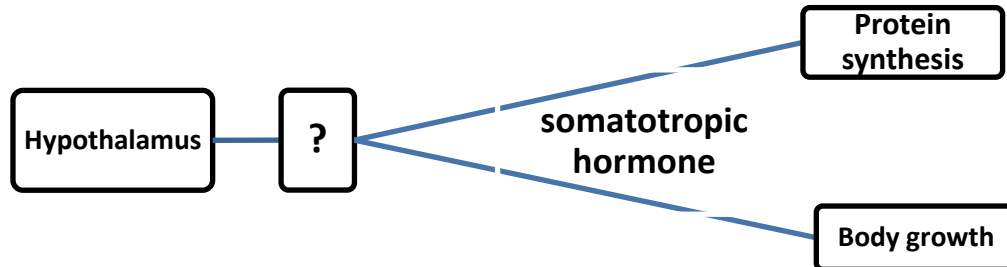


**Examination ticket in biology (in writing)
DEMO-OPTION**

PART 1 (max 15 points)

Answers to tasks 1-10 are a word or a number(s).

1. Examine the scheme. Write down the missing term indicated in the diagram by a question mark.



Answer: _____ (1 point)

2. Consider the table "Methods of biological research". Write down the missing term in the answer, indicated in the table by a question mark.

Method of biological research	Application of the method
The twin method	Determination of the role of environmental factors in the formation of the human phenotype
?	Study of the features of the phases of mitosis on a micropreparation (microslide)

Answer: _____ (1 point)

3. How many cells are formed as a result of single cell mitosis? Write down the corresponding number:

Answer: _____ (1 point)

OR

What is the probability of the birth of tall children in heterozygous parents of short stature (short stature dominates over tall).

Write down the numbers only:

Answer: _____% (1 point)

4. Match: for each position given in the first column, select the corresponding position from the second column.

FEATURES OF DIVISION

- A) occurs in two stages
- B) the result of division - diploid cells
- C) the resulting cells have a set of chromosomes and DNA 2n2c
- D) the process is accompanied by chromosome conjugation
- E) the resulting cells have a set of chromosomes and DNA nc
- F) crossing-over occurs

TYPE OF DIVISION

- 1) Mitosis
- 2) Meiosis

Write the selected numbers under the appropriate letters.

Answer (2 points - everything is correct, 1 point - no more than two errors, 0 points - more than two errors)

A	B	C	D	E	F

5. Choose three valid statements from the general list, and write down their numbers.

Select the features of the structure and functions of chloroplasts

- 1) inner membranes form cristae
- 2) many reactions occur in gran
- 3) glucose synthesis occurs in chloroplasts
- 4) chloroplasts are the site of lipid synthesis
- 5) chloroplasts consist of two different particles
- 6) these are double membrane organoids

Answer: (1 point - everything is correct, 0 points - there is at least one error)

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OR

Select the signs of sexual reproduction of seed plants. Write down their numbers

- 1) sperm and egg cells are involved in reproduction
- 2) As a result of fertilization, a zygote is formed.
- 3) In the process of reproduction occurs cell division in half
- 4) The offspring retains all hereditary characteristics of the parent
- 5) As a result of reproduction, new signs appear in the offspring.
- 6) Vegetative parts of a plant participate in reproduction

Answer: (1 point - everything is correct, 0 points - there is at least one error)

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6. Match: for each position given in the first column, select the corresponding position from the second column.

ORGANS

GERM LAYERS

- A) brain
- B) small intestine
- C) cartilage
- D) muscle
- E) pancreas
- F) hair

- 1) ectoderm
- 2) endoderm
- 3) mesoderm

Write the selected numbers under the appropriate letters.

Answer (2 points - everything is correct, 1 point - no more than two errors, 0 points - more than two errors)

A	B	C	D	E	F

7. Establish the correct sequence of passage of water in the excretory system.

- 1) water entering the renal pelvis
- 2) water absorption in convoluted tubules
- 3) collection of water in the bladder
- 4) passage of water in the renal capsule
- 5) removal of water through the urethra

Answer: (2 points - everything is correct, 1 point - no more than two errors, 0 points - more than two errors)

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7. Establish the sequence of nerve impulse transmission along the arc of the conditioned human salivary reflex to the bell.

- 1) the auditory center of the cerebral cortex,
- 2) sensitive neuron,
- 3) hearing receptors,
- 4) temporary connection,
- 5) the center of salivation,
- 6) salivary glands,
- 7) motor neuron.

Answer: (2 points - everything is correct, 1 point - no more than two errors, 0 points - more than two errors)

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8. Read the text:

It is known that the ancient reptiles were perfectly adapted to life on land, although they could live in the aquatic environment, and sometimes reached enormous sizes.

Using this information, select from the text below three statements relating to the description of these characteristics of this organism. Write their numbers in the table.

(1) The height of animals could reach several meters, and the mass – several tons. (2) The eggs contained a large amount of nutrients. (3) Cubs were born blind and helpless. (4) Ichthyosaurs lived in water and could move from laying eggs to a live birth. (5) Like modern reptiles, they were adapted to life on land. (6) They ate only plant food.

Answer: (1 point - everything is correct, 0 points - there is at least one error)

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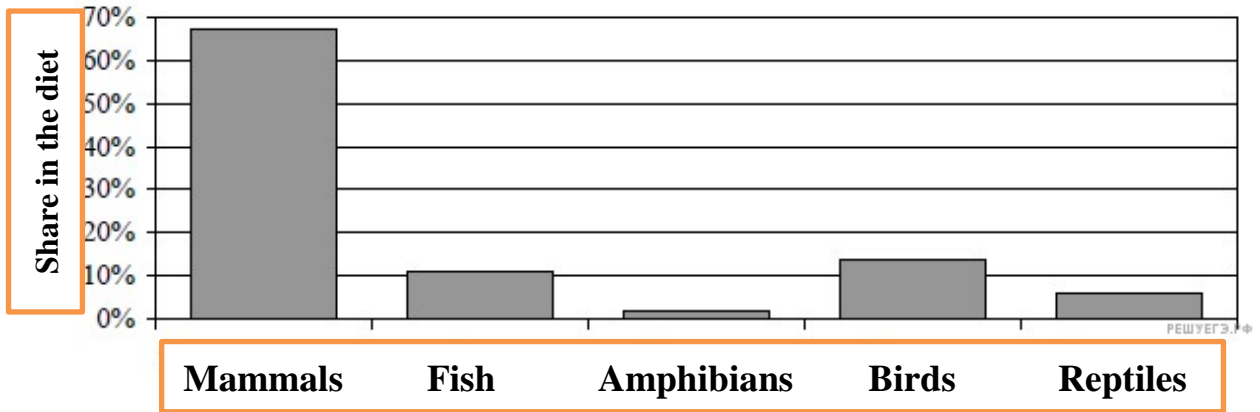
9. All the terms below, except for two, are properties of **natural selection**. Define two terms “drop-downs” from the general list and write down their numbers in the table.

- 1) lasts about a decade
- 2) occurs in natural ecosystems
- 3) mass and individual forms of selection
- 4) result - species adapted to habitat
- 5) the action object is the population

Answer: (1 point - everything is correct, 0 points - there is at least one error)

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10. Analyze the histogram, which shows the vertebrates that make up the food ration of the animal Z living in the tundra. Write down the numbers in the answer, under which the selected statements are indicated.



Select the statements that match the picture.

The animal can be attributed to

- 1) omnivorous animals
- 2) consults of the II-IV orders
- 3) autotrophic organisms
- 4) warm-blooded animals
- 5) nocturnal animals

Answer: (1 point - everything is correct, 0 points - there is at least one error)

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PART 2 (max 11 points)

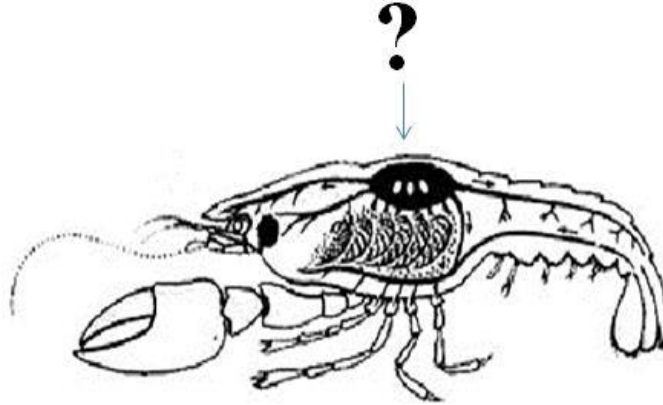
Answers to the tasks 11-14 are detailed answers. Write down the task number (11, 14, etc.) and a detailed answer to it. Write your answers clearly and legibly.

11. The analysis of the results of the violation of the linked inheritance of genes allows us to determine the sequence of the location of genes in the chromosome and make genetic maps. The results of numerous crosses of *Drosophila melanogaster* (drosophila flies) showed that the frequency of coupling disorders between genes A and B is 5%, between genes A and C – 11%, between genes C and B – 6%. Redraw the proposed scheme of a fragment of a chromosome on the answer sheet, mark the relative location of genes A, B, C on it and specify the distance between them. What is the value taken as a unit of the distance between genes?

Answer: _____ (The maximum score is 2.

The answer is complete and does not contain biological errors - 2 points, the answer is incomplete or contains biological errors-1 point, the answer is incorrect or not given - 0 points)

12. Consider an image of a crayfish. What is marked by a question mark? To which organ system does the indicated organ belong? What function does it perform?



Answer: _____ (The maximum score is 3.

The answer is complete and does not contain biological errors - 3 points, the correct answer is given to two questions or three questions, but contains biological errors-2 points, the correct answer is given to one or two questions, but contains biological errors-1 point, the answer is incorrect or not given-0 points)

13. Find the errors in the text below. Indicate the numbers of the sentences in which they are made and correct them by writing the correct statement:

1. All organisms have heredity and variability.
2. Mutations are random, permanent changes in the genotype that affect whole chromosomes, parts of them, or individual genes.
3. Changes associated with the doubling of any nucleotide in a gene are referred to as genomic mutations.
4. Intrachromosomal rearrangements may be associated with gene duplication.
5. If a change in the number of chromosomes occurs in a cell, then such mutations are called gene mutations.
6. Mutations are always beneficial to a living organism.

Answer: _____ The maximum score is 3. Three sentences are indicated and corrected - 3 points, two sentences are indicated and correctly corrected-2 points, one sentence is indicated and correctly applied-1 point, the answer is incorrect or not given-0 points)

14. With some disorders of protein metabolism in the patient, amino acids are excreted with urine, to which the codons in the messenger RNA correspond: GUU, CCU, CAU, UUU, AAU. What amino acids are excreted in the patient's urine?

Explain the answer.

To solve the problem, use the genetic code table.

		Second letter				
		U	C	A	G	
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA Stop UAG Stop	UGU } Cys UGC } UGA Stop UGG Trp	U C A G
	C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } Arg CGA } CGG }	U C A G
	A	AUU } AUC } Ile AUA } AUG Met	ACU } ACC } Thr ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U C A G
	G	GUU } GUC } Val GUA } GUG }	GCU } GCC } Ala GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } GGC } Gly GGA } GGG }	U C A G
						Third letter

Rules for using the table

The first nucleotide in the triplet is taken from the left vertical row, the second from the upper horizontal row and the third from the right vertical row. Where the lines coming from all three nucleotides intersect, the desired amino acid is located.

Answer: _____ (The maximum score is 3.

The answer is complete and does not contain biological errors - 3 points, the correct answer is given to two questions or three questions, but contains biological errors-2 points, the correct answer is given to one or two questions, but contains biological errors-1 point, the answer is incorrect or not given-0 points))

OR

It is known that the complementary chains of nucleic acids are antiparallel (the 5' end in one chain corresponds to the 3' end of the other chain). The synthesis of nucleic acids begins at the 5' end. The ribosome moves along the mRNA in the direction from the 5' to the 3' end. The retrovirus contains an RNA molecule as a genome. When a cell is infected, it creates a DNA copy of its genome and embeds it into the genome of the target cell. A fragment of the retrovirus genome has the following sequence:



Determine the sequence of the DNA copy fragment that will be embedded in the genome of the target cell. Determine the sequence of the protein fragment synthesized on this fragment of the DNA copy, if the chain complementary to the original RNA molecule will serve as a matrix for the synthesis of mRNA. To complete the task, use the genetic code table. When writing sequences of nucleic acids, specify the direction of the chain.

Answer: _____ (The maximum score is 3.

The answer is complete and does not contain biological errors - 3 points, the correct answer is given to two questions or three questions, but contains biological errors-2 points, the correct answer is given to one or two questions, but contains biological errors-1 point, the answer is incorrect or not given-0 points)