**AL-FARABI KAZAKH NATIONAL UNIVERSITY**

**Higher School of Medicine Department of Fundamental Medicine**

**AFFIRM**

**Dean of the Faculty**

**\_ (signature)**

**Kalmatayeva Z.A. " " \_ 2021**

**EDUCATIONAL AND METHODICAL COMPLEX OF DISCIPLINE**

**…….. Cell and molecular pathobiology**

**Specialty "....."**

**Educational program “..........”**

**Course – ...**

**Semester – ….**

**Number of credits – …. (ECTS ...)**

**Аlmaty 2021**

Educational and methodical complex of discipline was compiled by Doctor of Medical Sciences, ???????,

Based on the working curriculum in the specialty ????????

Considered and recommended at a meeting of the department fundamental medicine

from " " 2021, protocol No. ...

Head of the department Sarsenova L.K.

(signature)

Recommended by the faculty methodical bureau " " \_ 20 , protocol No.

Chairman of the method bureau of the faculty name (signature)

Full

Kazakh National University named after Al-Farabi Faculty of basic discipline

Department of Fundamental Medicine

**Syllabus**

Information about Academic course

| Discipline’s code | Discipline’s title | Type | Hours per week | | | Number of credits | ECTS |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Lect. | Pract. | |
| **????** | Cell and molecular pathobiology | ??? | 1 | 2 | | ??? | ??? |
| **Teacher 1** | Mussazhanova Zhanna MD, PhD | | | **Office hours** | | According to schedule | |
| **e-mail** | mussazhanova.zh@gmail.com | | |
| **Phone number** |  | | | **Auditorium** | | Faculty of Medicine and Health | |
| **Teacher 2** |  | | | **Office hours** | | According to schedule | |
| **e-mail** |  | | |
| **Phone number** |  | | | **Auditorium** | |  | |

| **The Program of the Course** | **Course type:** “**Cell and molecular pathobiology” module**  **The aim of the Discipline**: is to provide students an integrated study of cell and molecular pathobiology in the event of the development and outcomes of diseases; understanding of normal molecular biology and pathobiology of diseases developing due to inadequacy of the molecular genetic system; |
| --- | --- |

|  | to provide a stimulating and challenging learning environment where teaching is informed and enhanced by research, and to provide training in scientific principles and experience in the evaluation and practice of research.  **After completing this course students will**:  Demonstrate knowledge of the basic concepts of general cell and molecular biology;  Demonstrate knowledge of the pathological processes in cell molecular biology of human diseases. General principles of construction of biomedical experiments.  Demonstrate analytical skills in the integration of knowledge on pathobiology in the formation of judgments regarding general molecular biology.  Interpret the results of specific molecular diagnostic methods. Effectively communicate with other students, researchers and teachers regarding medical and scientific information, articulate their opinions clearly when discussing cellular and molecular pathobiological processes and their impact, and work effectively as a member of the research team. |
| --- | --- |
| Prerequisites | Structure and molecular biology of cell, human genome |
| Postrequisites | Cellular and Molecular pathology. Human diseases. |
| Information resources | **Basic literature**:   1. Human Genetics, Ricki Lewis. 2018 2. Medical Genetics at a Glance, Dorian J.Pritchard, Bruce R.Korf. 2013 3. Basic pathology, Robbins and Cotran Pathologic Basis of Disease [Electronic resource]: textbook / ed.: V. Kumar, A. Abbas, J. Aster. - Philadelphia : Elsevier Saunders, 2015. - 1392 p. - ISBN 978-1-4557-2613-4 : 0.00 |

|  | **Additional literature:**   1. Zhanna Mussazhanova et al. The Contribution of Genetic Variants to the Risk of Papillary Thyroid Carcinoma in the Kazakh Population: Study of Common Single Nucleotide Polymorphisms and Their Clinicopathological Correlations. Front Endocrinol 2021 doi: 10.3389/fendo.2020.543500. 2. Zhanna Mussazhanova, et al. Immunohistochemical and Molecular Analyses Focusing on Mesenchymal Cells in Papillary Thyroid Carcinoma with Desmoid-Type Fibromatosis. Pathobiology. 2018. DOI: 10.1159/000492117 3. Maria Romano et al. A Structural View of SARS-CoV-2 RNA Replication Machinery: RNA Synthesis, Proofreading and Final Capping. Cell. 2020. doi:10.3390/cells9051267 4. Adriaan H. de Wilde et al. Host Factors in Coronavirus Replication. Microbiology and Immunology. 2018. DOI 10.1007/82\_2017\_25 5. Zhanna Mussazhanova, et al. Association between p53-binding protein 1 expression and genomic instability in oncocytic follicular adenoma of the thyroid. Endocr J. 2016 doi: 10.1507/endocrj.EJ15-0629. 6. Zhanna Mussazhanova, et al. A Novel Diagnostic Method for Thyroid Follicular Tumors Based on Immunofluorescence Analysis of p53-Binding Protein 1 Expression: Detection of Genomic Instability. Thyroid. 2019. doi: 10.1089/thy.2018.0548. 7. Zhanna Mussazhanova et al. Causative role for defective expression of mitochondria-eating protein in accumulation of mitochondria in thyroid oncocytic cell tumors. Cancer Sci. 2020. doi:10.1111/cas.14501.   **Online resources:**  Set of video-lectures on Univer system KazNU  . [www.lecturio.com](http://www.lecturio.com/)  .textbooks on bookshelf of the department |
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| **The Policy of discipline** | **The Policy of discipline** |

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| **Evaluation** | **Criteria assessment:** |
| **and** |  |
| **attestation** |  |
| **policy** |  |
|  | **Written / oral quiz** - |
|  |  |
|  | **Group or individual Problem solving (cases)** - |
|  |  |
|  | **Direct observation** - |
|  |  |
|  | **Summary assessment:** |
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|  | Grades for final mark |
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**The plan of lectures and practical lesson**

**(Cell and Molecular Pathobiology)**

| We ek | #less ons | The title of lectures and practical lessons | Hour s | Max grad e |
| --- | --- | --- | --- | --- |
|  |  | **Cell and Molecular Pathobiology** |  |  |
| 1-2 | 1-2 | **Lecture:** Introduction to Cell and molecular biology  Informational macromolecules: proteins, nucleic acids. DNA as a carrier of genetic information: key experiments. Central dogma of molecular biology. The role of molecular biology in medicine. | 2 | 20 |
| 1-2 | **Practice:** overview and discussion of research scientific articles:   * Zhanna Mussazhanova et al. The Contribution of Genetic Variants to the Risk of Papillary Thyroid Carcinoma in the Kazakh Population: Study of Common Single Nucleotide Polymorphisms and Their Clinicopathological Correlations. Front Endocrinol 2021 doi: 10.3389/fendo.2020.543500. | 4 | 30 |
| 3-4 | 3-4 | **Lecture:** DNA replication and repair. The mechanism of DNA replication and repair. Hypothetical mechanisms of DNA replication. Replication enzymology. Molecular underpinnings of DNA synthesis. Sources of DNA damage in cells. DNA repair enzymology. | 2 | 20 |
| 3-4 | **Practice:** overview and discussion of research scientific articles:   * Zhanna Mussazhanova, et al. Immunohistochemical and Molecular Analyses Focusing on Mesenchymal Cells in Papillary Thyroid Carcinoma with Desmoid-Type Fibromatosis. Pathobiology. 2018. DOI: 10.1159/000492117 | 4 | 30 |
|  |  |
| 5 | 5 | **Colloquium 1**: includes 5 questions from lectures and articles for practical discussion. | 1 | 50 |
|  |  | **MIDTERM 1** |  | **55** |
| 5-6 | 5-6 | **Lecture:** Transcription of genetic information. Post-transcriptional RNA modifications.  Gene structure: promoter, exons, introns, terminator. Transcription enzymology. The mechanism of gene transcription: initiation, elongation, termination.  Post-transcriptional maturation of mRNA: 3' polyadenylation, 5' capping, exon excision. | 2 | 20 |
| 5-6 | **Practice:** overview and discussion of research scientific articles:   * Maria Romano et al. A Structural View of SARS-CoV-2 RNA Replication Machinery: RNA Synthesis, Proofreading and Final Capping. Cell. 2020. doi:10.3390/cells9051267 * Adriaan H. de Wilde et al. Host Factors in Coronavirus Replication. Microbiology and Immunology. 2018. DOI 10.1007/82\_2017\_25 | 4 | 30 |
| 7-8 | 7-8 | **Lecture:** Translation of genetic information. Post-translational protein modifications and folding. Ribosome structure: rRNA and ribosomal proteins. Genetic code: properties and key experiments. tRNAs, aminoacyl-tRNA synthetases. The mechanism of translation: initiation, elongation, termination.  Protein post-translational modifications. Protein folding: chaperones. | 2 | 20 |
| 7-8 | **Practice:** overview and discussion of research scientific articles:   * Zhanna Mussazhanova, et al. Association between p53-binding protein 1 expression and genomic instability in oncocytic follicular adenoma of the thyroid. Endocr J. 2016 doi: 10.1507/endocrj.EJ15-0629. * Zhanna Mussazhanova, et al. A Novel Diagnostic Method for Thyroid Follicular Tumors Based on Immunofluorescence Analysis of p53-Binding Protein 1 Expression: Detection of Genomic Instability. Thyroid. 2019. doi: 10.1089/thy.2018.0548. | 4 | 30 |
| 9-10 | 9-10 | **Lecture:** Regulation of gene expression in human. Gene structure in humans. Regulation of transcription: transcription factors. Regulation of translation: translation factors. Intracellular signal transduction pathways. | 2 | 20 |
| 9-10 | **Practice:** overview and discussion of research scientific articles: | 4 | 30 |

| 10 | 10 | **Colloquium 2**: includes 5 questions from lectures and articles for practical discussion. | 1 | 50 |
| --- | --- | --- | --- | --- |
|  |  | **MIDTERM 2** |  | **55** |
| 11 | 11 | **Lecture:** Epigenetics, epigenetic regulation of gene expression. Mechanisms of epigenetic regulation: DNA methylation. | 1 | 20 |
| 11 | **Practice:** overview and discussion of research scientific articles:   * Zhanna Mussazhanova et al. Causative role for defective expression of mitochondria-eating protein in accumulation of mitochondria in thyroid oncocytic cell tumors. Cancer Sci. 2020. doi:10.1111/cas.14501. | 2 | 30 |
| 12-13 | 12-13 | **Lecture:** Modern techniques in medicine. DNA technology, genome sequencing: Sanger method, Next Generation sequencing, Immunohistochemistry, FISH. Genomic data as a gateway to personalized medicine: SNPs, Human Genome Project. Databases: Ensembl, NCBI, Cosmic, etc. | 2 | 20 |
| 12-13 | **Practice:** overview and discussion of research scientific articles: | 4 | 30 |
| 14-15 | 14-15 | **Lecture:** Cancer Genetics and Genomics, Cancer genetics and genomics, hereditary cancer syndromes and familial occurrence of cancer. | 2 | 20 |
| 14-15 | **Practice:** overview and discussion of research scientific articles: | 4 | 30 |
| 15 | **Colloquium 3**: includes 5 questions from lectures and articles for practical discussion. | 1 | 50 |
|  |  | **MIDTERM 3** |  | **55** |

Head of the Department Sarsenova L.K. Chairman of the Faculty Methodical Bureau