**AL-FARABI KAZAKH NATIONAL UNIVERSITY**

**Faculty of Biology and Biotechnology**

**Educational program in the speciality**

 **«5В060700 – Biology»**

**SYLLABUS**

“**BIOCHEMISTRY AND PLANT PHYSIOLOGY**”

**Spring semester 2018-2019 academic year.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Discipline’s code | Discipline’s title | Type | No. of hours per week | Number of credits | ECTS |
| Lect. | Pract. | Lab. |
|  | **Biochemistry and plant physiology**  | BD  | 2 | 0 | 1 | 3 | 5 |
| Lecturer  | Goncharova Alla VladimirovnaKenzhebaeva Saule Sagindykovna | Office hours | Scheduled |
| e-mail | Alla.Goncharova@kaznu.kzSaule.Kenzhebaeva@kaznu.kz |
| Telephones | 3773329; 12-05 | Auditory 409 |  |
| Assistant  |  | Office hours | Scheduled |
| e-mail |  |
| Telephones |  | Auditory  |  |
| Academic presentation of the course | The course "Biochemistry and Plant Physiology" is a basic course in the educational program of the bachelor degree in the specialty "5B060700-Biology"The purpose of the course: To acquaint students with the main biochemical and physiological processes, to show their relationship with environmental conditions.As a result, the students will be able to:1. to gain knowledge of the main classes of biological substances (their structure, properties and mechanisms of their functioning);
2. assess the relationship of biological function and molecular structure;
3. understand the chemical basis of life;
4. to gain knowledge about the main metabolic pathways in the cell;
5. plan and conduct qualitative and quantitative analysis of biological material;
6. interpret the results of biochemical experiments from the point of view of the assumptions made about the structure of the molecule or the nature of the process;
7. demonstrate knowledge of the structural and functional characteristics of the plant cell;
8. possess knowledge of the basic physiological processes in normal conditions and under stress;
9. apply theoretical knowledge in solving professional problems;
10. orientate and analyze sources of information on biochemistry and physiology of plants;
11. know physiology of plant cell and main functions of cell organells.
12. understand water exchange of whole plant and cell transport of water
13. demonstrate knowledge of mechanisms of photosynthesis and photosynthetic apparatus plants
14. characterize significance of respiration in plant life
15. possess knowledge of the importance of plant mineral nutrition
16. evaluate the stages growth and development of plants
17. show knowledge of plants adaptationmechanisms to abiotic and biotic stresses
 |
| Prerequisites and corequisites | Chemistry, Zoology, Botany, Biodiversity of plants and animals |
| 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%3A_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-phaseshttp://plantphys.info/plant\_physiology/cellcycle.shtmlhttp://www.britannica.com/EBchecked/topic/623731/vascular-systemhttp://www.britannica.com/UpBeat-37879-Basic-Plant-Physiology-Parts-Flowering-Functions-Roots-Types-phy-Education-ppt-powerpoint.htm |
| Academic policy of the course in the context of university moral and ethical values | **Academic Behavior Rules:** Compulsory attendance in the classroom, the impermissibility of late attendance. Without advance notice of absence and undue tardiness to the teacher is estimated at 0 points.Submission of assignments (Independent work of students, midterm control, laboratory tasks, projects and etc.) prior to the deadlines. The violation of submission deadlines leads to the deduction of penalty points.**Academic values:** Academic honesty and integrity: independent performance of assignments; inadmissibility of plagiarism, forgery, cheating at all stages of the knowledge control, and disrespectful attitude towards teachers. (The code of KazNU Student’s honor)Students with disabilities may receive advice via E- address  |
| Evaluation and attestation policy | **Criteria-based evaluation:** assessment of learning outcomes in correlation with descriptors (verification of competence formation during midterm control and examinations).**Summative evaluation:** evaluation of the presence and activity of the work in the classroom; assessment of the assignment, independent work of students, (project / case study / program / ...) The formula for calculating the final grade. |

**APPENDIX 1**

Calendar (schedule) the implementation of the course content

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|  |  |  |  |
| --- | --- | --- | --- |
| **Week/date**  | Topic title (lectures, practical classes, Independent work of students) | Number of hours | Maximum score |

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | **Lecture 1:** Organization of protein structure. Classification and properties of proteins. | 2 |  |
| **Practice** 1. Safety (accident prevention). Introductory lesson. Qualitative reactions of the proteins and amino acids. | 1 | 4 |
| 2 | **Lecture 2.** Enzymes: structure, classification, properties and mechanism of enzyme action.  | 2 |  |
| **Practice** 2. Study of enzyme specificity and thermolability. | 1 | 4 |
|  | **Tests:** Proteins, aminoacids and enzymes. |  | 7 |
| 3 | **Lecture 3**. Carbohydrates. Functions, structure, classification. | 2 |  |
| **Practice** 3. Qualitative reaction to sugars. Properties of oligo-and polysaccharides. | 1 | 4 |
|  | **Independent work of a student with a teacher:** consultation and reception of tasks**SIW**1. Vitamins as cofactors. Biological significance. Fill in the two tables and answer the test questions. |  | 15 |
| 4 | **Lecture 4.** Lipids. Functions, classification, main structural components.  | 2 |  |
| **Practice** 4. Quantification of milk casein. | 1 | 4 |
| 5 | **Lecture 5**. Nucleic acids: structure, types, biological function. | 2 |  |
| **Practice** 5.Quantification of protein biuret method. | 1 | 4 |
|  | **Independent work of a student with a teacher:** consultation and reception of tasks**SIW**2. Carbohydrates and lipids.Answer to the questions in writing. Solving situational problems. |  | 15 |
|  | **Tests: Carbohydrates. Lipids.** |  | 7 |
| 6 | **Lecture 6.** Basis of metabolism. Catabolism of biological molecules. | 2 |  |
| **Practice** 6. Determination of catalase activity. | 1 | 4 |
| **Tests:** Nucleic acids. |  | 7 |
| 7 | **Lecture 7.** Anabolism of biological molecules. | 2 |  |
| **Practice** 7. Control interview №1. | 1 | 10 |
| **Test:** Carbohydrates**.** |  | 7 |
| **Independent work of a student with a teacher:** consultation and reception of tasks**SIW** 3. Nucleic acids. Basics of metabolism. Answer to the questions in writing.  |  | 15 |
| **Outcome for 7 weeks (Intermediate control - 1)** |  | **100** |
| 8 | **Lecture 8** Physiology of the plant cell | 2 |  |
| **Practice** 8. Effect of anion and cation salts on the form and time of plasmolysis | 1 | 5 |
| **Midterm** |  | 100 |
| 9 | **Lecture 9.** Plant water exchange of plant cell and whole plant  | 2 |  |
| **Practice** 9. Observing the cap plasmolysis | 1 | 5 |
|  | **Independent work of a student with a teacher:** **SIW** 4. Physiology and functions of plant cell organelles. The structure of the plant cell organelles. Significance of water exchange |  | 10 |
|  | **Tests:** Physiology and functions of the plant cell organelles |  | 5 |
| 10 | **Lecture 10**. Photosynthesis. Photosynthetic apparatus plants and photosynthetic plastid pigments | 2 |  |
| **Practice** 10. Changes in the permeability of the cytoplasm under damage | 1 | 5 |
| 11 | **Lecture 11**. Light and dark stage of photosynthesis | 2 |  |
| **Practice** 11. Extraction ofleaf pigments. Photosensitizing effect of chlorophyll on the reaction of hydrogen transfer. Alkaline saponification of chlorophyll. | 1 | 5 |
|  | **Independent work of a student with a teacher:** consultation and reception of tasks**SIW** 5. Interaction between phases of photosynthesis. Factors affecting on light and dark stage of photosynthesis. |  | 10 |
| 12 | **Lecture 12**. Significance of respiration in plant life | 2 |  |
| **Practice** **12.** Quantitative determination of chemical properties of leaf pigments. | 1 | 5 |
|  | **Tests:** Respiration substrates and chemiosmosis cycle |  | 5 |
| 13 | **Lecture 13**. The importance of plant mineral nutrition | 2 |  |
| **Practice** 13 Determination of the rate of photosynthesis by assimilation flask. Determination of the respiration of seeds in a closed vessel. Determiantion of dehydrogenases in plants recovery of methylene blue. Determination of peroxidase in the juice of potatoes | 1 | 5 |
|  | **Independent work of a student with a teacher:** consultation and reception of tasks**SIW**6. Significance of macro- and microelements in the plants life |  | 10 |
| 14 | **Lecture 14**. The growth and development of plants. Planthormones. Regulation of cell cycle | 2 |  |
| **Practice** 14. Micro chemical analysis of ash.  | 1 | 5 |
|  | **SIW 7** Regulation of plants growth and development. The main factors affecting on these procuresses. |  | 5 |
| 15 | **Lecture 15**. Introduction on physiology of stress. Abiotic and biotic stresses.  | 2 |  |
| **Practice** 15. Dependence of seed imbibition from the composition of seeds under the absorption of water. Determination of amylase in early seedlings. Effect of indolile acetic acid (IAA) on shoots and roots growth of wheat. | 1 | 5 |
| Control interview 2 |  | 15 |
| **Outcome for 7 weeks (Intermediate control - 2)** |  | **100** |
|  | **Exam**  |  | **100** |

Dean of the Faculty Zayadan B.K.

Chairman of the Faculty Methodical Bureau Kulbaeva M.S.

Head of Department Kistaubaeva A.S.

Lecturer Goncharova A.V.

 Kenzhebaeva S.S.