**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

### KMM 4310 «Cellular mechanisms of morphogenesis»

5В060700 - Biology

Educational program

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| Course | 4 |
| Semester | 7 |
| Number of credits | 3 |
| Lecture | 30 hour |
| Seminar | 30 hour |
| IWSP | 4 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 5В060700 - Biology

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 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5В060700 - Biology**

**«Cellular mechanisms of morphogenesis»**

**SYLLABUS**

**Fall semester 2021-2022 academic years**

**on the educational program «Cellular mechanisms of morphogenesis»**

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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)** | |
| KMM 4310 | «Cellular mechanisms of morphogenesis» | 4,2 | 30 | 0 | | 30 | | 3 | 3 |
| **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) | 4 course  biology | Lecture, interview. | | | Problem task. Presentation. Laboratory. | | 4,2 | | 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, 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 to learn to explain what are the cellular mechanisms of morphogenesis; to be able to show the role of cellular mechanisms of morphogenesis for the biology of cells and tissues | 4.1 be able to explain what are the cellular mechanisms of morphogenesis  4.2 be able to show the role of cellular mechanisms of morphogenesis for the biology of cells and tissues |
| 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** | Cell biology, Histology, Biochemistry, Genetics. | |
| **Post requisites** |  | |
| **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.  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  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. | |

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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**  Signs, properties of the living. Biological levels of organization of living things. Non-cellular life forms. Prokaryotes and eukaryotes. Evolutionary prerequisites for the creation of cellular and tissue levels of organization. | LО 1 | ID 1.1  1.2 | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 1 | **Lab 1**  Signs, properties of the living. Biological levels of organization of living things. Non-cellular life forms. Prokaryotes and eukaryotes. Evolutionary prerequisites for the creation of cellular and tissue levels of organization. | LО 1 | ID 1.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 2 | **L.2**  Morphogenesis: definition, history of study, examples. | LО 2 | ID 2.1. | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 2 | **Lab 2** Morphogenesis: definition, history of study, examples. | LО 2 | ID 2.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 3 | **L.3**  Morphogenesis - Genetic and molecular basis: Transcription factor. | LО 2 | ID 2.1 | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 3 | **Lab 3**  Morphogenesis - Genetic and molecular basis: Transcription factor. | 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**  Morphogenesis - Genetic and molecular basis: Cell junction. | LО 3 | ID 3.1 | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 4 | **Lab 4**  Morphogenesis - Genetic and molecular basis: Cell junction. | LО 4 | ID 4.1. | 2 | 12 | Analysis | Webinar  in ZOOM |
| 5 | **L.5**  Cell migration. Cell adhesion. | LО 4 | ID 4.2. | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 5 | **Lab 5**  Cell migration. Cell adhesion. | 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**  Hedgehog signaling pathway. Gastrulation. | LО 4 | ID 4.1. | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 6 | **Lab 6**  Hedgehog signaling pathway. Gastrulation. | LО 4 | ID 4.1 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 7 | **L.7**  Epithelial–mesenchymal transition. | LО 4 | ID 4.1, 4.2 | 1 |  | Lecture, interview. | Video lecture  in ZOOM |
| 7 | **Lab 7**  Epithelial–mesenchymal transition. | LО 4 | ID 4.1 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 8 | **L.8**  Morphogenesis - Cellular basis: cell-to-cell adhesion. | LО 4 | ID 4.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 8 | **Lab 8**  Morphogenesis - Cellular basis: cell-to-cell adhesion. | 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**  Morphogenesis - Cellular basis: extracellular matrix. | LО 4 | ID 4.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 9 | **Lab 9**  Morphogenesis - Cellular basis: extracellular matrix. | LО 4 | ID 4.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 10 | **L.10**  Morphogenesis - Cellular basis: cell contractility. | LО 4 | ID 4.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 10 | **Lab 10**  Morphogenesis - Cellular basis: cell contractility. | 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**  Cellular differentiation. Tissue growth. | LО 4, 5 | ID 4.1, 4.2, 5.1 |  |  | Lecture, interview. |  |
| 11 | **Lab 11**  Cellular differentiation. Tissue growth. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 2 | 12 | Analysis | Video lecture  in ZOOM |
| 12 | **L.12**  Differential adhesion hypothesis. | LО 4, 5 | ID 4.1, 4.2, 5.1 | 2 |  | Lecture, interview. | Webinar  in ZOOM |
| 12 | **Lab 12**  Differential adhesion hypothesis. | 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**  Embryonic differentiation waves. | LО 4, 5 | ID 4.1, 4.2, 5.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 13 | **Lab 13**  Embryonic differentiation waves. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 14 | **L.14**  Cancer morphogenesis. | LО 4, 5 | ID 4.1, 4.2, 5.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 14 | **Lab 14**  Cancer morphogenesis. | LО 4, 5 | ID 4.1, 4.2, 5.2 | 2 | 12 | Analysis | Webinar  in ZOOM |
| 15 | **L.15**  Virus morphogenesis. | LО 4, 5 | ID 4.1, 4.2, 5.1 | 2 |  | Lecture, interview. | Video lecture  in ZOOM |
| 15 | **Lab 15**  Virus morphogenesis. | 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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| Dean |  | Zayadan B.K. |
| Chairman of method’s bureau |  | Kulbayeva M.S. |
| Head of the Department |  | Kurmanbayeva M.S. |
| Lecturer |  | Faleyev D.G. |