

Entrance tests

1. Origin and evolution of the cell
2. Space-time organization of the cell
3. Transmembrane transfer of water, ions and organic compounds in a plant cell: basic types, mechanisms and dynamics
4. General characteristics of the metabolism of plant and animal cells
5. Genetic systems of plant cells and their interaction
6. General principles and mechanisms for the regulation of cellular metabolism
7. The general plan for the energy of plant, animal and bacterial cells
8. Signalling systems of plants. The principle of functioning. Interaction of different signalling systems.
9. Modern ideas about the mechanisms, evolution and the global role of photosynthesis
10. Bacterial photosynthesis
11. Photosensitizers of plant cells: their nature, properties, functions
12. The role of respiration in a plant body
13. Theories of conjugation of oxidation and phosphorylation
14. Mineral nutrition of plants and their water exchange. Interprocess communication
15. Systems and mechanisms of water transfer, inorganic and organic compounds in a plant
16. A plant and stress. Classification of stressors. Specific and nonspecific reactions.
17. Phytohormones. Characteristics of the main classes, mechanisms of action and physiological effects.
18. Cellular and molecular-genetic basic principles of plant growth and development
19. The production process of plants, endogenous and exogenous factors of its limitation
20. Cells and tissues culture of plants, its theoretical and applied aspects
21. Genetically modified organisms: goals and methods of obtaining, use, risks.
22. Basic principles of DNA replication. Eukaryotes' DNA replication characteristics
23. Mobile genetic elements of bacteria
24. Processing of primary transcripts
25. DNA repair.
26. Evolutionary significance of the signs of higher plants (progressive and archaic features).
27. Principles of constructing the latest phylogenetic systems of the plant world.
28. Modern understanding of the plant population. The age structure and dynamics of the populations.
29. Life strategies of plants. Ramensky and Grime's systems, r- and k-strategies
30. Morphological and anatomical features of plants of different ecological groups.
31. Classification of plant tissues. Characteristics, functions performed
32. The origin, evolution, structure and functions of vegetative organs of a plant.
33. Types of plant reproduction. Alternation of generations and the replacement of nuclear phases in higher plants
34. A flower. The origin and evolution of the flower.
35. Life forms of plants. Systems of life forms.
36. Phytocenosis. Biotic factors in the life of plant communities, the classification of plant communities
37. Principles of the classification of vegetation.
38. Dynamics of plant communities.
39. Vegetation change under human influence (synanthropisation).
40. An area as a species characteristics. The phenomena of relictiness and endemism

41. Endemic plants of the Urals and the scientific basis for their protection.
42. Basic aromorphosis of the arthropod type.
43. The comparative analysis of the anamniotes and the amniotes and their evolutionary and ecological strategies.
44. Appearance of the terrestrial vertebrates, their adaptation to inhabitation on land.
45. Evolution of the circulatory system of the chordates.
46. Evolution of the respiratory system of the chordates.
47. Evolution of the digestive system of the chordates.
48. Evolution of the genitourinary system of the chordates.
49. Evolution of the nervous system and sensory organs of the chordates.
50. Evolution of organs of movement and diversity of types of the extremities of the chordates
51. Evolution of the skull of the vertebrates
52. Evolution of the axial skeleton of the chordates.
53. Fundamentals of zoogeographical zoning of the land and the World ocean.
54. Basic theories explaining the distribution of animals.
55. Methods of breathing of the vertebrates.
56. The origin and evolution of the nervous system of the invertebrates.
57. Evolution of the respiratory system of the invertebrates.
58. The main methods of locomotion of the invertebrates.
59. The system of adaptations of the arthropod animals to living in a terrestrial environment.
60. The main directions of the evolution of the protozoa and multicellular animals.
61. Characteristics of the structure of the faunas of the urbanized territories.
62. The main hypotheses of the origin of multicellular animals. Hypotheses of non-colonial origin of the multicellular. The main hypotheses of the origin of the multicellular from the colony of the protozoa.
63. Evolutionary prerequisites for the vertebrates outflow to land.
64. The concept of regulation and self-regulation. Principles of humoral and reflex regulation of functions in the body. Neurohumoral regulation.
65. Breathing, its main stages. Biomechanics of inspiration and expiration. Pressure in the pleural cavity, its origin, changes in different phases of the respiratory cycle.
66. I.P. Pavlov's teaching on the first and second signal systems of reality. The role of words, suggestion and autosuggestion.
67. Modern ideas about the process of excitation. The potential of an action, its phases. Ionic mechanisms of the potential of an action.
68. Memory, its importance in the formation of adaptive reactions. Mechanisms and features of short-term and long-term memory.
69. Laws of irritation of excitable tissues.
70. Blood circulation, its importance for the body. The basic laws of hemodynamics.
71. Physiological mechanisms and characteristics of sleep. Phases of sleep. Dreams and their role.
72. Functional classification of vessels. Vascular tonus and its regulation. Characteristics of smooth muscle cells.
73. Nervous cells, their classification and functions. Characteristics of occurrence and distribution of excitation in afferent neurons.
74. Modern ideas about the process of excitation. Local excitation process (local response), its transition into a running excitation. Changes in excitability during excitation.
75. Congenital forms of behaviour (unconditioned reflexes, instincts), their significance for the adaptive activity of the organism.
76. The dynamic stereotype, its physiological essence, importance for training and labour skills acquisition.
77. Self-regulation of heart activity: cellular, intracardiac and non-cardiac mechanisms. Characteristics of the

basic regulatory influences.

78. I.P. Pavlov's teaching on the types of higher nervous activity of the man. Classification and characterization of types.
79. Functional properties of receptors. Peculiarities of the appearance of excitation in primary sensory and secondary sensory receptors.
80. General principles of the organization of sensory systems.
81. Synapses, structural features and classification. Mechanisms of transmission of excitation in the synapses. Post-synaptic potentials.
82. Physiology of the spinal cord. Self-regulation of the tone of skeletal muscles.
83. The cerebral cortex of the cerebral hemispheres, its functional role. Localization of functions in the cerebral cortex.
84. The nervous centre. Mechanisms of transmission of the excitation in the nerve centres. The time of reflex. Reflexometry.
85. The modern concept of digestion (A.M. Ugolev) and nutrition. Functions of the digestive tract.
86. Inhibition in the central nervous system, its role and types. Mechanisms of inhibition processes.
87. Thermoregulation in the man's body. The role of sweat glands.
88. Physiological properties of muscles. Classification and characteristics of skeletal muscle fibres. Neuromotor units.
89. The vegetative nervous system, its role in maintaining homeostasis. Parasympathetic and sympathetic parts of the vegetative nervous system. Transmission of excitation in vegetative ganglia. Mediators of the vegetative nervous system and their receptors.
90. Characteristics of salt water-water metabolism. The basic mechanisms of its regulation.
91. The endocrine system and its regulatory physiological functions. Forms of interaction of the nervous and endocrine systems. The role of the endocrine system in the regulation of growth, development, reproduction, different forms of adaptation, behaviour.
92. Metabolism. Basic and operational metabolism. Energy expenditure of the body for various types of work.
93. Principles of hormonal regulation of functions. General properties of hormones. Mechanisms of action of protein, steroid and thyroid hormones. Factors determining the effect of hormones on effector cells. Specificity of hormones action on effector cells.