Federal state budgetary educational institute of the higher education

«Orenburg state medical university» of Ministry of Health of the Russian Federation»

**ASSESSMENT FUND**

**FOR CURRENT PROGRESS MONITORING AND MIDTERM CERTIFICATION OF STUDENTS STUDYING ON DISCIPLINE**

**BIOLOGY**

majoring in (specialty)

31.05.01 Medicine

(faculty of foreign students)

It is part of the main professional educational program of higher education majoring in (specialty) 31.05.01 Medicine (faculty of foreign students), approved by the Academic Council of the FSBEI HE ORGMU of the Ministry of Health of Russia

protocol № 8 from 25.03.2016.

Orenburg

**1. PASSPORT OF THE ASSESSMENT FUND**

The fund of assessment tools for the discipline contains standard control and assessment materials for monitoring the progress of students, including monitoring the independent work of students, as well as for monitoring the learning outcomes formed in the process of studying the discipline at intermediate certification in the form of an exam.

Control and evaluation materials of the current control of progress are distributed by discipline topics and are accompanied by an indication of the control forms used and assessment criteria. Control and assessment materials for intermediate certification correspond to the form of intermediate certification in the discipline defined in the OBEP curriculum and are aimed at checking the formation of knowledge, skills and abilities for each competence established in the discipline's work program.

As a result of studying the discipline, the student develops the following competencies:

OK-5 readiness for self-development, self-realization, self-education, use of creative potential

OPK-1 readiness to solve standard tasks of professional activity using information, bibliographic resources, biomedical terminology, information and communication technologies and taking into account the basic requirements of information security

OPK-7 readiness to use basic physical, chemical, mathematical and other natural science concepts and methods in solving professional problems.

**Characteristics of monitoring forms**

|  |  |
| --- | --- |
| **Monitoring form** | **Characteristics** |
| **Control of assignments in the workbook** | Control tasks in the workbook are aimed at identifying and comparing at a particular stage of learning the results of students' educational activities with the requirements set by the content of the discipline being studied. It can be used in IS OrSMU if the workbook with methodological instructions is placed in the work program of the discipline and students have the opportunity to complete tasks by filling out the notebook and sending it to the teacher for checking. It allows you to check and evaluate the knowledge of students, to determine the degree of their readiness for further education, as well as the skills level, if the tasks are of a practice-oriented nature. |
| **Presentation** | A presentation (computer presentation) is a demonstration in a visual form of the main provisions of the oral presentation, the degree of mastering the content of the problem. It allows you to assess the level of students` knowledge on a given question (topic, section), as well as to check their skills of analysis, synthesis, generalization and concretization, information and communication skills used by students in the process of preparing a presentation. |
| **Testing** | Testing is a written way of testing students' knowledge. It can be current and final (by Module or discipline as a whole). Test items can include questions with one or more correct answers, assignments for matching and sequencing, as well as problem-situation tasks that require the selection of the correct (or several correct) answer options, as well as graphic images that require interpretation or definition. In most cases, testing is aimed at assessing students' knowledge. It allows to assess the students' skills when the test tasks are presented by problem-situational tasks, tasks with graphic (visual) images that require the use of a solution algorithm (action with an object). |
| **Recitation** | Recitation is a method of testing the knowledge and skills of students, which consists in the fact that students are invited to reproduce a certain content: empirical facts, theoretical positions, formulations of concepts, examples, classifications, scientific laws. It allows you to assess the level of knowledge of students on a particular issue, topic, section, discipline. Assessment of the students' skills is possible if, in the course of answering the question posed, the student needs to demonstrate the acquired knowledge in order to solve a problem question or problem-situational task. |
| **Practical task completion monitoring** | A practical task is a task that contains exercises and tasks that the student must solve (complete) visually (effectively), i.e. practically manipulating real objects or their substitutes. It is widely used in mathematics, computer science, physics, chemistry, economics, and other natural science disciplines. In medicine, it can be represented by the student performing direct practical manipulations with the "patient" both in the course of practical training and directly at the bases of practical training. It allows you to assess the ability of students to apply theoretical knowledge to solve (perform) a practical task in both standard and non-standard situations. |
| **Solving problem-situational tasks** | Problem-situational tasks are a kind of practical task that involves solving an issue in a certain situation. Both the question and the situation itself can be problematic. In most cases, problem-situational tasks have a professional focus. They allow assessing the ability of students to apply the obtained theoretical knowledge in various situations. |
| **Practical skills testing** | Testing of practical skills can be used to control the students' practical actions (medical manipulations) with the "patient". It allows you to assess the skills and abilities of students to apply the theoretical knowledge (about certain actions and manipulations) in standard and non-standard situations. |

**2. ESTIMATED MATERIALS OF THE CURRENT CONTROL OF STUDENTS 'ACHIEVEMENT.**

**Evaluation materials for each topic of the discipline**

**Module 2. Biology of the cell**

**Topic 1. The forms of living organisms. Cell theory. The basic structural components of the cell.**

**Monitoring form (s):**

1. testing

2. oral questioning

3. control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*It is necessary to choose only* ***one*** *version*

*Выберите один правильный ответ.*

1. THE TERM A CELL WAS INJECTED BY:

1. M. Shleydon
2. R. Hooke
3. T. Shvann
4. R. Virkhov

2. THE GENETIC MATERIAL IN EUKARYOTES IS STORED IN

1. nucleus
2. cytoplasm
3. nucleoid
4. lysosome

3. EUKARYOTES ARE

1. animals
2. viruses
3. archaea
4. bacteria

4. FOOD STORAGE IN ANIMAL CELL

1. starch
2. celluloses
3. chitin
4. glycogen

5. FOR THE OPTICAL PART OF THE MICROSCOPE BELONGS

1. draw tube
2. condenser
3. objectives
4. diaphragm

6. A LIGHT MICROSCOPE THAT HAS AN OBJECTIVE LENS OF 40´ AND AN OCULAR LENS OF 10´ HAS A MAGNIFICATION OF

1. 30´.
2. 50´.
3. 400´.
4. 1000´.

7. CELLULAR WALL OF BACTERIA CONSISTS OF

1. murein
2. celluloses
3. chitin
4. glycogen

8. NONCELLULAR FORMS OF LIFE

1. virus
2. bacteria
3. plants
4. animals

9. PROKARYOTES ARE

1. animals
2. viruses
3. bacteria
4. mushrooms

10. ESCHERICHIA COLI BELONGS TO

1. archaea
2. virus
3. bacteria
4. eukaryotes

11. WHICH ORGANELLE WOULD NOT BE FOUND IN ANIMALS CELLS?

1. smooth ER
2. chloroplast
3. mitochondria
4. ribosome

12. THE CELLS OF ORGANISMS WHICH DO NOT HAVE A CELL WALL

1. bacteria
2. plants
3. animals
4. mushroom

13. CELL THEORY WAS FORMULATED

1. M. Shleydon and T.Shvann
2. R. Hooke
3. A. Leeuwenhoek
4. C. Darwin

14. EUKARYOTES ARE

1. viruses
2. archaea
3. bacteria
4. plants

15. FOOD STORAGE IN PLANT CELL

1. murein
2. celluloses
3. starch
4. glycogen

16. TO THE LIGHTING PART OF THE MICROSCOPE BELONGS

* 1. draw tube
  2. condenser
  3. objectives
  4. eyepiece

17. THE GENETIC MATERIAL IN PROKARYOTES IS STORED IN

1. nucleus
2. cytoplasm
3. nucleoid
4. lysosome

18. A CELLS ARE OBSERVED THROUGH A MICROSCOPE. THE CELLS ARE FOUND TO HAVE A CELL WALL, A CELL MEMBRANE, AND NUMEROUS RIBOSOMES. THE CELLS DOES NOT HAVE A NUCLEUS. THIS CELLS IS MOST LIKELY FROM A

1. bacteria
2. fungi
3. plants
4. protist

19. CELLULAR WALL OF PLANTS CONSISTS OF

1. murein
2. celluloses
3. chitin
4. glycogen

20. NONCELLULAR FORMS OF LIFE

1. phages
2. bacteria
3. plants
4. animals

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | **b** | **11** | **b** |
| **2** | **a** | **12** | **c** |
| **3** | **a** | **13** | **a** |
| **4** | **d** | **14** | **d** |
| **5** | **c** | **15** | **c** |
| **6** | **c** | **16** | **b** |
| **7** | **a** | **17** | **c** |
| **8** | **a** | **18** | **a** |
| **9** | **c** | **19** | **b** |
| **10** | **c** | **20** | **a** |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Microscope device
2. The rules for the use of the microscope
3. Procedure of the preparation of temporary slide.
4. Forms of life: cellular and non-cellular
5. Differences between prokaryotes and eukaryotes
6. Structure of Eukaryotic Cell
7. Differences between Animal and Plant cells

**3. Form of progress monitoring: Practical task completion monitoring**

WORK No. 1. Microscope device

Работа №1. Устройство микроскопа

WORK No. 2. Work with microscope. Finding images.

Работа № 2. Работа с микроскопом. Нахождение изображения.

WORK No. 3. Procedure of the preparation of temporary slide. Plant cell: The unpainted film of onion.

Работа №4. Методика приготовления временного микропрепарата. Растительная клетка: Неокрашенная пленка лука.

Work No 4. Animal cell. Frog‘s erythrocytes (demonstration slide).

Работа № 4 . Животная клетка. Эритроциты лягушки (демонстрационный препарат).

Work No 5. Animal cell. Paramaecium caudatum. (Living object).

Работа № 5. Животная клетка. Инфузория-туфелька (Живой объект)

Work No. 6. Prokaryotic cell.Escherichia coli (demonstration slide).

Работа № 6. Прокариоты. Кишечная палочка (демонстрационный препарат).

**Topic 2. The structure of the cytoplasm. Modern ideas about the structure and functions of membranes.**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один или несколько вариантов ответов*

*Select one correct Answer*

1. According to the fluid mosaic model of the cell membrane

1. [proteins are scattered throughout a double layer of phospholipid.](http://www.angelfire.com/sc/mrcomeau/right.html)
2. [proteins are sandwiched between two layers of cellulose.](http://www.angelfire.com/sc/mrcomeau/wrong.html)
3. [phospholipids are sandwiched between two layers of protein](http://www.angelfire.com/sc/mrcomeau/wrong.html)
4. [phospholipids are scattered throughout a double layer of protein.](http://www.angelfire.com/sc/mrcomeau/wrong.html)

2. Endocytosis is an example of

1. [passive transport, substances are moved into the cell](http://www.angelfire.com/sc/mrcomeau/wrong.html)
2. [active transport, substances are moved out of the cell](http://www.angelfire.com/sc/mrcomeau/wrong.html)
3. [passive transport, substances are moved out of the cell](http://www.angelfire.com/sc/mrcomeau/wrong.html)
4. [active transport, substances are moved into the cell](http://www.angelfire.com/sc/mrcomeau/right.html)

3. The difference between active transport and facilitative transport is that

1. [active transport requires ATP](http://www.angelfire.com/sc/mrcomeau/right.html)
2. [facilitated transport requires ATP](http://www.angelfire.com/sc/mrcomeau/wrong.html)
3. [active transport uses carrier molecules](http://www.angelfire.com/sc/mrcomeau/wrong.html)
4. [facilitated transport uses carrier molecules](http://www.angelfire.com/sc/mrcomeau/wrong.html)

4. Which of the following statements is **NOT correct** about the phospholipid molecules in the plasma membrane?

A. Each phospholipid molecule has four nonpolar tails.

B. Each phospholipid molecule has one polar head.

C. The phospholipid heads are attracted to water.

D. The phospholipid tails are not attracted to water.

E. The phospholipid heads face outward.

5. Sodium and potassium ions are transported across the plasma membrane by a \_\_\_\_\_\_ protein.

A. cell-recognition

B. channel

C. carrier

D. receptor

E. enzymatic

6. Which statement best describes the plasma membrane?

A. It is freely permeable to all substances.

B. It is selectively permeable to certain substances.

C. It is nonpermeable to all substances.

7. \_\_\_\_\_\_ is the net movement of any type of molecule from a region of higher concentration to a region of lower concentration.

A. Osmosis

B. Diffusion

C. Facilitated diffusion

D. Active transport

E. Pinocytosis

8. Which type of solution will cause cells to swell, or even to burst?

A. isotonic solution

B. hypotonic solution

C. hypertonic solution

D. hygrotonic solution

9. Which type of solution will have a higher percentage of solute than the cell?

A. isotonic solution

B. hypotonic solution

C. hypertonic solution

10. Which of the following solutions is isotonic to red blood cells?

A. 0.5% NaCl

B. 0.9% NaCl

C. 1.5% NaCl

D. 2.5% NaCl

E. 5.5% NaCl

11. Which of the following describes the fluid-mosaic model of the plasma membrane structure?

A. phospholipid monolayer with embedded proteins  
B. phospholipid bilayer with embedded proteins  
C. phospholipid trilayer with embedded proteins  
D. triglyceride bilayer with embedded proteins  
E. triglyceride monolayer with embedded proteins

12. Which of the following is NOT an active means where molecules pass across the plasma membrane?

A. simple diffusion

B. active transport

C. endocytosis

D. exocytosis

13. Which of the following statements is NOT correct about the phospholipid molecules in the plasma membrane?

A. The polar heads face outward.

B. The nonpolar tails face inward.

C. The polar heads are hydrophobic.

D. The nonpolar tails are hydrophobic.

E. The phospholipids form a bilayer.

14. Which type of solution has a lower percentage of solute than the cell?

A. isotonic solution

B. hypotonic solution

C. hypertonic solution

15. Which structure prevents the plant cell from bursting when placed in a hypotonic solution?

A. central vacuole

B. lysosome

C. Golgi apparatus

D. cell wall

E. plasma membrane

16. Which term best describes the condition of plant cells when placed in a hypertonic solution?

A. hemolysis

B. plasmolysis

C. crenation

D. turgor pressure

E. osmotic pressure

17. Which process will transport sodium ions to the outside of the cell and potassium ions to the inside of the cell?

A. simple diffusion

B. facilitated diffusion

C. osmosis

D. active transport

E. pinocytosis

18. Which of the following transport processes will form a vesicle?

A. diffusion

B. facilitated diffusion

C. osmosis

D. active transport

E. phagocytosis

19. Pinocytotic vesicles or phagocytotic vesicles often fuse with a \_\_\_\_\_\_ inside the cell for digestion.

A. mitochondrion

B. lysosome

C. Golgi apparatus

D. rough endoplasmic reticulum

E. smooth endoplasmic reticulum

20. The process by which a vesicle is formed at the plasma membrane to bring substances into the cell is called \_\_\_\_\_\_.

A. endocytosis

B. exocytosis

C. plasmolysis

D. hemolysis

E. crenation

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | Правильный ответ | **№ вопроса** | Правильный ответ |
| **1** | A | **11** | B |
| **2** | D | **12** | A |
| **3** | A | **13** | C |
| **4** | A | **14** | B |
| **5** | C | **15** | D |
| **6** | B | **16** | B |
| **7** | B | **17** | D |
| **8** | B | **18** | E |
| **9** | C | **19** | B |
| **10** | B | **20** | A |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Composition of Cytoplasm: cytosol, organelles and cytoplasmic inclusions
2. Cytosol: Composition and Function.
3. Cytoplasmic inclusions: definition and differences from organelles, types of cytoplasmic inclusions
4. Classification of Organelles. Structure and Function of:

* ***Mitochondria***
* ***Plastids***
* ***Endoplasmic reticulum***
* ***Golgi bodies***
* ***Lysosomes***
* ***Peroxisomes***
* ***Vacuoles***
* ***Ribosomes***
* ***Centrosome and centrioles***
* ***Cytoskeleton: Microtubules and Microfilaments***
* ***Flagella and Cilia***

1. Structure, property and Function Plasma membrane.
2. Membrane Transport:

* passive transport: simple and facilitated diffusion, osmosis
* active transport: phagocytosis and pinocytosis, the sodium-potassium pump or Na +/K+-ATPase

1. Types of solutions: isotonic, hypertonic and hypotonic
2. Behavior of cells in different solutions.
3. Value of solutions in medicine.

**3. Form of progress monitoring: Practical task completion monitoring**

WORK No 1. Chloroplasts in cells of elodea leaf.

Работа № 1. Хлоропласты в клетках листа элодеи.

WORK No. 2. Calcium oxalate crystals - excretory inclusion.

Работа № 2. Кристаллы щавелевого кальция – экскреторные включения.

WORK No. 3. Starch grains in potato cells.

Работа № 3. Зерна крахмала в клетках картофеля.

WORK No. 4. Inclusion of glycogen in the liver cells (demonstration slide).

Работа № 4. Включения гликогена в клетках печени (демонстрационный препарат).

WORK No. 5. Plasmolysis and deplasmolysisof onion cells.

Работа № 5. Плазмолиз и деплазмолиз клеток лука.

WORK No. 6. Demonstration of hemolysis in vitro.

Работа № 6. Демонстрация гемолиза в пробирке.

**Topic 3. The hereditary apparatus of the cell. The structure and functions of the nucleus. Nucleic acids**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1. The cell nucleus consists of

1. a nucleoplasm, nucleolus and chromatin
2. a nuclear envelope, nucleoplasm, nucleolus.
3. a nuclear envelope, nucleoplasm, nucleolus and chromatin.
4. a nuclear envelope, nucleoplasm, nucleolus, chromatin and ribosome.

2. Which one of the following eukaryotic cell structures does NOT contain DNA?

1. a nucleus
2. a mitochondrion
3. the endoplasmic reticulum
4. a chloroplast

3. The substance of a cell nucleus, consisting of strands of DNA, RNA, and various proteins, that forms chromosomes during cell division.

1. Nucleus
2. Chromatin
3. Nuclear Pore
4. Cytoplasm

4. A karyotype is a:

1. general term for any type of chromosome
2. type of abnormal chromosome that is associated with Down's syndrome
3. picture of an individual's chromosomes arranged in a standardized way

5. Autosomes:

1. are all chromosomes other than the sex chromosomes
2. are normal sex chromosomes
3. automatically determine the sex of children

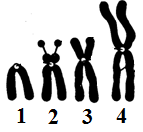
6. RNA in cells differ from DNA in that

1. it contains the base uracil, which preferentially pairs with cytosine.
2. it is single-stranded and cannot form base pairs.
3. it is single stranded can can fold up into a variety of structures.
4. the nucleotides are linked together in different way
5. the sugar ribose contains fewer oxygen atoms than does deoxyribose

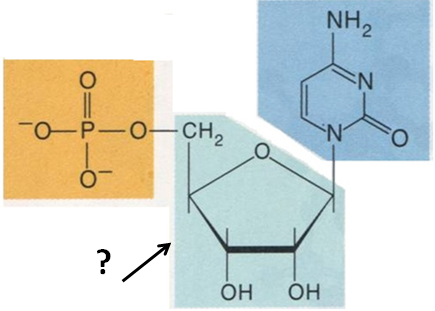
7. Normal humans have \_\_\_\_\_\_\_\_\_\_ pairs of autosomes and \_\_\_\_\_\_\_\_\_\_\_ pair(s) of sex chromosomes.

1. 23 and 23
2. 23 and 2
3. 46 and 1
4. 22 and 1

8. Type of chromosomes – 4?



1. Submetacentric
2. Metacentric
3. Acrocentric
4. Telocentric

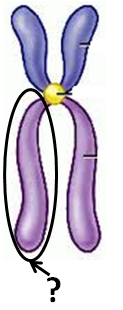


9. What is it?

1. a nitrogenous base
2. a five-carbon sugar
3. a phosphate group
4. a nucleobase

10. The enzymes responsible for adding nucleotides to the exposed DNA template bases are

1. Replicases
2. DNA polymerases
3. Helicases
4. None of the above

11. What is it?

1. Kinetochore microtubules
2. Long arm
3. Short arm
4. Centromere
5. Chromatid
6. Telomere

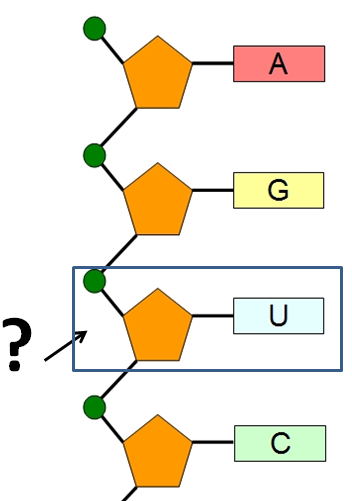
12. What is the simplest level of packing of the eukaryotic chromosome?

1. the nucleolus
2. the nucleoid
3. the nucleosome
4. the nucleoplasm

13. Chromatids are

1. dense patches within the nucleus.
2. bacterial chromosomes.
3. joined strands of duplicated genetic material (chromosome)
4. prokaryotic nuclei.

14. The entire molecule shown in the diagram is called a(n)



1. chromatin
2. a nitrogenous base
3. nucleotide DNA
4. nucleotide RNA
5. amino acids

15. Less condensed and capable of gene transcription – Most chromosomal regions in nondividing cells

1. Heterochromatin
2. Euchromatin

16. In the nucleus of eukaryotic cells, the genetic material is complexed with protein and organized into linear structures called:

1. centrioles
2. histones
3. chromosomes
4. plasmids

17. Perforations in a nuclear membrane which allow materials to flow in and out of the nucleus

1. Nucleus
2. Nuclear Envelope
3. Nuclear Pore
4. Nucleolus

18. Which of the following statements is true about the chromosomes of different plant and animal species?

1. They may differ in number, but are the same shape and size.
2. They may differ in the shape and size, but normally have the same number.
3. They may differ in number, shape, and size.

19. The sex chromosomes of normal females are:

1. X and Y
2. Y and Y
3. X and X
4. none of the above

20. A chromatid is:

1. one of the strands or arms of a chromosome
2. the point of attachment of two strands of a chromosome
3. a chromosome before it becomes visible during cell division

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | C | **11** | B |
| **2** | C | **12** | C |
| **3** | B | **13** | C |
| **4** | C | **14** | D |
| **5** | A | **15** | B |
| **6** | D | **16** | C |
| **7** | B | **17** | C |
| **8** | B | **18** | C |
| **9** | B | **19** | C |
| **10** | B | **20** | A |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Structural components of the nucleus. The role of the nucleus in the cell activity.
2. Structure and functions of the nuclear envelope. The structure of the nuclear pore.
3. The chemical composition and structure of chromatin. The concept of euchromatin and heterochromatin.
4. Nucleosome - the structural unit of chromatin. Stages of chromatin packaging in chromosomes.
5. Structure of chromosomes. Rules of chromosomes
6. Karyotype. Methods of study of the karyotype. International classification of chromosomes (Denver and Paris)
7. The structure of the DNA molecule. The functions of DNA. Properties of DNA: replication and repair. The mechanism of DNA replication.
8. Differences of RNA from DNA. The functions of RNA.
9. Cytoplasmic inheritance. Plasmids and their role in prokaryotes and eukaryotes.

**3. Form of progress monitoring: Practical task completion monitoring**

WORK No. 1. Nucleus and nucleolus in the cells of onion.

Работа № 1. Ядро и ядрышко в клетках лука.

WORK No. 2. RNA and DNA content the cell

Работа № 2. Содержание ДНК и РНК в клетке

WORK No. 3. Formation of normal human karyogram

Работа № 3. Составление нормальной кариограммы человека

Work No. 4. Solving of the task

Работа №4. Решение задачи.

Work No. 5. Study and analysis microphotograph of animal cell.

Работа № 5. Изучение и анализ электронограммы животной клетки.

Work No. 6. Chemical structure of DNA

Работа №6. Химическая структура ДНК

**Topic 4. Gene expression. Protein synthesis**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1. Genes which take part in protein synthesis are called

1. regulatory
2. structural
3. temporary
4. jumping

2. Define the correct sequence of steps in protein biosynthesis

1. translation→ transcription→ processing→ modifications
2. transcription→ processing→ translation→ modifications
3. processing→ transcription→ translation→ modifications
4. transcription→ modifications → translation→ processing

3. Into the structure of prokaryotic operon do not enter

1. promotor
2. gene-regulator and gene-operator
3. structural genes
4. introns

4. Promotor is the part of operon which

1. recognising the RNA-polymerase
2. starts synthesis of proteins
3. begins transcription
4. regulates the transcription of structural genes

5. System of determination of sequence of amino acids in polypeptide by the sequence of nucleotides in DNA is

1. duplication
2. penetrance
3. expressivity
4. genetic code

6. Three nucleotides in DNA molecule code a certain amino acid into a protein molecule

1. gene
2. triplet
3. heredity
4. plasmagenes

7. Each nucleotide of the neighboring nucleotides comes into only one codon compound

1. peculiarity
2. absence of “commas”
3. universality
4. non-overlapping

8. Synthesis of mRNA on DNA matrix is called

1. replication
2. direct transcription
3. inverse transcription
4. translation

9. Gene-regulator in operon

1. regulates the transcription of structural genes by production of protein-repressor
2. cooperates with enzyme RNA-polymerase
3. supervises synthesis of protein-enzymes
4. starts synthesis of structural protein

10. The first stage of biosynthesis of proteins at prokaryotic cell is

a) translation

b) transcription

c) processing

d) splicing

11. Process of transformation of pre-mRNA into mRNA is

1. translation
2. transcription
3. processing
4. posttranslated processes

12. Synthesis of protein on mRNA matrix is called

a) replication

b) direct transcription

c) inverse transcription

d)translation

13. 5' G T A \_ \_ \_ A A 3'

3' C A T G C A T T 5'

This segment of DNA has undergone a mutation in which three nucleotides have been deleted. A repair enzyme would replace them with

1. CGT.
2. GCA.
3. CTG.
4. GTA.

14. 5' ATCAGCGCTGGCTTTATC 3'

The above sequence of DNA is part of a gene. How many amino acids are coded for by this segment?

1. 4
2. 8
3. 12
4. 6

15. System of determination of sequence of amino acids in polypeptide by the sequence of nucleotides in DNA is

1. duplication
2. penetrance
3. expressivity
4. genetic code

16. There are no punctuation marks within the codes

1. peculiarity
2. absence of “commas”
3. universality
4. non-overlapping

17. Some amino acids have more, than one codon

1. peculiarity
2. excessiveness (degenerate, or redundant)
3. universality
4. non-overlapping

18. The second stage of biosynthesis of proteins at prokaryotic cell is

1. translation
2. transcription
3. processing
4. splicing

19. With enzyme RNA-polymerase cooperates

1. structural gene
2. gene-operator
3. promotor
4. gene-regulator

20. Production of protein-repressor acting on a gene-operator provides

1. structural gene
2. gene-operator
3. promoter
4. gene-regulator

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
|  | **b** |  | **c** |
|  | **b** |  | **d** |
|  | **d** |  | **a** |
|  | **a** |  | **d** |
|  | **d** |  | **d** |
|  | **b** |  | **b** |
|  | **d** |  | **b** |
|  | **b** |  | **a** |
|  | **a** |  | **c** |
|  | **b** |  | **d** |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. The concept of the gene.
2. The genetic code. Properties of genetic code: triplets, degenerate, nonoverlapping, comma-free, ordered, universal.
3. Central dogma molecular biology: DNA → RNA → protein. Stages of gene expression: **transcription** and **translation**
4. The role of RNA in gene expression. Types of RNAs. Characteristics of tRNAs, mRNA, rRNA, snRNA.
5. Basic structure of a protein-coding gene at Prokaryotes and Eukaryotes (operon, transcripton).
6. Stages of Transcription: initiation, elongation, termination (Characteristics)
7. Processing. Steps of Processing: capping, the “poly-A tail”, splicing. The Alternative splicing.
8. Translation. Characteristics of Stages of Translation. Translation product.
9. Protein Modifications
10. Control of an expression of genes. The ***lac-operon*** Escherichia coli

**3. Form of progress monitoring: solving problems in molecular biology**

**Task 1 (задача №1)**

How many nucleotides of mRNA code the protein consisting of 157 aminoacids?

**Task 2 (задача №2)**

The sense strand of DNA contains 702 nucleotides. How many amino acids will be a part of the protein which gene is this site of DNA?

**Task 3 (задача №3)**

Protein consists of 220 amino acids. Determine number of nucleotides of sites of molecules of mRNА and DNA coding this protein, and number of molecules of tRNА which are necessary for transfer of these amino acids to a synthesis place.

**Task 4 (задача №4)**

A sense strand of DNA has the following sequence of bases:

**ATCACAGTGCGTCTTCAAG**

How would the base sequence be coded on mRNA?

**Task 5 (задача №5)**

A antisense strand of DNA has the following sequence of bases:

**GGCTAAGTCTGGTACAA**

Determine the sequence of amino acids in the encoded protein

**Task 6 (задача №6)**

If the amino acid sequence of a protein is

**lys – asp – gly – thr - ala – glu – cys – met**

What nucleotid sequence has sense strand of DNA?

**Task 7 (задача №7)**

The ribosome consistently interacts with transport RNA which have anti-codons

**CGC, GUG, CUU, GGG, CUC, AUA, UAC, UAG**

Determine the protein structure and nucleotid sequence of in a sense strand of DNA

**Task 8 (задача №8)**

It is known that all RNA types are synthesized on DNA matrix. A fragment of a DNA molecule (antisense strand) which encodes a central loop of tRNA has the following nucleotide sequence **CGTTGGGCTAGGCTT**

Determine the nucleotide sequence portion tRNA, which will be synthesized on this DNA. Determine which amino acid will be transported to this tRNA, if the third triplet corresponds to the tRNA anticodon

**Task 9 (задача №9)**

Ionizing radiation is capable "to beat out" separate nucleotides from DNA molecule without violation of its integrity. One of DNA strand (antisense) has the following nucleotid sequence: **AATCACGATCCTTCTAGGAAG**

If the third nucleotide of DNA is beaten out, how to change the primary structure of the protein?

**Answers:**

|  |  |
| --- | --- |
| **№ задачи** | **Правильный ответ** |
|  | 471 |
|  | 234 |
|  | 660, 1200, 220 |
|  | UAGUGUCACGCAGAAGUUC |
|  | pro-ile-gln-thr-met-- |
|  | AAA-GAT-GGT-ACT-GCT-GAA-TGT-ATG |
|  | GCG-CAC-GAA-CCC-GAG-TAT-ATG-ATC |
|  | ala |
|  | protein after mutation |

**4. Form of progress monitoring: Practical task completion monitoring**

WORK No 1. Regulation of Gene Expression in Prokaryotes. The *lac- operon* of *E. coli*

Работа № 1. Регуляция экспрессии генов у прокариот. Лактозный оперон Кишечной палочки

Work No. 2. Solving of the problems.

Работа №2. Решение задач.

**Topic 5. Reproduction of organisms. The cell cycle. Mitosis. Meiosis. Gametogenesis**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

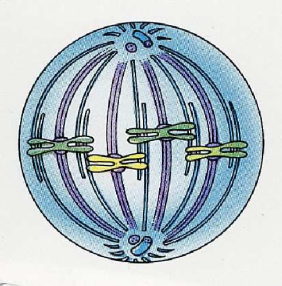
1. Which one is the right sequence of cell cycle?

1. M to S to G1 to G2 to cytokinesis
2. M to cytokinesis to G1 to S to G2
3. M to G2 to S to G1 to cytokinesis
4. M to S to G1 to G2 to cytokinesis

2. Which of the following correctly lists the order of the stages during mitosis?

1. anaphase, prophase, metaphase, telophase
2. telophase, metaphase, anaphase, prophase
3. prophase, metaphase, anaphase, telophase
4. metaphase, telophase, anaphase, prophase

3. Choose the mitotic stage shown in the drawing.

1. Prophase
2. Metaphase
3. Anaphase
4. Telophase

4. Meiosis:

1. characteristic only for abnormal cells
2. takes place during the formation of gametes
3. universal for unicellular and multicellular organisms
4. provides a constant hereditary information

5. Sister chromatids begin to diverge to the poles of the cell in the stage:

1. prophase
2. anaphase
3. metaphase
4. interphase

6. Growth of an organism is the result:

1. meiosis
2. mitosis
3. formation of gametes
4. increasing the number of somatic cells

7. In cell division, the phase following the anaphase is known as:

1. prophase
2. metaphase
3. telophase
4. extophase

8. Choose correct order of the stages during spermatogenesis.

1. reproduction, growth, maturation, forming  
   2. growth, reproduction, maturation, forming  
   3. maturation, reproduction, growth, formation  
   4. formation, reproduction, growth, maturation

9. The time of life cells from division to division called:

1. mitosis
2. meiosis
3. cell cycle
4. interphase

10. A human cell has 46 total or 23 pairs of chromosomes. Following mitosis, the daughter cells would each have a total of \_\_\_\_\_\_ chromosomes. After meiosis I, the two daughter cells would have \_\_\_\_\_chromosomes, and after meiosis II \_\_\_\_\_\_ chromosomes.

1. 46,46,46
2. 46,23,23
3. 23,23,23
4. 46,12,12

11. The first meiotic division results in the formation:

1. haploid nuclei
2. diploid cells
3. cells of different ploidy
4. gametes

12. Primary oocytes comprises a genetic material:

1. nc
2. 2n4c
3. 2n2c
4. n2c

13. The process of crossingover takes place at the stage:

1. Leptotene
2. Zygotene
3. Pachytene
4. Diplotene
5. Diakinesis

14. Rabbit has 44 chromosomes. How many chromosomes have his secondary

spermatocyte

1. 2n4c
2. 2n2c
3. nc
4. n2c

15. How many bivalents are at the stage metaphase 1 in human cells?

1. 46
2. 23
3. 13
4. 6

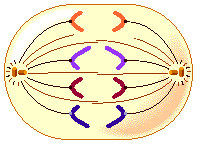
16.  During the final stage of cell division, the mitotic apparatus disappears, the chromosomes become attenuated, the centrioles duplicate and split, the nuclear membrane becomes reconstituted and the nucleolus reappears. This phase of cell division is known as:

1. prophase
2. metaphase
3. anaphase
4. telophase

17. DNA replication occurs in:

1. G1-period
2. G2-period
3. S – period
4. G0-period

18. Choose the mitotic stage shown in the drawing.

1. prophase
2. metaphase
3. anaphase
4. telophase

19. The process of meiosis produces four cells with nonidentical chromosomes. This diversification occurs during:

1. [telophase I](http://www.biology.arizona.edu/cell_bio/tutorials/meiosis/02a.html)
2. [prophase I](http://www.biology.arizona.edu/cell_bio/tutorials/meiosis/02b.html)
3. [metaphase II](http://www.biology.arizona.edu/cell_bio/tutorials/meiosis/02c.html)
4. prophase II

20.The Thompson seedless grape is triploid, with three copies of each chromosome. Which phase of the cell cycle would you expect triploid cells to be unable to complete.

1. Meiosis I
2. meiosisII
3. S
4. G2

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| № п/п | Ответы | № п/п | Ответы |
| **1** | 2 | **11** | 1 |
| **2** | 3 | **12** | 2 |
| **3** | 2 | **13** | 3 |
| **4** | 2 | **14** | 4 |
| **5** | 2 | **15** | 2 |
| **6** | 2 | **16** | 4 |
| **7** | 3 | **17** | 3 |
| **8** | 1 | **18** | 3 |
| **9** | 3 | **19** | 2 |
| **10** | 2 | **20** | 1 |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Reproduction. Levels of reproduction. The evolution of reproduction
2. Types of reproduction: asexual and sexual. Types of asexual and sexual reproduction in unicellular and multicellular organisms.
3. Cell reproduction. Characteristic of Life-cycle stages: **interphase, mitosis, cytokinesis.**
4. Meiosis: characteristic of stages, biological role.
5. Differences and similarity between a mitosis and meiosis
6. Gametogenesis: characteristic of stages
7. Gametes: structure and functions.

**3. Form of progress monitoring: solving problem-situational tasks**

1. How many mature gametes are produced from 100 primary spermatocytes? 100 secondary oocytes?
2. The dog has 78 chromosomes. How many chromosomes and DNA contain primary and secondary oocytes of dogs?
3. Rabbit has 44 chromosomes. How many chromosomes and DNA molecules will be present in the following types of rabbit cells?
4. Mature sperm
5. First polar body
6. Primary oocyte
7. Secondary spermatocyte
8. Zygote

**Answers:**

|  |  |
| --- | --- |
| **№ задачи** | **правильный ответ** |
|  | 400 sperms, 100 ovums |
|  | 78ch, 156DNA. 39ch, 78DNA |
|  | 1. 22,22  2. 22,44  3. 44,88  4. 22,44  5. 44,44 |

**4. Form of progress monitoring: Practical task completion monitoring**

WORK No 1.The evolution of sexual reproduction.

Работа № 1. Эволюция форм полового размножения

WORK No 2. Mitosis of onion root.

Работа № 2. Кариокинез корешка лука.

WORK No 3. Meiosis.

Работа № 3. Мейоз.

WORK No 4. Gametogenesis.

Работа 4. Гаметогенез.

WORK No 5. The structure of gametes. Guinea pig sperm (demonstration slide).

Работа № 5. Строение половых клеток. Сперматозоид морской свинки (демонстрационный препарат).

WORK No 6. The structure of gametes. Frog ovum (demonstration slide).

Работа № 6. Строение половых клеток. Яйцеклетка лягушки (демонстрационный препарат).

WORK No 7. The structure of gametes.The оvum of a cat (demonstration slide).

Работа № 7. Строение половых клеток. Яйцеклетка кошки (демонстрационный препарат).

WORK No 8. Problem solving.

Работа № 8. Решение проблемно-ситуационных задач.

**Module 2. Medical genetics.**

**Topic 1. Basic Concepts in Genetics. Mendel’s Laws**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1. An allele is:

1. another word for a gene
2. a homozygous genotype
3. a heterozygous genotype
4. one of several possible forms of a gene

2. Genotype is the

1. genetic constitution
2. genetic constitution of the phenotype
3. trait expressed
4. expressed genes

3. If the genotype consists of only one type of allele. It is called

1. homozygous
2. heterozygous
3. momoallelic
4. uniallelic

4. The number of types of gametes produced by a homozygous individual is

1. 1
2. 2
3. 3
4. many

5. A cross involving a single trait is called:

1. diploid cross
2. homozygous
3. monohybrid cross
4. an autosome

6. The crossing of F1 to homozygous recessive parent is cаlled

1. back cross
2. test cross
3. F1 cross
4. all of these

7. The Dihybrid test cross ratio is

1. 9:3:2:1
2. 9:3:2:2
3. 1:1:1:1
4. 9:3:3:1

8. If I cross a pea plant that is homozygous dominant for tallness and one that is recessive for shortness, what will the genotype of the offspring be? (T and t represent the alleles for height in pea plants).

1. All will be tall
2. TT
3. Tt
4. tt

9. The idea that different pairs of alleles are passed to offspring independently is Mendel's principle of:

1. unit inheritance
2. segregation
3. independent assortment

10. When crossing a homozygous recessive with a heterozygote, what is the chance of getting an offspring with the homozygous recessive phenotype?

1. 0%
2. 25%
3. 50%
4. 75%
5. 100%

11. Which of the following genetic crosses would be predicted to give a phenotypic ratio of 9:3:3:1?

1. [SSYY x ssyy](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/03t.html)
2. [SsYY x SSYy](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/03t.html)
3. [SsYy x SsYy](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/03c.html)
4. [SSyy x ssYY](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/03t.html)
5. [ssYY x ssyy](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/03t.html)

12. How many unique gametes could be produced through independent assortment by an individual with the genotype AaBbCCDdEE?

1. 4
2. 8
3. 16
4. 32
5. 64

13. A pea plant is heterozygous for both seed shape and seed color. *S* is the allele for the dominant, spherical shape characteristic; *s* is the allele for the recessive, dented shape characteristic. *Y* is the allele for the dominant, yellow color characteristic; *y* is the allele for the recessive, green color characteristic. What will be the distribution of these two alleles in this plant's gametes?

1. [50% of gametes are Sy; 50% of gametes are sY](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/01T.html)
2. [25% of gametes are SY; 25% of gametes are Sy; 25% of gametes are sY; 25% of gametes are sy.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/01c.html)
3. [50% of gametes are sy; 50% of gametes are SY](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/01t.html)
4. [100% of the gametes are SsYy](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/01t.html)
5. [50% of gametes are SsYy; 50% of gametes are SSYY.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/01t.html)

14. In a dihybrid cross, AaBb x AaBb, what fraction of the offspring will be homozygous for both recessive traits?

1. [1/16](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/07c.html)
2. [1/8](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/07t.html)
3. [3/16](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/07t.html)
4. [1/4](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/07t.html)
5. [3/4](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/07t.html)

15. The alternate forms of a gene is called

1. recessive character
2. dominant character
3. alleles
4. alternative gene

16. The physical expression or appearance of character is called as

1. morphology
2. genotype
3. phenotype
4. ecotype

17. If different alleles are present in the same genotype then it is called

1. homozygous
2. heterozygous
3. diallelic
4. polyallelic

18. The number of types of gametes produced by a heterozygous individual is

1. 1
2. 2
3. 3
4. many

19. The cross in which parents differ in two pairs of contrasting characters is called

1. monohybrid cross
2. dihybrid cross
3. trihybrid cross
4. tetrahybrid cross

20. The test cross is used to determine the

1. genotype of the plant
2. phenotype of the plant
3. both a and и
4. none of these

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | d |  | c |
| **2** | b |  | b |
| **3** | a |  | b |
| **4** | a |  | a |
| **5** | c |  | c |
| **6** | b |  | c |
| **7** | c |  | b |
| **8** | c |  | b |
| **9** | c |  | b |
| **10** | c |  | a |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Basic Concepts in Genetics:

**genetics, heredity, gene, genome, chromosomes, DNA, locus, allele, trait, genotype, phenotype, dominant allele, recessive allele, heterozygotes, homozygotes, the monohybrid cross, the dihybrid cross, polyhybrid cross, hybrid, test cross, backcross**

1. Mendel’s 1st Law : Rule of Dominance (Law of Dominance)
2. Mendel’s 2st Law (The Low of Segregation)
3. Mendel’s 3nd Law (The Law of Independent Assortment)

**3. Form of progress monitoring: Practical task completion monitoring**

**WORK No1.Genetics problems.**

**Работа № 1. Решение задач.**

**Topic 2. Linked inheritance. Sex-linked inheritance. Genetics of sex.**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1. Sex-linked genetically inherited traits:

1. can appear in both males and females
2. are only found in males
3. are only found in females
4. result from premarital sexual intercourse

2. Harmful X-linked traits are:

1. inherited only from mothers
2. more numerous than Y-linked ones
3. most likely to show up in the phenotype of daughters

3. Men with red-green color blindness inherited the genes for it from:

1. their mothers
2. their fathers
3. either their mothers or fathers

4. Which recombination frequency corresponds to independent assortment and the absence of linkage?

1. 0
2. 0.25
3. 0.50
4. 0.75

5. Crossing-over resulting in the inheritance of altered chromosomes by children occurs:

1. during mitosis
2. during meiosis
3. both of the above

6. If an affected male has all affected daughters but no affected sons, the trait is likely to be an

1. X-linked dominant trait
2. autosomal recessive trait
3. autosomal dominant trait
4. X-linked recessive trait

7. Dosage compensation of the X chromosome in mammals is by

1. the formation of Barr bodies in females
2. the formation of Barr bodies in males
3. hyperactivity of the X chromosome in males
4. reduced activity of the autosomes in males

8. What would a gene be called if it is inherited by both genders but expressed differently in the phenotype of men and women?

1. unstable
2. sex-controlled
3. recessive

9. Human males are neither heterozygous nor homozygous for alleles on the X chromosome, they are

1. hemizygous
2. heterozygous
3. homogametic

protozygous  
10. Two genes localized in one chromosome, are remote from each other on distance in 17 cM. Which recombination frequency at offspring?

1. 25%
2. 50%
3. 17%
4. 34%

11. Y-linked traits are inherited:

1. only by females
2. only by males
3. by both males and females

12. If the genes for a trait are inherited by both men and women but only show up in the phenotype of women, they are referred to as \_\_\_\_\_\_\_\_\_\_\_\_\_ genes.

1. sex controlled
2. codominant
3. sex-limited

13. Red-green color blindness is:

1. an X-linked trait
2. a Y-linked trait
3. both X and Y linked

14. Linked genes are:

1. located on different chromosomes of the same size and shape
2. located on the same chromosome
3. rarely inherited together

15. Crossing-over of parts of chromosomes:

1. has no effect on genetic linkage
2. usually decreases the number of genetic combinations in a population
3. can increase the number of genetic combinations in a population

16. X-linked recessive traits in humans (or in Drosophila) are observed \_\_\_\_\_\_\_\_.

1. in more males than females
2. in more females than males
3. in males and females equally
4. in different distributions depending on the trait

17. The crosses involving the white-eyed and red-eyed alleles on the X chromosome in fruit flies proved to be a test of the

1. Cell Theory
2. Lyon Hypothesis
3. Chromosome Theory of Inheritance
4. Rule of Segregation

18. The theory that the Barr Body is an inactivated X-chromosome is

1. the cell theory
2. the Lyon hypothesis
3. the chromosome theory of inheritance
4. the genic balance theory

19. If an affected male has affected daughters and sons in about the same number as unaffected daughters and sons, the trait is likely to be an

1. X-linked dominant trait
2. autosomal recessive trait
3. autosomal dominant trait
4. X-linked recessive trait

20. Which recombination frequency corresponds to perfect linkage and violates the law of independent assortment?

1. 0
2. 0.25
3. 0.50
4. 0.75

**2. Form of progress monitoring: solving a genetic problem**

*Решите задачи:*

*Solve the problems:*

**Problem 1:** Tongue-rolling and red-green colour blindness are two genetically controlled conditions which occur in humans. Tongue-rolling is controlled by the dominant allele, **T**, while non-rolling is controlled by the recessive allele, **t**.

Red-green colour blindness, is controlled by a sex-linked gene on the X chromosome. Normal colour vision is controlled by the dominant allele, **B**, while red-green colour blindness is controlled by the recessive allele, **b**.

To show the possible genotypes and phenotypes and what their frequency which could be produced from the following parents. A human female who is heterozygous for the traits

red-green color blindness and tongue-rolling, marries a normal male, which can't tongue-rolling.

**Problem 2:** Cataract and polydactyly controlled by the two dominant alleles (A, B). These genes are completely linked.

A woman with cataract and polydactyly has a mother with cataract and has a father with polydactyly. Her husband is healthy. To show the possible genotypes and phenotypes, which could be produced from these parents and what their frequency.

**Test answers:**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
|  | **a** |  | **b** |
|  | **b** |  | **c** |
|  | **a** |  | **a** |
|  | **c** |  | **b** |
|  | **b** |  | **c** |
|  | **a** |  | **a** |
|  | **a** |  | **c** |
|  | **b** |  | **b** |
|  | **a** |  | **c** |
|  | **c** |  | **a** |

**Problems answers**

**Problem 1**

|  |  |  |
| --- | --- | --- |
| **Фенотип** | **Ген** | **генотип** |
| Normal colour vision | XB | XBXB , XBXb |
| Red-green color blindness | Xb | XbXb |
|  |  |  |
| Tongue-rolling | T | TT, Tt |
| Non-roller | t | Tt |
| Р: XBXbTt **Х** XBYTT | | |

**Problem 2**

50%

**3. Form of progress monitoring: recitation**

**Lesson questions:**

1. Repetition: Mendelian inheritance – Chromosomal Theory of Inheritance. Recombination of Unlinked Genes (Independent Assortment of Chromosomes)
2. Linked genes. Complete and Incomplete Linkage. Recombination of Linked Genes: Crossing Over. Morgan’s Experimental Evidence of linked inheritance
3. Chromosome Theory of Linkage
4. Gene Mapping: A genetic map, а linkage map, а cytological maps, а map of sequence
5. Sex determination: chromosome theory of sex determination (heterogametic sex and a homogametic sex)
6. Bridges' Genie Balance Theory of Sex Determination
7. Sex-Linked Genes. Inheritance of Sex-Linked Genes:

* X-linked recessive inheritance, examples
* X-linked dominant inheritance, examples
* Y- linked inheritance, examples

**4. Form of progress monitoring: Practical task completion monitoring**

Work 1. Solving of genetics problems

Problem № 1. Linked inheritance. Crossing Over

Задача № 1. Сцепленное наследование. Кроссинговер.

Problem № 2. Sex-linked inheritance.

Задача № 2. Сцепленное с полом наследование.

Problem № 3. Sex-linked inheritance.

Задача № 3. Сцепленное с полом наследование

Problem № 4. Inheritance of two traits: Sex-linked and autosomal.

Задача № 4. Наследование двух признаков: сцепленного с полом и аутосомного.

Problem № 5. Inheritance of two traits: Sex-linked and autosomal.

Задача № 5. Наследование двух признаков: сцепленного с полом и аутосомного.

Problem № 6. Sex-linked inheritance. Crossing Over

Задача № 6. Сцепленное с полом наследование. Кроссинговер.

Problem № 7. Sex-Influenced Traits.

Задача № 7. Признаки, контролируемые полом

Problem № 8. Sex-linked inheritance. Sex differentiation

Задача № 8. Сцепленное с полом наследование. Дифференцировка пола

**Topic 3. Immunogenetics. Multiple alleles. Inheritance of HLA, ABO, Rh - systems. Interaction of allelic and non-allelic genes.**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

* + 1. Kinds of the allelic genes interactions. Except the wrong answer

a) complete dominance

b) codominance

c) polymeria

d) incomplete dominance

* + 1. Genotype, in which unallelic interaction is manifested

a) AA

b) aa

c) AABB

d) Aa

* + 1. Characteristic of the complete dominance

a) combines effect of two or more different pairs of genes

b) one allele of the pair is clearly dominant over the other one in eterozygous

c) one allele doesn’t completely mask the phenotypic expression of another one in pair

d) both characters are manifested in eterozygous

* + 1. Codominance is the genetic situation, when

a) both characters are manifested in heterozygous

b) one allele does not completely mask the phenotypic expression of another one in pair

c) one allele in the pair is clearly dominant over the other one in heterozygous

d) combines effect of two, or more different pairs of genes

* + 1. Example of polymeria

1. hair shape
2. colour of eyes
3. II and III blood groups in ABO system
4. colour of skin
   * 1. Rhesus conflict will be observers if
5. mother has Rh+ , child has Rh-
6. mother has Rh- , child has Rh+
7. mother has Rh+ , father has Rh-
8. all the answers are correct
   * 1. In Mendel’s experiments, if the gene for tall (T) plants was incompletely dominant over the gene for short (t) plants, what would be the result of crossing two Tt plants?
   1. [¼ would be tall; ½ intermediate height; ¼ short](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/09c.html)
   2. [½ would be tall; ¼ intermediate height; ¼ short.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/09t.html)
   3. [¼ would be tall; ¼ intermediate height; ½ short.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/09t.html)
   4. [All the offspring would be tall.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/09t.html)
   5. [All the offspring would be intermediate.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/09t.html)
      1. What are the possible blood types of the offspring of a cross between individuals that are type AB and type O?
9. [AB or O](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/13t.html)
10. [A, B, or O](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/13t.html)
11. [A or B](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/13c.html)
12. [A, B, AB, or O](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/13t.html)
13. [A, B, or AB](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/13t.html) 
    * 1. What antigens and antibodies are present in a person with В blood type
14. antigen A, antibody anti-A
15. antigen A, antibody anti-B
16. antigen B, antibody anti-A
17. antigen B, antibody anti-B
18. antigen A and B, no antibody
    * 1. Phenotypic ratio produced by complementation
19. 3:1
20. 1:2:1
21. 9:7
22. 12:3:1
23. 15:1
24. Name of the unallelic genes interaction

a) incomplete dominance

b) codominance

c) complementation

d) complete dominance

1. Genotype, in which allelic interaction is manifested

a) AA

b) aa

c) AABB

d) Aa

1. Incomplete dominance is the genetic situation, when

a) AA and Aa have the similar phenotype

b) AA and Aa have different intermediate phenotype

c) in result of crossing of heterozygous 3:1 ratio will be formed

d) in result of crossing of heterozygous 1:1 ratio will be formed

1. Example of the codominance

a) II and III blood groups in ABO system

b) IV blood group in ABO system

c) colour of skin

d) colour of eyes

1. Polymeria is the genetic situation, when

a) both characters are manifested in heterozygous

b) combines effect of two, or more different pairs of genes

c) one allele does not completely mask the phenotypic expression of another one in pair

d) one allele in the pair is clearly dominant over the other one in heterozygous

1. A woman with type A blood and a man with type B blood could potentially have offspring with which of the following blood types?
2. [type A](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/11t.html)
3. [type B](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/11t.html)
4. [type AB](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/11t.html)
5. [type O](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/11t.html)
6. [all of the above](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/11c.html)
7. What antigens and antibodies are present in a person with A blood type
8. antigen A, antibody anti-A
9. antigen A, antibody anti-B
10. antigen B, antibody anti-A
11. antigen B, antibody anti-B
12. antigen A and B, no antibody
13. A phenotype ratio of 12:3:1 in the offspring of a mating of two organisms heterozygous for two traits is expected when:
14. [pleiotropic](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/12t.html)
15. [codominant](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/12t.html)
16. [epistatic](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/12t.html)
17. [lethal](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/12c.html)
18. [sex-linked](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/12t.html)
19. Example of complementation
    * 1. hair shape
      2. human deafness
      3. colour of eyes
      4. colorblindness
      5. colour of skin
20. A genetic cross of inbred snapdragons with red flowers with inbred snapdragons with white flowers resulted in F1-hybrid offspring that all had pink flowers. When the F1 plants were self-pollinated, the resulting F2-generation plants had a phenotypic ratio of 1 red: 2 pink: 1 white. The most likely explanation is:
21. [pink flower color is epistatic to red flower color.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/10t.html)
22. [pink flowers are the result of a blending of the red and white genotypes.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/10t.html)
23. [flower color is due to 2 or more complementary genes.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/10t.html)
24. [heterozygous plants have a different phenotype than either inbred parent because of incomplete dominance of the dominant allele.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/10c.html)
25. [flower color inheritance in snapdragons does not behave as a Mendelian trait.](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/10t.html)

**2. Form of progress monitoring: solving a genetic problem**

*Решите задачи:*

*Solve the problems:*

**Problem 1.** Color-blindness is a X-linked recessive trait. Blood type is a result of three alleles IA IB IO (autosomal trait). The woman has II(A) blood type , and her husband has III(B) blood type. Both parents have normal vision. They have colorblind son with I(O) blood type.

What is the probability that their next born son will have normal vision and II(A) blood type .

**Problem 2.** Hemophilia is a X-linked recessive trait. Blood type is a result of three alleles IA IB IO (autosomal trait). The woman has I(О) blood type , and her husband has IV(АB) blood type. Both parents have normal blood clotting . They have son with III(B) blood type and hemophilia.

What is the probability that their next born child will be healthy. Determine the possible blood types of offspring.

**Test and problems answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | **C** | **11** | **C** |
| **2** | **С** | **12** | **D** |
| **3** | **В** | **13** | **B** |
| **4** | **A** | **14** | **B** |
| **5** | **D** | **15** | **B** |
| **6** | **B** | **16** | **E** |
| **7** | **A** | **17** | **B** |
| **8** | **C** | **18** | **C** |
| **9** | **C** | **19** | **B** |
| **10** | **C** | **20** | **D** |
| **1** | **P: ♀IAIO XDXd x ♂IBIO XD Y** | | |
| **2** | **P: ♀IOIO XHXh x ♂IAIB XHY** | | |

**3. Form of progress monitoring: recitation**

**Lesson questions:**

1. Multiple alleles
2. The ABO blood group system. Blood transfusion: Donor-recipient compatibility.
3. Rhesus-system **(Rh).**
4. Rh -Factor and Problems in Newborns. Hemolytic disease of the fetus and newborn
5. The human leukocyte antigen (HLA) system. Value of HLA system at organ and tissues transplantation.
6. Interactions between allelic genes:

* complete dominance and incomplete dominance,
* overdominance, codominance,
* interallelic complementation,
* allelic exclusion

1. Interactions between non-allelic genes: complementary, epistasis, polymerism
2. Pleiotropy

**4. Form of progress monitoring: Practical task completion monitoring**

Work 1. Solving of genetics problems

Problem № 1. Inheritance of blood type (АВО)

Задача №1. Наследование групп крови (АВО)

Problem № 2. Inheritance of blood type (АВО). Наследование групп крови (АВО)

Problem № 3. Inheritanceof blood type (АВО). Наследование групп крови (АВО)

Problem № 4. Inheritance of blood type (АВО). Наследование групп крови (АВО)

Problem № 5. Inheritance of blood type (АВО). Наследование групп крови (АВО)

Problem № 6. Inheritance of blood type (АВО) and Х-linked traits

Задача №6. Наследование групп крови (АВО) и признаков, сцепленных с Х-хромосомой.

Problem № 7. Linked inheritance. Задача №7. Сцепленное наследование

Problem № 8. Incomplete dominance. Задача №8. Неполное доминирование

Problem № 9. Interactions between non-allelic genes. Complementation

Задача №9. Взаимодействие неаллельных генов. Комплиментарность

Problem № 10. Additive Gene Interaction. Polymeria.

Задача №10. Кумулятивное взаимодействие генов. Полимерия.

**Topic 4. Variability and hereditary diseases**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1. Trisomy is a

a) chromosomal aberration

b) genous mutation

c) polyploidy

d) heteroploidy

2. To the reasons combinative variability does not concern

a) casual choice of gametes at fertilisation

b) spontaneous mutagenesis

c) crossing-over

d) independent distribution of chromosomes in meiosis

3. To characteristics of the genotypical variability does not concern

a) change of a genotype

b) it is inherited

c) has evolutionary value

d) it is not inherited

4. Genomic mutations are associated with

a) the change of structure of chromosomes

b) the change of number of chromosomes

c) a change in one codon

d) a rearrangement of parts between nonhomologous chromosomes

5. Karyotype at a Down Syndrome

1. 47, 18+
2. 47, 21+
3. 47, XXY
4. 46, 5p-

6. The exchange of a chromosome’s segment material between two unhomological chromosomes is

a) deletion

b) translocation

c) inversion

d) duplication

7. The degree to which a genotype is expressed in the phenotype is called

1. polymeria
2. penetrance
3. expressivity
4. pleiotropy

8. One human disease is caused by a change in one codon in a gene from GAA to GUA, and a change in one amino acid (glu to val). This disease is

1. Phenylketonuria (PKU)
2. Sickle-cell disease (SCD)
3. Turner Syndrome
4. Down Syndrome

9. A point mutation may be

1. polyploidy, haploidy, heteroploidy
2. deletion, translocation, duplication
3. silent, missense, nonsense
4. deletion, inversion, duplication

10. The mutations associated with a change of structure of a gene are

a) chromosomal

b) genomal

c) gene mutation

d) cellular

11. Kinds of genotypical variability

a) mutational and combinative

b) mutational and alarm

c) combinative and cytoplasmatic

d) cytoplasmatic and mutational

12. Chromosomal aberrations. Exclude the wrong answer.

a) deletion

b) translocation

c) polyploidy

d) duplication

13. Phenotypical variability. Exclude the incorrect characteristic

a) it is inherited

b) adapts an organism for conditions of environment

c) matters for the separate individual

d) it is not inherited

14. The frequency with which a dominant or homozygous recessive gene manifests itself in individuals in a population is called

1. polymeria
2. penetrance
3. expressivity
4. pleiotropy

15. Kinds of genomal mutations. Exclude the incorrect answer

a) polyploidy

b) polymeria

c) haploidy

d) heteroploidy

16. Mutations within a DNA sequence are

1. natural processes that produce genetic diversity.
2. natural processes that always affect the phenotype.
3. unnatural processes that always affect the phenotype.
4. unnatural processes that are harmful to genetic diversity.

17. Chromosomal aberrations are associated with

a) the change of structure of chromosomes

b) the reduction of number of chromosomes

c) the increase in number of chromosomes

d) the change of number of chromosomes

18. Albinism is associated with absence or defect of enzyme involved in the production of melanin. This enzyme is called ...

1. phenylalanine hydroxylase
2. tyrosinase
3. galactokinase
4. albumine

19. The turn of a chromosome’s segment on 180˚ is

a) deletion

b) translocation

c) inversion

d) duplication

20. Is a rare genetic disorder due to a missing part (deletion) of chromosome 5 is called

1. Klinefelter Syndrome
2. Turner Syndrome
3. Down Syndrome
4. Cri du chat Syndrome or cat-cry Syndrome

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | **d** | **11** | **a** |
| **2** | **b** | **12** | **c** |
| **3** | **d** | **13** | **a** |
| **4** | **b** | **14** | **b** |
| **5** | **b** | **15** | **b** |
| **6** | **b** | **16** | **a** |
| **7** | **c** | **17** | **a** |
| **8** | **b** | **18** | **b** |
| **9** | **c** | **19** | **c** |
| **10** | **c** | **20** | **d** |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Genes and the environment.
2. Classification of variability
3. Non-hereditary variability. Characteristics of modification variability. Norm of reaction. Expressivity and penetrance of genes. Phenocopy
4. Hereditary or Genotypic variability: Classification and characteristics
5. Combinative variability. Mechanism of combinative variability. Value for evolution
6. Mutational variability. Mutation theory Hugo de Vries. Classification of mutations. Mutagen agent.
7. Gene-level mutation. The types of gene mutations:

* Mutations without **frame shift** (Point mutation): silent, missense and nonsense.
* Frame shift mutation: Insertions, deletions and duplications.
* Splice Site mutation
* Repeat expansion

1. Gene diseases and their characteristics: sickle-cell anaemia (SCA), Phenylketonuria (PKU), Albinism, Galactosemia.
2. Anti-mutagenic mechanisms in multicellular animals
3. Chromosomal Abnormalities, classification and characteristics: numerical aberrations (Genomic mutations) and structural aberrations (Chromosomal aberrations). Mechanism of pathology.
4. Chromosomal diseases condition that results from genome mutation - numerical aberrations: Down Syndrome, Patau syndrome, Edwards syndrome, Turner Syndrome, Klinefelter Syndrome, Triple X Syndrome.
5. Chromosomal diseases condition that results from Chromosomal aberrations - structural aberrations: Cri du chat Syndrome or cat-cry Syndrome, deletion syndrome, duplication syndrome, Down Syndrome (Translocation)

**3. Form of progress monitoring: Practical task completion monitoring**

Work №1. Mutations and hereditary diseases. Determining the type of mutational variability. *Complete the table.*

Работа №1. Мутации и наследственные болезни. Определение типа мутационной изменчивости. *Заполните таблицу*

Work №2. Solving of genetics problems

Работа №2. Решение задач.

Work №3. Solving of genetics problems involving hereditary diseases

Работа №3. Решение задач, включающих наследственные болезни.

**Topic 5. Medical genetics. Methods for studying human heredity.**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1. The first stage of genealogical method is
2. collection and analysis of pedigree
3. statistical analysis of pedigree
4. gathering information about a disease in proband’s relatives
5. gathering information about a disease in mozygotic twins
6. Barr’ body can be observed in interphase nuclei of
7. normal male
8. normal female
9. female with Turner’s syndrome
10. male with Down’s syndrome
11. Biochemical method is for detection of
12. genome mutations
13. chromosomal mutations
14. primary enzymatic defect
15. sex chromatin

4.The method studying of skin relief on fingers is called

1. dermatoglyphic
2. modelling
3. immunological
4. karyotyping

5.The determination of the inheritance type is task of

1. cytogenetic method
2. genealogical method
3. immunological method
4. amniocentesis

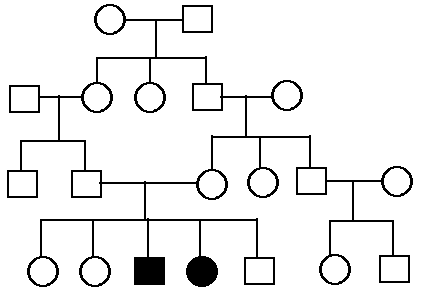
6.Inherited disease linked with X chromosome is:

1. galactosemia
2. daltonism
3. polydactily
4. phenylketonuria

7. The type of inheritance when affected individual present in each generation and both sexes are affected with the same frequency is called

1. autosomal dominant
2. autosomal recessive
3. X-linked dominant
4. X-linked recessive

8.Explain the inheritance of this trait in the pedigree

1. The trait is X-linked recessive, inherited through the mothers.
2. The trait is autosomal recessive.
3. X-linked recessive.
4. The trait is autosomal dominant.

9.Dizygotic twins have

1. same phenotype but different genotype
2. same genotype but different phenotype
3. same genotype and blood group
4. different phenotype and genotype

10.The method of microscopic investigation of metaphase chromosomes is called

1. immunological
2. karyotyping
3. biochemical
4. modelling

11.The number Barr’s body in Klinefelter syndrome is

* + 1. 1
    2. 2
    3. 3
    4. 0

12. What Types of Prints:

1. loop
2. whorl
3. arch

13.The method of karyotyping is used in diagnostics of

1. genic hereditary diseases
2. methabolic hereditary diseases
3. enzymopathias
4. chromosomal hereditary diseases

14. Barr’ body is found in

1. male somatic cells
2. ova
3. female somatic cells
4. spermatozoon

15.The method of prenatal diagnostics of hereditary diseases is called

1. genealogical
2. amniocentesis
3. modeling
4. twins method

16. Gene and genotype frequencies in human populations are studied by

1. method of modelling
2. popular-statistic method
3. twins method
4. immunological method

17. The material for cytogenetic investigation are

1. leukocytes
2. erythrocytes
3. sexual cells
4. neurons

18. Method of diagnostics of genic hereditary illnesses

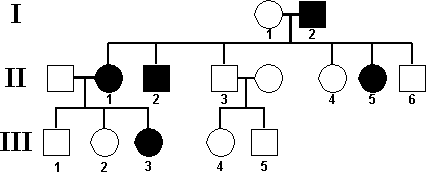
1. biochemical
2. karyotyping
3. twins method
4. modelling

19.The number Barr’s body in Turner syndrome

1. 1
2. 2
3. 3
4. 0

20. Explain the inheritance of this trait in the pedigree

1. autosomal dominant
2. autosomal recessive
3. X-linked dominant
4. X-linked recessive



**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | **C** | **11** | **A** |
| **2** | **B** | **12** | **C** |
| **3** | **C** | **13** | **D** |
| **4** | **A** | **14** | **C** |
| **5** | **B** | **15** | **B** |
| **6** | **B** | **16** | **B** |
| **7** | **A** | **17** | **A** |
| **8** | **B** | **18** | **A** |
| **9** | **D** | **19** | **D** |
| **10** | **B** | **20** | **A** |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Genetic counseling: purpose, stages of counseling, types of genetic testing
2. Genetic methods :
3. Dermatoglyphics
4. Phenotypic analysis
5. Pedigree Analysis
6. Biochemical test (screening)
7. Cytogenetic analysis or Cytogenetic Test Methods (Chromosomal analysis):
   * Buccal scraping or smear (Sex chromatin test)
   * Karyotyping
   * FISH
8. Molecular analysis (DNA sequencing)
9. Prenatal Diagnosis
10. Somatic cell hybridization
11. Twin study
12. Population genetics statistical methods. The Hardy-Weinberg Principle.

**3. Form of progress monitoring: Practical task completion monitoring**

Work №1. Dermatoglyphics analysis

Работа №1. Дерматоглифический анализ.

Work №2. Analysis of sex chromatin in buccal scrapings.

Работа №2. Анализ полового хроматина в буккальном соскобе

Work №3. Solving of problems of population genetics

Работа №3. Решение задач по популяционной генетике.

Work №4. Solving of problems of the Pedigree Analysis

Работа №4. Решение задач на генеалогический анализ.

**Module 3. Ecology. Medical parasitology**

**Topic 1. Basic concepts of parasitology. Protozoa. Phylum Sarcomastigophora**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1.Organisms for which a parasitic way of life - the obligatory form of existence, are called

a) relatively permanent

b) absolutely permanent

c) true parasites

d) false parasites

2.A host that harbors the larval or asexual stage of a parasite is known as

a) definitive host

b) intermediate host

c) supplementary host

d) reservoir host

3.The transmissible way of the causative agent’s transfer is characteristic for

a) Lambliasis

b) Trichomoniasis

c) Trypanosomiasis

d) Amoebiasis

4.Maximum number of nuclei in mature Entamoeba coli cyst is

a) 2

b) 4

c) 8

d) 16

5.Causative agents of Chagas Disease

а) Trypanosoma brucei gambiense

в) Trypanosoma cruzi

с) Leishmania tropica minor

d) Leishmania donovani

6.Tsetse fly is vector of

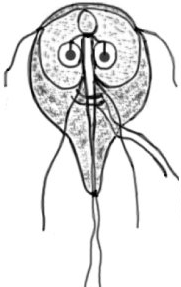
a) Cutaneous leishmaniasis

b) Visceral leishmaniasis

c) African Trypanosomiasis

d) American trypanosomiasis

7. What parasite is shown in Figure



a) *Entamoeba histolytica*

b) *Lamdlia intestinalis*

c) *Trichomonas vaginalis*

d) *Leishmania donovani*

e*)Trypanosoma cruzi*

8.Dysenteric amoeba localizes in

a) large intestine

b) blood

c) liver

d) small intestine

9.Epidemiological chain cutaneous leishmaniasis

1. small rodents – sandfly – healthy person
2. dogs - mosquito - healthy person
3. large horned livestock - mosquito - healthy person

d)sick person - mosquito - healthy person

10.Presence of ingested RBCs characteristic of

a) Entamoeba coli

b) Entamoeba histolytica

c) Entamoeba gingivalis

d) Balantidium coli

11.Trypanosoma cruzi localizes in

a) skin cells

b) erythrocytes

c) liver

d) cardiac muscle

12. Prevention of urinogenital trichomonosis. Choose the incorrect answer

* 1. avoiding sharing of towels and underwear
  2. wash vegetables, fruit
  3. avoid casual sexual contacts
  4. sterilization of gynecologic instruments, gloves

13. *Trichomonas vaginalis* belongs to a Subphylum

a) Sarcodina

b) Flagellata

c) Sporozoa

d) Ciliophora

14. Causative agents of Kala Azar

а) *Trypanosoma brucei gambiense*

в) *Trypanosoma cruzi*

с) *Entameba histolytica*

d) *Leishmania donovani*

e)*Trichomonas vaginalis*

15.Pathogenic effect of Leishmania tropica

1. liver and lymph nodes are enlarged
2. persistent irregular fever
3. anemia
4. oval, non-healing ulcers on the skin

16. Non-pathogenic is

a) Entamoeba histolytica

b) Entamoeba coli

c) Balantidium coli

d) Trichomonas vaginalis

17. Temporary parasites:

a) spend on the host one of phases of its life cycle

b) spend on the host some phases of the life cycle

c) are connected to the host only during a feed

d) spend all life in the host’s organism

18. A host that harbors the adult or sexual stage of a parasite is known as

a) definitive host

b) intermediate host

c) supplementary host

d) reservoir host

19.Causative agents of transmissible diseases penetrate into a host’s organism

a) with food

b) through a host’s skin

c) by vector’s bite

d) through respiratory ways with air

20.The transmissible way of the causative agent’s transfer is characteristic for

a) amoebiasis

b) trichomoniasis

c) lambliasis

d) leismaniasis

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | **c** | **11** | **d** |
| **2** | **b** | **12** | **b** |
| **3** | **c** | **13** | **b** |
| **4** | **c** | **14** | **d** |
| **5** | **b** | **15** | **d** |
| **6** | **c** | **16** | **b** |
| **7** | **b** | **17** | **c** |
| **8** | **a** | **18** | **a** |
| **9** | **a** | **19** | **c** |
| **10** | **b** | **20** | **d** |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Introduction to medical parasitology.
2. Parasitism. Sections of Medical Parasitology.
3. Prerequisites to a parasitic way of life. Adaptation of parasites to parasitic life
4. Pathogenic effect of the parasite on the host organism: Mechanical, Toxic, Trophic, Allergy, Immunological.
5. Сlassification of parasites
6. Life Cycle. Сlassification of Host. Parasitic system: Monoxenic parasites, Dixenic parasites, Trixenic parasite.
7. Localization of a parasite in a human body
8. Transmission mechanism and Route (pathway). Transmission factors. Invasive (Infective) stage. Carriers organisms for circulating pathogen in nature
9. Natural focal disease: Transmissible and Non-transmissible. Devastation and Deworming.
10. Subkingdom *Protozoa*. Classification and characteristics. *Protozoa* life cycle.
11. Phylum *Sarcomastigophora*: Subphylum *Sarcodina* and *Mastigophora:* Characteristics.
12. Non – pathogenic *Sarcodina*:

* *Ameba proteus*
* *Entamoeba gingivalis*
* *Entamoeba coli*

1. Pathogenic *Sarcodina*:

* *Entamoeba histolytica*
* *Acanthamoeba*
* *Naegleria*

1. Non – pathogenic *Mastigophora*:

* *Euglena*

1. Pathogenic *Mastigophora:*

* *Giardia lamblia (Lamblia intestinalis)*
* *Trypanosoma*
* *Leishmania*
* *Trichomonas*

**3. Form of progress monitoring: solving problem-situational tasks**

**Problem 1.**

During prophylactic (laboratory) examination of student’s dining hall cook cysts and vegetative forms (trophozoites) of amoebae were found in fecal smears. However, she continued to work and did not receive treatment.

1. *Which species of amoebae were found?*

**Problem 2.**

The patient complains of frequent stools with mucus and blood, general weakness. The examination revealed vegetative forms of Protozoa. Protozoan had pseudopodia and ingested erythrocytes in the cytoplasm.

1. *What disease has the patient?*

**Problem 3.**

Which morpho-physiological changes of dysentery amoeba do occur during patient treatment and convalescence?

**Problem 4.**

Group of epidemiologists is directed in natural focus of cutaneous leishmaniasis. You are а doctor of this group.

1. *What measures will you take for prevention of this parasitic disease?*

**Problem 5.**

A patient has genital discharge and pain in urination. Flagellates were found in smears of vaginal discharge.

1. *What disease has the patient?*

**Problem 6.**

Leishmaniasis, trypanosomiasis, giardiasis, trichomoniasis - which of these diseases are transmissible, natural focal? Explain your answer.

**Problem-situational tasks answers**

|  |  |
| --- | --- |
| **№ задачи** | **правильный ответ** |
|  | Entamoeba coli |
|  | Amebiasis |
|  | form magna convert into minuta and then cyst |
|  | vaccine |
|  | trichomaniasis |
|  | leishmaniasis and trypanosomiasis |

**4. Form of progress monitoring: Practical task completion monitoring**

**Work 1. Аmoeba рrоteus .** Работа №1. Амеба протей

Examine and draw the slide *Аmoeba рrоteus.*

**Work 2. Еntamоеbа histolуtica.** Работа №2. Дизентерийная амеба

Examine the slide *Еntamоеbа histolуtica* . What form of amoeba do you see? Draw the life cycleof*Еntamоеbа histolуtica.*

**Work 3. Lamblia intestinalis *(Giardia lamblia).*** Работа №3. Лямблия

Examine the slide *Lamblia intestinalis*. Draw the structure of *Giardia.*

**Work 4. Leishmania.** Работа №4. Лейшмания

Examine and draw the slide *Leishmania* in culture and *Leishmania* in the cell

**Work 5. Trypanosoma.** Работа №5. Трипаносома.

Examine and draw the slide *Trypanosoma.*

**Work 6. *Trichomonas.* Работа №6. Трихомонада**

**Work 7. Solving problems of parasitology**

Работа №7. Решение задач по паразитологии

**Topic 2. Protozoology: Subphylum Sporozoa, Subphylum Ciliophora**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1*.Balantidium coli* belongs to a Subphylum

a) Flagellata

b) Sarcodina

c) Sporozoa

d) Ciliophora

2. Vector of malaria

a) Sandfly *Phlebotomus*

b) Tsetse fly *Glossina*

c) kissing bugs *Triatoma*

d) mosquito *Anopheles*

3. Attributes which are not characteristic for infusorians

a) cilia

b) two nuclei

c) chloroplasts

d) two contractile vacuoles

4.The parasite, which belongs to a phylum *Sporozoa*

a) Paramecium

b) Balantidium

c) Lamblia

d) Toxoplasma

e) Trypanosoma

5. To pathogenic action of *Balantidium* does not concern

a) pains in a stomach

b) cough with sputum

c) ulcers in intestines

d) bloody diarrhea

6.To natural focal transmissible disease doesn’t concern

a) Balantidiasis

b) Trypanosomiasis

c) Malaria

d) Leishmaniasis

7.Localization of Plasmodium in human organism

* 1. liver cell and red blood cells (RBC)
  2. cells of a liver, intestines
  3. red blood cells (RBC) and nervous cells
  4. spleen, lymph nodes

8.Intermediate host of malarial plasmodium is/are

1. human
2. dogs, jackals
3. fine rodents
4. Anopheles mosquito

9. Epidemiological chain of malaria is

a) cattle - Anopheles mosquito - the healthy person

b) sick person - Anopheles mosquito - healthy person

c) sick person - tse-tse fly - healthy person

d) sick person - sandfly - healthy person

10.A material for diagnostics of malaria is

1. cells of liver
2. smear of blood
3. spinal liquid
4. cells of skin

11. Prevention of malaria

1. protection from mosquitoes bites (repellents, nets)
2. revealing and treatment sick people
3. struggle against vectors in all stages of development
4. All answers are true

12.Invasive stage of *Toxoplasma* for human is

1. merozoite, schizonte
2. ookinete
3. oocyst with sporozoites
4. macro- and microgametes

13.Methods of toxoplasmosis diagnostics does not include

1. immunologic reactions
2. allergic tests
3. microscopical investigation of feces
4. histologic

14.Mode of malaria transmission : exclude the incorrect answer

a) Vector-borne

b) Transplacental

c) Blood transfusion or organ transplantation.

d) Fecal-oral

15.*Toxoplasma gondii* belongs to a phylum

a) Flagellata

b) Sarcodina

c) Sporozoa

d) Ciliophora

16. Mosquito *Anopheles* is a vector of

a) malaria

b)Visceral leishmaniasis

c)Cutaneous leishmaniasis

d)American trypanosomiasis

e)African Trypanosomiasis

17.The parasite, which belongs to a phylum *Ciliophora* is

a) paramecium

b) balantidium

c) lamblia

d) toxoplasma

18.Material for laboratory diagnostics of balantidiasis is

a) urine

b) duodenal contents

c) blood

d) feces

19. *Balantidium* coli localizes in

a) blood

b) urine

c) large intestine

d) liver

20.Preventive measures balantidiasis does not include

a) careful washing vegetables, fruit

b) drinking of boiled water

c) struggle against pollution of environment by excrements

d) eating only well thermally treated pork

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | **d** | **11** | **d** |
| **2** | **d** | **12** | **c** |
| **3** | **c** | **13** | **c** |
| **4** | **d** | **14** | **d** |
| **5** | **b** | **15** | **c** |
| **6** | **a** | **16** | **a** |
| **7** | **a** | **17** | **b** |
| **8** | **a** | **18** | **d** |
| **9** | **b** | **19** | **c** |
| **10** | **b** | **20** | **d** |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Subkingdom *Protozoa*. Phylum *Ciliophora (Ciliates).* Characteristics.
2. Non – pathogenic *Ciliates*:

* *Paramecium*

1. Pathogenic *Ciliates*:

* *Balantidium coli*

1. Subkingdom Protozoa. Phylum *Sporozoa*. Characteristics.
2. Pathogenic Sporozoa:

* *Plasmodium*
* *Toxoplasma gondii*

**3. Form of progress monitoring: solving problem-situational tasks**

**Problem 1.**

In the examination of fecal smears of patients with symptoms of acute intestinal colitis was found the large vegetative form of the Protozoa with large sausage-shaped nucleus in the cytoplasm. *What is the name of disease?*

**Problem 2.**

Prophylactic examination of workers of meat plant revealed the presence of vegetative forms of *Protozoa* in some fecal smears. Was focused attention that all vegetative forms were large, rounded and had sausage-shaped nucleus. *Are these workers sick? What name of disease?*

**Problem 3.**

In a blood smear of a patient with attacks of fever in some erythrocytes (staining according to Romanovsky) the accumulations of cherry color nuclei with blue cytoplasm were observed. *What is the cause of the patient fever?*

**Problem 4.**

A patient has fever, swollen lymph nodes. In oral mucous secretions microorganisms in crescent shape was found. The large nucleus is seen in cytoplasm. *What is the name of disease?*

**Problem 5.**

The woman had a child with hydrocephalus (dropsy on the brain). Genetic testing did not reveal pathology. Cause of abnormal development was protozoan invasion. *What is the name of disease?*

**Problem 6.**

Russian Engineer returned from abroad and at once went to the doctor complaining of attacks of fever systematically repeating after 3 days. *What is the name of disease?*

**Problem-situational tasks answers**

|  |  |
| --- | --- |
| **№ задачи** | **правильный ответ** |
|  | Balantidiasis |
|  | Yes, he is sick. Balantidiasis |
|  | Plasmodium vivax |
|  | Toxoplasmosis |
|  | Toxoplasmosis |
|  | Tertian malaria |

**4. Form of progress monitoring: Practical task completion monitoring**

**Work 1. Balantidium coli.** Работа 1.Кишечный балантидий

Examine and draw the slide Balantidium coli

**Work 2. The life cycle of Plasmodium**

Работа 2. Жизненный цикл плазмодия.

**Work 3. Plasmodium vivax.**

Работа 3. Малярийный плазмодий

Examine and draw the slide *Plasmodium vivax.*

**Work 4. The life cycle of Toxoplasma**

Работа 4. Жизненный цикл токсоплазмы.

**Work 5. Toxoplasma gondii .**

Работа 5.Токсоплазма

**Work 6. Solving problems of Parasitology**

Работа 6. Решение задач по паразитологии

**Topic 3. Helminthology: Trematode infections and Cestoidea infections**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1. Parasitic worms, one stage of development of which takes place in the external environment (e.g.soil)

а) biohelminths

b) geohelminths

c) ectoparasites

d) endoparasites

2.Name the systems of organs that are absent in flat worms

а) nervous, sexual

b) digestive

c) respiratory, blood

d) secretory, sexual

3.In the human organism a *Fasciola hepatica* is localized in

а) lungs

b) brain

c) large vessels

d) biliary paths of the liver

4.Peculiarities of structure of the Fasciola’s ova

а) small, pale yellow, without an operculum

b) Large, yellowy-brown, on a pole is an operculum (tegmen)

c) small, dark brown, without an operculum

d) small, colorless, with corks on the poles

5.Definitive host of *Fasciola hepatica* is/are

а) snails

b) dogs, jackals

c) fish

d) human, herbivores

6.To the pathogenic effect of *Opisthorchis felineus* one does not concern

а) toxic and allergic action

b) mechanical arrest of the bile flow

c) ulceration of intestinal mucosa

d) inflammatory processes in liver, cirrhosis

7.The first intermediate host of *Opisthorchis felineus* is/are

а) fish of carp family

b) mollusc *Bitinia*

c) terrestrial molluscs

d) ant *Formica*

8.Invasive stage of *Opisthorchis felineus* for human is

а) cercarium

b) an ovum

c) metacercarium

d) redia

9.Select the worm having one intermediate host

1. *Fasciola hepatica*
2. *Opisthorchis felineus*
3. *Clonorchis sinensis*
4. *Paragonimus westermani*
5. *Dicrocoelium lanceatum*

10.Second intermediate (supplementary) host of *Dicrocоelium lanceatum*

1. mollusc Bitinia
2. fresh-water crayfish and crabs
3. ants
4. terrestrial mollusks
5. fish

11.The anatomic location of inflammation caused by *Schistosoma mansoni* is primarily:

1. the bone marrow
2. renal tubules
3. intestinal venules
4. lung alveoli

12. In the life cycle of blood fluke *Schistosoma* there is no stage of

а) ovum

b) miracidium

c) sporocyst

d) adolescaria

13.Laboratory Diagnosis of paragonimiasis

а) detection of spiral larvae in muscles

b) detection of ova in feces and sputum

c) detection of ova in urine

d) immunological tests

14.Route of opisthorchiasis transmission

1. fecal-oral
2. alimentary
3. vector-borne

d) transplacental

15.In the human organism *Paragonimus westermani* is localized in

а) billiary paths of the liver

b) microbranches of bronchial tubes

c) pancreas

d) small intestine

16.Invasive stage of *Schistosoma mansoni* for human is

а) cercarium

b) an ovum

c) metacercarium

d) redia

17.Select a parasite for which man is only intermediate host

1. *Teaniarhynchus saginatus*
2. *Echinococcus granulosus*
3. *Diphyllobothrium latum*
4. *Hymenolepis nana*

18.Final (Definitive) host of *Taenia solium* is

a) pig

b) human

c) cow

d) dog

19.The finner stage of *Taenia solium* causes disease

a) teaniarinchosis

b) diphyllobothriasis

c) cysticercosis

d) teanianis

20.What preventive measures do not apply to teniasis

a)using well thermally treated pork only

b) sanitary examinations of pig carcasses

c) Diagnosis and Treatment of affected people

d) drinking boiled water

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | b | 11 | c |
| **2** | c | 12 | d |
| **3** | d | 13 | b |
| **4** | b | 14 | b |
| **5** | d | 15 | b |
| **6** | c | 16 | a |
| **7** | b | 17 | b |
| **8** | c | 18 | b |
| **9** | a | 19 | c |
| **10** | c | 20 | d |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Subkingdom *Metazoa.* Phylum *Platyhelminthes*. Classification and characteristics. *Platyhelminthes* life cycle.
2. Pathogenic *Trematoda*:

* Blood fluke: *Schistosoma*
* Lung fluke: *Paragonimus Westermani*
* Biliary (liver) flukes: *Fasciola hepatica*, *Opisthorchis felineus, Dicrocoelium lanceatum*

1. Pathogenic *Cestoda*:

* *Taenia solium* (pork tapeworm), *Teniarhynchus saginatus* (beef tapeworm), *Diphyllobothrium latum* (fish tapeworm), *Echinococcus granulosus*, *Alveococcus multilocularis*, *Hymenolepis nana* (dwarf tapeworm)

**3. Form of progress monitoring: solving problem-situational tasks**

**Problem 1.**

The patient complains of pain at the end of urination. From history: worked 2 years in Africa. Laboratory analysis revealed admixture of blood in urine of patient. Disease caused by *Trematoda* was diagnosed. *What disease has the patient?*

**Problem 2.**

The patient complains of cough and chest pain. Laboratory analysis revealed admixture of blood in sputum. Disease caused by *Trematoda* was diagnosed. *What disease has the patient?*

**Problem 3.**

Husband has a diagnosis Opisthorchiasis. What is the probability of his wife infection from contact at home? *What is the causative agent of disease?*

**Problem 4.**

The patient has pain in the liver. Laboratory analysis detected very small pale yellow eggs of trematodes in duodenal aspirate. *What disease has the patient?*

**Problem 5.**

The patient complains of abdominal pain, loss of appetite, weakness, and occasionally the presence of "noodles" (white tapes) in the faeces. Laboratory analysis detected proglottids of tapeworm. Uterine had 30 lateral branches. *What disease has the patient?*

**Problem 6.**

Patient: 12 years old girl. She complains of abdominal pain, weakness, dizziness. Laboratory analysis detected anemia caused by vitamin B12 deficiency. Disease caused by *Cestoidea* was diagnosed. *What disease has the patient?*

**Problem 7.**

Patient: 2 years old girl. Сomplaints: abdominal pain, loss of appetite, attacks such as epilepsy. Laboratory analysis detected helminthes eggs: colourless, oval, 30–50 µm in diameter, has polar filaments. Shell consists of two distinct membranes. Disease caused by *Cestoidea* was diagnosed. *What disease has the patient?*

**Problem 8.**

Patient: male, 42 years old. Сomplaints: pain in the liver, nausea, low-grade fever. Doctor revealed enlargement of the liver, jaundice. From history: the patient has a dog, like hunting. CT scan revealed rounded shape cyst in right lobe of liver. Disease caused by *Cestoidea* was diagnosed. *What disease has the patient?*

**Problem 9.**

Preventive examination 6 year old boy revealed liver fluke eggs in the faeces (large, yellowy-brown, on a pole is an operculum). However, the child has no symptoms of liver disease. Give a possible explanation for this fact. *What disease can be caused by liver fluke?*

**Problem-situational tasks answers**

|  |  |
| --- | --- |
| **№ задачи** | **правильный ответ** |
|  | Schistosomiasis |
|  | Paragonimiasis |
|  | 0% Opistorchis felineus |
|  | Opisthorchiasis |
|  | teniasis saginata |
|  | Defilobotriasis |
|  | Сysticercosis |
|  | Echinococcosis |
|  | Fascioliasis |

**4. Form of progress monitoring: Practical task completion monitoring**

**Work 1. *Fasciola hepatica.***

Работа №1. Печеночный сосальщик

Examine and draw the slide *Fasciola hepatica.* Find oral and ventral sucker, testicles, uterus with eggs. Draw the structure of the liver fluke.

**Work 2. *Opisthorchis felineus*** and ***Dicrocoelium lanceatum***

Работа №2. Кошачий сосальщик и Ланцетовидный сосальщик

**A)** Examine and draw the slides ***Opisthorchis felineus*** and ***Dicrocoelium lanceatum***. Find the testes and uterus with eggs. Compare the structure of flukes. Draw the structure ***Opisthorchis felineus*** and ***Dicrocoelium lanceatum***

**B)** Consider the slides *Opisthorchis felineus* eggs and *Dicrocoelium lanceatum* eggs. **Draw the eggs**

**Work 3. *Paragonimus westermani.***

Работа №3. Легочный сосальщик

**Work 4. *Taenia solium* and *Taenia saginatus (Taeniarhynchus saginatus)***

Работа №4. Вооруженный цепень и Невооруженный цепень

1. Examine and draw the slides **Сysticercus *Taenia solium*** and **Сysticercus *Taeniarhynchus saginatus*** . Compare scolexes structure. Draw the scolexes *.* Designate the figure suckers and hooks.
2. Examinethe slide ***mature proglottids.*** Remember the differences between **Pork tapeworm** and **Beef tapeworm**
3. Examine **and draw the** slide ***gravid proglottids***
4. Examineand draw the slide ***eggs Taenia solium*** and ***Taenia saginatus***

**Work 5. *Diphyllobothrium latum.*** Работа №5. Широкий лентец

Examineand draw the slides ***gravid proglottids***and ***eggs*** of ***Diphyllobothrium latum***

**Work 6. *Hymenolepis nаnа***

Работа №6. Карликовый цепень

Examine and draw  the slides *Hymenolepis nаnа*

**Work 7. *Echinococcus granulosus*** and ***Echinococcus multilocularis***

Работа 7. Эхинококк и альвеококк

**Work 8. Solving problems of Parasitology**

Работа 8. Решение задач по паразитологии

**Topic 4. Theme: Helminthology: Nematoda infections**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

*Выберите один вариант ответа*

*It is necessary to choose only* ***one*** *version*

1.Round worms haven’t following systems of organs

а) excretory and digestive

b) respiratory and circulatory

c) digestive and nervous

d) nervous and excretory

2.A body cavity of round worms is

a) primary

b) secondary

c) absent

d) mixed

3.The latin name of pinworm is

1. Ascaris lumbricoides
2. Enterobius vermicularis
3. Trichocephalus trichiurus
4. Ancylostoma duodenale

4.Autoinfection occurs in

1. enterobiasis
2. ascariasis
3. trichocephaliasis
4. ancylostomiasis

5.Laboratory diagnosis of enterobiasis is

a) detection of eggs in feces

b) detection of eggs in scraping from perianal folds

c) detection of larva in biopsic muscles

d) the clinical analysis of blood

6.To features of structure *Ascaris lumbricoides* does not concern

a) white - pink colour of a body

b) female’s length – 20-40 cm, male’s length – 15-20 cm

c) mouth surrounded by three lips

d) front end look like whip

7.Oval ova with 3 coats is characterized for

a) Ascaris lumbricoides

b) Enterobius vermicularis

c) Trichocephalus trichiurus

d) Trichinella spiralis

8.Invasive stage of whip-worm for human is

a) egg

b) larvae

c) oncosphere

d) adolescaria

9.The name of the disease caused by whip-worm

a) dracunculiasis

b) trichocephaliasis

c) taeniarhynchiasis

d) trichinosis

10.Biohelminth is

a) Enterobius vermicularis

b) Trichinella spiralis

c) Ascaris lumbricoides

d) Trichocephalus trichiurus

11.Stages of life cycle of hook-worm are following

a) larvae, adult form

b) egg, phaditiform larvae, crysalis, adult form

c) egg, oncosphere, finner, adult form

d) egg, rhabditiform larvae, filariform larvae, adult form

12.Larvae of trichina is localized in

a) chewing muscles and diaphragm

b) small intestine

c) pancreas and liver

d) lungs

13.Invasion stage of trichina for human is

a) egg

b) finn

c) larva

d) oncosphere

14.A way of migration ascaride’s larvae in human organism is

a) intestine – liver portal system – systemic circulation – pulmonary circulation – lungs – oral cavity - intestine

b) intestine – veins of urinary bladder – uterus

c) intestine – lungs – brain

d) small intestine – large intestines – environment

15.All the following parasitic invasions are acquired by ingestion of infective eggs except

a) ascariasis

b) eterobiasis

c) ancylostomiasis

d) trichocephaliasis

16. In an organism of the person Guinea worm is localized in

a) large intestine

b) pancreas, liver

c) subcutaneous fatty tissue

d) muscles

17.The shape of round worms’ body is

1. cylindrical
2. tape-form
3. leaf-form
4. flattened

18.Stages of round worms’ life cycle are following

a) egg, larva, chrysalis

b) egg, oncosphere, adult form

c) egg, larva, adult form

d) egg, larva, finn

*19.Enterobius vermicularis* is commonly known as

1. Roundworm
2. Pinworm
3. Whip worm
4. Hook worm

20.Development without migration occurs at

a) Enterobius vermicularis

b Ascaris lumbricoides

c) Trichinella spiralis

d) Ancylostoma duodenale

**Test answers**

|  |  |  |  |
| --- | --- | --- | --- |
| **№ вопроса** | правильный ответ | **№ вопроса** | правильный ответ |
| **1** | b | 11 | d |
| **2** | a | 12 | a |
| **3** | b | 13 | c |
| **4** | a | 14 | a |
| **5** | b | 15 | c |
| **6** | d | 16 | c |
| **7** | a | 17 | a |
| **8** | a | 18 | c |
| **9** | b | 19 | b |
| **10** | b | 20 | a |

**2. Form of progress monitoring: recitation**

**Lesson questions:**

1. Subkingdom *Metazoa*. Phylum *Nemathelminthes*. Classification and characteristics. *Nemathelminthes* life cycle.
2. Parasites of *Nematoda*:

* *Ascaris lumbricoides* (Аскарида)
* *Trichocephalus trichiuris* - whipworm (Власоглав)
* *Enterobius vermicularis* – pinworm or threadworm (Острица)
* *Trichinella spiralis* (Трихина)
* *Ancylostoma duodenale* and *Necator americanus* (hookworms) (Анкилостома и Некатор)
* *Strongyloides stercoralis* (Угрица кишечная)
* *Dracunculus medinensis* (Ришта)
* *Toxocara* (Токсокара)

1. Filariasis:

* *Wuchereria bancrofti* (Вухерерия)
* *Loa loa* (Лоа-Лоа)
* *Onchocerca volvulus* (онкоцерки)

**3. Form of progress monitoring: solving problem-situational tasks**

**Problem 1.**

The child has severe itching at night in the anus area, weakness, irritability, loss of appetite, abdominal pain. Disease caused by Nematoda was diagnosed. *What disease has the patient?*

**Problem 2.**

Woman found in your cat's feces fusiform worms, size 5-8cm. *What is the kind of parasites?*

**Problem 3.**

Child ate unwashed strawberries. What types of roundworms he could infected?

**Problem 4.**

Patient: male, 50 years old. Complaints: high fever, severe muscle pain, swelling of the face. From history: working as a forester, like hunting, often eats the meat of wild animals. A blood test revealed eosinophilia. Disease caused by Nematoda was diagnosed. *What disease has the patient?*

**Problem 5.**

Patient: male 5 years old. Сomplaints: abdominal pain, vomiting. Mom saw some fusiform worms in the vomit, size 15-20 cm. *What disease has the patient?*

**Problem 6.**

Patient: male 7 years old. Complaints: colicky abdominal pain, diarrhea, weakness, dizziness, transient loss of consciousness. A blood test revealed anemia. Laboratory analysis revealed eggs of roundworms. Eggs was barrel-shaped, colorless and have bipolar protuberances.*What disease has the patient?*

**Problem-situational tasks answers**

|  |  |
| --- | --- |
| **№ задачи** | **правильный ответ** |
|  | Enterobiasis |
|  | Toxocarosis |
|  | Ascariasis, Ankilostomiasis, Strongiloidiasis |
|  | Trichinosis |
|  | Ascariasis |
|  | Trichocephalosis |

**4. Form of progress monitoring: Practical task completion monitoring**

**Work 1. *Ascaris lumbricoides.*** Работа №1. Аскарида человеческая

**Work 2. *Trichocephalus trichiurus.***

Работа №2. Власоглав

**A)** **Examine** the fixed *Trichocephalus trichiurus* and slide *Trichocephalus trichiurus.*  Draw **male and female** *Trichocephalus trichiurus.*

**B)** Examine the slide **Eggs of** *Trichocephalus trichiurus.* Draw **Eggs.**

**Work 3. *Enterobius vermicularis.*** Работа №3. Острица

**A)** Examine the slide ***Enterobius vermicularis.*** Draw male and female

**B)** Examine  the slide **Eggs of *Enterobius vermicularis****.* DrawEggs**.**

**Work 4. *Trichinella spiralis.***

Работа №4. Трихина

**Work 5. *Toxocara, Ancylostoma, Strongyloides, Dracunculus, Filaria***

Работа 5. Токсокара, анкилостома, угрица, ришта, филярии

**Work 6. Solving problems of Parasitology**

Работа 6. Решение задач по паразитологии

**Topic 5. Medical arachnoentomology. Phylum Arthropoda.**

**Monitoring form (s):**

1.testing

2. oral questioning

3.control of the implementation of the practical task

**Evaluation materials for progress monitoring:**

**1. Form of progress monitoring: testing**

**Lesson questions:**

1. Phylum *Arthropoda* (The Arthropods). General characteristics, Classification.
2. Class *Crustacea*. General characteristics, medical significance of Some Crustaceans
3. Class *Arachnida.* General characteristics, medical significance
4. Order *Scorpions.* General characteristics, medical significance
5. Order *Solifugae* (camel spiders). General characteristics, medical significance
6. Order *Aranei* (Spiders). General characteristics, medical significance. Venomous spiders
7. Order *Acarina* (Ticks and mites). General characteristics, classification, medical significance
8. Acariform ticks *(Acariformes). Sarcoptes scabei, Demodex folliculorum.* Characteristics, medical significance
9. Family *Ixodidae ("*hard ticks").Genus *Ixodes,* Genus *Dermacentor,* Genus *Rhipicephalus.* Characteristics, medical significance
10. Family *Argasidae ("*soft ticks*").* Characteristics, medical significance
11. Class *Insectа.* General characteristics, classification, medical significance
12. Order *Phthiraptera (=Anoplura).* Lice. Characteristics, medical significance
13. Order *Siphonaptera.* Fleas. Characteristics, medical significance

**2. Form of progress monitoring: Practical task completion monitoring**

**WORK 1. Demo slide: Iitch-mite – *Sarcoptes scabiei or Acarus siro.***

Работа №1.Чесоточный зудень /*Sarcoptes scabiei or Acarus siro*/

Examine the slide *Sarcoptes scabiei* (adult). Write down their medical significance

**WORK 2. Head louse (*Pediculus humanus capitis*)**

Работа №2. Вошь головная /*Pediculus capitis*/

Examine the slide *Pediculus capitis* (adult)

**WORK 3. Human flea /*Pulex irritans/***

Работа №3. Блоха человеческая /*Pulex iriritans*/

Examine the slide adult *Pulex irritans* (adult)

**WORK 4. European Sheep tick /*I. ricinus/,* Taiga tick */I. persulcatus/ and Dermacentor pictus***

Работа №4. Европейский овечий клещ, таежный клещ, клещ дермацентор. Look in the microscope adult mites without drawing

**WORK 5. Medical significance of some ticks**

Работа №5. Медицинское значение некоторых клещей

Examine some of the tick’s species in a Petri dish and write down their medical **significance.** Determine the sex differences.

**WORK 6. Medical significance of some insects**

Работа №6. Медицинское значение некоторых насекомых

**WORK 7. The main differences of the mosquitoes *Culex* and *Anopheles***

Работа №7. Основные отличия обыкновенного и малярийного комаров

Examine and draw the slide **head, larva, pupa** and **egg** of *Culex sp.* and *Anopheles sp.*

**“Assessment criteria used in the current control of progress, including in the control of students' independent work”.**

|  |  |
| --- | --- |
| **Monitoring form** | **Assessment criteria** |
| **Recitation** | On "FIVE POINTS" the answer is assessed, which shows solid knowledge of the main questions of the studied material, is distinguished by the depth and completeness of the disclosure of the topic; knowledge of the terminological apparatus; the ability to explain the essence of phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples; fluency in monologue speech, consistency and consistency of the answer. |
| On "FOUR POINTS" the answer is assessed, which reveals a solid knowledge of the basic questions of the studied material, differs in the depth and completeness of the disclosure of the topic; knowledge of the terminological apparatus; the ability to explain the essence of phenomena, processes, events, draw conclusions and generalizations, give reasoned answers, give examples; fluency in monologue speech, consistency and consistency of the answer. However, one or two inaccuracies in the answer are allowed. |
| On "THREE POINTS" the answer is assessed, which testifies mainly to the knowledge of the studied material, which is characterized by insufficient depth and completeness of the disclosure of the topic; knowledge of the basic issues of theory; poorly formed skills in analyzing phenomena, processes, insufficient ability to give reasoned answers and give examples; lack of fluency in monologue speech, logic and consistency of the answer. Several mistakes are allowed in the content of the answer. |
| On "TWO POINTS" the answer is assessed, revealing ignorance of the studied material, characterized by a shallow disclosure of the topic; ignorance of the main issues of theory, unformed skills in the analysis of phenomena, processes; inability to give reasoned answers, weak command of monologue speech, lack of consistency and consistency. Serious errors in the content of the answer are allowed. |
| ZERO POINTS" is given if there is no answer |
| **Testing** | "FIVE POINTS" is given on condition of 90-100% correct answers |
| "FOUR POINTS" is given on condition of 80-89% correct answers |
| "THREE POINTS" is given on condition of 70-79% correct answers |
| "TWO POINTS" is given on condition of 60-69% correct answers |
| "ONE POINTS" is given on condition of 50-59% correct answers |
| "ZERO POINTS" is given 49% or less correct answers or if there is no answer |
| **Problem-situational tasks** | "FIVE POINTS" - the student correctly and fully conducts the initial assessment of the condition, independently identifies the satisfaction of which needs are violated, determines the patient's problems, sets goals and plans nursing interventions with their justification, conducts current and final assessment. |
| "FOUR POINTS" - the student correctly conducts the initial assessment of the condition, identifies the satisfaction of what needs are violated, determines the patient's problems, sets goals and plans nursing interventions with their justification, conducts the current and final assessment. Some minor difficulties in answering are allowed; justification and final assessment is carried out with additional comments from the teacher. |
| "THREE POINTS" - the student correctly but incompletely conducts the initial assessment of the patient's condition. Identifying the satisfaction of what needs are violated, determining the patient's problem is possible with leading questions from the teacher. Sets goals and plans for nursing interventions without justification, conducts ongoing and final assessment with leading questions from the teacher; Difficulties with a comprehensive assessment of the proposed situation. |
| "TWO POINTS" - wrong assessment of the situation; incorrectly chosen tactics of action. |
| "ZERO POINTS" is set if there is no answer. |
| **Completing assignments in workbooks** | *Notebooks must be submitted for verification no later than the period of the lesson following the lesson with midterm control in this discipline (module).*  *In case of late delivery of the notebook, points for registration will not be awarded.*  *An increase in the score for the design of notebooks is not provided.* |
| "FIVE POINTS" is awarded for a timely completed high-quality notebook, in which all tasks in all topics of the notebook are correctly completed; |
| “FOUR POINTS” is awarded if all tasks of all topics were completed, but serious mistakes or inaccuracies were made that do not distort the essence of the task;  - all tasks of all topics were correctly completed, but "poorly designed" (for example, design is provided with colored pencils, but it is done with a simple or pen; it is necessary to provide the stages of implementation / solution, but it is not, etc.);  - all topics and tasks have been completed, but some mistakes are made that distort the meaning of the task;  - the design of the notebook corresponds to "5 points", but it was submitted later than the deadline; |
| "THREE POINTS" is given if all topics and tasks have been completed, but systematic errors are made that distort the meaning of the tasks;  - the tasks of the topics are performed efficiently, but by less than 70%;  - more than 70% of the topics are not completed, but the rest are designed efficiently and competently;  - the design of the notebook corresponds to "4 points", but was submitted later than the deadline; |
| "TWO POINTS" is given if the tasks of the topics were completed from 50 to 70%, with high quality and without errors;  - all tasks of all topics are completed, but more than 50% of them make mistakes that distort the meaning of the tasks;  - the design of the notebook corresponds to "3 points", but it was submitted later than the deadline; |
| "ZERO POINTS" is given if tasks are completed by less than 20%;  - completed less than 20% of topics;  - the notebook has not been submitted for verification;  - the design of the notebook meets the criteria for 5,4,3,2,1 points ", but was submitted later than the last lesson in the next module |

**3. ESTIMATED MATERIALS OF MIDTERM CERTIFICATION OF STUDENTS.**

**3.1. Midterm certification in the discipline** "Biology" is carried out in the form of an exam in the 2nd semester (spring semester in the 1st year).

The exam rating is the sum of the points for the exam checkpoints on the ticket on the day of the oral exam.

The exam ticket has three parts:

1. Exam testing conducted in a computer laboratory. Maximum 5 points.

2. Theoretical part: includes 2 questions on the subjects of the discipline, each of which is evaluated from 0 to 5 points.

3. Practical part: includes 3 tasks (solving a genetic problem, solving a problem in genetics, including a hereditary disease and a parasitology slide (photograph of a slide).

Each task is evaluated from 0 to 5 points. The maximum amount of points is 30.

The criteria for assessing each type of assignment are specified in the Assessment fund for this discipline.

**Disciplinary rating RD (final rating) is based on the current rating RC (knowledge assessment or rating of academic performance), bonus rating RB and exam rating RE! The bonus rating includes required marks (attendance of lectures and practical classes) and additional points (optional).**

**RD=RC+RB+RE**

**RB= required bonus marks+Additional bonus marks**

**Additional bonus marks will be awarded to students who took part in the Biological Olympiad**

**On the exam at the end of the oral answer, the examiner calculates the arithmetic average of all control points and, according to the table, translates into an exam rating. The maximum value is 30 points.**

**Exam rating / Экзаменационный рейтинг**



If the exam rating (RE) is less than 15 points (i.e., the average score for the answer is less than 2.5), the disciplinary rating (RD) is not calculated. Discipline is considered not mastered.

If RE is 15 or more points, but RC is less than 35, the disciplinary rating (RD) is not calculated. Discipline is considered not mastered.

The resulting score RD is rounded to the nearest whole value in accordance with the mathematical rules and according to the table regulated by the regulation "On the point-rating system for assessing the educational achievements of students" (version 3, P 004.03-2020), is transferred to the assessment of the discipline.



The received results RD and the mark for the discipline are entered into the examination sheet.

In the student's record book, the grade for the discipline "excellent", "good", "satisfactory" is given in accordance with the rating in the discipline.

**3.2. Re-midterm certification.**

The results of a student who received on the exam less than 15 points of the examination rating or less than 35 points of the current standardized rating are recognized as unsatisfactory and the student has academic debt. Students who do not show up for the exam for an unjustified reason are subject to re-midterm certification.

The disciplinary rating during the repeated intermediate certification is calculated on the basis of the examination rating without taking into account the current standardized rating in accordance with clause 11.10 and Appendix 5 of the Regulation On the point-rating system for assessing the educational achievements of students "(version 3, P 004.03-2020)

Exam rating conversion table in the disciplinary rating

with **re-midterm certification**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| RE | RD | **Mark** | RE | RD | **Mark** | RE | RD | **Mark** |
| 15 | 50 | satisfactorily | 20 | 70 | good | 25 | 86 | excellent |
| 16 | 54 | satisfactorily | 21 | 74 | good | 26 | 89 | excellent |
| 17 | 59 | satisfactorily | 22 | 78 | good | 27 | 92 | excellent |
| 18 | 64 | satisfactorily | 23 | 82 | good | 28 | 95 | excellent |
| 19 | 69 | satisfactorily | 24 | 85 | good | 29 | 98 | excellent |
|  |  |  |  |  |  | 30 | 100 | excellent |

**Criteria used for assessing students at intermediate certification**

Computer testing is rated based on a maximum of 100%.

|  |  |  |
| --- | --- | --- |
| Result in % |  | Mark |
| 0-10% |  | - 0 |
| 11-30% |  | - 1 |
| 31-49% |  | - 2 |
| 50-55% |  | - 2,5 |
| 56–64% |  | - 3 |
| 65–70% |  | - 3,5 |
| 71–80% |  | - 4 |
| 80–85% |  | - 4,5 |
| 86–100% |  | - 5 |

Criteria for evaluating ticket theoretical questions:

"4.1 - 5" - is awarded for informal and deliberate, deep, complete answers to all questions of the ticket (theoretical and practical), as well as additional questions from the examiner.

"3.1 - 4" - is awarded for good mastering of the material; sufficiently complete answers to all questions of the ticket, independent problem solving, correct craniometric measuring manipulations and determination of the skulls of fossil hominids. However, in the assimilation of the material and presentation there are shortcomings that are not of a fundamental nature. In case of controversial answers to one of the questions on the ticket to the student, an additional question may be asked.

"2.1 - 3" - is awarded for partially correct or insufficiently complete answers to the questions of the ticket and additional questions that indicate significant deficiencies of the student, for formal answers based on cramming, lack of understanding of the question.

“1-2” - is awarded for meaningless answers to ticket questions and additional questions, ignorance of the basic concepts of the discipline, inability to apply knowledge in practice.

"0" - is displayed without a conversation on ticket issues, if the student has not solved the problem and has not coped with the proposed practical task, as well as if the student refuses to answer.

Criteria for evaluating a genetic problem.

|  |  |
| --- | --- |
| **Mark** | **Criteria** |
| 4,1 - 5 | 1. The type of inheritance of the trait (s) is correctly defined. 2. The genotypes and phenotypes of the parents and their gametes are correctly identified. 3. The genotypes and phenotypes of the offspring are correctly identified. 4. The answer to the question (s) posed is correct. 5. Correct formulation of the problem. |
| 3,1 - 4 | 4 of 5 criteria are answered correctly |
| 2,1 - 3 | Answers to 2-3 of 5 criteria are correct. |
| «0-2» | The problem has not been solved.  Gross biological mistakes were made. |

Criteria for evaluating a problem in genetics involving a hereditary disease.

|  |  |
| --- | --- |
| **Mark** | **Criteria** |
| 4,1 - 5 | the student gave the correct answer to the problem question. The explanation of the course of its solution is detailed, consistent, competent, with theoretical justifications (including from the lecture course), with the necessary schematic images and demonstrations of practical skills, with correct and fluent knowledge of terminology; answers to additional questions are correct, clear. |
| 3,1 - 4 | the student gave the correct answer to the problem question. The explanation of the course of its solution is detailed, but not logical enough, with isolated errors in details, some difficulties in theoretical justification (including from the lecture material), in schematic images and demonstrations of practical actions, the answers to additional questions are correct, but not clear enough. |
| 2,1 - 3 | the student gave the correct answer to the problem question. The explanation of the course of its solution is insufficiently complete, inconsistent, with errors, poor theoretical justification (including lecture material), with significant difficulties and errors in schematic images and demonstration of practical skills, answers to additional questions are not clear enough, with errors in details. |
| 2 | the student gave the correct answer to the problem question. The explanation of the course of its solution is given incomplete, inconsistent, with gross errors, without theoretical justification (including lecture material), without the ability to schematic images and demonstrations of practical skills, or with a large number of errors, answers to additional questions are incorrect or absent. |
| 1 | correct answer, but without explanation, answers to additional questions and demonstration of practical skills |
| 0 | **“0 points”** is given if the answer is incorrect or absent. |

Criteria for evaluating the practical skill of identifying a parasite from photographs.

|  |  |
| --- | --- |
| **Mark** | **Criteria** |
| **5** | a complete answer, including the Latin and Russian name of the representative, its systematic position, morphology and biology of the parasite, features of the disease. |
| **4** | good assimilation of the material; fairly complete answers to all questions. However, in the assimilation of the material and presentation there are shortcomings that are not of a fundamental nature. |
| **3** | partially correct or insufficiently complete answers to questions indicating significant shortcomings of the student, for formal answers based on cramming, misunderstanding of the question, if it is not included in the risk group. |
| **2** | meaningless answers to questions, ignorance of the basic concepts of parasitology, inability to apply knowledge in practice. |
| **1** | gross errors in the answer and in the execution of the task. |
| **0** | refusal to complete the task or no answer |

**Questions to test the theoretical knowledge of the discipline**

**EXAM QUESTIONS**

|  |  |  |
| --- | --- | --- |
|  | **CYTOLOGY** | |
|  | Microscope device | Устройство микроскопа |
|  | Rules for Microscope Use | Правила пользования микроскопом |
|  | Forms of life: cellular and not cellular. Сlassification of living organisms. | Формы жизни: клеточные и неклеточные. Классификация живых организмов. |
|  | Differences between prokaryotes and eukaryotes | Различия между прокариотами и эукариотами |
|  | The main structure components of eukaryotic cell. | Основные структурные компоненты эукариотической клетки. |
|  | Differences between Animal and Plant cells | Различия между животной и растительной клетками |
|  | Cytosol: Composition and Function. | Цитозоль: состав и функции |
|  | Cytoplasmic inclusions: definition and differences from organelles, types of cytoplasmic inclusions | Цитоплазматические включения: опреление, отличие от органелл, виды включений. |
|  | Classification of Organelles. Structure and Function of:  Mitochondria  Ribosomes  Endoplasmic reticulum  Golgi bodies  Lysosomes  Cytoskeleton: Microtubules and Microfilaments  Centrosome and centrioles  Flagella and Cilia | Классификация органелл. Строение и функции:  Митохондрий  Рибосом  Эндоплазматической сети  Аппарата Гольджи  Лизосом  Цитоскелет: Микротрубочки и микрофиламенты  Клеточный центр и центриоли  Реснички и жгутики |
|  | Structure, property and Function Plasma membrane. | Строение, свойства и функции плазматической мембраны. |
|  | Membrane Transport:  Passive transport: simple and facilitated diffusion, osmosis  Active transport: phagocytosis and pinocytosis, the sodium-potassium pump or Na +/K+-ATPase | Мембранный транспорт:  Пассивный транспорт: простая и облегченная диффузия, осмос  Aктивный транспорт: фагоцитоз, пиноцитоз, K/Na-насос |
|  | Types of solutions: isotonic, hypertonic and hypotonic | Виды растворов: изотонический, гипертонический и гипотонический. |
|  | Behavior of cells in different solutions. Value of solutions in medicine. | Поведение клеток в разных растворах. Значение растворов в медицине. |
|  | The overall plan of the nuclear structure. The role of the nucleus in the cell activity. | Общий план строения ядра. Роль ядра в жизнедеятельности клетки. |
|  | Structure and function of the nuclear envelope. The structure of the nuclear pore | Строение и функции ядерной оболочки. Строение ядерных пор. |
|  | The chemical composition and structure of chromatin. The concept of euchromatin and heterochromatin. | Химический состав и структура хроматина. Понятие об эухроматине и гетерохроматине. |
|  | Nucleosome - the structural unit of chromatin. The stages in the formation of chromatin packaging of chromosomes. | Нуклеосома - структурная единица хроматина. Этапы упаковки хроматина при образовании хромосом. |
|  | Modern ideas about the structure of chromosomes. Terms of chromosomes | Современные представления о структуре хромосом. Правила хромосом |
|  | Karyotype. Methods of study of the karyotype. International Classification of chromosomes (Denver and Paris) | Кариотип. Методы изучения кариотипа. Международные классификации хромосом (Денверская и Парижская) |
|  | The structure of the DNA molecule. The functions of DNA. Properties of DNA replication and repair. The mechanism of DNA replication | Строение молекулы ДНК. Функции ДНК. Свойства ДНК: репликация и репарация. Механизм репликации ДНК |
|  | Differences of RNA from DNA. The functions of RNA. | Отличия РНК от ДНК. Функции РНК. |
|  | Cytoplasmic inheritance. Plasmids and their role in prokaryotes and eukaryotes. | Цитоплазматическая наследственность. Плазмиды и их роль у прокариот и эукариот. |
|  | Reproduction. Levels of reproduction. The evolution of reproduction | Воспроизводство. Уровни воспроизводства. Эволюция воспроизводства |
|  | Reproduction of organisms: asexual and sexual reproduction; in single-celled and in multicellular organisms. | Воспроизводство организмов: бесполое и половое размножение; у одноклеточных и многоклеточных организмов. |
|  | [Cell](http://www.britannica.com/EBchecked/topic/101396/cell) reproduction. [Life-cycle](http://www.britannica.com/EBchecked/topic/340084/life-cycle). Interphase. Mitosis. Cytokinesis. Characteristic of stages | Размножение клеток. Жизненный цикл. Интерфаза. Митоз. Цитокинез. Характеристика стадий |
|  | Meiosis. Characteristic of stages | Мейоз. Характеристика стадий |
|  | Differences and similarity between a mitosis and meiosis | Отличия и сходство между митозом и мейозом |
|  | Gametogenesis. Characteristic of stages | Гаметогенез. Характеристика этапов. |
|  | Gametes: structure and functions. Egg and sperm. | Гаметы: структура и функции. Яйцеклетка и сперматозоид. |
|  | The genetic code. Properties of genetic code. | Генетический код. Свойства генетического кода. |
|  | Central dogma molecular biology. | Центральная догма молекулярной биологии. |
|  | Basic structure of a protein-coding gene at Prokaryotes and Eukaryotes (operon, transcripton). | Базовая структура белок-кодирующих генов у прокариот и эукариот (оперон, транскриптон) |
|  | Stages of synthesis of protein: Transcription and Translation | Этапы синтеза белка: транскрипция и трансляция |
|  | Transcription. Stages of Transcription (initiation, elongation, termination). | Транскрипция. Этапы транскрипции (инициация, элонгация, терминация). |
|  | Transcription product - all RNA types. Characteristics of tRNAs, mRNA, rRNA, snRNA. | Продукты транскрипции – все типы РНК. Характеристика мРНК, тРНК, рРНК, snRNA |
|  | Processing. Steps of Processing: capping, the "poly-A tail", splicing. The Alternative splicing. | Процессинг. Этапы процессинга: кзпирование, поли-аденирование, сплайсинг. Альтернативный сплайсинг. |
|  | Translation. Stages of Translation. Translation product. | Трансляция. Этапы трансляции. Продукт трансляции. |
|  | Protein Modifications. Levels of protein structure. | Модификация белков. Уровни структуры белка. |
|  | Control of an expression of genes. Two mechanisms of gene control: positive and negative. The *lac* operon [Escherichia coli](http://en.wikipedia.org/wiki/Escherichia_coli). | Контроль экспрессии генов. 2 механизма контроля генов: позитивный и негативный. Лактозный оперон Кишечной палочки. |
|  | Gene Regulation in Eukaryotes. Levels of control of gene expression in eukaryotes. | Регуляция гена у эукариот. Уровни контроля экспрессии гена у эукариот. |
|  | **GENETICS** | |
|  | Basic Concepts in Genetics:  genetics, heredity, gene, genome, chromosomes, DNA, locus, allele, trait, genotype, phenotype, dominant allele, recessive allele, heterozygotes, homozygotes, the monohybrid cross, the dihybrid cross, polyhybrid cross, hybrid, test cross, backcross | Основные понятия генетики |
|  | Mendel’s 1st Law (Law of Dominance) | Первый закон Менделя (Закон доминирования) |
|  | Mendel’s 2st Law (The Low of Segregation) | Второй закон Менделя (Закон расщепления) |
|  | Mendel’s 3nd Law (The Law of Independent Assortment) | Третий закон Менделя (Закон независимого наследования) |
|  | Linked genes. Complete and Incomplete Linkage. Recombination of Linked Genes: Crossing Over. Morgan’s Experimental Evidence of linked inheritance | Сцепленные гены. ЗаконМоргана. |
|  | Chromosome Theory of Linkage | Хромосомная теория сцепления |
|  | Gene Mapping (a genetic map, a linkage map, a cytological maps, a map of sequence) | Картирование хромосом. Виды карт. |
|  | Sex determination: chromosome theory of sex determination (heterogametic sex and a homogametic sex) | Пол. Хромосомная теория пола. |
|  | Bridges' Genie Balance Theory of Sex Determination | Балансовая теория определения пола. |
|  | Sex-Linked Genes. Inheritance of Sex-Linked Genes (X-linked recessive inheritance, examples, X-linked dominant inheritance, examples, Y- linked inheritance , examples) | Сцепленные с полом гены. Наследование признаков, сцепленных с полом. |
|  | Multiple alleles | Множественные аллели. |
|  | The ABO blood group system | Система групп крови. |
|  | Rhesus system | Система резус фактора |
|  | Hemolytic disease of the fetus and newborn | Гемолитическая болезнь плода и новорожденных. |
|  | Blood transfusion and its components | Переливание крови и ее компонентов. |
|  | The human leukocyte antigen (HLA) system. Value of HLA system at organs and tissues transplantation. | Система HLA. Значение системы гистосовместимости для трансплантации. |
|  | Interactions between allelic genes (complete dominance and incomplete, dominance, overdominance, codominance, interallelic complementation, allelic exclusion) | Взаимодействие аллельных генов. |
|  | Interactions between non-allelic genes (complementary, epistasis, polymerism) | Взаимодействие неаллельных генов. |
|  | Variability, definition. Classification of variability | Изменчивость. Классификация. |
|  | Non-hereditary variability. Characteristics of modification variability. Norm of reaction. Examples | Ненаследственная изменчивость. Характеристика модификационной изменчивости. Норма реакции. Примеры. |
|  | Expressivity and penetrance genes - modifications of Phenotypes | Экспрессивность и пенетрантность генов - модификации фенотипов. |
|  | Hereditary or Genotypic variability. Classification and characteristics | Наследственная или генотипическая изменчивость. Классификация и характеристика. |
|  | Combinative variability. Mechanism of combinative variability. Value for evolution | Комбинативная изменчивость. Механизм. Значение для эволюции. |
|  | Mutational variability. Mutation theory of Hugo de Vries. Mutations, their classification. Mutagenesis and mutagen agent. Anti-mutagenic mechanisms in multicellular animals | Мутационная изменчивость. Мутационная теория Гуго де Фриза. Мутации, их класификация. Мутагенез и мутагены. Антимутагенные механизмы многоклеточных организмов. |
|  | Gene-level mutation. The types of gene mutations (mutations without reading frame shift - point mutation - silent, missense and nonsense, frameshift mutation: insertions, deletions and duplications). | Генные мутации. Типы генных мутаций. |
|  | Gene diseases and their characteristics: sickle-cell anaemia (SCA), Phenylketonuria (PKU), Albinism, Galactosemia. | Генные болезни иих характеристика: серповидно-клеточная анемия (СКА), фенилкетонурия (ФКУ), альбинизм, галактоземия. |
|  | Chromosomal Abnormalities, classification and characteristics: numerical aberrations (Genomic mutations) and structural aberrations (Chromosomal aberrations). Mechanism of pathology. | Хромосомные нарушения, классификация и характеристика: численные нарушения (геномные мутации) и структурные нарушения (хромосомные аберрации). Механизм патологии. |
|  | Chromosomal diseases condition that results from genome mutation - numerical aberrations: Down Syndrome, Patau syndrome, Edwards syndrome, Turner Syndrome, Klinefelter Syndrome, Triple X Syndrome. | Хромосомные болезни как результат геномных мутаций – численных нарушений: синдром Дауна, синдром Патау, синдром Эдвардса, синдром Тернера, синдром Клайнфельтера, синдром трипло Х. |
|  | Chromosomal diseases condition that results from Chromosomal aberrations - structural aberrations: Cri du chat Syndrome or cat-cry Syndrome, deletion syndrome, duplication syndrome, Down Syndrome (Translocation) | Хромосомные болезни как результат хромосомных аберраций – структурных перестроек: синдром «кошачьего крика», делеционные синдолмы, дупликационные синдромы, синдром Дауна (транслокационный) |
|  | Genetic counseling: purpose, stages of counseling, types of genetic testing | Медико-генетическое консультирование: цель, этапы, типы генетического тестирования |
|  | Methods of Medical genetics:   1. Dermatoglyphics 2. Phenotypic analysis 3. Pedigree Analysis 4. Biochemical test (screening) 5. Cytogenetic analysis or Cytogenetic Test Methods (Chromosomal analysis):  * Buccal scraping or smear (Sex chromatin test) * Karyotyping * FISH  1. Molecular analysis (DNA sequencing) 2. Prenatal Diagnosis 3. Somatic cell hybridization 4. Twin study 5. Population genetics statistical methods. The Hardy-Weinberg Principle. | Методы диагностики наследственных болезней:   1. Дерматоглифика 2. Фенотипический анализ 3. Клинико-генеалогический метод 4. Биохимический метод (скрининг) 5. Цитогенетический анализ или метод цитогенетического теста (анализ хромосом):  * Соскоб слизистой щеки (анализ полового хроматина) * Кариотипирование * Флюоресцентное окрашивание и гибридизация in situ  1. Молекулярный анализ (ДНК секвенирование) 2. Пренатальная диагностика 3. гибридизация соматических клеток 4. Близнецовый метод 5. Популяционно-статистический метод. Закон Харди-Вайнберга |
|  | **PARASITOLOGY** | |
|  | Parasitism. Sections of Medical Parasitology. | Паразитизм. Разделы медицинской паразитологии. |
|  | Prerequisites to a parasitic way of life. Adaptation of parasites to parasitic life | Предпосылки к паразитическому образу жизни. Адаптации паразитов к паразитическому образу жизни. |
|  | Pathogenic effect of the parasite on the host organism: Mechanical, Toxic, Trophic, Allergy, Immunological. | Патогенное действие паразита на организм хозяина: механическое, токсическое, трофическое, аллергическое, иммунологическое. |
|  | Сlassification of parasites | Классификация паразитов. |
|  | Life Cycle. Сlassification of Host. Parasitic system: Monoxenic parasites, Dixenic parasites, Trixenic parasite. | Жизненный цикл. Классификация хозяев. Паразитарные системы: моноксенные, диксенные, триксенные |
|  | Localization of a parasite in a human body | Локализация паразита в организме человека. |
|  | Transmission mechanism and Route (pathway). Transmission factors. Invasive (Infective) stage. Carriers organisms for circulating pathogen in nature | Механизм и путь передачи. Факторы передачи. Инвазионная стадия. Переносчики для циркуляции возбудителя в природе. |
|  | Natural focal disease: Transmissible and Non-transmissible. Devastation and Deworming. | Природно-очаговые болезни: трансмиссивные и нетрансмиссивные. Девастация и дегельминтизация. |
|  | Subkingdom Protozoa. Classification and characteristics. Protozoa life cycle. | Тип Простейшие. Классификация и характеристика. Жизненный цикл простейших. |
|  | Phylum Sarcomastigophora: Subphylum Sarcodina and Mastigophora. Characteristics. | Надкласс Саркомастигофоры. Подкласс Саркодовые и Жгутиковые. Характеристика. |
|  | Non – pathogenic Sarcodina:   * Ameba proteus * Entamoeba gingivalis * Entamoeba coli | Непаразитические Саркодовые:   * Амёба протей * Ротовая амёба * Кишечная амёба |
|  | Pathogenic Sarcodina:   * Entamoeba histolytica * Acanthamoeba * Naegleria | Патогенные Саркодовые:   * Дизентерийная амёба * Акантамёба * Неглерия |
|  | Non – pathogenic Mastigophora:   * [Euglena](file:///F:\макеты%20и%20комплект%20к%20содержанию%20дисциплины\ФИС\EuglenaMotion-S.mov) | Непатогенные Жгутиковые:   * Эвглена |
|  | Pathogenic Mastigophora:   * Giardia lamblia (Lamblia intestinalis) * Trypanosoma * Leishmania * Trichomonas * Naegleria | Патогенные Жгутиковые:   * Лямблия * Трипаносома * Лейшмания * Трихомонада * Неглерия |
|  | Subkingdom Protozoa. Phylum Ciliophora (Ciliates). Characteristics. | Тип Простейшие. Класс Инфузории. Характеристика. |
|  | Non – pathogenic Ciliates:   * Paramecium | Непаразитические Инфузории:   * Инфузория туфелька |
|  | Pathogenic Ciliates:   * Balantidium coli | Патогенные Ифузории:   * Кишечный балантидий |
|  | Subkingdom Protozoa. Phylum Sporozoa. Characteristics. | Тип Простейшие. Класс Споровики. |
|  | Pathogenic Sporozoa:   * Plasmodium * Toxoplasma gondii | Патогенные Споровики:   * Малярийные плазмодии * Токсоплазма |
|  | Subkingdom Metazoa. Phylum Platyhelminthes. Classification and characteristics. Platyhelminthes life cycle. | Тип Плоские черви. Классификация и характеристика. Жизненный цикл плоских червей. |
|  | Pathogenic Trematoda:  Blood fluke:   * Schistosoma   Lung fluke:   * Paragonimus Westermani   Biliary (liver) flukes:   * Fasciola hepatica, * Opisthorchis felineus, * Dicrocoelium lanceatum | Патогенные Сосальщики:  Кровяные паразиты:   * Шистосомы   Лёгочный паразиты:   * Парагонимус Вастермани   Печеночные паразиты:   * Печеночный сосальщик, * Кошачий сосальщик, * Ланцетовидный сосальщик |
|  | Pathogenic Cestoda:   * Taenia solium (pork tapeworm), * Teniarhynchus saginatus (beef tapeworm), * Diphyllobothrium latum (fish tapeworm), * Echinococcus granulosus, * Alveococcus multilocularis, * Hymenolepis nana (dwarf tapeworm) | Патогенные Ленточные:   * Свиной цепень * Бычий цепень * Широкий лентец * Эхинококк * Альвеококк * Карликовый цепень |
|  | Subkingdom Metazoa. Phylum Nemathelminthes. Classification and characteristics. Nemathelminthes life cycle. | Тип Круглые черви. Классификация и характеристика. Жизненный цикл Круглых червей. |
|  | Parasites of Nematoda:   * Ascaris lumbricoides (Аскарида) * Trichocephalus trichiuris - whipworm (Власоглав) * Enterobius vermicularis – pinworm or threadworm (Острица) * Trichinella spiralis (Трихина) * Ancylostoma duodenale and Necator americanus (hookworms) (Анкилостома и Некатор) * Strongyloides stercoralis (Угрицы кишечная) * Dracunculus medinensis (Ришта) * Toxocara (Токсокара) | Паразитические Круглые:   * Ascaris lumbricoides (Аскарида) * Trichocephalus trichiuris - whipworm (Власоглав) * Enterobius vermicularis – pinworm or threadworm (Острица) * Trichinella spiralis (Трихина) * Ancylostoma duodenale and Necator americanus (hookworms) (Анкилостома и Некатор) * Strongyloides stercoralis (Угрицы кишечная) * Dracunculus medinensis (Ришта) * Toxocara (Токсокара) |
|  | Filariasis:   * Wuchereria bancrofti (Вухерерия) * Loa loa (Лоа-Лоа) * Onchocerca volvulus (онкоцерки) | Филяриозы:   * Wuchereria bancrofti (Вухерерия) * Loa loa (Лоа-Лоа) * Onchocerca volvulus (онкоцерки) |
|  | Phylum *Arthropoda* (The Arthropods). General characteristics, Classification. | Тип Членистоногие. Общая характеристика. Классификация. |
|  | Class *Crustacea*. General characteristics, medical significance of Some Crustaceans | Класс Ракообразные. Общая характеристика, Медицинское значение некоторых ракообразных. |
|  | Class *Arachnida.* General characteristics, medical significance | Класс Паукообразные. Общая характеристика, Медицинское значение |
|  | Order *Scorpions.* General characteristics, medical significance | Отряд Скорпионы. Общая характеристика, Медицинское значение |
|  | Order *Solifugae* (camel spiders). General characteristics, medical significance | Отряд Сольпуги. Общая характеристика, Медицинское значение |
|  | Order *Aranei* (Spiders). General characteristics, medical significance. Venomous spiders | Отряд Пауки. Общая характеристика, Медицинское значение. Ядовитые пауки. |
|  | Order *Acarina* (Ticks and mites). General characteristics, classification, medical significance | Отряд Клещи. Общая характеристика, классификация. Медицинское значение |
|  | Acariform ticks *(Acariformes). Sarcoptes scabei, Demodex folliculorum.* Characteristics, medical significance | Акариформные клещи. Чесоточный зудень. Железница угревая. Характеристика, медицинское значение. |
|  | Family *Ixodidae ("*hard ticks").Genus *Ixodes,* Genus *Dermacentor,* Genus *Rhipicephalus.* Characteristics, medical significance | Семейство Иксодовые («твердые клещи»). Род *Ixodes,* род *Dermacentor,* род *Rhipicephalus.* Характеристика, медицинское значение. |
|  | Family *Argasidae ("*soft ticks*").* Characteristics, medical significance | Семейство Аргазовые («мягкие клещи»). Характеристика, медицинское значение. |
|  | Class *Insectа.* General characteristics, classification, medical significance | Класс Насекомые. Общая характеристика, классификация. Медицинское значение. |
|  | Order *Phthiraptera (=Anoplura).* Lice.Characteristics, medical significance | Отряд Вши. Характеристика, медицинское значение. |
|  | Order *Siphonaptera.* Fleas.Characteristics, medical significance | Отряд Блохи. Характеристика, медицинское значение. |
|  | **The answer has to include: Morphology, Life Cycle, Disease, Localization of a parasite in a human body, Invasive (Infective) stage, Transmission mechanism and Route (pathway), Transmission factors, Clinical, Diagnosis, Prevention.** | **Ответ должен включать: морфологию, жизненный цикл, название заболевания, локализацию паразита в организме человека, инвазионную стадию, механизм и путь передачи, факторы передачи, клинические проявления, диагностику, профилактику.** |

**Practical tasks to test the skills and abilities formed**

**List of typical genetic problems:**

**Problem 1.**

In humans, normal skin color (A) is dominant over albino (a). Diabetes is inherited as a recessive trait (d).

A diabetic albino man marries a normal woman whose mother was an albino and whose father was diabetic. What are the genotypes of the man and the woman? What proportion of their children would be expected to be both non-diabetic and have normal color?

**Problem 2.**

Color-blindness is a sex-linked recessive trait in humans. The alleles for the hair color are located on a pair of autosomes, and brown hair ***(B)*** is dominant to blond hair ***(b).*** A woman who is homozygous for normal vision who has blond hair marries a man that is color blind and heterozygous for brown hair. What is the probability that their first born daughter will have brown hair and normal vision?

**Problem 3.**

In humans, the genes for colorblindness (d) аnd hemophilia (h) are recessive and located on the X chromosome. The distance between these genes 10 map units.

The woman, whose mother is colorblind, and his father with hemophilia marries a man who has both diseases. Determine the probability that children will have two diseases.

**Problem 4.**

Brown-eyed man and woman have four children. Two children have blue eyes, their blood type **I(O)** and **IV(AB)** . Two children have brown eyes, their blood type **II(A)** and **III(B).** Determine the genotype of the parents. What is the probability that their next born child will have brown eyes and **I(O)** blood type .

**Problem 5.**

**Muscular dystrophy** is a Х-linked recessive trait in humans. And blood type is a result of three alleles **IA IB IO** (autosomal trait). A women that is carrier of muscular dystrophy and has blood type IV(**AB)**, marries a man that has **muscular dystrophy** and has type I(**O)** blood. What is the probability that their first male child will have **muscular dystrophy** and have type III(**B)** blood?

**Problem 6.**

In humans, Rh-factor locus linked with locus controlling the shape of red blood cells. The elliptical shape of erythrocytes and Rh+ are dominant traits. Normal erythrocyte and Rh- are recessive. The distance between genes 3 map unit. Women is heterozygous for both traits. Her mother had elliptical erythrocytes, her father had Rh+. Her husband has a normal red blood cells and Rh-. Determine the percentage of genotypes and phenotypes of offspring.

**Problem 7.**

In humans, brown eyes (А) are dominant over blue (а). Retinoblastoma (is the most common malignant tumor of the eye) is inherited as an other autosomal dominant trait (R). Retinoblastoma is 60% penetrant.

A woman is heterozygous for color eyes and retinoblastoma, marries a healthy man with blue eyes. What is the probability that their first born will have blue eyes and retinoblastoma?

Problem 8.

Arachnodactyly ("spider fingers") is inherited as an autosomal dominant trait (A), which has 30% penetrant. Left-handedness is inherited as an autosomal recessive trait with penetrance is complete.

If two parents are heterozygous for both traits. What is the probability that their child will have left-handedness and "spider fingers".

Problem 9.

Cataract and polydactyly controlled by the two dominant alleles (A, B). These genes are completely linked. A woman with cataract and polydactyly has a mother with cataract and has a father with polydactyly. Her husband is healthy. To show the possible genotypes and phenotypes, which could be produced from these parents and what their frequency.

Problem 10.

Hemophilia is a X-linked recessive trait. Blood type is a result of three alleles IА , IВ ,IО (autosomal trait). The woman has I(О) blood type , and her husband has IV(АB) blood type. Both parents have normal blood clotting. They have son with III(B) blood type and hemophilia.

What is the probability that their next born child will be healthy? Determine the possible blood types of offspring.

Problem 11.

Anemia is a recessive sex – linked blood disorder. Blood type is determined by multiple alleles and a pattern of co – dominance. An anemic father and a non – affected mother that is carrying the allele for anemia have a son. If the father has type AB blood and the mother has type O blood, what are the chances that their son in non –affected and has type B blood?

Problem 12.

In man, assume that spotted skin (A) is dominant over nonspotted (a) skin and that wooly hair (B) is dominant to nonwoolly (b).  List the genotypes and phenotyopes of children to be expected from a   
marriage of a spotted Aabb man and a woolly-haired aaBb woman. If A and B assort independently, in what proportions should the different phenotypes appear in the children?

Problem 13.

In sheep, horns are the result of a factor (H), and hornlessness of a factor (h) which are sex-linked.  White is due to a dominant factor (W) and black is recessive.  A heterozygous horned white ram is crossed with a heterozygous hornless white ewe.  What would be the phenotypes of the F1?

Problem 14.

*In a plant, leaf color and leaf shape are controlled by two linked genes. Leaves of the wild-type plant are red. A recessive mutation in this gene causes white leaves. Wild-type leaves are pointed, and a recessive mutation in this gene causes them to be smooth. The following crosses were performed:*

Cross 1: pure breeding white, smooth X pure breeding wild type gives F1: all red, pointed

Cross 2: red, pointed F1 X pure breeding white, smooth (test cross) gives F2: 40 (white, smooth), 36 (red, pointed), 10 (white, pointed), 14 (red, smooth).

What is the recombination frequency between the gene for color and for shape?

Problem 15.

*Tongue-rolling and red-green color blindness are two genetically controlled conditions which occur in humans. Tongue-rolling is controlled by the dominant allele,* ***T****, while non-rolling is controlled by the recessive allele,* ***t****.* Red-green color blindness, is controlled by a sex-linked gene on the X chromosome. Normal color vision is controlled by the dominant allele, **B**, while red-green color blindness is controlled by the recessive allele, **b**.

To show the possible genotypes and phenotypes and what their frequency which could be produced from the following parents. A human female who is heterozygous for the traits of red-green color blindness and tongue-rolling, marries a normal male, which can't tongue-rolling.

Problem 16.

In humans, the genes for colorblindness (d) and hemophilia (h) are recessive and located on the X chromosome. The distance between these genes 10 map units. A woman whose father suffers from hemophilia and color blindness, and the mother is healthy and homozygous, marries a healthy man. Determine the probable phenotypes of children in this marriage.

Problem 17.

Color-blindness is a X-linked recessive trait. Blood type is a result of three alleles IA,IB, IO, (autosomal trait). The parents with the III (B) blood group have colorblind son with I(O) blood type. Both parents are healthy. Determine the probability that their next son will have color-blindness and III (B) blood type.

Problem 18.

Hemophilia is a X-linked recessive trait. Blood type is a result of three alleles IA IB IO (autosomal trait). The parents with the II (A) blood group had a son with I (O) blood group, suffering from hemophilia. Both parents are healthy. Determine the probability that their next son will have normal clotting and his blood group.

Problem 19.

In humans, normal skin color (A) is dominant over albino (a), and hemophilia is a recessive gene linked to the X chromosome (Xd). Normal man and woman have an albino son with hemophilia. What is the probability that the second child will have two diseases?

Problem 20.

The gene of color blindness (**d**) and the gene of night blindness (**a**) are inherited as a X-linked recessive genes and they are located on a distance of 34 sentimorgans (or map units) from each other. A woman who is heterozygous and whose father suffers from both diseases marries a man that has both forms of blindness. Determine the probability that children will have two diseases.

Problem 21.

In humans, albinism is an autosomal recessive gene. Hypohidrosis, or anhidrosis (the absence of sweat glands) is inherited as a recessive X-linked trait. One married couple, normal by these signs, had a son with both anomalies. What is the probability that their next child will have both diseases?

Problem 22.

Hypertrichosis gene is 'Y' chromosome linked gene or holoandric gene. It is always transferred from father to son. Polydactyly — as dominant autosomal trait. In a family where father had hypertrichosis, and mother — polydactyly, normal daughter was born. What is the chance that the next child in this family will have both anomalies?

Problem 23.

Otosclerosis is inherited as dominant autosomal trait with penetrance of 30%. Hypertrichosis is Y-linked trait. Specify probability of simultaneous display of both anomalies at children in family where wife is normal and the husband has both anomalies (but his mother was normal homozygote).

Problem 24.

Daltonism (colorblindness) is caused by recessive gene linked with the Х-chromosome. Thalassemia is inherited as an autosomal incomplete dominant trait. Homozygous is lethal. Heterozygous have a mild form of the disease. The woman with normal vision, but with mild form of thalassemia in a marriage with healthy but colorblind man, has the colorblind son with the mild form of thalassemia. What is the probability of a birth of the next son without anomalies?

Problem 25.

A person with Rh+ blood has a specific protein in his/her blood. Persons with Rh- blood do not have this particular protein in their blood. Rh + is dominant to Rh-. Also, normal insulin production dominates abnormal insulin production. If two individuals are heterozygous for Rh+ and normal insulin production, what probable phenotypes might their children be?

Problem 26.

A man suffering from colorblindness and deafness married a woman with normal vision and hearing. They had a deaf and a color blind son, a color blind daughter, but with normal hearing. What is the probability that their daughter will have both anomalies, if it is known that color blindness and deafness are inherited as recessive traits, but color blindness is X-linked and deafness is an autosomal trait?

Problem 27.

The dominant autosomal gene determines the defect syndrome of the nails and the patella (Nail–patella syndrome - NPS). At a distance of 10 map units from this gene is the ABO blood group locus. Female suffered from a defect in the nails and patella and had II (A) blood group. Her father had no defect and was I (O) blood type. Male was healthy with III (B) blood type. His parents had the same III (B) blood types. Determine the probability that their child will have defect and his blood type.

Problem 28.

Recessive genes a and b in humans cause the development of diabetes and a tendency to hypertension. These genes are linked together. A healthy woman, whose mother suffered from both diseases, marries a man; also healthy, but his father suffered from diabetes, and his mother - hypertension. What is the probability that their child will have two diseases at once?

Problem 29.

A brown-haired (dominant trait), a freckle-free man married a blond-haired woman with freckles (a dominant trait). They had a blond-haired son without freckles. Determine the probability that next child will have brown hair and freckles.

Problem 30.

Parents have II (A) and III (B) blood group. They had an affected child with sickle cell anemia and I (0) blood group (autosomal inheritance with overdominance). What are the chances that their next child will be affected and has IV (AB) blood group?

Problem 31.

A woman with an IV (AB) blood group, an Rh-negative (recessive trait), married a diheterozygous man with an III (B) blood group, an Rh-positive. Determine the probability that their baby will have Rh negative IV (AB) blood group.

**List of problem-situational tasks**

**PROBLEM-SITUATIONAL TASKS ON GENETICS.**

**Problem 1.**

**Patient:** 7yr old female; infrequent episodes of seizures. Child is blond with blue eyes.  Peculiar mousy body smell.  Mentally retarded; functions at about the level of a child at 20 months. Was born at home.  Did not undergo screening for congenital disorders. Analysis of serum samples gave the following results: Serum [Phe] : 1600 micromol/L (high level)

**Questions:**

1. What do the lab results tell you about **Phe** metabolism in this child?
2. What might be causing the peculiar body smell of this child?
3. What girls disease?
4. Determine the type of mutation.
5. Describe the mechanism of this disease.
6. What method was used to diagnose?
7. What is the treatment of this disease?

**Problem 2.**

**Patient:** Girl 10yr old. Lack of skin and hair pigmentation. Iintelligence is normal. Girl has vision defects: photophobia, nystagmus. Labs: absence of the enzyme tyrosinase.

**Questions:**

1. What girls disease?
2. Determine the type of mutation?
3. Describe the mechanism of this disease?
4. What method was used to diagnose?
5. What is the treatment of this disease?

**Problem 3.**

Young family has a newborn son. The child is very restless, irritable, sleeps poorly. Boy has pale hair and skin. At the age of one month convulsions appeared. Labs: EEG abnormalities, high level of Phe in the serum ([Phe] > 1200 micromol/L).

**Questions:**

1. What do the lab results tell you about **Phe** metabolism in this child?
2. What boys disease?
3. Determine the type of mutation?
4. Describe the mechanism of this disease?
5. What method was used to diagnose?
6. What is the treatment of this disease?
7. What is the probability that their second born child will be healthy? Write down the crossing scheme.

**Problem 4.**

Young family has a newborn son. In the first days of life feeding difficulties and vomiting appeared. Baby is not gaining. The doctor diagnosed an enlarged liver, jaundice and sent for a blood test. Labs: Low blood sugar, high levels of galactose in the blood and urine.

**Questions:**

1. What do the lab results tell you about metabolism in this child?
2. What boys disease?
3. Determine the type of mutation?
4. Describe the mechanism of this disease?
5. What method was used to diagnose?
6. What is the treatment of this disease?
7. What is the probability that their second born child will be healthy. write down the crossing scheme.

**Problem 5.**

The patient complains of chest and joint pain, difficulty breathing, weakness. A blood test revealed low red blood cell count. Electrophoresis revealed the presence of abnormal hemoglobin HbS.

**Questions:**

1. What patients disease?
2. What caused the low number of red blood cells?
3. Why the patient has pain?
4. Determine the type of mutation?
5. Describe the mechanism of this disease?
6. What method was used to diagnose?
7. What is the treatment of this disease?

**Problem 6.**

The patient is directed to a medical examination with suspected heart disease. Boy from the second pregnancy. Woman gave birth him at age 40.

**On examination:** flat face and epicanthus, muscle hypotonia, the child's height and weight below normal. Sick natured, emotional, motor and mental development delay. Mild degree of mental retardation. Meager vocabulary.

**Karyotyping:** found 47 chromosomes, trisomy 21

**Questions:**

1. What patient’s disease?
2. What signs of the patient are essential for the diagnosis?
3. What method was used to diagnose?
4. Type of mutation? Mechanism of pathology?
5. Make a scheme of the formation and fusion of gametes
6. What is the prognosis of offspring in this family?
7. What is the prognosis of this patient's offspring ?

**Problem 7.**

Girl 2 months**.** Multiple malformations: high muscle tone, seizures, microcephaly, small eyes, small lower jaw, ventricular septal defect, hands with 2nd and 5th fingers on top of the others. The family has two children (a boy and a girl). Children are healthy. **Karyotyping:** 47, 18+

**Questions:**

1. What patient’s disease?
2. What signs of the patient are essential for the diagnosis?
3. What method was used to diagnose?
4. Type of mutation? Mechanism of pathology?
5. Make a scheme of the formation and fusion of gametes
6. What is the prognosis of offspring in this family?
7. What is the prognosis of this patient's offspring ?

**Problem 8.**

Patient (female) 15 years, was directed to the genetic counseling: Significant deviations in mental development, increased irascibility, Content of speech: unreal fantasies. Increased interest in the male gender. In the department of gynecology was conducted abortion (12 - 14 weeks).

**Analysis of sex chromatin:** Found 2 Barr bodies in buccal scrapings

**Questions:**

1. What patient’s disease?
2. What signs of the patient are essential for the diagnosis?
3. What method was used to diagnose?
4. Type of mutation? Mechanism of pathology?
5. Make a scheme of the formation and fusion of gametes
6. What is the prognosis of this patient's offspring ?
7. What other method can be used to diagnose?

**Problem 9.**

Woman, 27 years old, height 142 cm, weight 50 kg short stature, wide and webbed neck, low posterior hairline, broad chest. Оligophrenia (dementia) in moronity stage. Mammary glands are underdeveloped, Uterus is very small, underdeveloped.

**Karyotyping:** 45, ХО

**Questions:**

1. What patient’s disease?
2. What signs of the patient are essential for the diagnosis?
3. What method was used to diagnose?
4. Type of mutation? Mechanism of pathology?
5. Make a scheme of the formation and fusion of gametes
6. What is the prognosis of this patient's offspring ?
7. What other method can be used to diagnose?

**Problem 10.**

Patient (male) 18 years old admitted to the genetic counseling with complaints of obesity and sexual underdevelopment. Height 184 cm, weight 97 kg. Reduced body and facial hair. Testicles reduced.

**Analysis of sex chromatin:** Found sexual X - chromatin body in buccal scrapings

**Questions:**

1. What patient’s disease?
2. What signs of the patient are essential for the diagnosis?
3. What method was used to diagnose?
4. Type of mutation? Mechanism of pathology?
5. Make a scheme of the formation and fusion of gametes
6. What is the prognosis of this patient's offspring ?
7. What other method can be used to diagnose?

**Problem 11.**

Healthy parents have a child (boy) with multiple congenital malformations.

**On examination:** Microcephaly, scalp defects, sloping forehead, nose broad and flat, cleft lip and cleft palate, polydactyly, holoprosencephaly, interatrial septal defect.

**Karyotyping:** Found 47 chromosome, trisomy 13

**Questions:**

1. What patient’s disease?
2. What signs of the patient are essential for the diagnosis?
3. What method was used to diagnose?
4. Type of mutation? Mechanism of pathology?
5. Make a scheme of the formation and fusion of gametes
6. What is the prognosis of offspring in this family?
7. What is the prognosis of this patient's offspring ?

**Problem 12.**

A pregnant woman and her husband are concerned about the possibility their unborn child could have a genetic disorder. They decide to have amniocentesis and karyotyping performed to look for chromosomal abnormalities. It turns out that the child has 47 chromosomes: 22 normal autosomal pairs plus one Y chromosome and two X chromosomes.

**Questions:**

1. Will this child be a male or a female?
2. What patient’s disease?
3. What signs of the patient are essential for the diagnosis?
4. What method was used to diagnose?
5. Type of mutation? Mechanism of pathology?
6. Make a scheme of the formation and fusion of gametes
7. What is the prognosis of this patient's offspring ?
8. What other method can be used to diagnose?

**Problem 13.**

Patient (female) visited Genetic counseling with the purpose to know the prognosis offspring. Her son with Down syndrome died at the age of one month from sepsis. She is married to 33 years. Up to 38 years of pregnancy was not. Subsequently 3 spontaneous abortions was occurred, the cause of which has remained unknown. The fourth pregnancy ended by the birth of a child with Down syndrome.

**On examination:**

**Therapist:** Abnormalities were not found.

**Psychiatrist:** Intelligence without gross violations. Social adaptation threshold is normal.

**Karyotyping:** 45, tr21/14

**Questions:**

1. What patient’s disease?
2. Type of mutation? Mechanism of pathology?
3. Make a scheme of the formation and fusion of gametes
4. What method was used to diagnose?
5. What is the prognosis of offspring in this family?
6. Woman with alterations in karyotype has no significant abnormalities on examination. Why?
7. How can we explain the woman’s initial infertility and spontaneous abortion?
8. What is the risk of having a child with Down's syndrome this married couple have?
9. Had this marrieds a smaller risk of having an affected child 10 or 20 years ago?

**Problem 14.**

Patient (female) 15 years is directed to the genetic counseling about the lack of menstruation and stunting. Patient has complaints of headache, fatigue, poor memory, academic failure in school.

**Gynecologist:** Uterus is very small, underdeveloped.

**Endocrinologist:** low estrogen levels

During chromosomal analysis 11 cells were examined. Karyotype of 6 cells - 46, XX; 5 cells had only one X-chromosome.

**Questions:**

1. What patient’s disease?
2. What signs of the patient are essential for the diagnosis?
3. What method was used to diagnose?
4. Type of mutation?
5. What causes different amounts of chromosomes in the cells? Mechanism of pathology?
6. What is the prognosis of this patient's offspring ?
7. What is the treatment of this disease?

***List of slides for determining the parasite:***

1. Амеба обыкновенная (Amoeba proteus): трофозоит
2. Дизентерийная амеба (Еntamоеbа histolуtica): трофозоит
3. Эвглена зеленая (Euglena viridis): трофозоит
4. Вольвокс (Volvox globator): трофозоит
5. Лямблия (Lamblia intestinalis): трофозоит
6. Лейшмании (Leishmania tropica, L. donovani): трофозоит
7. Трипаносомы (Trypanosoma gambiense, T.cruzi): трофозоит
8. Инфузория туфелька (Paramecium caudatum): трофозоит
9. Кишечный балантидий (Balantidium coli): трофозоит
10. Малярийный плазмодий (Plasmodium vivax) на разных стадиях эритроцитарного цикла
11. Токсоплазма (Toxoplasma gondi): трофозоит
12. Печеночный сосальщик (Fasciola hepatica): марита, яйцо
13. Ланцетовидный сосальщик (Dicrocoelium lanceatum): марита, яйцо
14. Кошачий или сибирский сосальщик (Opisthorchis felineus): марита, яйцо
15. Вооруженный цепень (Taenia solium): гермафродитные и зрелые проглоттиды, финна, яйцо
16. Невооруженный цепень (Taeniаrhynchиs saginatиs): гермафродитные и зрелые проглоттиды, финна, яйцо
17. Карликовый цепень (Hymenolepis nana): половозрелая особь
18. Широкий лентец (Diphyllobothrium latum): зрелые проглоттиды, яйцо
19. Аскарида человеческая (scaris lumbricoides): половозрелая особь (самка, самец), поперечный срез, яйцо
20. Острица (Enterobius vermicularis): половозрелая особь (самка, самец), яйцо
21. Власоглав (Trichocephalus trichiurus): половозрелая особь (самка, самец), яйцо
22. Трихина (Trichinella spiralis): половозрелая особь, капсула
23. Собачий клещ (Ixodes ricinus): имаго (самка, самец)
24. Таежный клещ (Ixodes persulcatus): имаго (самка, самец)
25. Дермацентор (Dermacentor sp.): имаго (самка, самец)
26. Орнитодорус (Ornithodorus papillipes): имаго
27. Вошь головная (Pediculus capitis): имаго
28. Блоха человеческая (Pulex iriritans): имаго
29. Обыкновенный комар (Culex pipiens): головка, яйца, личинка, куколка
30. Малярийный комар (Anopheles): головка, яйца, личинка, куколка

**Sample exam ticket**

|  |
| --- |
| **FSBEI of HE OrSMU of the Health Ministry of Russia**  **Biology department**  **The Full-time studying, specialist**  **Speciality: 31.05.01 – General medicine**  **Discipline: Biology**  **Form of intermediate certification: Exam**  **ФГБОУ ВО ОрГМУ Минздрава России**  **Кафедра биологии**  **Подготовка кадров высшей квалификации – специалитет**  **Специальность 31.05.01 лечебное дело**  **Дисциплина: Биология**  **Форма промежуточной аттестации: Экзамен**  **Examination ticket/card №1 – Экзаменационный билет №1**  1. Set variant of test questions in the University Information System.  2. Differences between prokaryotes and eukaryotes.  3. *Entamoeba histolytica*. Systematic position, morphology, life cycle, disease, localization of a parasite in a human body, invasive (infective) stage, transmission mechanism and route (pathway), transmission factors, symptoms, diagnosis, prevention.  4. Genetic problem: Muscular dystrophy is a Х-linked recessive trait in humans. A women that is carrier of muscular dystrophy and has blood type I (O), marries a man that has muscular dystrophy and blood type III (B) (heterozygous). What is the probability that their first male child will have muscular dystrophy and have type III (B) blood?  5. Problem: Patient: Girl 10yr old. Lack of skin and hair pigmentation. Intelligence is normal. Girl has vision defects: photophobia, nystagmus. Labs: absence of the enzyme tyrosinase. Identify the disease and type of mutation and explain mechanism of this disease, method was used to diagnose, treatment of this disease, the probability that the next child of patient’s parents will be healthy. Write down the crossing scheme.  6. Examination of the parasite photograph (№1).  Head of the Biology department  MD, PhD, Professor G.N. Solovykh  Dean of the Foreign students faculty  MD, PhD A.O. Mironchev  2020 год |

**Correspondence table of learning outcomes by discipline and assessment materials used in midterm certification.**

|  |  |  |  |
| --- | --- | --- | --- |
| № | Verifiable competence | Descriptor | Control and evaluation tool (question / practical task number) |
| 1 | OK-5 readiness for self-development, self-realization, self-education, use of creative potential | Know the basic theoretical laws of biology used in practical medicine. | Q. № 1-109 |
| To be able to use basic basic biological knowledge for self-development, self-realization in the medical profession. | typical genetic problems №1-31  problem-situational tasks in genetics №1-14 |
| 2 | OPK-1 readiness to solve standard tasks of professional activity using information, bibliographic resources, biomedical terminology, information and communication technologies and taking into account the basic requirements of information security | Know the main bibliographic resources and information systems on cell biology, human genetics, parasitology, ecology used to solve problems in professional activities. | Q. № 1-109 |
| To be able to apply biological knowledge of information systems to solve standard problems of professional activity in cytology, genetics, parasitology, anthropology, ecology. | typical genetic problems №1-31  problem-situational tasks in genetics №1-14  parasitology slides №1-30 |
| 3 | OPK-7 readiness to use basic physical, chemical, mathematical and other natural science concepts and methods in solving professional problems. | Know biological terms, structure and types of cells, patterns of inheritance of traits, development cycles of pathogens, diagnostic and morphological signs of hereditary diseases and parasitic invasions. | Q. № 5-29, 41-109 |
| To be able to use the general biological principles of cell life for the correct solution of professional problems. Determine the causative agents of parasitic diseases by morphological characteristics, apply theoretical knowledge to solve professional problems. | typical genetic problems №1-31  проблемно- problem-situational tasks in genetics №1-14  parasitology slides №1-30 |

**4. METHODOLOGICAL RECOMMENDATIONS FOR THE APPLICATION OF THE SCORE RATING SYSTEM FOR ASSESSING THE LEARNING ACHIEVEMENTS OF STUDENTS IN THE FRAMEWORK OF STUDYING THE DISCIPLINE OF BIOLOGY**

**4.1. Rules for the formation of the current actual rating of the student.**

The current actual rating (Rca) by discipline (**maximum 70 points**) is calculated as the **arithmetic mean** of the current ratings for all modules. It includes the results of all checkpoints aimed at assessing the success of mastering the discipline in the classroom and extracurricular work. For each module, the following are assessed:

- current control the progress of students at each practical lesson in the discipline (Cc);

- final control of students' progress in the discipline (Fc);

Current control of progress (Cc). The maximum value is 50 points.

For each practical lesson, from 1 to 4 control points are provided (testing, problem-situational tasks / problems, recitation, etc.), for which the student receives from 0 to 5 points inclusive. Testing is a mandatory checkpoint in every practice; oral questioning is not a mandatory checkpoint in every session; problem-situational tasks / problems - are a mandatory checkpoint if it is provided by the structure of the practical lesson. The number of marks (for recitation and problem-situational tasks within the entire discipline) - for all students should be approximately the same.

When calculating the current rating, the performance of independent and practical work according to the module in a notebook for independent and practical work is assessed. A score from 0 to 5 is assigned for each notebook.

Based on these results, the average score of the current academic performance is formed, the value of which can be from 0 to 5 points.

The criteria for evaluating each form of control are presented in the Assessment fund by discipline.

The average score of the current academic performance is transferred to the maximum 50 points in the structure of the current actual rating, according to the formula:

Cc = (average student score \* 50) / 5,

when:

- maximum average score - the maximum possible arithmetic mean of all control points. Provided that each control point is scored from 0 to 5, it is 5 points;

- 50 points - the maximum current control score within the current actual rating.

- student result - the student's average score for all control points in the framework of the current control of progress.

Final control (Fc). The maximum value is 20 points.

At the end of all practical sessions of the module, a midterm control is carried out aimed at controlling the development of knowledge, skills and abilities for each module. Checkpoints and their number are different for different modules and are determined by the work program for the discipline.

The criteria for assessing control points are presented in the Assessment fund (from 0 to 5 points).

Based on the results of all the control points of the final control for the module, the average score is calculated (from 0 to 5). This result is translated into the maximum 20 points in the structure of the current actual rating, according to the formula:

Fc = (student result \* 20) / 5

when:

- the maximum value of Fc - the maximum possible value for the oral response at midterm control. According to Assessment fund, it is 5 points;

- 20 points - the maximum score of the final control within the current actual rating.

- student result - student assessment at final control.

The current actual rating (Rca) is obtained by summing the points of current control (Cc) and final control (Fc).

If you miss a practical lesson and / or final control, "0" points are set for the mandatory checkpoints. After repeating the lesson, they are replaced with the actual results obtained.

**4.2. The rules for the formation of the bonus actual rating of the student.**

Bonus actual rating by discipline (maximum value - 5 points).

Bonus points are regulated by the Regulation "On the point-rating system for assessing the educational achievements of students" (P 004.03-2020).

Bonus points are formed as the sum of points for attending classes and lectures (from 0 to 2 points) and participation in a subject Olympiad in a discipline (up to 3 points).

4.2.1. The calculation of the bonus point for attending lectures and classes (B) is carried out according to the formula:

*B = number of classes and lectures attended by a student \* 100*

*total number of lectures and classes*

For each lesson and lecture, the student receives 1 point. Lecture attendance is assessed on the basis of passing a test on the topic of the lecture in IS.

If you miss a lesson / lecture - 0 points are given. After repeating the lesson, points are awarded: if the pass was "respectful", 1 point is given, if "disrespectful" - 0.5 points;

The maximum score for this bonus provided by the Regulation (P 004.03-2020) is 2 points.

The total number of lectures and classes - the number of lectures and practical classes provided for in the calendar-thematic plan for this discipline, excluding lectures and classes "drop-out" on weekends and holidays or for other "valid" reasons.

Translation table for% of attended lectures and classes in B

|  |
| --- |
| до 50% - 0 |
| 50-80% - 1; |
| 81-100% - 2 |

4.2.2. The calculation of the bonus for the subject Olympiad in the discipline (Bo) is carried out in accordance with the Regulations (P 004.03-2020):

1st place - 3 points,

2nd and 3rd place - 2 points,

Participation in the Olympiad - 1 point. Students who have passed the qualifying round are allowed to participate in the Olympiad.