**Al-Farabi Kazakh National University**

**Faculty of Biology and Biotechnology**

**Department of Biodiversity and Bioresources**

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|  | APPROVED by **Dean of Faculty**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Zayadan B.K.**  **"\_\_\_\_\_\_"\_\_\_\_\_\_\_\_ 2021** |

### EDUCATIONAL-METHODICAL COMPLEX OF DISCIPLINE

### CG 1202«Biology of cells and tissues»

6B05103 - Biotechnology

Educational program

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| Course | 1 |
| Semester | 1 |
| Number of credits | 6 |
| Lecture | 45 hour |
| Laboratory work | 90 hour |
| IWSP | 6 number |

**Almaty 2021**

Educational-methodical complex of the discipline is made by Faleyev D.G. Candidate of Biological Sciences, senior teacher, department of biodiversity and bioresources ав (name, surname, scientific degree, academic rank).

Based on the working curriculum on the specialty 6B05103 - Biotechnology

Considered and recommended at the meeting of the department of Biodiversity and Bioresources from 15.06.2021. year, protocol № 32

Head of department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Kurmanbayeva M.S.

### Recommended by methodical bureau of the faculty of Biology and Biotechnology

9.07.2021. year, protocol № 11

Chairman of the method bureau of the faculty \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Asrandina S.Sh.

**Al-Farabi Kazakh National University**

**Faculty of Biology and Biotechnology**

**SYLLABUS**

**Education program of specialty**

**6B05103 - Biotechnology**

**«Biology of cells and tissues»**

**Fall semester 2021-2022 academic year**

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| **Discipline’s code** | **Discipline’s title** | **Independent work of students (IWS)** | **No. of hours per week** | | | | | | **Number of credits** | | **Independent work of student with teacher (IWST)** | |
| **Lectures (L)** | **Practical training (PT)** | | **Laboratory (Lab)** | | |
| BK 2208 | «Biology of cells and tissues» | 4,2 | 1 | 0 | | 2 | | | 6 | | 6 | |
| **Academic course information** | | | | | | | | | | | | |
| **Form of education** | **Type of course** | **Types of lectures** | | | **Types of practical training** | | **Number of IWS** | | | **Form of final control** | |
| Daytime, full-time.  (Distance learning) | 1 course  biology | Lecture, interview. | | | Problem task. Presentation. Laboratory. | | 6 | | | exam | |
| Lecturer | Faleyev Dmitry Gennadievich  Candidate of Biological Sciences,  senior teacher, department of biodiversity and bioresources | | | | | | |  | | | | |
| e-mail | Ex-eko@yandex.ru | | | | | | |
| Telephone number | Telephone: 87772779593 | | | | | | |

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| **Academic presentation of the course** |

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| **Aim of course** | **Expected Learning Outcomes (LO)**  As a result of studying the discipline the undergraduate will be able to: | **Indicators of LO achievement (ID)**  (for each LO at least 2 indicators) |
| During the study of this discipline (Biology of cells and tissues), students should form an idea of the discipline, connections with other biological scientific directions. Learn to use the acquired knowledge in theoretical aspects. Get an idea of the possibilities of practical application of this biological discipline. | 1 to form an idea of the discipline, connections with other biological scientific directions, | 1.1 be able to define this discipline, show the connection with other sciences and biological directions  1.2 know the theoretical and applied significance of the discipline |
| 2 learn to use the acquired knowledge in theoretical aspects, | 2.1 be able to show the possibilities of theoretical justification of aspects of the discipline  2.2 be able to show the main theoretical aspects of the discipline |
| 3 to get an idea of the possibilities of practical application of this biological discipline, | 3.1 be able to show the possibilities of applying this biological discipline in practice  3.2 be able to justify the combination of theoretical and applied aspects |
| 4 get an idea of the structure and biology of various types of cells, tissues, | 4.1 to understand the features of the structure of cells and tissues of various systematic groups of living organisms  4.2 the ability to work with a microscope, interpret cytological and histological preparations |
| 5 clearly and logically present your ideas in writing and orally | 5.1 have the skills to search for reliable scientific information on the Internet  5.2 have the skills to work with scientific publications |
| **Prerequisites** | “Biology”, “General Biologists”, “Ecology”, “Chemistry”. | |
| **Post requisites** | "Systematics of plants", "Zoology of invertebrates", "Zoology of vertebrates", "Ecology", "Biochemistry", "Histology". | |
| **Information resources** | Literature:  1 Bolsover S.R., Hyams J.S., Shephard E.A., White H.A., Wiedemann C.G. CELL BIOLOGY A Short Course. - Hoboken, New Jersey: A JOHN WILEY & SONS, INC., PUBLICATION, 2004. - 535 р.  2 Pollard T.D., William C.E., Schwartz J.L., Graham T.J. Cell biology - 3rd Edition. - Elsevier, 2017. - 900 p.  3 Верещагина В. А. Цитология: учеб. для студентов учреждений высш. проф. образования. - Москва: Академия, 2012. - 173 с.  4 Ченцов Ю.С. Общая цитология. Учебник.М., МГУ, 1995, 384 с.  5 Заварзин А.А.,Харазова А.Д. Основы общей цитологии.Л.,ЛГУ,1982, 239 с.  6 Заварзин А.А. Основы сравнительной гистологии. - Л.: Высш. шк., 1985. – 400 с.  7 Нуртазин С.Т. Общая гистология: учебное пособие - Алматы: Казахский национальный университет им. аль-Фараби, 2010. - 242 c.  Internet resources:  http://www.nature.com/scitable/ebooks/essentials-of-cell-biolog  <https://upload.wikimedia.org/wikipedia/commons/1/17/Cell_Biology.pdf>  <http://www.biologymad.com/resources/Ch%201%20-%20Cells.pdf>  http://window.edu.ru/catalog/pdf2txt/860/79860/60255  http://old.gsu.by/biglib  Additional literature:  1 Nabors, Murray W. (2004). Introduction to Botany. San Francisco, CA: Pearson Education, Inc. ISBN 978-0-8053-4416-5.  2 Dube H.C. An Introduction to Fungi. – New Delhi, Scientific Publishers (India), 2013. – 603 p. ISBN 978-81-7233-743-8  3 Мяделец, О. Д. Основы цитологии, эмбриологии и общей гистологии. - Москва : Медицинская книга, 2002. - 363 с.  4 Peterson R.L., Massicotte H.B., Melville L.H. Mycorrhizas: Anatomy and Cell Biology. - Ottawa, 2004. - P. 57-79. - 173 p.  5 Свенсон К.,Уэбстер П. Клетка.М.,Мир.1980. - 304 с.  6 Робертис Е., Новинский В., Саэс Ф. Биология клетки. М.,Мир,1973. - 487 с.  7 William J. Krause KRAUSE’S ESSENTIAL HUMAN HISTOLOGY FOR MEDICAL STUDENTS Third Edition. – Columbia, Missouri USA. – 315 p.  8 Хем А., Кормак Д. Гистология: В 5 т. - М.: Мир, 1982-1983.  9 Практикум по общей гистологии: Учебное пособие. – Спб.: Изд-во С-Петерб. ун-та, 2007 – 108 с.  10 Кузнецов С.Л, Мушкамбаров Н.Н., Горячкина В.Л. Атлас по гистологии, цитологии и эмбриологии. – М.: Медицинское информационное агенство, 2002.- 374с.  11 Заварзин А.А. Сравнительная гистология.- СПб.: Изд-во СпбГУ, 2002. – 520 с.  12 Гартнер Л.П., Хайатт Д.Л. Цветной атлас гистологии. М.: Логосфера, 2008.- 480с. | |

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| **Academic policy of the course in the context of university moral and ethical values** | **Academic Behavior Rules:**  All students have to register at the MOOC. The deadlines for completing the modules of the online course must be strictly observed in accordance with the discipline study schedule.  ATTENTION! Non-compliance with deadlines leads to loss of points! The deadline of each task is indicated in the calendar (schedule) of implementation of the content of the curriculum, as well as in the MOOC.  **Academic values:**  - Practical trainings/laboratories, IWS should be independent, creative.  - Plagiarism, forgery, cheating at all stages of control are unacceptable.  - Students with disabilities can receive counseling at e-mail bioingenering2020@mail.ru |
| **Evaluation and attestation policy** | **Criteria-based evaluation:**  assessment of learning outcomes in relation to descriptors (verification of the formation of competencies in midterm control and exams).  **Summative evaluation:** assessment of work activity in an audience (at a webinar); assessment of the completed task. |

**CALENDAR (SCHEDULE) THE IMPLEMENTATION OF THE COURSE CONTENT:**

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| weeks | Topic name | LO | ID | amount of hours | Maximum score | Form of Knowledge Assessment | The  Form of the lesson  / platform |

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| Module **1** | | | | | | | |
| 1 | **L. 1** Introduction. Cytology-as a scientific direction. Levels of organization of the living. The structure of the cell-general information. Cell structure of prokaryotes and eukaryotes. | LО 1 | ID 1.1  1.2 | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 1 | **Lab 1** Similarity and difference in the cell structure of prokaryotes and eukaryotes. Cell structure of bacteria, fungi, plants and animals. | LО 1 | ID 1.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 2 | **L. 2** Cell organelles. Cell wall: structure, purpose, biology. Cell organelles. Membrane: structure, purpose, biology, biochemical aspects. | LО 2 | ID 2.1. | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 2 | **Lab 2** The structure of the cell wall of bacteria, plants, fungi, animals. The cell membrane. | LО 2 | ID 2.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 3 | **L. 3** Cell organelles. Cytoplasm: structure, purpose, biology, biochemical aspects. Endoplasmic reticulum: structure, purpose, biology, biochemical aspects. | LО 2 | ID 2.1 | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 3 | **Lab 3** Cell organelles. Cytoplasm: structure, purpose, biology, biochemical aspects. Endoplasmic reticulum: structure, purpose, biology, biochemical aspects. | LО 2 | ID 2.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 3 | **IWSP 1 Consultation on the implementation of IWS1** | LО 1, 2, 3 | ID 1.1, 1.2, 2.1, 2.2, 3.1 | 0,5 |  |  | Webinar  in ZOOM |
| 3 | **IWS 1.** Reports. | LО 2 | ID 2.1, 2.2 | 1 | 12 | Presentation |  |
| 4 | **L 4.** Cell organelles. Golgi apparatus: structure, purpose, biology, biochemical aspects. Mitochondria: structure, purpose, biology, biochemical aspects. | LО 3 | ID 3.1 | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 4 | **Lab. 4** Cell organelles. Golgi apparatus, Mitochondria: structure, purpose, biology, biochemical aspects. | LО 4 | ID 4.1. | 2 | 12 | Analysis | Webinar  in ZOOM |
| 5 | **L 5.** Cell organelles. Cell nucleus, Ribosomes: structure, purpose, biology, biochemical aspects. | LО 4 | ID 4.2. | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 5 | **Lab. 5** Cell organelles. Cell nucleus, Ribosomes: structure, purpose, biology, biochemical aspects. | LО 4 | ID 4.1. | 2 | 12 | Analysis | Webinar  in ZOOM |
| 5 | **IWSP 2 Consultation on the implementation of IWS2** | LО 3, 4 | ID 3.1, 3.2, 4.1, 4.2 | 0,5 |  |  | Webinar  in ZOOM |
| 5 | **IWS 2**  Reports. | LО 4 | ID 4.1 | 1 | 15 | Presentation |  |
| 5 | **MT 1** | LО 4 | ID 4.1, 4.2 |  | 100 |  |  |
| 6 | **L 6.** Cell division: mitosis, meiosis. | LО 4 | ID 4.1. | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 6 | **Lab. 6** Cell division: mitosis, meiosis. | LО 4 | ID 4.1 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 7 | **L 7.** 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. | LО 4 | ID 4.1, 4.2 | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 7 | **Lab. 7** Viruses. Cellular inclusions. | LО 4 | ID 4.1 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 8 | **L 8.** 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. The 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. | LО 4 | ID 4.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 8 | **Lab. 8** Modern methods of histological studies: autoradiography, electron microscopy, cloning method, method of preparation of a permanent histological preparation, histochemistry, immunocytochemistry.  Classification of tissues. | LО 4 | ID 4.1 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 8 | **IWSP 3 Consultation on the implementation of IWS3** | LО 4, 5 | ID 4.1, 4.2, 5.1 | 0,5 |  |  | Webinar  in ZOOM |
| 8 | **IWS 3**  **Reports.** | LО 4, 5 | ID 4.1, 4.2, 5.2 | 1 | 12 | Presentation |  |
| 9 | **L 9.** Epithelial tissue: structural features, classification, functional significance.  Skin epithelium. | LО 4 | ID 4.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 9 | **Lab. 9** Epithelial tissue. Skin epithelium. Secretory (glandular) epithelium. | LО 4 | ID 4.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 10 | **L 10.** 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. | LО 4 | ID 4.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 10 | **Lab 10** Intestinal epithelium. Osmoregulatory and excretory epithelium. | LО 4 | ID 4.1 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 10 | **IWSP 4 Consultation on the implementation of IWS4** | LО 4, 5 | ID 4.1, 4.2, 5.1 | 0,5 |  |  | Webinar  in ZOOM |
| 10 | **IWS 4**  Reports. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 1 | 15 | Presentation |  |
| 10 | **МТ (Midterm Exam)** | LО 4 | ID 4.1, 4.2 |  | 100 |  |  |
| 11 | **L.11** Connective tissue: general typical features, functions, classification. Loose unformed connective tissue. Blood. Hematopoiesis. | LО 4, 5 | ID 4.1, 4.2, 5.1 |  |  | Lecture, interview. |  |
| 11 | **Lab 11** 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. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 2 | 12 | Analysis | Video lecture  in ZOOM |
| 12 | **L.12** Lecture 12. Dense fibrous connective tissues: classification, structure. The structure of the tendon, ligament and dermis of the skin. Cartilage, bone tissue. | LО 4, 5 | ID 4.1, 4.2, 5.1 | 2 |  | Lecture, interview. | Webinar  in ZOOM |
| 12 | **Lab 12** Dense fibrous connective tissues. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 2 | 12 | Analysis | Video lecture  in ZOOM |
| 12 | **IWSP 5 Consultation on the implementation of IWS5** | LО 4, 5 | ID 4.1, 4.2, 5.1 |  |  |  | Webinar  in ZOOM |
| 12 | **IWS 5**  Reports. | LО 4, 5 | ID 4.1, 4.2, 5.2 |  | 12 | Problem task. Presentation |  |
| 13 | **L.13** Muscle tissue. | LО 4, 5 | ID 4.1, 4.2, 5.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 13 | **Lab 13** Muscle tissue. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 14 | **L.14** Nerve tissue. | LО 4, 5 | ID 4.1, 4.2, 5.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 14 | **Lab 14** Nerve tissue. The structure of a neuron, axon. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 15 | **L.15** Sensor systems. Characteristics of interoreceptors, exteroreceptors. | LО 4, 5 | ID 4.1, 4.2, 5.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 15 | **Lab 15** Sensor systems. Characteristics of interoreceptors, exteroreceptors. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 15 | **IWSP 6 Consultation on the implementation of IWS 6** | LО 4, 5 | ID 4.1, 4.2, 5.1 | 0,5 |  |  | Webinar  in ZOOM |
| 15 | **IWS 6**  Reports. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 1 | 15 | Presentation |  |
|  | **MT 2** | LО 4, 5 | ID 4.1, 4.2, 5.1, 5.2 |  | 100 |  |  |

[Abbreviations: QS - questions for self-examination; TK - typical tasks; IT - individual tasks; CW - control work; MT - midterm.

Comments:

- Form of L and PT: webinar in MS Teams / Zoom (presentation of video materials for 10-15 minutes, then its discussion / consolidation in the form of a discussion / problem solving / ...)

- Form of carrying out the CW: webinar (at the end of the course, the students pass screenshots of the work to the monitor, he/she sends them to the teacher) / test in the Moodle DLS.

- All course materials (L, QS, TK, IT, etc.) see here (see Literature and Resources, p. 6).

- Tasks for the next week open after each deadline.

- CW assignments are given by the teacher at the beginning of the webinar.]

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| Lecturer |  | Faleyev D.G. |