



48SJ-MBAG

ECTS: 4

YEAR: 2020Z

MOLECULAR BIOLOGY AND GENETICS
MOLECULAR BIOLOGY AND GENETICS**COURSE CONTENT**
CLASSES

Construction of prokaryotic and eukaryotic cells, cell cycle. The basic concepts of genetic, chromosomal theory of inheritance and the mechanisms of the division of genetic material in the nucleus as well as the mitochondria. Rules of monogenic inheritance and multifactorial traits (quantitative). The phenomenon of coupling and interaction of genes. Genetic blood groups in humans. Types of sex determination in man, inheritance of sex-linked traits. Structure of chromosomes and rules for description of karyotypes. Aberrations of autosomes and heterosomes, the basis of mutagenesis. The basics of population genetics. Environmental threats from chemical and biological agents. Analysis of the risks of transgenic organisms to humans and the environment. The rules for working in molecular biology. Genetic engineering techniques as a basis for molecular diagnostics. Methods for isolating nucleic acids. Principles and types of PCR. The enzymes used in molecular biology. Gene Therapy. The human genome project. The genetic database. Diagnostic techniques used in medical genetics. The use of stem cells in medicine. Good Laboratory Practice in cell culture. The biological properties of stem cells.

LECTURES

Structure and function of lipids and carbohydrates. Characterization of primary, secondary, tertiary, and quaternary protein structure. Protein modifications and their functions, as well as the regulation of protein degradation. The structure of RNA, DNA and chromatin. DNA replication, repair and recombination, as well as the regulation of nucleic acid degradation. Transcription, translation, and the regulation of gene expression. The human genome, transcriptome, and proteome, including their function and methods of analysis

EDUCATIONAL OBJECTIVE:

Transfer of knowledge of the basis of genetics - the basic concepts and mechanisms of genetic inheritance. Acquire the skills of determining the selected chromosomal aberrations and genetic diseases. Calculating frequency of alleles and genotypes in the population and to determine the reasons that affect their changes. Influence of environmental factors on the body and the environment. Transfer of knowledge of the basic methods used in molecular biology. The basic concepts of simple research, interpretation of results and how to draw conclusions. The acquisition of the ability to use online databases as a source of information. Knowledge of the problems of stem cells and their use in medicine.

DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN RELATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field of study: M/NM+++,

Codes of learning outcomes in a major area of study: B.U10.+, B.U13.+, B.U3.+, B.U8.+, B.W.27.+, B.W.29.+, B.W11.+, B.W12.+, B.W13.+, B.W14.+, B.W18.+, B.W19.+, C.U1.+, C.U2.+, C.U3.+, C.U4.+, C.U5.+, C.W1.+, C.W10.+, C.W2.+, C.W4.+, C.W5.+, C.W6.+, C.W7.+, C.W8.+, C.W9.+, D.W22.+, K.5+, K.7.+, K.8.+, K.9.+,

LEARNING OUTCOMES:**Knowledge**

W1 - The student knows the structure and function of lipids and polysaccharides
W10 - (B.W19) in the basic scope of stem cells and their application in medicine;
W11 - (C.W8) factors influencing the primary and secondary genetic balance of a population;
W12 - The student knows the rules of scientific research
W13 - principles of conducting scientific, observational and experimental research and in vitro research for the development of medicine;
W14 - the process of shaping new specialties in the field of scientific discipline - medical sciences and achievements of leading representatives of Polish and world medicine;
W2 - characterize I-, II-, III- and IV-order structures of proteins, knows the post-translational and functional modifications of proteins and their importance
W3 - The student knows the function of nucleotides in the cell, the first- and second-order structure of nucleic acids (DNA, RNA) and the structure of chromatin
W4 - The student knows the functions of the human genome, transcriptome and proteome and the basic methods used in their study and study; describes the processes of DNA replication, repair and recombination, transcription and translation, and the degradation of DNA, RNA and proteins; knows the concepts of gene expression regulation;
W5 - The student knows the cell cycle and its importance for the functioning of the body;
W6 - The student knows the basic concepts of genetics and the phenomena of gene coupling and interaction;
W7 - The student knows the principles of the inheritance of a different number of traits, the inheritance of quantitative traits, the independent inheritance of traits and the inheritance of non-nuclear information;
W8 - Student describes the structure of chromosomes and the molecular basis of mutagenesis, (C.W7) describes the aberrations of autosomes and heterosomes that cause diseases; (C.W9) basics of diagnostics of gene and chromosomal mutations responsible for hereditary and acquired diseases;
W9 - Student can identify the benefits and risks of the presence of genetically modified organisms (GMOs) in the ecosystem

Skills

U1 - student examines a cross between genetic lineages of human traits and diseases

Course/module:

Molecular Biology and Genetics

Fields of education:**Course status:** mandatory**Course group:** A - przedmioty podstawowe**ECTS code:** 12048-3-A**Field of study:** Medicine**Specialty area:** Medicine**Educational profile:** General academic**Form of study:** full-time**Level of study:** uniform master's studies**Year/semester:** 1 / 1**Type of course:**

Classes, Lecture

Number of hours per semester/week: Classes: 40, Lecture: 10**Teaching forms and methods**

Classes(K1, K2, K3, K4, U1, U2, U4, U5, U6, U7, U8, W10, W11, W12, W13, W14, W3, W5, W6, W7, W8, W9) : Laboratory Exercises - solving genetic and molecular biology tasks and problems on the basis of prepared work cards and instructions (W1, W11, W14, W2, W3, U1, U2, U4, U5, U6, U7, K1) other: consultation , Lecture(K1, K2, K4, W1, W14, W2, W3, W4) : Lectures: formal lectures with multimedia presentations – W6, W7, W8, W9, K1 Classes : Laboratory seminars – solving problems and genetic tasks, discussions (W1, W10, W12, W13, W14, W2, W3, W4, W5, W6, U1, U3)

Form and terms of the verification results:

CLASSES: Written test - null(K2, U1, U2, U4, U5, U6, U7, U8, W10, W11, W14, W3, W5, W6, W7, W8) ; CLASSES: Colloquium practical - Practical exercises(K2, U4, U5, U6, U7, U8) ; CLASSES: Write-up - Written quizzes – Short tests with open ended questions (W6, W7, W8, W9)(K2, K3, K4, U1, U2, W13, W6, W7, W8, W9) ; CLASSES: Colloquium test - Written colloquiums – written test with closed questions (W1, W10, W11, W14, W2, W3, W4, W6, U1, U2, U3, U4, U5, U6, U7, K1) Completion of practical exercises– (U4, U5, U6, U7) Practical colloquium – Completion of practical exercises: (U4, U5, U6, U7) Report 1 - Assessment of tasks and problem solving with work cards (W1, W2, W3, W4, W5, U1, U2) (K1, K2, U1, U2, U8, W10, W11, W14, W3, W5, W6, W7, W8, W9) ; CLASSES: Part in the discussion - Participation in discussions 1 – assessment of involvement in discussion and ability to solve genetic and molecular biology tasks (W1, W10, W11, W12, W13, W14, W2, W3, W4, W5, W6, U1, U2, U3, K1) (K3, K4, W10, W11, W12, W13) ; LECTURE: Written exam - Participation in discussions 1 – assessment of involvement in discussion and ability to solve genetic and molecular biology tasks (W1, W10, W11, W12, W13, W14, W2, W3, W4, W5, W6, U1, U2, U3, K1) (K2, U1, U2, U8, W1, W10, W11, W14, W2, W3, W4, W5, W6, W7, W8, W9)

Number of ECTS points: 4**Language of instruction:** English**Introductory courses:****Preliminary requirements:**

- U2 - Student can describe the human karyotype and typical karyotypes of chromosomal aberrations
- U4 - Student performs isolation of nucleic acids, involving PCR and agarose gel electrophoresis
- U5 - Student use of online databases in order to search for needed information
- U6 - Student plans and performs tests based on DNA analysis
- U7 - Student can calculate the molar concentrations and rates of the compounds and the concentration of the substance in isoosmotic solutions, single and multi-component
- U8 - The student can estimate the risk of a given disease manifesting in the offspring based on family predisposition and the influence of environmental factors;

Social competence

- K1 - In terms of social competences, the graduate is ready to: (K.5) perceive, recognize and self-assess educational deficits and needs;
- K2 - The student respects and applies the principles of academic and professional ethics and professional image, professionalism academic, social and professional
- K3 - (K.8) student formulates conclusions from own measurements and observations;
- K4 - (K.9) implementation of the principles of professional camaraderie and cooperation in a team of specialists, including representatives of other medical professions, also in a multicultural and multinational environment.

BASIC LITERATURE

- 1) A. Buczek , Medical Biology, Part 1, wyd. Koliber, Lublin , 2007 ; 2) A. Buczek , Medical Biology, Part 2, wyd. Koliber, Lublin , 2007

SUPPLEMENTARY LITERATURE

- 1) Jorde, Lynn B., et.al. , Medical Genetics 6th edition, wyd. Elsevier MOSBY, 2019

Name of the organizational unit offering the course:

Katedra Biologii Medycznej,

Person in charge of the course:

prof. dr hab. Ewa Dzika,

Course coordinators:

dr Magdalena Weidner-Glunde, , prof. dr hab. Ewa Dzika, , dr n. med. Michael Thoene, , dr n. med. Katarzyna Jezierska-Woźniak, , dr n. med. Joanna Korycińska, , mgr Małgorzata Lepczyńska,

Notes:

Detailed description of the awarded ECTS points - part B

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The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: classes	40 h.
- participation in: lecture	10 h.
- consultation	5 h.
	55 h.

2. Student's independent work:

-	15 h.
-	20 h.
-	10 h.
	45 h.

1 ECTS point = 25-30 h of the average student's work, number of ECTS points = 100 h : 25 h/ECTS = 4,00 ECTS
on average: **4 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	2,20 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	1,80 ECTS points,