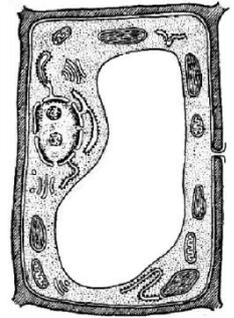


1. All the features listed below, **EXCEPT TWO OF THEM**, are used to describe the cell shown in the picture. Choose two features «dropping out» from the list.



- 1) chloroplasts
- 2) glycocalyx
- 3) photosynthesis
- 4) phagocytosis
- 5) protein biosynthesis

2. **MATCH** the processes to the stages of energy exchange: for each item given in the first column select the right option from the second one.

PROCESSES

STAGES OF ENERGY EXCHANGE

- | | |
|---|--------------|
| A) breakdown of glucose in the hyaloplasm | 1) anaerobic |
| B) synthesis of 36 ATP molecules | 2) aerobic |
| B) lactic acid production | |
| Г) complete oxidation of substances to CO ₂ and H ₂ O | |
| Д) pyruvic acid production | |

3. All the terms listed below, **EXCEPT TWO OF THEM**, are used to describe the sexual reproduction of organisms. Choose two terms «dropping out» from the list.

- 1) the gonad
- 2) the spore
- 3) fertilization
- 4) ovogenesis
- 5) budding

4. **MATCH** the examples of biological phenomena to the forms of variability illustrating these examples: for each item given in the first column select the right option from the second one.

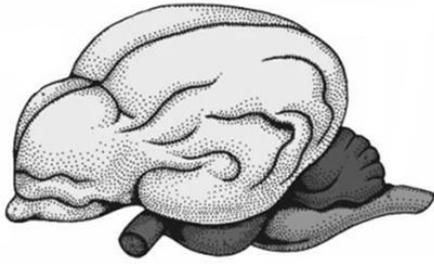
EXAMPLES OF PHENOMENA

FORMS OF VARIABILITY

- | | |
|--|-------------------|
| A) white-eyed Drosophila flies in the offspring of red-eyed Drosophila flies | 1) hereditary |
| B) an albino mouse in the offspring of grey mice | 2) non-hereditary |
| B) different forms of leaves of arrowhead in water and in the air | |
| Г) child's eye color similar to one of the parents | |
| Д) reducing the size of the cabbagehead by the lack of moisture | |

5. Choose **THREE** correct answers out of six. If an animal during the evolution process had the brain shown in the picture, that animal can be characterized by the following

- 1) four-chambered heart
- 2) external fertilization
- 3) skin covered with scutes or scales
- 4) constant body temperature
- 5) cellular lungs
- 6) embryo development in the uterus



6. **MATCH** the functions to the organs of the plant that perform these functions: for each item given in the first column select the right option from the second one.

FUNCTIONS

- A) mineral nutrition
- B) water absorption
- B) synthesis of organic compounds from inorganic
- Г) transpiration
- Д) nutrients storage during the wintering
- E) carbon dioxide uptake and oxygen release

ORGANS OF THE PLANT

- 1) root
- 2) leaf

7. Set the **SEQUENCE** of systematic taxa of the organism starting with the largest taxon.

- 1) Kentucky bluegrass
- 2) bluegrass
- 3) Angiosperms
- 4) Monocotyledons
- 5) Plantae
- 6) Cereals

8. Choose **THREE** correct answers out of six. During running in the human organism

- 1) the synthesis of bile by liver cells increases
- 2) the process of protein biosynthesis in skeletal muscles stops
- 3) blood pressure decreases
- 4) blood flow to the skin increases
- 5) diaphoresis increases
- 6) the activity of the sympathetic nervous system increases

9. **MATCH** the characteristics to the different types of human tissue: for each item given in the first column select the right option from the second one.

CHARACTERISTICS

- A) conductivity
- B) the functions are support and nutrition
- B) forms the outer cover of the skin
- Г) produces antibodies
- Д) consists of closely adjacent cells
- E) forms the grey matter of the spinal cord

TYPES OF TISSUE

- 1) epithelial
- 2) connective
- 3) nervous

10. Set a **SEQUENCE** of processes that occur in the human digestive system during the digestion process.

- 1) the flow of bile into the duodenum
- 2) breakdown of proteins by pepsin
- 3) the beginning of breakdown of starch
- 4) absorption of fats into the lymph
- 5) the flow of faeces into the rectum

11. Choose **THREE** correct answers out of six. Compared to the natural ecosystem, the artificial ecosystem can be characterized by the following:

- 1) wide variety of species
- 2) various food chains
- 3) opened circulation of substances
- 4) predominance of one or two species
- 5) influence of anthropogenic factor
- 6) closed circulation of substances

12. MATCH the objects of research to the methods of research that are used according to each object: for each item given in the first column select the right option from the second one.

OBJECTS OF RESEARCH

METHODS OF RESEARCH

- | | |
|--|--------------------|
| A) laying of gill arches in human ontogenesis | 1) paleontological |
| Б) fossils of mammal-like reptiles | 2) embryological |
| В) phylogenetic row of horses | |
| Г) similarity of the embryos of vertebrate animals | |
| Д) comparison of flora | |

13. Choose **THREE** correct answers out of six. The stability of wet Equatorial forest ecosystem is determined by:

- 1) wide variety of species
- 2) the lack of decomposers
- 3) large number of predators
- 4) composite food chains
- 5) population fluctuations
- 6) balanced circulation of substances

14. MATCH the examples to the environmental factors that can be illustrated by these examples: for each item given in the first column select the right option from the second one.

EXAMPLES

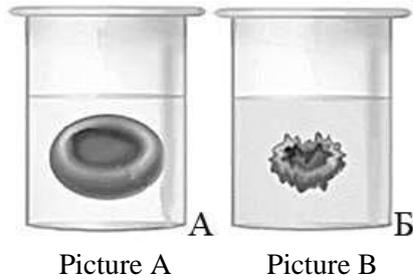
ENVIRONMENTAL FACTORS

- | | |
|--|------------|
| A) atmospheric pressure increasing | 1) abiotic |
| Б) changes in ecosystem relief caused by the earthquake | 2) biotic |
| В) changes in the populations of hares caused by the epidemic | |
| Г) relations between wolves in the pack | |
| Д) competition for the light and water between pines in the forest | |

15. Set a **SEQUENCE** of evolutionary processes that occurred on the Earth in chronological order:

- 1) colonization of land by animals
- 2) occurrence of photosynthesis in prokaryotes
- 3) formation of the ozone layer
- 4) abiogenic synthesis of organic compounds
- 5) occurrence of cellular life forms

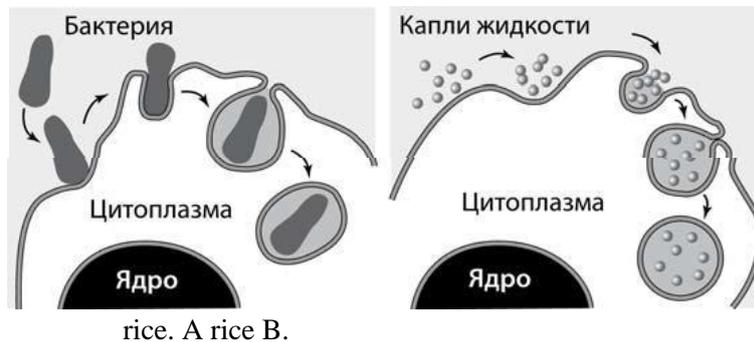
16. It is known that in blood plasma the concentration of a solution of salts is normally 0.9%. Red blood cells were placed in a glass cup filled with a solution of sodium chloride. Compare the image of a normal red blood cell in plasma (picture A) and a red blood cell in the solution (picture B). Explain the observed phenomenon. Determine the concentration of salt in the glass with the solution (more than 0.9%, less than 0.9%, equal to 0.9%).



Response elements:

- 1) the red blood cell shrivels in the solution due to the loss of water that flows out from the cell into the solution according to the law of diffusion (osmosis);
- 2) the concentration of the solution of the salt in the glass is more than 0.9%.

17. What processes are shown in pictures A and B? Name the cell structure involved in these processes. What transformations will take place next with the bacterium in picture A?



Response elements:

- 1) A - phagocytosis; B - pinocytosis;
- 2) the plasma membrane of the cell (cytoskeleton);
- 3) the phagocytosis bubble will merge with the lysosome, its contents will undergo digestion

OR

17. Find three errors in the text below. Write down the numbers of the sentences that contain errors and correct them.

- (1) All glands of the human body are divided into three groups: external, internal and mixed secretions.
- (2) Secretions of all glands of external secretion through the excretory ducts enter the surface of the body.
- (3) Secretions of glands of internal secretion flow through the ducts into the blood.
- (4) Endocrine glands secrete biologically active regulatory substances – hormones.
- (5) Hormones regulate metabolism, affect the growth and development of the body, participate in the regulation of all organs, systems of organs and processes at the cellular level.
- (6) The pancreatic hormone (insulin) regulates blood glucose level.
- (7) The thyroid hormone (adrenalin) stimulates the nervous system and increases heart rate.

Errors were made in the following sentences:

- 1) 2 – secretions of all glands of external secretion through the excretory ducts enter not only the surface of the body but also the cavities of internal organs;
- 2) 3 – glands of internal secretion do not have ducts, so their secretions go directly into the blood;
- 3) 7 – thyroxine is a thyroid hormone while adrenalin is a hormone produced by adrenal glands.

OR

17. In 1724 Stephen Hales, an English explorer, conducted an experiment using several branches of a plant similar to each other, vessels with the same amount of water and a measuring tool – a ruler. He removed some leaves from the branches (the number differed for each branch) and placed the branches in the vessels. Then he continually measured the level of water. In a little while Hales found that the water level had not changed equally in the vessels. Why has the water level changed differently in the vessels? What processes cause the water level to change? What structure of the leaf is responsible for these processes?

Response elements:

- 1) the water level has changed depending on the number of leaves on the branch: the more leaves, the less water is left in the vessel;
- 2) the change of the level of water is associated with the processes of absorption and evaporation of water by the plant;
- 3) stomata provide evaporation, vessels provide water transport

18. What processes of living substance in the biosphere are associated with the relative constancy of oxygen and nitrogen in the atmosphere? Name at least four processes and explain your answer.

Response elements:

- 1) oxygen is released into the atmosphere as a product of photosynthesis;
- 2) oxygen is absorbed from the atmosphere by the process of breathing;
- 3) nitrogen is absorbed from the atmosphere as a result of nitrogen fixation by bacteria;
- 4) the process of denitrification releases nitrogen into the atmosphere

OR

18. It is known that complementary strands of nucleic acids are antiparallel (the 5' end of one strand is paired with the 3' end of the other strand). Nucleic acid synthesis begins at the 5' end. The ribosome moves along the mRNA in the 5'-to-3' direction. All types of RNA are synthesized on a DNA template. A fragment of the central tRNA loop is synthesized on a fragment of DNA molecule which has the following sequence of nucleotides (the first strand is considered as a template):

5'-CGAAGGTGACAATGT-3'

3'-GCTTCCACTGTTACA-5'

Write down the nucleotide sequence of the tRNA fragment that is synthesized on this DNA fragment, mark the 5' and 3' ends of the fragment and name the amino acid which will be carried by this tRNA during the process of protein biosynthesis: the third triplet from the 5' end is considered as the anticodon of tRNA. Explain your answer. For the task, use the genetic code table.

Genetic code (mRNA)

First letter	Second letter				Third letter
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	-	-	A
	Leu	Ser	-	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	D

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. The amino acid is located in the spot where the lines coming from all three nucleotides are crossed.

Response elements:

1) the nucleotide sequence of the tRNA fragment:

5'-CGAAGGUGACAAUGU-3';

2) the nucleotide sequence of the UGA-anticodon (the third triplet) is paired with the mRNA codon – UCA;

3) according to the genetic code table, the mRNA codon leads to the amino acid – Ser which will be carried by the tRNA