

## **Essay Topics**

**\$\$\$001**

Effectiveness of using PISA tasks in biology lessons

**\$\$\$002**

The Role of Digital Tools and Online Resources in Biology Education.

**\$\$\$003**

Game Technologies in Biology Education: Motivation and Increasing Interest.

**\$\$\$004**

The Effectiveness of Using Gamification Elements in Teaching Biology.

**\$\$\$005**

Development of Creative Skills in Students through Biology Education Based on STEM Technologies.

**\$\$\$006**

Integration of Research and Project-Based Methods in Biology Lessons.

**\$\$\$007**

The Problem of Implementing Modeling Technology in Biology Lessons.

**\$\$\$008**

Application of Research and Project-Based Methods in Developing Creative Skills of Students.

**\$\$\$009**

Application of Digital Technologies in Teaching Biology.

**\$\$\$010**

The Role of Research Methods in Developing Students' Scientific Thinking.

**\$\$\$011**

Genetic Diseases and Methods of Their Prevention.

**\$\$\$012**

Genetic Mutations — The Driving Force of Natural Evolution.

**\$\$\$013**

Bioremediation and Environmental Sustainability.

**\$\$\$014**

Genetically Modified Plants and Animals.

**\$\$\$015**

Molecular features of the genome of eukaryotes and prokaryotes

**\$\$\$016**

Vaccines and biological products based on microorganisms

**\$\$\$017**

Conditions for microclonal cultivation of plants

**\$\$\$018**

Modern problems of biotechnology

**\$\$\$019**

Ecobiotechnologies and Environmental Protection Preconditions.

**\$\$\$020**

GMO and GMO products. Biosafety issues

## **Exam questions**

### ***Block 1 questions***

###001

The methodology of teaching biology is science and an academic discipline. Forms of biology education

###002

Didactic principles in the methodology of teaching biology. Selective (elective) biology courses

###003

Assessment of students' academic achievements in the process of teaching biology

###004

Methods of teaching biology. The history of the origin and development of the biology teaching process

###005

Interactive assessment platforms

###006

Signs of pedagogical technologies

#007

The process of formative assessment

###008

Blended and e-learning

###009

Interactive learning platforms

###010

The process of differentiated learning

###011

Critical thinking in learning

###012

Competencies of a modern teacher

###013

Comparison of formative and summative assessment

###014

The material base of the biology room

###015

The cumulative assessment process

###016

A mutation. Types of mutations. Types of gene mutations and the causes of their origin

###017

Genetics of prokaryotes. Genetic recombination

###018

Genetic recombination. Transduction. General and actual transduction

###019

Chemical mutagenesis. Features of the mutagenic action of chemical agents

###020

Cytological foundations of heredity. Cell division and self-production

###021

Mitotic cycle and phases of mitosis

###022

The structure of chromosomes: chromatide, heterochromatin and euchromatin regions of the chromosome, chromomeres, chromocenters

###023

The main patterns of heredity of signs and principles of heredity

###024

Inheritance in dihybrid hybridization. Separation by genotype and phenotype during dihybrid hybridization

###025

DNA as the keeper of the hereditary message

###026

The main energy substrates of the cell.

###027

The molecular basis of heredity

###028

Karyotype. The number and morphological feature of chromosomes

###029

Meiosis and gamete formation. Phases and stages of meiosis

###030

Variability. Phenotypic and genotypic variability

###031

The emergence of various fields of microbiology: according to the objects of research (bacteriology, mycology, parasitology, virology)

###032

Factors affecting microorganisms. The influence of physical factors on microorganisms

###033

Factors affecting microorganisms. The influence of chemical factors on microorganisms

###034

Microbiological research methods. Rules of work in microbiological laboratories

###035

Types of relationships between microorganisms and higher organisms: (neutralism, commensalism, mutualism, parasitism)

###036

Factors affecting microorganisms: the influence of anthropogenic factors on the structure of microbiocenosis

###037

The role of microorganisms in the circulation of substances in nature: the processes of transportation of phosphorus-containing substances

###038

Genetics of microorganisms: biological function of plasmids, integration in chromosomes

###039

The world of microorganisms, common characteristics and diversity: prokaryotic and eukaryotic microorganisms, their differences

###040

Methods of molecular biology. Physical and chemical methods.

###041

The amino acid composition of proteins. Polar and non-polar amino acids

###042

Replication. The basic principles and types of DNA replication.

###043

Transcription. Transcription mechanisms in pro - and eukaryotes

###044

The prokaryotic genome. The structure and organization of the prokaryotic genome.

###045

Organization of the prokaryotic genome using the example of E.coli.

###046

The structure and organization of the eukaryotic genome. Quantitative features of the eukaryotic genome

###047

Membrane structures. The principles of the structure. Lipids and membrane proteins

###048

Intermolecular interactions and their role in the functioning of living systems

###049

Genetically modified animals and plants

###050

The cell cycle. The cell cycle and phases of mitosis

### ***Block 2 questions***

###001

Planning the learning environment based on group learning technology for the following educational purposes: 7.1.7.1-comparison of types of the nervous system of animals

###002

Planning the middle of classes based on STEM educational technologies for the following educational purposes: 7.1.6.2-explanation of the influence of light on plant development

###003

Preparation of a formative assessment assignment for the educational purpose presented below: 8.3.2.3 explanation of the causes of environmental problems in Kazakhstan and ways to solve them

###004

Preparation of a formative assessment task according to the educational goal set below: 9.2.2.2 description of the stages of mitosis

###005

Preparation of a formative assessment assignment for the educational goal set below: 11.3.2.1-forecasting the possible consequences of global warming

###006

Preparation of a formative assessment task for the educational purpose set below: 9.2.4.9-description of the main methods of human genetics research

###007

Preparation of a formative assessment assignment for the educational goal set below: 10.1.3.3-explanation of the passive transport mechanism

###008

Preparation of a formative assessment task according to the educational goal set below: 7.1.4.1-description of respiratory significance in living organisms

###009

Planning the middle of the lesson using a single method/approach/strategy for the following learning objectives: 8.1.3.9 establishing the relationship between the structure and function of the vascular wall

###010

Planning the start of classes for the following educational purposes: 9.1.3.1 comparison of active and passive transportation

###011

Planning the middle of the lesson using one method/approach/strategy for the next learning goal: 11.1.3.3-explanation of the mechanisms of various types of transport of substances through the cell membrane

###012

Planning the middle of the lesson in the form of pair training for the following educational purpose: 9.2.5.3-description of the driving forces of evolution

###013

Planning the middle of the lesson using a single method/approach/strategy for the following learning objectives: 8.1.3.9 establishing the relationship between the structure and function of the vascular wall

###014

Planning the middle of the lesson using a single method/approach/strategy for the following learning objectives: 8.2.1.1 Comparison of animal reproduction methods

###015

Planning the middle of the lesson in the form of pair training for the following educational purposes: 8.2.3.1 description of the stages of embryonic development

###016

Preparation of a formative assessment task for the educational purpose set below: 9.3.2.3 explanation of the greenhouse effect on living organisms

###017

Preparation of a formative assessment task for the educational purpose set below: 7.1.1.3 description of the structural features of vertebrates and invertebrates

###018

Planning the middle of the lesson based on critical thinking technology for the following learning objectives: 10.1.7.3-study of the structure and functions of the spinal cord and brain

###019

Planning the middle of the lesson for the next learning goal based on critical thinking technology: 10.1.6.2-explanation of the mechanism of muscle contraction

###020

Planning the middle of classes based on CLIL technology for the following educational purposes: 7.1.1.3 description of the structural features of vertebrates and invertebrates

###021

The Law of Independent Assortment of Genes. General Formula of Segregation in Independent Inheritance

###022

Non-allelic Interactions: Complementarity, Epistasis, Polygeny

###023

Studies of Heredity. Characteristics of Inheritance in Gene Linkage

###024

Linkage Groups. Cytological Foundations of Gene Linkage

###025

Genetic Maps: Principles and Their Creation in Eukaryotes

###026

Formation and Biological Functions of Biogenic Amines. Deactivation of Biogenic Amines.

###027

Gene Mutations. Occurrence of Gene Mutations, General Characteristics of the Molecular Nature: Base Substitution, Deletion, or Insertion of Bases.

###028

Autopolyploidy. Meiosis in autopolyploids. Genetic analysis of autopolyploids. Heredity

###029

Allopolyploidy. Meiosis and heredity in allopolyploidy.

###030

Polyploid rows. The role of polyploid in evolution and breeding

###031

Lactic Acid Fermentation. Diversity of Microorganisms Involved in the Process of Lactic Acid Fermentation.

###032

The growth of microorganisms. Methods for determining growth. Growth curve and phases

###033

Types of bacterial differentiation: dormant forms (endospores, cysts, akinetes)

###034

Industrial biotechnology. The use of prokaryotes as a form of biotechnology.

###035

Biogas production. The importance of anaerobic microorganisms in biogas production.

###036

Biotechnological processes. The use of biological methods in the treatment of industrial and domestic wastewater

###037

Enzymes produced by microorganisms. Microorganisms used in the production of enzyme preparations and their characteristics.

###038

Obtaining proteins by biotechnological means

###039

Environmental biotechnology and its achievements

###040

Production of amino acids. The value of the amino acid and its applications

###041

Intermolecular interactions and their role in the functioning of living systems.

###042

Protein-lipid interactions and biological membrane formation

###043

Bioinformatics

###044

Genetic engineering. Genetic engineering and safety issues

###045

Protein-nucleic interactions in the regulation of genome activity, during self-assembly of intercellular structures, viruses and phages

###046

Cell division. Mitosis. Meiosis or reductive division

###047

Intercellular and intracellular signals and membrane receptors

###048

Heterogeneity of eukaryotic DNA by nucleotide composition

###049

Mobile genetic elements of prokaryotes: IS elements, transposons

###050

The diversity of viral genomes. DNA and RNA with viruses

### ***Block 3 questions***

###001

According to Mercer's research, conversation is an integral part of student learning. He distinguishes between three types of conversations in which subjects participate. What types are there?

###002

Smart technology. The importance and effectiveness of Smart technologies in teaching biology. Using Smart technologies.

###003

Why is it said that biological knowledge can be expressed through concepts? When and by whom was the theory of the development of biological concepts developed?

###004

What learning goals should be set in a biology lesson? Why is great importance attached to the preparation of high-level assignments in modern conditions?

###005

Planning an experiment for the purpose of learning below: (M) determining the number of chromosomes in different organisms.

###006

Planning a laboratory lesson for the following learning purpose: (D) cheese/yogurt preparation.

###007

Planning a laboratory lesson for the following educational purpose: DCP, DEC the influence of various factors on the photosynthesis process (intensity of light waves).

###008

Planning a laboratory lesson for the following learning objective: DEC study of plant respiration.

###009

Planning a laboratory session for the following educational purposes: DCP, DEC hearing detection.

###010

Planning a laboratory lesson for the following learning purpose: (M) comparative characteristics of the respiratory system of insects, fish and humans.

###011

Planning a laboratory lesson for the following educational purpose: (D) studying the biological properties of water.

###012

"The diversity of living organisms. Preparation of formative assessment tasks on this topic according to the standard curriculum of updated content on the discipline "Biosphere and ecosystems

###013

Drawing up a plan for a standard curriculum of updated content in the discipline "Biology" in accordance with the objectives of training on the topic "Cell Biology", drawing up formative assessment tasks on these topics

###014

Drawing up a plan in accordance with the objectives of training according to the standard curriculum of updated content in the discipline "Biology" on the topic "Transportation of substances", drawing up formative assessment tasks on these topics

###015

Planning and Development of Tasks for Formative and Summative Assessment in the Section "Molecular Biology" in Accordance with the Educational Objectives of the Model Curriculum for the Subject "Biology" with Updated Content.

###016

Drawing up a short-term plan for the discipline "Biology" in accordance with the objectives of the training in the section "Reproduction"

###017

Planning an experiment for the purpose of learning below: (D) studying the presence of various pigments in plants.

###018

Planning an experiment for the following educational purpose: (D) Investigation of membrane semipermeability using the example of a dialysis tube.

###019

Planning an experiment for the following educational purpose: (D) the study of various forms of bacteria.

###020

Planning a laboratory lesson for the following educational purpose: DCP, DEC the influence of various factors on the photosynthesis process (intensity of light waves)

###021

Environmental mutagens and methods of their study. Test systems and genetic activity testing systems

###022

The Law of Homologous Series of Hereditary Variability by N.I. Vavilov.

###023

Gene Activity Regulation. The Operon Model.

###024

Population and Its Genetic Structure.

###025

Replication. Replicon. Features of replication and organization of eukaryotic chromosomes.



###026

The structure of chromosomes. Changes in the morphological organization of chromosomes during mitosis and meiosis.

###027

The population and its genetic structure. The Hardy-Weinberg law, its applicability.

###028

Genetic heterogeneity of populations

###029

Ontogenetic variability of chromosomes. Replication of chromosomes. Polyteny

###030

The law of "purity of gametes". Homozygous and heterozygous

###031

Lactic acid bacteria, their distribution and association with other microorganisms.

The use of lactic acid bacteria in the dairy industry, bakery products, biological canning, meat and fish industries, lactic acid and dextran production.

###032

Conditions for growing microorganisms. Industrial production and use of microbial polysaccharides.

###033

Manufacturers of lipids. Industrial production and practical application of lipids.

###034

The use of microbial enzymes in the food industry, textile industry, agriculture, medicine, organic synthesis

###035

Features of microorganisms' enzymes. Enzymes of microorganisms used in production.

###036

Bioremediation. The role of microorganisms in the restoration of degraded soils.

###037

Purification of water and reservoirs. Purification of waters contaminated with oil and petroleum products with the help of microorganisms.

###038

Biological leaching. Important microorganisms for hydrometallurgy. New trends in the development of biogeotechnology of metals

###039

Getting protein. The process and principles of controlling the growth of microorganisms.

###040

Obtaining antibiotics in industrial conditions.

###041

Technology for the production of monoclonal antibodies (hybridomas)

###042

Ways to heal plants from viral diseases

###043

Rules of work in biotechnological laboratories, ethics issues

###044

Biotechnological processes: principles of systematic and phased implementation

###045

The main branches and tasks of cellular biotechnology

###046

Problems of cloning and gene expression

###047

DNA Repair and Crossing Over.

###048

Features of Replication of Eukaryotic Chromosomes..

###049

Translation. Translation mechanisms (protein biosynthesis).

###050

Physical and chemical properties of proteins. The shape of protein molecules and methods of its study.