MINISTRY OF EDUCATION AND SCIENCE OF REPUBLIC OF KAZAKHSTAN

AL FARABY KAZKAH NATIONAL UNIVERSITY

LEARN-METODICAL COMPLEX

**on discipline «Chromosomal and gene engineering»**

**of preparation direction of specialty «6M070100 - biotechnology» for master course**

1– **course**, 1 - trimestr, credit number – 3

# Almaty, 2015

## Standard of study program has composed by Al Faraby Kazakh National University

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## Annotation

Study of methodical case on discipline «Chromosomal and gene engineering» of preparation direction of specialty «540850 - biology» for master course has to create by corresponding of GOSO-RK request. The discipline to give for student information about genetic engineering technology use and control methods and negative effects on genome inside country also, but and adjoining country, which is used of genetical resources and biotechnology methods by request of convention in accordingly of country law. Main aims are using of modern biotechnology methods to conservation and sustainable genetically resources of biodiversity components Republic of Kazakhstan and to take economical issue, to improving of nature using strategy, law aspects and financial system. It is the issue of Kazakhstan to genetically and biologically diversity conservation global strategy.

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#### INTRODUCTION

### Study of methodical case on discipline has to create to realizing of Ministry Education and Science of RK instruction from15 August 2005 y.

 Study of methodical case on discipline « Chromosomal and gene engineering » of preparation direction of specialty «540850 - biology» for master course have full packet of study-methodical materials to give masters the materials of nature protection genetically and biologically diversity conservation to develop basic tendentious.

 **Aim of discipline teaching.** « Chromosomal and gene engineering » is to give for student information about genetically and biologically resource use and control methods and negative effects on genome sustainability inside country also, but and adjoining country, which is used of genetical resources and biotechnology methods by request of convention in accordingly of country law. Main aims are to conservation and sustainable using of genome components Republic of Kazakhstan and to take economical issue, to improving of nature using strategy, law aspects and financial system. It is the issue of Kazakhstan to genetically and biologically diversity conservation global strategy.

 At the plants, animals and microbes genome sustainability is related by one of one and with environment factors as basis of sustainable developing. Biological and genetically resources is basis for Labour and Health Safety and give ability of adaptation to environment changing. Today we have every time the anthropogenic presage on ecosystems, specie’s and genes diversity, It’s will be stopped of progressive developed of society in future. Republic of Kazakhstan is ratified of Rio-92 Convention of biodiversity convention.

The discipline study objectives

Case study of discipline include information about basic objectives to realization request of Rio-92 convention in Kazakhstan to conservation of genetically resourses.

**In particularly** :

1. Biologycally and genetically diversity state evaluation as humanity issue for people;
2. The estimation of risk of anthropogenic influence on genome sustainability and species life;
3. The estimation of independence country right on himself resources to conservation genetically resource;
4. Traditional depending of local citizen from biologically resources using as food, public health, energy and other resources;
5. The estimation of economical, social and ecological issue to formation of normative of rational using of genetically resources;
6. To realization of Convention aims create of national politic strategy.

By professional preparation master of ecology must be:

**Have theoretical perphormance:** about main problems and advances of modern genetics; gene and chromosomal engineering new methods

**to know:** the principles of measurement systems and their using; basic standards of document preparation; international standards of genetically engineering management; main problems and advances of modern biotechnology; the research methods, which used in chromosomal and gene engineering now ability; real mathematic and statistical methods for treat of experimental dates; the principles of quality standards and technical improving of control and safety systems of environment, the principles of effectively using nature resources, **to be able: to decision of real objectives and methods elect**; elect of real mathematic methods to treat of information; to able of prognozing of results of professional activity; integrate of knowledge, make conclusion inside professional activity;

**have experience:** provide genetically researches; employed of knowledge for creative decision of biotechnology problem;

**to be comprehensive activity:** in scientific technology which used of genetically researches ; at the methods elect for assessment of genome stability; to decision of applied professional problems in biotechnology, biodiversity conservation in management decision; in problem of informatics search;

**Prerequisites.**  Actually, The discipline to give for student information about bioresource use and control methods and negative effects on genetically sustainability and diversity inside country also, but and adjoining country, which is used of genetically resources and biotechnology methods by request of convention in accordingly of country law. Main aims are to conservation and sustainable using of biodiversity components Republic of Kazakhstan and to take economical issue, to improving of nature using strategy, law aspects and financial system.

 **Adjacent disciplines:**

«General ecology@, «General genetics», «Human genetics and sustainable development of society», «Biological diversity of plants, animals», «Ecologically genetics education and viewpoint».

**DISCIPLINE OF CONTENT AND STRUCTURE**

|  |  |  |  |
| --- | --- | --- | --- |
| weeks | Title of lecture | hours | balls |
| **Мodule 1 History, study methods and modern state of chromosomal and gene engineering**  |
| 1 | Lecture 1. History, study methods of chromosomal and gene engineering | 1 |  |
| Seminar 1. To view of chromosomal and gene engineering methods. (morphological, cytogenetically and molecular-genetically) | 2 |  |
| 1 HSW |  |  |
| 2 | Lecture 2. Theoretical issue and using of chromosomal - gene engineering methods. | 1 |  |
| Seminar 2. To view of creation gene engineering. | 2 |  |
| HSW 2 |  |  |
| 3 | Lecture 3. Modern methods of selection.  | 1 |  |
| Seminar 3. View of cell engineering experimental issue basic to plants and animals selection. | 2 |  |
| HSW 3 |  |  |
| **Module 2** Chromosomal engineering and genetically evaluable of organisms. |  |
| 4 | Lecture 4. Genetically basic of hereditary unhereditary evaluable. Individual and groups evaluable.  | 1 |  |
| Seminar 4. View the methods of changing and addition of separate chromosome.  | 2 |  |
| HSW 4 |  |  |
| 5 | Lecture 5. Principles and methodology of the introduction of additional chromosome and getting new forms and supplemented line. | 1 |  |
| Seminar 5. Consider the introduction of instructional techniques into the genome of a particular species or varieties of any additional pairs of chromosomes of another species. | 2 |  |
| HSW 5 |  |  |
| 6 | Lecture 6. Changing dynamics of ecosystems. | 1 |  |
| Seminar 6. The role of genetic engineering methods in coherent and incoherent evolution. | 2 |  |
| HSW 6 |  |  |
| 7 | Lecture 7. Monitoring studies on the stability of biological systems as a result of the application of engineering technology. | 1 |  |
| Seminar 7. Selections principles in evolutionary theory. Biotsenotichesky crises and their causes, as a result of genetic engineering. | 2 |  |
| HSW 7 |  |  |
|  |  |  |
| **1 midterm** |  | **30** |
| **Module №3.The meaning of modern khromosomic and genetic engineeriny for sustainable genome of natural populations (plants, animals, human) and ecosystem in general.**

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| --- | --- | --- | --- |
| 8 | Lecture №8. Species, as a main carrier of evolution by Vernandstys theory and its influence on modern technologys sustainability. | 1 |  |
| Seminar №8. Factors and driving forces of speciation in modern conditions, application of genetic engineering methodos. | 2 |  |
| 9 | Lecture №9. Community of systems as a elementary carrier of evolution process. | 1 |  |
| Seminar №9. Influence of community to the evolution. Modification of internal and external environment of community. | 2 |  |
| Students independent work – 9 СРС |  |  |
| 10 | Lecture №10. Internal and external factors of historical climatic changement and theiz role in organic evolution. | 1 |  |
| Seminar №10. Climate, climatic and environmental changement mechanisms, models of biosystems sustainable development. | 2 |  |
| Students independent work  |  |  |
| 11 | Lecture №11. Genetic engineering – artificial changement of necessary organisms (bacteriums, animals, plants) to another species | 1 |  |
| Seminar №11. To consider the methods and ways of genes changement (transgenesis) | 2 |  |
| Students independent work  |  |  |
| 12 | Lecture №12. Principles of separation from bacteriums, animals or plants genes for changement or artificial synthesis of necessary genes. | 1 |  |
| Seminar №12. To consider the methods of creation the special genetic constructions (vectors), in wich separated genes will introduce in another genes.  | 2 |  |
| Students independent work –  |  |  |
| 13 | Lecture №13. Transgenetic plans and animals which chanyed in genetic operations. | 1 |  |
| Seminar №13. To get acquainted with genes – promoters, terminators, and genes reporters, wich change the genes. | 2 |  |
| Students independent work  |  |  |
| 14 | Lecture №14. Ti – plasmids of Acrobacteriumtumefasiens ground bacterium, wich carry the gene of protein – toxic and introduction in plant cells (ONA of plants). | 1 |
|  | Seminar №14. Use of to create the form of useful agrocultural plants, sustainable for harmful insects | 2 |  |
| Students independent work  |  |  |
| 15 | Lecture №15. New methods of animals selection chimeric or transgenetic animals and role of genes in cell differentiation and regulation of interaction between cells in process of development. | 1 |  |
| Seminar №15.To carry out the revien of experimental methods of obtaininytobally extraordinary animals, which one father and mother, but more than one quanfity of parents. (chimeric animals) | 2 |  |
| Students independent work  |  |  |

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|  | **2 midterm**  |  | **30** |
| **Exam** |  | **40** |
|  | **Total** |  | **100** |
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