

## Master Program in “Nanobiotechnology”

Ticket 1.

Part 1-1. Test 1-1.

Please select one or several correct answers to each question.

1. Hydrogen bonding is characterized by interaction of the following atoms:
  - A. Oxygen
  - B. Hydrogen
  - C. Sodium
  - D. Nitrogen
  
2. Specify which biological molecules are polymers:
  - A. Simple proteins
  - B. Neutral fat
  - C. DNA
  - D. Glycogen
  
3. What chemical bond is hydrolyzed in the decay of proteins?
  - A. Hydrogen bond
  - B. Ester bond
  - C. Peptide bond
  - D. Hydrophobic bond
  
4. How the =NH functional group is named:
  - A. Alcohol
  - B. Amino-
  - C. Aldehyde
  - D. Imino-
  
5. Primary protein structure is:
  - A. Configuration of polypeptide chain
  - B. Polypeptide chain packing in certain volume
  - C. Order of amino acids in the polypeptide chain
  - D. Quantitative composition of amino acids in the polypeptide chain
  
6. Secondary structure is:
  - A. Alpha-helix, beta-sheet and amorphous sites
  - B. Configuration of polypeptide chain
  - C. Formation of protomer
  - D. Way of spatial interaction of several protomers
  
7. What is the role of biological membrane?
  - A. Potential formation
  - B. Cell elasticity
  - C. Ionic transport
  - D. Regulation of cyclosis
  
8. Within a cell, energy is stored in the form of:

- A. ATP
  - B. GTP
  - C. AMP
  - D. cAMP
9. Eukaryotic genes are located in:
- A. Plasmids
  - B. Heterochromatin
  - C. Euchromatin
  - D. Telomeres
10. Non-membranous cell components include:
- A. Lysosomes
  - B. Ribosomes
  - C. Peroxisomes
  - D. Mitochondria
11. Of the blood cells, the following cells are of most stable and uniform shape:
- A. Thrombocytes
  - B. Erythrocytes
  - C. Phagocytes
  - D. Lymphocytes
12. Adrenalin is secreted in:
- A. The thyroid
  - B. The pancreas
  - C. The hypophysis
  - D. The adrenal glands
13. Population comprises individuals:
- A. Of various species
  - B. Related to same food chain
  - C. Of same species
  - D. Having same ecological niches
14. Chromosomes segregate to the cell poles in:
- A. Metaphase
  - B. Prophase
  - C. Interphase
  - D. Telophase

Part 1-2.

Please provide free-form answers:

1. Algae. General characteristics. Cell and thallus structure. Pigments of algae, their role in the adaptation to the environment and in taxonomy. Distribution and the role of algae in nature
2. Lung structure in various groups of organisms. Mechanisms of pulmonary respiration.
3. The metabolism of microorganisms. Types of how microorganisms feed. Types of ATP formation in microorganisms. Microbial electron transport chains.
4. The role of light in the biosphere formation.

5. Structural organization of biological membranes.
6. Ion channel transport.

## Master program “Fundamental and systemic ecology”

Ticket 2.

Part 2-1. Test 2-1.

Please select one or several correct answers to each question.

1. Okazaki fragments are formed during:
  - A. DNA recombination
  - B. DNA replication
  - C. Transcription
  - D. Translation
  
2. Segregation of 1: 2: 1 is observed in the following hybridization:
  - A. Two heterozygotes with complete dominance
  - B. Two homozygous with one dominant allele
  - C. Two heterozygotes with incomplete dominance
  - D. Two heterozygotes with co-dominance
  
3. The following substances are absorbed to the lymph from the intestine:
  - A. Amino acids
  - B. Simple sugars
  - C. Water
  - D. Fatty acid
  
4. Erythrocytes are formed in:
  - A. The spleen
  - B. The lymphatic nodes
  - C. Red bone marrow
  - D. The liver
  
5. How many chambers does the heart of amphibians have:
  - A. Two: the atrium and the ventricle
  - B. One with the septum
  - C. Three: the two atria and the ventricle with the septum
  - D. Three: the two atria and the ventricle
  
6. In sexual reproduction, the following are formed:
  - A. Spores
  - B. Cysts
  - C. Buds
  - D. Gametes
  
7. The blastula stage comes immediately after the stage of:
  - A. Zygote
  - B. Gastrula
  - C. Neurula
  - D. Morula

8. The Lotka-Volterra competition model is based on:
- A. Linear equation
  - B. Exponential equation
  - C. Logistic equation
  - D. Equation of harmonic oscillations
9. Suggest another correct term for “ the factors of the non-living environment”
- A. Biotic factors
  - B. Abiotic factors
  - C. Humankind-dependent factors
  - D. Ecological factors
10. To what group of biotic components do earthworms belong?
- A. Producers
  - B. Consumers
  - C. Detritophages
  - D. Reducers
11. What trophic level do first-order consumers represent?
- A. 1
  - B. 2
  - C. 3
  - D. 4
12. What type of biotic relationship is mutually beneficial and obligatory at least for one of the partner organisms?
- A. Amensalism
  - B. Mutualism
  - C. Protooperation
  - D. Commensalism
13. Nodule bacteria that establish a symbiotic relationship with some plants are involved in the cycle of
- A. Oxygen
  - B. Carbon dioxide
  - C. Nitrogen
  - D. Phosphorus
14. The whole ensemble of coexisting and interconnected species is referred to as....
- A. A biotope
  - B. A biocenosis
  - C. The biosphere
  - D. An agrocenosis

Part 2-2.

Please provide free-form answers:

1. Morphobiological characteristic of the class of birds. Homeothermy. The mechanisms of thermoregulation, properties of respiratory, circulatory, digestive and excretory systems.
2. The periodization of individual human development, stages of ontogeny and their morpho-functional characteristics.

3. Features of mammalian early development. Formation of eyes, limbs, heart, kidneys in vertebrates. Morphogenetic interactions between the parts of the rudiment in the course of development of these organs.
4. The purine and pyrimidine bases. Nucleosides and nucleotides. Cyclic nucleotides.
5. Comparative Characterization of Steppe and Desert Biomes: Vegetation, Biomass, Productivity, Degree of Anthropogenic Transformation. Desertification and Global-level Measures Aimed at Overcoming the Trend
6. Aquatic Ecosystems, Main Ecological Groups of Aquatic Organisms. Ecological Zonation of the Ocean. Net Primary Production in Ocean Ecosystems. Humankind's Impact on the Ocean.