

**Specification of the test on Biology for  
Unified National Testing and Complex Testing**

(Approved for use in the Unified National Testing and Complex Testing from 2018)

The document was developed in accordance with the State Educational Standards of secondary education and with educational programs in general subjects.

**1. Test development purpose:** Determination of preparedness level of entrants for Biology to admit to higher educational institutions of the Republic of Kazakhstan.

**2. The content of the test:** The test consists of 30 test items. There are 3 difficulty levels, which are as follows: 15 test items of the first level, 8 of the second level, 7 of the third level.

The test includes educational material of Biology in accordance with the curriculum for the general education school.

№	Chapter	№	Topic	№	Subtopic
01	Botany	01	Plants	01	Cell and tissue structure of plants
				02	Organs, organ systems of plants. Modifications
				03	Main processes of plant life. Respiration. Reproduction
				04	Nonvascular and vascular plants
				05	Main divisions of Kingdom Plantae
				06	Viruses. Bacteria. Fungi. Lichens
02	Zoology	01	Animals	01	Unicellular animals
				02	Multicellular animals
				03	Phylum Chordata
03	Human biology	01	Human anatomy and physiology	01	Human as a biological species. General view of human organism. Coherence of organ systems functions in human body. Humoral regulation of body systems.
				02	Nervous system. Sensory organs.
				03	Locomotion system
				04	Internal medium of an organism. Cardiovascular system
				05	Respiratory system
				06	Digestive system
				07	Excretion. Metabolism. Skin and thermoregulation
				08	Individual development of an organism. Behavior and psyche
04	General biology	01	Cytology, genetics, ecology	01	Basics of cytology
				02	Basics of genetics. Selection of animals and plants, biotechnology
				03	Origin and history of life on Earth, basics of evolution.
				04	Biosphere and human. Nutrients and energy transfer. Basics of ecology
05	Qualitative	01	Qualitative problems	01	Problems for application

	problems			02	Problems for analysis
				03	Problems for synthesis

### 3. Characteristics of the content of test items:

According to the curriculum of the course, graduates should master:

Living organisms - magnifying devices; the cell is the main structural and functional unit of plant organism; the concept about plant tissues, their diversity; features of flowering plants; vegetative (root, shoot, leaf, stem, bud) and generative (flower, fruit, seed) organs of flowering plants, their internal and external structure, importance, modifications; the concept of photosynthesis and respiration; the concept of double fertilization in plants, fruit formation; reproduction and dispersal of plants; the concept of vegetative reproduction, its types and biological role; the structural features and life activities, reproduction and development of different animal groups: unicellular - protists; multicellular, invertebrates – coelenterates, flatworms, roundworms and segmented worms; mollusks and arthropods; chordata – acrania (lancelet), and vertebrates: fishes, amphibia, reptilia, birds and mammals.

Diversity of living organisms – the principle of the classification of living organisms, the main systematic groups and their co-ordination; diversity and importance of plants in nature and human life: the lower spore bearing – algae; higher spore bearing - mosses, horsetails, club mosses, ferns; diversity of gymnosperms and angiosperms, their importance in nature and human life; structural features of different plant families (classes of monocots and dicots); wild, cultural, medicinal, important national economic cultures of plants; structural features of viruses, bacteria, fungi and lichens, their properties in form, nutrition, respiration, reproduction, dispersal, diversity and their importance in nature and human life; diversity of different groups of animals and their importance in nature and human life: unicellular - protozoa; multicellular, invertebrates - coelenterates, flat, round and segmented worms; mollusks and arthropods; chordates - acrania (lancelet) and vertebrates: fish, amphibians, reptiles, birds, mammals.

Human and his health – the structure, life activity, chemical composition of the cell; features of basic human tissues; man as a biological species; endocrine, exocrine and mixed glands; prevention of diseases endocrine system caused by malfunctioning of endocrine glands; features of hormones, humoral regulation; nervous system: central, peripheral; structure, functions and the importance of the brain and spinal cord; features of a neuron, nervous regulation, white and grey matter, a reflex and a reflex arc, excitation and inhibition; coordination of organs and organ system functions in human body; properties of sensory organs and analyzers, their properties, meaning and interrelation; hygiene, diseases of the sensory organs and their prevention; locomotion system: skeleton and muscles; skeleton parts; importance of joints, seams, periosteum, structure and growth of bones; types of muscles, their structure, importance; main muscle groups; first aid in sprains, joint dislocation, bone fractures; prevention of posture deformation and flat feet; the internal environment of the body - blood, tissue fluid and lymph; properties of plasma and blood corpuscles; structure and functions of erythrocytes, leukocytes, thrombocytes; importance of immunity, vaccinations, vaccine, blood groups, antibodies and antigens, Rh factor; donor and recipient; blood transfusion; the cardiovascular system; structure of the heart; concepts of myocardium, heart attack, cardiac cycle, aorta, cardiac valves, pulse, arterial pressure; systemic and pulmonary circulations; structure and types of blood vessels; first aid for capillary, venous, arterial bleeding; structure and functions of respiratory organs; features of the alveoli; vital capacity of the lungs; artificial respiration; respiratory movements, their regulation; respiratory center; first aid in the damage of respiratory organs; diseases of the respiratory system, their prevention; respiratory hygiene; digestive system – structure and functions; importance of food and nutrients, bile, pancreatic juice, digestion and absorption; structure and functions of digestive glands; structure, functions and hygiene of teeth; infectious and helminth diseases of the digestive system, preventative measures; food poisoning, first aid in food poisoning; metabolism and energy transformation; dietary standards; vitamins, their importance; the notion of hypovitaminosis, hypervitaminosis

and avitaminosis; urinary organs - structure and functions; the structure of the kidney; features of nephron, renal pelvis, homeostasis; formation of urine; prevention of kidney diseases (ascending and descending infections); causes of kidney diseases; structure of the skin; the concept of epidermis, dermis, hypodermis, heat regulation; fungal diseases; first aid for thermal strokes, sunstrokes, burns and frostbite; hygiene of skin and clothing; structure and functions of female and male reproductive organs; concepts of sex chromosomes, puberty, fertilization, embryo, placenta, pregnancy, childbirth; intrauterine development of the fetus; hereditary and congenital diseases; sexually transmitted diseases, their prevention; concept of human behavior and psyche; sleeping and dreams; attention and imagination; consciousness and memory; speech and emotions; perceptions and sensations; temperament and character.

General biology - main stages of the development of biology as a science; the basic properties of life; basic concepts of cell theory; structure and functions of cell organelles; chemical composition of the cell; the notion of replication, complementarity, DNA, RNA, centromeres, chromatin; types of chromosomes; prokaryotes and eukaryotes; matter and energy exchange - metabolism, the concept of catabolism and anabolism, glycolysis and photolysis; protein synthesis; genetic code, its properties; the concept of transcription and translation; gene and cell engineering; reproduction and individual development of organisms; the concept of ontogenesis, mitosis and meiosis (their phases); spermatogenesis and oogenesis; forms and types of reproduction of organisms; concept of self-regulation; biological clock, biorhythms, anabiosis; the fundamentals of genetics and methods of investigating heredity; concept of mono-, dihybrid cross; Mendel's laws; the concepts of the phenotype and genotype, allelic genes, alternative traits, gametes, homozygotes and heterozygotes; full and incomplete dominance; independent inheritance; genetic determination of the sex; sex-linked inheritance; gene interactions; cytoplasmic heredity; human genetic diseases; modificational and hereditary (mutational) variability; gene, chromosomal, genomic mutations; the law of homologous series of hereditary variability; genetics and medicine; methods of studying human heredity; treatment and prevention of certain genetic diseases of human; bases and methods of modern breeding; origin centers of cultivated plants; concepts of polyploidy, distant hybridization, artificial mutagenesis, inbreeding, outbreeding; heterosis, its use in agriculture; cellular and genetic engineering; biotechnology; main features of the evolutionary theory; mechanisms of the evolutionary process; concepts of the species and its criteria, of the population; struggle for survival and its types; forms of natural selection in populations; fitness of organisms; the concept of macroevolution and microevolution; the main directions of evolution - concepts of anamorphosis, idioadaptation, degeneration; the emergence of life on Earth; the theory of biogenesis, abiogenesis, panspermia, creationism; features of coacervate; the development of life on Earth; eras and periods of the geochronological table of the Earth; human origin; the most ancient, ancient and modern man; concepts of anthroposociogenesis, atavisms, rudiments, fossils and transitional forms of life; human races; subject and tasks of ecology; environmental factors of the environment; biotic optimum; natural communities; biogeocenosis; ecosystems and their properties; agrocenosis; concepts of decomposers, producers, consumers, ecological pyramid, food chains; concepts of symbiosis, mutualism, commensalism, parasitism, predation, succession; ecological problems; biosphere, its components: living matter, species composition; the cycle of substances in nature; bionics is an applied science used by man to solve daily life problems, based on the principles of the organization of plants and animals; forms of living in nature and their industrial analogies (building structures, machines, mechanisms, instruments), the concept of the structural organization of living organisms and objects created on this basis.

#### **4. Forms of test items:**

The test consists of 20 test items with the choice of one correct answer from 5 proposed and 10 test items with one or more correct answers from multiple choices.

#### **5. Assessment of the test item and the whole test:**

The correctly done test item with the choice of one correct answer is given one point, incorrectly done no (zero) points.

In the test items with one or more correct answers (up to three correct answers):

- if there is only one correct answer and if a test-taker chooses the correct answer, he/she gets two points;
- if there is only one correct answer and if a test-taker chooses the correct answer and one incorrect answer, he/she gets one point;
- if there is only one correct answer and if a test-taker chooses two or more incorrect answers, he/she gets no (zero) points;
- if there are two correct answers and if a test-taker chooses two correct answers, he/she gets two points;
- if there are two correct answers and if a test-taker chooses one correct answer, he / she gets one point;
- if there are two correct answers and if a test-taker chooses one correct and one incorrect answer, he/she gets one point;
- if there are two correct answers and if a test-taker chooses both correct answers and one incorrect answer, he/she gets one point;
- if there are two correct answers and if a test-taker chooses two or more incorrect answers, he/she gets no (zero) points;
- if there are three correct answers and if a test-taker chooses all three correct answers, he/she gets two points;
- if there are three correct answers and if a test-taker chooses two correct answers, he/she gets one point;
- if there are three correct answers and if a test-taker chooses two correct answers and one incorrect answer, he/she gets one point;
- if there are three correct answers and if a test-taker chooses three correct answers and one incorrect answer, he/she gets one point;
- if there are three correct answers and if a test-taker chooses one correct answer or two and more incorrect answers, he/she gets no (zero) points.

If a test-taker answers the whole test correctly, he / she gets 40 points.