**SYLLABUS**

**Fall semester 2020-2021 academic years**

**on the educational program**   
**5B011300 - Biology (NIS)**

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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)** | |
|  | Biochemistry and physiology of plants |  | 1 | 0 | | 1 | | 3 |  |
| **Academic course information** | | | | | | | | | |
| **Form of education** | **Type of course** | **Types of lectures** | | | **Types of practical training** | | **Number of IWS** | | **Form of final control** |
| Full-time | Professional  disciplines elective component |  | | | Laboratory works | | In writing form | | tests |
| Lecturer | Goncharova Alla Vladimirovna  Kenzhebaeva Saule Sagindikovna | | | | | |  | | |
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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) |
| To acquaint students with the peculiarities of the molecular organization of living organisms, biochemical and physiological processes occurring in them, to show their relationship with environmental conditions. | 1. demonstrate knowledge about the peculiarities of the molecular organization and metabolism of the most important biological compounds of living organisms; to form, substantiate, organize, define the main topics of plant physiology, remember mechanisms of main processes, name, order; reproduce, demonstrate the knowledge of plant physiology | 1.1. know the features of the structural organization and properties of the main classes of biological molecules;  1.2. analyze the biological functions of the most important cell compounds;  1.3. finds a correspondence between the properties of compounds and their biological functions;  1.4. demonstrates knowledge about the most important metabolic processes of a living organism  1.5. based on lecture material and information sources, can write chemical formulas and reactions of various biological molecules, describe the mechanism of their biochemical and physiological action on a living organism |
| 2. to select and apply in practice modern methods of biochemical and physiological research for the qualitative and quantitative analysis of biological material; repeat and apply main methods used in different part of plant physiology, | 2.1. conducts information search for solving research problems;  2.2. formulates research objectives and plans the process of its implementation; prepares equipment (instruments, apparatus) for conducting experiments;  2.3. selects and prepares samples (biological material) for the experiment;  2.4. conducts a qualitative and quantitative analysis of biological material, in accordance with methodological recommendations in accordance with safety regulations; |
| 3. to interpret the results of biochemical and physiological experiments, assessing the relationship between the structure of biomolecules and their physiological functions at the molecular level; interpret the results during obtaining experiments with plants, contextualize the different approaches and methods used in plant physiology | 3.1. records and formalizes the results of experimental work in the required format (tables, graphs, diagrams, etc.)  3.2. assesses the correctness of the laboratory test;  3.3. analyzes the data obtained during the experiment;  3.4. compares the obtained data with the expected results, confirming the correctness of the experiment performed;  3.5. makes final conclusions from the received data; |
| 4. Demonstrate knowledge of the structural and functional characteristics of the plant cell; describe the schemes used for characterization of main processes of plant physiology, | 4.1 explain the means of main processes of plant cells and application, reformulate the conclusions obtained from experiments, argue another approach to study |
| 5. to analyze the features of the main physiological processes of plants under normal conditions and under stress; discuss your results with them that are known,; apply the theoretical knowledge of plant physiology in different area of biology, select main factors regulating investigated process, | 5.1 explain the mechanisms of key processes that occur in plant during growth and development  5.2 demonstrate theoretical knowledge and practical skills in plant physiology, illustrate your knowledge of plant physiology cells as their applications. |
| **Prerequisites** | **Cell biology, Botany,** | |
| **Post requisites** | Molecular Biology, Endocrinology,Immunology | |
| **Information resources** | **Main:**   1. [Andrew Davison](https://www.goodreads.com/author/show/75015.Andrew_Davison), [Anna Milan](https://www.goodreads.com/author/show/14916195.Anna_Milan), [Suzannah Phillips](https://www.goodreads.com/author/show/14916196.Suzannah_Phillips), [Lakshminarayan Ranganath](https://www.goodreads.com/author/show/14916197.Lakshminarayan_Ranganath) Biochemistry and Metabolism// Published 2015 by JP Medical Ltd/  [U. Satyanarayana](https://www.goodreads.com/author/show/848544.U_Satyanarayana) Biochemistry, 2014.  1. Pratt, Donald Voet, Judith G. Voet, Charlotte W. (**2013**). [**Fundamentals of Biochemistry:** Life at the Molecular Level](https://en.wikipedia.org/wiki/Fundamentals_of_Biochemistry:_Life_at_the_Molecular_Level) (4th ed.). Hoboken, NJ: Wiley. pp. 441–442. 2. Berg, Jeremy M.; Tymoczko, John L.; Stryer, Lubert; Gatto, Gregory J. (**2012**). **Biochemistry**(7th ed.). New York: W.H. Freeman. p. 429. 3. Cox, David L. Nelson, Michael M. (**2008**). *Lehninger principles of biochemistry* (5th ed.). New York: W.H. Freeman. p. 26. 4. Biochemistry and molecular Biology of Plants, 2nd Edition Bob B. Buchanan, (Editor), [Wilhelm Gruissem](http://eu.wiley.com/WileyCDA/Section/id-302479.html?query=Wilhelm+Gruissem) (Editor), [Russell L. Jones](http://eu.wiley.com/WileyCDA/Section/id-302479.html?query=Russell+L.+Jones) (Editor). 2015. 1280 p. 5. Медведев С.С. Физиология растений Учебник — СПб.: БХВ-Петербург, 2012. — 512 с., 6. J. A. Bryant and D. Francis (2015). The plant cell cycle. Annals of Botany 107: 1063. 7. Atabayeva S., Kenzhebayeva S., Blavanchinskaya L. Stress physiology. ISBN978-601-04-1098-5. 2015, 84 p 8. Yakushkina N.I., Bakhtenko E.J. Plant physiology. 2018. 466 p.   **Additional:** Editors: **Segev**, Nava (Ed.) Trafficking Inside Cells Pathways, Mechanisms and Regulation 2009. Kristiina Himanen (2015). Cell cycle regulation during plant growth and development, Jörg D. Becker (2012) Decision- Making in the Plant Cell Cycle.Canal BQ-n.9.  **Internet resources:** <https://www.goodreads.com/>  https://www.khanacademy.org/science/biology/cellular-molecular-biology/mitosis/a/cell-cycle-phases  http://plantphys.info/plant\_physiology/cellcycle.shtml  http://www.britannica.com/EBchecked/topic/623731/vascular-system  http://www.britannica.com/UpBeat-37879-Basic-Plant-Physiology-Parts-Flowering-Functions-Roots-Types-phy-Education-ppt-powerpoint.htm | |

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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 \*\*\*\*\*\*\*@gmail.com. |
| **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:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | L1. Introduction to Biochemistry. Amino acids are the structural components of proteins. Proteins. Structure, functions, classification. | **LO** 1 | **ID** 1.1.  **ID**.1.2. | 1 |  |  | Video lecture  in MS Teams |
| 1 | PT 1 Biological laboratory safety | **LO** 2 | **ID** 2.1.  **ID** 2.2 | 2 |  |  | Webinar  in MS Teams |
| 2 | L2. Enzymes. Features of the structure of enzymes, properties, mechanism of action and classification. | **LO** 1 | **ID** 1.2  **ID** 1.3  **ID** 1.1 | 1 |  |  | Video lecture  in MS Teams |
| 2 | Lab. 2 Qualitative reactions to proteins and amino acids | **LO** 2  **LO** 3 | **ID** 2.1.  **ID** 2.3  **ID** 2.4..  **ID** 3.1  **ID** 3.2  **ID** 3.3  **ID** 3.5. | 2 | 10 | Analysis of the written report | Webinar  in MS Teams |
| 3 | L3. Carbohydrates. Structure, function, classification, biological significance | **LO** 1 | ID 1.1. | 1 |  |  | Video lecture  in MS Teams |
| 3 | Lab. 3 Quantitative determination of protein by biuret method. | **LO** 2  **LO** 3 | **ID** 2.1.  **ID** 2.3  **ID** 2.4..  **ID** 3.1  **ID** 3.2  **ID** 3.3  **ID** 3.5. | 2 | 10 | Analysis of the written report | Webinar  in MS Teams |
| 3 | IWSP 1 Consultation on the implementation of IWS1 |  |  |  |  |  |  |
| 3 | **IWS 1.** Topic: Amino Acids. Proteins. (in writing according to options). Vitamins. Enzymes. (make a table on vitamins and coenzymes. Answer test questions on enzymes). | **LO** 1 | **ID** 1.2  **ID** 1.5 |  | 20 | Written assignment |  |
| 4 | L4. Lipids. Features structure, properties, classification and biological functions. | **LO** 1 | **ID** 1.2  **ID** 1.3  **ID** 1.1 | 1 |  |  | Video lecture  in MS Teams |
| 4 | Lab Z. Quantification of milk casein. | **LO** 2  **LO** 3 | **ID** 2.1.  **ID** 2.3  **ID** 2.4..  **ID** 3.1  **ID** 3.2  **ID** 3.3  **ID** 3.5. | 2 | 10 | Analysis of the written report | Webinar  in MS Teams |
| 4 | SRSP2. Testing on theoretical material. | **LO** 1 | **ID** 1.2  **ID** 1.5 |  | 20 |  | Moodle system |
| 5 | Lecture 5. Nucleic acids. Features of the structure, functions, classification. | **LO** 1 | **ID** 1.1.  **ID**.1.2. | 1 |  |  | Video lecture  in MS Teams |
| 5 | Lab 5 Study of the specificity and thermolability of enzymes | **LO** 2  **LO** 3 | **ID** 2.1.  **ID** 2.3  **ID** 2.4..  **ID** 3.1  **ID** 3.2  **ID** 3.3  **ID** 3.5. | 2 | 10 | Analysis of the written report | Webinar  in MS Teams |
| 5 | СРС 2 Topic: Carbohydrates and lipids. Answer questions in writing. Solving situational tasks. | **LO** 1 | **ID** 1.2  **ID** 1.5 |  | 20 | Written assignment | Webinar  in MS Teams |
| **TOTAL for 5 weeks of training: LC 1 100** | | | | | | | |
| 6 | Lecture 6. Basics of metabolism. Basic catabolic processes in living organisms. | **LO** 1 | **ID** 1.4  **ID** 1.1 | 1 |  |  | Video lecture  in MS Teams |
| 6 | Lab. 6 Qualitative reactions to sugar. Properties of oligo- and polysaccharides. | **LO** 2  **LO** 3 | **ID** 2.1.  **ID** 2.3  **ID** 2.4..  **ID** 3.1  **ID** 3.2  **ID** 3.3  **ID** 3.5. | 2 | 10 | Analysis of the written report | Webinar  in MS Teams |
| 6 | Testing on theoretical material. | **LO** 1 | **ID** 1.1.  **ID**.1.2. |  | 10 |  | Moodle system |
| 7 | Lecture 7. Anabolic processes in a living organism. | **LO** 1 | **ID** 1.4 | 1 |  |  | Video lecture  in MS Teams |
| 7 | Lab 7. Hydrolysis of cellulose. Obtaining a scale of dextrins | **LO** 2  **LO** 3 | **ID** 2.1.  **ID** 2.3  **ID** 2.4..  **ID** 3.1  **ID** 3.2  **ID** 3.3  **ID** 3.5. | 2 | 10 |  | Webinar  in MS Teams |
|  | IWSP 2 Consultation on the implementation of IWS |  |  |  |  |  | Webinar  in MS Teams |
| 7 | SIW 3 Topic nucleic acids. Solving situational tasks. | **LO** 1 | **ID** 1.2  **ID** 1.5 | 1 | 10 | Written assignment | Webinar  in MS Teams |
|  | **Total for 2 weeks** |  |  |  | **40** |  |  |
| 5 | **MT 1** | LО 1 | ID 1.1. |  | 100 |  |  |
| 8 | Lecture **8.** Physiology of the plant cell**»** | LО 1 | ID 1.1. | 1 |  |  | Video lecture  in MS Teams |
| Lab **8.** Effect of anion and cation salts on the form and time of plasmolysis | LО 1 | ID 1.1. | 2 | 10 | Analysis | Webinar  in MS Teams |
| 9 | Lecture **9.** Water exchange at cell and whole plant levels | LО 1 | ID 1.1. |  |  |  | Video lecture  in MS Teams |
| Lab **9.** Changes in the permeability of the cytoplasm is damaged | LО 5 | ID 5.1. | 2 | 10 | Analysis | Webinar  in MS Teams |
| 10 | Lecture **10.** Photosynthesis. Photo-synthetic apparatus plants. Photosynthetic plastid pigments | LО 1 | ID 1.1. | 2 |  |  | Video lecture  in MS Teams |
| Lab **10.** Dye accumulation in vacuoles of living cells. | LО 1 | ID 1.1. | 2 | 10 | Analysis | Webinar  in MS Teams |
| 10 | **IWSP 3 Consultation on the implementation of IWS3.** Physiology of plant cell. The structures of the plant cell. Significance of water exchange. **Presentation of results of performance:** The written decision or situational problems.Home task | LО 1 | ID 1.1. |  | 5 |  | Webinar  in MS Teams |
| 10 | **IWS 3** | LО 1 | ID 1.1. |  | 25 | Logic task |  |
| 11 | Lecture **11** | LО 1 | ID 1.1. |  |  |  | Video lecture  in MS Teams |
| Lab **11** | LО 1 | ID 1.1. | 2 | 8 | Analysis | Webinar  in MS Teams |
| 12 | **L.1** | LО 1 | ID 1.1. | 2 |  |  | Video lecture  in MS Teams |
| **PT 1** | LО 1 | ID 1.1. |  | 8 | Analysis | Webinar  in MS Teams |
| 10 | **IWSP 4 Consultation on the implementation of IWS4** | LО 1 | ID 1.1. |  | 5 |  | Webinar  in MS Teams |
| 10 | **IWS 4** | LО 1 | ID 1.1. |  | 25 | Problem task |  |
| 10 | **IWSP 5**  **Make a structural and logical diagram of the read material** | LО 1 | ID 1.1. |  | 10 |  |  |
| 10 | **МТ (Midterm Exam)** | LО 1 | ID 1.1. |  | 100 |  |  |
| 11 | **L.1** | LО 1 | ID 1.1. |  |  |  |  |
| 11 | **PT 1** | LО 1 | ID 1.1. | 1 | 8 | Analysis | Video lecture  in MS Teams |
| 12 | **L.1** | LО 1 | ID 1.1. | 1 |  |  | Webinar  in MS Teams |
| 12 | **PT 1** | LО 1 | ID 1.1. | 1 | 8 | Analysis | Video lecture  in MS Teams |
| 12 | **IWSP 6 Consultation on the implementation of IWS5** | LО 1 | ID 1.1. |  | 5 |  | Webinar  in MS Teams |
| 12 | **IWS 5** | LО 1 | ID 1.1. |  | 25 | Problem task |  |
| 13  13 | **L.1** | LО 1 | ID 1.1. | 1 |  |  | Video lecture  in MS Teams |
| **PT 1** | LО 1 | ID 1.1. | 1 | 8 | Analysis | Webinar  in MS Teams |
| 14 | **L.1** | LО 1 | ID 1.1. | 1 |  |  | Video lecture  in MS Teams |
| 14 | **PT 1** | LО 1 | ID 1.1. | 1 | 8 | Analysis | Webinar  in MS Teams |
| 15 | **L.1** | LО 1 | ID 1.1. | 1 |  |  | Video lecture  in MS Teams |
|  | **PT 1** | LО 1 | ID 1.1. | 1 | 8 | Analysis | Webinar  in MS Teams |
|  | **IWSP 7 Consultation on the implementation of IWS6** | LО 5 | ID 5.1. |  | 5 |  | Webinar  in MS Teams |
|  | **IWS 6** | LО 1 | ID 1.1. |  | 25 | Analysis |  |
|  | **Тест** | LО 1 | ID 1.1. |  | 10 |  |  |
|  | **MT 2** | LО 1 | ID 1.1. |  | 100 |  |  |

**Dean Zaydan B.**

**Chairman of the Faculty Methodical Bureau Nazarbekova S.T.**

**Head of the Department Kistaubaeva A.S.**

**Lecturer** Goncharova A.V.

Kenzhebaeva S.S.

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.]