**Al-Farabi Kazakh National University**

**Faculty of Biology and Biotechnology**

**Department of Molecular Biology and Genetics**

**Final exam program by discipline**

SPGR 7303 "Modern problems of plant genetics"

Educational program in the specialty "8D05104 - Genetic"

Doctor’s degree 1 year, 1 semester,

autumn semester 2023-2024 academic year

**Almaty**

The program of the final exam of the discipline SPGR 7303 "Modern problems of plant genetics" of the specialty "8D05104 - Genetic" was compiled by Amirova Aigul Kuzembaevna Ph.D.

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

From "\_\_\_" \_\_\_ 2023, protocol No. \_\_

Head of the Department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Zhunusbayeva Zh.K.

**The form of the final exam on the discipline** – written, offline, “Univer”.

**The purpose of the assignment** is to assess the students' knowledge and understanding of the topics covered in this discipline; to recreate the conditions under which they will be able to assess the problem, analyze ways to solve the problem and apply the knowledge gained in practice; Test their ability to reason for their answers.

**Type of options -** tickets.

There will be 3 questions on the ticket.

**Time to exam** **-** 2 hours.

**Evaluation criteria:** Block I - 30 points, Block II - 30 points, Block III - 40 points.

The first block includes questions of cognitive (knowledge) competence, which assess the knowledge and understanding of the object of study. This task allows you to demonstrate knowledge in the field of the genetic foundations of biotechnology, achievements and prospects for the development of biotechnology and genetic engineering, practical significance in various fields of science, production and industry, based on modern advanced textbooks, manuals and other literary sources. Valued at 30 points.

The second block includes questions that reveal functional competence, which assess the ability to apply, analyze information and systematize the results of scientific research by processing literature data. This task is aimed at identifying the ability to apply their knowledge, formulate and justify arguments and solve problems within the field of study. Valued at 30 points.

The third block includes questions of systemic competence, which reveal the ability to synthesize and evaluate information. This question is an applied task related to the use of biotechnological methods, which are aimed at testing practical skills. Valued at 40 points.

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.

**PhD STUDENTS / WRITTING/ ONLINE**

**Discipline**: Modern problems of plant genetics. **Exam form:** Standard / Written /offline **Platform:** “Univer”

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| --- | --- | --- | --- | --- | --- |
| **Points**  **Criteria** | **DESCRIPTORS** | | | | |
| **Excellent** | **Good** | **Satisfactorily** | **Unsatisfactory** | |
| **90–100** **points** | **70–89 points** | **50–69 points** | **25–49 points** | **0–24 points** |
| **1. Knowledge and** | Questions answered comprehensive answers, | The questions are answered in general | Answers to questions are fragmentary nature, | The answers are not correspond | Answers on questions |
| **understanding of theory and** | illustrated clear | correct answers, but with some inaccuracies, | correct conclusions | content of questions. | absent;  ignorance revealed |
| **course concepts** | examples where | not wearing | interspersed with | Key for educational | or misunderstanding |
|  | necessary; | principled | unfaithful. Missed | concept course, | student greater or |
|  | The answers are laid out | character. Not all physical | content blocks | contained in | the most important part |
|  | competent scientific | technical terms | physical and technical | issues are interpreted | educational material. |
|  | technical language, | used correctly there are | profiles required for | wrong. | Violation of the Rules |
|  | everything | separate incorrect | full disclosure of the topic. |  | holding the final |
|  | physical and technical | statements and | Student as a whole |  | control. |
|  | terms and concepts | grammatical / | oriented to the topic |  |  |
|  | used correctly | stylistic errors | training course, but |  |  |
|  | and are revealed correctly. | of presentation. | has problems with |  |  |
|  |  | The answers are not | disclosure of specific |  |  |
|  |  | illustrated | questions. |  |  |
|  |  | examples in due least. |  |  |  |
| **2. Application** | Technology and course | Course methodology and | Course Tools are used | Applies incorrectly | Inability to apply knowledge to solve problems and explain physical phenomena; when answering (one question), he makes more than 3-4 gross mistakes, which he cannot correct even with the help of teaching staff; didn’t fully understand the material. Violation of the Rules for final control. |
| **chosen one** | methodology used with | knowledge gained | superficially, different | essential part |
| **methodology and** | deep meaningful with | weak student | little content, | disciplines natural sciences, |
| **technology to** | taking into account the | integrated and | there are inaccuracies in | allows significant |
| **specific** | specifics | adapted to the solution | answer, logic is broken | factual errors |
| **applied** | areas of training | specific practical | presentation, missing | which the student is not |
| **tasks** | students; scientific | tasks proposed in the copy. | meaningfulness | can fix |
|  | physical concepts | ticket; student knowledge | provided | on your own, on most |
|  | freely apply to | adapted; answers | material, missing | additional |
|  | assigned task with | are distinguished by weak | picture of | questions on the content of |
|  | subsequent logical | structured, in | interdisciplinary connections. | the exam student finds it |
|  | and evidence-based disclosure of the main problem; | the answer takes place insignificant factual errors  which he is able to correct on his own, thanks to a leading question; |  | difficult to answer or does not give correct answers. |

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| **3. Assessment and** | Having the ability to | Integration and Analysis | Superficial justification | Absence validity and | Lack of ability |
| **analysis** | integration, | application of methods and | patterns and principles | application analysis | apply methodology |
| **applicability** | validity and | technology course with | of physics phenomena, weak | methods and technologies | course when bringing |
| **selected** | analysis of methods and | subsequent using visual | application of basic | course, manifestation | examples, use |
| **methods for** | technology by | materials for | volume of material in | difficulties with | visual materials; |
| **proposed** | a specific topic | consolidation of their | according to the program | providing answers | Violation of the Rules |
| **practical** | structuring answer, | reasoning through | learning disabilities | to questions | holding the final |
| **task, rationale** | to analysis 5 | use of scientific | with his independent | reproducing character. | control. |
| **received** | provisions | technical terms with | reproduction and |  |  |
| **result** | existing theories, | assumption minor errors | requirement of suggestive |  |  |
|  | scientific schools, | when playing | questions; |  |  |
|  | directions for question | knowledge; analysis 3-4 |  |  |  |
|  | examination tickets, | provisions existing theories, |  |  |  |
|  | answers illustrated | scientific schools, |  |  |  |
|  | examples and visual | directions on the issue |  |  |  |
|  | materials, including | examination ticket. |  |  |  |
|  | including from own |  |  |  |  |
|  | student's practice; |  |  |  |  |
|  | demonstrates skill |  |  |  |  |
|  | dialogue and engage |  |  |  |  |
|  | into scientific discussion. |  |  |  |  |
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**Exam questions**

**Block I**

1. Modern problems of plant genetics.

2. High-quality reference genome sequences.

3. Challenging Features of Plant Genomes.

4. Major achievements in plant pan-genomics.

5. In vitro culture and plant breeding.

6. Pollen and Microspore culture in Plant Improvement

7. Creation of Haploid and Dihaploid plants.

8. Recent applications of plant cell culture technology in the breeding process.

9. Aspects of Somatic Hybridization.

10. Genetic Resources, Chromosome Engineering and Crop Improvement.

**Block II**

1. Chromosome Engineering.

2. Biotechnology based on Recombinant DNA.

3. Creation of Recombinant DNA.

4. The tools of recombinant DNA technology.

5. Methods of genetic transformation of plants.

6. Chromosome Engineering and Crop Improvement.

7. Agrobacterium-mediated plant transformation.

8. Structure of Ti- plasmid of *Agrobacterium tumefaciens*.

9. Method of biolistic transformation of plants.

10. Particle bombardment apparatus (biological ballistics) for delivering DNA into the plant genome.

**Block III**

1. Risks of modern biotechnologies and legal aspects of their implementation in agriculture.

2. Main problems of food safety.

3. Plant genome analysis. Pan-genome of plants.

4. The plant microbiome: ecology, functions, and emerging trends in microbial application.

5. Plant microbiota and their interactions

6. From Sanger Technology to NGS: Getting Plants of the Ground.

7. NGS is tightly bound to bioinformatics.

8. Impact of Genetic engineering in agriculture: zero hunger, achieving food security and nutrition and promoting sustainable agriculture.

9. CRISPR/Cas Genome Editing and Precision Plant Breeding in Agriculture.

10. Effect of abiotic and biotic stresses on food production.

**REFERENCES AND RESOURCES**

**Literature:**

1.Космин, В. В. Основы научных исследований (Общий курс) [текст] : учеб. пособие . - 2-е изд. - M. : Риор, 2014. - 214 с.

2. Герасимов, Борис Иванович. Основы научных исследований. - Москва ; Москва : Издательство "ФОРУМ" : ООО "Научно-издательский центр ИНФРА-М", 2013. - 272 с.

3. Леонова, Ольга Владимировна. Основы научных исследований. - 1. - Москва : Московская государственная академия водного транспорта (МГАВТ), 2015. - 72 с.

4. Шкляр, Михаил Филиппович. Основы научных исследований. - Москва : Издательско-торговая корпорация "Дашков и К", 2018. - 208 с.

5. Shanti Bhushan Mishra and Shashi Alok Handbook of research methodology. – India 2017. – 28 p.

6. В. А. Бакулев, Н. П. Бельская, В. С. Берсенева Основы научного исследования. - Екатеринбург: Изд-во Урал. ун-та, 2014. – 64 c.

**Internet resources:**

Internet resources (at least 3-5)

http://elibrary.kaznu.kz/ru

https://www.goodreads.com/

https://www.coursera.org/

https://www.edx.org/