16.	The genetics of human		
17.	The hereditary disorders of human		
18.	**Test in the topics 9–17: Genetics**		
19.	Overview of the human body. Tissues, organs and organ systems		
20.	Bone tissue. The structure of bones		
21.	The skeleton of human		
22.	Muscle tissue		
23.	Interstitial fluid, lymph and blood		
24.	Circulatory system. The structure and functioning of the heart		
25.	The structure of blood vessels. Circulation of blood in the body		

Plan of the course and current grades

Name of the student _____

№	Topic of lesson	Mark	**Teacher's signature**
26.	Respiratory system		
27.	Digestive system		
28.	Digestive enzymes. Secretions of digestive glands		
29.	Excretory system. Integumentary system		
30.	Nervous system. Spinal cord		
31.	The brain		
32.	Sense organs. The organ of sight		
33.	The organ of hearing		
34.	Reproductive system. The structure and production of gametes		
35.	**Test in the topics 19–34: The Anatomy and Physiology of human**		
36.	Prokaryotes: bacteria		
37.	Kingdom Protista. Parasitic protists		
38.	Phylum Platyhelminthes (flatworms)		
39.	Class Trematoda (Flukes)		
40.	Class Cestoda (Tapeworms)		
41.	Phylum Nematoda (Roundworms)		
42.	Phylum Arthropoda		
43.	Class Arachnida		
44.	Class Insecta		
45.	Phylum Chordata		
46.	Class Osteichthyes (bony fishes)		
47.	Class Amphibia		
48.	Class Reptilia		
49.	Class Mammalia		
50.	**Test in the topics 36–49: Microbiology and Zoology**		

Lesson 1. Topic: BIOLOGY AS A SCIENCE. BASIC PROPERTIES OF LIVING MATTER «____» _____ 20____ year

Aim of the lesson is to learn the subject matter of Biology and properties of livings.

CONTENTS OF THE TOPIC

1. Biology as a science.
2. Properties and characteristics of the livings.

BASIC TERMS AND CONCEPTS

1. Biology —

2. Heredity —

3. Homeostasis —

4. Irritability —

5. Ontogenesis —

TESTS FOR SELF-CONTROL

1. What does the human body receive from the environment? a) oxygen and carbon dioxide; **b)** food, oxygen; **c)** only oxygen; **d)** carbon dioxide and food; **e)** carbon dioxide.

2. The evolutional history of species is also called: a) heredity; **b)** integrity; **c)** discretion; **d)** ontogenesis; **e)** phylogenesis.

3. Reproduction is the ability to: a) repair damaged body parts; **b)** multiply; **c)** change; **d)** move to food source; **e)** release wastes to the environment.

4. The constancy of the internal environment of an organism is: a) heredity; **b)** variability; **c)** phylogenesis; **d)** homeostasis; **e)** ontogenesis.

5. Ontogenesis is: a) evolution of species; **b)** evolution of individuals; **c)** individual development of an organism; **d)** individual development of a species; **e)** all the answers are wrong.

6. Organism's ability to respond to the environmental factor is: a) reproduction; **b)** heredity; **c)** phylogenesis; **d)** irritability; **e)** regeneration.

7. Similarity of children and parents is the result of: a) variability; **b)** heredity; **c)** reproduction; **d)** regeneration; **e)** phylogenesis.

8. The difference between children and parents is an example of: a) variability; **b)** heredity; **c)** reproduction; **d)** regeneration; **e)** phylogenesis.

9. The form of irritability that involves nervous system is called: a) taxis; **b)** stimulus; **c)** homeostasis; **d)** phylogenesis; **e)** reflex.

10. The form of irritability when a unicellular organism moves to a stimulus is: a) reflex; **b)** heredity; **c)** taxis; **d)** phylogenesis; **e)** homeostasis.

Fill in the gaps:

1. The ability of living organisms to multiply is called …

2. Similarity of children and parents is the result of …

3. Distinction of children from parents is the result of …

4. Evolutional history of a species is called …

5. The property of organisms to maintain constancy of their internal environment is called …

6. Development of an organism from the formation of the first cell to death is called …

7. The ability of organisms to adjust their vital activity to the changes of the environment is called …

Teacher's signature

Lesson 2. Topic: CHEMISTRY OF LIFE «____» _____ 20____ year

Aim of the lesson is to learn the main concepts of the Cell Theory, to get acquainted with chemical elements in cell, their content and role, to consider inorganic (water, minerals) and organic (proteins, lipids, carbohydrates) substances, the structure and function of main biomolecules.

CONTENTS OF THE TOPIC

1. Cell as the structural, functional and genetic unit of living matter.
2. Main concepts of the Cell Theory.
3. Chemical elements on the cells, their classification.
4. Inorganic substances: water, minerals and their role in cells.
5. Structure and functions of proteins.
6. Structure and functions of lipids.
7. Structure and functions of carbohydrates.

BASIC TERMS AND CONCEPTS

1. Microscope —

2. Inorganic compound —

3. Organic compound —

4. Macroelements —

5. Microelements —

6. Macromolecule —

7. Biopolymer —

8. Monomer —

9. Monosaccharide —

10. Polysaccharide —

11. Protein —

12. Unsaturated fatty acid —

13. Saturated fatty acid —

TESTS FOR SELF-CONTROL

1. Organic molecules always contain: a) carbon; **b)** phosphorus; **c)** nitrogen; **d)** magnesium; **e)** calcium.

2. An example of organic molecule: a) oxygen; **b)** carbon dioxide; **c)** water; **d)** fatty acid; **e)** ammonium.

3. Examples of organic molecules: a) oxygen and carbohydrates; **b)** carbohydrates and lipids; **c)** lipids and water; **d)** water and minerals; **e)** minerals and proteins.

4. Macroelements are: a) carbon and manganese; **b)** carbon and calcium; **c)** copper and oxygen; **d)** oxygen and zinc; **e)** manganese and phosphorus.

5. Microelements are: a) zinc and copper; **b)** carbon and sulfur; **c)** calcium and potassium; **d)** copper and carbon; **e)** iron and phosphorus.

6. What is wrong about water? a) all the content of the cell is water solution; **b)** water participates in many biochemical reactions of the cell; **c)** water is polar and can dissolve other polar molecules and ions; **d)** biochemical reactions of the cell take place in water solution; **e)** life can exist without water.

7. The pH of cells is determined by: a) balance of Ca^{2+} and K^{+}; **b)** balance of CO_3^{2-} and Cl^{-}; **c)** balance of H^{+} and OH^{-}; **d)** balance of proteins and carbohydrates; **e)** balance of lipids and proteins.

8. Cations are: a) K^{+}, Cl^{-}; **b)** Cl^{-}, Na^{+}; **c)** Na^{+}, HCO_3^{-}; **d)** HCO_3^{-}, NH_4^{+}; **e)** NH_4^{+}, K^{+}.

9. The organic molecules that are made of many repeating structural units are called: a) monomers; **b)** ions; **c)** anions; **d)** polymers; **e)** microelements.

10. The repeating structural units of polymers are called: a) monomers; **b)** ions; **c)** anions; **d)** polymers; **e)** microelements.

11. The monomers of proteins are: a) monosaccharides; **b)** polysaccharides; **c)** amino acids; **d)** fatty acids; **e)** glycerol.

12. The monomers of polysaccharides are: a) monosaccharides; **b)** polysaccharides; **c)** amino acids; **d)** fatty acids; **e)** glycerol.

13. Organic substances of cell are: a) water, ATP and lipids; **b)** minerals, nucleic acids and carbohydrates; **c)** hormones, vitamins and water; **d)** proteins, carbohydrates and lipids; **e)** proteins, carbohydrates and minerals.

14. Proteins do not perform the following functions: a) structural; **b)** enzymatic; **c)** motion, transport; **d)** regulatory, energetic; **e)** all the answers are wrong.

15. Examples of simple carbohydrates: a) starch and chitin; **b)** sucrose and glucose; **c)** lactose and ribose; **d)** fructose, glucose, ribose; **e)** lactose, starch.

16. Nucleic acids contain: a) fructose and ribose; **b)** ribose and deoxyribose; **c)** glucose and fructose; **d)** glucose and deoxyribose; **e)** fructose and deoxyribose.

17. Functions of lipids are: a) energetic; **b)** structural; **c)** thermoregulatory; **d)** storage; **e)** all the answers are correct.

Fill in the gaps:

1. Chemical elements of the living organisms compose organic and … substances.

2. The chemical elements that are abundant in cells are called …

3. The chemical elements contained in the cell in small amounts are called …

4. K and Na are …

5. Ca and Mg are …

6. I, F, Zn are …

7. Cells contain approximately …% of water.

8. The balance of cations H^+ and anions OH^- determines … of cytoplasm.

9. Proteins, lipids, carbohydrates are … substances.

10. Biomolecules which consist of numerous repeating structural units are called …

11. The monomers of proteins are …

12. The proteins which catalyze chemical reactions are called …

13. The transport of oxygen within the body is the function of the protein …

14. Muscle contraction is provided by the proteins actin and …

15. Complex carbohydrates consisting of many monomers are called …

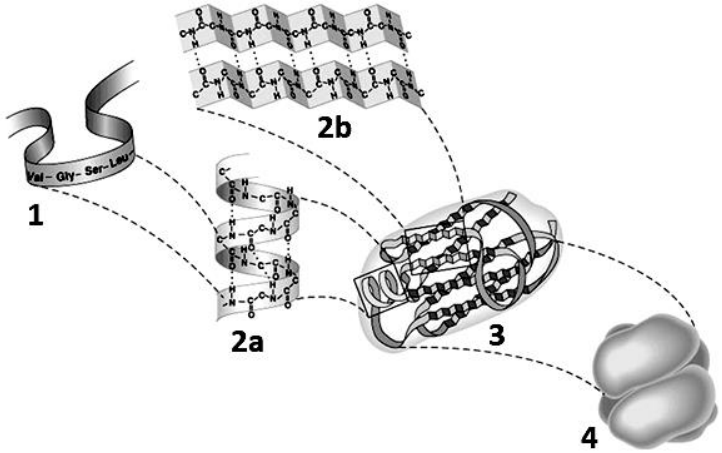
16. Fatty acids that have double bonds are called …

17. Solid fats contain … fatty acids.

18. Liquid fats contain … fatty acids.

PRACTICAL WORK

Task 1. Fill in the table "Levels of protein structure":



Structure	Bonds
1.	
2a **2b**	
3.	
4.	

Teacher's signature

Lesson 3. Topic: THE STRUCTURE OF PLASMA MEMBRANE. «____» _____ 20____ year
TRANSPORT ACROSS THE PLASMA MEMBRANE

Aim of the lesson is to learn the structure, properties and functions of plasma membrane, to learn the mechanisms substance transport through the plasma membrane.

CONTENTS OF THE TOPIC

1. General structure of the cell.
2. Structure, properties and functions of the plasma membrane.
3. Passive and active transport.
4. Endo- and exocytosis.

BASIC TERMS AND CONCEPTS

1. **Cell envelope** —
2. **Plasma membrane** —
3. **Selective permeability** —
4. **Active transport** —
5. **Passive transport** —
6. **Simple diffusion** —
7. **Facilitated diffusion** —
8. **Osmosis** —
9. **Pinocytosis** —
10. **Phagocytosis** —

TESTS FOR SELF-CONTROL

1. Human cell does not have: a) organelles; **b)** nucleus; **c)** cytosol; **d)** plasma membrane; **e)** all the answers are wrong.
2. The content of the cell without nucleus and envelope is called: a) cytoplasm; **b)** plasma membrane; **c)** nucleoplasm; **d)** cell wall; **e)** cytosol.
3. Basic molecules of the cell membrane are: a) proteins and water; **b)** water and carbohydrates; **c)** carbohydrates and minerals; **d)** minerals and lipids; **e)** lipids and proteins.
4. A phospholipid molecule has: a) head and body; **b)** head and neck; **c)** head and tails; **d)** body and neck; **e)** head, body and tails.
5. The hydrophobic tails of phospholipids are directed: a) outside the membrane; **b)** to the inside of the membrane; **c)** toward heads; **d)** toward proteins; **e)** randomly.
6. The hydrophilic heads of phospholipids are directed: a) outside the membrane; **b)** to the inside of the membrane; **c)** toward heads; **d)** toward proteins; **e)** randomly.

7. The heads of phospholipids contact with water because: a) both heads and water molecules are polar; **b)** heads and water are not polar; **c)** heads are polar while water molecules are not; **d)** water molecules are polar while heads are not; **e)** heads and water molecules form covalent bonds.

8. The property of plasma membrane that allows cytoplasm and environment have different chemical composition is: a) elasticity; **b)** universality; **c)** selective permeability; **d)** viscosity; **e)** stability.

9. Functions of plasma membrane: a) protects cells; **b)** takes part in formation of organelles; **c)** contains enzymes; **d)** transports substances into/from the cell; **e)** all the answers are correct.

10. The transport through the membrane down the concentration gradient is: a) phagocytosis; **b)** pinocytosis; **c)** diffusion; **d)** active transport; **e)** exocytosis.

11. Water passively passes through the membrane to the area of high concentration of solute by means of: a) phagocytosis; **b)** pinocytosis; **c)** osmosis; **d)** exocytosis; **e)** active transport.

12. Passive transport is: a) transport of substances down the concentration gradient without energy expenditure; **b)** transport of substances against the concentration gradient with energy expenditure; **c)** engulfment of solid particles by the membrane and their transfer into the cytoplasm; **d)** engulfment of liquids by the cell membrane and their transfer into the cytoplasm; **e)** transport of substances down the concentration gradient with energy expenditure.

13. Phagocytosis is: a) transport of substances down the concentration gradient without energy expenditure; **b)** transport of substances against the concentration gradient with energy expenditure; **c)** engulfment of solid particles by the cell membrane and their transfer into the cytoplasm; **d)** engulfment of liquids by the cell membrane and their transfer into the cytoplasm; **e)** transport of substances down the concentration gradient with energy expenditure.

Fill in the gaps:

1. The colloid solution in which organelles are located is called …

2. Cell is covered with …

3. Lipid bilayer covering the cell is called …

4. Tails of phospholipids are …

5. Heads of phospholipids are …

6. An essential property of the membrane is … permeability.

7. Passive flow of substances down the concentration gradient is called …

8. Transport of water through the membrane is …

9. Osmosis is a type of … transport.

10. Two main types of transport: passive and …

11. The transport of substances down the concentration gradient directly through the lipid bilayer is called …

12. Active transport requires energy, so it requires … molecules.

13. The process of engulfing solid particles by the cell membrane is called …

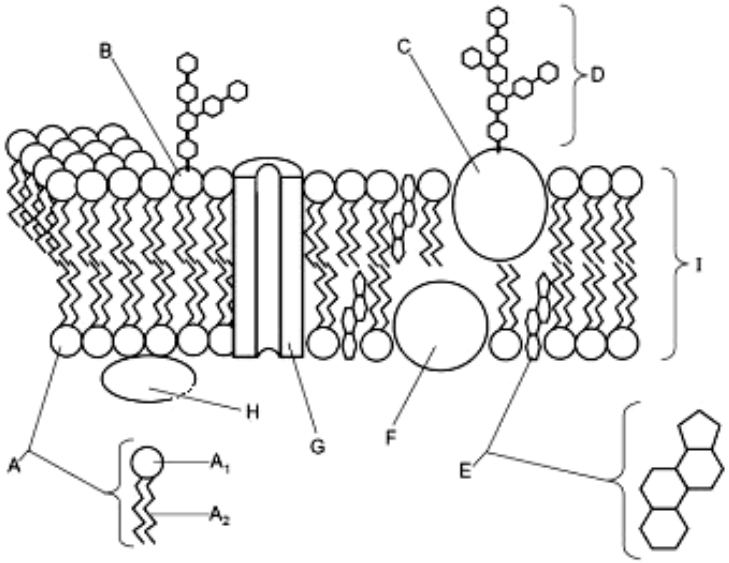
14. The process of engulfing liquids by the cell membrane is called …

15. Engulfing bacteria by leucocytes is example of …

16. Phagocytosis and pinocytosis are types of …

PRACTICAL WORK

Task 1. Write the labels for the diagram of plasma membrane.



A_1 –

A_2 –

B –

C –

D –

E –

F –

G –

H –

I –

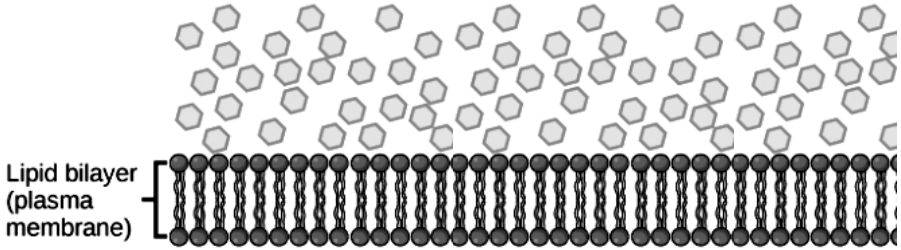
Task 2. Complete the scheme «Transport of substances to cells».

Types of transport

Requiring energy

Not requiring energy

Task 3. Draw the directions of the active transport, facilitated and simple diffusion.



Teacher's signature

Lesson 4. Topic: ORGANELLES OF THE CELL AND THEIR ROLE IN METABOLISM «____» _____ 20____ year

Aim of the lesson is to understand process of anabolism and catabolism, to learn basic organelles of the cell, their structure and functions and their role in cell's metabolism.

CONTENTS OF THE TOPIC

1. Concepts of metabolism, anabolism, catabolism.
2. Classification of living according to their types of metabolism.
3. Classification of organelles.
4. Organelles of the anabolic system of the cell (endoplasmic reticulum, Golgi complex, and plastids).
5. Organelles of the catabolic system of the cell (lysosomes, mitochondria).
6. Centrioles and their function.

BASIC TERMS AND CONCEPTS

1. Organelles —

2. Membrane-bound organelles —

3. Autotrophic organisms —

4. Heterotrophic organisms —

5. Aerobic organisms —

6. Anaerobic organisms —

7. ATP —

8. Metabolism —

9. Dissimilation —

10. Assimilation —

TESTS FOR SELF-CONTROL

1. Organelles are: a) storages of cell's food; **b)** differentiated regions of cytoplasm performing certain functions; **c)** regions of cytoplasm having variable structure and performing no functions; **d)** clusters of enzymes and membranes; **e)** sections of the nucleus.

2. Membrane-bound organelles are: a) Golgi apparatus, ribosomes; **b)** ribosomes, plastids; **c)** Golgi apparatus, endoplasmic reticulum, mitochondria; **d)** ribosomes and Golgi apparatus; **e)** centrosomes and ribosomes.

3. Conversion of complex organic compounds into simpler ones occurs in: a) anabolic system of the cell; **b)** catabolic system of the cell; **c)** nucleus; **d)** cell envelope; **e)** outside the cell.

4. Organelles of the catabolic system of the cell are: a) lysosomes; **b)** ER; **c)** plastids; **d)** ribosomes; **e)** centrioles.

5. The organelles forming vesicles for transport of substance: a) Golgi body and endoplasmic reticulum; **b)** ER and lysosomes; **c)** lysosomes and mitochondria; **d)** mitochondria and ribosomes; **e)** ribosomes and GB.

6. Ribosomes are located: a) freely in the cytoplasm and on the rough endoplasmic reticulum; **b)** in the cytoplasm and on the Golgi complex; **c)** in the nucleus and nucleolus; **d)** on the nucleus and smooth ER; **e)** in the centrosomes and smooth ER.

7. The functions of mitochondria are: a) breakdown of lipids; **b)** carbohydrate synthesis; **c)** lipid synthesis; **d)** ATP synthesis; **e)** photosynthesis.

8. The functions of centrosomes are: a) participation in cell division; **b)** participation in protein synthesis; **c)** participation in creation of lysosomes; **d)** participation ATP synthesis; **e)** participation in lipid synthesis.
9. Functions of chloroplasts are: a) synthesis of lipids and proteins; **b)** photosynthesis; **c)** synthesis of proteins and DNA; **d)** breakdown of macromolecules into H_2O and CO_2; **e)** participation in cell division.
10. Metabolism includes: a) reproduction and assimilation; **b)** irritability and dissimilation; **c)** assimilation and dissimilation; **d)** reproduction and dissimilation; **e)** growth and reproduction.
11. Assimilation includes: a) synthesis of proteins and carbohydrates; **b)** passive and active transport; **c)** cell growth; **d)** cell division; **e)** breakdown of proteins and lipids.
12. Synthesis of organic compounds from simpler molecules is: a) diffusion; **b)** assimilation; **c)** dissimilation; **d)** catabolism; **e)** osmosis.
13. Breakdown of complex organic molecules is: a) diffusion; **b)** assimilation; **c)** dissimilation; **d)** phagocytosis; **e)** pinocytosis.
14. Autotrophic organisms are: a) all fungi; **b)** all bacteria; **c)** all plants; **d)** all animals; **e)** all protists.
15. Cells breakdown complex organic compounds: a) to release energy; **b)** to produce water; **c)** to produce metabolic wastes; **d)** to produce oxygen; **e)** to produce CO_2 and H_2O.
16. A cell is autotrophic if it: a) uses inorganic carbon to produce organic substances; **b)** is not capable of photosynthesis; **c)** uses organic carbon to produce inorganic substances; **d)** uses organic carbon to produce other organic substances; **e)** all the answers are wrong.
17. Heterotrophic cells: a) produce only organic substances; **b)** use inorganic carbon to produce new organic substances; **c)** are capable of photosynthesis; **d)** produce only inorganic substances; **e)** use ready-made organic substances as a source of carbon.
18. During photosynthesis organic substances are formed from: a) oxygen and amino acids; **b)** amino acids and water; **c)** water and carbon dioxide; **d)** carbon dioxide and ions; **e)** ions and oxygen.

19. Classification of cells according to the type of assimilation: a) autotrophs and anaerobes; **b)** autotrophs and heterotrophs; **c)** heterotrophs and aerobes; **d)** heterotrophs and anaerobes; **e)** aerobes and anaerobes.
20. Classification of cells according to the type of dissimilation: a) autotrophs and anaerobes; **b)** autotrophs and heterotrophs; **c)** heterotrophs and aerobes; **d)** heterotrophs and anaerobes; **e)** aerobes and anaerobes.

Fill in the gaps:

1. Differentiated regions of the cytoplasm having certain structure and performing certain functions are …

2. Types of endoplasmic reticulum: granular (rough) and agranular (…)

3. Granular endoplasmic reticulum has … on its surface.

4. The function of ribosomes is synthesis of …

5. Synthesis of ATP is the main function of the organelle that is called …

6. A centrosome consists of two …

7. The function of mitochondria is synthesis of …

8. Green plastids of plant cells are called …

9. A chloroplast contains green pigment …

10. Synthesis of complex compounds is the part of metabolism that is called …

11. Breakdown of organic compounds is …

PRACTICAL WORK

Task 1. Write the labels for the diagrams.

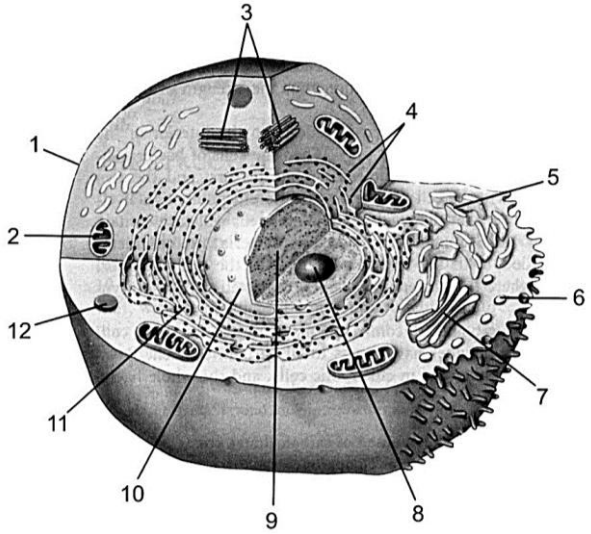


Fig. 1. Internal structure of the cell:

1 –
2 –
3 –
4 –
5 –
6 –
7 –
8 –
9 –
10 –
11 –
12 –

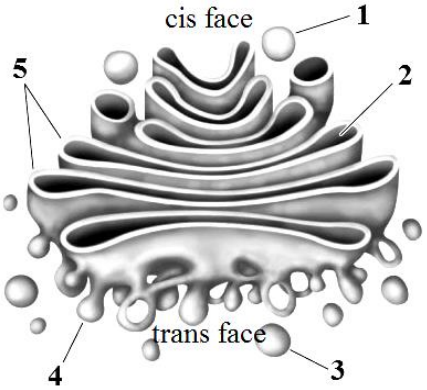


Fig. 2. Golgi body:

1 –
2 –
3 –
4 –
5 –

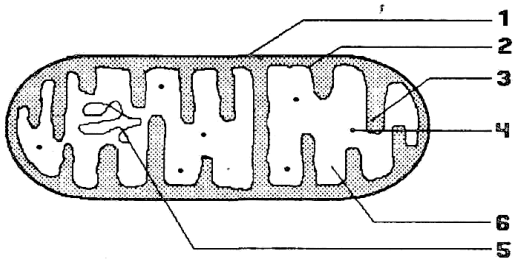


Fig. 3. Mitochondrion:

1 –
2 –
3 –
4 –
5 –
6 –

Teacher's signature

Lesson 5. Topic: THE STRUCTURE OF THE NUCLEUS AND CHROMOSOMES «____» _____ 20____ year

Aim of the lesson is to learn the structure and functions of the nucleus of eukaryotic cell and the structure and functions of chromosomes.

CONTENTS OF THE TOPIC

1. The structure and functions of the nucleus.
2. The structure of metaphase chromosomes.
3. Types of chromosomes.
4. Principles (rules) of chromosomes.

BASIC TERMS AND CONCEPTS

1. Nucleus —

2. Perinuclear space —

3. Nuclear pores —

4. Karyoplasm —

5. Chromatin —

6. Chromosome —

7. Homologous chromosomes —

8. Centromere —

9. Acrocentric chromosome —

10. Metacentric chromosome —

11. Satellite —

12. Nucleolus —

13. Genetic information —

TESTS FOR SELF-CONTROL

1. Structural components of the nucleus: a) nuclear envelope; **b)** karyoplasm; **c)** chromatin; **d)** nucleoli; **e)** all the answers are correct.
2. Nuclear envelope has: a) outer membrane; **b)** inner membrane; **c)** perinuclear space; **d)** pores; **e)** all the answers are correct.
3. What is located in karyoplasm? a) chromatin and nucleoli; **b)** plastids and nucleoli; **c)** mitochondria; **d)** Golgi complex; **e)** centrosome.
4. Subunits of ribosomes are made in: a) chromosomes; **b)** nucleolus; **c)** Golgi complex; **d)** plastids; **e)** endoplasmic reticulum.
5. Chromatin is: a) DNA + proteins; **b)** DNA + carbohydrates; **c)** DNA + lipids; **d)** DNA + ATP; **e)** all the answers are correct.
6. Parts of metaphase chromosomes are: a) two chromatids; **b)** centromeres; **c)** arms; **d)** satellites; **e)** all the answers are correct.
7. Features of submetacentric chromosomes are: a) arms of the same length; **b)** one arm is much longer than the other one; **c)** one arm is not much longer than the other one; **d)** one arm is very long and another arm is very short; **e)** all the answers are wrong.

8. Features of acrocentric chromosomes are: a) arms of the same length; **b)** arms of almost same length; **c)** one arm is very long while the other one is very short; **d)** has no centromere; e) all the answers are wrong.
9. Principles of chromosomes: a) constant number; **b)** pairing; **c)** individuality; **d)** continuity; **e)** all the answers are correct.
10. The rule of pairing of chromosomes: a) chromosomes of different pairs are identical in size; **b)** chromosomes of different pairs are different; **c)** each chromosome of karyotype has a homologous pair; **d)** each new daughter chromosome originates from a maternal one; **e)** cells of an organism have same constant number of chromosomes.
11. Functions of the nucleus: a) storage and transfer of genetic information; **b)** protein accumulation; **c)** lipid storage; **d)** breakdown of organic molecules; **e)** regulation of body functioning.

Fill in the gaps:

1. The compartment of eukaryotic cell containing its genetic information is called …

2. The membrane of the nucleus is called …

3. Nuclear envelope consists of … and … membranes.

4. The space between the membranes of the nucleus is called …

5. The perforations in the nuclear envelope are called …

6. The liquid content of the nucleus is called …

7. Ribosomal subunits are made in …

8. Complex of DNA and nuclear proteins is called …

9. During division cell condenses chromatin into …

10. The region of primary constriction of chromosomes is called …

11. The parts of chromosome on the two sides of primary constriction are called …

12. The terminal region of chromosome arm separated from others by a secondary constriction is called …

13. A chromosome formed before cell division consists of two same halves which are called …

14. Types of chromosomes are: metacentric, submetacentric and …

15. Chromosomes with arms of equal length are called …

16. Chromosomes where one arm is not much shorter than the other one are …

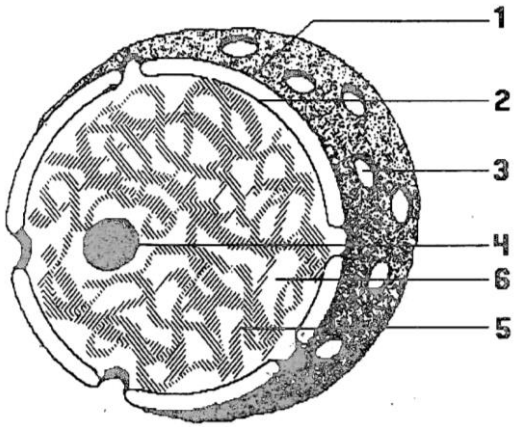
17. Chromosomes were one arm is much longer than the other one are …

18. Paired chromosomes of the same shape and size are called …

19. The normal species-specific set of chromosomes in the cell of an organism is its …

PRACTICAL WORK

Task 1. Write labels for the diagram of the nucleus.



1 –

2 –

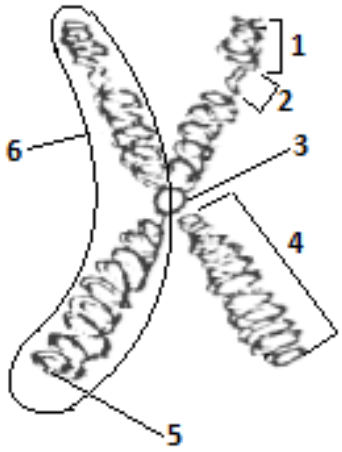
3 –

4 –

5 –

6 –

Task 2. Write labels for the diagram of the chromosome.



1 –

2 –

3 –

4 –

5 –

6 –

Teacher's signature

Lesson 6. Topic: CELL CYCLE AND MITOSIS «____» _____ 20____ year

Aim of the lesson is to learn the processes occurring during the interphase, phases of mitosis; to understand their significance.

CONTENTS OF THE TOPIC

1. Reproduction as an essential property of living matter.
2. Stages of interphase and their characteristics.
3. Stages of mitosis and their characteristics.

BASIC TERMS AND CONCEPTS

1. **Cell cycle** —
2. **Diploid chromosome set** —
3. **Somatic cells** —
4. **Interphase** —
5. **Mitosis** —
6. **Spindle apparatus** —
7. **Prophase** —
8. **Metaphase** —
9. **Anaphase** —
10. **Telophase** —
11. **Cytokinesis** —

TESTS FOR SELF-CONTROL

1. What takes place during the interphase? a) DNA condensation; **b)** segregation of chromatids; **c)** DNA duplication; **d)** synapsis of chromosomes; **e)** crossing-over.
2. What does the cell do during the interphase? a) grows; **b)** performs its functions; **c)** prepares for mitosis; **d)** duplicates DNA; **e)** all the answers are correct.
3. The set of cell's genetic material in G_1 phase is: a) 1n4chr; **b)** 2n1chr; **c)** 2n2chr; **d)** 1n2chr; **e)** 1n1chr.
4. DNA duplicates during: a) prophase; **b)** telophase; **c)** interphase; **d)** anaphase; **e)** metaphase.
5. Mitosis is: a) production of gametes; **b)** sexual reproduction; **c)** common division of somatic cells; **d)** transport of substances; **e)** cell growth.
6. Phases of mitosis: a) prophase; **b)** metaphase; **c)** anaphase; **d)** telophase; **e)** all the answers are correct.
7. Condensation of chromatin is observed in: a) anaphase; **b)** telophase; **c)** prophase; **d)** metaphase; **e)** interphase.
8. Content of genetic material in the cell during the prophase of mitosis: a) 2n2chr; **b)** 1n2chr; **c)** 2n1chr; **d)** 1n1chr; **e)** 2n3chr.

9. What takes place during the metaphase? a) condensation of chromatin; **b)** chromosomes are located on the equator of the cell; **c)** chromosomes separate into 2 chromatids; **d)** nucleolus dissolve; **e)** DNA duplicates.

10. The content of cell's genetic material in the metaphase of mitosis is: a) 2n2chr; **b)** 1n2chr; **c)** 2n1chr; **d)** 1n1chr; **e)** 1n3chr.

11. Every chromosome is separated into 2 chromatids during: a) anaphase; **b)** telophase; **c)** prophase; **d)** metaphase; **e)** interphase.

12. The content of genetic material at each cell's pole in the anaphase of mitosis: a) 2n2chr; **b)** 1n2chr; **c)** 2n1chr; **d)** 1n1chr; **e)** 2n3chr.

13. When the formation of nuclear envelope and division of maternal cytoplasm occur? a) anaphase; **b)** telophase; **c)** prophase; **d)** metaphase; **e)** interphase.

Fill in the gaps:

1. Property of living organisms to multiply is …

2. Cells multiply by …

3. All cells of the body except sex cells are called …

4. Somatic cells divide by …

5. The period between 2 mitoses is …

6. Movement of centrosomes towards cellular poles occurs in … of mitosis.

7. Chromosomes become visible in … of mitosis.

8. The microtubules of the spindle apparatus attach to the … that is situated on the centromere of chromosomes.

9. The phase of mitosis when chromosomes are located on the equator of the cell is called …

10. Daughter chromosomes diverge to the cell poles during … of mitosis.

11. Division of cytoplasm between daughter cells is called …

12. Cytokinesis occurs during …

PRACTICAL WORK

Task 1. Study the scheme of mitosis. Define the stages, write their numbers and characteristics.

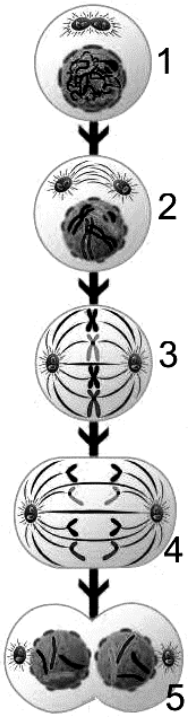
1 –

2 –

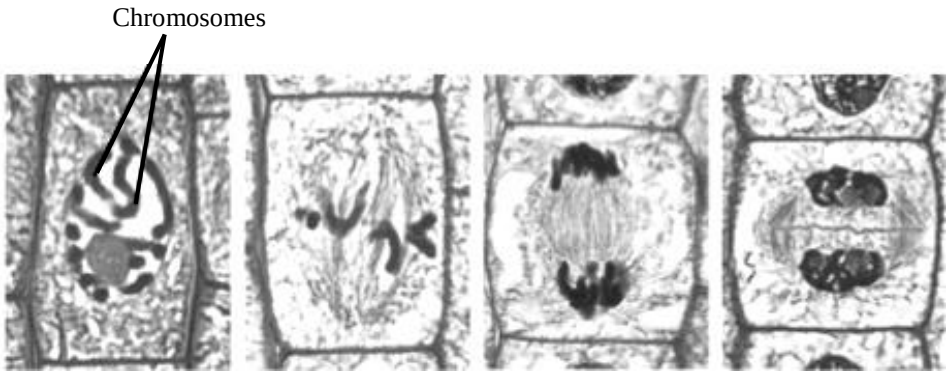
3 –

4 –

5 –



Task 2. The photograph illustrates stages of mitosis in plant cells. Write the names of the stages.



1 **2** **3** **4**

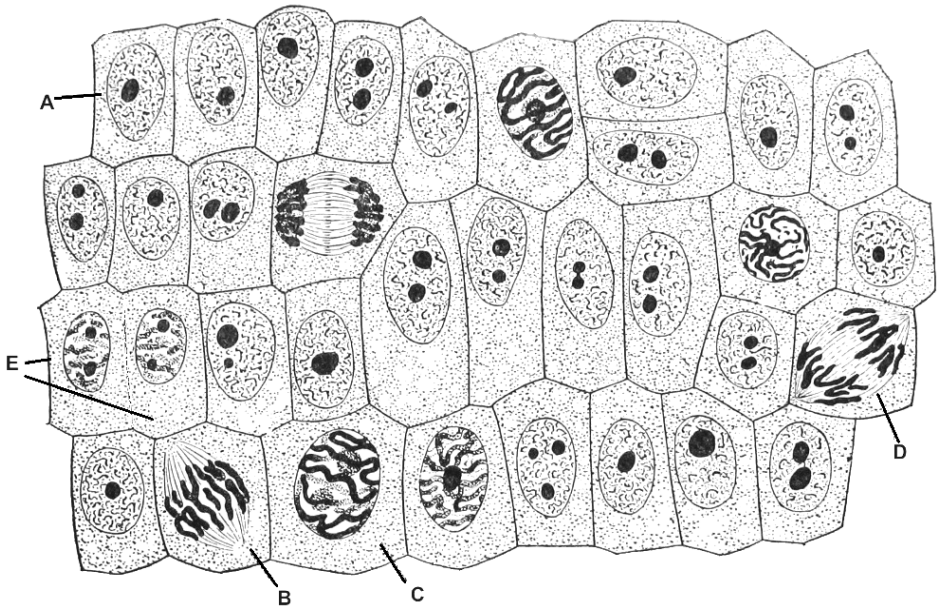
1 –

2 –

3 –

4 –

Task 3. Define the stages of mitosis in the diagram.



A –

B –

C –

D –

E –

Teacher's signature

Lesson 7. Topic: MEIOSIS «___» _____ 20____ year

Aim of the lesson is to learn the process of meiosis and its biological significance.

CONTENTS OF THE TOPIC

1. Characteristic of meiosis I, meiosis II and their phases. Changes in the content of genetic material.
2. Biological significance of meiosis.
3. Similarities and differences of meiosis and mitosis.

BASIC TERMS AND CONCEPTS

1. **Meiosis** —
2. **Gametes** —
3. **Haploid cell** —
4. **Synapsis** —
5. **Crossing-over** —
6. **Reductional division** —
7. **Equational division** —
8. **Interkinesis** —

TESTS FOR SELF-CONTROL

1. What cells are formed after meiosis? a) somatic; **b)** gametes; **c)** without nucleus; **d)** any cells; **e)** diploid cells.

2. The first meiotic division is called: a) crossing-over; **b)** reductional division; **c)** mitotic division; **d)** synapsis; **e)** equational division.

3. Meiosis results in formation of: a) two diploid cells; **b)** four haploid cells; **c)** two haploid cells; **d)** four diploid cells; **e)** all answers are wrong.

4. Meiosis consists of: a) one division; **b)** 2 divisions; **c)** 3 divisions; **d)** 4 divisions; **e)** 5 divisions.

5. Synapsis of chromosomes is: a) connection of homologous chromosomes; **b)** connection of non-homologous chromosomes; **c)** exchange between the same regions of homologous chromosomes; **d)** exchange between the same regions of non-homologous chromosomes; **e)** exchange of chromosomal satellites.

6. Chromosomal synapsis occurs in: a) prophase II; **b)** metaphase I; **c)** prophase I; **d)** metaphase II; **e)** prophase of mitosis.

7. Crossing-over is: a) connection of homologous chromosomes; **b)** connection of non-homologous chromosomes; **c)** exchange between the same regions of homologous chromosomes; **d)** exchange between the same regions of non-homologous chromosomes; **e)** exchange chromosomal satellites.

8. When does crossing-over occur? a) prophase I; **b)** prophase II; **c)** metaphase I; **d)** metaphase I; **e)** interkinesis.

9. When homologous chromosomes are connected into bivalents and situated on the equator of a cell? a) metaphase I; **b)** prophase I; **c)** metaphase II; **d)** telophase II; **e)** anaphase II.

10. When homologous chromosomes are pulled to the cell's poles? a) metaphase I; **b)** metaphase II; **c)** telophase II; **d)** anaphase II; **e)** anaphase I.

11. The content of genetic material 1n1chr in cell is typical for: a) prophase of mitosis; **b)** telophase of meiosis II; **c)** interphase; **d)** telophase of meiosis I; **e)** metaphase of mitosis.

Fill in the gaps:

1. Cells divide by meiosis in order to form …

2. Gametes are … cells as they have single set of chromosomes.

3. Gametes fuse into a diploid cell which is called …

4. The first division of meiosis when number of chromosomes is halved is called …

5. During the prophase of meiosis I, synapsis of homologous chromosomes and … occur.

6. In the prophase of meiosis I, the number of chromatids in each chromosome is …

7. In the prophase of meiosis II, the number of chromatids in each chromosome is …

8. The period between meiosis I and meiosis II is called …

9. The connection of homologous chromosomes which occurs at prophase of meiosis I is called …

10. The exchange between the same regions of homologous chromosomes is called …

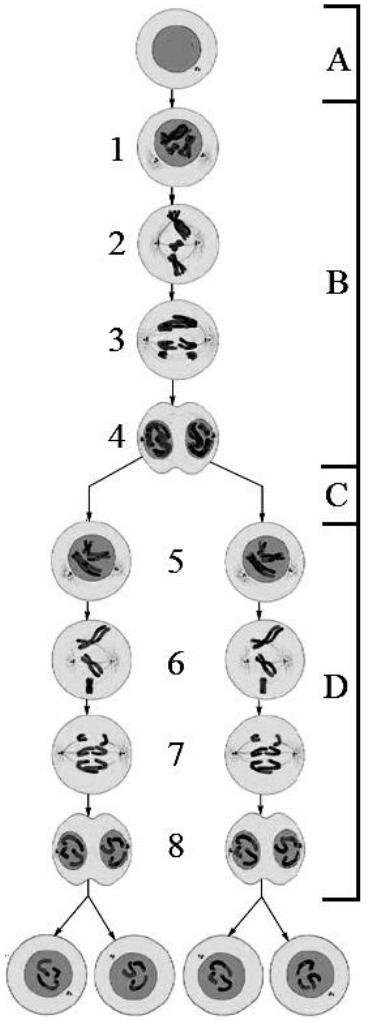
11. The content of genetic material at each pole of the cell during the anaphase of meiosis I is …

12. The content of genetic material in the cells after telophase II is …

13. After meiosis, the cells with the content of genetic material … are formed.

PRACTICAL WORK

Task 1. The diagram illustrates mitosis. Define the stages, write their numbers and characteristics.



Interphase ( )

Meiosis I ( )

– Prophase

– Metaphase

– Anaphase

– Telophase

Interkinesis ( )

Meiosis II ( )

– Prophase

– Metaphase

– Anaphase

– Telophase

Teacher's signature

Lesson 8. Topic: TEST IN THE TOPICS 1–7: BIOLOGY OF THE CELL «____» _____ 20____ year

Aim of the lesson is to estimate student's knowledge level in considered topics.

CONTENTS OF THE COLLOQUIUM	
1. Cell is a structural, functional and genetic unit of living things. 2. Main concepts of The Cell Theory. 3. Content of chemical elements in the cells, their classification. 4. Inorganic substances: water, minerals and their role in cells. 5. Structure and functions of proteins. 6. Structure and functions of carbohydrates. 7. Structure and functions of lipids. 8. Cell structure. 9. Plasma membrane, its models, properties and functions. 10. Passive transport. 11. Active transport. 12. Classification of organelles. 13. Structure and functions of membrane-bound organelles (endoplasmic reticulum, Golgi complex, lysosomes, mitochondria and plastids). 14. Structure and functions of non-membrane bound organelles (ribosomes, centrosomes). 15. Metabolism and energy exchange as a basis of life for cells. 16. Correlation between anabolism and catabolism. 17. Concepts of autotrophic and heterotrophic organisms. 18. Structure and functions of nucleus. 19. Structure of a metaphase chromosome. 20. Types of chromosomes. 21. Principles of chromosomes.	22. Reproduction as a fundamental property of livings. 23. Periods of interphase and their characteristics. 24. Features of phases of mitosis. 25. Biological significance of mitosis. 26. Characteristic of meiosis I and meiosis II. Changes in content of genetic material. 27. Biological significance of meiosis. 28. Similarity and differences in meiosis and mitosis.

Lesson 9. Topic: GENETICS AS A SCIENCE. NUCLEIC ACIDS. PROTEINS SYNTHESIS «____» _____ 20____ year

Aim of the lesson is to learn basic terms of genetics, understand the structure and functions of nucleic acids, to get acquainted with of protein synthesis.

CONTENTS OF THE TOPIC

1. Subject matter of genetics.
2. Structure and functions of nucleic acids (DNA, RNA).
3. Genes and genetic code.
4. Biosynthesis of proteins in cells.

BASIC TERMS AND CONCEPTS

1. Genetics —

2. Heredity —

3. Hereditary variation —

4. Gene —

5. DNA —

6. RNA —

7. Nucleotide —

8. Complementarity of nitrogenous bases —

9. Anti-codon —

10. Genetic code —

11. Replication —

12. Transcription —

13. Translation —

TESTS FOR SELF-CONTROL

1. Genetics studies: a) the laws of heredity; **b)** the laws of variability; **c)** the mechanisms of heredity; **d)** the mechanisms of variability; **e)** all the answers are correct.

2. Heredity is a property of living organisms: a) to hand on their own characteristics and features to descendants; **b)** to acquire new characteristics and features; **c)** to be different from their brothers and sisters; **d)** to be different from their parents; **e)** to lose characters and features.

3. Nucleic acids are: a) DNA and ATP; **b)** ATP and RNA; **c)** RNA and DNA; **d)** DNA and amino acids; **e)** amino acids and ATP.

4. DNA is located in: a) plastids and ribosomes; **b)** cytoplasm and centrosomes; **c)** nucleus, mitochondria, plastids; **d)** nucleus and ribosomes; **e)** Golgi complex and endoplasmic reticulum.

5. The bases of DNA nucleotides are: a) adenine and uracil; **b)** uracil and thymine; **c)** thymine and lysine; **d)** lysine and cytosine; **e)** cytosine and adenine.

6. Bonds between cytosine and guanine of complementary DNA strands are: a) 1 hydrogen bonds; **b)** 2 hydrogen bonds; **c)** 3 hydrogen bonds; **d)** 4 hydrogen bond; **e)** 5 hydrogen bonds.

7. Each DNA nucleotide contains: a) ribose and phosphoric acid; **b)** deoxyribose and phosphoric acid; **c)** ribose, nitrogenous base, phosphate; **d)** amino acid, deoxyribose, 6-carbon sugar; **e)** adenine, guanine, uracil.

8. The bonds between thymine and adenine of complementary DNA strands are: a) 1 hydrogen bonds; **b)** 2 hydrogen bonds; **c)** 3 hydrogen bonds; **d)** 4 hydrogen bond; **e)** 5 hydrogen bonds.

9. An amino acid of a polypeptide is encoded by: a) 1 nucleotide; **b)** 2 nucleotides; **c)** 3 nucleotides; **d)** 4 nucleotide; **e)** 5 nucleotides.

10. Stages of protein synthesis are: a) replication and transcription; **b)** translation and replication; **c)** crossing-over and transcription; **d)** transcription and translation; **e)** conjugation and translation.

11. Amino acids are connected to one another in: a) small ribosomal subunit; **b)** large ribosomal subunit; **c)** mRNA; **d)** tRNA; **e)** DNA.

Fill in the gaps:

1. The laws of heredity and variability are studied by the science …

2. Due to variability organisms … to their environment.

3. Chemical matter of heredity is …

4. The property of living organisms to hand on their own characteristics to descendants is …

5. The property of new generations to acquire new characteristics and to become different from their parents is …

6. As DNA consists of many structural units, it is a …

7. The monomer of DNA is …

8. Duplication of DNA by the cell is called …

9. New DNA strand is assembled by the enzyme …

10. The new DNA strand is formed on the principle of …

11. RNA contains … polynucleotide chain(s).

12. RNA contains the nitrogenous base … instead of …

13. RNA contains pentose sugar … instead of …

14. The «nucleotide language» of DNA determining the sequence of amino acids in proteins is called …

15. Bases of complementary DNA strands are connected by … bonds.

16. The unit of heredity and variability is …

17. Triplet of nucleotides that codes for an amino acid is called …

18. The main function of gene is …

19. The process of rewriting the nucleotide sequence of DNA into a messenger RNA is called …

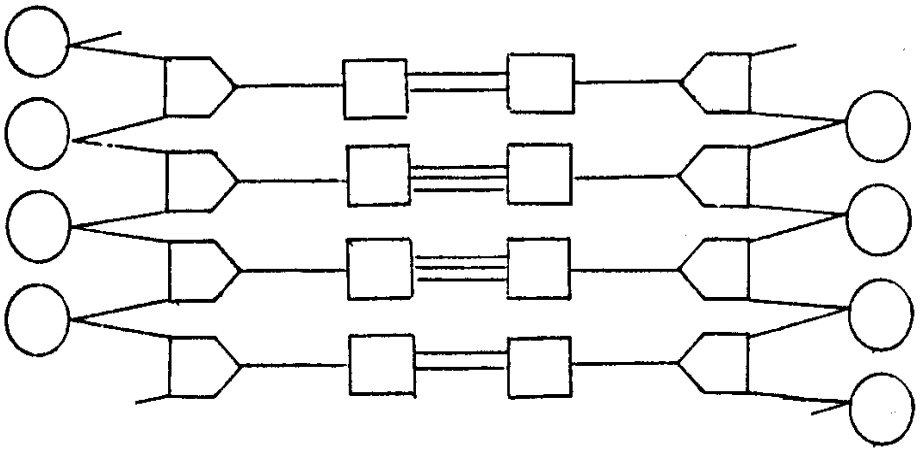
20. Genes contains the information about the structure of …

21. The process of making a sequence of amino acids according to the sequence of nucleotides in mRNA is called …

22. A group of ribosomes on the same mRNA is …

PRACTICAL WORK

Task 1. Mark the components of the DNA nucleotides with the letters.



D — deoxyribose,

P — phosphate group,

A — adenine,

T — thymine,

G — guanine,

C — cytosine.

Task 2. Solve the problems.

Problem № 1. There is a DNA fragment containing 18 % of adenine bases. What is the percentage of other bases in that DNA fragment?

Problem № 2. There is a DNA fragment consisting of 2000 nucleotides and containing 24 % of cytosine bases. What is the number of all the nucleotides of different types in that DNA fragment?

Problem № 3. There is a DNA fragment containing 660 thymine bases. It is 33 % of all the bases in that fragment. What is the percentage of all the nucleotides of different types in that DNA fragment?

Teacher's signature

Lesson 10. Topic: MONOHYBRID CROSS. THE LAW OF HYBRID UNIFORMITY. THE LAW OF SEGREGATION «____» _____ 20____ year

Aim of the lesson is to learn Mendel's laws and solution of genetic problems.

CONTENTS OF THE TOPIC

1. The concept of alleles. Homozygotes and heterozygotes.
2. The Law of Hybrid uniformity.
3. The Law of Segregation.

BASIC TERMS AND CONCEPTS

1. **Gene** —
2. **Allele** —
3. **Alternative characteristics** —
4. **Genotype** —
5. **Dominant allele** —
6. **Recessive allele** —
7. **Heterozygote** —
8. **Homozygote** —
9. **Hybridological method** —
10. **Phenotype** —

TESTS FOR SELF-CONTROL

1. The basic laws of inheritance of traits were described by: a) R. Hooke; **b)** T. Schwann; **c)** T. Morgan; **d)** G. Mendel; **e)** R. Punnett.
2. The set of all individual alleles of an organism is its: a) genotype; **b)** genome; **c)** genetics; **d)** karyotype; **e)** phenotype.
3. The complex of all features and properties of organisms is called: a) genotype; **b)** phenotype; **c)** gene; **d)** hybrid; **e)** phene.
4. Variants of the same gene which determine alternative traits are called: a) autosomal; **b)** alleles; **c)** homozygous; **d)** heterozygous; **e)** non-allelic.
5. The trait that develops in both homo- and heterozygous genotypes is: a) recessive; **b)** dominant; **c)** homozygous; **d)** heterozygous; **e)** alternative.
6. Organisms that have same alleles of the analyzed gene are called: a) heterozygous; **b)** homozygous; **c)** recessive; **d)** dominant; **e)** autosomal.
7. Organisms that can form two types of gametes with different alleles of the analyzed gene are: a) monohybrid; **b)** dominant; **c)** homozygous; **d)** heterozygous; **e)** recessive.
8. Monohybrid cross is the crossing when: a) one generation is analyzed; **b)** only one allele is analyzed; **c)** one pair of alternative characters is analyzed; **d)** segregation is present in one generation; **e)** one trait is always inherited.
9. If heterozygotes are crossed, the expected percentage of descendants having the dominant trait is: a) 10 %; **b)** 25 %; **c)** 50 %; **d)** 75 %; **e)** 100 %.
10. In humans, the allele of brown eyes dominates over the allele of blue eyes. The children of heterozygous parents should be: a) AA and Aa; **b)** Aa and aa; **c)** AA and aa; **d)** uniform – Aa; **e)** AA, Aa, aa.
11. How many types of gametes could an organism with the genotype Aa form? a) 1; **b)** 2; **c)** 3; **d)** 4; **e)** 5.

Fill in the gaps:

1. The basic laws of heredity had been described by …

2. The traits that exclude presence of each other are called …

3. An organism is called … if it has both dominant and recessive alleles of the same gene in its genotype.

4. The … trait cannot develop if the dominant allele is present in the genotype.

5. The method of cross that was used by G. Mendel is called …

PRACTICAL WORK

Task 1. Solve the problems.

Problem № 1. How many and what types of gametes could be formed by organisms with genotypes:

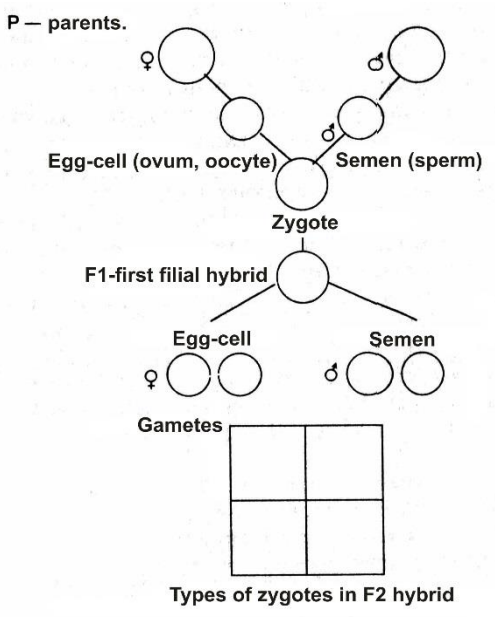
AA **Aa** **aa**

Problem № 2. In humans, brown eyes are determined by the dominant allele of a gene. Blue-eyed female married brown-eyed homozygous male. What eye color would their children have?

Feature	Gene	Genotype
brown eyes	**B**	**BB; Bb**
blue eyes	**b**	**bb**

Problem № 3. The allele determining normal growth of tomato plants dominates over the allele causing dwarf growth. What plants could be expected in F_1 and F_2 after cross of a normal homozygous tomato plant with a dwarf tomato plant?

Trait	Allele	Genotype
Normal growth	B	BB; Bb
Dwarfism	b	bb



Task 2. Write down the genotypes of parents (pure lines). Point out parental gametes. Write the name of the process when gametes are formed. Write the genotype of F_1. What gametes are formed by F_1 — first filial hybrid. Write down the genotypes of descendants derived from F_1-crosses.

Teacher's signature

Lesson 11. Topic: DIHYBRID CROSS. THE LAW OF INDEPENDENT ASSORTMENT «____» _____ 20____ year

Aim of the lesson is to learn the 3rd Mendel's law and understand the mechanism of independent inheritance of genes.

CONTENTS OF THE TOPIC

1. The Law of Independent Assortment and its cytological basis.
2. Significance of the Mendel's laws.

BASIC TERMS AND CONCEPTS

1. **Hypothesis of purity of gametes** —
2. **Dihybrid cross** —
3. **Law of Independent Assortment** —
4. **Punnett square** —

TESTS FOR SELF-CONTROL

1. Characteristic of dihybrid cross: a) two alleles of the same gene are analyzed, **b)** two pairs of alternative characters are analyzed; **c)** two chromosomes are analyzed; **d)** two genotypes are analyzed; **e)** two gametes are analyzed.
2. Phenotypic ratio in dihybrid crosses of two double heterozygotes: a) 1 : 2 : 1; **b)** 1 : 1; **c)** 9 : 3 : 3 : 1; **d)** 3 : 1; **e)** 13 : 3.
3. Alleles are located in: a) same loci of non-homologous chromosomes; **b)** different loci of non-homologous chromosomes; **c)** different loci of homologous chromosomes; **d)** the same loci of homologous chromosomes; **e)** all the answers are correct.
4. How many types of gametes could be produced by the organism with the genotype AABb? a) 1; **b)** 2; **c)** 3; **d)** 4; **e)** 8.
5. The hypothesis of purity of gametes states that: a) parental alleles in hybrids do not mix and remain in pure allelic state; **b)** parental alleles in hybrids mix; **c)** genes do not mix during meiosis; **d)** during meiosis all the alleles pass to the same gamete; **e)** all the answers are correct.
6. The 3rd Mendel's law is: a) The Law of Dominance; **b)** The Law of Segregation; **c)** The Law of Independent Assortment; **d)** Hypothesis of Purity of Gametes; **e)** Rules of Chromosomes.
7. Descendants of the cross AAbb x aaBB are: a) AAbb and aaBB; **b)** AaBb; **c)** AaBB and AABb; **d)** AaBb, Aabb, aaBb and aabb; **e)** aabb.
8. Specifics of the G. Mendel's laws: a) universality (generality); **b)** explain mechanisms of inheritance of alternative characters in all diploid organisms; **c)** based on statistic; **d)** laws work on a large number of organisms and allow to determine the probability of a particular trait in descendants; **e)** all the answers are correct.

Fill in the gaps:

1. Alleles of different genes assort independently of one another during gamete formation. It is … G. Mendel's law.

2. The … square is used to write down gametes and hybrid genotypes.

3. The cytological basis of the G. Mendel's law is explained by hypothesis of …

PRACTICAL WORK

Task 1. Solve the problems.

Problem № 1. How many and what types of gametes could be formed by organisms with the genotypes:

P: AAcc BbDd Eehh

Problem № 2. Yellow coloring of pea seeds and their smooth surface are caused by the dominant alleles of two different genes. The recessive alleles of the genes are associated with development of green color and wrinkled surface of seeds. What percentage of yellow wrinkled seeds could be expected from the cross of two individuals heterozygous for both traits?

Trait	Allele	Genotypes

Problem № 3. In dogs, black and coffee colorings are determined by dominant and recessive alleles respectively; the two alleles of another gene cause development of short (dominant allele) and long hair (recessive allele). What percentage of coffee-colored short-haired puppies could be expected from crossing of diheterozygous and coffee-colored long- haired dogs?

Trait	Allele	Genotypes

Problem № 4. In humans, the allele determining brown color of eyes is dominant over the allele of blue color. The dextrality (right-handedness) is also caused by the dominant allele of another gene while sinistrality (left-handedness) is caused by recessive one. Browned-eyed (heterozygous) left-handed man married a blue-eyed right-handed (heterozygous) woman. What is the probability of giving birth of a blue-eye left-hander child in this family?

Trait	Allele	Genotypes

Teacher's signature

Lesson 12. Topic: SOLVING THE PROBLEMS OF MONOHYBRID AND DIHYBRID CROSS «____» _____ 20____ year

Aim of the lesson is to gain experience of solving genetic problems.

PRACTICAL WORK

Task 1. Solve the problems.

Problem № 1. How many and what types of gametes could be formed by organisms with the following genotypes:

P: **AA** **Bb** **ccdd** **EeFf**

P: **GgHhIi** **KkLLMM**

Problem № 2. The allele of black coloring of cattle dominates the allele of the red one. What offspring could be expected from a heterozygous breeding?

Trait	Allele	Genotypes

Problem № 3. In humans, the allele of the gene causing hexadactylism (6 fingers) **P** is dominant over the allele of pentadactylism (5 fingers) **p**. What is the probability of pentadactyl child in family where one parent is heterozygous hexadactyl and the other one is pentadactyl?

Trait	Allele	Genotypes

Problem № 4. In humans, the recessive allele of a gene causes development of hereditary deaf-mutism (surdomutiasis). The dominant allele of this gene provides acusis (normal abilities to hear and talk). A deaf-mute woman delivered a sick child while her husband is not affected. What are the genotypes of the parents?

Trait	Allele	Genotypes

Problem № 5. A blue-eyed male married a brown-eyed female. Her father was blue-eyed and mother was brown-eyed. It's known that the allele of brown eyes is dominant. What phenotypes of children could be expected in this family and what is their chance?

Trait	Allele	Genotypes

Problem № 6. The "Angora" (long) wool in cats is determined by the dominant allele of one gene. A short-wooled lady-cat crossed with an Angora cat delivered 6 short-wooled and 2 Angora cats. What are the genotypes of the parental cats?

Trait	Allele	Genotypes

Problem № 7. A rare recessive allele of the gene **a** causes anophthalmia (congenital absence of one or both eyes). Its dominant allele **A** determines normal eyes, heterozygotes have smaller eyes. What are thephenotypes and genotypes of children in a family of parents with smaller eyes?

Trait	Allele	Genotypes

Problem № 8. In humans, brown eyes and dextrality (right-handedness) are determined by the dominant alleles of two different genes. The blue eyes and sinistrality (left-handedness) are determined by their recessive alleles. A browned-eyed right-hander man married a blue-eyed left-hander woman. What traits could be expected in children if the man is double-heterozygous?

Trait	Allele	Genotypes

Problem № 9. In humans, brown eyes and dextrality (right-handedness) are determined by dominant alleles of two different genes. The blue eyes and sinistrality (left-handedness) are determined by their recessive alleles. A diheterozygous man married a blue-eyed right-handed (homozygous) woman.

1. What is the probability of giving birth to blue-eyed children in this family?
2. What is the probability of giving birth to brown-eyed right-handed children in this family?
3. What is the probability of giving birth to children having the phenotypes of their parents?

Trait	Allele	Genotypes

Problem № 10. In dogs, the allele of black colour is dominant over the allele of coffee-color and the allele of short hair dominates the allele long hair.

1. What percentage of black puppies could be expected at crossing of 2 double-heterozygotes?
2. What percentage of coffee-colored long-haired puppies could be expected at the same crossing?
3. How many puppies will have only one dominant trait (anyone)?

Trait	Allele	Genotypes

Teacher's signature

Lesson 13. Topic: GENETIC LINKAGE. THE CHROMOSOME THEORY OF INHERITANCE «____» _____ 20____ year

Aim of the lesson is to study Morgan's experiments and understand mechanism of genetic linkage.

CONTENTS OF THE TOPIC

1. Thomas Morgan's experiments. Genetic linkage. Complete and partial genetic linkage.
2. Crossing-over. Crossover and non-crossover gametes.
3. Main concepts of the Chromosome Theory of Inheritance.

BASIC TERMS AND CONCEPTS

1. **Genetic linkage** —
2. **Linkage group** —
3. **Crossover gamete** —
4. **Non-crossover gamete** —
5. **Gene locus** —
6. **Partial linkage** —
7. **Complete linkage** —

TESTS FOR SELF-CONTROL

1. The linked inheritance was discovered by: a) G. Mendel; **b)** T. Morgan; **c)** Ch. Darwin; **d)** T. Boveri; **e)** T. Schwann.

2. Linkage group is: a) diploid chromosome set; **b)** group of genes situated in the same chromosome; **c)** the number of genes in a chromosome; **d)** the genes of all chromosomes; **e)** all genes of an organism.

3. If genes A and B linked, then a female Drosophila with genotype AB//ab could produce gametes: a) AB, Ab, aB, ab; **b)** AB, ab; **c)** Ab, aB; **d)** only AB; **e)** only aB.

4. Crossing-over is the exchange of: a) dominant alleles; **b)** same regions of homologous chromosomes; **c)** some regions of non-homologous chromosomes; **d)** different regions of sex chromosomes; **e)** recessive alleles.

5. Crossing-over takes place in: a) telophase of mitosis; **b)** prophase I of meiosis; **c)** anaphase I of meiosis; **d)** prophase II of meiosis; **e)** interphase.

6. Phenotypic segregation ratio in Morgan's experiment with diheterozygous female and recessive homozygous male *Drozophilae*: a) BbVv – 25 %, Bbvv – 25 %, bbVv – 25 %, bbvv – 25 %; **b)** BbVv – 41.5 %, Bbvv – 8.5 %, bbVv – 8.5 %, bbvv – 41.5 %; **c)** BbVv – 20 %, Bbvv – 30 %, bbVv – 25 %, bbvv – 25 %; **d)** BbVv – 40 %, Bbvv – 10 %, bbVv – 10 %, bbvv – 40 %; **e)** BbVv – 15 %, Bbvv – 15 %, bbVv – 35 %, bbvv – 35 %.

7. What is not applicable to Chromosome Theory of Inheritance: a) chromosomes are linear sequences of genes; genes are located in specific sites on chromosomes; **b)** genes in a chromosome compose a linkage group; **c)** the number of linkage groups is equal to haploid chromosome set; **d)** crossing over breaks the genetic linkage; **e)** linkage of genes is always complete.

Fill in the gaps:

1. The group of genes situated in the same chromosome is called … …

2. Genetic linkage was discovered by …

3. The results of 1st Morgan's experiment confirmed … G. Mendel's law.

4. The genes determining the body color and the length of wings of fruit flies are situated in … chromosome.

5. Genes located in the same chromosome are …

6. Males of *Drosophila* have … genetic linkage.

7. Females of *Drosophila* have … genetic linkage.

8. The results of Morgan's experiments are expressed in … … …

PRACTICAL WORK

Task 1. Solve the problems.

Problem № 1. How many and what types of gametes could be formed by fruit flies (*Drosophila melanogaster*) with the following genotypes if the distance between the analyzed genes is 10 cM?

1. **Male** $\frac{A\ B}{a\ b}$ 2. **Female** $\frac{A\ B}{a\ b}$ 3. **Male** $\frac{AB}{a\,b}$ 4. **Female** $\frac{AB}{a\,b}$

Problem № 2. How many and what types of gametes could be formed by fruit flies (*Drosophila melanogaster*) with the following genotypes if the distance between the analyzed genes is 26 cM?

Male $\frac{AB}{a\,b}$ **Female** $\frac{AB}{a\,b}$ **Male** $\frac{Ab}{a\,b}$ **Female** $\frac{Ab}{a\,b}$

Problem № 3. Homozygous tan fruit fly with long wings (dominant traits) was crossed with homozygous black vestigial-winged fly. In F_1, all flies were uniform. What flies can be expected in F_2? The distance between the analyzed genes is 17 cM.

Gene	Trait
B	tan body
b	black body
V	long wings
v	vestigial (short) wings

Teacher's signature

Lesson 14. Topic: GENETICS OF SEX «____» _____ 20____ year

Aim of the lesson is to learn the patterns of sex determination, inheritance of sex-linked genes; to solve problems on sex-linked characteristics.

CONTENTS OF THE TOPIC

1. Sex as a biological feature.
2. Determination of organism's sex.
3. X- and Y linked inheritance.

BASIC TERMS AND CONCEPTS

1. **Sex (gender)** —
2. **Reproduction** —
3. **Sexual dimorphism** —
4. **Autosome** —
5. **Sex chromosomes (heterochromosomes)** —
6. **Homogametic sex** —
7. **Heterogametic sex** —
8. **X linked gene** —
9. **Fertilization** —
10. **Hemophilia** —
11. **Daltonism** —

TESTS FOR SELF-CONTROL

1. Autosomes are: a) chromosomes of only men; **b)** chromosomes of only women; **c)** chromosomes of gametes; **d)** chromosomes that are same in men and women; **e)** chromosomes which are different in men and women.

2. Heterochromosomes are: a) chromosomes of only men; **b)** chromosomes of only women; **c)** chromosomes of gametes; **d)** chromosomes that are same in men and women; **e)** chromosomes which are responsible for sex determination.

3. Human karyotype has: a) 48 chromosomes; **b)** 44 chromosomes; **c)** 46 chromosomes; **d)** 40 chromosomes; **e)** 23 chromosomes.

4. The number of autosomes in humans: a) 20 pairs; **b)** 22 pairs; **c)** 46 pairs; **d)** 2 pairs; **e)** 23 pairs.

5. Hair color and eye color in humans are determined by genes of: a) X-chromosome; **b)** mitochondrial DNA; **c)** Y-chromosome; **d)** X- and Y-chromosomes; **e)** autosomes.

6. Development of gametes and sexual characteristics are determined by chromosomes of: a) the 1^{st} pair; **b)** 20^{th} pair; **c)** 22^{nd} pair; **d)** 23^{rd} pair; **e)** 21^{st} pair.

7. Normal chromosomes of 23^{rd} pair in men: a) X and X; **b)** X, X and Y; **c)** X and Y; **d)** X, Y and Y; **e)** X, X and X.

8. If a zygote has female sex, then the ovum was fertilized by a sperm carrying: a) X chromosome; **b)** Y chromosome; **c)** X and X chromosomes; **d)** X and Y chromosomes; **e)** X, X and Y chromosomes.

9. If a zygote has male sex, then the ovum was fertilized by a sperm having: a) X-chromosome; **b)** Y-chromosome; **c)** X- and X-chromosomes; **d)** X- and Y-chromosomes; **e)** X, X- and Y-chromosomes.

10. The hereditary disorder impairing blood coagulation is: a) daltonism; **b)** influenza; **c)** hemophilia; **d)** Down syndrome; **e)** hypertension.

11. The name of hereditary disorder when the human eye cannot distinguish colors: a) daltonism; **b)** influenza; **c)** hemophilia; **d)** Down syndrome; **e)** anophthalmia.

Fill in the gaps:

1. The complex of morphological, physiological and other traits that determine organism's role in sexual reproduction is its …

2. The chromosomes that are same in men and women are called …

3. The chromosomes that are different in men and women are called …

4. The sex of human is determined at the moment when … is formed.

5. Mergence of gametes into a zygote is called …

6. The genes mutations of which may cause hemophilia and daltonism are located in the … chromosome.

7. A … embryo develops from a zygote if the ovum is fertilized by sperm carrying Y chromosome.

8. A … embryo develops from a zygote if the ovum is fertilized by sperm carrying X-chromosome.

9. The sex chromosomes in males are … and those of females are …

10. Gender depends on a combination of … chromosomes in the zygote.

11. The gene the allele of which causes ichtiosis is located in the … chromosome.

12. The probability to form male or female zygote during fertilizaton is …

PRACTICAL WORK

Task 1. Solve the problems.

Problem № 1. Hemophilia is caused by the recessive allele of a gene situated in the X chromosome. There is a girl whose father was a hemophiliac. Her mother was healthy and there were no cases of hemophilia in her family. This girl married a healthy man. What is the probability of giving birth to a child sick with hemophilia?

Problem № 2. Daltonism (inability to distinguish red and green colors) is caused by the recessive allele of a gene situated in the X chromosome. Parents with normal color vision have 2 daughters with normal vision and a daltonian son. What are the genotypes of the parents?

Teacher's signature

Lesson 15. Topic: VARIATION «____» _____ 20____ year

Aim of the lesson is to learn types of variation, properties of modification and genotypic variation.

CONTENTS OF THE TOPIC

1. Variation and its types.
2. The role of genotype and environment in phenotype formation.
3. Phenotypic modifications and their properties. Reaction range.
4. Combinative variation. Mutations and their types. Mutagens.

BASIC TERMS AND CONCEPTS

1. **Variation** —
2. **Phenotypic plasticity** —
3. **Genotypic variation** —
4. **Combinative variation** —
5. **Norm of reaction** —
6. **Mutation** —
7. **Gene mutation** —
8. **Chromosome mutation** —
9. **Genome mutation** —

TESTS FOR SELF-CONTROL

1. Phenotype develops on the basis of: a) genotype and environmental factors; **b)** genotype and mutations; **c)** environmental factors and mutations; **d)** only genotype; **e)** only environmental factors.

2. Non-heritable adaptation of organism to its environment occurs due to: a) mutations; **b)** phenotypic plasticity; **c)** narrow reaction range; **d)** wide reaction range; **e)** combinative variation.

3. Examples of modifications occurring due to phenotypic plasticity: a) thicker coat of animals in cold climate; **b)** different eye color in the same person; **c)** different hair color in twins; **d)** variations of pea seed color in Mendel's experiments; **e)** presence of the gene causing hemophilia.

4. Norm of reaction is: a) the range of the number of mutations; **b)** the range of phenotypic plasticity; **c)** the range of combinative variation; **d)** range of phenotypes caused by mutations; **e)** a+d.

5. A phenotypic change of an individual triggered by the environment, but not changes in the genotype is called: a) mutation; **b)** reaction range; **c)** recombination; **d)** modification; **e)** mutagens.

6. A phenotypic change caused by changes in the genotype is called: a) genotypic variation; **b)** phenotypic variation; **c)** reaction norm; **d)** ontogenesis; **e)** adaptation.

7. Mutations that change the structure of a gene are: a) genome mutations; **b)** chromosome mutations; **c)** gene mutations; **d)** modification; **e)** adaptation.

8. Mutations that change the structure of a chromosome are: a) genome mutations; **b)** chromosome mutations; **c)** gene mutations; **d)** modification; **e)** range of reaction.

9. Mutations that change the number of chromosomes are: a) genome mutations; **b)** chromosome mutations; **c)** gene mutations; **d)** modification; **e)** range of reaction.

10. Hemophilia and albinism are caused by: a) genome mutations; **b)** gene mutations; **c)** chromosome mutations; **d)** modifications; **e)** combinations of genes.

Fill in the gaps:

1. The property of an organism to change its phenotype and the property of descendants to differ from their parents are the examples of …

2. Types of variation: phenotypic and …

3. The changes in the phenotype caused by the changes of the environmental conditions is …

4. The range between the limits of modification is called …

5. The reaction norm is … if a feature varies considerably.

6. The reaction norm is … if a feature varies inconsiderably.

7. The factors which cause mutations are called …

8. Inborn errors of metabolism are caused by … mutations.

9. Malformations of organs and organ systems are more commonly caused by … and … mutations.

PRACTICAL WORK

Task 1. Draw a scheme «classification of mutations according to changes in genetic material».

Task 2. Fill in the table «differences between modifications and mutations».

	Modifications	**Mutations**
Inherited		
Material for natural selection		
Adaptability		
Irreversibleness		
Predictability		
Individuality		

Teacher's signature

Lesson 16. Topic: THE GENETICS OF HUMAN «____» _____ 20____ year

Aim of the lesson is to learn the characteristics of human as a genetic object and methods of Human Genetics.

CONTROL QUESTIONS

1. Characteristics of human being as a genetic unit.
2. Methods of human genetics (genealogical, karyotyping, biochemical).

BASIC TERMS AND CONCEPTS

1. **Genetics of human** —
2. **Biochemical method** —
3. **Genealogical method** —
4. **Karyotyping** —
5. **Human karyotype** —

TESTS FOR SELF-CONTROL

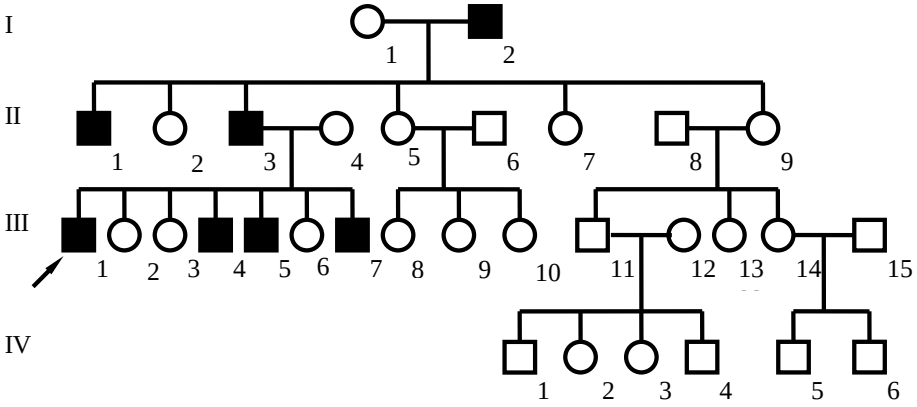
1. Human genetics studies: a) the normal karyotype of human; **b)** abnormalities of the human karyotype; **c)** causes of hereditary disorders; **d)** diagnosis of genetic disorders; **e)** all the answers are correct.
2. Difficulties of Human Genetics are: a) humans have many chromosomes; **b)** humans have small number descendants for statistical analysis; **c)** human is not an object for experiments; **d)** it is impossible to make same conditions for all analyzed persons; **e)** all the answers are right.
3. Genealogical analysis allows to: a) determine the number of chromosomes and their structure; **b)** diagnose inborn errors of metabolism; **c)** determine whether a certain trait is hereditary or not; **d)** determine the sex of an organism; **e)** measure the concentration of enzymes in a sample.
4. The activity of enzymes and concentrations of metabolites in samples could be measured by: a) hybridological method; **b)** karyotyping; **c)** biochemical method; **d)** genealogical method; **e)** microbiological method.
5. Methods of human genetics: a) cytogenetic, biochemical; **b)** only biochemical; **c)** genealogical, hybridological; **d)** practical; **e)** a+b+c.
6. Karyotyping allows to: a) diagnose inborn errors of metabolism; **b)** study the number of chromosomes and their structure; **c)** measure the activity of enzymes; **d)** measure the concentration of amino acids; **e)** calculate the chance of giving birth to a child with a hereditary disorder.
7. Biochemical methods allow to: a) study the number of chromosomes and their structure; **b)** determine the sex of an organism; **c)** diagnose inborn errors of metabolism; **d)** determine whether a certain trait is hereditary or not; **e)** calculate the chance of giving birth to a child with a hereditary disorder.
8. Method of human genetics that allows to determine the number of chromosomes and their structure: a) hybridological; **b)** karyotyping; **c)** biochemical; **d)** genealogical; **e)** microbiological.

Fill in the gaps:

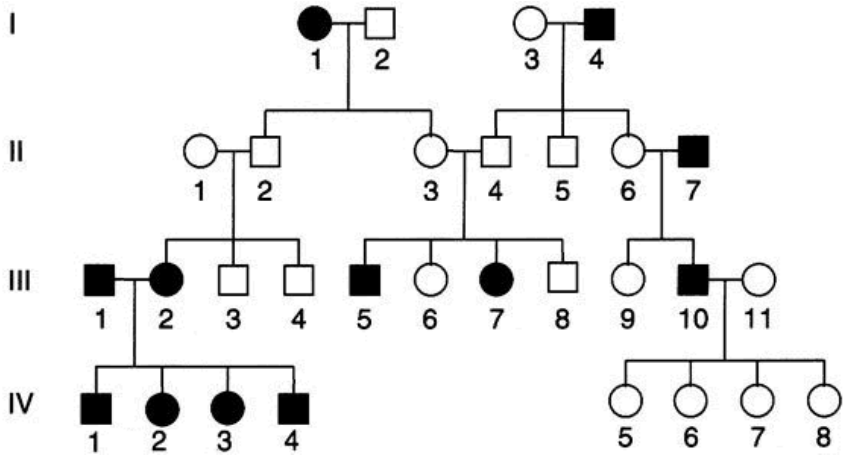
1. The classical method of Genetics that is not used in Human Genetics is …
2. The diploid set of chromosomes of somatic cells is called …
3. The karyotype of humans is studied by …
4. Inborn errors of metabolism can be diagnosed by … methods.
5. The sex of organism could be revealed by …
6. The method of making and analysis of pedigree is called …
7. Hemophilia usually occurs in men because they have … X-chromosome.

PRACTICAL WORK

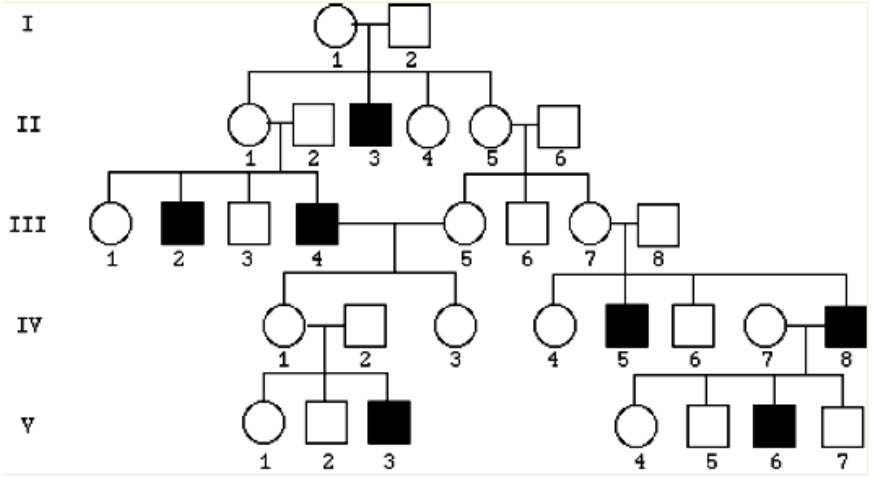
Task 1. Analyze the pedigree chart: find out the pattern of inheritance and the genotypes of all family members when it is possible.



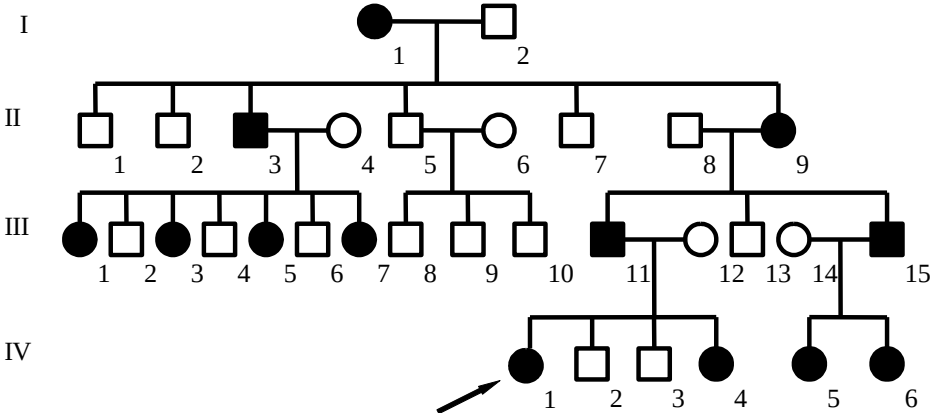
Task 2. Analyze the pedigree chart: find out the pattern of inheritance and the genotypes of all family members when it is possible.



Task 3. Analyze the pedigree chart: find out the pattern of inheritance and the genotypes of all family members when it is possible.



Task 4. Analyze the pedigree chart: find out the pattern of inheritance and the genotypes of all family members when it is possible.



Teacher's signature

Lesson 17. Topic: THE HEREDITARY DISORDERS OF HUMAN «____» _____ 20____ year

Aim of the lesson is to consider and understand causes, diagnostic features and prevention of human hereditary disorders.

CONTENTS OF THE TOPIC

1. Albinism, phenylketonuria, daltonism, hemophilia, Down syndrome, Klinefelter syndrome, Trisomy X, Shereshevsky–Turner syndrome, cat's cry syndrome.
2. Prevention of human hereditary disorders. Genetic counseling.

BASIC TERMS AND CONCEPTS

1. **Genetic counseling** —
2. **Inborn errors of metabolism** —
3. **Chromosomal disorders** —
4. **Trisomy** —
5. **Monosomy** —

TESTS FOR SELF-CONTROL

1. Phenylketonuria is caused by: a) lack of coagulation factor VIII; **b)** chromosomal aberration; **c)** lack of the enzyme participating in conversion of tyrosine into melanin; **d)** lack of the enzyme participating in conversion of phenylalanine into tyrosine; **e)** absence of the second sex chromosome.

2. Turner syndrome is caused by: a) chromosomal aberration; **b)** gene mutations; **c)** abnormal number of autosomes; **d)** absence of the second sex chromosome; **e)** all the answers are wrong.

3. Klinefelter syndrome is caused by: a) mutations affecting the structure of chromosomes; **b)** point mutation; **c)** abnormal number of autosomes; **d)** presence of the second X-chromosome in the male karyotype; **e)** presence of an extra Y-chromosome.

4. Symptoms of oculocutaneous albinism are: a) intellectual disability; **b)** milky white skin; **c)** black pupil; **d)** dark hair; **e)** low sensitivity of the skin to ultraviolet rays.

5. Examples of chromosomal aberrations in humans: a) cri-du-chat syndrome; **b)** Down syndrome; **c)** Shereshevsky–Turner syndrome; **d)** Klinefelter syndrome; **e)** phenylketonuria.

6. Down syndrome is caused by: a) lack of coagulation factor VIII; **b)** chromosomal aberration; **c)** presence of extra 21^{st} chromosome; **d)** increase in the number of sex chromosomes; **e)** all the answers are wrong.

7. Hereditary disorders of human caused by mutations in sex-linked genes: a) Down and Klinefelter syndromes; **b)** hemophilia and daltonism; **c)** albinism; **d)** Turner syndrome; **e)** phenylketonuria.

8. The main tasks of genetic counseling are: a) advising the families and patients with infectious diseases; **b)** advising patients who are at risk of genetic disorders; **c)** estimating the rate of infections in population; **d)** surgical treatment of malformations; **e)** all the answers are wrong.

Fill in the gaps:

1. The hereditary human disorder in which phenylalanine cannot be metabolized into tyrosine is called …

2. The hereditary disorder of human associated with impairment of color distinguishing is called …

3. The absence of the second sex chromosome causes … syndrome.

PRACTICAL WORK

Task 1. Fill in the table describing these human syndromes.

The name of the disease	Chromosomal abnormalities	Main symptoms of the disease
Down syndrome		
Klinefelter syndrome		
Turner syndrome		
Trisomy X		
Cri-du-chat syndrome		

Teacher's signature

Lesson 18. Topic: TEST IN THE TOPICS 9–17: GENETICS «____» _____ 20____ year

Aim of the lesson is to estimate students' knowledge in considered topics.

CONTENTS OF THE COLLOQUIUM

1. Subject matter of genetics.
2. Structure and functions of nucleic acids (DNA, RNA).
3. Gene. Genetic code.
4. Biosynthesis of proteins in cells.
5. The concept of alleles. Homozygote and heterozygote.
6. Law of dominance in F_1 hybrids (first filial hybrid).
7. Law of segregation in F_2 hybrids.
8. The Law of Independent Assortment and its cytological basis.
9. Significance of the G. Mendel's laws.
10. Thomas Morgan's experiments. Genetic linkage. Complete and partial linkage.
11. Crossing-over, crossover and non-crossover gametes.
12. Main concepts of the Chromosome Theory of Heredity.
13. Sex as a biological feature.
14. Chromosomal sex determination.
15. X- and Y-linked inheritance.
16. Variation, its types.
17. The role of genotype and environment in phenotype formation.
18. Modification, its properties. Norm of reaction.
19. Genotypic variability.
20. Characteristics of human as a genetic unit.
21. Methods of human genetics (genealogical, cytogenetic, biochemical).
22. Diseases caused by gene mutations (albinism, phenylketonuria, daltonism, hemophilia).
23. Diseases caused by chromosome mutations (cat's cry syndrome).
24. Diseases caused by genome mutations (Down syndrome, Klinefelter syndrome, trisomy X, Shereshevsky–Turner syndrome).
25. Prevention of hereditary human diseases. Genetic counseling.

Lesson 19. Topic: OVERVIEW OF THE HUMAN BODY. TISSUES, ORGANS AND ORGAN SYSTEMS «____» _____ 20____ year
Aim of the lesson is to learn the subject matters of Anatomy, Physiology and Hygiene; classification and peculiarities of tissues (epithelial, muscle, nervous, connective tissue); to consider the organs and organ systems of the human body.

CONTENTS OF THE TOPIC

1. Anatomy, Physiology and Hygiene — the sciences that deal with the structure and functions of human body and conditions of health maintenance.
2. Tissues: epithelial, muscle, nervous, connective.
3. Human's organs and systems of organs.

BASIC TERMS AND CONCEPTS

1. Hygiene —

2. Physiology —

3. Anatomy —

4. Tissue —

5. Connective tissue —

6. Epithelial tissue (epithelium) —

7. Nervous tissue —

8. Simple epithelium —

9. Stratified epithelium —

10. Muscle tissue —

11. Organ —

12. System of organs —

13. Respiratory system —

14. Musculoskeletal system —

15. Digestive system —

16. Diaphragm —

TESTS FOR SELF-CONTROL	Fill in the gaps:
1. Human body has the following tissues: a) epithelial and strengthening; **b)** muscle and conductive; **c)** nervous and connective; **d)** connective and excretive; **e)** meristem, connective and nervous. **2. Types of epithelium: a)** squamous; **b)** cuboidal; **c)** columnar; **d)** simple and stratified; **e)** all the answers are correct. **3. Blood is: a)** dense connective tissue; **b)** liquid connective tissue; **c)** loose fibrous connective tissue; **d)** epithelial tissue; **e)** muscle tissue. **4. Bone and cartilage are examples of: a)** hard connective tissue; **b)** liquid connective tissue; **c)** loose fibrous connective tissue; **d)** soft connective tissue; **e)** epithelial tissue. **5. In human, nervous tissue forms: a)** skeletal muscles and nerves; **b)** spinal cord and the outer layer skin; **c)** brain, spinal cord and blood; **d)** brain, spinal cord, ganglions and nerves; **e)** exocrine and endocrine glands. **6. Epithelial tissue: a)** forms skeletal muscles and inner organs; **b)** forms the outer layer of skin, lines inner organs; **c)** forms brain and skeletal muscles; **d)** forms spinal cord, skeletal muscles and skin; **e)** forms brain, spinal cord and lines inner organs. **7. Muscle tissue forms: a)** skeletal muscles and skin; **b)** skin and muscles of inner organs; **c)** brain and skeletal muscles; **d)** spinal cord and skeletal muscles; **e)** skeletal muscles and muscles of inner organs. **8. Diaphragm consists of: a)** muscle and epithelial tissues; **b)** muscle and connective tissues; **c)** connective, muscle and nervous; **d)** nervous and muscle; **e)** epithelial and connective. **9. Thoracic cavity contains: a)** lungs, heart, liver; **b)** trachea, esophagus, stomach; **c)** lungs, trachea, esophagus; **d)** esophagus, intestine, lungs; **e)** stomach, intestine, kidneys. **10. Abdominal cavity contains: a)** lungs, liver; **b)** trachea, esophagus, stomach; **c)** stomach, intestine, liver; **d)** heart, liver, intestine; **e)** kidneys, heart, liver.	**1.** Human body is covered with … tissue. **2.** The brain and spinal cord consist of … tissue. **3.** The epidermis of skin is … tissue. **4.** The heart mostly consists of … … … tissue. **5.** Blood is an example of … … tissue. **6.** Cartilage is an example of … … tissue. **7.** Cavities of the body are lined with … tissue. **8.** The heart and blood vessels comprise the … system. **9.** Hormones are produced by the … system. **10.** Nasopharynx, larynx, bronchi and lungs are parts of … system. **11.** Stomach is located in the … cavity. **12.** Esophagus is located in the … cavity. **13.** Liver is located in the … cavity.

PRACTICAL WORK

Task 1. Fill in the table "Organ systems".

System	Organs
Locomotory system	
Integumentary system	
Nervous system	
Circulatory system	
Respiratory system	
Digestive system	

Task 2. Fill in the table "Cavities of human body".

Cavity	Organs
Abdominal	
Thoracic	

Task 3. Fill in the table "Types of tissues".

Tissue	Types
Epithelial	
Connective	
Muscle	
Nervous	

Teacher's signature

Lesson 20. Topic: BONE TISSUE. THE STRUCTURE OF BONES «____» _____ 20____ year

Aim of the lesson is to learn the structure, growth and types of bone's conjunction.

CONTENTS OF THE TOPIC

1. The structure and growth of bones.
2. Connections of bones: synarthrosis, diarthrosis, amphiarthrosis.
3. The structure of synovial joint.

BASIC TERMS AND CONCEPTS

1. Bone tissue —

2. Cartilage —

3. Diaphysis —

4. Epiphysis —

5. Immovable bone connection —

6. Semi–movable bone connection —

7. Osteoblast —

8. Osteoclast —

9. Osteocyte —

10. Osteon —

11. Yellow bone marrow —

12. Red bone marrow —

13. Synovial joint —

14. Periosteum —

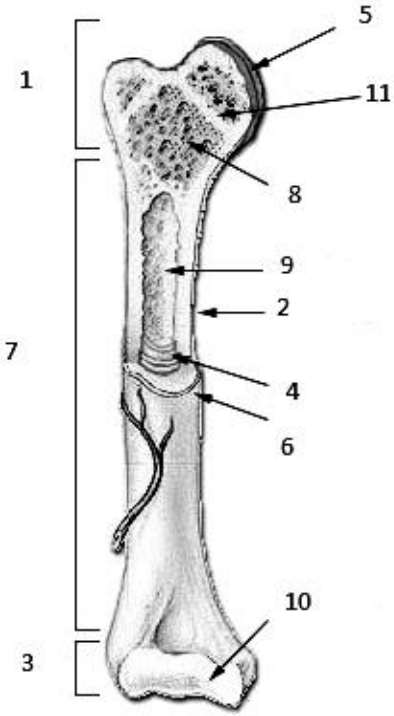
TESTS FOR SELF-CONTROL	Fill in the gaps:
1. Regions of long bone are: a) diaphysis and epiphyses covered with cartilage; **b)** diaphysis and epiphyses without coverings; **c)** diaphysis covered with cartilage and epiphyses covered with periosteum; **d)** cartilage covered with periosteum; **e)** diaphysis covered with periosteum and epiphyses covered with cartilage. **2. Bone diaphysis is covered with: a)** bone tissue; **b)** epithelial tissue; **c)** cartilage; **d)** muscular tissue; **e)** periosteum. **3. Bone tissue consists of: a)** blood cells; **b)** bone cells and extracellular matrix; **c)** nervous cells; **d)** cartilage; **e)** adipose tissue. **4. Inorganic substances of bones provide their: a)** plasticity; **b)** strength; **c)** liquidity; **d)** fragility; **e)** shapelessness. **5. Organic substances of bones provide their: a)** elasticity; **b)** solid; **c** liquid; **d)** hard; **e)** fragile. **6. What is there inside flat bones? a)** yellow marrow; **b)** water; **c)** epithelial tissue; **d)** red marrow; **e)** cerebrospinal liquids. **7. What is there inside the diaphysis of long bones? a)** yellow marrow; **b)** lymph; **c)** epithelial tissue; **d)** red marrow; **e)** cerebrospinal liquids. **8. Epiphyses of bones are covered with: a)** bone tissue; **b)** nervous tissue; **c)** cartilage; **d)** muscular tissue; **e)** periosteum. **9. According to the shape, bones are: a)** flat and long; **b)** triangular; **c)** quadratic; **d)** round; **e)** oval. **10. Periosteum is: a)** epithelial tissue; **b)** nervous tissue; **c)** muscular tissue; **d)** connective tissue; **e)** epithelial and nervous tissues. **11. Synovial joints have: a)** articular surfaces of the bones, joint cavity and synovial fluid; **b)** articular surfaces of the bones, joint capsule and synovial fluid; **c)** articular surfaces of the bones, joint capsule and joint cavity; **d)** articular surfaces of the bones and joint capsule; **e)** articular surfaces of the bones, joint capsule, joint cavity and synovial fluid.	**1.** Bones consist of … connective tissue. **2.** Organic substances make bone tissue … **3.** Inorganic substances make bone tissue … **4.** Most spread elements of inorganic salts of bones are calcium and … **5.** The inorganic salt contained in bones is called … **6.** Blood cells are produced in … bone marrow. **7.** The regions of long bones are diaphysis and … **8.** Bone becomes thicker during growth due to multiplication of cells in its … **9.** The bones of skull are connected via … **10.** There is … connection between vertebrae. **11.** The movable connection of bones is called … **12.** Bones femur and tibia are connected with … … **13.** Immovable bone connection of pelvis is formed due to … of bones. **14.** Vertebra is an example of … bone. **15.** Rib is an examples of … bones. **16.** Phalanges are … bones. **17.** Carpals are … bones.

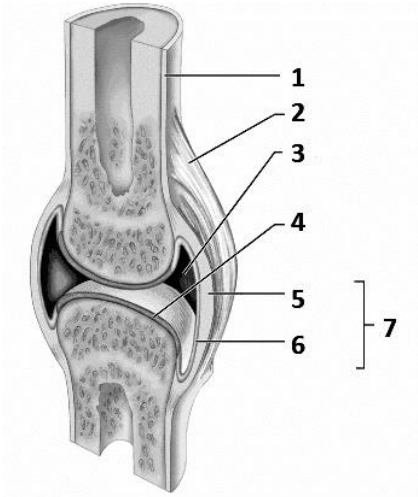
PRACTICAL WORK

Task 1. Write indications for the pictures.

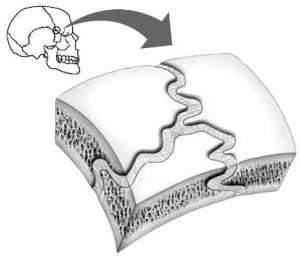
Long bone:

– spongy bone,
– compact bone (epiphyseal line),
– yellow marrow,
– cartilage
– distal epiphysis,
– proximal epiphysis,
– diaphysis,
– periosteum,
– medullary cavity,
– articular surface,
– nutrient canal.





Task 2. Write the names of bone connections and explain them:

Teacher's signature

Lesson 21. Topic: THE SKELETON OF HUMAN «____» _____ 20____ year

Aim of the lesson is to learn the structure of the human skeleton, its parts (axial skeleton, the skeleton of head, the skeleton upper and lower extremities and their girdles).

CONTENTS OF THE TOPIC

1. Parts of the human skeleton (axial skeleton, the skeleton of head, the skeleton upper and lower extremities and their girdles).
2. Functions of the human skeleton.

BASIC TERMS AND CONCEPTS

1. **Neurocranium** —
2. **Viscerocranium** —
3. **Vertebra** —
4. **Axial skeleton** —
5. **Floating ribs** —
6. **Kyphosis** —
7. **Lordosis** —

TESTS FOR SELF-CONTROL

1. The number of vertebrae in the human spine is: a) 12–20; **b)** 13–14; **c)** 25–28; **d)** 33–34; **e)** 60–63.

2. The number of rib pairs in the human skeleton is: a) 9; **b)** 10; **c)** 11; **d)** 12; **e)** 20.

3. The regions of the human spine are: a) trunkal and caudal; **b)** cervical, trunkal and sacral; **c)** cervical, thoracic, sacral and coccygeal; **d)** cervical, thoracic, lumbar, sacral and coccygeal; **e)** cervical, trunkal, lumbar coccygeal and caudal.

4. The number of vertebrae in the cervical spine is: a) 5; **b)** 8; **c)** 10; **d)** 7; **e)** 6.

5. Pelvic girdle consists of: a) one pelvic bone that is connected with lumbar spine; **b)** one pelvic bone that is connected with sacral spine; **c)** pelvic and femoral bones; **d)** two pelvic bones that are connected with lumbar spine; **e)** two pelvic bones that are connected with sacral spine.

6. The upper limb consists of the following parts: a) upper arm, forearm; **b)** upper arm, forearm and palm; **c)** femur, leg and foot; **d)** upper arm, crus and palm; **e)** upper arm, forearm, foot.

7. The thoracic cage consists of: a) ribs and sternum; **b)** ribs, sternum and cervical spine; **c)** ribs, sternum and thoracic spine; **d)** ribs, sternum and scapulae; **e)** ribs, sternum, clavicles, scapulae cervical and thoracic spine.

8. The number of vertebrae in the thoracic spine is: a) 11; **b)** 5; **c)** 7; **d)** 12; **e)** 10.

9. The number of vertebrae in the coccyx: a) 4; **b)** 5; **c)** 4–5; **d)** 6; **e)** 5–6.

10. The bones of the neurocranium are: a) frontal, temporal, zygomatic; **b)** temporal, maxillary, parietal; **c)** occipital, temporal, parietal; **d)** zygomatic, temporal, frontal; **e)** temporal, frontal, zygomatic.

Fill in the gaps:

1. Skeleton is the … part of locomotory system.

2. The regions of the skull are neurocranium and …

3. Zygomatic bones belong to …

4. Single bones of neurocranium are frontal, occipital, ethmoid and …

5. Vertebra consists of body, … and several processes.

6. Spinal cord is in … canal.

7. The thoracic spine consists of … vertebrae.

8. The sacrum consists of … fused vertebrae.

9. Thoracic cage consists of ribs, … and thoracic vertebrae.

10. Human body has … pairs of ribs.

11. Pectoral girdle consists of scapulae and …

12. The bones of forearm are ulna and …

13. Carpal bones, metacarpal bones and phalanges of the fingers form …

14. The girdle of lower extremity is connected to the … spine.

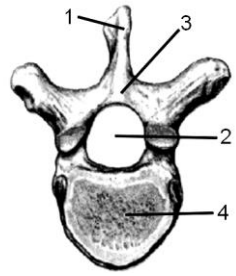
15. The skeleton of lower extremity consists of a femur, …, fibula and foot.

16. Tibia and fibula are bones in the … of the leg.

17. Foot contains phalanges, metatarsal and … bones.

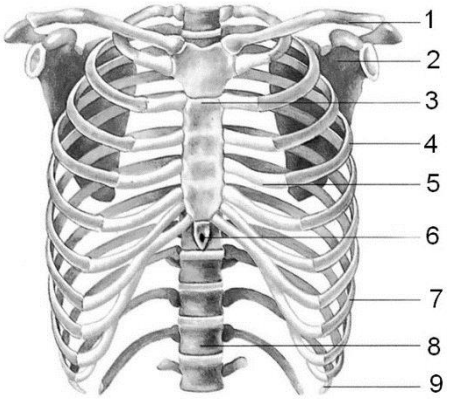
PRACTICAL WORK

Task 1. Find the correct labels for the diagram of vertebra.



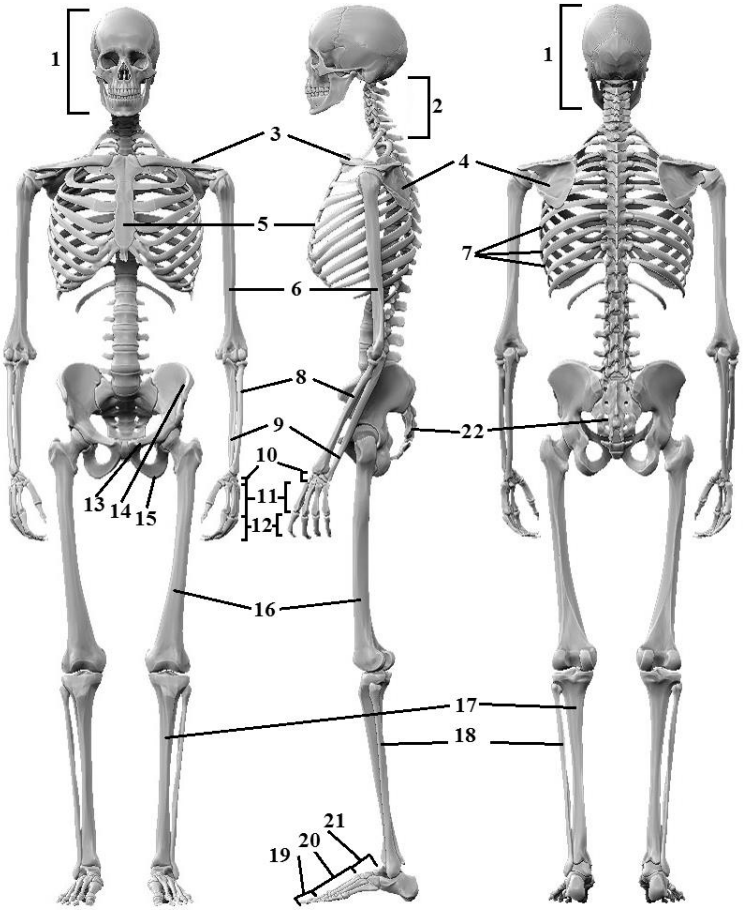
– vertebral arch,
– spinose process,
– vertebral foramen,
– body of the vertebrae

Task 2. Find the correct labels for the diagram of the chest.



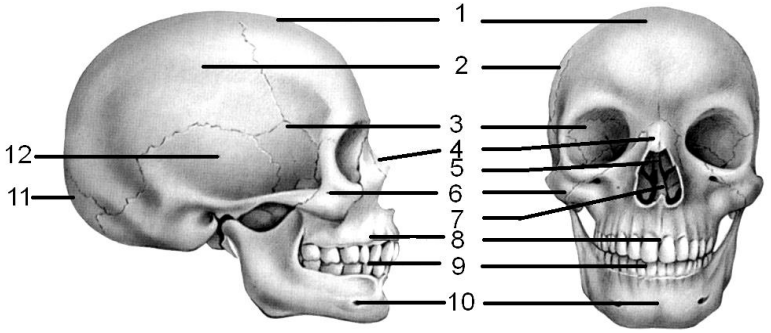
– sternum,
– vertebrosternal ribs (true ribs),
– clavicle,
– floating ribs,
– vertebrochondral ribs (false ribs),
– scapula (shoulder blade),
– xiphoid process of the sternum,
– vertebral column,
– rib cartilage.

Task 3. Find the correct labels for the diagram of human skeleton.

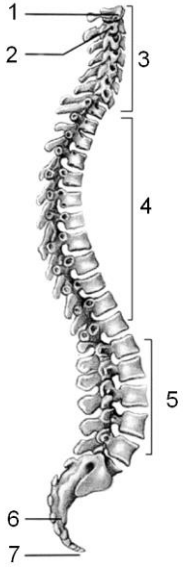


– femur,
– tibia,
– sternum,
– clavicle,
– carpal bones,
– metatarsal bones,
– tarsal bones,
– metacarpal bones,
– sacrum,
– pubic bone,
– ilium,
– ischium,
– ulna,
– radius,
– fibula,
– skull,
– humerus,
– cervical spine,
– ribs,
– phalanges of the fingers,
– phalanges of the toes,
– scapula.

Task 4. Find the correct labels for the diagram of the skull.



– maxilla,
– teeth,
– mandible,
– nasal bone,
– vomer,
– temporal bone,
– sphenoid bone,
– nasal concha,
– zygomatic bone,
– parietal bone,
– occipital bone,
– frontal bone.



Task 5. Find the correct labels for the diagram of the vertebral column.

– atlas,
– thoracic vertebrae,
– coccyx (coccygeal bones),
– sacrum,
– lumbar vertebrae,
– cervical vertebrae,
– axis (epistropheus).

Teacher's signature

Lesson 22. Topic: MUSCLE TISSUE «___» _____ 20____ year

Aim of the lesson is to learn different types of muscle tissue, peculiarities of their structure, functions and work.

CONTENTS OF THE TOPIC

1. Smooth muscles.
2. Skeletal muscles.
3. Cardiac muscles.
4. Reflex arc.

BASIC TERMS AND CONCEPTS

1. Muscle tissue —

2. Smooth muscles —

3. Skeletal muscles —

4. Cardiac muscles —

5. Fascicle —

6. Muscle belly —

7. Reflex —

8. Reflex arc —

9. Receptor —

10. Nerve impulse —

11. Efferent (motor) neuron —

12. Afferent (sensory) neuron —

13. Somatic nervous system —

14. Autonomic nervous system —

TESTS FOR SELF-CONTROL

1. Types of muscle tissue: a) smooth and stratified; **b)** simple and smooth; **c)** loose fibrous and striated; **d)** striated and smooth; **e)** striated and adipose.

2. Properties of skeletal striated muscles: a) multinucleated cells, consist of fibers up to 10–12 μm in length; **b)** mononuclear cells with light and dark discs; **c)** consists of fibers up to 10–12 cm in length, contracts and tires quickly; **d)** has light and dark discs, contracts quickly, runs continuously; **e)** contracts and tires slowly.

3. Properties of smooth muscle tissue: a) consists of separate mononuclear cells 0.1 mm length; **b)** contracts and tires quickly; **c)** contracts slowly and tires quickly; **d)** consists of separate mononuclear cells 0.1 cm in length, contracts and tires quickly; **e)** consists of separate mononuclear cells up to 10–12 cm in length.

4. The approximate length of smooth muscle cell is: a) 1 mm; **b)** up to 10–12 cm; **c)** 0.1 mm; **d)** 1–12 mm; **e)** 3 μm.

5. Myofibrils of muscle fibers contain proteins: a) actin, hemoglobin; **b)** actin, myosin; **c)** myosin, fibrinogen, myoglobin; **d)** fibrinogen, prothrombin; **e)** actin, myosin, prothrombin.

6. Muscles of head are: a) biceps, masseter; **b)** triceps, mimic; **c)** masseter and mimic; **d)** intercostals; **e)** biceps and triceps.

7. Reflex arc consists of: a) receptor, interneuron; **b)** afferent neuron, interneuron, working organ; **c)** receptor, afferent neuron, interneuron, efferent neuron, working organ; **d)** efferent neuron, working organ; **e)** receptor, efferent neuron, interneuron, working organ.

8. The pathway of excitation in the reflex arc is: a) receptor – efferent neuron – interneuron – afferent neuron – working organ; **b)** working organ – afferent neuron – interneuron – efferent neuron – receptor; **c)** receptor –afferent neuron – efferent neuron – interneuron – working organ; **d)** receptor – afferent neuron – interneuron – efferent neuron – working organ; **e)** efferent neuron – interneuron – afferent neuron – working organ.

9. The heart mostly consists of: a) smooth muscle tissue; **b)** skeletal striated muscle tissue; **c)** smooth and striated muscle tissue; **d)** striated muscle tissue with a special structure; **e)** smooth and striated muscle tissue with a special structure.

Fill in the gaps:

1. The musculoskeletal system consists of skeleton and …

2. The active part of the musculoskeletal system is …

3. The passive part of the musculoskeletal system is …

4. The walls of blood vessels and intestines contain … muscle tissue.

5. Voluntary controlled muscles consist of … … … tissue.

6. Muscles contract due to the proteins … and …

7. The longitudinal parallel contractile elements of a muscle cell that are composed of myosin and actin are called …

8. The average length of a smooth muscle cell is approximately …

9. … muscles tire more quickly.

10. … muscles tire more slowly.

11. The capsules covering skeletal muscles consist of … tissue.

12. Skeletal muscles attach to bones by means of …

13. The involuntary response of the organism to a stimulus with involvement of the nervous system is …

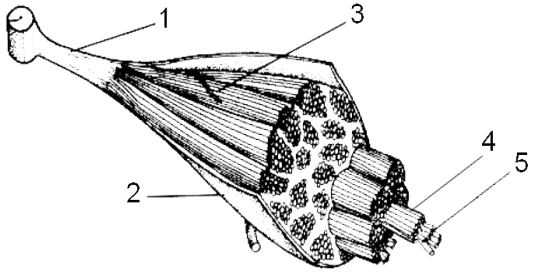
14. The excitation from receptors is conducted to the CNS by … neurons.

15. Reflex arc consists of receptor, afferent neuron, …, efferent neuron and working organ.

PRACTICAL WORK

Task 1. Write the labels for the diagrams.

Structure of a skeletal muscle:



1 –

2 –

3 –

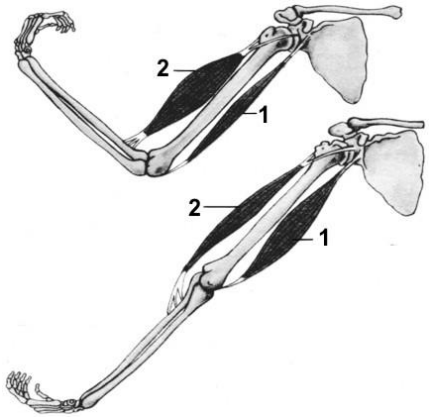
4 –

5 –

Flexor and extensor muscles of the arm:

– Biceps (flexor);

– Triceps (extensor).



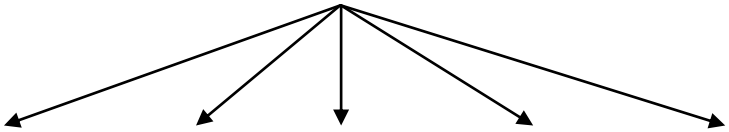
Task 2. Answer the questions:

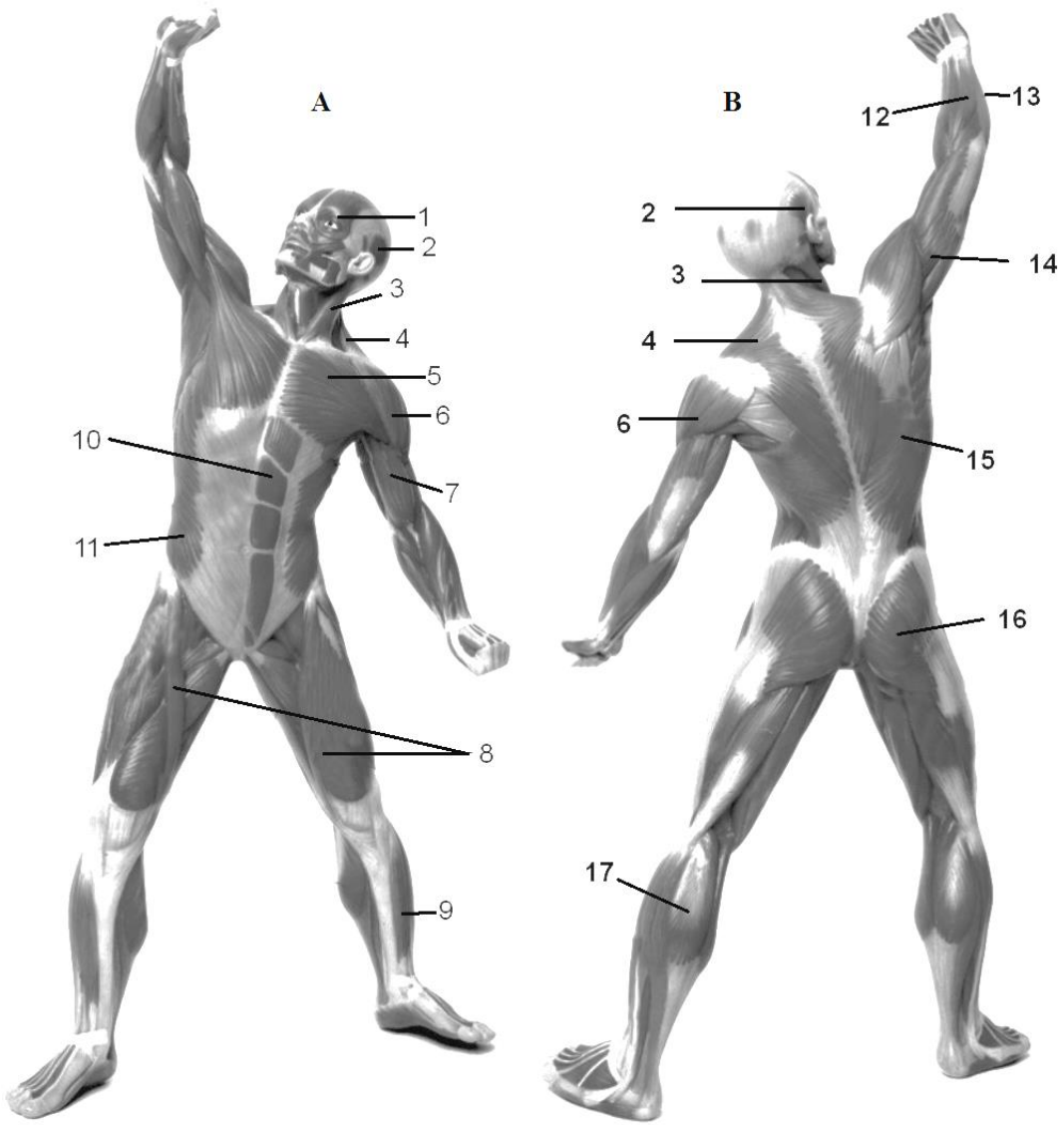
1. Name skeletal muscles according to location.

2. What is the main function of muscle tissue?

3. What is the way the excitation passes in a reflex arc?

4. What are the functions of muscles?





Task 3. Human skeletal muscles
(A — front view, B — back view)

– pectoralis major,
– gluteus maximus,
– tibialis,
– temporalis,
– sternocleidomastoid,
– biceps,
– rectus abdominis,
– wrist extensors,
– wrist flexors,
– trapezius,
– triceps,
– latissimus dorsi.
– deltoid,
– gastrocnemius,
– orbicularis oculi,
– external oblique,
– sartorius.

Teacher's signature

Lesson 23. Topic: INTERSTITIAL FLUID, LYMPH AND BLOOD «____» _____ 20____ year

Aim of the lesson is to learn the components of the internal environment of the body, the structure and functions of blood, plasma and interstitial fluid.

CONTENTS OF THE TOPIC

1. An internal environment of the body: interstitial fluid, lymph, blood.
2. Blood composition: plasma, blood corpuscles — red blood cells, white blood cells, platelets, their structure and functions.
3. Functions of blood.

BASIC TERMS AND CONCEPTS

1. **Interstitial fluid** —
2. **Lymph** —
3. **Blood** —
4. **Blood plasma** —
5. **Erythrocytes (red blood cells)** —
6. **Hemoglobin** —
7. **Leucocytes (white blood cells)** —
8. **Antibodies** —
9. **Thrombocytes (platelets)** —
10. **Coagulation** —

TESTS FOR SELF-CONTROL

1. Lymph originates from: a) interstitial fluid; **b)** plasma and interstitial fluid; **c)** blood; **d)** plasma; **e)** red marrow.

2. Lymph composition is more similar to: a) interstitial fluid; **b)** blood; **c)** cytosol; **d)** plasma; **e)** karyoplasm.

3. Interstitial fluid originates from: a) lymph and plasma; **b)** blood cells; **c)** lymph; **d)** plasma; **e)** blood and lymph.

4. Features of leukocytes: a) inconstant shape, nucleus is absent, participate in blood coagulation; **b)** there are 5 types of them, have nucleus; **c)** contain a protein hemoglobin, have nucleus; **d)** shape is a biconcave disk, have nucleus; **e)** have pseudopodia, contain hemoglobin.

5. Erythrocytes contain transport protein: a) actin; **b)** myosin; **c)** hemoglobin; **d)** fibrinogen; **e)** prothrombin.

6. Red blood cells are made in: a) yellow bone marrow; **b)** red bone marrow; **c)** spleen; **d)** lymph nodes; **e)** spleen and red bone marrow.

7. Platelets are made in: a) yellow bone marrow; **b)** red bone marrow; **c)** spleen; **d)** lymph nodes; **e)** spleen and red bone marrow.

8. The main function of erythrocytes: a) transport; **b)** energetic; **c)** protective; **d)** structural; **e)** initiation of blood coagulation.

9. The main function of platelets: a) transport; **b)** energetic; **c)** protective; **d)** regulatory; **e)** participation in blood coagulation.

10. Approximate volume of blood in an adult man: a) 1 liter; **b)** 9 liters; **c)** 5 liters; **d)** 2.5 liters; **e)** 10 liters.

11. Lifespan of red blood cells: a) 2–4 days; **b)** 120 days; **c)** 8–11 days; **d)** 10–15 days; **e)** 1–2 days.

12. The hemoglobin bound with carbon monoxide is called: a) carbhemoglobin; **b)** oxyhemoglobin; **c)** carboxyhemoglobin; **d)** hemoglobin alpha; **e)** hemoglobin beta.

13. Leukocytes are made in: a) red bone marrow; **b)** lymph nodes, spleen; **c)** yellow bone marrow; **d)** liver and spleen; **e)** spleen and yellow bone marrow.

14. Some leukocytes maturate in: a) red bone marrow, yellow bone marrow; **b)** lymph nodes, spleen; **c)** spleen and liver; **d)** red bone marrow, spleen and yellow bone marrow; **e)** heart and blood vessels.

15. Lifespan of some white blood cells: a) 120 days; **b)** 2–4 days; **c)** 8–11 days; **d)** 210 days; **e)** 15–30 days.

16. Features of erythrocytes: a) shape of a biconcave disk, have nucleus; **b)** inconstant shape, have nucleus, life span is 2–4 days; **c)** shape of a biconcave disk, nucleus is absent; **d)** spherical shape, nucleus is absent, life span is 120 days; **e)** inconstant shape, nucleus is absent, produce protective proteins — antibodies.

17. Features of platelets: a) constant shape, nucleus is absent; **b)** inconstant shape, nucleus is present; **c)** shape of a biconcave disk, nucleus is present; **d)** shape of a biconcave disk, nucleus is present, life span is 8–11 days; **e)** nucleus is absent, life span is 8–11 days, participate in blood coagulation.

18. What is not transported by blood? a) oxygen from the lungs and the rest of the body; **b)** nutrients from the digestive tract and storages to the rest of the body; **c)** heat to help regulate body temperature; **d)** hormones from the glands in which they are produced to their target cells; **e)** waste products from liver and kidneys to be detoxified in tissues of other organs.

Fill in the gaps:

1. An internal environment of the body includes blood, interstitial fluid and …

2. The origin of interstitial fluid is …

3. Blood is … connective tissue.

4. The volume of blood in an adult is approximately …

5. Blood cells are erythrocytes, leukocytes and …

6. Erythrocytes have the shape of … disks.

7. The protein that makes blood red is …

8. Lifespan of erythrocytes is … days.

9. Leukocytes are made in …

10. Some leukocytes maturate in … and …

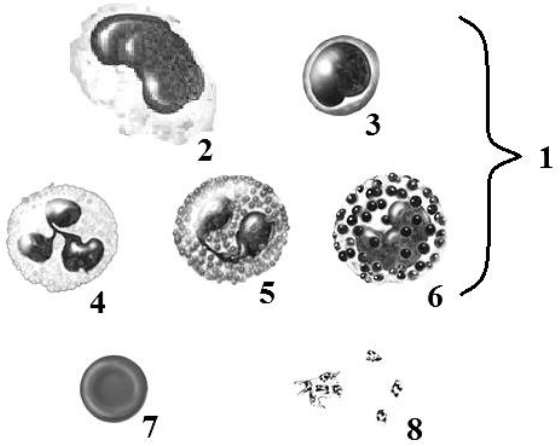
11. The cells called … participate in initiation of blood coagulation.

12. Cells transporting oxygen within the body are …

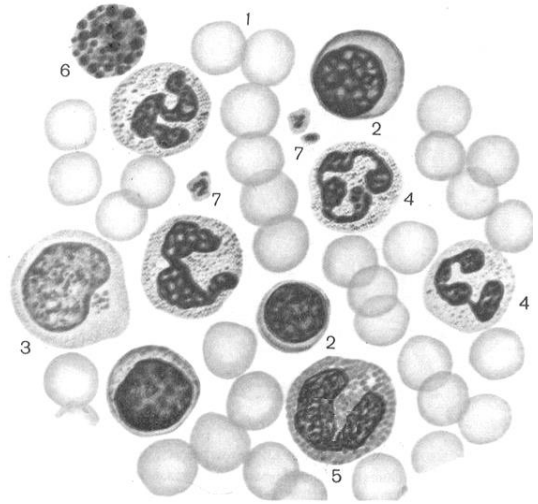
13. The life span of platelets is … days.

PRACTICAL WORK

Task 1. Write the labels for the diagrams of blood cells.



1 –
2 –
3 –
4 –
5 –
6 –
7 –
8 –



1 –
2 –
3 –
4 –
5 –
6 –
7 –

Task 2. Fill in the table.

	RBC	WBC	Platelets
Count 1 ml of blood			
Size			
Shape			
Producing tissue			
Life span			
Function			

Teacher's signature

Lesson 24. Topic: CIRCULATORY SYSTEM. THE STRUCTURE AND FUNCTIONING OF THE HEART «____» _____ 20____ year
Aim of the lesson is to learn the structure of the heart and its work.

CONTENTS OF THE TOPIC

1. Circulatory system.
2. Heart, its structure and functioning.
3. Nervous and humoral control of the heart work.

BASIC TERMS AND CONCEPTS

1. Heart —

2. Endocardium —

3. Myocardium —

4. Epicardium —

5. Pericardium —

6. Atrium —

7. Ventricle —

8. Atrioventricular valves —

9. Semilunar valves —

10. Mitral valve —

11. Tricuspid valve —

12. Systole —

13. Diastole —

14. Cardiac cycle —

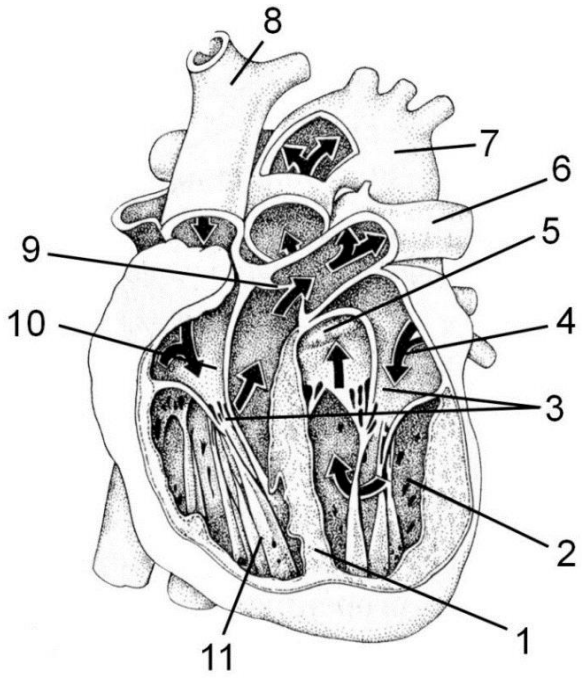
15. Coronary arteries —

16. Interventricular septum —

TESTS FOR SELF-CONTROL	Fill in the gaps:
1. What valve is situated between the right atrium and ventricle? a) semilunar; **b)** bicuspid; **c)** tricuspid; **d)** quadricuspid; **e)** monocuspid. **2. The wall of the heart consists of: a)** epicardium; **b)** pericardium; **c)** epicardium and myocardium; **d)** pericardium, myocardium, endocardium; **e)** endocardium, myocardium and epicardium. **3. Epicardium consists of: a)** connective tissue; **b)** muscle tissue; **c)** connective tissue covered with epithelium; **d)** epithelial tissue; **e)** muscle tissue covered by epithelium. **4. Endocardium consists of: a)** connective tissue; **b)** muscle tissue; **c)** connective tissue covered with epithelium; **d)** epithelial tissue; **e)** muscle tissue covered with epithelium. **5. Myocardium consists of: a)** connective tissue; **b)** muscle tissue; **c)** connective tissue covered by epithelium; **d)** epithelial tissue; **e)** muscle tissue covered by epithelium. **6. Pericardium consists of: a)** muscle tissue; **b)** epithelial tissue; **c)** connective tissue; **d)** connective and epithelial tissues; **e)** connective and muscle tissues. **7. The systole of atria lasts: a)** 0.1 sec; **b)** 0.2 sec; **c)** 0.3 sec; **d)** 0.4 sec; **e)** 0.8 sec. **8. The systole of ventricles lasts: a)** 0.1 sec; **b)** 0.2 sec; **c)** 0.3 sec; **d)** 0.4 sec; **e)** 0.8 sec. **9. The diastole of atria lasts: a)** 0.7 sec; **b)** 0.2 sec; **c)** 0.3 sec; **d)** 0.8 sec; **e)** 0.5 sec. **10. The diastole of ventricles lasts: a)** 0.7 sec; **b)** 0.3 sec; **c)** 0.4 sec; **d)** 0.5 sec; **e)** 0.8 sec. **11. The duration of cardiac cycle at rest is: a)** 0.5 sec; **b)** 0.7 sec; **c)** 0.8 sec; **d)** 0.9 sec; **e)** 0.4 sec. **12. The heart wall consists of: a)** 3 layers; **b)** 2 layers; **c)** 5 layers; **d)** 1 layer; **e)** 4 layers.	**1.** The heart is located in … cavity. **2.** Pericardium consists of connective and … tissues. **3.** The inner layer of heart wall is called … **4.** The middle layer of heart wall is called … **5.** The outer layer of heart wall is called … **6.** The … valve is situated between the left atrium and ventricle. **7.** Blood from the right ventricle is pumped to the vessel which is called … **8.** There are … at the border between ventricles and blood vessels that branch out from them. **9.** The diastole (relaxation) of atria lasts … sec. **10.** The systole (contraction) of ventricles lasts … sec. **11.** Cardiac cycle lasts … sec. **12.** The hormone … increases the heart activity.

PRACTICAL WORK

Task 1. Write the labels for the diagram of the heart.



– superior vena cava,
– aortic arch,
– left pulmonary artery,
– left atrium,
– left ventricle,
– interventricular septum,
– pulmonary valve,
– aortic valve,
– right atrium,
– right ventricle,
– atrioventricular valves.

Task 2. Fill in the table "Layers of the heart wall".

Layers of the heart wall	Tissue

Task 3. Fill in the table "Cardiac cycle".

Stage	Blood is pumped from … to …	Duration

Teacher's signature

Lesson 25. Topic: THE STRUCTURE OF BLOOD VESSELS. CIRCULATION OF BLOOD IN THE BODY «____» _____ 20____ year
Aim of the lesson is to learn the differences in structure of vessels; to learn circulation of blood in the body.

CONTENTS OF THE TOPIC

1. Structure of vessels (arteries, veins, capillaries).
2. Circulation of blood.
3. Systemic (greater) and pulmonary (lesser) circulation.

BASIC TERMS AND CONCEPTS

1. **Arteries** —
2. **Veins** —
3. **Arterial blood** —
4. **Venous blood** —
5. **Capillaries** —
6. **Pulmonary circulation** —
7. **Systemic circulation** —
8. **Aorta** —
9. **Pulmonary arteries** —

TESTS FOR SELF-CONTROL

1. Veins are the vessels which: a) carry mixed blood from the heart; **b)** carry arterial blood to the heart; **c)** carry venous blood to the heart; **d)** carry blood to the heart; **e)** carry venous blood from the heart.

2. Arteries are the vessels which: a) carry mixed blood from the heart; **b)** carry arterial blood to the heart; **c)** carry venous blood to the heart; **d)** carry arterial blood from the heart; **e)** carry blood from the heart.

3. Systemic circulation: a) begins in the left ventricle and ends in the left atrium; **b)** begins in the right ventricle and ends in the left atrium; **c)** begins in the left ventricle and ends in the right atrium; **d)** begins in the right ventricle and ends in the right atrium; **e)** begins in the left ventricle and ends in the right atrium.

4. Pulmonary circulation: a) begins in the left ventricle and ends in the left atrium; **b)** begins in the right ventricle and ends in the left atrium; **c)** begins from the left ventricle and ends in the right atrium; **d)** begins in the right ventricle and ends in the right atrium; **e)** begins in the left ventricle and ends in the right atrium.

5. Inferior and superior vena cava carry: a) venous blood to the right atrium; **b)** arterial blood to the right atrium; **c)** venous blood to the left atrium; **d)** arterial blood to the left atrium; **e)** venous blood to the right ventricle.

6. Through the capillary wall tissues receive: a) oxygen and nutrients; **b)** carbon dioxide and nutrients; **c)** oxygen and metabolic wastes; **d)** carbon dioxide and metabolic wastes; **e)** only oxygen.

7. After contact with tissues blood saturates with: a) oxygen and nutrients; **b)** carbon dioxide and nutrients; **c)** oxygen and metabolic wastes; **d)** carbon dioxide and metabolic wastes; **e)** only carbon dioxide.

8. The capillary wall consists of: a) one layer of epithelial cells and smooth muscles; **b)** one layer of epithelial cells; **c)** two layers of epithelial cells and smooth muscles; **d)** elastic fibers; **e)** one layer of epithelial cells and elastic fibers.

9. The right heart contains: a) only venous blood; **b)** only arterial blood; **c)** venous and arterial blood; **d)** mixed blood; **e)** mixed, venous and arterial blood.

10. The left heart contains: a) only venous blood; **b)** only arterial blood; **c)** venous and arterial blood; **d)** mixed blood; **e)** mixed, venous and arterial blood.

11. Pulmonary arteries carry: a) venous blood to the left atrium; **b)** venous blood to the right atrium; **c)** arterial blood to the left atrium; **d)** arterial blood to the lungs; **e)** venous blood to the lungs.

12. Pulmonary veins carry: a) venous blood to the right atrium; **b)** arterial blood to the right atrium; **c)** venous blood to the left atrium; **d)** arterial blood to the left atrium; **e)** venous blood to the lungs.

Fill in the gaps:

1. The vessels that carry blood from the heart to the organs and tissues are called …

2. The wall of arteries contains smooth muscles and … fibers.

3. The vessels that carry blood from the organs and tissues to the heart are called …

4. The movement of blood through the vessels is called …

5. The heart chamber where systemic circulation starts is …

6. The heart chamber where pulmonary circulation starts is …

7. The heart chamber where systemic circulation ends is …

8. The heart chamber where pulmonary circulation ends is …

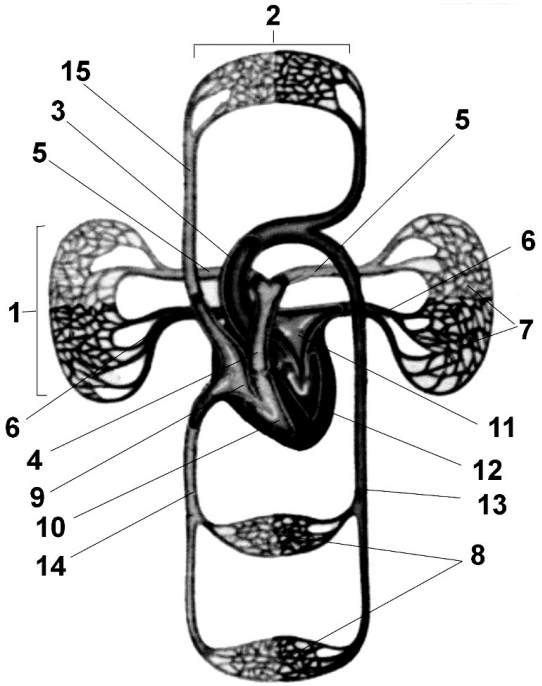
PRACTICAL WORK

Task 1. Fill in the table "Blood vessels".

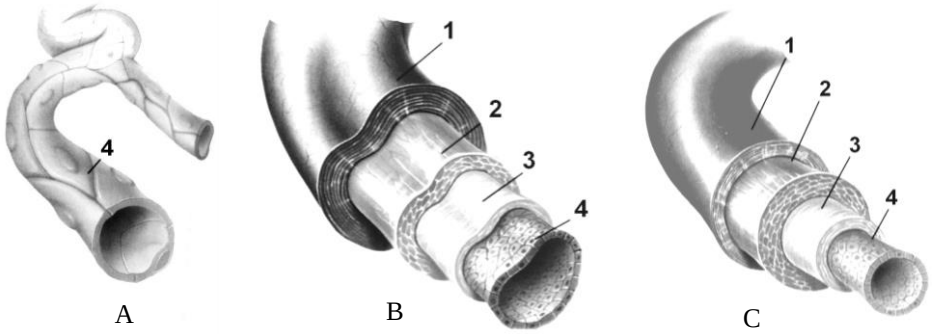
	Artery	**Capillary**	**Vein**
Structure of the wall			
Function			

Task. 2. Find the correct labels to the diagram of circulation.

– capillaries of inner organs,
– aorta,
– systemic circulation,
– abdominal aorta,
– superior vena cava,
– alveolar capillaries,
– left atrium,
– left ventricle,
– pulmonary trunk,
– pulmonary arteries,
– pulmonary veins,
– pulmonary circulation,
– inferior vena cava,
– right atrium,
– right ventricle.



Task 3. Find the correct labels to the diagram of blood vessels.



A B C

– capillary,
– vein,
– artery,
– smooth muscle layer,
– layer of elastic fibers,
– connective tissue layer,
– endothelium.

Teacher's signature

Lesson 26. Topic: RESPIRATORY SYSTEM «___» _____ 20____ year

Aim of the lesson is to learn the structure and functions of respiratory organs and airways.

CONTENTS OF THE TOPIC

1. Importance of breathing.
2. Respiratory tract and respiratory organs, their structure and functions.
3. Structure of vocal apparatus.

BASIC TERMS AND CONCEPTS

1. Breathing —

2. Respiratory system —

3. Lungs —

4. Respiratory tract —

5. Nasal cavity —

6. Nasopharynx —

7. Larynx —

8. Bronchi, bronchioles —

9. Alveoli —

10. Pleura —

TESTS FOR SELF-CONTROL

1. Humoral regulation of breathing is associated mainly with the concentration of the following substance in blood: a) carbon dioxide; **b)** oxygen; **c)** sodium ions; **d)** hormones; **e)** hormones and carbon dioxide.

2. Nervous control of respiration is provided by the respiratory center that is located in: a) forebrain; **b)** midbrain; **c)** hindbrain; **d)** medulla oblongata; **e)** cerebellum.

3. The pathway of inhaled air in the respiratory tract: a) nasal cavity → larynx → nasopharynx → trachea → bronchi → bronchioles; **b)** nasopharynx → nasal cavity → larynx → trachea → bronchioles → bronchi; **c)** nasal cavity → nasopharynx → larynx → trachea → bronchi → bronchioles; **d)** larynx → nasopharynx → trachea → nasal cavity → bronchi → bronchioles; **e)** nasal cavity → nasopharynx → trachea → larynx → bronchi → bronchioles.

4. In nasal cavity, air becomes: a) warmed and humidified; **b)** purified from dust; **c)** purified from bacteria and warmed; **d)** warmed; **e)** warmed, humidified, purified from dust and bacteria.

5. The wall of alveolus consists of: a) one layer of epithelial cells; **b)** two layers of epithelial cells; **c)** one layer of epithelial cell and smooth muscles; **d)** smooth muscles and cartilage; **e)** two layers of epithelial cells and elastic fibers.

6. The main respiratory muscles are: a) intercostal muscles and muscles of the pelvic floor; **b)** intercostal muscles and diaphragm; **c)** diaphragm and the muscles of the shoulder girdle; **d)** diaphragm and muscles of the back; **e)** intercostal muscles and the muscles of the upper extremities.

7. The tracheal wall consists of: a) cartilaginous semirings; **b)** cartilaginous rings; **c)** striated muscles; **d)** epithelial tissue; **e)** muscular and epithelial tissue.

8. Epithelial membrane of nasal cavity contains: a) glands; **b)** blood vessels; **c)** blood vessels and glands; **d)** cilia, glands; **e)** cilia, glands and blood vessels.

Fill in the gaps:

1. Respiratory tract includes nasal cavity, pharynx, larynx, trachea, bronchi, and …

2. The respiratory organs of human are …

3. The epithelium of the nasal cavity has cilia, … and blood vessels.

4. Each half of the nasal cavity has nasal …

5. Air passes from the nasal cavity to …

6. Lungs are situated in … cavity.

7. There are … at the ends of the bronchioles.

8. Gas exchange takes place in … of lungs.

9. The respiratory center is located in the region of the brain that is called …

10. The biggest cartilage of the larynx is …

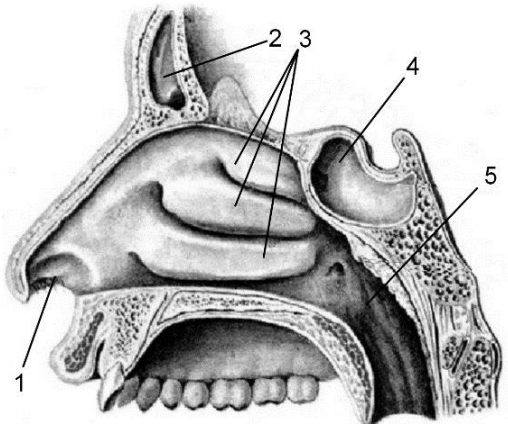
11. During swallowing, the entrance to the larynx is closed by the …

12. The wall of trachea has cartilaginous …

13. The wall of bronchi has cartilaginous …

PRACTICAL WORK

Task 1. Find the correct labels for the diagram of the nasal cavity.



– sphenoid sinus,

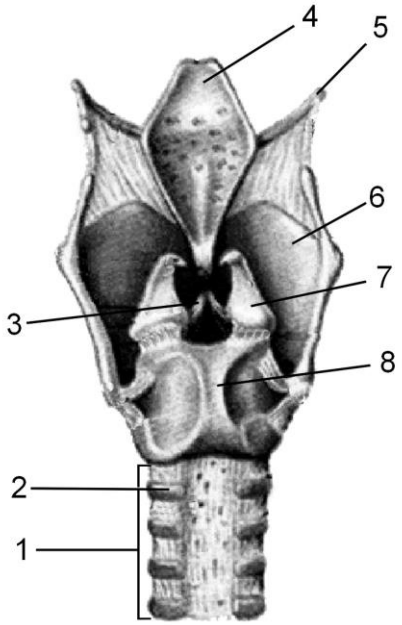
– frontal sinus,

– nostril,

– nasal turbinates (conchae),

– nasopharynx.

Task 2. Find the correct labels for the diagram of the larynx (back view).



– vocal ligament (chord),

– epiglottis,

– cricoid cartilage,

– hyoid bone,

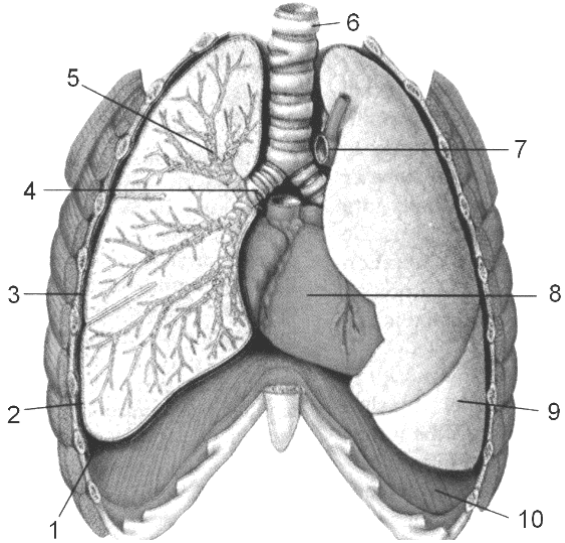
– trachea,

– cartilagenous semiring,

– arytenoid cartilage,

– thyroid cartilage.

Task 3. Find the correct labels for the diagram of lungs.



– aorta,

– parietal pleura,

– visceral pleura,

– intrapulmonary bronchi,

– diaphragm,

– lower lobe of the left lung,

– pleural cavity,

– right bronchus,

– heart,

– trachea.

Teacher's signature

Lesson 27. Topic: DIGESTIVE SYSTEM «___» _____ 20____ year

Aim of the lesson is to learn the anatomy and work of digestive organs.

CONTENTS OF THE TOPIC

1. Digestive system and its parts. Digestive glands.
2. Structure of oral cavity.
3. Structure of stomach.
4. Structure of intestine.

BASIC TERMS AND CONCEPTS

1. Digestion —

2. Digestive gland —

3. Ruga —

4. Appendix —

5. Bile —

6. Villus —

7. Liver —

8. Pulp —

9. Gallbladder —

10. Chief cells —

TESTS FOR SELF-CONTROL

1. Determine the way of food in the digestive tract: a) oral cavity, esophagus, pharynx, stomach, small intestine, large intestine; **b)** oral cavity, pharynx, small intestine, esophagus, stomach, large intestine; **c)** pharynx, esophagus, oral cavity, small intestine, large intestine; **d)** oral cavity, esophagus, pharynx, large intestine, small intestine; **e)** oral cavity, pharynx, esophagus, stomach, small intestine, large intestine.

2. Stomach is located in: a) upper part of the thoracic cavity on the left, **b)** upper part of the thoracic cavity on the right; **c)** upper part of the abdominal cavity on the left; **d)** upper part of the abdominal cavity on the right; **e)** lower part of the abdominal cavity on the left.

3. Liver is located in: a) upper part of the thoracic cavity on the left, **b)** upper part of the thoracic cavity on the right; **c)** upper part of the abdominal cavity on the left; **d)** upper part of the abdominal cavity on the right; **e)** lower part of the abdominal cavity on the left.

4. Glands of the gastric mucosa secrete: a) pancreatic juice, **b)** gastric juice; **c)** bile; **d)** bile and gastric juice; **e)** pancreatic juice and bile.

5. Pancreatic juice is secreted into: a) duodenum; **b)** stomach; **c)** duodenum and other parts of small intestine; **d)** stomach and small intestine; **e)** small and large intestine.

6. Regions of the stomach: a) fundus; **b)** cardia; **c)** body; **d)** pylorus; **e)** all the answers are correct.

7. Bile is produced by: a) gallbladder; **b)** stomach; **c)** esophagus; **d)** duodenum; **e)** liver.

8. Ducts of the liver carry bile to the: a) duodenum; **b)** stomach; **c)** duodenum and other parts of small intestine; **d)** large intestine; **e)** pancreas.

9. The number of molars on each jaw of an adult: a) 6; **b)** 2; **c)** 4; **d)** 8; **e)** 10.

10. The number of premolars on each jaw of an adult: a) 6; **b)** 2; **c)** 4; **d)** 8; **e)** 10.

11. The total number of incisors in humans: a) 2; **b)** 4; **c)** 6; **d)** 8; **e)** 10.

Fill in the gaps:

1. The digestive system consists of digestive tract and …

2. The digestive tract consists of oral cavity, pharynx, … stomach, small intestine, large intestine.

3. The regions of the small intestine: duodenum, jejunum, …

4. The regions of the large intestine: cecum with appendix, ascending colon, transverse colon, descending colon, sigmoid colon and …

5. Digestive glands are salivary glands, pancreas, glands of stomach, glands of intestine and …

6. Adult humans typically have … premolars and … molars.

7. A tooth consists of a crown, … and root.

8. Taste receptors are located on …

9. The oral cavity has … pairs of salivary glands.

10. The stomach is located in … cavity.

11. The ducts of liver and pancreas open into …

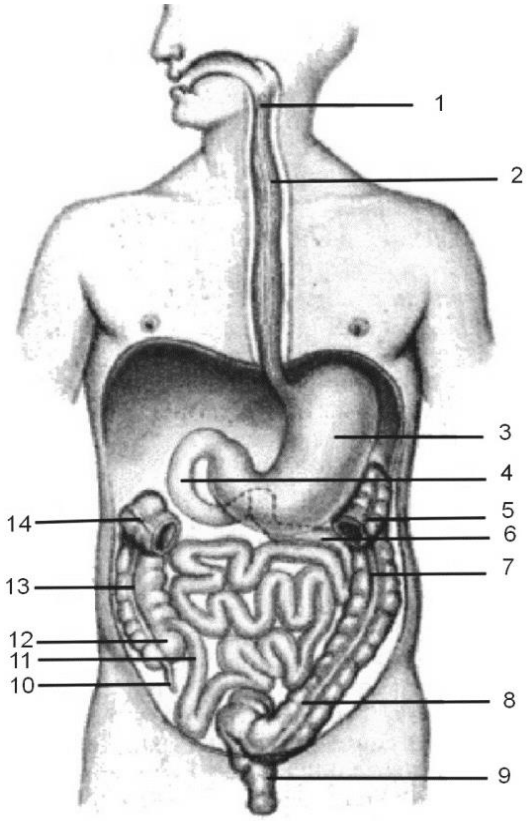
12. Liver is situated in the upper part of the abdominal cavity on the … side.

13. Bile is produced by … and is stored in …

14. For better absorption of nutrition, the mucosa of the small intestine has multiple projections which are called …

PRACTICAL WORK

Task 1. Find the correct labels for the diagram of digestive tract.



– appendix,

– ascending colon,

– pharynx,

– duodenum,

– stomach,

– descending colon,

– transverse colon,

– esophagus,

– ilium,

– rectum,

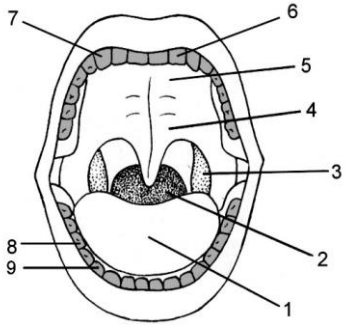
– sigmoid colon,

– cecum,

– jejunum.

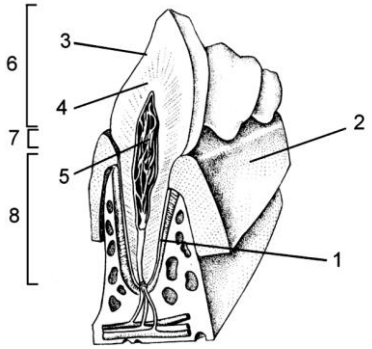
Task 2. Find the correct labels for the diagram of the oral cavity.

– molars,
– fauces (pharynx),
– canines,
– premolars,
– soft palate,
– tonsils,
– incisors,
– hard palate,
– tongue.



Task 3. Find the correct labels for the diagram of tooth.

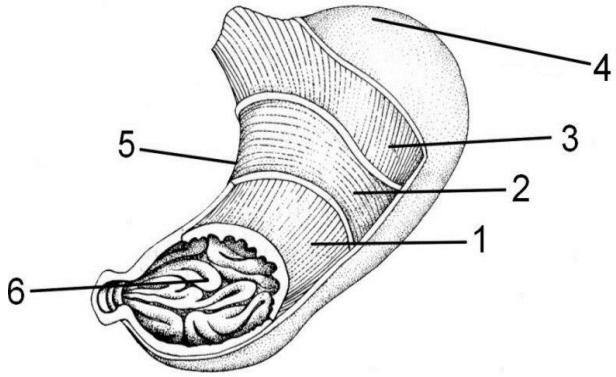
– dentine,
– gum,
– root of the tooth,
– crown of the tooth,
– pulp,
– cement,
– neck of the tooth,
– enamel.



Task 4. Fill in the table "Human teeth".

Type of tooth	Quantity		
	Quadrant	Jaw	Totally

Task 5. Find the correct labels for the diagram of stomach.



– fundus of stomach,
– circular muscle layer,
– oblique muscle layer,
– longitudinal muscle layer,
– rugae,
– body of stomach.

Teacher's signature

Lesson 28. Topic: DIGESTIVE ENZYMES. SECRETIONS OF DIGESTIVE GLANDS «____» _____ 20____ year

Aim of the lesson is to learn secretions and enzymes of digestive glands and their functions.

CONTENTS OF THE TOPIC

1. Digestive enzymes and their properties. Importance of enzymes in digestion.
2. Digestion in the mouth, stomach and intestine.

BASIC TERMS AND CONCEPTS

1. **Mechanical processing of food** —
2. **Chemical processing of food** —
3. **Enzymes** —
4. **Glycosidases** —
5. **Proteases** —
6. **Lipases** —
7. **Nucleases** —
8. **Amylase** —
9. **Chymosin** —
10. **Lysozyme** —
11. **Emulsification** —

TESTS FOR SELF-CONTROL

1. Digestion in the stomach occurs under the action of: a) enzymes of intestinal juice; **b)** enzymes of gastric juice; **c)** bile; **d)** enzymes of pancreatic juice; **e)** enzymes of gastric and pancreatic juices.
2. Enzymes amylase and maltase break down: a) starch into glucose; **b)** polypeptides into amino acids; **c)** fats into glycerol and fatty acids; **d)** nucleic acids to nucleotides; **e)** proteins into polypeptides.
3. Enzyme trypsin breaks down: a) carbohydrates into glucose and fructose; **b)** polypeptides into amino acids; **c)** fats into glycerol and fatty acids; **d)** starch (amylum) into glucose; **e)** proteins into smaller peptides.
4. Enzyme lipase breaks down: a) carbohydrates into glucose and fructose; **b)** polypeptides into amino acids; **c)** fats into glycerol and fatty acids; **d)** starch (amylum) into glucose; **e)** proteins into polypeptides.
5. Gastric juice contains enzyme: a) amylase; **b)** maltase; **c)** pepsin; **d)** trypsin; **e)** lactase.
6. Pepsin is active in: a) neutral environment; **b)** alkalescent (weakly alkaline) environment; **c)** acidic environment; **d)** alkaline environment; **e)** weak acidic medium.
7. The pH of pancreatic juice is: a) weakly acidic; **b)** weakly alkaline; **c)** strongly acidic; **d)** strongly alkaline; **e)** neutral.
8. The mucosa of the small intestine secretes: a) intestinal juice; **b)** pancreatic juice; **c)** gastric juice; **d)** hydrochloric acid; **e)** bile.
9. Bile emulsifies: a) proteins; **b)** carbohydrates; **c)** fats; **d)** amino acids; **e)** nucleic acids.
10. The vitamins produced by bacteria of digestive tract are: a) A, D; **b)** B, K; **c)** E, A; **d)** B, D; **e)** C, E.
11. What is synthesized in the villi of the small intestine? a) polysaccharides; **b)** proteins; **c)** nucleic acids; **d)** fats; **e)** proteins and fats.

Fill in the gaps:

1. The proteins which catalyze certain chemical reactions are called …

2. The property of enzymes to have an effect only on certain organic substances is called …

3. Salivary enzymes break down starch into …

4. Gastric juice contains enzymes: chymosin, lipase and …

5. The digestion in the stomach lasts … hours.

6. Pancreatic juice and … are secreted into the duodenum.

7. Pepsin is active in … medium.

8. Bile is produced in the …

9. Pancreatic juice contains enzymes: glycosidases, lipases, nucleases and …

10. The enzymes which break down polypeptides into amino acids are called …

11. The enzymes of pancreatic juice act in … medium.

12. Fats from the small intestine are transported by …

13. Amino acids from the small intestine are transported by …

14. Bacteria of large intestine synthesize vitamins of the group… and …

Teacher's signature

PRACTICAL WORK

Task 1. Fill in the table "Digestive enzymes".

	Enzymes	Function
Saliva (1–1.5 liters per day)		
Gastric juice (1.5–2 liters per day)		
Bile (0.25–1 liter per day)		
Pancreatic juice (2 liters per day)		
Intestinal juice (2 liters per day)		

Lesson 29. Topic: EXCRETORY SYSTEM. INTEGUMENTARY SYSTEM «____» _____ 20____ year

Aim of the lesson is to learn the structure and work of urinary system, to learn the structure of skin.

CONTENTS OF THE TOPIC

1. The structure of urinary organs.
2. Nephron as a structural and functional unit of kidneys. Formation of primary and secondary urine.
3. Functions of kidneys.
4. The structure and functions of skin.

BASIC TERMS AND CONCEPTS

1. Urinary system —

2. Renal hilum —

3. Nephron —

4. Collecting duct —

5. Renal pelvis —

6. Ureter —

7. Urinary bladder —

8. Filtration —

9. Reabsorption —

10. Primary urine —

11. Secondary urine —

12. Epidermis —

13. Dermis —

14. Subcutaneous adipose tissue —

15. Sebaceous gland —

16. Sweat glands —

17. Stratum corneum —

18. Stratum basale —

19. Melanin —

TESTS FOR SELF-CONTROL

1. The system which has prime importance in the removal of metabolic wastes from the body: a) respiratory; **b)** integumentary; **c)** urinary; **d)** digestive; **e)** circulatory.

2. Kidneys are located in: a) the lumbar region of thoracic cavity; **b)** the sacral region behind the abdominal cavity, on each side of the spine; **c)** the lumbar region behind the abdominal cavity, on each side of the spine; **d)** the sacral region of thoracic cavity; **e)** the lumbar region of abdominal cavity in front of the small intestine.

3. Collecting ducts open into: a) urinary bladder; **b)** ureter; **c)** renal pelvis; **d)** urethra; **e)** capsule of nephron.

4. Primary urine is produced in: a) capsule of nephron by filtration of blood plasma; **b)** tubules of nephron by filtration of blood plasma; **c)** tubules of nephron by reabsorption and secretion; **d)** capsule of nephron by reabsorption and secretion; **e)** renal pelvis by filtration of blood plasma.

5. Secondary urine is produced in: a) capsule of nephron by filtration of blood plasma; **b)** tubules of nephron by filtration of blood plasma; **c)** tubules of nephron by reabsorption and secretion; **d)** capsule of nephron by reabsorption and secretion; **e)** renal pelvis by filtration of blood plasma.

6. The center of micturition is situated in: a) medulla oblongata; **b)** spinal cord; **c)** diencephalon; **d)** mesencephalon; **e)** forebrain.

7. The layers of the integument of human body: a) connective, muscular, epithelial; **b)** epidermis, dermis; **c)** dermis, subcutaneous fat; **d)** epidermis, dermis, subcutaneous fat; **e)** cortical layer, medulla.

8. Melanin is situated in: a) dermis; **b)** epidermis; **c)** subcutaneous fat; **d)** epidermis and dermis; **e)** dermis and subcutaneous fat.

9. Hair bags are located in: a) papillary layer of dermis; **b)** reticular layer of the dermis; **c)** both papillary and reticular layers of dermis; **d)** epidermis; **e)** deep layers of subcutaneous fat.

10. Sweat glands are located in: a) the papillary layer of dermis; **b)** the reticular layer of dermis; **c)** both papillary and reticular layers of dermis; **d)** epidermis; **e)** subcutaneous fat.

Fill in the gaps:

1. Urinary system consists of kidneys, …, urinary bladder and urethra.

2. The inner layer of the kidney is called …

3. Structural and functional unit of the kidney is …

4. Nephron consists of capsule, glomerulus, convoluted tubules and …

5. The layer of kidney where capsules of nephrons are situated is …

6. In capsule of nephron … urine is produced.

7. Kidneys produce … liters of primary urine per day.

8. Secondary urine is formed in … of nephron.

9. Primary urine is formed during … of blood plasma.

10. The processes forming secondary urine are … and …

11. The volume of urinary bladder is about … ml.

12. Kidneys produce about … liter of secondary urine per day.

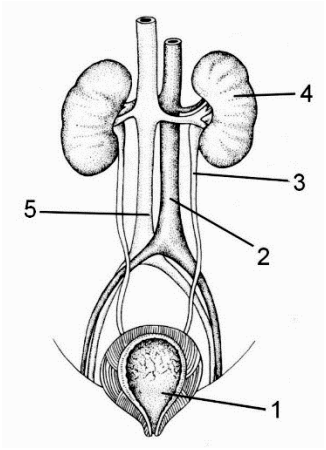
13. The small cavity in the kidney connected to the ureter is called …

14. Dermis has 2 layers: papillary and …

15. The outermost and the lowermost layers of epidermis are: stratum corneum and … …

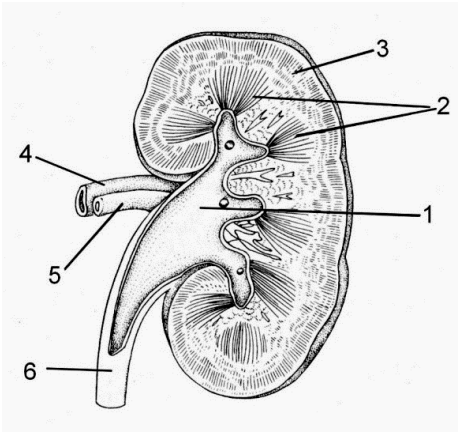
PRACTICAL WORK

Task 1. Find the correct labels for the diagram of urinary system.



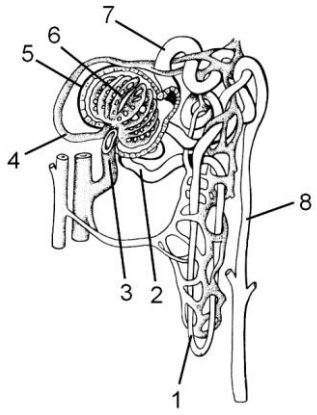
– abdominal aorta,
– bladder,
– ureter,
– inferior vena cava,
– kidney.

Task 2. Find the correct labels for the diagram of kidney.



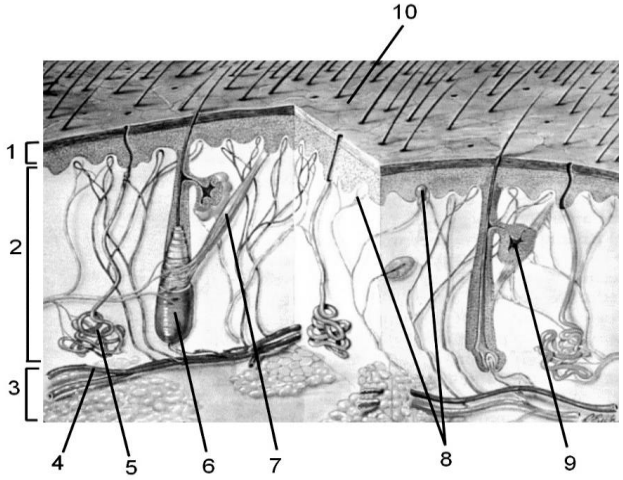
– cortical layer,
– pyramids of medulla,
– ureter,
– renal artery,
– renal vein,
– renal pelvis.

Task 3. Find the correct labels for the diagram of nephron.



– efferent artery,
– proximal convoluted tubule,
– distal convoluted tubule,
– capsule,
– loop of Henle,
– afferent artery,
– collecting duct,
– glomerulus of the renal corpuscle.

Task 4. Find the correct labels for the diagram of skin.



– hair's stem,
– smooth muscle fiber,
– blood vessels,
– subcutaneous fat,
– sebaceous glands,
– hair follicle,
– dermis,
– nerve terminals,
– sweat gland,
– epidermis.

Teacher's signature

Lesson 30. Topic: NERVOUS SYSTEM. SPINAL CORD «____» _____ 20____ year

Aim of the lesson is to learn the structure and functions of the spinal cord.

CONTENTS OF THE TOPIC

1. The functions of nervous system.
2. The structure of neuron.
3. The structure of the spine.
4. The functions of the spine.

BASIC TERMS AND CONCEPTS

1. Nervous system —

2. Central nervous system (CNS) —

3. Peripheral nervous system (PNS) —

4. Dorsal (posterior) root of the spinal cord —

5. Ventral (anterior) root of spinal cord —

6. Gray matter —

7. White matter —

8. Motor (descending) pathways —

9. Sensory (ascending) pathways —

10. Vegetative (autonomic) nervous system —

11. Somatic nervous system —

TESTS FOR SELF-CONTROL

1. The central nervous system includes: a) red marrow; **b)** yellow marrow; **c)** spinal cord and brain; **d)** ganglia; **e)** nerves and nerve endings (receptors).

2. The peripheral nervous system includes: a) nerves and ganglia; **b)** red marrow; **c)** yellow marrow; **d)** spinal cord; **e)** brain.

3. The posterior roots of the spinal cord contain the processes of: a) efferent (motor) neurons; **b)** afferent (sensory) neurons; **c)** efferent (sensory) neurons; **d)** afferent (motor) neurons; **e)** efferent and afferent neurons.

4. The anterior roots of the spinal cord contain the processes of: a) efferent (motor) neurons; **b)** afferent (sensory) neurons; **c)** efferent (sensory) neurons; **d)** afferent (motor) neurons; **e)** efferent and afferent neurons.

5. The length of spinal cord is: a) 41–45 cm; **b)** 41–45 mm; **c)** 21–25 cm; **d)** 10–15 cm; **e)** 0.5–1 m.

6. The central canal of the spinal cord contains: a) synovial fluid; **b)** cerebrospinal fluid; **c)** blood; **d)** lymph; **e)** interstitial fluid.

7. The gray matter consists of: a) only the bodies of neurons; **b)** axons; **c)** dendrites; **d)** axons and dendrites; **e)** bodies of neurons and dendrites.

8. The white matter consists of: a) bodies of neurons; **b)** axons; **c)** dendrites; **d)** axons and dendrites; **e)** bodies of neurons and dendrites.

9. How many pairs of spinal nerves originate from the spinal cord? a) 30; **b)** 31; **c)** 32; **d)** 33; **e)** 34.

10. Somatic nervous system is responsible for the control of: a) heart; **b)** stomach; **c)** liver; **d)** skeletal muscles; **e)** lungs.

11. Vegetative nervous system is responsible for the control of: a) skeletal muscles; **b)** sensory organs; **c)** spinal cord; **d)** the brain and nerves; **e)** all internal organs.

Fill in the gaps:

1. The basic cell of the nervous tissue is called …

2. Neuron consists of processes and …

3. The long process of neuron carrying impulse from the cell is called …

4. The processes of neuron conducting impulses to the cell are called …

5. Gray matter consists of … and … of neurons.

6. White matter consists of …

7. Brain and spinal cord make up the … nervous system.

8. … nervous system is responsible for the voluntary work of skeletal muscles.

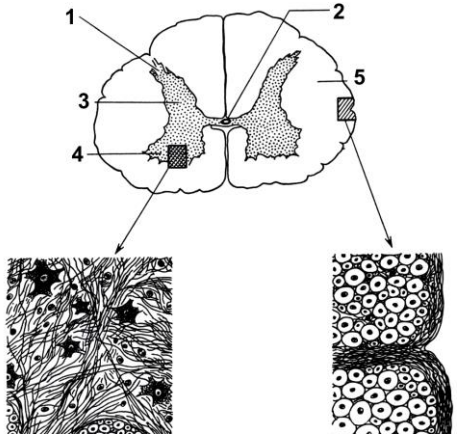
9. The spinal canal contains … fluid.

10. The anterior roots of the spinal cord contain the processes of … neurons.

11. The posterior roots of the spinal cord contain the processes of … neurons.

PRACTICAL WORK

Task 1. Find the correct labels for the diagram of the spinal cord (cross-section).



– posterior horn,

– central canal,

– gray matter,

– white matter,

– anterior horn.

Task 2. Write classification of the nervous system.

Anatomically		
Physiologically		

Teacher's signature

Lesson 31. Topic: THE BRAIN «___» _____ 20____ year

Aim of the lesson is to learn the structure and functions of the brain.

CONTENTS OF THE TOPIC

1. Brain, its parts and functions.
2. Significance of the cerebral cortex.

BASIC TERMS AND CONCEPTS

1. Myelencephalon (medulla oblongata) —

2. Metencephalon —

3. Mesencephalon (midbrain) —

4. Diencephalon (interbrain) —

5. Telencephalon (cerebrum) —

6. Cerebellum —

7. Pons —

8. Quadrigemina —

9. Aqueductus —

10. Thalamus —

11. Hypothalamus —

12. Cerebral cortex —

13. Cerebral ventricles —

14. Girus —

15. Sulcus —

16. Cerebrospinal fluid (liquor) —

TESTS FOR SELF-CONTROL

1. The number of main regions in the brain is: a) 3; **b)** 4; **c)** 5; **d)** 6; **e)** 7.

2. How many pairs of cerebral nerves originate from the brain? a) 10; **b)** 11; **c)** 12; **d)** 13; **e)** 14.

3. Medulla oblongata contains the centers of: a) respiration and circulation of blood; **b)** balance; **c)** tone of muscles; **d)** metabolism and body temperature; **e)** work of exocrine glands.

4. Diencephalon contains: a) two hemispheres; **b)** thalamus and hypothalamus; **c)** quadrigemina and cerebral peduncles; **d)** quadrigemina; **e)** one hemisphere and cerebral peduncles.

5. The parts of the midbrain (mesencephalon) are: a) two hemispheres; **b)** thalamus and hypothalamus; **c)** quadrigemina and cerebral peduncles; **d)** thalamus; **e)** one hemisphere.

6. Gray matter covers the following parts of the brain: a) the hemispheres of cerebrum and midbrain; **b)** the hemispheres of midbrain and cerebellum; **c)** hemispheres of cerebrum and cerebellum; **d)** the hemispheres of diencephalon; **e)** the hemispheres of medulla oblongata and cerebrum.

7. The surface area of the cerebral cortex is: a) 1500–2000 cm^2; **b)** 2000–2500 cm^2; **c)** 3000–3500 cm^2; **d)** 3500–4000 cm^2; **e)** 4000–4500 cm^2.

8. White matter covers following part of the brain: a) hemispheres of telencephalon, midbrain and diencephalon; **b)** midbrain, diencephalon and medulla; **c)** cerebellum; **d)** hemispheres of telencephalon, cerebellum; **e)** diencephalon, cerebellum and hemispheres of telencephalon.

9. Diencephalon (interbrain) contains centers of: a) respiration; **b)** balance; **c)** metabolism and body temperature; **d)** muscular tone; **e)** circulation.

10. The thickness of the cerebral cortex is: a) 2–4 cm; **b)** 2–4 mm; **c)** 5–10 cm; **d)** 5–10 mm; **e)** 10–15 mm.

11. Subcortical centers of vision and hearing are located in: a) midbrain; **b)** medulla; **c)** pons; **d)** cerebellum; **e)** telencephalon.

12. The work of endocrine glands is regulated by: a) diencephalon; **b)** telencephalon; **c)** cerebellum; **d)** midbrain; **e)** medulla.

13. Visual area of the cerebral cortex is in the: a) frontal lobe; **b)** parietal lobe; **c)** occipital lobe; **d)** temporal lobe; **e)** central sulcus (fissure).

14. The average size of the brain of modern human is: a) 1100 cm^3; **b)** 1200 cm^3; **c)** 1350 cm^3; **d)** 1500 cm^3; **e)** 1800 cm^3.

15. The cortex area processing sensory information from skin and muscles is situated in the: a) frontal lobe; **b)** parietal lobe; **c)** occipital lobe; **d)** temporal lobe; **e)** central sulcus.

16. The hearing center of the cerebral cortex is situated in: a) frontal lobe; **b)** parietal lobe; **c)** occipital lobe; **d)** temporal lobe; **e)** central sulcus.

17. Cerebral cortex contains: a) 10 million neurons; **b)** 10 billion neurons; **c)** 12 million neurons; **d)** 12 billion neurons; **e)** 14 billion neurons.

Fill in the gaps:

1. Brain consists of telencephalon, diencephalon, mesencephalon, metencephalon and …

2. Telencephalon consists of two hemispheres connected with …

3. Thalamus and hypothalamus are the parts of the brain region called …

4. Mesencephalon has quadrigemina and … …

5. Metencephalon has pons and …

6. Myelencephalon (medulla oblongata) connects the brain with … …

7. The respiratory center is situated in …

8. Cerebellum is located above the …

9. Cerebellum contains centers of regulation of balance, muscular tone and …

10. Midbrain consists of cerebral peduncles and …

11. Subcortical centers of vision and hearing are located in …

12. Thalamus and hypothalamus are the parts of …

13. Subcortical centers of all types of sensitivity except smell are located in …

14. Metabolism and body temperature are regulated by …

15. Sleep and wakefulness are regulated by …

16. The lateral ventricles are situated in the …

17. The grooves in the cerebral cortex are called …

18. The convoluted ridges between anatomical grooves of the cortex are called …

19. The lobes of the cerebrum are: frontal, occipital, temporal and …

PRACTICAL WORK

Task 1. Write the labels for the diagram of the brain.

1 –

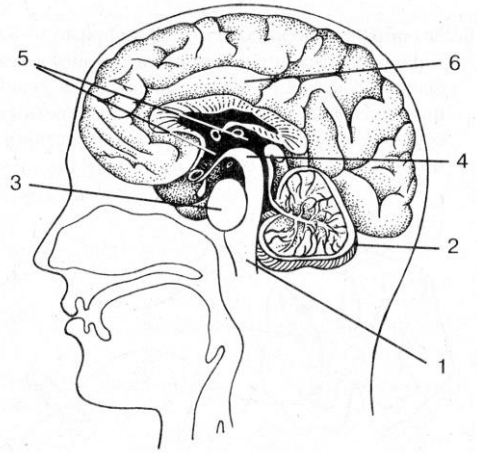
2 –

3 –

4 –

5 –

6 –



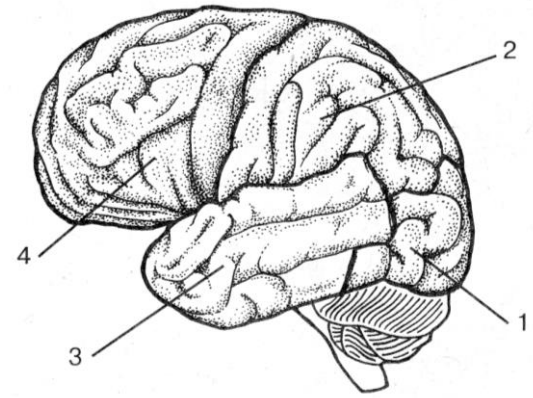
Task 2. Write the labels for the diagram of the cerebrum.

1 –

2 –

3 –

4 –



Teacher's signature

Lesson 32. Topic: SENSE ORGANS. THE ORGAN OF SIGHT «____» _____ 20____ year

Aim of the lesson is to consider the concepts of sensory organ and analyzer; to learn structure and functions of the visual organ.

CONTENTS OF THE TOPIC

1. Sensory organs. Analyzers.
2. Structure and function of the visual organ.

BASIC TERMS AND CONCEPTS

1. Analyzer —

2. Fibrous tunic —

3. Vascular tunic —

4. Internal tunic —

5. Sclera —

6. Cornea —

7. Choroid —

8. Ciliary body —

9. Iris —

10. Pupil —

11. Anterior chamber of the eye —

12. Posterior chamber of the eye —

13. Lens —

14. Vitreous body —

15. Rods —

16. Cones —

17. Yellow spot (macula) —

18. Blind spot —

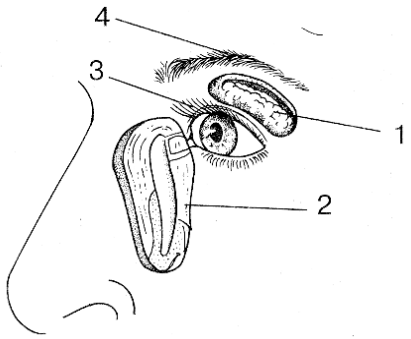
19. Myopia —

TESTS FOR SELF-CONTROL	Fill in the gaps:
1. The outer tunic of the eye is: a) fibrous tunic; **b)** iris; **c)** sclera; **d)** choroid; **e)** retina. **2. The anterior transparent part of fibrous tunic is: a)** cornea; **b)** iris; **c)** pupil; **d)** sclera; **e)** lens. **3. Part of the vascuar tunic below the sclera is: a)** cornea; **b)** iris; **c)** choroid; **d)** pupil; **e)** retina. **4. Vitreous body is located: a)** behind the retina; **b)** between lens and retina; **c)** between cornea and iris; **d)** in lens; **e)** in cornea. **5. The peripheral part of an analyzer consists of: a)** tracts in which impulses go from sensory organs to the brain; **b)** cortex, where an analysis of information takes place; **c)** receptors of sensory organs; **d)** posterior horns of spinal cord; **e)** anterior horns of spinal cord. **6. The central part of an analyzer is in: a)** cerebral cortex; **b)** cerebellum; **c)** diencephalon; **d)** midbrain; **e)** spinal cord. **7. The part of the vascular tunic which contains the pigment coloring the eye is: a)** cornea; **b)** iris; **c)** sclera; **d)** retina; **e)** pupil. **8. An analyzer is a system that: a)** receives information; **b)** transfers information; **c)** analyzes information; **d)** receives and transfers information; **e)** receives, transfers and analyzes information. **9. The largest number of photoreceptors is located in: a)** macula; **b)** blind spot; **c)** choroid; **d)** iris; **e)** cornea. **10. Sensory organ is a system that: a)** receive information; **b)** transfer information; **c)** receive and transfer information; **d)** analyze information; **e)** receive and analyze information. **11. Visual analyzer consists of: a)** eye bulb; **b)** eye bulb and auxiliary apparatus; **c)** photoreceptors; **d)** photoreceptors, optic nerve and visual cortex; **e)** visual cortex.	**1.** Sensory organs transfer information to the … nervous system. **2.** An analyzer consists of peripheral, … and central parts. **3.** The peripheral part of the analyzer is … of sensory organs. **4.** The region of cerebral cortex which analyzes the information is the … part of the analyzer. **5.** Cornea is the part of the … tunic of eye bulb. **6.** The inner tunic of eye bulb is called … **7.** The vascular tunic consists of choroid, ciliary body and … **8.** The space between the lens and retina is filled with … **9.** Visual receptors are of two types: … and … **10.** Analysis of visual stimuli takes place in the … lobe of the cortex. **11.** The region of the retina where optic nerve starts is called … **12.** The spot of retina with many visual receptors is called …

PRACTICAL WORK

Task 1. Find the correct labels for the diagram of the visual organ.

1 –
2 –
3 –
4 –

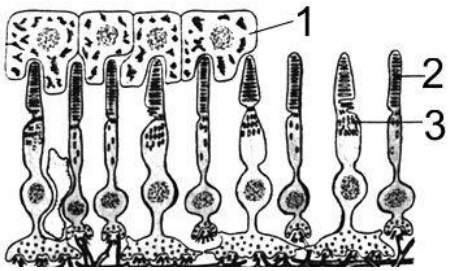


Task 2. Find the correct labels for the diagram of retina structure.

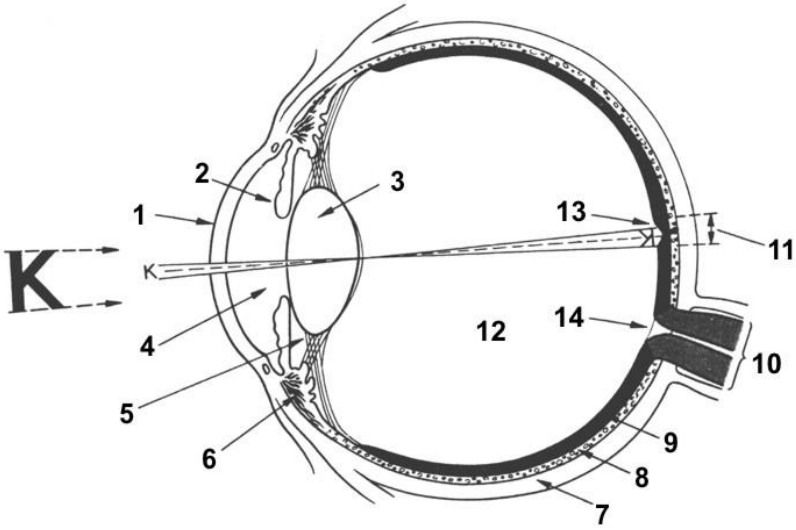
– pigment epithelium,

– rod,

– cone.



Task 3. Find the correct labels for the diagram of the eye.



– cornea,
– anterior chamber,
– iris,
– posterior chamber,
– lens,
– ciliary muscle,
– vitreous body,
– sclera,
– choroid,
– retina,
– yellow spot,
– blind spot,
– optic nerve,
– location of the image on the retina.

Teacher's signature

Lesson 33. Topic: THE ORGAN OF HEARING «____» _____ 20____ year

Aim of the lesson is to learn the structure and functions of the hearing organ.

CONTENTS OF THE TOPIC

1. The structure and functions of the ear and its regions.

BASIC TERMS AND CONCEPTS

1. **Auditory ossicles** —
2. **Cochlea** —
3. **Eardrum** —
4. **Endolymph** —
5. **Perilymph** —
6. **Eustachian tube** —
7. **Outer ear** —
8. **Organ of Corti** —
9. **Round window** —

TESTS FOR SELF-CONTROL

1. The vibrations from the membrane of the oval window are transmitted to the: a) eardrum; **b)** malleus; **c)** incus; **d)** stapes; **e)** fluid of the cochlea.

2. The outer ear consists of: a) external auditory canal; **b)** external auditory canal and tympanic cavity; **c)** auricle and external auditory canal; **d)** malleus, stapes and incus; **e)** eardrum and cochlea.

3. The inner ear is located in: a) occipital bone; **b)** parietal bone; **c)** frontal bone; **d)** temporal bone; **e)** sphenoid bone.

4. The inner ear contains: a) eardrum and ossicles; **b)** cochlea and organ of balance (equilibrium); **c)** auditory tube and cochlea; **d)** auricle and ossicles; **e)** organ of balance (equilibrium) and ossicles.

5. The auditory tube connects nasopharynx with: a) external ear; **b)** middle ear; **c)** inner ear; **d)** pharynx; **e)** environment.

6. The vibrations from the eardrum are transmitted to the: a) stapes; **b)** incus; **c)** malleus; **d)** the oval window; **e)** fluid in the cochlea.

7. Auditory receptors transmit the impulse they generate through the nerve to the: a) occipital lobe of the cortex; **b)** temporal lobe of the cortex; **c)** parietal lobe of the cortex; **d)** frontal lobe of the cortex; **e)** temporal and occipital lobes of the cortex.

8. The vibrations from the eardrum are transmitted into the following way: a) malleus – incus – stapes – oval window; **b)** malleus – stapes – incus – oval window; **c)** malleus – stapes – incus – round window; **d)** stapes – incus – malleus – round window; **e)** incus – malleus – stapes – oval window.

9. Auditory receptors are located on the: a) basilar membrane; **b)** tectorial membrane; **c)** eardrum; **d)** external auditory canal (meatus); **e)** membrane of oval window.

10. Endolymph is between: a) basilar and vestibular membranes; **b)** basilar and tympanic membranes; **c)** tympanic and vestibular membranes; **d)** basilar and tectorial membranes; **e)** tectorial and tympanic membranes.

Fill in the gaps:

1. The hearing organ consists of the outer, … and inner ears.

2. The length of external auditory canal (meatus) is approximately … mm.

3. The membrane between the outer and middle ear is called …

4. The acoustic tube connects the middle ear with …

5. Auditory ossicles are situated in the … ear.

6. The membrane of the oval window receives vibration from an auditory ossicle which is called …

7. Hair cells are located on the basilar membrane of the … ear.

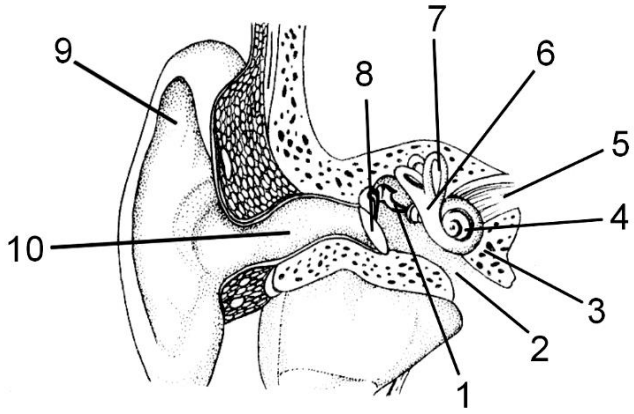
8. Eardrum conducts vibration to the auditory ossicle which is called …

9. The auditory ossicles are malleus, incus, and …

10. The nerve impulses from the auditory receptors are transmitted through the vestibulocochlear nerve to the … lobe of the cerebral cortex.

PRACTICAL WORK

Task 1. Labels the diagram of the ear.



1 –

2 –

3 –

4 –

5 –

6 –

7 –

8 –

9 –

10 –

Teacher's signature

Lesson 34. Topic: REPRODUCTIVE SYSTEM. THE STRUCTURE AND PRODUCTION OF GAMETES «____» _____ 20____ year
Aim of the lesson is to learn the anatomy and physiology of reproductive organs.

CONTENTS OF THE TOPIC

1. The structure and functions of male reproductive system.
2. The structure and functions of female reproductive system.
3. Gametogenesis.

BASIC TERMS AND CONCEPTS

1. **Fertilization** —
2. **Gametogenesis** —
3. **Gonad** —
4. **Oogenesis (ovogenesis)** —
5. **Ovary** —
6. **Sperm** —
7. **Testicle** —
8. **Uterus** —

TESTS FOR SELF-CONTROL

1. Male gonads are called: a) testes; **b)** fallopian tubes; **c)** ovaries; **d)** vas deferens (deferent duct); **e)** ejaculatory ducts.
2. Testes produce: a) only male hormones; **b)** only male gametes (sperms); **c)** male and female hormones; **d)** female gametes (egg cells); **e)** male hormones and gametes.
3. Female gonads are called: a) ovaries; **b)** fallopian tubes; **c)** testes; **d)** vas deferens; **e)** uterus.
4. Female hormones are produced in: a) fallopian tubes; **b)** ovaries; **c)** testes; **d)** uterus; **e)** vas deferens.
5. The nucleus of spermatozoon has set of chromosomes: a) haploid; **b)** diploid; **c)** triploid; **d)** tetraploid; **e)** polyploid.
6. During the proliferative period of gametogenesis, cells: a) divide by mitosis; **b)** grow and increase their size; **c)** divide by meiosis; **d)** transform into gametes of a certain shape; **e)** divide by amitosis.
7. During the period of growth of gametogenesis, cells: a) divide by mitosis; **b)** grow and increase their size; **c)** divide by meiosis; **d)** transform into gametes of a certain shape; **e)** divide by amitosis.
8. During the period of maturation of gametogenesis, cells: a) divide by mitosis; **b)** grow and increase their size; **c)** divide by meiosis; **d)** transform into gametes of a certain shape; **e)** divide by amitosis.
9. During the period of transformation of gametogenesis, cells: a) divide by mitosis; **b)** grow and increase their size; **c)** divide by meiosis; **d)** transform into gametes of a certain shape; **e)** divide by amitosis.
10. The length of spermatozoon is: a) 55 micrometers; **b)** 0.5–0.7 mm; **c)** 1–2 micrometers; **d)** 2–2.5 mm; **e)** 2.5–5 micrometers.

11. The head of a sperm contains: a) only the nucleus; **b)** nucleus and acrosome; **c)** centrosome; **d)** mitochondria; **e)** centrosome and nucleus.
12. The midpiece of sperm contains: a) centrosome and mitochondria; **b)** nucleus; **c)** Golgi complex and mitochondria; **d)** Golgi complex; **e)** mitochondria.
13. Sperm and ovum fuse in: a) ovaries; **b)** fallopian tubes; **c)** uterus; **d)** testis; **e)** vas deferens.

Fill in the gaps:

1. Female gonads are called …

2. Female gametes are called …

3. Female gametes are formed in …

4. Female hormones are produced in …

5. Male gonads are called …

6. Male gametes are called …

7. Male gametes are formed in …

8. Male hormones are produced in …

9. Spermatozoon consists of head, … and tail.

10. The head of a spermatozoon contains nucleus and …

11. The process of gamete formation is called …

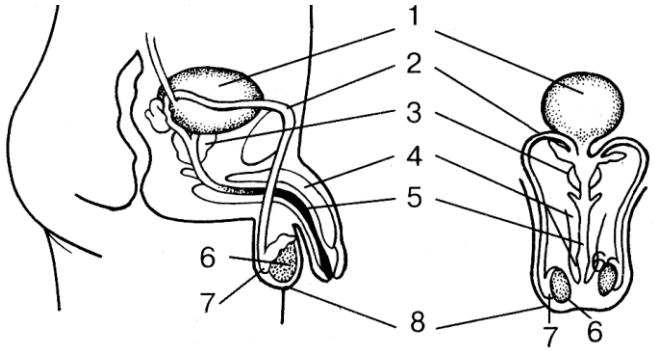
12. Zygote is produced as the result of … of an ovum.

13. Fetus develops in the organ which is called …

PRACTICAL WORK

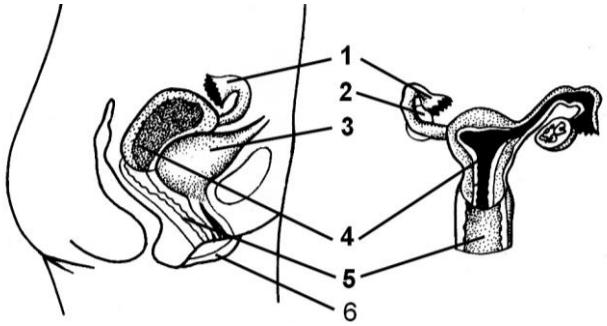
Task 1. Find the correct labels for the diagram of male reproductive system.

– bladder,
– urethra,
– scrotum,
– prostate,
– vas deferens,
– testis,
– penis,
– epididymis.



Task 2. Find the correct labels for the diagram of female reproductive system.

– vagina,
– bladder,
– ovaries,
– labia,
– uterus,
– fallopian tubes.



Teacher's signature

Lesson 35. Topic: TEST IN THE TOPICS 19–34: THE ANATOMY AND PHYSIOLOGY OF HUMAN «____» _____ 20____ year
Aim of the lesson is to estimate student's knowledge in considered topics.

CONTENTS OF THE COLLOQUIUM

1. Anatomy, physiology and hygiene are sciences that deal with a structure and functions of human body and conditions of health maintenance.
2. Tissues: epithelial, muscular, nervous, connective.
3. Human's organs and systems of organs.
4. A structure and growth of bones.
5. Conjunction of bones: immovable, freely movable.
6. Freely movable conjunction of bones.
7. Parts of the human skeleton (the head, the trunk, extremities and their girdles).
8. Functions of the human skeleton.
9. Skeletal and smooth muscles.
10. Skeletal muscles, their structure and functions.
11. Nervous control of muscles.
12. Functions of muscular system.
13. An internal environment of the body: interstitial fluid, lymph, blood.
14. Blood composition: plasma, blood corpuscles- red blood cells, white blood cells, platelets, their structure and functions.
15. Functions of blood.
16. The circulatory system. The heart, its structure and functioning.
17. Nervous and humoral control of action of the heart.
18. Structure of vessels (arteries, veins, capillaries).
19. Sanguimotion through the vessels.
20. Systemic (greater) and pulmonary (lesser) circulation.
21. Importance of breathing.
22. Respiratory tract and respiratory organs, their structure and functions.
23. Structure of vocal (laryngeal) apparatus.
24. Digestive system and its parts. Digestive glands.
25. Structure of oral cavity.
26. Structure of stomach.
27. Structure of intestine.
28. Digestive enzymes and their properties. Importance of enzymes in digestion.
29. Digestion in the mouth, stomach and intestine.
30. A structure of urinary organs.
31. Nephron as a structural and functional unit of the kidney. Formation of primary and secondary urine.
32. Functions of kidney.
33. Structure and function of the skin.
34. Functions of nervous system. Structure of neuron.
35. Structure of the spine. Functions of the spine.
36. Brain, its parts and functions. Significance of the cerebral cortex.
37. Sensory organs. Analyzers.
38. Structure and function of the visual organ.
39. Structure and function of the external, middle and inner ear.
40. Structure and function of the Male Reproductive System.
41. Structure and function of the Female Reproductive System.
42. Formation of gametes.

Lesson. 36. Topic: PROKARYOTES: BACTERIA «___» _____ 20____ year

Aim of the lesson is to learn the characteristics of bacteria.

CONTENTS OF THE TOPIC

1. The living conditions and the abundance of bacteria.
2. Structure of the bacterial cell.
3. Functioning of bacteria.
4. The role of bacteria in the nature.
5. Pathogenic bacteria and methods of dealing with them.

BASIC TERMS AND CONCEPTS

1. Bacteria —

2. Aerobic bacteria —

3. Anaerobic bacteria —

4. Autotrophic bacteria —

5. Heterotrophic bacteria —

6. Photosynthetic bacteria —

7. Plasmid —

8. Chemosynthetic bacteria —

9. Pathogenic bacteria —

10. Bacterial capsule —

11. Bacterial spore —

12. Mesosomes —

13. Nucleoid —

14. Gram-positive bacteria —

TESTS FOR SELF-CONTROL

1. Common sizes of bacterial cells are: a) 0.2–13 mm; **b)** 0.2–13 micrometers; **c)** 13–20 micrometers; **d)** 13–20 mm; **e)** 14–15 micrometers.
2. Common shapes of bacterial cells are: a) rods, triangles; **b)** spheres, commas, rods; **c)** spirals, triangles; **d)** commas, squares; **e)** squares, rods.
3. Rod-shaped bacteria are called: a) cocci; **b)** bacilli; **c)** vibrios; **d)** spirilla; **e)** vireos.

4. Comma-shaped bacteria are called: a) cocci; **b)** bacilli; **c)** vibrios; **d)** spirilla; **e)** vireos.

5. Spiral-shaped bacteria are called: a) cocci; **b)** bacilli; **c)** vibrios; **d)** spirilla; **e)** vireos.

6. Common coverings of bacterial cell include: a) capsule; **b)** plasma membrane; **c)** cells wall; **d)** plasma membrane and capsule; **e)** capsule, cell wall and plasma membrane.

7. Nucleoid is: a) capsule; **b)** the genetic apparatus of bacterial cell; **c)** nucleotide; **d)** mitochondrial DNA; **e)** nuclear membrane.

8. According to the type of assimilation bacteria are: a) autotrophic and heterotrophic; **b)** anaerobic and aerobic; **c)** aerobic and autotrophic; **d)** autotrophic and anaerobic; **e)** aerobic and heterotrophic.

9. According to the type of dissimilation bacteria are: a) autotrophic and heterotrophic; **b)** anaerobic and aerobic; **c)** aerobic and autotrophic; **d)** autotrophic and anaerobic; **e)** aerobic and heterotrophic.

10. Bacteria multiply by: a) binary fission; **b)** multiple fission; **c)** forming spores; **d)** forming spores and binary fission; **e)** forming spores and multiple fission.

11. Bacterial spores perform the functions of: a) sexual reproduction; **b)** asexual reproduction; **c)** survival in hostile environment; **d)** sexual reproduction and survival in unfavorable conditions; **e)** asexual reproduction and a survival.

12. Parasitic bacteria cause human disease such as: a) flu and plague; **b)** cholera and tuberculosis; **c)** sore throat and flu; **d)** sore throat and AIDS; **e)** AIDS and plague.

Fill in the gaps:

1. The kingdom of unicellular prokaryotic organisms which are considerably different from eukaryotes is called …

2. The genetic apparatus of bacteria is called …

3. The genetic apparatus of bacteria is a circular … molecule.

4. The invaginations of bacterial plasma membrane which appear when they are prepared for microscopy are called …

5. Protein synthesis in bacteria is performed by …

6. According to the type of assimilation, lactic acid bacteria are …

7. Anaerobic bacteria live in the environment without …

8. According to the type of dissimilation bacteria are … and …

9. Bacteria multiply by …

10. In unfavorable condition bacteria form …

11. Bacteria that cause human diseases are called …

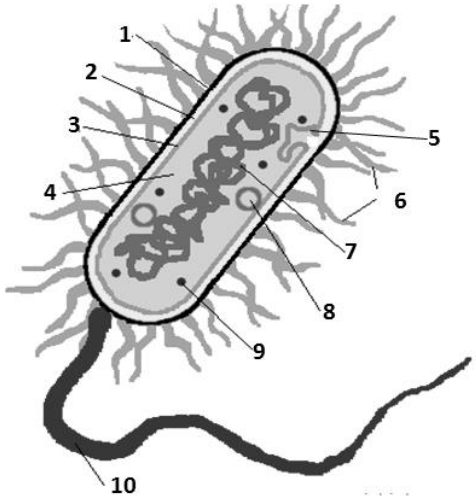
12. Rod-shaped bacteria are called …

13. Comma-shaped bacteria are called …

14. Spiral-shaped bacteria are called …

PRACTICAL WORK

Task 1. Write the labels for the diagram of bacterium.



1 –

2 –

3 –

4 –

5 –

6 –

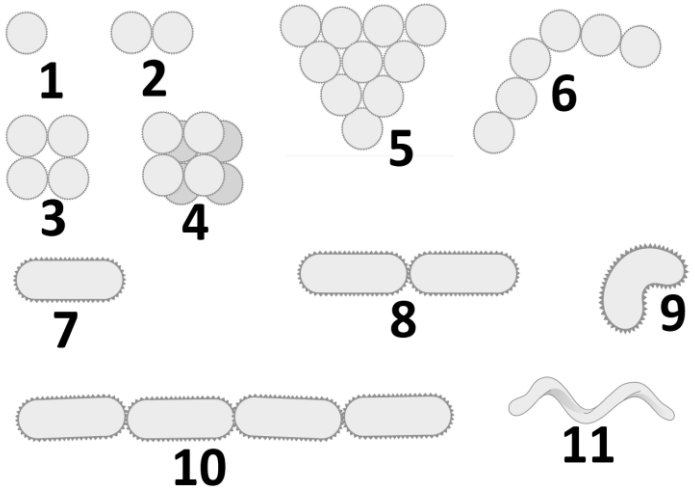
7 –

8 –

9 –

10 –

Task 2. Write the labels for the diagram of bacterial shapes.



1 –

2 –

3 –

4 –

5 –

6 –

7 –

8 –

9 –

10 –

11 –

Teacher's signature

Lesson 37. Topic: KINGDOM PROTISTA. PARASITIC PROTISTS «____» _____ 20____ year

Aim of the lesson is to learn the characteristics of protists.

CONTENTS OF THE TOPIC

1. Free-living protists: *Amoeba*, *Euglena*, *Paramecium*.
2. Features of the structure and physiology of protists.
3. Parasitic protists: *E. histolytica*, *Giardia*, *malaria parasite*

BASIC TERMS AND CONCEPTS

1. Contractile vacuole —

2. Food vacuole —

3. Pellicle —

4. Pseudopodia —

5. Flagella —

6. Conjugation of Paramecium —

7. Anal pore —

8. Cyst —

9. Taxis —

10. Ectoplasm —

11. Endoplasm —

12. Macronucleus —

13. Micronucleus —

14. Schizogony —

15. Malaria —

16. Giardiasis —

17. Amoebiasis —

18. Diagnostics —

19. Fever —

TESTS FOR SELF-CONTROL

1. An autoheterotrophic protist is: a) Amoeba; **b)** Paramecium; **c)** Euglena; **d)** Giardia; **e)** Plasmodium.

2. Paramecium does not have: a) nuclei; **b)** pigment chlorophyll; **c)** food vacuoles; **d)** contractile vacuoles; **e)** pellicle.

3. Euglena does not have: a) nuclei; **b)** pigment chlorophyll; **c)** food vacuoles; **d)** pellicle; **e)** contractile vacuoles.

4. The macronucleus and micronucleus are present in: a) Amoeba; **b)** Euglena; **c)** Paramecium; **d)** Giardia; **e)** Plasmodium.

5. The process when two Paramecia exchange their genetic materials is called: a) copulation; **b)** conjugation; **c)** asexual reproduction; **d)** nutrition; **e)** breathing**.**

6. Conjugation is: a) division into two cells; **b)** division into many cells; **c)** sexual process; **d)** type of irritability; **e)** secretion of liquid products of metabolism.

7. Paramecium releases undigested remains of food through: a) anal pore; **b)** contractile vacuoles; **c)** body surface; **d)** food vacuoles; **e)** cell mouth.

8. Protists form cysts for: a) feeding; **b)** breathing; **c)** survival; **d)** conjugation; **e)** motion.

9. Many parasitic protists do not have: a) nucleus; **b)** contractile vacuoles; **c)** mitochondria; **d)** food vacuoles; **e)** ribosome.

10. Symptoms of amoebic dysentery: a) injury of skeletal muscles; **b)** diarrhea with blood; **c)** destruction of red blood cells, fever; **d)** destruction of liver cells, itching; **e)** inflammation of the gallbladder and duodenum.

11. Human becomes infected with malaria by: a) eating fruits and vegetables with cysts of the parasite; **b)** drinking water with parasites; **c)** bite of the female Anopheles mosquito; **d)** eating poorly thermally processed beef; **e)** poor personal hygiene.

12. Phyla of the kingdom protists: a) Sarcomastigophora, Ciliata, Nematoda; **b)** Apicomplexa, Arthropoda; **c)** Sarcomastigophora, Chordata; **d)** Ciliata, Sarcomastigophora, Apicomplexa; **e)** Roundworms, Ciliata.

13. Plasmodium belongs to the phylum: a) Sarcomastigophora; **b)** Ciliata; **c)** Apicomplexa; **d)** Arthropoda; **e)** Chordata.

14. Euglena belongs to the phylum: a) Sarcomastigophora; **b)** Ciliata; **c)** Apicomplexa; **d)** Arthropoda; **e)** Chordata.

15. Protists that have changeable shape are: a) Euglena, Amoeba; **b)** Paramecium; **c)** Amoeba, Giardia; **d)** Euglena, Paramecium; **e)** Amoeba.

16. Protists that have constant body shape: a) Euglena, Amoeba; **b)** Paramecium, Giardia; **c)** Amoeba, Giardia; **d)** Amoeba; **e)** Paramecium, Amoeba.

17. The locomotory organelle of Euglena: a) pseudopodium; **b)** cilium; **c)** contractile vacuole; **d)** pilus; **e)** flagellum.

18. The protist which has the green pigment chlorophyll: a) Amoeba; **b)** Paramecium; **c)** Euglena; **d)** Giardia; **e)** Plasmodium.

Fill in the gaps:

1. The form irritability of protists which makes them move to a stimulus is called …

2. The response of protists to various external factors is called …

3. The protists having vegetative and generative nuclei belong to the phylum …

4. The generative nucleus of *Paramecium* is called …

5. The vegetative nucleus of *Paramecium* is called …

6. The differentiation of disease or parasite are called …

7. Paramecium removes undigested remains of food through …

8. Euglena is … according to its type of feeding.

9. When environmental conditions become unfavorable protists form …

10. The person or animal where a parasite lives is the … of this parasite.

11. The life stage of *E. histolytica* that infects humans is called …

12. The type of asexual reproduction of malaria parasite when mother cell divides into many daughter cells called …

PRACTICAL WORK

Task 1. Write labels for the diagram of *Euglena*.

1 –

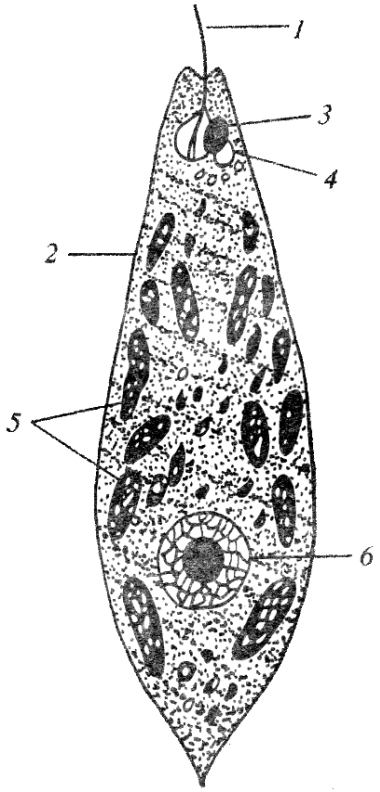
2 –

3 –

4 –

5 –

6 –



Task 2. Write labels for the diagram of *Amoeba*.

1 –

2 –

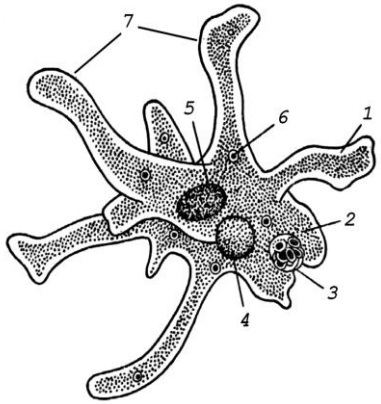
3 –

4 –

5 –

6 –

7 –



Task 3. Write labels for the diagram of *Paramecium*.

1 –

2 –

3 –

4 –

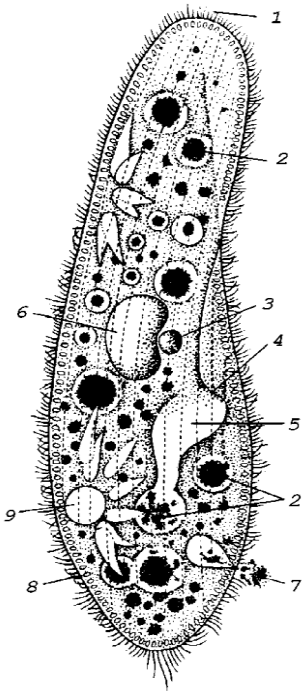
5–

6 –

7 –

8 –

9 –



Task 4. Write labels for the diagram of *Giardia*.

1 –

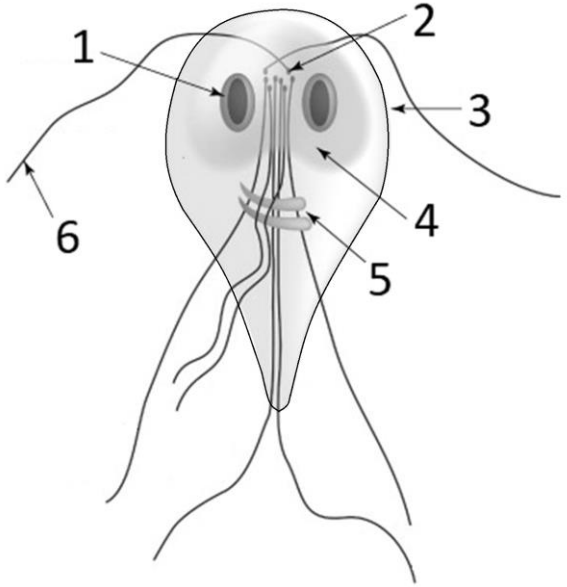
2 –

3 –

4 –

5 –

6 –



Teacher's signature

Lesson 38. Topic: PHYLUM PLATYHELMINTHES (FLATWORMS) «____» _____ 20____ year

Aim of the lesson is to learn the characteristics of flatworms, their external and internal anatomy.

CONTENTS OF THE TOPIC

1. General characteristics of the phylum flatworms.
2. Systematics of the phylum flatworms.
3. Features of the anatomy and physiology of flatworms.
4. Medical significance of protists.

BASIC TERMS AND CONCEPTS

1. Flatworms —

2. Eddy worms —

3. Flukes —

4. Tapeworms —

5. Bilateral symmetry —

6. Parasite —

7. Hermaphrodite —

8. Germ layers (ectoderm, endoderm and mesoderm) —

9. Dermo-muscular body wall —

10. Protonephridium —

11. Sucker —

12. Foregut —

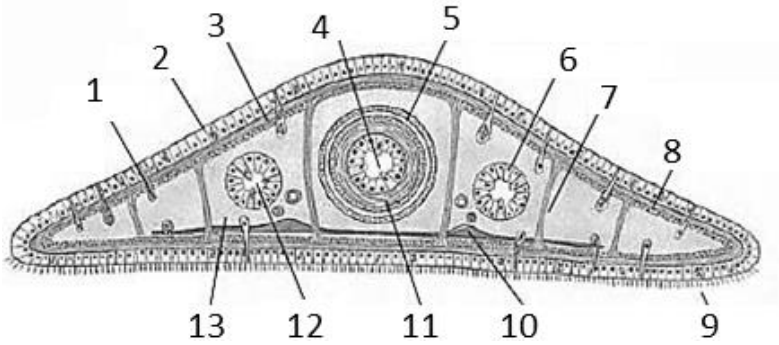
13. Midgut —

14. Hindgut —

TESTS FOR SELF-CONTROL	Fill in the gaps:
1. The number of muscle layers in the dermo-muscular body wall of flatworms: a) one; **b)** two; **c)** three; **d)** four; **e)** five. **2. The body cavity of flatworms: a)** primary (pseudocoelom); **b)** secondary (coelom); **c)** mixed (mixocoel); **d)** absent, the space between organs is filled with connective tissue; **e)** tertiary. **3. The organs of flatworms develop from the following germ layers: a)** ectoderm; **b)** ectoderm and endoderm; **c)** endoderm; **d)** endoderm and mesoderm; **e)** ectoderm, endoderm and mesoderm. **4. Flatworms have no: a)** digestive system; **b)** circulatory system; **c)** reproductive system; **d)** nervous system; **e)** excretory system. **5. The digestive system of eddy worms has**: **a)** foregut, midgut and anal opening; **b)** foregut, midgut, hindgut and no anal opening; **c)** foregut, midgut, hindgut and rectum; **d)** foregut, midgut and no anal opening; **e)** midgut and hindgut and no anal opening. **6. The organs of the excretory system of flatworms are: a)** metanephridia; **b)** Malpighian tubules; **c)** kidneys; **d)** protonephridia; **e)** nephridia. **7. The components of the nervous system of flatworms: a)** 2 ganglia and ventral nerve cord; **b)** 2 ganglia and nerve cords; **c)** the brain and spinal cord; **d)** the brain and no nerves; **e)** star-shaped cells. **8. The sensory organs of flatworms are: a)** touch and hearing organs; **b)** chemical sense and olfactory organs; **c)** sight sense and hearing; **d)** light-sensitive, touch and chemical senses; **e)** hearing and smell. **9. There are following classes of phylum *Platyhelminthes*: a)** arachnids and flukes; **b)** eddy worms and tapeworms; **c)** crustaceans and eddy worms; **d)** eddy worms, flukes and tapeworms; **e)** amphibians and tapeworms.	**1.** There are following classes of phylum flatworms: eddy worms, … and tapeworms. **2.** Organs of the excretory system of flatworms are … **3.** Flukes and eddy worms have digestive, excretory, … and nervous systems. **4.** The circulatory system in flatworms is … **5.** The respiratory system in flatworms is … **6.** The dermo-muscular body wall of flatworms consist of 3 layers of smooth muscles: circular, diagonal and … **7.** The space between organs of flatworms is filled with … **8.** The … gut is absent in the digestive system of flatworms. **9.** The … is an organ of eddy worms able to turn out through the mouth. **10.** The nervous system of flatworms has two … and nerve cords, extending along the body. **11.** Planaria has … development.

PRACTICAL WORK

Task 1. Write the labels for the diagram of the cross-section of a flatworm.



1 –

2 –

3 –

4 –

5 –

6 –

7 –

8 –

9 –

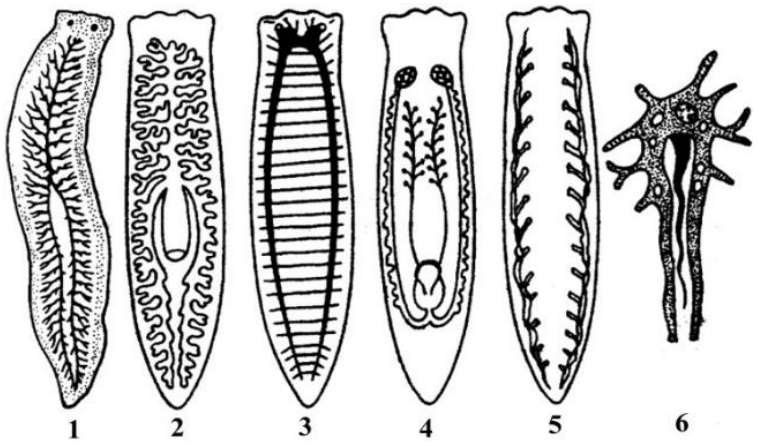
10 –

11 –

12 –

13 –

Task 2. Write the labels for the diagram of the organ systems.



1 –

2 –

3 –

4 –

5 –

6 –

Teacher's signature

Lesson 39. Topic: CLASS TREMATODA (FLUKES) «____» _____ 20____ year

Aim of the lesson is learn the characteristics of flukes, their external and internal anatomy, life cycle on the of liver fluke.

CONTENTS OF THE TOPIC

1. Features of the external and internal anatomy of the liver fluke.
2. Features of the life cycle of the liver fluke.
3. Prevention of the fascioliasis.

BASIC TERMS AND CONCEPTS

1. Tegument —

2. Helminthes —

3. Helminthiasis —

4. Host of a parasite —

5. Definitive host —

6. Intermediate host —

7. Miracidium —

8. Life cycle of a parasite —

9. Cercaria —

10. Fascioliasis —

11. Adolescaria —

12. Prophylaxis —

TESTS FOR SELF-CONTROL

1. The length of *Fasciola hepatica* can reach: a) 3–5 mm; **b)** 3–5 cm; **c)** 1–2 cm; **d)** 6–10 cm; **e)** 10–12 mm.

2. *Fasciola hepatica* lives in: a) small intestine; **b)** large intestine; **c)** ducts of liver; **d)** lungs; **e)** skeletal muscles.

3. The outer layer of dermo-muscular body wall of flukes is: a) ciliated epithelium; **b)** tegument; **c)** hypodermis; **d)** epidermis; **e)** dermis.

4. The definitive host of liver fluke is: a) only human; **b)** human and cattle; **c)** only cattle; **d)** cats; **e)** snails.

5. The intermediate host of liver fluke is: a) only human; **b)** human and cattle; **c)** only cattle; **d)** cats; **e)** snails.

6. The larva of liver flukes that hatches from the egg in water is called: a) cercaria; **b)** oncosphere; **c)** measle; **d)** miracidium; **e)** redia.

7. The human can become infected with fascioliasis by: a) eating poorly thermally processed beef; **b)** swallowing adolescariae with water; **c)** eating poorly thermally processed pork; **d)** eating dirty vegetables and fruits; **e)** eating poorly thermally processed fish.

8. The pathogenic effect of *Fasciola hepatica*: a) destruction of ducts and tissue of liver; **b)** destruction of lung tissue; **c)** destruction of muscle tissue; **d)** destruction of the intestinal mucosa; **e)** pneumonia.

9. Features of reproduction and development of parasitic flatworms: **a)** complex life cycles with changes of hosts, direct development; **b)** lifecycles without changing hosts, direct development; **c)** life cycles without changing hosts, indirect development; **d)** complex life cycles with alternations of hosts, indirect development; **e)** asexual reproduction, direct development.

Fill in the gaps:

1. The body shape of liver fluke is …

2. Mature liver flukes attach to the walls of bile ducts by means of …

3. The outer layer of dermo-muscular wall of flukes is called …

4. The organism where adult parasite lives and multiplies sexually is called …

5. The organism where the development and/or asexual reproduction of a parasite occur is … host of the parasite.

6. The larva of flukes which hatches from the egg in water is called …

7. The intermediate host of liver fluke is …

8. The disease caused by the liver fluke is called …

9. The prevention of a disease is called …

PRACTICAL WORK

Task 1. Write the labels for the diagram of lie cycle of liver fluke.

1 –

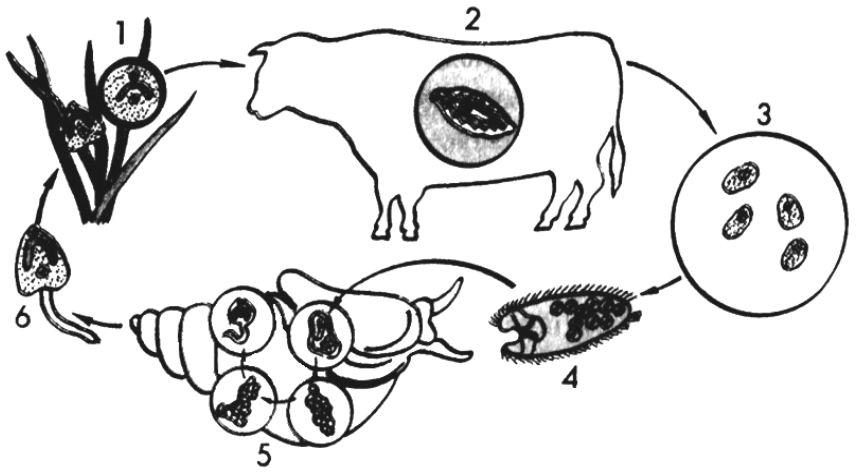
2 –

3 –

4 –

5 –

6 –



Teacher's signature

Lesson 40. Topic: CLASS CESTODA (TAPEWORMS) «____» _____ 20____ year

Aim of the lesson is to learn characteristics of tapeworms, the features of the anatomy and life cycle of the beef tapeworm.

CONTENTS OF THE TOPIC

1. Characteristics of class tapeworms.
2. The features of the structure and life cycle of beef tapeworm.

BASIC TERMS AND CONCEPTS

1. **Scolex** —
2. **Neck of tapeworms** —
3. **Microtriches** —
4. **Mature proglottids** —
5. **Gravid proglottids** —
6. **Oncosphere** —
7. **Cisticercus** —
8. **Cestodosis** —

TESTS FOR SELF-CONTROL

1. The body of tapeworms consists of: a) scolex, neck, tail; **b)** body and tail; **c)** scolex, neck, and strobila; **d)** scolex and strobila; **e)** scolex, body, tail.
2. The fixation organs of tapeworms: a) cuticular lips; **b)** oral and ventral suckers; **c)** teeth; **d)** suckers and hooks; **e)** only hooks.
3. The size of beef tapeworm can reach: a) 5 m; **b)** 10 m; **c)** 10 cm; **d)** 3–5 cm; **e)** 1–2 m.
4. Adult beef tapeworm lives in: a) intestine; **b)** liver; **c)** liver ducts; **d)** lungs; **e)** skeletal muscles.
5. The scolex of beef tapeworm has: a) two suckers and hooks; **b)** three suckers; **c)** three suckers and hooks; **d)** four suckers and hooks; **e)** four suckers.
6. Mature segments of tapeworms are located: a) in anterior region of the body; **b)** in the middle of the body; **c)** in the posterior region of the body; **d)** in the anterior and middle regions of the body; **e)** in the middle and posterior regions of the body.
7. The gravid segments of tapeworms are located: a) in anterior region of the body; **b)** in the middle of the body; **c)** in the posterior region of the body; **d)** in the anterior and middle regions of the body; **e)** in the middle and posterior regions of the body.
8. The gravid segments of tapeworms contain: a) no organs but parenchyma; **b)** male reproductive system; **c)** male and female reproductive system; **d)** only uterus with eggs; **e)** all organ systems, except reproductive.
9. The intermediate host of beef tapeworm is: a) snail; **b)** cattle; **c)** human; **d)** pig; **e)** cattle and human.
10. The definitive host of beef tapeworm is: a) snail; **b)** cattle; **c)** human; **d)** pig; **e)** cattle and human.

11. The correct sequence of stages in the life cycle of beef tapeworm:
a) egg → cysticercus → oncosphere → adult tapeworm; **b)** oncosphere → cysticercus → adult tapeworm; **c)** egg → oncosphere → cysticercus → adult tapeworm; **d)** cysticercus → egg → oncosphere → adult tapeworm; **e)** egg → miracidia → cysticercus → adult tapeworm.

Fill in the gaps:

1. The body of tapeworms consists of: scolex, neck, and …

2. Tapeworms have special organs of attachment to the body of the host: suckers and …

3. The attachment organs of the beef tapeworm are only …

4. The growth zone of tapeworms is their …

5. The segments in the middle of tapeworm's body are called …

6. The segments in the end of tapeworm's body are called …

7. The segments in the middle of tapeworm's body contain …

8. The segments in the end of tapeworm's body contain large branching … filled with …

9. The definitive host of beef tapeworm is …

10. The larva which develops from the egg of beef tapeworm is called …

11. The larva of beef tapeworm which may infect human is called …

PRACTICAL WORK

Task 1. Write the labels for the diagram of *Taeniarhynchus saginatus*.

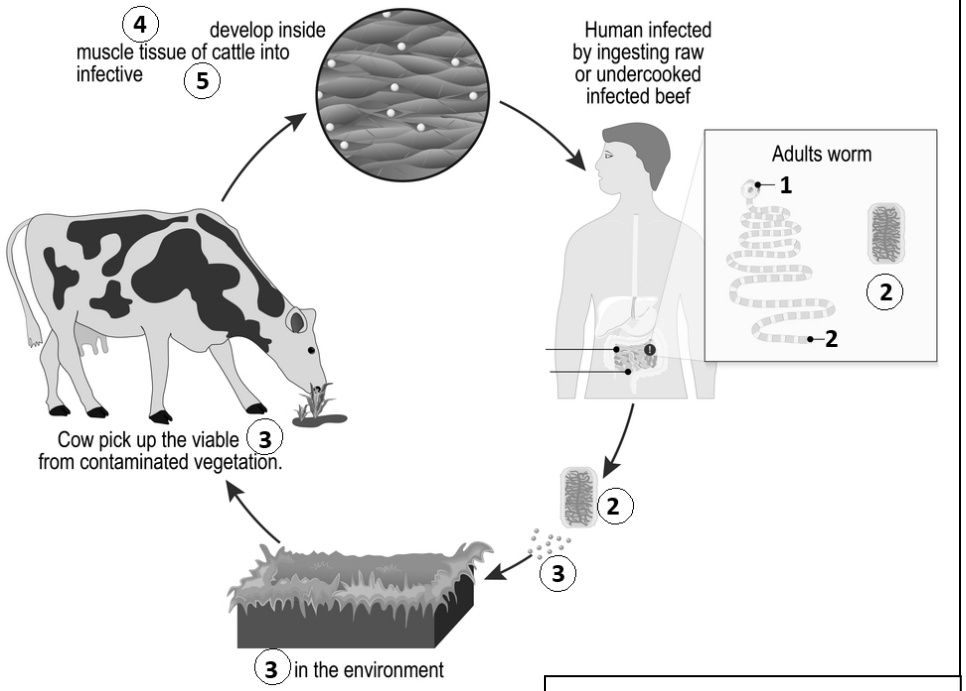
1 –

2 –

3 –

4 –

5 –



Teacher's signature

Lesson 41. Topic: PHYLUM NEMATODA (ROUNDWORMS) «____» _____ 20____ year

Aim of the lesson is to learn the characteristics of roundworms, the anatomy and life cycle of *Ascaris lumbricoides*.

CONTENTS OF THE TOPIC

1. General characteristics of the phylum roundworms.
2. Structure and vital processes of *Ascaris lumbricoides*.
3. Life cycle of *Ascaris lumbricoides*.
4. Prevention of ascariasis.

BASIC TERMS AND CONCEPTS

1. **Cuticule** —
2. **Primary body cavity (pseudocoel)** —
3. **Hypodermis** —
4. **Sexual dimorphism** —
5. **Nematodosis** —
6. **Ascariasis** —

TESTS FOR SELF-CONTROL

1. Roundworms are: a) only free-living; **b)** only parasites; **c)** free-living and plant parasites; **d)** free-living and animal parasites; **e)** free-living or plant and animal parasites.

2. The dermo-muscular body wall of roundworms contains: a) only cuticle; **b)** only hypodermis; **c)** cuticle and one layer of muscles; **d)** hypodermis and two layers of muscles; **e)** cuticle, hypodermis and one layer of muscles.

3. Hypodermis is: a) epithelial tissue; **b)** muscle tissue; **c)** connective tissue; **d)** nervous tissue; **e)** muscle, covered with epithelial tissues.

4. The body cavity of roundworms: a) primary; **b)** secondary; **c)** mixed; **d)** absent and the space between organs is filled with connective tissue; **e)** tertiary.

5. The digestive system of roundworms: a) is absent; **b)** consists of foregut and midgut; **c)** consists of foregut and hindgut; **d)** consists of foregut, midgut and hindgut; **e)** all the answers are wrong.

6. Excretory organs of roundworms: a) body surface; **b)** phagocytic cells; **c)** connected longitudinal canals on the left and right sides and excretory pore; **d)** all the answers are correct; **e)** all the answers are wrong.

7. The nervous system of roundworms consists of: a) star-shaped cells in hypodermis; **b)** ganglia; **c)** circular nerve ring surrounding the pharynx and nerves; **d)** brain and sensory organs; **e)** brain and spinal cord.

8. Features of the circulatory system of roundworms: a) tubular heart on the dorsal side; **b)** tubular heart on the ventral side; **c)** it is absent; **d)** sac-shaped heart; **e)** two-chambered heart.

9. Conditions necessary for development of eggs of *A. lumbricoides*: **a)** temperature 25 °C, humidity, oxygen; **b)** being in the human body; **c)** water, temperature 15 °C, carbon dioxide; **d)** water, temperature 30–40 °C; **e)** soil, carbon dioxide, temperature 10–15 °C.

10. The migration pathway of larvae of *A. lumbricoides* in the human body: a) mouth → intestine → blood → heart → liver → lungs → bronchi → trachea → mouth → intestine; **b)** mouth → larynx → lungs → liver → heart → intestine; **c)** mouth → throat → blood → lungs → bronchi → trachea → mouth → intestine; **d)** mouth → intestine → blood → liver → heart → lungs → bronchi → trachea → mouth → intestine; **e)** mouth – intestine → blood → lungs → trachea → throat → intestine.

11. Measures for prevention of ascariasis: a) non-eating raw or undercooked fish; **b)** boiling water taken from rivers or lakes before usage; **c)** non-eating raw or undercooked beef; **d)** protection from bites of sand flies and mosquitoes; **e)** good washing of vegetables, observing the rules of personal hygiene.

Fill in the gaps:

1. The dermo-muscular body wall of roundworms contains one layer of … smooth muscles.

2. The outer layer of the dermo-muscular wall of *Ascaris* is called …

3. The body cavity of roundworms is …

4. The region of the gut that appeared in roundworms but was absent in flatworms is …

5. Roundworms excrete waste products such as ammonia through the …

6. The female *A. lumbricoides* can reach … cm in length.

7. The time required for the development of larva in the eggs of *A. lumbricoides* is …

8. After migration, the larva of *A. lumbricoides* maturate in … months.

9. The disease caused by *A. lumbricoides* is called …

10. The larva of ascaris hatches from the egg when it is in the …

11. An adult ascaris lives in …

12. The diseases caused by roundworms are called …

PRACTICAL WORK

Task 1. Write the labels for the diagram of dissected ascaris.

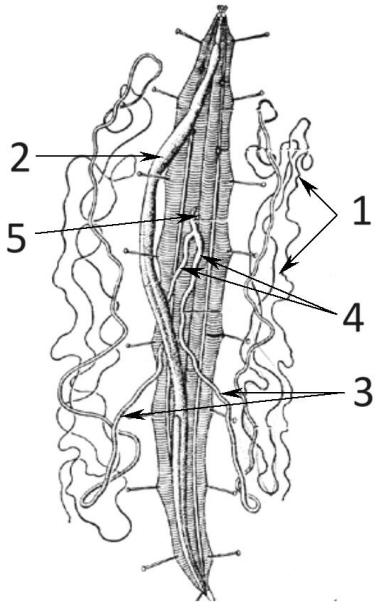
– ovaries,

– oviducts,

– uteri,

– vagina,

– gut.



Task 2. Write the labels for the diagram of the cross-section of ascaris.

– cuticle,

– ovaries,

– primary body cavity,

– oviducts,

– nerves,

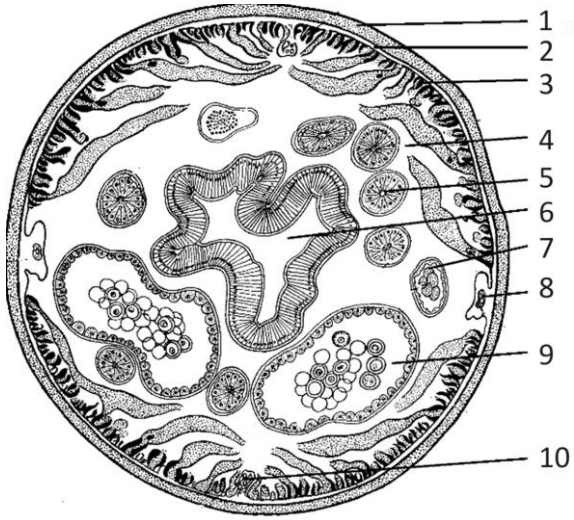
– uterus,

– muscle cells,

– hypodermis,

– excretory channel,

– intestine.



Teacher's signature

Lesson 42. Topic: PHYLUM ARTHROPODA «___» _____ 20____ year

Aim of the lesson is to learn the general characteristics of the phylum *Arthropoda*.

CONTENTS OF THE TOPIC

1. General characteristics of the phylum *Arthropoda*.
2. Taxonomy of the phylum *Arthropoda*.
3. Structural and vital features of arthropods.

BASIC TERMS AND CONCEPTS

1. Cephalothorax —

2. Chitin —

3. Coxal glands —

4. Gills —

5. Molting —

6. Mixocoel —

7. Metamorphosis —

8. Incomplete metamorphosis —

9. Complete metamorphosis —

TESTS FOR SELF-CONTROL

1. The classes of the phylum Arthropoda are: a) Crustaceans, Insects, Arachnids; **b)** Ticks; **c)** Scorpions; **d)** Beetles; **e)** Beetles and Ticks.

2. The appendages of arthropods do not perform the following function: a) flying; **b)** locomotion; **c)** griping food; **d)** protection from other animals; **e)** sensory.

3. Bodies of arthropods are covered with: a) hypodermis; **b)** epidermis and dermis; **c)** cuticule consisting of chitin; **d)** cuticule consisting of collagen; **e)** tegument with microvilli.

4. The body cavity of arthropods is: a) absent; **b)** primary; **c)** secondary; **d)** tertiary; **e)** mixed.

5. Functions of arthropod's chitin are: a) respiration; **b)** sensory; **c)** digestion; **d)** protection and support of the body; **e)** all the answers are correct.

6. The digestive system of arthropods consists of: a) foregut and midgut; **b)** Malpighian tubules; **c)** hindgut; **d)** foregut and digestive glands; **e)** foregut, midgut, hindgut and digestive glands.

7. Excretory organs of arthropods are: a) metanephridia; **b)** protonephridia; **c)** coxal glands and Malpighian tubules; **d)** skin glands; **e)** Malpighian tubules.

8. Features of the circulatory system of arthropods are: a) closed, the heart is at the dorsal side; **b)** open, the heart is at the dorsal side; **c)** open, the heart is at the ventral side; **d)** arthropods do not have the heart; **e)** closed, the heart is at the ventral side.

9. Respiratory organs of arthropods are: a) book lungs only; **b)** only gills; **c)** Malpighian tubules; **d)** book lungs, gills and tracheae; **e)** bronchi.

10. The nervous system of arthropods has: a) dorsal nerve cord; **b)** ventral nerve cord; **c)** several nerve cords; **d)** brain and the spinal cord; **e)** no nerve cords.

Fill in the gaps:

1. The excretory organs arthropods are coxal glands, green glands and …

2. Arthropods grow during …

3. The body regions of insects are head, thorax and …

4. The body regions of arachnids and crustaceans are … and abdomen.

5. The bodies of arthropods are covered with the organic compound called …

6. The body cavity of arthropods is …

7. The digestive tract of arthropods includes foregut, … and hindgut.

8. The heart of arthropods is at the … side of the body.

9. The blood of arthropods is colorless or …

10. The respiratory organs of aquatic arthropods are …

11. The nervous system of arthropods includes cerebral ganglion, … nerve ring and … nerve cord.

12. The visual difference between individuals of different sex of the same species is called … …

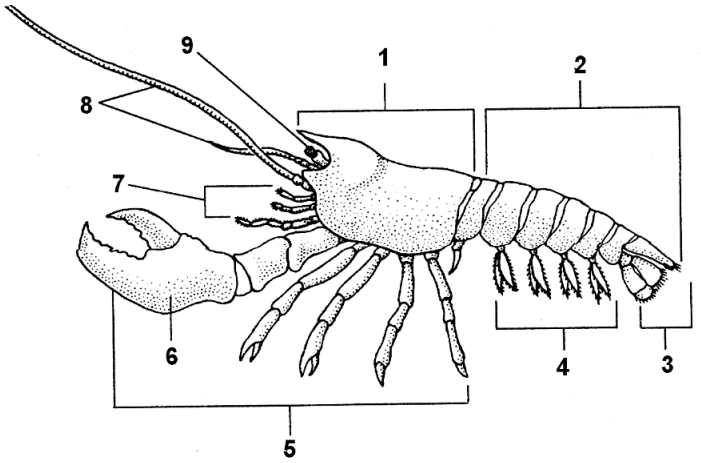
13. If an arthropod undergoes 3 stages during the life cycle (egg – larva – adult) then development is … … … …

14. Spiders belong to the class …

15. Crawfishes belong to the class …

PRACTICAL WORK

Task 1. Write the labels for the diagram of European crawfish.



1 –

2 –

3 –

4 –

5 –

6 –

7 –

8 –

9 –

Task 2. Fill in the table "Peculiarities of arthropods".

	Body regions	Walking legs
1. Insects		
2. Crustaceans		
3. Arachnids		
• Ticks		

Teacher's signature

Lesson 43. Topic: CLASS ARACHNIDA «____» _____ 20____ year

Aim of the lesson is to learn the general characteristics of the class Arachnida.

CONTENTS OF THE TOPIC

1. The general characteristics of the class *Arachnida*.
2. Features of anatomy and physiology of arachnids.
3. Features of anatomy and physiology of ticks.
4. Ticks as transmitters and pathogens of diseases.
5. Measures of protection from ticks.
6. Medical significance of arachnids.

BASIC TERMS AND CONCEPTS

1. Cephalothorax —

2. Chelicerae —

3. Pedipalps —

4. Malpighian tubules —

5. Tracheae —

6. Coxal glands —

7. Ventral nerve cord —

8. Scabies —

9. Encephalitis —

10. Ticks —

11. Mites —

TESTS FOR SELF-CONTROL

1. The bodies of all arachnids except ticks consist of: a) head and abdomen; **b)** thorax and abdomen; **c)** cephalothorax and abdomen; **d)** head, abdomen and tail; **e)** head, thorax and tail.

2. The number of appendages situated near the mouth of arachnids is: a) two pairs; **b)** three pairs; **c)** four pairs; **d)** five pairs; **e)** six pairs.

3. The number of walking legs in arachnids is: a) two pairs; **b)** three pairs **c)** four pairs; **d)** five pairs; **e)** six pairs.

4. The animals of the class Arachnida are: a) louse, tick; **b)** spider, scorpion, flea; **c)** spider, scorpion, tick; **d)** lobster, cockroach, mite; **e)** scorpion, shrimp, grasshopper.

5. The excretory organs of arachnids are: a) protonephridiae; **b)** coxal glands and Malpighian tubules; **c)** only coxal glands; **d)** only Malpighian tubules; **e)** kidneys.

6. The respiratory organs of arachnids are: a) bronchi; **b)** book lungs; **c)** gills; **d)** book lungs and tracheae; **e)** the body surface.

7. Features of the circulatory system of arthropods are: a) closed, tube-shaped heart is at the dorsal side; **b)** open, tube-shaped heart is at the ventral side; **c)** open, there is no heart; **d)** closed, there is no heart; **e)** open, tube-shaped heart is at the dorsal side.

8. Visual organs of arachnids are: a) simple eyes on the cephalothorax; **b)** compound eyes at the cephalothorax; **c)** simple eyes at the abdomen; **d)** compound and simple eyes; **e)** compound eyes at the abdomen.

9. Features of ticks are: a) body consists of 3 regions; **b)** body is not subdivided into regions, development is direct; **c)** body consists of 2 regions **d)** body is not subdivided into regions, development with metamorphosis; **e)** development is direct.

10. Ticks transmit pathogens of: a) scabies; **b)** encephalitis and influenza; **c)** encephalitis and typhus; **d)** scabies and typhus; **e)** influenza and scabies.

11. Features of the digestive system of arachnids are: a) 3 regions of gut, liver ducts open into the foregut; **b)** 2 regions of gut, liver ducts open into the midgut; **c)** 3 regions of gut, liver ducts open into the midgut; **d)** 3 regions of gut, there is no liver; **e)** 2 regions of gut, there is no liver.

Fill in the gaps:

1. The arachnids that feed on other animals are …

2. The first pair of arachnid appendages where ducts of venomous glands open is called …

3. The second pair of arachnid's appendages which help to hold a prey is called …

4. The digestion of spiders begins …

5. The number of walking legs in arachnids is …

6. The excretory organs of arachnids are Malpighian tubules and … glands.

7. The ducts of liver in arachnids open into … gut.

8. The heart of arachnids is …-shaped.

9. The respiratory organs of arachnids are book lungs and …

10. The simple eyes of arachnids are situated at the body region which is called …

11. The development of spiders is …

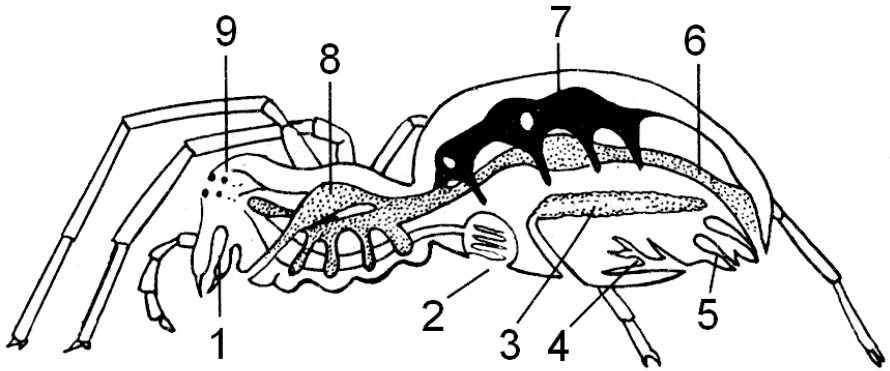
12. Ticks of the family *Ixodidae* transmit the pathogens of … and …

13. Scabies is caused by …

14. The walking legs of a spider are attached to the body region called …

PRACTICAL WORK

Task 1. Write the labels for the diagram of spider's internal anatomy.



1 –

2 –

3 –

4 –

5 –

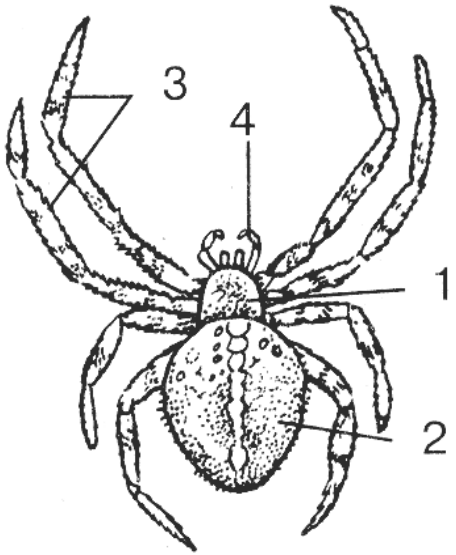
6 –

7 –

8 –

9 –

Task 2. Write the labels for the diagram of spider's external anatomy.



1 –

2 –

3 –

4 –

Teacher's signature

Lesson 44. Topic: CLASS INSECTA «____» _____ 20____ year

Aim of the lesson is to learn the general characteristics of insects.

CONTENTS OF THE TOPIC

1. Taxonomy of insects.
2. Anatomy and physiology of insects.
3. Reproduction and development insects.

BASIC TERMS AND CONCEPTS

1. **Antenna** —
2. **Fat body** —
3. **Compound eye** —
4. **Complete metamorphosis** —
5. **Pupa (chrysalis)** —
6. **Spiracle** —

TESTS FOR SELF-CONTROL

1. The body regions of insects: a) cephalothorax and abdomen; **b)** head, thorax and abdomen; **c)** head and abdomen; **d)** trunk and tail; **e)** head and tail.

2. The wings of insects are situated: a) on the dorsal side of the thorax; **b)** on the dorsal side of the abdomen; **c)** on the thorax and the abdomen; **d)** on the ventral side of the thorax; **e)** on the ventral side of the abdomen.

3. The number of wings in insects is: a) one pair; **b)** two pairs; **c)** one or two pairs; **d)** three pairs; **e)** two or three pairs.

4. The walking legs of insects are situated: a) on the head; **b)** on the dorsal side of the thorax; **c)** on the ventral side of the thorax; **d)** on the dorsal side of the abdomen; **e)** on the ventral side of the abdomen.

5. The number of walking legs in insects is: a) two pairs; **b)** three pairs; **c)** four pairs; **d)** one or two pairs; **e)** two or three pairs.

6. Chewing insects are: a) beetles; **b)** lice; **c)** flies; **d)** fleas; **e)** mosquitoes.

7. The fat body of insects is: a) digestive organ; **b)** organ that collects dissimilation products; **c)** reproductive organ; **d)** part of respiratory system; **e)** organ that store water.

8. The mouthparts of insects consist of: a) upper and lower lips; **b)** upper and lower jaws; **c)** upper and lower lips and upper and lower jaws; **d)** upper jaw and lip; **e)** lower jaw and lip.

9. The digestive system of insects consists of: a) mouth, pharynx, stomach, gut and anal opening; **b)** mouth, esophagus, gut and anal opening; **c)** mouth, stomach and anal opening; **d)** mouth, esophagus, stomach and anal opening; **e)** mouth, esophagus, crop, proventriculus, stomach, intestine and anus.

10. The respiratory system of insects consists of: a) book lungs; **b)** tracheae; **c)** book lungs and tracheae; **d)** gills; **e)** gills and tracheae.

11. Features of the circulatory system of insects are: a) the heart is at the dorsal side of the thorax, blood is colorless; **b)** the heart is at the dorsal side of the abdomen, blood is red; **c)** the heart is at the dorsal side of the abdomen, blood is colorless; **d)** no heart, colorless blood; **e)** the heart is at the abdominal side of the thorax, blood is colorless.

12. The developmental stage which is absent in case of incomplete metamorphosis is: a) egg; **b)** larva; **c)** pupa; **d)** adult; **e)** larva and pupa.

Fill in the gaps:

1. The number of walking legs in insects is … pairs.

2. The type of mouthparts in beetles is …

3. The main excretory organ of insects is …

4. The respiratory organs of insects are …

5. The wings of insects are situated on the dorsal side of …

6. The parasitic insects which don't have wings are fleas and …

7. Digestion and absorption of nutrients takes place in the … of insects.

8. The "blood" of insects is called …

9. The … is the organ responsible for complex behavior of insects.

10. The heart of insects is situated at the … side of the abdomen.

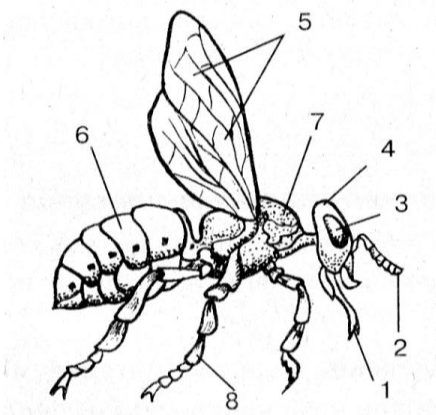
11. The sensory appendages on the head of insects are called …

12. Development of insects occurs with complete or incomplete …

13. The pathogens of plague are transmitted by …

PRACTICAL WORK

Task 1. Write the labels for the diagram of the external anatomy of insect.



1 –

2 –

3 –

4 –

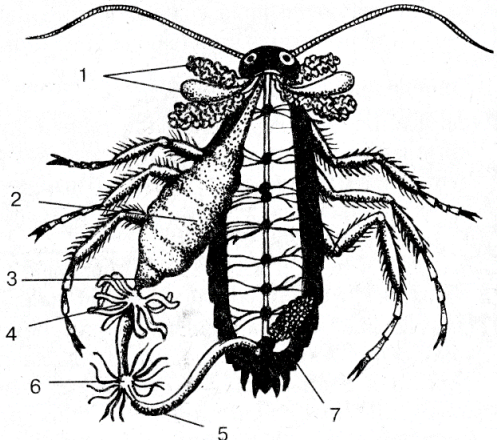
5 –

6 –

7 –

8 –

Task 2. Write the labels for the diagram of the internal anatomy of insect.



1 –

2 –

3 –

4 –

5 –

6 –

7 –

Teacher's signature

Lesson 45. Topic: PHYLUM CHORDATA «___» _____ 20____ year

Aim of the lesson is to learn the general characteristics chordates on the example of lancelet.

CONTENTS OF THE TOPIC

1. General characteristics of chordates.
2. Classification of chordates.
3. Characteristics of lancelets.

BASIC TERMS AND CONCEPTS

1. **Notochord** —
2. **Coelom** —
3. **Nerve tube** —
4. **Neurocoel** —
5. **Nephridium** —
6. **Oral cirri** —

TESTS FOR SELF-CONTROL

1. The animals which refer to chordates are: a) roundworms; **b)** amphibians; **c)** crustaceans; **d)** insects; **e)** arachnids.

2. The features of lancelet's feeding are: a) feeding is passive, the particles of food are propelled to the mouth with water; **b)** lancelets are predators which actively look for the prey; **c)** lancelets feed on aquatic plants; **d)** lancelets are predators wait for the prey; **e)** adult lancelets do not feed.

3. The organ that replaces the notochord in adult higher chordates is: a) spinal cord; **b)** spine; **c)** aorta; **d)** intestine; **e)** vertebral canal.

4. The sensory structures of lancelet are: a) photosensitive cells in the nerve tube; **b)** simple eyes; **c)** ears; **d)** taste receptors on the tongue; **e)** compound eyes.

5. In lancelets, the circulatory system: a) is absent; **b)** is open; **c)** has 2-chambered heart; **d)** has 4-chambered heart; **e)** has no heart and the blood is pumped by the ventral aorta.

6. The integument of lancelets consists of: a) epidermis and dermis; **b)** only epidermis; **c)** only dermis; **d)** dermo-muscular body wall; **e)** cuticle, hypodermis and one layer of muscles.

7. The excretory organs of lancelets are: a) metanephridia; **b)** coxal glands; **c)** nephridia; **d)** kidneys; **e)** Malpighian tubules.

8. The nervous system of lancelets has: a) brain and spinal cord; **b)** nerve tube; **c)** cerebral ganglion and several nerve cords; **d)** ventral and dorsal nerve cords; **e)** circumpharyngeal ganglion and double ventral nerve cord with ganglia.

Fill in the gaps:

1. Chordates have … body cavity which is called …

2. The internal axial organ that is present in embryos of all chordates and adult lower chordates is …

3. The axial organ situated above the lancelet's notochord is …

4. The cavity of the nerve tube is called …

5. The axial organ situated below the lancelet's notochord is …

6. The perforations in the anterior region of the lancelet's digestive tract are called …

7. The excretory organs of the lancelet are …

8. In lancelet, the function of the heart is performed by … aorta.

9. The heart of chordates is situated at the … side of the body.

10. The external layer of skin in lancelet is …

11. Lancelets refer to the subphylum …

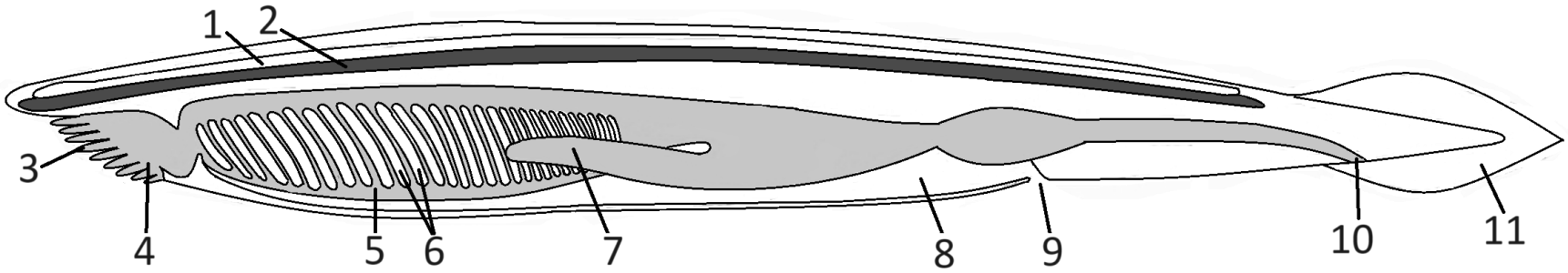
PRACTICAL WORK

Task 1. Fill in the table "Similarities of lancelet to invertebrates and other chordates".

Similarities of lancelet and invertebrates	Similarities of lancelet and other chordates

Task 2. Write the labels for the diagram of lancelet.

1 –	7 –
2 –	8 –
3 –	9 –
4 –	10 –
5 –	11 –
6 –	



Teacher's signature

Lesson 46. Topic: CLASS OSTEICHTHYES (BONY FISHES) «____» _____ 20____ year

Aim of the lesson is to learn the general anatomical and physiological characteristics of bony fishes.

CONTENTS OF THE TOPIC

1. General characteristics of the class.
2. Features of structure and vital processes of fishes linked with waterway of living.

BASIC TERMS AND CONCEPTS

1. Lateral line —

2. Scales —

3. Swim bladder —

TESTS FOR SELF-CONTROL

1. The regions of the digestive system in fishes are: a) mouth, pharynx, stomach; **b)** mouth, pharynx, intestine; **c)** mouth, pharynx, esophagus, stomach, intestine; **d)** mouth, stomach, small and large intestines; **e)** mouth, pharynx, stomach, cloaca.

2. The specific sensory organ that is present in fishes, but not terrestrial vertebrates: a) organ of touch; **b)** olfactory organ; **c)** ear; **d)** lateral line; **e)** eye.

3. The body regions of fishes are: a) cephalothorax and abdomen; **b)** head, thorax and abdomen; **c)** head, trunk and tail; **d)** trunk and tail; **e)** head and trunk.

4. The features of the integumentary system in fish: a) the epidermis has one layer of cells; **b)** there is no dermis, but two layers of epidermis; **c)** fishes are covered with scales; **d)** there are no glands in the skin; **e)** there are epidermis, dermis and subcutaneous fat.

5. The spine regions of fishes are: a) cervical and thoracic regions; **b)** head, trunkal and caudal regions; **c)** trunkal and caudal regions; **d)** trunkal, lumbar and caudal regions; **e)** cervical, trunkal and caudal regions.

6. Features of reproduction and development of fishes are: a) separate sexes, sexual reproduction, internal fertilization; **b)** hermaphroditism, sexual reproduction, development occurs in water; **c)** asexual reproduction, development occurs in water; **d)** separate sexes, external fertilization, development occur in water; **e)** internal fertilization, development occurs in water.

7. The excretory organs of fishes are: a) protonephridia; **b)** metanephric kidneys; **c)** nephridia; **d)** mesonephric kidneys; **e)** cloaca.

8. The circulatory system of fishes has: a) 1-chambered heart, 1 circulation; **b)** 2-chambered heart, 1 circulation; **c)** 3-chambered heart, 2 circulations; **d)** 3-chambered heart, 1 circulation; **e)** 2-chambered heart, 2 circulations.

9. The respiratory organs of fishes are: a) tracheae; **b)** lungs; **c)** bronchi; **d)** gills; **e)** swim bladder.

Fill in the gaps:

1. The locomotory organs of fishes are …

2. The skin of fish has multiple bony …

3. The spine regions of fishes are … and …

4. The skeleton of fishes is subdivided into skeleton of head, trunk and …

5. In fishes, ribs are attached to vertebrae of … spine region.

6. The excretory system of fishes has … kidneys.

7. The heart of fishes is …-chambered.

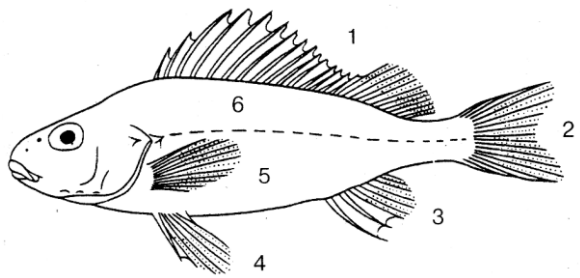
8. There is … blood in the heart of fish.

9. The organ that helps fish to identify the direction of water current is …

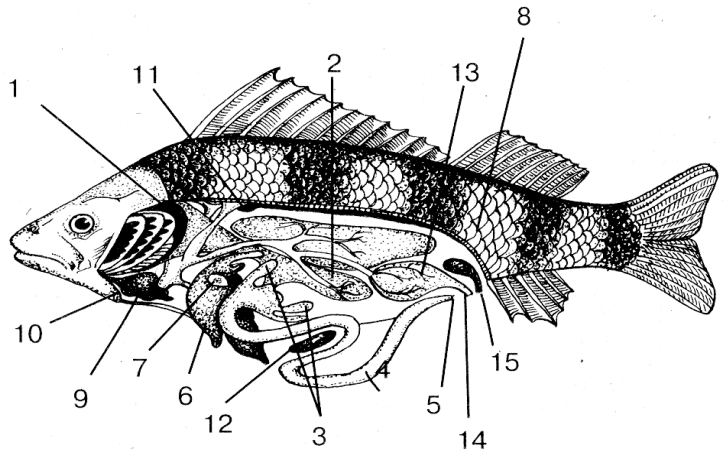
PRACTICAL WORK

Task 1. Write the labels for the diagram of the fish.

1 –
2 –
3 –
4 –
5 –
6 –



Task 2. Write the labels for the diagram of the fish.



1 –
2 –
3 –
4 –
5 –
6 –
7 –
8 –
9 –
10 –
11 –
12 –
13 –
14 –
15 –

Teacher's signature

Lesson 47. Topic: CLASS AMPHIBIA «___» _____ 20____ year

Aim of the lesson is to learn general anatomical and physiological characteristics of amphibians.

CONTENTS OF THE TOPIC

1. General characteristics of the class: features of structure and vital processes, reproduction and development of amphibians.
2. Significance of amphibians.

BASIC TERMS AND CONCEPTS

1. **Cold-blooded (poikilotherm) animals** —
2. **Cloaca** —
3. **Girdle of forelimb** —
4. **Girdle of hind limb** —
5. **Lungs** —
6. **Mesonephric kidneys** —
7. **Three-chambered heart** —
8. **Pulmocutaneous circulation** —
9. **Oropharyngeal cavity** —
10. **External fertilization** —
11. **Nictitating membrane** —
12. **Tadpole** —

TESTS FOR SELF-CONTROL

1. Animals which do not refer to amphibians are: a) crocodiles; **b)** toads; **c)** newts; **d)** frogs; **e)** caecilians.

2. Features of the integument of amphibian are: a) it is dry; **b)** it is wet; **c)** there are no glands in it; **d)** it covered with scales; **e)** it doesn't participate in gas exchange.

3. Features of the respiratory system of amphibians are: a) larvae and adult individuals have lungs with thin wall; **b)** larvae have gills, adult individuals have lungs and skin participating in breathing; **c)** larvae and adult individuals breathe with gills; **d)** skin doesn't participate in breathing; **e)** larvae have lungs, adult individuals have gills.

4. The spine of amphibians has: a) cervical, thoracic, caudal regions; **b)** cervical, lumbar, sacral, caudal regions; **c)** lumbar, sacral, caudal regions; **d)** cervical, trunkal, sacral, caudal regions; **e)** cervical, trunkal, lumbar, caudal regions.

5. The pectoral girdle of amphibians consists of: a) scapula and clavicle; **b)** bones of the forearm and the upper arm; **c)** sternum, coracoids, scapula and clavicle; **d)** scapula, clavicle and humerus; **e)** coracoids, scapula and clavicle.

6. The digestive glands of amphibians are: a) absent; **b)** only liver and pancreas; **c)** only salivary glands and liver; **d)** salivary glands, liver and pancreas; **e)** only salivary glands and pancreas.

7. Features of the excretory system of amphibians are: a) mesonephric kidneys, ureters open into the urinary bladder; **b)** pelvic kidneys, ureters open into the cloaca; **c)** mesonephric kidneys, ureters open into the cloaca; **d)** head kidneys, ureters open into the urinary bladder; **e)** head kidneys, ureters open into the cloaca.

Features of the circulatory system of adult amphibians are: a) 2-chambrered heart; **b)** 3-chambrered heart, 2 circulations, all organs are fed with arterial blood; **c)** 3-chambrered heart, 2 circulations, the brain is fed with arterial blood; **d)** 1 circulation, venous blood in the heart; **e)** 2 circulations, all organs are fed with mixed blood.

Fill in the gaps:

1. Amphibians evolved from …

2. Compared with fishes, amphibians have two new regions of spine: cervical and …

3. The tongue of the amphibian is situated in the … cavity.

4. The ureters of amphibians open into …

5. The girdle of hind limb of amphibians consists of … bones.

6. The terminal part of the intestine connected with urinary and reproductive systems of amphibians is called …

7. The anteriormost region of amphibian's digestive system is called …

8. The excretory organs of amphibians are two … kidneys

9. The heart of amphibians consists of … atrium(a) and … ventricle(s).

10. The larva of amphibians is called …

11. The systemic circulation of amphibians begins from …

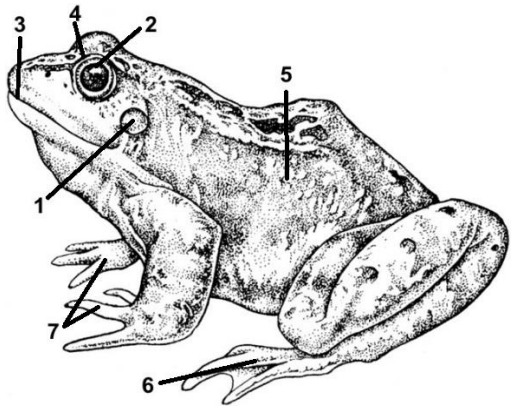
12. The pulmocutaneous circulation of amphibians begins from …

13. All the organs of amphibians except brain are fed with … blood.

14. The heart of larval amphibians is …-chambered

PRACTICAL WORK

Task 1. Write the labels for the diagram of the external anatomy of frog.



1 –

2 –

3 –

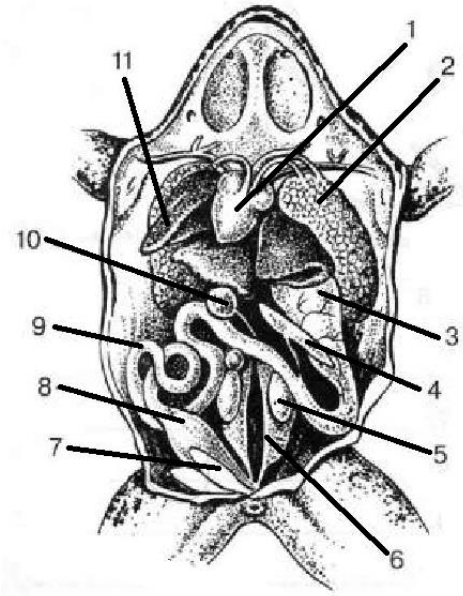
4 –

5 –

6 –

7 –

Task 2. Write the labels for the diagram of the internal anatomy of frog.



1 –

2 –

3 –

4 –

5 –

6 –

7 –

8 –

9 –

10 –

11–

Teacher's signature

Lesson 48. Topic: CLASS REPTILIA «___» _____ 20____ year

Aim of the lesson is to learn typical characteristics of reptiles.

CONTENTS OF THE TOPIC

1. Taxonomy of reptiles.
2. General characteristics of the class.
3. Features of structure and vital processes; reproduction and development of reptiles.

BASIC TERMS AND CONCEPTS

1. **Pelvic kidney (metanephros)** —
2. **Molting of reptiles** —
3. **Predator** —
4. **Regeneration** —
5. **Amnion** —

TESTS FOR SELF-CONTROL

1. The skin of reptiles is: a) dry, does not contain glands, covered with corneous scales; **b)** wet, contains glands; **c)** dry, contains glands; **d)** wet, does not contain glands; **e)** wet or dry, does not contain glands.

2. Organisms which don't belong to the class Reptilia are: a) lizards; **b)** snakes; **c)** crocodiles; **d)** turtles; **e)** newts.

3. The regions of the reptilian spine are: a) cervical, thoracic, caudal; **b)** cervical, thoracic, sacral, caudal; **c)** cervical, thoracic, lumbar, sacral, caudal; **d)** cervical, thoracic, lumbar; **e)** thoracic and caudal.

4. Features of the skeleton of all reptiles except snakes: a) 3 regions of the spine, have chest, 2 pairs of limbs with girdles; **b)** 5 regions of spine, no chest; **c)** 5 regions of the spine, 2 pairs of limbs with girdles, have chest; **d)** 2 regions of the spine, no chest, no girdles of limbs; **e)** 4 regions of the spine, have chest, no limbs.

5. Reproduction of reptiles occurs: a) at land; fertilization is internal; **b)** at land; fertilization is external; **c)** at water; fertilization is internal; **d)** at water; fertilization is external **e)** asexually.

6. The digestive system of reptiles consists of: a) oropharyngeal cavity with teeth and gut; **b)** oral cavity, pharynx, small and large intestines with primordial caecum; **c)** oral cavity, pharynx, esophagus, stomach, small and large intestines with primordial caecum and cloaca; **d)** oropharyngeal cavity, stomach, rectum and anus; **e)** oropharyngeal cavity, gut and cloaca.

7. The excretory organs of reptiles are: a) ureters that are open into the urinary bladder; **b)** mesonephric kidneys and ureters open into the cloaca; **c)** ureters, urinary bladder and urethra; **d)** mesonephric kidneys, ureters opened into urinary bladder; **e)** pelvic kidneys, ureters and urinary bladder; urine is excreted through the cloaca.

8. Features of the circulatory system of reptiles (except crocodiles): a) two-chambered heart; **b)** three-chambered heart, incomplete septum in the ventricle, the brain is fed with arterial blood; **c)** three-chambered heart, 1 circulation; **d)** two-chambered heart, 1 circulation; **e)** two-chambered heart, 2 circulations.

9. The respiratory tract of reptiles has: a) trachea and bronchial tree; **b)** trachea, bronchi and bronchioles; **c)** alveolar passages; **d)** trachea and two bronchi; **e)** bronchial tree.

10. Features of the reptilian brain: a) 5 regions; there is cortex; cerebellum is well-developed; **b)** 4 regions, no cortex; **c)** cerebellum is developed weakly; **d)** 3 regions, well-developed cerebellum; **e)** medulla oblongata is absent.

11. Auditory organ of reptiles consists of: a) outer and inner ears; **b)** only inner ear; **c)** outer and middle ears; **d)** middle and inner ears; **e)** outer, middle and inner ears.

12. Features of reproduction and development of reptiles are: a) hermaphroditism, sexual reproduction; **b)** dioecious, asexual reproduction; **c)** internal fertilization, direct development; **d)** internal fertilization, indirect development; **e)** external fertilization.

Fill in the gaps:

1. The body regions of reptiles are head, …, trunk, tail and two pairs of limbs.

2. The spine of reptiles consists of … regions:

…

3. The chest of reptiles consists of thoracic vertebrae, ribs and …

4. The skeleton of the reptile forelimb consists of bones of upper arm, forearm and …

5. The pectoral girdle of reptiles consists of coracoids, clavicles, scapulae and …

6. The pelvic girdle of the reptile consists of … bones.

7. The excretory system of reptiles has … kidneys.

8. Ureter and urinary bladder of reptiles open into …

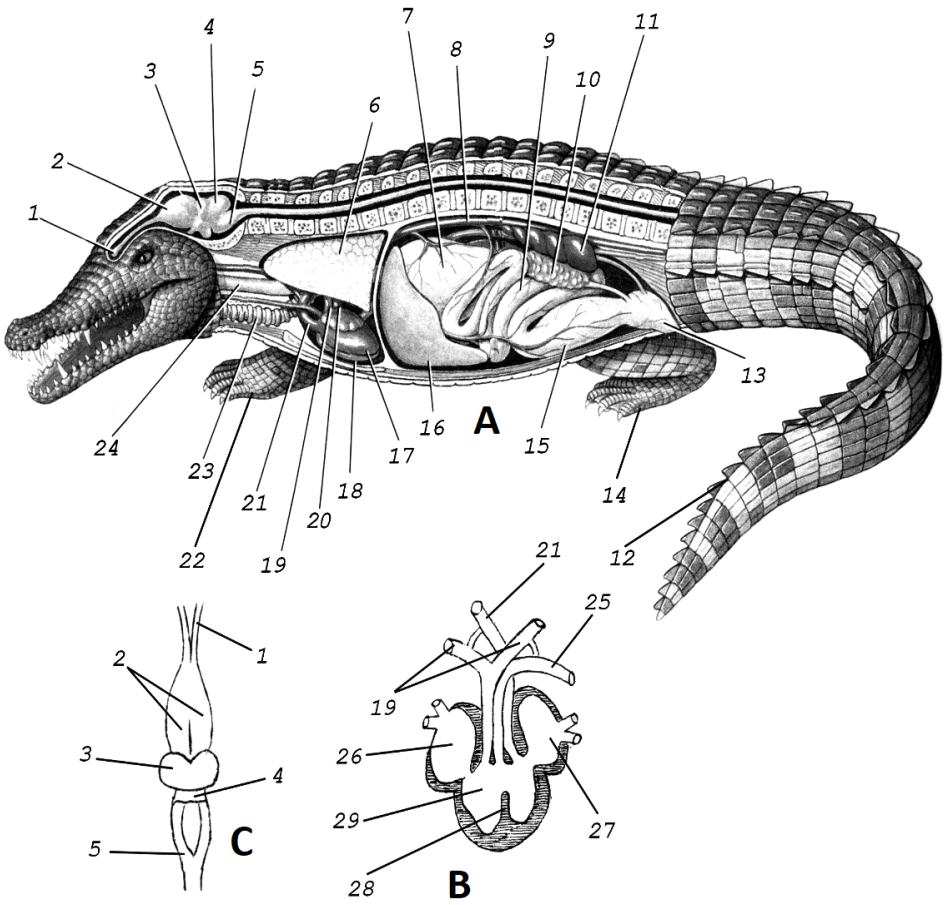
9. The respiratory tract of reptiles consists of nasal cavity, larynx, trachea and …

10. The auditory organ of reptiles has middle and … ears.

PRACTICAL WORK

Task 1. Write the labels for the diagram of crocodile (A), the brain of reptile (B), and the 3-chambered heart of reptile (C).

1 –
2 –
3 –
4 –
5 –
6 –
7 –
8 –
9 –
10 –
11 –
12 –
13 –
14 –
15 –
16 –
17 –
18 –
19 –
20 –
21 –
22 –
23 –
24 –
25 –
26 –
27 –
28 –
29 –



Teacher's signature

Lesson 49. Topic: CLASS MAMMALIA «____» _____ 20____ year

Aim of the lesson is to learn characteristics of mammals.

CONTROL QUESTIONS

1. Taxonomy of the class *Mammalia*.
2. Characteristics of the class: features of structure and vital processes of mammals.
3. Reproduction and development of the class.
4. Significance of mammals.

BASIC TERMS AND CONCEPTS

1. Placenta —

2. Warm-blooded (homoiotherm) animals —

TESTS FOR SELF-CONTROL

1. Features of the digestive system of mammals: a) undifferentiated teeth, intestine ends with anus; **b)** differentiated teeth, intestine ends with cloaca; **c)** differentiated teeth, intestine ends with anus, cecum is well-developed; **d)** there is no stomach, homodont teeth; **e)** cecum is well-developed, intestine ends with cloaca.

2. Only the skin of mammals has: a) glands; **b)** hair coat; **c)** epidermis; **d)** dermis; **e)** no corneous scales.

3. Features of the excretory system of mammals: a) single ureter opens into the urinary bladder; **b)** ureters open into the cloaca; **c)** pelvic kidneys, excretion of urine through the urethra; **d)** mesonephric kidneys; **e)** pelvic kidneys, ureters open into the cloaca.

4. The circulatory system of mammals has: a) 1-chambered heart; **b)** 2-chambered heart; **c)** 3-chambered heart; **d)** 4-chambered heart; **e)** 5-chambered heart.

5. The circulatory system of mammals has: a) 1 circulation; **b)** 2 circulations; **c)** 3 circulations; **d)** 1 or 2 circulations; **e)** 2 or 3 circulations.

6. All the organs of mammals are fed with: a) venous blood; **b)** arterial blood; **c)** mixed blood; **d)** brain with arterial blood while other organs with mixed blood; **e)** brain with arterial blood while other organs with venous blood.

7. Muscles of mammals which take part in breathing are: a) intercostal and dorsal; **b)** dorsal, thoracic and diaphragm; **c)** diaphragm and intercostal muscles; **d)** intercostal muscles and muscles of the upper limbs; **e)** intercostal muscles and muscles of the lower limbs.

8. Body wall of mammals has: a) epidermis, dermis and no subcutaneous fat; **b)** dermo-muscular body wall; **c)** scales; **d)** chitinous cuticle; **e)** epidermis, dermis and subcutaneous fat.

9. Feature not typical for mammal's development: a) intrauterine development; **b)** offspring are fed with milk; **c)** fertilization is internal; **d)** development is direct; **e)** indirect development.

10. The class *Prototheria* includes: a) bats; **b)** kangaroos; **c)** platypuses; **d)** elephants; **e)** wolfs.

11. The infraclass *Placentalia* doesn't include: a) mice; **b)** hares; **c)** tigers; **d)** kangaroos; **e)** bats.

12. Gas exchange of mammals occurs in: a) alveoli; **b)** bronchioles and bronchi; **c)** alveoli and wet skin; **d)** respiratory tract and alveoli; **e)** all answers are wrong.

13. The number of spine regions of mammals: a) two; **b)** two or three; **c)** three or four; **d)** four; **e)** five.

Fill in the gaps:

1. The teeth of mammals are incisors, …, premolars and molars.

2. The ureters of mammals open into …

3. The heart of mammals consists of … chambers.

4. In mammals, the arterial blood is pumped from the chamber … to the vessel …

5. Bubble-shaped structures of mammalian lungs where gas exchange occurs are called …

6. The muscular septum between thoracic and abdominal cavities of mammals is called …

7. The big muscle of mammals participating in breathing is …

8. The skull of mammals consists of visceral cranium and …

9. The main and most massive part of mammalian brain is …

10. The embryonic development of placentals occurs in …

11. The development of mammals is …

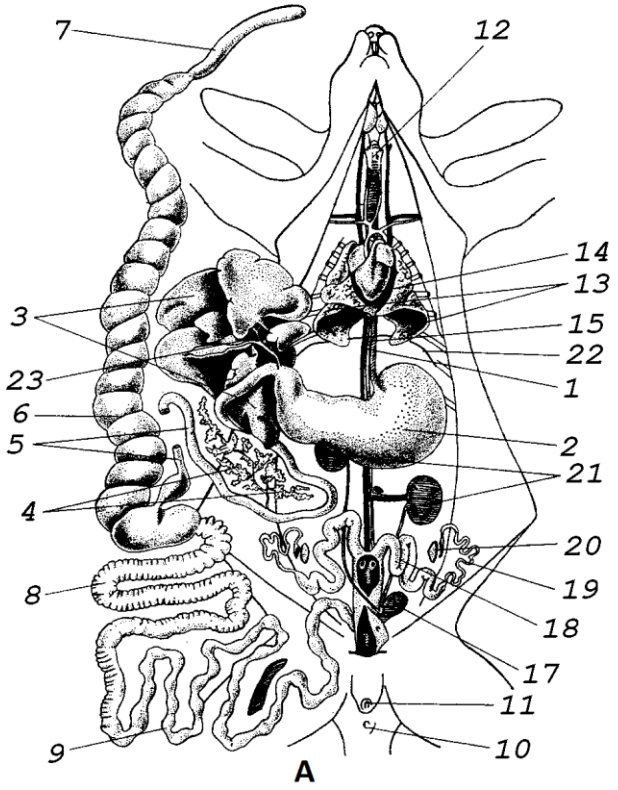
PRACTICAL WORK

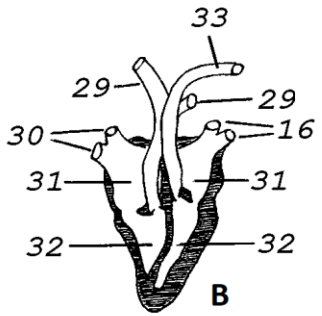
Task 1. Fill in the table "Comparison of reptilian and mammalian skeletons".

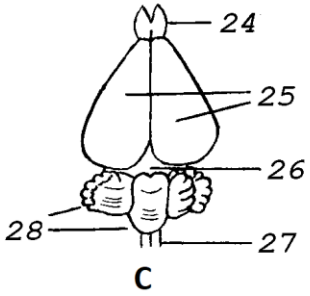
	Mammals	Reptiles	Amphibians	Fishes
Spine				
Ribs and chest				
Pelvic girdle				
Pectoral girdle				

Task 2. Write the labels for the diagram of the internal anatomy of mammal:
A — dissected rabbit; B — the heart of mammal; C — the brain of mammal.

1 –	18 –
2 –	19 –
3 –	20 –
4 –	21 –
5 –	22 –
6 –	23 –
7 –	24 –
8 –	25 –
9 –	26 –
10 –	27 –
11 –	28 –
12 –	29 –
13 –	30 –
14 –	31 –
15 –	32 –
16 –	33 –
17 –	







Teacher's signature

Lesson 50. Topic: TEST IN THE TOPICS 36–49: MICROBIOLOGY AND ZOOLOGY «____» _____ 20____ year

Aim of the lesson is to reveal knowledge level of considered topics.

CONTROL QUESTIONS

1. Life conditions and spread of bacteria.
2. Structure features of bacterial cell.
3. Vital processes of bacteria.
4. Role of bacteria in the nature.
5. Pathogenic bacteria and methods to combat them.
6. Free-living protists: amoeba, euglena, paramecium caudatum. Features of their structure and vital processes.
7. Characteristics of parasitic protists.
8. General characteristics of the phylum flatworms. Systematics of the phylum.
9. Features of structure and vital processes of tapeworms. Medical significance.
10. Morphology and anatomy features of the liver fluke.
11. Features of life cycle of the liver fluke.
12. Prophylaxis of fascioliasis.
13. Characteristics of tapeworms.
14. Features of structure and life cycle of the biff tapeworm.
15. General characteristics of roundworms.
16. Features of structure and vital processes of ascaris.
17. Life cycle of ascaris. Prophylaxis of ascariasis.
18. General characteristics of arthropods. Systematics of the phylum Arthropoda.
19. General characteristics of the class. Features of structure and vital processes that are linked with terrestrial way of living.
20. Features of the structure and vital processes of ticks.
21. Ticks as transmitters and causative agents of diseases. Measures of protection from ticks.
22. Role of arachnids in the nature and their medical significance.
23. General characteristics of the class Insecta. Features of structure and vital activity.
24. Insect reproduction and types of reproduction.
25. Significance of insects.
26. General characteristics of chordates.
27. Classification of the phylum Chordate.
28. Characteristics of the Lancelets.
29. General characteristics of bony fishes.
30. Features of structure and vital processes of fishes linked with water way of living.
31. General characteristics of amphibians: features of the structure and vital processes; the reproduction and the development of amphibians.
32. Significance of amphibians.
33. General characteristics of the class Reptilia.
34. Features of structure and vital processes, the reproduction and the development of reptiles.
35. Significance of reptiles.
36. Systematics of mammals.
37. Characteristics of Mammals: features of the structure and vital processes of mammals.
38. Reproduction and development of mammals.
39. Significance of mammals.

REFERENCES

1. *Biology*. Pre-University course / V. E. Butvilovsky [et al.]. – Minsk : Vitposter, 2015. – 192 p.
2. *Биология* : доуниверситетский курс. Иллюстрации = Biology: Pre-University course. Illustrations / В. Э. Бутвиловский [и др.]. – Минск : БГМУ, 2016. – 110 с.
3. *Биология* : контрольные работы для слушателей подготовительного отделения иностранных учащихся = Biology : tests of English studying international students of preparatory department / В. Э. Бутвиловский [и др.]. – 3-е изд., испр. – Минск : БГМУ, 2018. – 92 с.
4. *Биология* = Biology : практикум для слушателей подготовительного отделения иностранных учащихся, обучающихся на английском языке / В. Э. Бутвиловский [и др.]. – 3-е изд., испр. – Минск : БГМУ, 2018. – 132 с.
5. *Биология* для слушателей подготовительного отделения иностранных учащихся = Biology for English studying international students of preparatory department : учеб.-метод. пособие / В. Э. Бутвиловский [и др.]. – 4-е изд., испр. – Минск : БГМУ, 2018. – 112 с.