

Федеральное государственное бюджетное образовательное учреждение
высшего образования

«Уральский государственный медицинский университет»

Министерства здравоохранения Российской Федерации

ПРЕДМЕТНАЯ КОМИССИЯ ПО БИОЛОГИИ

УТВЕРЖДАЮ

Ректор ФГБОУ ВО УГМУ

Минздрава России, профессор

_____ О.П. Ковтун

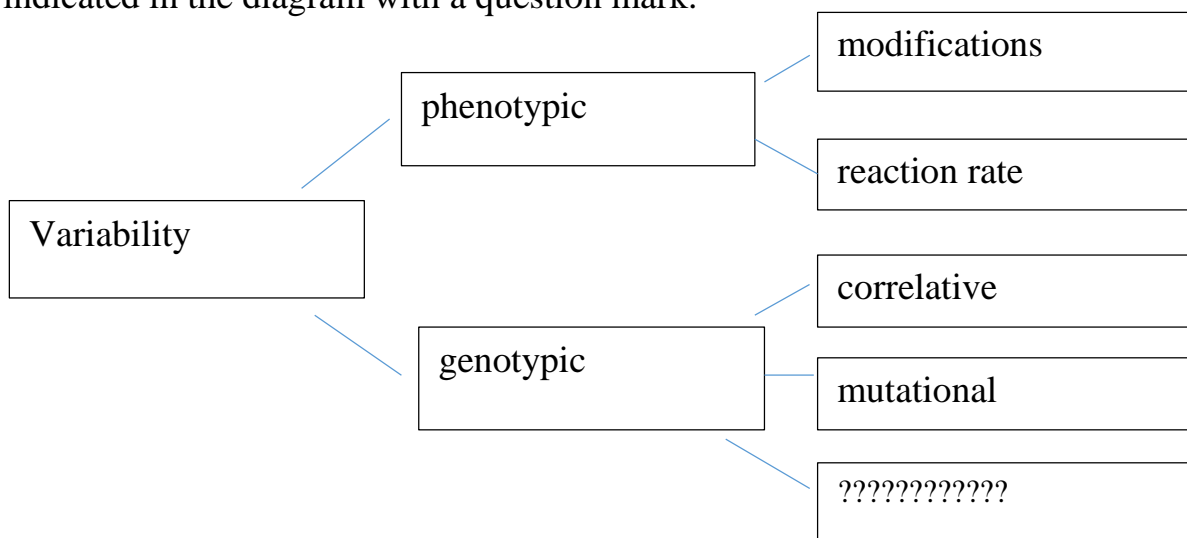
« _____ » _____ 2023 г.

Examination assignment №3

Part 1

Answers to tasks 1-21 are a sequence of numbers, a number or a word (phrase). Write the answers in the ANSWER SHEET №1 to the right of the numbers of the corresponding tasks, starting from the first cell, without spaces, commas or other additional characters

1. Consider the proposed “Variability” scheme. Write down the missing term indicated in the diagram with a question mark.



2. Look at the table "Levels of wildlife organization" and fill in the empty cell by entering the appropriate term.

Biology Section	Example
Ecosystem	mycorrhiza of aspen and boletus
?????	winter wheat resistant to parasitic fungi

3. How many nucleotides in a gene region encode a protein fragment of 25 amino acid residues? Write down only the corresponding number.

4. All the characters listed below, except for two, are used to describe the characteristics of polysaccharides. Identify the two characters that differ from the general list, and write down the numbers under which they are indicated.

1. perform structural and storage functions
 2. are composed of amino acid residues
 3. are hydrophobic
 4. serve as enzymes
 5. are part of the cellular wall
5. Match the characters and groups of substances: select a position from the second column for each element of the first column.

CHARACTER	GROUP
A. participate in the synthesis of nucleic acids	1. monosaccharides 2. polysaccharides
B. form a glycocalyx	
C. have a molecule containing from three to seven carbon atoms	
D. form glucose during hydrolysis	
E. are a reserve substance in the cell	
F. have a sweet taste	

Write down the numbers, arranging them in the order corresponding to the letters:

6) What percentage of the offspring had a dominant phenotype for both characters when a pea plant that was diheterozygous for these characters was hybridized with a plant that was recessive for both characters? Write your answer as a number.

7. All but two of the following features can be used to describe the process of spermatogenesis. Identify two features that differ from the general list, and write down the numbers under which they are indicated.

- 1) male sex cells are formed
- 2) female sex cells are formed
- 3) the number of chromosomes is halved
- 4) four sex cells are formed from one
- 5) one sex cell is formed

8. Match the examples and methods of reproduction of organisms: select the corresponding position from the second column for each position given in the first column.

EXAMPLE	METHOD
A) seed propagation of plants	1) sexual 2) asexual
B) budding	
C) fragmentation	
D) parthenogenesis	
E) binary fission	

Write down the numbers, arranging them in the order corresponding to the letters:

9. Select the characteristic features of the circulatory and respiratory organs of mammals:

- 1) four-chambered heart, pulmonary breathing
- 2) three-chambered heart with an incomplete septum in the ventricle
- 3) one blood circulation
- 4) two blood circulations
- 5) arterial blood enters the lungs
- 6) venous blood enters the lungs

10. Match the characters of animals and classes: select the corresponding position from the second column for each position given in the first column.

CHARACTERS OF ANIMALS	CLASSES
A. presence of a tarsometatarsus B. development of hair on the body C. involvement of sweat glands in thermoregulation D. most of them have a placenta E. presence of the coccygeal gland F. live birth	1. Birds 2. Mammals

Write down the numbers, arranging them in the order corresponding to the letters:

11. Put the developmental stages of the pork tapeworm in the right order, starting with the egg.

- 1) penetration into the organs of the intermediate host
- 2) the stage of a six-hooked embryo
- 3) egg
- 4) penetration into the human intestine
- 5) measle stage

12. What processes take place in the human liver?

- 1) bile production
- 2) production of the insulin hormone
- 3) disinfection of toxic blood compounds
- 4) synthesis of vitamin C
- 5) conversion of glucose into a reserve carbohydrate - glycogen
- 6) absorption of aqueous solutions of organic substances into the lymph

13. Match the characteristic of the glands and their type: select the corresponding position from the second column for each position given in the first column.

CHARACTERISTICS	TYPE OF GLANDS
A. form digestive enzymes B. secrete into the cavity of the body or organ C. secrete chemically active substances - hormones D. participate in the regulation of processes of the vital activity of the organism E. have excretory ducts	1. external secretion 2. internal secretion

Write down the numbers, arranging them in the order corresponding to the letters:

14. Put the stages of the passage of a portion of oxygen through the human body from the moment of inspiration to the supply of oxygen to the tissues in the correct order. Write down the corresponding sequence of numbers in the table.

- 1) lungs
- 2) trachea
- 3) nasopharynx
- 4) bronchi
- 5) blood
- 6) larynx
- 7) tissues

15. Choose three correct answers and write down their numbers. What factors are the driving forces of evolution?

- 1) modification variability
- 2) mutation process
- 3) natural selection
- 4) adaptation of organisms to the environment
- 5) population waves
- 6) abiotic environmental factors

16. Compare the form of natural selection and its characteristics: select the corresponding position from the second column for each position given in the first column.

CHARACTERISTICS	FORMS OF NATURAL SELECTION
A) acts against individuals with extreme values of characters B) leads to a narrowing of the reaction rate C) usually operates under constant conditions D) occurs during the development of new habitats E) changes the average values of the character in the population F) can lead to the emergence of new species	1) Driving 2) Stabilizing

Write down the numbers, arranging them in the order corresponding to the letters:

17. Choose three correct answers and write down their numbers. The biogeocenosis of a coniferous forest is characterized by the following characters:

- 1) variety of deciduous trees
- 2) abundant forbs
- 3) the animal world is represented by predators, elks, rodents, wild boars and various birds
- 4) the branches of most trees grow with a downward slope
- 5) most trees are evergreen

6) a multi-tiered community of herbs, shrubs, trees

18. Match the characteristics of metabolism and organisms for which these features are characteristic: select the corresponding position from the second column for each position given in the first column.

FEATURES	ORGANISMS
A) use of energy of sunlight for ATP synthesis	1) autotrophs
B) use of energy contained in food for ATP synthesis	2) heterotrophs
C) use of ready-made organic substances only	
D) synthesis of organic substances from inorganic ones	
E) release of oxygen in the process of metabolism	

Write down the numbers, arranging them in the order corresponding to the letters:

19. Put the processes occurring during meiosis in the correct order.

- 1) location of pairs of homologous chromosomes in the equatorial plane
- 2) conjugation, crossing over of homologous chromosomes
- 3) location in the equatorial plane and the divergence of sister chromosomes
- 4) formation of four haploid nuclei
- 5) divergence of homologous chromosomes

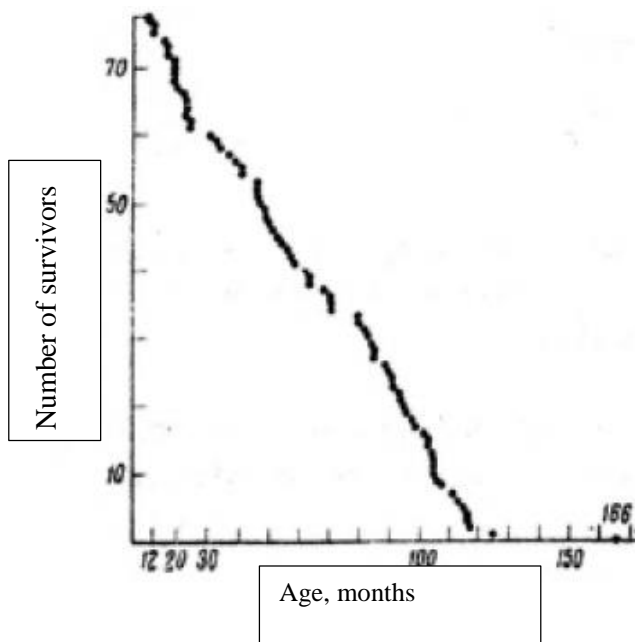
20. Analyze the table. Fill in the blank cells of the table using the concepts and terms, examples given in the list. Select the appropriate term from the list provided for each lettered cell.

Type of variability	Form of variability	Example of variability
(A) _____	mutational	occurrence of an albino plant in the offspring
hereditary	(B) _____	as a result of a combination of gametes, a new phenotype is formed in the offspring
non-hereditary	modification	(C) _____

List of terms:

1. hereditary
2. the birth of a white-eyed individual from red-eyed parent organisms of *Drosophila*
3. change in coat color in a white hare depending on temperature
4. combinative
5. non-hereditary

21. Analyze the graph "Survival of the mouflon at the London Zoo". Select statements that can be formulated based on the analysis of the data presented.



Statements:

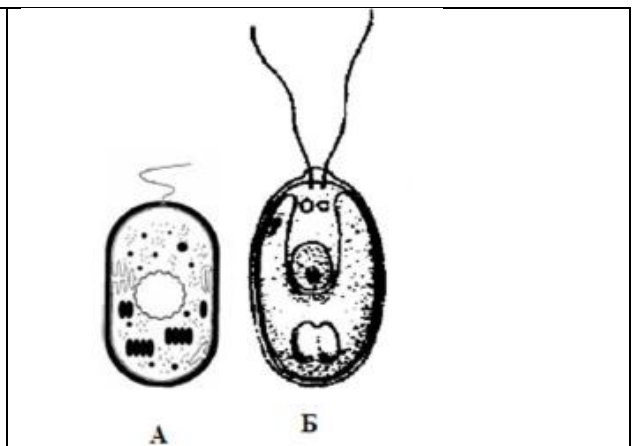
1. a group of animals was studied, consisting of 79 individuals
2. three to four individuals live 118 months
3. born individuals often die in the third year of life
4. most individuals live up to eight years
5. in the initial population, the average age of individuals is one year

Part 2

When answering tasks 22 - 28, first write down the task number (22, 23, etc.), then the full detailed answer to it. The answer shall be written clearly and legibly.

22. During heavy rain, you can observe a massive exit of earth worms to the surface of soil or paths. Explain this phenomenon.

23. Consider the cells on the pictures. Define, what letters are used for prokaryotic and eukaryotic cells. Provide proof of your points of view.



24. Find errors in the given text. Indicate the numbers of sentences where they are made, correct them.

1. G. Mendel hybridized two pure lines of pea plants.

2. They differed in two ways: the yellow and green color of the seeds.
3. In the first generation from hybridizing these lines, plants appeared that produced only fruits with yellow seeds.
4. In the second generation, obtained from crossing hybrids of the first generation, plants appeared that produced both yellow and green seeds.
5. At the same time, half of the hybrids produced yellow seeds.
6. The color (yellow) of the seeds, which appeared in two generations of hybrids, was called recessive.

25. Mammals class is a thriving group of vertebrates. Explain what aromorphoses allowed them to achieve biological progress. List at least four characters.

26. Why are owls in the forest ecosystem classified as second-order consumers, and mice are classified as first-order consumers?

27. The gametophyte is the predominant generation in *Chlamydomonas*. Determine the chromosome set of spores and gametes of *Chlamydomonas*. Explain from what initial cells and as a result of what division these cells are formed during sexual reproduction.

28. Blood type and Rh factor are autosomal unlinked characters. The blood group is controlled by three alleles of one gene: i^0 , 1^A , 1^B . 1^A and 1^B alleles are dominant with respect to the i^0 allele. The first group (0) is determined by recessive i^0 alleles, the second group (A) is determined by the dominant 1^A allele, the third group (B) is determined by the dominant 1^B allele, and the fourth (AB) is determined by two dominant 1^A1^B alleles. Positive Rh factor (R) dominates over negative one (r). The father has the third blood type and positive Rh (diheterozygous), the mother has the second group and positive Rh (dihomozygous). Determine the genotypes of the parents. What blood type and Rh factor can children in this family have, what are their possible genotypes and phenotype ratio? Make a scheme for solving the problem. What law of heredity is manifested in this case?