

MINISTRY OF HEALTH OF UKRAINE

ODESSA NATIONAL MEDICAL UNIVERSITY

Department of clinical immunology, genetics and medical biology

APPROVED

Vice-rector for research and educational work,


Eduard BURYACHKOVSKY



01 September 2023

**METHODOLOGICAL RECOMMENDATIONS
FOR THE INDEPENDENT WORK OF HIGHER EDUCATION STUDENTS
IN THE ACADEMIC DISCIPLINE
BIOLOGY WITH BASES OF GENETICS**

The level of high education: second (magister)

Branch of knowledge: 22 “Health Care”

Speciality: 226 “Pharmacy, industrial pharmacy”

Educational- professional program: Pharmacy, industrial pharmacy

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Developments are discussed and approved at a methodic meeting of the
Department of Clinical Immunology, Genetics and Medical Biology.

Minutes № 1, 28.08.2023.

Head of the department, professor.

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Minutes № 1 4.09 2023.

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Minutes № _____ 202____.

Head of the department _____

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(First Name SURNAME)

Module section 1. Molecular- cellular level of life organization

Preparation for practical class 1. Levels of living matter organization. Optical systems in biological studies.

The Purpose of the Lesson. To study the structure of the light microscope. To get the skills of microscoping and preparation of temporary slides. To realize the importance of studying the elementary units of life organization on the each level for understanding underlying basis of health and disease mechanisms.

TOPIC CONTENT

1. Structure of compound optical microscope
2. Usage of optical microscope in low and high magnification
3. Common mistakes in usage of optical microscope
4. Preparation of temporary slides.
5. Levels of organization of living matter. Their importance for understanding of pathological processes.
6. Elementary units and elementary functions of different levels of living matter organization.

TEST QUESTIONS for individual work

	Questions	Answers
1	What are the structural parts of the optical microscope: a ,b, c	
2	Name the main components of mechanical part: a, b, c, d, e, f, g	
3	Name the main components of illuminating part: a, b, c	
4	Name the main components of optical part: a, b	
5	What is the magnification of a)eye-piece lens – a,b,c b)objective lens of low magnification– a c)objective lens of high magnification– a d)objective lens of oil immersion magnification– a	
6	Calculate the total magnification of microscope, if magnification of eye-piece lens is 15x and magnification of objective lens is 8x	
7	List the main levels of biological organization : a, b, c, d, e, f.	

Preparation for practical class 2. Biological membranes. Transport across the cell membrane

The Purpose of the Lesson: To study the importance of biological membranes and transport across the membranes for activities of the cells

TOPIC CONTENT

1. Modern model of plasma membrane organization.
2. Chemical composition of plasma membrane.
3. Structure and function of glycocalyx.
4. Functions of plasma membranes.
5. Active and passive transport across the plasma membrane.
6. Endocytosis (phagocytosis and pinocytosis). Exocytosis.

TEST QUESTIONS for individual work

№ №	Questions	Answers
1	Name the modern model of cell plasma membrane structure:a	
2	List the organic substances that compose plasma membrane: a,b	
3	What are the main functions of cell membrane? a,b,c,d,e	
4	Name the types of a) passive transport: a,b,c b) active transport: a,b,c,	
5	Which kind of transport requires ATP energy?	
6	Through which membrane components and by which mechanisms passes <ul style="list-style-type: none"> ○ water ○ water-soluble substances ○ fat-soluble substances ○ glucose ○ amino acids ○ ions 	
7	What is <ul style="list-style-type: none"> • pinocytosis • phagocytosis • exocytosis 	

Preparation for practical class 3. Morphology of eukaryotic cell. Structural components of cytoplasm

The Purpose of the Lesson: to study the morphology of the cell as elementary life unit. To get an association between structure and functioning of eukaryotic cell as basis for studying of other morphological and medical disciplines. To understand importance of organelles studying in medicine.

TOPIC CONTENT

1. Cellular and non-cellular forms of life.
2. Prokaryotes and eukaryotes.
3. Principle differences in morphology of animal and plant cell

4. Importance of scientific works of R. Hooke, A. Leeuwenhoek, M. Malpighi, R. Brown, J. Purkinje, M.Schleiden, T. Schwann in development of the cell theory.
5. Modern postulates of the cell theory.
6. Structure and function of the main structural components of the cytoplasm: hyaloplasm (cytosol), cell organelles, inclusions, nucleus.
7. Classification of cell organelles: general function organelles (double-membranous, single-membranous, non-membranous) and special function organelles.

TEST QUESTIONS for individual work

	Questions	Answers
1	Cell was discovered by ... in year	
2	Cell theory was formulated by ... inyear	
3	List cell organelles of A. general function: a,b,c,d,e,f B. special function: a,b,c,d	
4	Name the primary functions of 1) lysosomes: a,b,c,d,e 2) mitochondria: a,b 3) smooth endoplasmic reticulum: a,b,c, 4)rough endoplasmic reticulum: a,b 5) ribosomes: a	
6	6) Golgi complex: a, b, c, d 7) centrioles: a	
7	Proteins that are produced for inner cell needs are synthesized in ... Proteins that are exported from the cells are synthesized in	
8	Dysfunction of which organelles leads to the “storage disorders”?	
9	Name the organelles that provide main processes of 1)synthesis of organic substances: a, b,c 2) disintegration of organic substances: a, b	

Preparation for practical class 4. Nucleus. Chromosomes morphology. Human karyotype

The Purpose of the Lesson: To study the morphological characteristics of the chromosomes. To characterize normal human karyotype and importance of its studying for the diagnosis of hereditary disorders.

TOPIC CONTENT

1. Chemical composition of the chromosomes.
2. The levels of chromatin condensation.
3. Notion of the euchromatin and heterochromatin
4. The autosomes and heterosomes (sex chromosomes). Homologous and non-homologous chromosomes.
5. Shape of the metaphase chromosome.
6. Karyotype and ideogram. Characteristics of the normal human karyotype.
7. International classification of the chromosomes.
8. The rules of the chromosomes.

TEST QUESTIONS for individual work

№	Questions	Answers
1	Name the main components of the nucleus: a,b,c,d	
2	What are the main functions of the nucleus?(a,b,c)	
3	Where does the nucleolus form?	
4	What is the function of the nucleolus?	
5	What is the chemical composition of the chromosomes? (a,b,c)	
6	What are the functions of histones and non-histone proteins?(a,b)	
7	Which kind of chromatin (euchromatin, heterochromatin) possesses active genes?	
8	What is the state of chromosomes (condensed, decondensed) during the interphase(a); metaphase of mitosis(b)	
9	When and where the first international classification of chromosomes has been adopted?	
10	Classification of the human chromosomes is based on: a,b,c	
11	What are the shapes of human metaphase chromosomes: a, b, c (normal),d (pathological)?	
12	Give the definition of:	
13	a) metaphase plate	

	b) karyotype	
	c) ideogram	
14	Human karyotype is studied in practical medicine for....	
15	Which cells are taken for karyotyping? a,b,c	
16	How many autosomes (a) and sex chromosomes (b) are in normal human karyotype?	
17	The length of the chromosomes is measured in	
18	Which human chromosome is the largest (a) and the smallest (b) in size?	
19	Name the rules of the chromosomes (a,b,c,d)	

Preparation for practical class 5. Characteristics of nucleic acids.

The Purpose of the Lesson: To study the characteristics of nucleic acids, structure of genes, classification of eukaryotic and prokaryotic genes for understanding of molecular mechanisms of inheritance.

TOPIC CONTENT

1. Nucleic acids as biological polymers.
2. DNA. Structure, composition of nucleotides, functions.
3. RNA. Structure, composition of nucleotides, functions.
4. Principle of complementarity. Chargaff's rule. The coefficient of DNA specificity.
5. Role of DNA in transmission of hereditary information. Transformation, transduction, conjugation.
6. Organization of eukaryotic genome. Unique, moderately repetitive and highly repetitive sequences.
7. DNA replication. Initiation, elongation, termination.
8. DNA repair. Types of repair.
9. Structural and regulatory genes. Genes for rRNA and tRNA. Mobile genes (transposons).
10. Split genes. Exon-intron organization of eukaryotic genes.

TEST QUESTIONS for individual work

№	Questions	Answers
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1	Point out location in a cell of 1) DNA – a,b,c; 2) rRNA-a,b; 3) mRNA – a,b; 4) tRNA- a,b.	
2	Which space organization has 1) DNA molecule; 2) RNA molecule?	
3	What is the chemical composition of	
4	1) DNA nucleotide – a,b,c; 2) RNA nucleotide – a,b,c.	
5	What is the difference between DNA and RNA nucleotide?(a,b)	
6	Where are all the types of RNA formed? What are the functions of	
7	1)DNA – a,b; 2) tRNA – a; 3) mRNA – a; 4) rRNA – a,b	
8	What are the main functional centers of tRNA molecule? (a,b)	
9	Which components participate in formation of amino-acyl-tRNA complex ?(a,b,c,d)	
10	Replication is....	
11		
12	List main components participating in DNA replication – a,b,c.	
13	Name main stages of DNA replication – a,b,c.	
14	DNA repair is....	
15	An importance of DNA repair is	
16	The main difference in organization of prokaryotic and eukaryotic genes is – (a) Exon is..... Intron is...	

Preparation for practical class 6. Organization of information flow in the cell. Regulation of gene expression.

The Purpose of the Lesson: To get notion of genetic code and its properties. To study mechanisms of storage and expression of hereditary information.

TOPIC CONTENT

1. Gene. Genetic code and its main properties.
2. Main stages of protein biosynthesis.
3. Central dogma of molecular biology.
4. Main peculiarities of protein biosynthesis in eukaryotes (transcription, processing, splicing, activation of amino acids, translation, posttranslational modifications).

TEST QUESTIONS for individual work

№	Questions	Answers
1	What is a) gene b) genetic code	
2	List the main properties of genetic code a) b) c) d) e)	
3	Transcription is....	
4	Main stages of transcription are: a, b, c	
5	In transcription participate: a, b, c	
6	Which RNA molecule is transcribed on DNA molecule primarily?	
7	Processing is...	
8	Splicing is...	
9	Activation of amino acids is...	
10	Translation is....	
11	Main active centers of a ribosome are: a, b	
12	Main stages of translation are: a, b, c	
13	In translation participate: a, b, c	
14	Posttranslational modification is...	
15	Posttranslational modification takes place in...	

16	Write down scheme of central dogma of molecular biology	
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Preparation for practical class 7. Cell cycle. Cell division. Reproduction and its forms.

The Purpose of the Lesson: To study the cell cycle, and the peculiarities of organization of cell genetic apparatus during the interphase and each mitotic phase. To get an importance of mitosis in maintaining of genetic stability and meiosis in genetic variability.

TOPIC CONTENT

1. Cell cycle. Mitotic cycle
2. Types of cell division: mitosis, amitosis, endomitosis, polyteny.
3. Characteristics of mitotic phases.
4. Biological significance of mitosis.
5. Mitotic index. Failure of mitosis.
6. Meiosis as a special type of cell division.
7. Characteristics of phases of meiosis.
8. Biological significance of meiosis
9. Principle differences between meiotic and mitotic divisions.

TEST QUESTIONS for individual work

	Questions	Answers
1	Give the definition of cell cycle	
2	What is the difference between cell cycle and mitotic cycle?	
3	Mitotic cycle includes two periods: a, b	
4	Mitosis is	
5	List the phases of mitosis:a,b,c,d.	
6	Cytokinesis is	
7	At which mitotic phase cell division is arrested for karyotype studying?	
8	Give the examples of non-dividing cells in humans(a,b). At which period of interphase do they exist? (c)	
9	What is a mitotic index (MI)? (a)	
10	Give the examples of human cells with the high MI (a, b)	
11	What is biological significance	

12	of mitosis? What is the main difference between mitosis and amitosis?	
13	What is endomitosis?(a) polyteny?(b)	
14	Meiosis is.....	
15	Which kind of human cells divide by meiosis?	
16	The first meiotic division is termed reduction division as ...	
17	The second meiotic division is termed equational division as...	
18	How many daughter cells are formed after mitosis (a) and meiosis(b)	
19	Which set of the chromosomes get daughter cells after mitosis(a), meiosis I (b), meiosis II(c)?	
20	What are the mechanisms of genetic variability of gametes due to the meiosis? (a, b)	
21	What is biological significance of meiosis?	

Fill the table

Characteristics of interphase

Stage of the interphase	Main events	Number of chromosomes and chromatids	Number of DNA molecules

Fill the table

Characteristics of mitosis

Phase of mitosis	Main events	Number of chromosomes and chromatids	Number of DNA molecules

Preparation for practical class 8. Biological peculiarities of human reproduction. Gametogenesis. Fertilization. The

Purpose of the Lesson. To study human heredity disease concept, its classification. Principles of diagnosis of the heredity pathology. Gene (molecular) diseases, mechanisms of its development and principles of laboratory diagnosis. Gene engineering. Biotechnology. Gene therapy. Population-statistic method. Law of constancy of genetic structure of the population. To practice in usage of Hardy-Wineberg's law for studying of the genetic structure of the population.

TOPIC CONTENT

1. The main forms and sense of sexual and asexual multiplication of organisms.
2. The structure of ovum and spermatozoid.
3. Stages of ovogenesis and spermatogenesis. The most important events of every stage.
4. Principal differences of spermatogenesis and ovogenesis, gametes and somatic cells.
5. The process of fecundation in human. Monospermy.
6. Peculiarities of human reproduction and human biological sociality.

TEST QUESTIONS FOR INDIVIDUAL WORK

	Questions	Answers
1	Gametogenesis is	
2	What is a name of gametogenesis 1) In male- 2) In female -?	
3	Where does gametogenesis take place 1) In female – a; . 2) In male - a?	
4	What are the periods of gametogenesis in 1) male – a,b,c,d; 2) female - a,b,c?	
5	The period (zone) of formation is present only during ...	
6	The period of growth is the most manifested during ...	
7	How many gametes are formed from one 1) primary oocyte – a; 2) primary spermatocyte – a ?	
8	What are the sizes (mcm) of human gametes: 1) ovum (diameter) – a; 2) spermatozoid (length) - a ? What is a structure of human gametes:	

9	1) ovum - a,b,c; 2) spermatozoid - a,b,c,d.	
10	In which period of human ontogenesis does ovogenesis and spermatogenesis begin and continue? Fecundation is ...	
11	What are the stages of fecundation?	
12	In which part of female sexual system does fecundation take place?	
13	What is the biological importance of fecundation?	
14		

Module section 2. Biology of ontogenesis

Preparation for practical class 9. Peculiarities of prenatal and postnatal development in human.

The Purpose of the Lesson. To study ontogenesis and its periods. Embryonic period of the development, its stages. Congenital defects, its classification. Regulation of gene function in ontogenesis. Experimental studying of embryonic development. Critical periods of development. Teratogenesis. Teratogenic factors of environment.

TOPIC CONTENT

1. Ontogenesis, its periods
2. Stages of embryogenesis.
3. Embryonic induction. Experiences of D.Gerdon and G.Shpeman.
4. Problems of differentiation.
5. Prenatal period of human development. Peculiarities and critical periods.
6. Classification of congenital malformations in human.

TEST QUESTIONS FOR INDIVIDUAL WORK

	Questions	Answers															
1	What is ontogenesis: a. 1) from embryological point; 2) from genetic point of view.																
2	What are the periods of ontogenesis?																
3	Embryologic development begins from ... and finishes																
4	...																
5	What is a type of ovum according to a quantity and a position of a yolk in a cytoplasm? (a,b,c,d)																
6	The nutrition of an embryo is done by ... Fill a table																
	<table border="1"> <thead> <tr> <th>Stage</th> <th>Stage of human embryo genesis</th> <th>It finishes by formation</th> </tr> </thead> <tbody> <tr> <td>I</td> <td></td> <td></td> </tr> <tr> <td>II</td> <td></td> <td></td> </tr> <tr> <td>III</td> <td></td> <td></td> </tr> <tr> <td>IV</td> <td></td> <td></td> </tr> </tbody> </table>	Stage	Stage of human embryo genesis	It finishes by formation	I			II			III			IV			
Stage	Stage of human embryo genesis	It finishes by formation															
I																	
II																	
III																	
IV																	
7																	
8																	
9	Blastula is ...																
10	Which type of blastula is formed in human? a																

	Gastrula is ...	
11	What are the types of human embryo gastrulating during the period of	
12	1) Early gastrulating – a;	
13	2) Late gastrulating – a.	
14	What are the derivatives of 3 embryonic layers in human?	
15	What are the functions of provisory organs? (a,b,c,d)	
	What are the provisory organs of human? (a,b,c,d)	
16	What are the critical periods of embryogenesis?	
17	What are the critical periods in human embryogenesis?	
18	(a,b,c,d)	
	What is an embryo?	
	Fetal period continues from ... week till ...	
19	What is 1) teratology	
20	2) Teratogenesis	
	3) Teratogenic factors?	
	Embryonic induction is ...	
	What are the examples of tissues -inductors?	

Module section 3. Regularities of inheritance and variation. Methods of human genetics.

Preparation for practical class 10. Peculiarities of human genetics. Mendelian human characters (mono- and dihybrid, polyhybrid crossing).

The Purpose of the Lesson. To study subject and tasks, periods; main terms and notions of genetics. Mendelian characters in human. Principles of hybridological analysis. Monohybrid cross: law of dominance, law of segregation. Law of “gamete purity”. Cytological basis of the laws. Test cross and its practical usage. Lethal genes. Deviations from the expected ratio. Di- and polyhybrid cross: law of independent assortment and its cytological basis. Dominant and recessive modes of inheritance of normal and pathological characters. Intermediate inheritance in humans.

TOPIC CONTENT

1. The science of genetics. Medical genetics. Human genetics.
2. Hybridologic method. What about its using in human genetics?
3. Monohybrid crossing. I and II Mendel’s laws.
4. Dihybrid crossing. III Mendel’s law.
5. Cytological improvement of the hypothesis of “gametes purity”.
6. Test-crossing and its using.

TEST QUESTIONS FOR INDIVIDUAL WORK

	Questions	Answers
1	When did Mendel discover his laws of heredity?	
2	What is the year of genetics birth? Who did rediscovered Mendel's laws?	
3	Inheritance is ... Variability is ...	
4	Allelic genes are – 1)2)3)	
5	Alternative characters are ...	

6	Homozygote organism is ... A. with allelic genes ...; B. how many types of gametes are formed?	
7	Genotype is ...	
8	Phenotype is ...	
9	Phenotype depends on 1)2)	
10	What are the peculiarities of hybridologic method? 1)2)3)	
11	I Mendel's law is ...	
12	II Mendel's law is ...	
13	What is the segregation 1) by genotype C. by phenotype	
14	III Mendel's law is ...	
15	What is the segregation 1) by genotype D. by phenotype	
16	In the case of complete dominance C. dominant gene is ... D. segregation by genotype is ... E. segregation by phenotype is ...	
17	In the case of incomplete dominance A. dominant gene is ... B. segregation by genotype is ... C. segregation by phenotype is ...	
18	What is a hypothesis of "gametes purity"?	
19	Analyzing crossing is used for ...	
20	Lethal genes are ...	

Preparation for practical class 11. Multiple alleles. Blood groups genetics. Interaction of genes.

The Purpose of the Lesson. To study gene interaction and its manifestations in different types of inheritance. Multiple alleles. Inheritance of blood groups of ABO and MN antigen systems. Rh-factor. Rh-conflict. Immunogenetics: subject and tasks. Tissue and species specificity of the proteins, its antigen properties.

To study gene interaction and its manifestations in different types of inheritance. Interaction of the allele and non allele genes. Polygenic inheritance of quantitative traits. Primary and secondary pleiotropy.

TOPIC CONTENT

1. Notion of allele genes. Mechanisms of multiple alleles formation.
2. Inheritance of blood groups of the ABO antigen system in humans
3. Importance of ABO blood groups detection in clinical practice and forensic medicine
4. Notion of universal donor and universal acceptor
5. Inheritance of Rh-factor

6. Development of hemolytic disease in newborns (erythroblastosis fetalis) as a result of Rh-conflict.
7. What means the interaction of allelic and nonallelic genes?
8. Complementary interaction of genes, its manifestation and practical importance.
9. Epistasis.
10. Polygeny. Mechanisms, biological and practical importance.
11. Molecular mechanism of pleiotropy. Variants of actions of pleiotropic genes. Practical importance of primary and secondary pleiotropy.

TEST QUESTIONS FOR INDIVIDUAL WORK

	Questions	Answers
1	In homologous chromosomes usually are situated allele genes.	
2	In case of multiple alleles there areallele genes	
3	Multiple alleles are formed as a result of	
4	ABO blood groups are characterized by presence (or absence) of 1)(.....) in the membrane of 2)(.....) in blood	
5	How we term the ABO proteins 1) antigens – a, b 2) antibodies – a, b	
6	How many allele genes specify human ABO blood groups 1) in population 2) in somatic cell 3) in gamete?	
7	What is the difference of I(0) blood group from other groups? (a, b)	
8	What antigens (a) and antibodies (b) has a person with II blood group?	
9	What kind of gene interactions is in following genotypes 1) ii 2) I ^A I ^A 3) I ^A i 4) I ^B I ^B 5) I ^B i 6) I ^A I ^B	
10	Rh – positive blood is defined by presence ofin the membrane of erythrocyte	
11	Blood transfusion of the Rh-positive blood to the Rh-negative acceptor leads to the of the erythrocytes	
12	Rh-factor is important in following clinical situations: a,b	
13fetus can develop hemolytic disease of the newborn if mother is	
14	What are the genotypes of a person with 1)Rh-positive I(0) blood 2)Rh-negative IV(AB) blood?	
	Questions	Answers
1	What are the types of genes interaction:	

	1) Allelic genes – 1,2,3 2) Nonallelic genes – 1,2,3. Codominance is ...	
2	Write down a ratio of segregation by phenotype in F2 in a case of: 1) Complementary interaction of genes – a; 2) Epistasis – a; 3) Polygeny – a.	
3	In the case of complementary interaction of genes a character manifests when ...	
4	Make examples of complementary interaction of genes in human: 1,2,3.	
5	Epistasis is such a type of genes interaction ...	
6	Polygeny is ...	
7	Make examples of polygeny in human: 1,2,3,4.	
8	Pleiotropy is ...	
9	Write down a scheme of	
10	1) primary pleiotropy – 1; 2) secondary pleiotropy – 1.	
11	Make examples of human disorders in a case of: 1) primary pleiotropy – 1; 2) secondary pleiotropy – 1.	

Preparation for practical class 12. Chromosomal theory. Linked inheritance.

The Purpose of the Lesson. To study chromosomal theory of heredity. Mechanisms of crossing over: cytological proves, biological importance. Genetic maps of human chromosomes. Methods of human chromosome mapping. Modern state of human genome studying. Non-chromosomal heredity. Inheritance of sex in humans. Inheritance of sex-linked diseases in humans. Sex-linked, sex-influenced and sex-limited characters. Hemizygosity. Genetics of sex. Mechanisms of genetic differentiation in humans and its failure. Bisexual nature of humans. Psychosocial aspects

TOPIC CONTENT

1. What are the main points of chromosomal theory of heredity?
2. What is sex of human and mammals is determined by?
3. Which characters of human are inherited linked with sex?
4. Groups of genes linkage. Complete genes linkage.
5. Incomplete genes linkage. Crossing over. Morgan's law and his experiences.
6. Principles of genetic and cytological maps making.

TEST QUESTIONS FOR INDIVIDUAL WORK

	Questions	Answers
1	Sex in human and mammals is inherited as ... character.	
2	What is 1) autosome – a 2) heterosome (allosome) – a	
3	Sex chromosomes are located in ... and ... cells.	

4	In human somatic cells there are ... autosomes and ... sex chromosomes.	
5	In human somatic cells there are ... autosomes and ... sex chromosomes.	
6	Make examples of organisms with heterogametous 1) female sex – a,b; 2) male sex – a,b.	
7	Count types of gametes (%) formed 1) in woman's organism – a, 2) in man's organism – a.	
8	Which parent determines sex of a child?	
9	Where are located genes of linked with sex characters?	
10	What are the human characters which are inherited with 1) X-chromosome – a,b; 2) Y-chromosome – a,b.	
11	Where are located gene, which determines holandric characters?	
12	What is the Morgan's law (law of genes linkage)?	
13	Give examples of complete genes linkage in human.	
14	The number of groups of genes linkage is equal ...	
15	What are the groups of genes linkage in 1) woman – a; 2) man – a.	
16	Crossing over is ...	
17	In which period of cell cycle does crossing over take place?	
18	The percentage of crossing over is proportional ...	
19	The unit of crossing between genes is named ... in honor of ...	
20	Genes in chromosome are located in ... order.	
21	What are the methods of genetic and cytological maps of chromosomes making: 1) for human – a,b; 2) for drosophilae – a,b.	

Preparation for practical class 13. Variation. Phenotypic and genetic variation.

The Purpose of the Lesson. To study variation, its forms and manifestations on the organism level: phenotypic and genotypic variation. Modification and norm of reaction. Mutations and its phenotypic manifestation. Classification of mutations. Mutagens: physical, chemical, biological. Genetic danger of pollution.

TOPIC CONTENT

1. Variation: Type of variation.
2. Modification.
3. Phenocopies. Morphoses. Norm of reaction. Heterosis (hybrid power).
4. Biometry. Statistic studying of quantitative characters.
5. Types of genotype variation.
6. Mechanisms and types of combination.
7. Mutation. Autogeneses. Mutagenes.

8. Somatic, generative, induced, spontaneous mutations. Classification of mutations according to changes of genetic apparatus.
9. Mechanisms of genome, gene (point) and chromosome mutations.

TEST QUESTIONS FOR INDIVIDUAL WORK

	Questions	Answers
1	What are the main type of variation? a,b	
2	What is modification?	
3	Phenocopy is Give examples of phenocopies in human.	
4	Genocopy is	
5	Give examples of genocopies in human: a,b.	
6	Norm of reaction	
7	Qualitative characters are inherited according to the laws of	
8	Which method is used for studying of quantitative characters?	
9	Combinative variation is formation of new	
10	What are the mechanisms of combination of genes in children: a,b,c,d,e.	
11	Biological importance of combination is	
12	Mutation is	
13	Mutations appear in different cells of a human that's why they are ... and	
14	Classify mutation according to the character of changes in hereditary apparatus: a,b,c.	
15	What are the mechanisms and types of <ol style="list-style-type: none"> 1) genome mutation – a,b; 2) chromosome aberrations – a,b,c,d; 3) gene (point) mutation – a,b,c,d. 	
16	Polyploidy is	
17	Aneuploidy is	
18	What is <ol style="list-style-type: none"> 1) trisomy; 2) monosomy; 3) nullosomy. 	
19	Give examples of disorders as a result of <ol style="list-style-type: none"> 1) monosomy; 2) trisomy of autosomes; 3) polysomy of heterosomes in men; 4) polysomy of heterosomes in women. 	
20	The smallest locus of DNA which change results in transgeneration is named	
21	Spontaneous mutations appear as a result of	
22	What are the mutagens <ol style="list-style-type: none"> 1) chemical – a,b,c,d,e; 2) physical – a,b,c,d; 3) biological – a,b,c. 	

Preparation for practical class 14. Methods of human genetics. Pedigree, twins, cytogenetic, population-statistic methods. Biochemical method and DNA-diagnostic.

The Purpose of the Lesson. To study basis of medical genetics. Man as a specific subject of genetic analysis. Methods of human heredity studying. Genealogic methods. Rules of pedigree composition. Pedigree analyses. Twins method. Detection of the genotype and environment influence on the manifestation of pathological characters in humans. Dermatoglyphic, immunological methods and hybridization of somatic cells. To study classification of hereditary disorders in humans. Chromosomal diseases caused by quantitative or qualitative chromosomal aberrations; mechanisms of its formation. Cytogenetic methods. Karyotyping. Analysis of karyotypes of patients with hereditary disorders. Detection of X and Y-chromatin as method of diagnosis of chromosomal disorders.

TOPIC CONTENT

1. Human as a subject of genetics.
2. Genealogy. Stages of genealogical method.
3. Genetic symbols. Rules of pedigree construction.
4. Main characters of autosome-dominant, autosome-recessive, linked with X-chromosome (dominant and recessive), linked with X-chromosome, linked with Y-chromosome (holandric) types of inheritance.
5. Practical importance of genealogic method.
6. Peculiarities of mono- and dizygote twins' formation. Concordance and discordance of twin pairs.
7. Usage of twins method. Determine the coefficient of inheritance and environmental influence for a development of a character by Holtzenger's formulas.
8. Classification of cytogenetic methods? Their clinical importance.
9. Caryotyping method, its sense and technique.
10. The nature and mechanism of X-sexual chromatin formation. Hypothesis of M.Layon.
11. Amniocentesis, indications, its terms and techniques, possible complications.
12. Main chromosomal disorders of human, their cytogenetic diagnostic.

1.

TEST QUESTIONS FOR INDIVIDUAL WORK

	Questions	Answers
1	What are the stages of genealogical method? a,b,c	
2	How do we term a person whose pedigree is composed?	
3	What are the rules of pedigree charting? a,b,c,d.	
4	What are the main goals of usage of the genealogical method? a,b,c.	
5	What are the characters of types of inheritance: <ul style="list-style-type: none"> - Autosome-dominant one – a,b,c; - Autosome-recessive one – a,b,c; - Linked with X-chromosome dominant one – a,b,c; - Linked with X-chromosome recessive one – a,b,c; 	

6	- Linked with Y-chromosome – a. Twins method uses for accounts roles of ... and ... in manifestation of characters.	
7	Monozygote twins are formed as a result of fusion of ... and ... following	
8	Monozygote twins are characterized by ... a,b,c.	
9	Dizygote twins are formed as a result of fusion of ... and	
10	Dizygote twins are characterized by ... a,b,c.	
11	Write formulas for counting of coefficient of: 1) pair concordance (Kn) - ; 2) role of heredity (H) - ; 3) role of environment influence – (C).	

	Questions	Answers
1	Repeat topic 1.4 “Morphology of chromosomes. Human karyotype.”	
2	When was the Norman human karyotype studied?	
3	What are the cytogenetic methods? a,b.	
4	What are the main indications for karyotyping?	
5	For chromosomes indication the following methods are used: 1) Quantitative morphometric analysis: a) Measuring of ... of chromosomes; b) Accounting of ... index; c) The method of ... chromosome.	
6	Centromeric index is relation of a length of ... arm to the length of	
7	Which mutations can be determined by karyotyping? a,b.	
8	Sex chromatin is	
9	Which chromosome disorders are determined by studying of 1) X-sex chromatin – a,b,c; 2) Y-sex chromatin – a.	
10	Which cytogenetic methods are used for prenatal (before delivery) diagnostic of chromosome disorders? a,b	
11	Which material of an embryo is taken during: 1) Amniocentesis – a; 2) Chorionicentesis – a; 3) Cordocentesis – a.	
12	Which material of an embryo are concerned with a disorder of number of 1) autosomes – a,b,c; 2) heterosomes – a,b,c,d.	
13	Which types of mutations are the reasons of the main forms of Down syndrome? a,b	

Module section 4. Medical and biological basics of parasitology. Medical protozoology and helminthology

Preparation for practical class 15. Protozoa. Dysenteric amoeba, Balantidium, giardia lamblia, trichomonas, malaria parasites, toxoplasma.

The Purpose of the Lesson. To study principles of classification of the parasites. Principles of parasite-host interaction. Morphophysiological adaptations of the parasites. Typical features of protists. To study Sarcodina. Dysenteric amoeba (*Entamoeba histolytica*). Infusoria. *Balantidium*. Geographical distribution, morphofunctional peculiarities, life cycles of dysenteric amoeba, *balantidium*. Ways of infection, laboratory diagnosis and prophylaxis of amebiasis, balantidiasis. Geographical distribution, morphology, life cycle of lamblia? trichomonas. Ways of infection, laboratory diagnosis and prophylaxis of lambliosis, urogenital trichomoniasis. To study geographical distribution, morphofunctional peculiarities, life cycles of malaria parasites. Ways of infection, laboratory diagnosis and prophylaxis of malaria. Methods of laboratory diagnosis of diseases caused by protists. To study geographical distribution, morphofunctional peculiarities, life cycles of toxoplasma. Ways of infection, laboratory diagnosis and prophylaxis of toxoplasmosis.

TOPIC CONTENT

1. General characteristic of Protozoa's.
2. General characteristic of class Sarcodina. Free-living and parasitic amoebas.
3. Ways of infecting of human with dysenteric amebiasis. Localization of dysenteric amoeba in human organism, its pathogenic importance.
4. Laboratory diagnostic and prevention of amebiasis.
5. Peculiarities of structure of balantidium, its pathogenic importance.
6. Laboratory diagnostic and prevention of balantidiasis.
7. Characteristics of Flagellates.
8. Lamblia. Peculiarities of morphology and cycle of development, localization, ways of invasion, methods of laboratory diagnostic and prevention of lambliose.
9. Trichomonas. Peculiarities of morphology and cycle of development, localization, ways of invasion, methods of laboratory diagnostic and prevention of urogenital trichomonose.
10. Biological peculiarities of Apicomplexa on an example of malarial plasmodiums.
11. Life cycle of *Plasmodium vivax*. Phenomenon of change of hosts, stages of parasite's development.
12. Ways of invasion of human by *Pl. vivax*,
13. Laboratory diagnostic and prevention.
14. Main morphological characters and life cycle of *Toxoplasma*.
15. Ways of invasion of toxoplasmosis.
16. Pathogenic influence of *Toxoplasma* on human organism. Congenital and acquired toxoplasmosis.
17. Ways of laboratory diagnostic and prevention of toxoplasmosis.

TEST QUESTIONS FOR INDIVIDUAL WORK

Questions	answers
What are the main characters of Sarcodina? 1)2)3)4)5) Which Sarcodina species are human parasites? Dysenteric amoeba: 1)Latin name: 2) the name of disease;	

<p>3) forms-1,2,3; 4) localization in human organism -1; 5) invasive stage -1; 6) the way of invasion -; 7) mechanic carriers are -1,2; 8) pathogenic effect-1; 9) laboratory diagnostic -1,2; 10) prevention –private -1,2,3,4; social -1,2.</p> <p>What are the characters of forma minuta:</p> <p>1) size, mm -; 2) localization -; 3) feeding -; 4) meaning- .</p> <p>A person in which organism forma minuta has its inhabitation is named ...</p> <p>What are the characters of forma magna:</p> <p>1)size-; 2) localization -: typical – 1; out of intestine – 1; 3) pathogenic (nonpathogenic) -1.</p> <p>What is the difference between dysenteric and intestinal amoebas?</p> <p>What is the medical importance of free-living amoebas <i>Negleria</i> and <i>Acanthamoeba</i>?</p> <p>What are the main characters of infusorians: 1)2)3)4)5)6)</p> <p>Balantidium:</p> <p>1)Latin name: 2) the name of disease; 3) forms-1,2,3; 4) localization in human organism -1; 5) invasive stage -1; 6) the way of invasion -; 7) mechanic carriers are -1,2; 8) pathogenic effect-1; 9) laboratory diagnostic -1,2; 10) prevention –private -1,2,3,4; social -1,2.</p> <p>Why balantidiasis is considered professional disease? 1.</p>	
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	Questions	Answers
1	Parasite is ...	
2	Definite host is ...	
3	Intermediate host is ...	
4	Reservoir host is ...	
5	Invasion is ...	
6	Invasive stage is ...	
7	Specific carriers are ...	
8	Mechanical carriers are ...	
9	What are the ways of transmission of	

	<p>parasitic diseases? 1)2)3)4)5)</p>	
10	Antroponoses are ...	
11	Antropozoonoses are ...	
12	Transmissive diseases are ...	
13	Natural-focal diseases are ...	
14	<p>What are the components of natural focus? 1)2)3)4)</p>	
15	<p>What are the characters of Flagellates? 1) structure-1; 2) movement -1); 3) feeding -1); 4) Multiplication -1, 2.</p>	
16	<p>Lamblia: 1) Latin name-1; 2) disease -1; 3) peculiarities -; 4) localization in human organism -1; 5) invasive stage -1; 6) a way of invasion -1. 7) pathogenic influence -1,2; 8) laboratory diagnostic -1; 9) prevention - personal -1,2; social -1,2.</p>	
17	<p>Trichomonas vaginalis : 1) Latin name-1; 2) disease -1; 3) peculiarities -; 4) localization in human organism -1; 5) invasive stage -1; 6) way of invasion -1. 7) pathogenic influence -1,2; 8) laboratory diagnostic -1; 9) prevention - personal -1,2; social -1, 2.</p>	
18	What are the other types of trichomonas-human parasites?	
19	<p>Dermatotropic leishmanias: 1) Latin name-I; 2) disease -1; 3) localization in human organism -1; 4) forms -1,2; 5) way of invasion -1. 6) reservoir hosts -1,2,3,4; 7) their transmitter -1;</p>	
20	<p>Viscerotropic leishmanias: 1) Latin name-I; 2) disease -1; 3) localization in human organism -1; 4) way of invasion -1.</p>	

21	5) their transmitter -1,2; African trypanosomes: 1)Latin name-I; 2) disease -1; 3) localization in human organism -1; 4) way of invasion -1. 5) their transmitter is;	
22	Southern American trypanosomes: 1)Latin name-I; 2) disease -1 ; 3) localization in human organism -1,2,3; 4)natural reservoir hosts in human organism-I,2,3; 5) transmitters of trypanosomes are ...	

	Questions	Answers
1	Which species of plasmodiums are pathogenic for human?	
2	What are the hosts for Malarial Plasmodiums: 1) definite host -1; 2) intermediate host -1.	
3	Which type of carrier for Plasmodium (mechanical or specific) is female Anopheles?	
4	What are the possible ways of human invasion with malaria? 1,2,3.	
5	Human is infected with Malaria when ...goes into his blood.	
6	What are the stages of Plasmodium's life cycle? 1,2,3	
7	Where does tissue (preerythrocytic) shisogonia take place in human organism? 1.	
8	What are the stages of plasmodium's development in human liver? 1,2	
9	What are the stages of Plasmodium development in human erythrocytes? 1,2,3,4,5	
10	How long is erythrocytic shisogonia in different species of Plasmodium? 1) Pl. vivax -1; 2) Pl.ovale -1; 3) Pl. malariae -1; 4) Pl. falciparum -1.	
11	Female of Anopheles is invaded with malaria when ... goes into its blood. What are the stages of Plasmodium's life cycle in female Anopheles -1, 2? How can you explain high temperature	

<p>12</p> <p>13</p> <p>14</p>	<p>during the malaria attack? What are the stages of Malarial fever? What are the ways of laboratory diagnostic of Malaria? 1,2,3 What are the ways of Malaria prevention? 1) private 1,2; 2) social-1, 2.</p>	
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QUESTIONS	ANSWERS
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<p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p>	<p>What are the hosts of Toxoplasma: 1) definite hosts – 1; 2) intermediate hosts -1,2,3.</p> <p>What is localization of Toxoplasma in human and animal organisms? 1,2,3,4</p> <p>What is endozoit: 1) shape -1; 2) size (mkm)-1; 3) number of nuclei -1; 4) meaning of conoid -1.</p> <p>Pseudo cyst is ...</p> <p>True cyst (...) is ...</p> <p>What are the ways of human invasion by Toxoplasma:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Way of invasion</th> <th style="width: 33%;">Factors of invasion</th> <th style="width: 33%;">Stages of invasion</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table> <p>What are the ways of Toxoplasma's excretion from thick animal's organisms? 1)with secrets -1,2,3,4; 2) with excretes -1,2.</p> <p>What is a way of Toxoplasma reproduction in intermediate hosts? 1.</p> <p>Which stage of Toxoplasma is stored in healthy carries? 1.</p> <p>How can definite hosts be invaded with Toxoplasma? 1,2</p> <p>What are the stages of Toxoplasma development in Cat's organism?</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Stage of development</th> <th style="width: 33%;">Tissues, organs</th> <th style="width: 33%;">Forming stage</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	Way of invasion	Factors of invasion	Stages of invasion																Stage of development	Tissues, organs	Forming stage							
Way of invasion	Factors of invasion	Stages of invasion																											
Stage of development	Tissues, organs	Forming stage																											

12				
13				
14	What are the forms of toxoplasmosis? 1,2 What are the characters of acute acquired toxoplasmosis? 1,2,3 What are the results of congenital toxoplasmosis in a case of invasion of pregnant woman:			
15	During the first months of pregnancy		During the last period of pregnancy	
16	What are the methods of laboratory diagnostic of toxoplasmosis? 1,2,3,4,5 What are the ways of prevention of toxoplasmosis? 1) private -1,2,3,4; 2) social -1,2.			

Preparation for practical class 16. Flat worms. Liver fluke, cat (Siberian) fluke and lung fluke.

The Purpose of the Lesson. To study geographical distribution, morphofunctional peculiarities, life cycle of liver fluke (fasciola), cat fluke (Opisthorchis felineus), lung fluke (Paragonimus). Ways of infection, pathogenicity, laboratory diagnosis and prophylaxis.

TOPIC CONTENT

1. Main morphological characters of Flat worms.
2. Morphology and life cycles of trematods.
3. Liver fluke: morphology, life cycle, ways of infection, pathogenic action, laboratory diagnosis, prevention.
4. Cat fluke: morphology, life cycle, ways of infection, pathogenic action, laboratory diagnosis, prevention.
5. Lung fluke: morphology, life cycle, ways of infection, pathogenic action, laboratory diagnosis, prevention.

	QUESTIONS	ANSWERS
1	Biohelminthes are	
2	Geogelminthes are	
3	Give the general characteristics of flukes a) body shape; b) body cavity; c) body wall d) digestive system e) excretory system f) nervous system g) female reproductive system h) male reproductive system	

4	Are all of the flukes hermaphrodites?	
5	Describe the trematode type of the development	
4	Which larvae is in the egg of the fluke?	
5	Which larvae develop inside the intermediate host?	

Complete the table

Latin name	Location in definitive host	Intermediate hosts	Stages of the development	Infective for the definitive host
Liver fluke				
Cat fluke				
Lung fluke				

Complete the table

	Name of the disease	Infective for the intermediate hosts	Source of infection	Laboratory diagnosis	Prevention
Liver fluke					
Cat fluke					
Lung fluke					

Preparation for practical class 17. Tape worms. Beef, pork, dwarf worms, echinococcus, broad tapeworm.

The Purpose of the Lesson. To study geographical distribution, morphofunctional peculiarities, life cycle of pork tapeworm, beef tapeworm, dwarf tapeworm. Ways of infection, pathogenicity, laboratory diagnosis and prophylaxis of teniasis, cysticercosis, teaniarhynchosis.

To study geographical distribution, morphofunctional peculiarities, life cycle of broad tapeworm, Echinococcus, Alveococcus. Ways of infection, pathogenicity, laboratory diagnosis and prophylaxis

TOPIC CONTENT

1. Peculiarities of life cycles of tape worm.
2. Peculiarities of tape worms in their parasitic life.
3. Structure and life cycle of beef worm.
4. Structure and life cycle of pork worm.
5. Auto invasion. Cysticercosis.
6. Laboratory diagnostic of teniose, teniarhinhose, cysticercose.

7. Prevention of teniose, teniarhinose, cysticercose.
8. Echinococcus granulosus. Peculiarities of structure, life cycle, ways of invasion, laboratory diagnostic, prevention of echinococcosis.
9. Diphyllbothrium latum. Peculiarities of structure, life cycle, ways of invasion, laboratory diagnostic, prevention of diphyllbothriosis.

questions	answers
<p>Characterize adult tape worm:</p> <ol style="list-style-type: none"> 1) body shape; 2) body parts -1,2,3; 3) organs of fixation on scolex-1,2,3; 4) neck is ...; 5) types of proglottides -1,2,3. <p>First larva of tape worms is named ... It develops inside ... The peculiarity of oncosphere is ... The second larva of Cestoidea is named ... Cysticercus is an invasive stage for ... host.</p> <p>Beef (unarmed) worm:</p> <ol style="list-style-type: none"> 1) length of mature worm (m); 2) peculiarities of scolex; 3) peculiarities of hermaphrodite segment; 4) peculiarities of mature segment; 5) pathogenic effect -1,2,3; <p>Pork (armed)worm:</p> <ol style="list-style-type: none"> 1)length of mature worm (m); 2) peculiarities of scolex; 3) peculiarities of hermaphrodite segment; 4) peculiarities of mature segment; 5) a way of invasion of definite host; 6) duration of life in human organism; 7) methods of laboratory diagnostic –of teniose, cisticercose; <p>In which cases human can be intermediate host for pig worm? Characterize mechanism of auto invasion during teniose. What are manifestations of cisticercose: Why it's dangerous to prescribe drugs which can dissolve an envelope of pork tape worm for patients with teniose?</p>	

Latin name	Name of the disease	Definitive host, location in definitive host	Intermediate hosts	Stages of the development
Pork tape worm				
Beef tape worm				

	Infective for the intermediate hosts	Infective for the definitive host	Mode of infection	Laboratory diagnosis	Prevention
Pork tape worm					
Beef tape worm					
peculiarities	Pock tapeworm	Beef tapeworm	Dog warm	Broad (fish) warm	
Latin name					
disease					
Is it natural-focal disease?					
Geography of habitation					
Length of strobile					
Organs of fixation on scolex					
Number of proglottides					
Shape (type) Of uterus in mature segment					
eggs					
Type of larva					
Character of larva					
Biohelminth or geohelminth					
Definite host					
Localization in an organism of definite host					
Intermediate hosts					
Localization in an organism of intermediate host					
Invasive stage for human					
Way and mechanism of human invasion					
Duration of life in human organism					
Is human a biological stop?					

Ascaris							
Pinworm							
Whipworm							

Literature: Medical biology: manual for practical classes / Bazhora Yu.I. et al. – Odessa: OSMU, 2006.-pp 262-271;
Atlas of medical helminthology and protozoology, fourth edition / Chiodini P.L. et al. – Churchill Livingstone, 2001.-pp 5-7.

Preparation for practical class 19. Arthropoda. Arachnoideans as agents and vectors of diseases. Insects as human ectoparasites.

The Purpose of the Lesson. To study characters of structure and classification of **Arthropoda**. Medical importance of Arachnida and Insects.

TOPIC CONTENT

1. Characters of structure and classification of Arachnida.
 2. Medical importance of spiders.
 3. Peculiarities of morphology and development of ticks and mites.
 5. Medical importance of Ixodida? Argasida and Gamasida ticks as vectors of human disorders.
 6. Medical importance of the itch mite and follicle mite.
 7. What are the changes in louse's morphology because of their parasitic mode of life?
 9. Morphology and biological peculiarities, life cycles of lice.
 10. Medical importance of lice as agents and vectors of human diseases.
 11. Pediculose and phtiriose.
- Medical importance of E.N.Pavlovsky's works about natural focal transmissive diseases,

TEST QUESTIONS FOR INDIVIDUAL WORK

	Questions	Answers
1	What are the characters of Arthropoda? 1) body cavity- 1; 2) body parts -1,2,3; 3) organs of respiratory system-1; 4) peculiarities of circulatory system -1; 5) organs of nervous system-1,2; 6) peculiarities of excretory system- 1; 7) development -1, 2.	
2	What are the peculiarities of Arachnida? 1) body parts-1 ,2; 2) mouth apparatus -1,2; 3) number of walking extremitie - 1; 4) respiratory organs -1;	

	5) development: of spiders-1 ; of ticks -1; of mites -1.	
3	What are the orders of Arachnida? 1,2,3,4.	
4	Examples of venomous Arachnida? 1,2,3	
5	What is the medical importance of Crimean scorpion-1; Caracurt ("black widow")-1 ; Southern Russian tarantula (wolf Spider)-1.	
6	What are the peculiarities of ticks and mites during their different stages of development? 1)larva -1,2,3; 2)chrysalis -1,2;	
7	3) Imago -1,2,3,4. Which ticks and mites are 1) transmitters of human invasions - 1,2,3,4; 2) agents of human diseases -1, 2.	
8	Transovarial transmission of viruses is ...	
9	Transphase transmission of viruses is ...	
10	Natural focus is ...	
11	What are the components of natural focus? 1 ,2,3,4	

Fill the table 1 "Epidemiological importance of parasitic ticks"

Ticks and mites families	Latin name	Geography of inhabitation	morphology	Life cycle	Medical importance
Ixodida	Taiga tick Canine tick Pasture ticks				
Argasida					
Gamasida					

Fill the table 1 "Epidemiological importance of parasitic ticks and mites"

Characters, species, Latin name	Itch mite	Follicle mite
Agent of disease		
localization		
morphology		
Life cycle		
Way of human invasion		
Pathogen effect		
Laboratory diagnostic		

Contents of the topic (scheme)

1. Home fly. Morphology.
2. Autumn fly. Life cycle, transmission of agents of diseases.
3. *Wolffartia magnifica* fly. Life cycle, medical importance.
4. Malarial and not malarial gnats, their morphological characters.
5. Metamorphose and characteristic of gnats stages of development (egg, larva, chrysalis, and imago).
6. Organization of effective struggle against gnats.
7. Scientists role in the struggle against transmissible diseases.
8. What are the changes in louse's morphology because of their parasitic mode of life?
9. Morphology and biological peculiarities, life cycles of lice.
10. The meaning and importance of N.G.Minh and O.O.Mochutkovsky works in examination of transmissible ways of agents of typhuses.
11. Pediculose and phtiriose.
12. Epidemic importance of fleas. Characteristic of "fleas block".
13. Epidemic importance of bed-bug and kissing bug.

Questions	Answers
<p>What are the characters of insect's morphology?</p> <p>1) parts of their body -1,2,3; 2) number of walking legs -1; 3) Respiratory organs -1.</p> <p>What are the stages of insects development?</p> <p>1) with complete metamorphosis -1,2,3,4; 2) With incomplete metamorphosis - 1,2,3.</p> <p>Which type of mouth apparatus appears in the process of evolution at first?</p> <p>What is it:</p> <p>1) type of fly's mouth apparatus; 2) the way of agents transmission; 3) what does it transmits-1,2,3,4,5,6; 4) The type of gnat's mouth apparatus.</p> <p>What is the medical importance of</p> <p>1)autumn fly; 2) tsetse fly; 3) <i>Wolffartia magnifica</i>; 4) Malarial gnats; 5) Not malarial gnats -1, 2, 3,4,5,6.</p> <p>What are the agents.of miases;</p> <p>1) tissular-1,2; 2) intestinal -1,2,3; 3) Urinal-I, 2.</p> <p>What are the main ways of struggle against gnats? -1,2</p> <p>What are lice-human parasites? 1,2,3.</p> <p>What is</p> <p>1) type of lice's mouth apparatus; 2) type of lice development.</p> <p>What are the morphological differences of head louse and body louse?</p> <p>1,2, 3</p>	

<p>What is a medical importance of lice?</p> <ol style="list-style-type: none"> 1) head louse-1,2; 2) body louse -1,2; 3) pubic or crab louse -1. <p>What is a mechanism of human invasion with</p> <ol style="list-style-type: none"> 1)relapsing fever -1; 2) epidemic typhus-1. <p>What are the symptoms of</p> <ol style="list-style-type: none"> 1)pediculose -1,2,3; 2) phtiriose -1, 2. <p>What are the species of fleas? 1,2,3.</p> <p>What is a medical importance of fleas? 1,2,3.</p> <p>What are the ways of transmission of plague to human by fleas? 1,2.</p> <p>What is a medical importance of bugs:</p> <ol style="list-style-type: none"> 1) bed – bug; 2) kissing bug -1, 2. 	
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Main literature

1. Medical Biology / Bazhora Yu. I., Bulyk R. Ye., Chesnokova M. M. [et al.]. – 2nd ed. – Vinnytsia: Nova Knyha, 2019. 448 p.

Additional literature

1. Before we are born : Essentials of embryology and birth defects / Keith L. Moore, T. V. N. Persaud, Mark G. Torchia. – 9th ed. – Elsevier, 2016. 348 pp.
2. Campbell biology / Lisa Urry, Michael Cain, Steven Wasserman, [et al.].– 11th rectricted ed. – Hoboken : Pearson Higher Education, 2016. - 560 pp.
3. Chiodini P. L. Atlas of Medical Helminthology and Protozoology 4th ed. – Churchill Livingstone, 2003. 87 pp.
4. Peter Turnpenny, Sian Ellard. Emery's Elements of medical genetics.-15th ed.,– Elsevier, 2017. 400 pp.
5. Essential Cell Biology : textbook / B.M. Alberts, D. Bray, K. Hopkin [et al]. – 4th ed., rev. and upd. NY: Garland Publishing Inc., 2019. 862 p.
6. Bruton J. Bogitsh, Clint E. Carter. Human parasitology – 4th ed., – Elsevier, 2013. 430 pp.
7. T. W. Salder. Langman's medical embryology. – 14th ed. – Wolter Kluwer Health, 2018. - 423 pp.
8. Lynn B. Jorde, John C. Carey, Michael J. Bamshad. Medical genetics. 5th ed. Elsevier, 2016. 356 pp.
9. David. T. John, William A. Petri. Markell and Voge's Medical parasitology. – 9th ed. – Elsevier, 2017. 463 pp.
10. M. R. Speicher, S. E. Antonarakis, F. G. Motulsky. Vogel and Motulsky's human genetics. Problems and approaches.- 4th ed. – Springer, 2010. 981 pp.
11. Young Ian. D. Medical genetics. – 2nd ed. – Oxford university press, 2010. 304 pp.

13. Information resources:

1. Testing Center - the base of licensing test tasks "Krok" - 1: <http://testcentr.org.ua/>
2. OMIM (Online Mendelian Inheritance in Man) – An Online Catalog of Human Genes and Genetic Disorders <http://omim.org/>
3. The tech interactive: <https://genetics.thetech.org/genetics-news>

4. Phys.org internet news portal provides the latest news on science. <https://phys.org/biology-news/>
5. Sci-News.com provides the latest science news from around the world, covering breaking news in astronomy and astrophysics, archaeology, paleontology, medicine, biology, physics, genetics & more <http://www.sci-news.com/news/biology>
6. link to the most thought-provoking, well researched online items in the world of science and technology <https://scitechdaily.com/news/biology/>
7. Web atlas of medical parasitology <http://www.atlas.or.kr/about/index.html>

