al-Farabi Kazakh National University

Faculty of Biology and Biotechnology

Department of Biodiversity and Bioresources

**Program of final exam by discipline**

**100365**

**Biology of cell and Histology**

**Educational program**

**6B05102 – Biology**

**1 course, 1 semester**

Almaty 2025

Program of final exam by discipline 100365 Biology of cell and Histology of the educational program 6B05102 – Biology as compiled by senior lecturer Zaparina Yelena

Reviewed and approved at a meeting of the Department of Biodiversity and Bioresources

From " " \_\_ 2025, Protocol

Head of the Department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Kurmanbayeva M.S.

Reviewed and approved at the meeting of the methodical council of biology and biotechnology faculty

From "" 2025, Protocol

**FORM OF FINAL EXAM IN DISCIPLINE - WRITTEN EXAM:**

**TRADITIONAL - ANSWERS TO QUESTIONS**

It is conducted in oral offline format. The task goal is to identify the expected results of the discipline training

Exam questions will be created automatically, the student will have 15 minutes to prepare, after which he will have to give an oral answer.

**EXAM PROCEDURE**

**IMPORTANT** - the exam is held on a schedule that must be known in advance as the students as the teachers.

**Requirements for the design of the work.** The answers to the tickets should correspond to the content of the question and most fully reflect the results of training.

**MODULE 1 Cell organization**

Cytology-as a scientific direction. Levels of organization of the living. The structure of the cell-general information.

Cell structure of prokaryotes and eukaryotes.

Similarity and difference in the cell structure of prokaryotes and eukaryotes.

Cell structure of bacteria, fungi, plants and animals.

Cell organelles. Cell wall: structure, purpose, biology.

Membrane: structure, purpose, biology, biochemical aspects.

The structure of the cell wall of bacteria, plants, fungi, animals.

Cytoplasm: structure, purpose, biology, biochemical aspects.

Endoplasmic reticulum: structure, purpose, biology, biochemical aspects.

Golgi apparatus: structure, purpose, biology, biochemical aspects

Mitochondria: structure, purpose, biology, biochemical aspects.

Cell nucleus: structure, purpose, biology, biochemical aspects.

Ribosomes: structure, purpose, biology, biochemical aspects.

Cell division: mitosis

Cell division: meiosis.

Non-cellular life forms and cell division.

The role of viruses in cell biology.

The role of viruses in the evolution of the organic world.

Cellular inclusions.

Methods of cell research.

Applied aspects of cell biology.

Viruses. Cellular inclusions.

**MODULE 2 Histology**

Histology-as a scientific direction.

The relationship of histology with other disciplines.

Levels of organization of the living.

The concept of tissues.

The origin and development of tissues in the evolution of multicellular organisms. T

he theory of I. I. Mechnikov's phagocytella. E. Haeckel's theory of gastritis.

Classification of tissues. Morphofunctional and histogenetic principles of tissue classification.

Divergent theory of N. G. Khlopin and the theory of parallelisms of academician A. A. Zavarzin.

Modern methods of histological studies: autoradiography, electron microscopy, cloning method, method of preparation of a permanent histological preparation, histochemistry, immunocytochemistry.

Epithelial tissue: structural features, classification, functional significance.

Skin epithelium.

Secretory (glandular) epithelium.

Intestinal epithelium.

Types of digestion: intracellular, cavity and membrane.

Histological organization of the mucous membrane of the digestive tract (esophagus, stomach, small and large intestines).

Osmoregulatory and excretory epithelium.

Connective tissue: general typical features, functions, classification. Loose unformed connective tissue. Blood. Hematopoiesis.

Connective tissue.

Characteristics of stem cells, progenitor cells, colony-forming units, blast forms and differentiated (mature) shaped blood elements.

 Blood and its analogues in invertebrates. Hemolymph.

Dense fibrous connective tissues: classification, structure.

The structure of the tendon, ligament and dermis of the skin.

Cartilage, bone tissue.

Muscle tissue.

Nerve tissue.

Sensor systems. Characteristics of interoreceptors, exteroreceptors.

**Grading Criteria:**

A (90-100%) - the student has thoroughly studied the study material; consistently and comprehensively answers the questions posed; freely applies the acquired knowledge in practice.

B (75-89%) - the student knows the study material; does not make serious mistakes in answering; the student is able to apply the acquired knowledge in practice.

C (60-74%) - student knows only basic material, does not always give a clear and complete answer.

D (50-59%) - the student has some idea of the studied material; cannot answer the questions completely and correctly, he/she makes serious mistakes while answering.

**The main sources:**

1. Dalton L. and Young R. Fundamentals of Cell Biology. Oregon State University. – 2024. – 586 p. ISBN978-1-955101-38-7.
2. Mescher A.L. Junqueira's Basic Histology: Text and Atlas, 17th Edition. – 2023. – 486p.
3. Sorenson R.L. Atlas of Human Histology. - A Guide to Microscopic Structure of Cells, Tissues and Organs– 2nd Edition, All Rights Reserved. – 2008. – 359 p.