**AL-FARABI KAZAKH NATIONAL UNIVERSITY**

**Faculty of Biology and Biotechnology**

**Department of Molecular Biology and Genetics**

### The program of the final exam for the discipline

**MMK 6307- Molecular mechanisms of carcinogenesis**

Educational program 7M 05109 - “Genetics”

Course – 1, Semester – 1

(5 credits)

Almaty, 2021

The program of the final exam of the discipline MMK 6307- Molecular mechanisms of carcinogenesis of the specialty «7M 05109 - Genetics» drew up by Dr., Professor Saparbaev M.K.

Reviewed and approved at the meeting of the Department of Molecular Biology and Genetics

From "\_\_\_" \_\_\_ 2021, protocol No. \_\_

Head of Department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Zhunusbaeva Zh.K.

**The program of the final exam**

The final exam form for the discipline is written on the platform Oqylyq . The ticket will contain 3 questions.

**The first block** includes questions of cognitive (knowledge) competence, which assess knowledge and understanding of the learning object. This assignment is aimed at identifying the ability to demonstrate knowledge and understanding of advanced knowledge in the field of study, which is based on the content of modern advanced textbooks. Estimated at 33 points.

**The second block** includes questions that identify functional competence, which assess the ability to apply and analyze information. This task is aimed at identifying the ability to apply their knowledge, formulate and substantiate arguments and solutions to problems within the scope of study. Estimated at 33 points.

**The third block** includes questions of systemic competence, which reveal the ability to synthesize and evaluate information. This question is an applied task that is aimed at testing the practical skills of students. Estimated at 34 points.

**Topics for which assignments will be drawn up:**

1. Chemical and physical alterations in primary structure of nucleic acids and their consequences on heredity and variability in the population.
2. Role of environmental factors in the genome stability and mutational variability.
3. Mechanisms of cellular response to DNA damage in bacteria and eukaryotes their role in the maintenance of genome stability.
4. Molecular mechanisms of DNA repair of non-bulky lesions in cellular genome.
5. Molecular mechanisms of nucleotide incision repair for oxidative DNA base damage and its role in cellular protection against genetoxic stress.
6. Molecular mechanisms of direct DNA damage reversal in mutations prevention and active epigenetic reprogramming.
7. Molecular mechanisms of bulky DNA lesions and their role in mutagenesis and human genetically inherited diseases.
8. Molecular mechanisms of homologous recombination and their role in DNA replication and chromosome breakage repair.
9. Molecular mechanisms of non-homologous end joining (NHEJ) and their role in protection against ionizing radiation and immune response.
10. Molecular mechanisms of DNA replication errors and their role in the maintenance of genome stability and low rate of spontaneous mutations.
11. Molecular mechanisms of action of poly(ADP-ribose) polymerases (PARPs) in DNA strand break signaling and repair: their role in genome stability and transcription regulation.
12. Molecular mechanisms of aberrant DNA repair and their role in mutagenesis and genetic evolution.
13. Molecular mechanisms of inter-strand DNA crosslinks (ICLs) repair and their role in the genome stability, mutagenesis and age-related diseases.
14. DNA repair and mutagenesis in vertebrate mitochondria.
15. Mutational signatures in cancer and aging.

**Evaluation criteria:**

A (90-100%) - the student carefully studied the educational material; consistently and comprehensively answers the questions posed; freely applies the acquired knowledge in practice.

B (75-89%) - the student knows the educational material; does not make serious mistakes when answering; he can apply the acquired knowledge in practice.

С (60-74%) - the student knows only the basic material, does not always give an answer clearly and completely.

D (50-59%) - the student has separate ideas about the material being studied; cannot fully and correctly answer the questions posed, when answering, he makes gross mistakes.

**Plagiarism check procedure:**

The platform Oqylyq has an integrated checker for plagiarism

**Recommended sources of literature for exam preparation:**

**Main literature:**

1. Benjamin Lewin. Genes VIII: AND Molecular Biology of the Gene Prentice Hall, 2007.
2. Griffiths AJF, Gelbart WM, Miller JH, et al. Modern Genetic Analysis.New York: [W. H. Freeman](http://www.whfreeman.com/); 1999.
3. Brown T. A. Genomes 3. 3rd edition. Garland Science: New York, 2006. 711p.
4. Brown T. A. Gene Cloning and DNA Analysis: An Introduction/ Blackwell Publishings,2010.
5. W.A. Bickmore. Chromosome Structural analysis: A Practical Approach/ **Oxford University Press**, UK, 1999, 234 pp
6. Sambrook J. et al. Molecular Cloning: A Laboratory Manual (3- Volume Set)/ CSHL Press,2012.
7. Strachan, T. Human Molecular Genetics. 3rd ed. New York, NY: Garland Science, 2003.

**Internet-resources:**

<http://study.com/academy/subj/science.html>

<https://www.khanacademy.org>

https://www.nature.com/scitable/topics