Ministry of Education and Science of the Kyrgyz Republic

Government-run Educational Institution of Higher Professional Education
Kyrgyz-Russian Slavic University
School of Medicine

ENDORSED BY
Vice-rector, Prof
Anes Zarifyan
28 02 2023 y.

Medical biology

Course Outline (Module)

Assigned to the department of **Physics, Medical Informatics and Biology**
Academic Curriculum 560001 – KR General Medicine (for foreign students)

Qualification **Specialist**

Mode of Study **Intramural**
Total Credit Value 3 credit point

Course Hours 108
including:
in-class learning 108
individual work 54

cope of Testing Semesters:
credit 1

Course Hours Scheduling (per semester)				
Semester Academic Year	1 (1.1)		Total	
Weeks	18			
Type of Traning	AC	CO	CO	AC
Lectures	18	18	18	18
Practical Session	36	36	36	36
Contact work during the period of theoretical training	0,3	0,3	0,3	0,3
Including interactive session	2	2	2	2
Total in class Session	54	54	54	54
Face to face learning	54,3	54,3	54,3	54,3
Individual work	53,7	53,7	53,7	53,7
Total				

The Course outline developed by:
Candidate of Biological Sciences, associated professor, Karaeva R.R., Candidate of Biological Sciences, associated professor, Morkovkina A.B., Doctor of Biological Sciences, professor Kobzar V.N.

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The Course Outline
Medical biology

developed in full compliance with State Educational Standards of Higher Professional Education of the Kyrgyz Republic:
The State Education Standards of Higher Professional Education for students trained for specialty 560001 (The Ministry of Education and Science of the Kyrgyz Republic Order of "30" July 2021 № 1357/1)

in accordance with Academic Curriculum:
Specialty 560001 – KR General Medicine (for foreign students)

confirmed by KRSU Board of Academics in 28.02.2023 record № 7.

The Course Outline endorsed by
Physics, Health Informatics and Biology Department Meeting

Record of 03.01.2023 y. № 7
Valid for: 2023-2027 academic years
The Head of Department, Candidate of Biological Sciences, associated professor Karaeva R.R.

The course outline endorsed for the following academic year

Chairman of the Educational and Methodological Board
____ _____ 202__ y.

The course outline has been revised, considered and endorsed
for implementation in 2022-2023 Academic Year at the Staff Meeting of
Physics, Medical Informatics and Biology Department

Record of ____ _____ 202__ y. №
The Head of Department, Candidate of Biological Sciences., associate professor Karaeva R.R.

Chairman of the Educational and Methodological Board
____ _____ 202__ y.

The course outline has been revised, considered and endorsed
for implementation in 2023-2024 Academic Year at the Staff Meeting of
Physics, Medical Informatics and Biology Department

Record of ___ _____ 202__ y. №
The Head of Department, Candidate of Biological Sciences., associate professor Karaeva R.R.

Chairman of the Educational and Methodological Board
____ _____ 202__ y.

The course outline has been revised, considered and endorsed
for implementation in 2024-2025 Academic Year at the Staff Meeting of
Physics, Medical Informatics and Biology Department

Record of ___ _____ 202__ y. №
The Head of Department, Candidate of Biological Sciences., associate professor Karaeva R.R.

Chairman of the Educational and Methodological Board
____ _____ 202__ y.

The course outline has been revised, considered and endorsed
for implementation in 2026-2027 Academic Year at the Staff Meeting of
Physics, Medical Informatics and Biology Department

Record of ___ _____ 202__ y. №
The Head of Department, Candidate of Biological Sciences., associate professor Karaeva R.R.

1. COURSE OUTLINE OBJECTIVES	
1.1	The formation of students' theoretical knowledge and skills used to study the function and structure of the human body at the molecular, cellular, tissue, organ, organismal levels, necessary for the formation of a holistic natural-science outlook in the practice of a doctor.
1.2	Acquaintance with the principles of the structural and functional organization of living systems: features of the biological level of the organization of matter, the principles of reproduction and development of living systems; the laws of genetics, their role in evolution, cell biology, the diversity of living organisms, the principles of their classification, the main functional systems, the relationship with the environment of supraorganismal systems, which are of interest to practical public health.
1.3	Preparing students for a systematic perception of biomedical, general medical, social and clinical disciplines and the formation of a natural-scientific worldview and the logic of biological thinking, which are necessary for the subsequent practical activities of a specialist in the field of medical and preventive care; Developing the ability to use various kinds of reference materials and manuals necessary for solving practical medical problems.

2. PLACE OF THE COURSE IN THE EDUCATIONAL PROGRAM	
Educational Program Units:	Б1.В.16.06
2.1	**Students' Preliminary Training Requirements:**
2.1.1	Biology, anatomy and general biology which include in a high school level
2.1.2	Medical biology
2.1.3	Chemistry in the framework of a high school level
2.2	**Course Units and Practical Sessions imposing the prior Proficiency**
2.2.1	Anatomy
2.2.2	Biochemistry
2.2.3	Histology
2.2.4	Microbiology, virology
2.2.5	normal physiology
2.2.6	Hygiene
2.2.7	Epidemiology
2.2.8	Immunology
2.2.9	Obstetrics and gynecology
2.2.10	Urology
2.2.11	Pathophysiology, clinical pathophysiology
2.2.12	Ophthalmology
2.2.13	General hygiene
2.2.14	Anesthesiology, resuscitation and intensive care
2.2.15	Forensic Medicine
2.2.16	Phthisiology
2.2.17	Infectious diseases
2.2.18	Dermatovenereology
2.2.19	Faculty Pediatrics, Endocrinology
2.2.20	Nervous diseases

3. STUDENTS' COMPETENCIES RESULTING FROM THE COURCE UNIT (MODULE)	
IC-l - is able and ready to analyze socially significant problems and processes, use the methods of natural sciences, mathematics and the humanities in various types of professional and social activities	
Know:	
Level 1	basic biological concepts
Level 2	basic scientific medical and biological terminology
Level 3	the main sources of information, bibliographic resources, the methodology for processing scientific and technical

	information on the Internet and specialized databases, the main methods of working with specialized software for solving standard problems of professional activity
Ability:	
Level 1	use biomedical terminology, information and communication technologies, incl. research methods for solving standard problems of professional activity
Level 2	apply basic research methods to solve professional problems
Level 3	apply information, bibliographic resources, processing methods, search for scientific and technical information using general and specialized databases and use specialized software when carrying out theoretical calculations and processing experimental data to solve standard problems of professional activity
Skills:	
Level 1	elementary methods of work in a biological, physical, chemical laboratory; general safety rules for handling computers, laboratory equipment and chemical reagents
Level 2	biomedical and other terminology; skills of mathematical, biological, chemical and biochemical thinking, skills of independent work with reference, educational and scientific literature
Level 3	skills in working with scientific and educational portals, basic skills in using standard as well as specialized software and databases for statistical processing of research results and presenting them to the scientific community
Final Students' Competences	
3.1	**Know:**
3.1.1	definitions, laws and basic concepts of biology;
3.1.2	structure and functions of the most important chemical compounds (nucleic acids, proteins); the concept of signals and the nature of their occurrence;
3.1.3	the laws of genetics, its significance for medicine; general patterns of origin and development of life
3.1.4	антропогенез и онтогенез человека; основные понятия и проблемы биосферы;
3.1.5	the main patterns of development and vital activity of the organism of an adult and a teenager;
3.1.6	возрастно-половые и индивидуальные особенности строения и развития здорового и больного организма;
3.1.7	morphophysiological characteristics, life cycles of individual groups of parasitic unicellular organisms and their carriers.
3.2	**Ability:**
3.2.1	work with light microscopes;
3.2.2	solve case tasks, including genetic tasks;
3.2.3	draw up a pedigree and determine the type and nature of inheritance using the genealogical method;
3.2.4	solve case tasks for modeling medical genetic counseling;
3.2.5	to diagnose pathogens of human protozoal parasitic diseases on a micropreparation and photograph;
3.2.6	select the appropriate methods of comparative analysis in the identification of individual representatives of protozoan parasitic animals and their carriers;
3.2.7	use educational, scientific literature, the Internet for the professional activities of a doctor;
3.3	**Skills:**
3.3.1	the skills of displaying the studied objects and processes in diagrams, drawings, animations;
3.3.2	skills in drawing up diagrams illustrating the causes and mechanisms of chromosomal pathology;
3.3.3	skills in making temporary preparations for microscopy (onion and elodea skin cells, inclusions in the cell);
3.3.4	technique of working with a light microscope;
3.3.5	methods for studying heredity in humans (cytogenetic method, genealogical method); information on the principles of sterilization, disinfection and antiseptic treatment of instruments, etc.;
3.3.6	methods for determining species by morphophysiological characteristics of unicellular parasitic animals and their carriers;
3.3.7	methods of comparative analysis in the study of morphophysiology and development of representatives of individual systematic groups of unicellular parasitic animals and their carriers;

3.3.8	modern methods of computer processing of medical information, basic information transformation technologies: text, spreadsheet editors.

4. COURSE (MODULE) STRUCTURE AND CONTENT

Class Code	Subject Name /Type of Class/	Semester / Academic Year	Hours	Competencies	Literature	Interactive Sessions	Notes
	Section 1. Cellular and molecular-genetic levels of life organization						
1.1	Introduction to biology. Levels of life organization (Lek)	1	2	IC-l		0	
1.2	Methods of biomedical research: microscope, technique for making micropreparations (Pr)	1	2	IC-l		0	
1.3	Cell Medical Biology (Lek)	1	2	IC-l		0	
1.4	Biological basis of human life, cell biology (Pr)	1	2	IC-l		0	
1.5	The history of the study of the cell, the invention of the microscope. Cell research methods. Types of mitochondria, mitochondrial diseases and their types (SIW)	1	3	IC-l		0	
1.6	Patterns of the existence of a cell in time, the cell cycle, the consequences of a violation of the mitotic cycle (Pr)	1	2	IC-l		0	to solve case tasks
1.7	Problems associated with disruption of the mitotic cycle in the body (SIW)	1	4	IC-l			
1.8	Introduction to Medical Genetics (Lek)	1	2	IC-l		0	
1.9	Fundamentals of Medical Genetics (Pr)	1	2	IC-l		0	
1.10	Features of the structure and regulation of the activity of genes in prokaryotes and eukaryotes (SIW)	1	4	IC-l		0	
1.11	Gene Interaction (Pr)	1	2	IC-l		0	
1.12	Chromosomal level of organization of hereditary material (Pr)	1	2	IC-l		0	Students conference “Day of DNA”
1.13	Introduction to wave genetics (Lek)	1	2	IC-l		0	
1.14	Mutations, factors causing and suppressing mutations (Pr)	1	2	IC-l		0	
1.15	Medical significance of mutations for humans, diseases caused by mutations (SIW)	1	5	IC-l		0	
1.16	Medical genetic counseling. Test work on the topic of section 1 (Pr)	1	2	IC-l		0	to solve case tasks

1.17	The use of genetically engineered products in medicine	1	5	IC-l		0	
1.18	Introduction to DNA genealogy (Lek)	1	2	IC-l			
1.19	Hereditary polymorphism of natural populations. Genetic polymorphism of humanity (Lek)	1	2	IC-l			
1.20	The role of heredity and environment in the formation of the human phenotype. The frequency of hereditary diseases (SIW)	1	8	IC-l			
	Section 2. Ontogenetic level of organization of the living. Biology of development and reproduction. Postnatal ontogeny						
2.1	Reproduction, classification of methods of reproduction (Pr)	1	2	IC-l		0	to solve case tasks
2.2	The cell as an open system. Organization of the flow of energy, information and matter (SIW)	1	3,7	IC-l		0	
2.3	Ontogeny, periodization. Embryogenesis (Pr).	1	2	IC-l		0	
2.4	Postnatal ontogeny. Gerontology and geriatrics (SIW)	1	5	IC-l		0	
2.5	Critical periods in human ontogenesis. Test work on the topic of section 2 (Pr)	1	2	IC-l		0	to solve case tasks
2.6.	Biological (chronobiology) and physiological rhythms of a person (SIW)	1	2	IC-l		0	
2.7	Regeneration, transplantation (Lek)	1	2	IC-l		0	
	Section 3. Biocenotic level of organization of the living. Medical protozoology						
3.1	Biological bases of parasitism. Transmissible natural focal diseases (Lek)	1	2	IC-l		0	
3.2	Questions of ecological parasitology. Population level of interaction between parasites and their hosts (SIW)	1	3	IC-l		0	
3.3	Fundamentals of protozoology. The simplest type. Flagella class - 1. Trypanasoma family, Leishmania genus, Trypanosoma genus (Pr)	1	2	IC-l		0	

3.4	Flagella class - 2. Order Multiflagellate, genus Giardia, Genus Trichomonas (Pr)			IC-l	L1.1, L1.2, L1.3	0	to solve case tasks
3.5	Ecological principles of combating parasitic diseases (SIW)	1	4	IC-l		0	
3.6	Class sporozoans - 1. Order Blood sporozoans (Pr)	1	2	IC-l		0	to solve case tasks
3.7	Class sporozoans - 2. Order Coccidia, Order Piroplasmids (Pr)	1	2	IC-l		0	Business games “Doctor – pacient”
3.8	Diagnostic signs of parasitic unicellular (SIW)	1	7	IC-l		0	
3.9	Sarcode class, Amoeba order; Ciliate class, Family Balantidia (Pr)	1	2	IC-l		0	to solve case tasks
3.10	Examination in Medical Protozoology (Pr)	1	2	IC-l		0	
3.11	Credit	1	0			0	

5. ASSESSMENT FUND

5.1. Advancement Questions and Assignments

Questions for check student’s competences (Annex 2):

Know:

- theory of biological systems, their organization, molecular mechanisms of processes in health and disease;
- definition and properties of the living, levels of organization of the living, the main characteristics of living systems and the principles of their organization;
- biology of the cell as an elementary, structural, functional and genetic unit of the living. The current state of cell theory, cell organization of living organisms, hypotheses of the evolutionary origin of cell membrane components, molecular mechanisms of transport, intercellular interactions, energy conversion in the cell;
- methods of cell reproduction and their significance. Consequences associated with disruption of cell division processes;
- fundamental properties of the living (reproduction, heredity, variability) that ensure the indefinitely long existence of species and life on Earth;
- structural and functional levels of organization of genetic material (genetic, chromosomal, genomic);
- the main patterns of inheritance of traits and their applicability to humans;
- stages and patterns of individual development of organisms;
- modern taxonomy of the animal world;
- the main features of the organization of animals of different types, their formation in phylogenesis;
- fundamentals of animal ecology, principles of ecological radiation within the types of the animal kingdom;
- parasitism as an ecological phenomenon, relationships in the "parasite-host" system. The most important human parasitoses as one of the types of environmental diseases, the life cycles of their pathogens. The teachings of E.N. Pavlovsky on transmissible and natural focal diseases. The role of environmental factors and blood-sucking arthropods in their distribution;
- regularities, driving forces and results of macroevolution and microevolution;
- general concepts of phylogenesis, the ratio of ontogenesis and phylogenesis, the direction of the evolution of ontogenesis in the process of phylogenesis;
- phylogeny of organ systems of vertebrates, phylogenetically determined malformations of organ systems of mammals. General patterns of evolution of functional systems of organs;
- anthropogenesis;
- the place of man in the system of nature;

Ability:

- work with a microscope and identify biological objects;
- work with text, drawings, tables, models;
- analyze microscopic preparations and sketch the main details of microscopic objects;
- solve problems on mono-, di - and polyhybrid crossing
- solve problems on the patterns of inheritance of traits;
- solve situational problems in cytology, reproduction and embryogenesis, genetics;

- solve situational problems in medical protozoology,
- compare different groups of unicellular parasitic organisms, their adaptation to parasitism and life cycles;

- comparison of the phylogenesis of systems and organs of different groups of organisms in order to understand the pathological processes of human development.

Skills:
- to be able to work with a microscope;
- identify the human parasite by micropreparations and photographs;
- work with text, drawings, tables, models;
- solve typical tasks;
- solve typical case-tasks for self-control for all parasites;
- use the information resources of Internet sites and sites of official scientific publications;
- use identification protocols of parasitic laboratories.

Tasks for checking the level of training TO BE ABLE and SKILLS
1. The number and types of gametes are determined. The number of gametes depends on the homo- or heterozygosity of the location of genes in one or different pairs of chromosomes. All homozygotes form one type of gamete. The number of gamete types in heterozygotes depends on the number of alleles in its genotype and is equal to 2n, where n is the number of heterozygous alleles. In an individual with the AaBb genotype, 4 (22) types of gametes are formed: AB, Ab, aB, ab.
2. The type of interaction of genes and their localization in chromosomes, as well as the survival rate of offspring of different genotypes, i.e. the absence of lethal and semi-lethal genes.
3. The phenotype of the descendants of the analyzing cross is determined by the types of gametes of the heterozygous parent, and the splitting depends on the numerical ratio of these gametes and the nature of gene inheritance.
4. The main principle of genetic analysis is the analysis of single (individual) characters. At the first stage, generations are considered for each trait separately, regardless of other traits. Then the splitting by feature pairs is analyzed, and so on.
An important role in solving problems is played by knowledge of theoretical material: splitting formulas by phenotype and genotype, the reasons that cause deviations from them, the ability to write out gametes correctly. The solution of the problem includes a brief record of the condition using genetic symbolism.
As an example, typical problems are analyzed, the student solves 25 problems for mono-, di- and polyhybrid crossing as an independent work on solving problems.

A business game is a form of recreating the subject and social content of professional activity,
modeling systems of relations, various conditions of professional activity, characteristic of this type of practice.
Criteria for evaluating participants in a business game: mutual assistance in a group, the ability to communicate with colleagues, the ability to organize work in a group, the ability to meet time when solving problems, the ability to listen to the speech of one's speaker and the speaker of another group.
The maximum number of points awarded for tactful behavior during the game is 5.
The advantage of business games is that they allow: to consider the problem in a short time, mastering the skills of identifying, analyzing, and solving specific problems by students, working in a group with different methods, decision-making, orientation in non-standard situations, focusing students' attention on the main aspects of the problem and establishing cause-and-effect relationships, develop mutual understanding between the participants in the game.
Disadvantages of business games: the relative complexity of preparation and short terms, the lack of formalized criteria for an objective assessment, the lack of a clear algorithm for the game.

5.2. Course Papers Themes

The discipline doesn't include writing coursework.

5.3. Assessment Fund

Case tasks imitate situations that arise during diagnostic and therapeutic procedures, are practice-oriented, include a description of the situation and a control question, in the process of working with information they allow one to consistently master intellectual operations: familiarization - understanding - application - analysis - synthesis - evaluation. Describe situations encountered in the educational process or problem situations that need to be found in additional literature. In the condition of the problem, essential and non-essential features can be given. Their solution contributes to the development of self-organization skills, increasing the level of literacy, preparing for a professional choice, and orientation in the key problems of modern life. When solving a situational problem in biology, two main stages of the solution algorithm are distinguished: analysis of a specific situation (what is given?) And diagnosis (what to find?). Let us give examples of situational tasks from the course of medical biology. A typical task, in the condition of which all essential signs are given, according to which a diagnosis can be made, there are no insignificant signs.
The situational task is a form of control that does not change during the current, intermediate attestation of students and the final attestation. When solving any situational problem in parasitology, two main stages of the solution algorithm can be

distinguished:
1) analysis of a specific situation based on the input assumptions (what is given?);
2) diagnosis (what to find?). In the condition of the problem, both essential and non-essential features can be given, therefore, standards for solving problems are given.
A typical task, in the condition of which all essential signs are given, according to which a diagnosis can be made, there are no insignificant signs.

The main actions of a student when working with situational problems are as follows: preparation for the lesson, studying the algorithm for solving a situational problem, discussing the problem (in the case of a group form of solution), developing options for making a decision, choosing decision criteria, evaluating and predicting solution options, presenting a solution to a situational problem (written or oral), participation in a general discussion, receiving an assessment and its comprehension.

Task. Determine whether the course of mitosis will be affected if the genes that should have been included in the work in the G2 period remained inactive.
Solution. During the G2 cell cycle, the proteins necessary for the formation of spindle fibers are synthesized.
Answer. Yes, it will be reflected, in the absence of proteins necessary for the formation of fission spindle filaments, the divergence of chromatids in the anaphase of mitosis will be disturbed or not occur at all.

Task. The famous scientist I.S. Darevsky discovered the absence of males in some species of lizards (Armenian, white-bellied). Observations have shown that females lay unfertilized eggs, from which quite viable cubs emerge - females. What process makes this possible?
Solution. A similar phenomenon has been described in 90 species of animals: crustaceans, rotifers, insects (aphids, wasps, bees and ants), lizards, birds (turkeys, pigeons). Parthenogenesis in lizards is as follows: before meiosis, a mitotic increase in the number of chromosomes in the cells of the gonads occurs. The cells go through a normal cycle of meiosis with the formation of diploid eggs, which, without fertilization, give rise to a new generation consisting only of females.
Answer. This is possible due to natural parthenogenesis, more precisely diploid (somatic parthenogenesis).

Case task. Duodenal probing revealed pear-shaped parasites with 4 pairs of flagella and paired nuclei in the contents of the duodenum. What is your expected diagnosis? Solution. In the condition of the problem, the usual localization is indicated and significant signs of the structure of Giardia are given, therefore the diagnosis of the disease is not in doubt.
Answer. Giardiasis (Protozoa type, Flagellata class, Polymastigina order, Lamblia intestinalis species).

Case task. The patient has a fever, an enlarged spleen and liver. Established a decrease in the content of erythrocytes. Microscopic examination of breast punctate smears revealed a large number of small non-flagellar parasites in bone marrow cells. The nucleus is located in the cytoplasm. A rod-shaped kinetoplast is visible. When the parasite is cultivated, the artificial environment does not turn into a flagellar form. What disease can be assumed in this case?
Standard response. Visceral leishmaniasis.

Questions of **control (modular) wor**k and a list of lecture questions are in Appendix 2.
List of control tasks on topics: 1) test; 2) drawing to yourself on all the topics studied; 3) silent micropreparation on parasitology; 4) lecture question.
Questions of control works and lecture questions (Appendix 2). Theoretical questions included in the tasks of midterm control correspond to the work program, allow you to find out the depth and degree of assimilation of the factual material, contribute to the activation of the cognitive and mental activity of students, reveal their ability to analyze the studied material, compare data and draw conclusions.
A sample test is given in Appendix 3.

Tests allow you to quickly assess the knowledge of students, identify gaps in the study of specific educational material, increase the objectivity of knowledge control, and increase students' interest in the problem being studied. When compiling tasks for current, intermediate and intermediate control, various types of tests are used: closed type, for the correspondence of the concept and its definition, establishing the sequence of events, processes, etc. In tasks of boundary control, control tasks are used, the solution of which contributes to the assimilation of the educational topic, the study of specific situations of medical importance. Assessment of students' skills is carried out by solving specific or generalized professional problems.

The **theoretical questions** included in the final assessment correspond to the biology program and allow you to clarify the assimilation of the studied material, contribute to the cognitive and intellectual activity of students, reveal their ability to analyze the studied material, compare data and draw conclusions.

Зачет по диагностике микропрепаратов одноклеточных паразитов по микрофотографиям.

Modul work. List of control tasks on the topics: 1) test; 2) silent drawing on the all topics studied; 3) silent microslide on parasitology; 4) a lecture question.

Questions of module works and list of lecture questions are in the Attachment 3.

Theoretical questions included in the summative assessment correspond to syllabus on biology and allow to clarify assimilation of the studied material, promotes cognitive and intellectual activities of students, reveals their ability to analyze the material studied, compare data and make conclusions.

Test for the diagnosis of micropreparations of unicellular parasites by microphotographs.

5.4. List of Assessment Tools

Case tasks,
Modul work,
Credit on diagnostics of microslides,
Abstract,
Essay,
Business game,
Student Conference on environmental pollution.

THE SITUATIONAL TASK is to identify the control of students, which does not change during observation, intermediate certification and final certification. When solving any situational problem in biology, two main solution algorithms can be distinguished: 1) analysis of a specific situation based on the input assumptions (what is given?); 2) diagnosis (what to find?). In a probable task, there can be both essential and identified signs, therefore, standards for solving problems are given.

EVALUATING SCALE OF CASE TASKS (formative assessment)
5 points – student gives complete answer for all questions case tasks (86-100%), widely use information from basic and additional literature.
4 points – student gives correct but not very detailed answer with minor errors for all questions (76-85%), use information from basic and additional literature.
3 points – student solves correct tasks but answer on all questions were not correct (60-74%), passed details, allowing for gross errors, uses information from basic literature.
2 points – student solves correctly separate fragments of the tasks, doesn't answer all questions, makes mistakes, uses information from basic literature (36-59%).
1 point – student demonstrates single fragments of knowledge, not solve tasks at all (20-35%).
0 points – student did not solve any tasks, gives wrong answer (0-19%).

EVALUATING SCALE OF THE MICROSLIDE DIAGNOSIS
The marks are set on a 5-point scale and correspond to the number of correctly identified microslides. In a case when rating system of the assessment of knowledge is used, the mark may vary in the range of 10%. For example "4" mark can match from 76 to 85 points or % in 100 points scale. Unsatisfactory marks received by the student on the credit must be retaken before receiving a positive mark.

Microslides Response Evaluation
5 points – student gives complete answer (86-100%) and identifies parasite in a microslide, does student-independent work on identifying parasite correctly, showed deep knowledge on this question.
4 points – student identifies parasite in a microslide right and gives correct answer for all questions (76-85%), but made a minor mistake in the theoretical material or student-independent work on diagnostic microslide, demonstrates deep knowledge in these questions.
3 points – student identifies parasite in a microslide, but answers incompletely, answer 60-75% of materials or does gross mistakes in filling student-independent work on diagnostic microslide.
2 points – student does not identify parasite in a microslide, answers 36-59% of materials and does gross errors in filling student independent work on diagnostic microslide.
1 point – student does not identify parasite in a microslide, answers 20-35% of materials and does not do student-independent work on diagnostic microslide.
0 points – student does not identify parasite in a microslide, answers less 0-19% of materials and does not do student independent work on diagnostic microslide.

EVALUATING SCALE OF THE ABSTRACT
Maximum points – 50-39 – as "excellent"; 38-33 – "good"; 32-27 – "satisfactorily".
Evaluation of the abstract
Mark "excellent" – fulfilled all the requirements for writing and protection of abstracts: problem is designated and relevance is indicated, did short analysis of various points of view in the problem under consideration and it is logically stated personal position, gave write answers on additional questions.
Mark "good" – primary requirements to abstract and its protection fulfilled, but did some shortcomings. There are inaccuracies in abstract, logical sequence in judgments absented; didn't give full answers on additional questions.
Mark "satisfactorily" – there are significant digressions from the requirements to abstract: the topic is described in part; did mistakes in the content of abstract or mistakes in answer on additional questions; no conclusions.
Mark "unsatisfactory" – the subject of the abstract is not disclosed, the problem is not understood.

CRITERIA FOR EVALUATION OF BUSINESS GAME: 1) mutual assistance in a group; 2) ability to communicate with colleagues; 3) ability to work with colleagues; 4) ability to meet the time when tasks solving; 5) ability to listen to the speaker's speech.

5 points – for tactful behavior in the game, some points may be added at the discretion of the facilitator and experts.

CRITERIA FOR EVALUATION OF STUDENTS CONFERENCE ON ENVIRONMENTAL POLLUTION: 1) mutual assistance in a group; 2) ability to write and design Pawer Point Presentation; 3) ability to time work; 4) ability to report a presentation; 5) ability to listen to the speaker's speech; 6) ability to ask questions to the speaker.

EVALUATING SCALE OF THE ORAL QUESTIONNAIRE

5 points – the answer is logically correct and full without leading questions to the teacher, clear statement of thoughts to the questions; student may work with basic and additional literature; attended all or most lectures; owns scientific terminology, competently uses Latin terminology; independently solves learning tasks, focuses on basic theories, concepts.

4 points – the answer is incomplete and (or) inaccurate; student give rite answer on questions after additional, clarifying questing of the teacher; student was absent on 3-4 lectures without good reason, demonstrate mastering the basic literature for all sections of the program; owns scientific literature at the level of understanding with using of Latin terminology; correctly answers questions, knows how to solve standard tasks, oriented in the main theories.

3 points – the answer is incomplete and (or) inaccurate. The student cannot give correct answer, makes gross mistakes when answering on additional questions, does not own scientific terminology; unaccountably retells retails study material; cannot solve case tasks even with the help of teacher; knows basic and additional literature fragmentary.

2 points – the answer is absent or wrong in theoretical questing, did not implement practical part, the lecture course is skipped.

Oral answers are evaluated in practical classes on 5 points system with account for completeness and consistency of the topic, as well as activity on the practical classes.

Criteria for evaluating knowledge and skills of the students in the practical lessons on biology: 1) correctness and independence of the target definition of this work; 2) completion of the work fully with consistency of experiments, measurements; 3) independent rational selection and preparation equipment for performance of work; 4) literacy, logical description of course of practical work; 5) correctly formulates conclusions; 6) accurately and correctly executes all records, tables, pictures, graphs, calculations; 7) follows the rules of prevention of accidents.

EVALUATING SCALE OF THE PRACTICAL WORKS

– high level – 86-100% (rating “excellent”, mark “5”),
– elevated level – 75-85% (rating “good”, mark “4”),
– base level – 60-74% (rating “satisfactorily”, mark “3”),
– reduced level – 36-59% (rating “unsatisfactory”, mark “2”),
– low level – 26-35% (rating “badly”, mark “1”).

6. COURSE (MODULE) METHODOLOGICAL AND INFORMATIONAL SUPPORT

6.1 Recommended Reading

6.1.1 Required Reading List

	Authors, Compliers	Title	Book publisher, Year
L1.1	Campbell N.A.	Biology concepts and connections	University of California, Riversside, 2018
L1.2	David Sadava et al.	LIFE: The Science of Biology	Ninth Edition. 2011 by Sinauer Associates, Inc.
L1.3	Gil D. Brum, Larry K. McKane	Biology: Exploring Life	2010
L1.4	Apubra S. Sastry	Essential of medical parasitology	Jaypee Brothers Medical Publishers (P) LTD. New Delhi. London. Philadelphia. Panama. 2014.

6.1.2 Advanced Reading

	Authors, Compliers	Title	Book publisher, Year
L2.1	Chiodini P.L.	Atlas of Medical Helminthology and Protozoology.	Churchill Livingstone, 2003.
L2.2	Gillespie S.H., Pearson R.D.	Principles and practice of clinical parasitology.	by John Wiley & Sons Ltd.
L2.3	Mehlhorn H.	Encyclopedia of Parasitology.	Vol. 1, Vol. 2. Heinrich-Heine-Universität Institut für Zoomorphologie, Zellbiologie und Parasitologie. Düsseldorf

			Germany, 2008.
6.1.3 Guidance Papers			
	Authors, Compliers	Title	Book publisher, Year
6.2 Online Resources			
E1.	Diagnostic protocols for the identification of parasites	https://www.cdc.gov/parasites/az/index.html	
E2.	Silluvan J.T. Electronic atlas on parasitology	https://msu.edu/~rmorning/documents/Sullivan_Electronic_Atlas.pdf	
E3.	Genetics: A Conceptual Approach, 6th edition, Benjamin A. Pierce, W. H. Freeman, 2016	https://ru.b-ok2.org/book/3675893/565004?dsource=recommend	
E4.	Principles of Genetics, 6th edition, D. Peter Snustad, Michael J. Simmons, John Wiley and Sons, 2011	https://ru.b-ok2.org/book/2323413/983305?dsource=recommend	
E5.	Essentials of Medical Parasitology, Apurba Sankar Sastry, Jaypee Brothers Medical Publishers, 2014	https://ru.b-ok2.org/book/3562671/e55e1e?dsource=recommend	
6.3. List of Information and Education Technologies			
6.3.1 Competence-based Educational Technologies			
6.3.1.1.	To organize the study of the discipline, traditional educational technologies are used, aimed at providing knowledge and means of action transmitted to students in a finished form. Lecture material is provided to students using multimedia equipment. Explanatory and illustrative lectures, explanatory and introductory practical classes are traditional educational technologies.		
6.3.1.2.	Information educational technologies are: classes in an interactive form, forms a systematic thinking and the ability to generate ideas when solving various case-tasks. In accordance with the requirements of the State Educational Standards of Higher Professional Education for students in the specialty 560001 General Medicine of the Kyrgyz Republic, active and interactive forms of education are widely used in the educational process: conversations, cases, developing classes, explanatory and illustrative classes, business games. and role-playing games, lectures with elements of discussion, make up at least 50% of classroom lessons. Information and educational technologies include 5 business games, which are controlled in the form of independent work, case tasks in practical classes.		
6.3.1.3.	Information educational technologies – independent use by a student of computer equipment and Internet resources including video films for performance of tasks of practical training and independent work.		
6.3.2 List of Information Reference Systems and Software			
6.3.2.1.	http://www.medlinks.ru/ - MedLinks.ru		
6.3.2.2.	http://elibrary.ru/defaultx.asp - Scientific electronic library		
6.3.2.3.	https://www.ncbi.nlm.nih.gov/pubmed/ - US National library of medicine		
6.3.2.4.	http://rmic.med.kg/ru/ - Republic medico-information center Bishkek city		
7. COURSE (MODULE) LOGISTICS			
7.1.	lecture room for 150 seats,		
7.2.	computer class for 20 seats with connection to the Internet,		
7.3.	3 classrooms for 14 seats for practical classes,		
7.4.	multimedia projector,		
7.5.	wall-mounted screen,		
7.6.	microscopes,		
7.7.	a set of macro and micro preparations, albums, photo albums, models and tables on the topic under study,		
7.8.	educational videos within the following sections: biology of development, medical parasitology, ecology and biosphere,		
7.9.	biological museum.		

8. METHODOLOGICAL INSTRUCTIONS FOR STUDENTS ON MASTERING THE DISCIPLINE (MODULE)

Technological chart of the discipline «Medical parasitology» is in Attachment 1
Guidelines for independent out-of-class work of students on the study of theoretical foundations discipline «Biology».

As part of the study of the discipline, the following types of tasks for independent work are used: independent study by the student of the topic of the theoretical course; preparation of oral answers to control and theoretical questions for each topic; to do homework; solution of situational problems on the topics studied; sketching drawings in the album; preparation for practical exercises and tests on micropreparations; preparation for test tasks for the assimilation of the material; preparation for an interactive lesson;
preparing presentations for a student conference on environmental pollution; essay writing;

When studying the discipline, it is necessary to read the recommended literature on each topic and draw up a summary (summary) of the main provisions, terms, information, tables that require memorization and are fundamental in this topic, for the development of subsequent topics of the course. To expand knowledge of the discipline, it is recommended to use Internet resources; search in various systems and use materials from sites recommended by the teacher.

Current control (CC).
The study of the theoretical part of the discipline is intended not only to deepen and consolidate the knowledge gained in the classroom, but also to contribute to the development of students' creative skills. initiative and organization of their own time.
Independent work of the student in the study of the discipline includes:
- reading the recommended literature and mastering the theoretical material of the discipline;
- Familiarity with Internet sources;
-preparation for various forms of control (test, test);
- work on the design of albums - sketching of micro preparations;
- "reading" and description of micro preparations

It is better for students to plan the time required for studying disciplines throughout the semester, while providing for regular repetition of the material. The material outlined in the lectures must be regularly worked out and supplemented with information from other sources of literature, presented not only in the program of the discipline, but also in periodicals. When studying the discipline, it is necessary to read the recommended literature for each topic and draw up a brief summary of the main provisions, terms, information that requires memorization and is fundamental in this topic, for the development of subsequent topics of the course. to expand knowledge of the discipline, it is recommended to use Internet resources; conduct searches in various systems and use materials from sites recommended by the teacher.

Module control (MC). When preparing for module work, it is necessary to work out the lecture material and the corresponding pages of textbook (it is desirable to read additional literature). In preparation for the decision of the module work, it is necessary:
- work out the relevant pages of textbooks, manuals;
- use lecture notes or notes from practical material;
- read the description of parasites and sketch the structures of parasite and their life cycle in the album.
Tests. When preparing for testing, it is necessary to work out the lecture material and the corresponding pages of study guides, read additional literature. The study of the theoretical part of the discipline will deepen and consolidate the knowledge gained in the classroom, will contribute to the development of students' creative abilities and skills necessary for doctors.

HOW STUDENTS SHOULD PREPARE TO LECTURES
Lecture is the most important form of organization of educational process. It
- **introduces** to new study material,
- **explains** educational elements which are difficult for understanding,
- **systematizes** study material,
- **directs** in educational process.

Lecture is efficient if student prepares it.
Preparation to lecture by students is as follows:
- become aware of lecture subject (using course schedule, lecturer's information),
- read study material using textbook and learning guides,
- understand place of subject studied in your professional training,
- write basic terms,
- answer control question of lecture subject,
- make clusters and cinquains,
- understand what educational elements are not clear for you,
- write question which you should ask to lecturer during lecture.

HOW TO WRITE LECTURE NOTE CORRECTLY
Lecture notes – creative process requiring certain knowledge and skills. *Advice for making lecture notes*:
1. Don't try to write word for word everything what teacher says – it is impossible. If you do it and strive to it, there will be unfinished sentences and gaps in notes which break logic of material and make your lecture notes useless. Learn to write only the most important things!
2. Learn to distinguish main and secondary statements "by ear". But it doesn't mean that you should write only main statements and definitions which will be incomprehensible without examples and illustrations during reading lecture notes. That's why facts and examples also should be written.
3. Notes should be brief, logically connected, represent some kind of detailed plan of lecture.
4. If there are charts and tables in lecture, they should be written completely in copybook.
5. During lecture when teacher usually emphasizes a particular thought, statements, make corresponding descriptive statements in notes immediately. For this you can use not only various underlining and marking with different colors, but also various signs, for example: 1 – important, ? – check, specify, NB – pay attention.
6. Leave margins which can be used in future for comments, notes, additions, etc.
7. Use paragraph for highlighting of descriptive parts in notes.
8. Try to develop your own system of abbreviations of the most widespread word of substitution of them with certain signs. It provides possibility to write less, to listen and think more.

9. Immediately after lecture try to look through your notes and to reconstruct gaps, write unfinished and finish highlighting of essential moments. It's important to stress that lecture is not the whole material on the subject studied given for students to "memorize" it. First of all, it is "guide" for their further individual study and scientific work.

CRITERIA OF LECTURE EFFICIENCY:

- Scientific character, informational value, argumentativeness and reasonableness of content;
- Presence of outstanding convincing examples and facts;
- Preferential use of topical form of exposition of material;
- Clear structure of content and logic of its delivery;
- Lecturer's methodical literacy: 1) goal setting and issue actualization; 2) highlighting of the main and secondary; 3) leading to conclusions; 4) use of feedback; 5) explanation; 6) note of new terms; 7) use of illustrative materials;
- emotionality of interaction between lecturer and audience, creation of conditions for activation of thinking, use of counter-intuitive techniques, novelty effect, interest, discussion elements, statement of research questions and involvement of students to "laboratory" of scientific and clinical thinking.

The study of the theoretical part of the discipline is intended not only to deepen and consolidate the knowledge gained in the classroom, but also to promote the development of students' creative skills, initiative and organization of their free time. As part of the study of the discipline, the following types of tasks for independent work are used:

• independent study of the topic of the theoretical course;
•preparation of oral answers to control questions given in study prepare instructions;
•doing homework according preparation instructions;
• writing essays or conspectus;
•preparation for practical exercises on microslades or diagrams;
•preparation of reports and presentations (if necessary);
•preparation for an interactive lesson;
• solution of situational problems on all topics studied;
• performance of drawings in a drawing notebook.

PRACTICAL CLASSES. Practical classes on the subject of medical parasitology are held in specially equipped rooms equipped with microscopes, diagrams. In conducting practical classes, a creative approach of the teacher is necessary in order to improve the quality of students' knowledge. When discussing the content of the topic, it is recommended to use interactive teaching methods (cinquain, cluster, "carousel", "mosaic", Venn diagram).

INTERACTIVE LESSONS. The advantages of an interactive lesson over other types of learning are that the game used, simulating real situations in the future profession, develops the ability to search for and work with information, and can significantly enhance the student's creative abilities. Visual aids, models, multimedia presentations, educational videos contribute to a better perception of theoretical material, and the solution of test tasks, situational tasks - to consolidate the material covered and develop analytical thinking. The computerization of all spheres of life creates the need to master teaching and controlling computer programs.

DISTANCE LEARNING. For the 2022-2023 academic year, if necessary, it is planned to conduct lectures, practical classes, examenations remotely online using the Internet. Conducting practical classes on Skype, ZOOM, Google Classroom, Google meet resources and Instagram. Lectures on Skype, ZOOM, Instagram, Google meet, Google Classroom platform. Checking written homework by exchanging files on free mail resources - the Google Classroom service (or from a photo via WhatsApp): drawing notebook, lecture notebooks, demonstration and description of parasite microslides on the Google classroom platform. Placement of educational and methodological materials on the resources of the department are: https://medinfo.krsu.edu.kg/index.php/ru/

The content of distance learning is completed considering the thematic plan (attachment 1)

Attachment 1

Technological chart of the discipline «Medical biology»

II semester

Name of discipline module (by number of credits in the semester minus on control work)	Control	Modules of study	credit minimum	credit maximum	Control Schedule (week of semester)
Module 1					
Fundamentals of Medical Cytology and Medical Genetics	Formative assessment	Activity; attendance; participation in research work of students. Self-training on theoretical issues, preparation for practical exercises. Preparing for the midterm assessment (theoretical questions).	3	5	
	Midterm examination	Test: test control, theoretical question, silent drawing, problem solving.	10	20	8
Module 2					
Biology of development and reproduction. Postnatal ontogeny	Formative assessment	Activity; attendance; participation in research work of students. Self-preparation for theoretical issues, preparation for practical exercises. Preparation for midterm assessment (theoretical questions).	3	5	
	Midterm examination	Test: test control, theoretical question, problem solving, silent drawing,	10	15	11
Module 3					
Medical protozoology	Formative assessment	Activity; attendance; Frontal survey; Independent preparation for theoretical questions, solving situational problems, filling out a workbook or album (description, drawings of anatomy and development cycles of parasites).	4	5	
	Midterm examination	Test: Identification of the parasite in a photograph or microslide, silent life cycle of the parasite Theoretical question.	10	20	17
TOTAL for semester			**40**	**70**	
Mindpoint assessment (credit)			**20**	**30**	18
Mindpoint assessment (exam)					
Summarative assessment			**60**	**100**	

Attachment 2

II semester

Questions to mid-term control 1

- levels of organization and qualitative features of living systems. The concept of a biological system;
- the definition of life. integrity and discreteness. properties of the living;
- assimilation and dissimilation at the cellular level. stages of dissimilation. The division of organisms into groups according to the type of assimilation and dissimilation;
- microscope device (illuminating, optical and mechanical parts;
- the history of the discovery of the cell (R. Hooke, M. Malpighi, A. Grew, A. Leeuwenhoek);
- cell theory (M. Schwann, T. Schleiden, R. Virchow), its main stages, provisions and significance for the development of science and medicine;
- the concept of "cell". Prokaryotic and eukaryotic cells, their differences;
- the structure of the eukaryotic cell, components, their structure and functions;
- composition of the cytoplasm. Organelles and inclusions;
- similarities and differences between animal and plant cells;
- the nuclear apparatus of the cell;
- mitosis and mitotic cell cycle. The main phases of mitosis and their characteristics. The biological role of mitosis;
- cytology, research methods;
- the cell as an open system;
- meiosis. Features of the first and second division of meiosis;
- meiosis, its difference from mitosis and biological significance;
- structure and functions of DNA and RNA. DNA reproduction. biological significance. Genetic code. Encoding and realization of information in a cell. DNA and protein code system;

Chromosomes are structural components of the nucleus. Structure, composition, function. Features of the morphofunctional structure of chromosomes. Hetero- and euchromatin;

- classification of genes: genes for the structural synthesis of RNA, regulators. Properties of genes (discreteness, stability, lability, polyallelism, specificity, pleiotropy);
- fine structure of genes. Features of pro- and eukaryotes. The concept of transcription. Principles of regulation of gene activity on the example of prokaryotes (operon model) and eukaryotes;
- genotype, genome, phenotype, gene pool. Phenotype as a result of the implementation of genetic information in environmental conditions;
- allelic genes. Definition. Forms of interaction (dominance - complete and incomplete, overdominance, codominance, interallelic complementation and allelic exclusion). Origin mechanisms. Examples of signs in humans;
- multiple allelism. Inheritance of blood groups. Rh factor inheritance. Rhesus conflict;

- polygenic inheritance. Forms of interaction of non-allelic genes (complementarity, epistasis, polymerism, pleiotropy). Examples;
- Morgan's law. Chromosomal theory of heredity. Complete and incomplete linkage of genes. The concept of genetic maps of chromosomes. The method of somatic cell hybridization and its application for mapping human chromosomes;
- the chromosomal mechanism of sex inheritance. Cytogenetic methods for determining sex. Sex-linked inheritance. Examples. Genetic mechanisms of sex determination. Differentiation of sex characteristics in development. gender predetermination;
- Genetic Engineering. Biotechnology. Tasks, methods. Achievements, prospects;
- heredity and variability - the fundamental properties of the living, their unity. General concepts of genetic material and its properties: storage, change, reparation, transfer, implementation of genetic information;
- modification variability. Reaction rate, penetrance and expressivity. Phenocopies. The adaptive nature of the modification. The role of heredity and environment in human development. Genocopies;
- combinative variability, mechanisms of its occurrence. The value of combinative variability in ensuring the genotypic diversity of people. Types of heterosis (reproductive, somatic and adaptive);
- mutational variability, classification of mutations according to the level of damage to hereditary material (genomic, chromosomal, gene). Generative and somatic mutations;
- chromosomal mutations: aberrations (inversion, deletion, differentiation, duplication, translocation), polyploidy, heteroploidy, mechanisms of their occurrence;
- gene mutations, molecular mechanisms of occurrence, frequency of mutations in nature. Vavilov's law. Biological anti-mutation mechanisms;
- spontaneous and induced mutations. Their biological role. mutagenesis factors. Classification. Examples;
- Methods for studying human heredity. Family-genealogical, twin, biochemical, population-statistical methods, dermatoglyphics and their significance for medicine;
- a cytological method for diagnosing human chromosomal disorders. Amniocentesis. Karyotype and idiogram of human chromosomes;
- human hereditary diseases. Principles of treatment, methods of diagnosis and prevention. Examples. Medical genetic counseling.

Questions to Mid-term control 2

- reproduction is the main property of the living. Asexual reproduction of unicellular and multicellular organisms. biological significance;
- Sexual reproduction in protozoa. conjugation and copulation;
- sexual reproduction in multicellular animals (with and without fertilization). Parthenogenesis, its types. The process of fertilization and its biological significance;
- spermatogenesis and oogenesis. periods and distinctions. Cytological and cytogenetic characteristics;
- the structure of the egg and sperm. Types of eggs in animals and humans;
- fertilization, insemination, regulation by hormones. Acrosomal and cortical reactions during fertilization;

- parthenogenesis. Forms and prevalence in nature. Sexual dimorphism: morphophysiological, difference in secondary sexual characteristics;
- the concept of ontogenesis, its types, periods and characteristic features in animals and humans;
- criticism of the theories of preformism and epigenesis;
- stages of embryogenesis;
- crushing, its characteristics in different animals. Types of blastula;
- gastrula, its structure and types, methods of formation;
- methods of mesoderm formation (teloblastic, enterocelous);
- germ layers (ecto-, endo- and mesoderm) and the formation of organ systems in the process of organogenesis;
- provisional organs of the embryo;
- critical periods of ontogeny. Anomalies and deformities;
- the concept of teratogenic factors;
- violation of embryonic development;
- neurohumoral regulation of growth and development of the body;
- postembryonic period, its characteristics and stages;

Questions to Mid-term control 3

- a general characteristic of the type of protozoa. Morphophysiological features of classes. Free-living and parasitic representatives.
- dysenteric amoeba. Structure, unlike non-parasitic amoebae. Life cycle of development. Diagnosis and prevention of amoebiasis.
- leishmania, cycles of development. Cutaneous, mucocutaneous and visceral leishmaniasis. Diagnosis, ways of infection and prevention.
- trypanosomes. Morphophysiological features. Life cycle of development. Diagnosis, ways of infection and prevention of trypanosomiasis.
- lamblia. Structure, life cycle, diagnosis and prevention of giardiasis.
- Trichomonas. Structure, life cycle of development, diagnosis, ways of infection and prevention of trichomoniasis.
- Toxoplasma. Structure, life cycle, diagnosis, ways of infection and prevention of toxoplasmosis.
- malarial plasmodium, its forms, structure, life cycle in the human and mosquito body. Ways of infection, diagnosis and prevention of malaria.
- balantidia. Structure, life cycle, diagnosis, ways of infection and prevention of balantidiasis.

Attachment 3

Recommended minimum number of drawings in a drawing book for passing modules on medical parasitology

I semester

Intermediate control 1

Microscope, microscopy technique – 39 microscopes

Introduction to genetics, medical genetics - 53

Intermediate control 2

Fundamentals of reproduction of organisms - 31

Intermediate control 3

Medical protozoology - 19

Total: 142 drawings

Attachment 4

Test control example

1. Name of element which mechanical part of microscope is: a) stage, b) condenser, c) ocular, d) iris diaphragm, e) objective.
2. The prokaryotic cell haves: a) nucleus, b) mesosomes, c) centrocome, d) mitochondria, e) endoplasmic reticulum.
3. The prokaryote cell walls contain: a) cellulose, b) chitin, c) murein, d) fibrin, e) protoplast.
4. The mitochondria, plastid and nucleus are consist from: a) one membrane, b) double membrane, c) three membrane, d) four membrane, e) unmembrane.
5. The function of nucleus is: a) cell division, b) protein biosynthesis, c) synthesis of DNA, RNA, d) storage and transmission of genetic information, e) a+b+c+d
6. The function of lysosome is: a) oxidation of proteins, lipids and carbohydrates, b) synthesis of proteins, c) synthesis of lipids and carbohydrates, d) synthesis of ATP, e) photosynthesis.
7. The function of chloroplast: a) synthesis of organic substances, b) accumulation of nutrients, c) oxidation of organic substances, d) photosynthesis, e) protein biosynthesis.
8. The genetic material is distributed between daughter cells when amitosis: a) evenly, b) unevenly, c) as in meiosis, d) as in mitosis.
9. Life cycle – is: a) life of the cell during its division, b) life of the cell from its division till next division or death, c) personal development, d) historical development.
10. The centromeres divide and chromatids diverge toward the poles in the following phase of mitosis: a) prophase, b) metaphase, c) anaphase, d) telophase, e) interphase.

Theoretical question, write answer on the following questions:

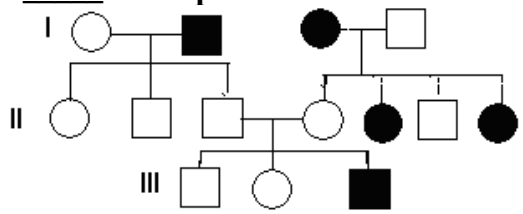
1. Property of life.
2. Difference between plant and animal cells.

Test control example 2

1. _____ A nucleotide does NOT contain
a) a sugar b) polymerase c) a nitrogen base d) a phosphate group
2. _____ If A – normal pigment, a – albinism (no pigment), B – brown eyes and b – blue eyes, select the genotype of the person who will not develop any pigment for eye color
a) aaBb b) AaBb c) AaBB d) Aabb
3. _____ What type of macro-molecules are DNA and RNA?
a) Protein b) Carbohydrate c) Nucleic Acid d) Lipid
4. _____ The job of tRNA is to...
a) carry amino acids to the ribosomes b) carry ribosomes to the ER c) carry mRNA out of the nucleus d) carry glucose to mitochondria
5. _____ Which of the following best describes a DNA molecule?
a) contains ribose b) made of amino acids c) contains Uracil d) double helix
6. _____ What will be the resulting mRNA from this DNA sequence: GAT-TAC-AGA-TTA-CAT?
a) CTA-ATG-TCT-AAT-GTA b) GAU-UAG-UGA-UUA-GUT
c) CUA-AUG-UCU-AAU-GUA d) CAT-ACA-TAC-ATA-TAG
7. _____ A DNA nucleotide may be made up of a phosphate group, along with
a) deoxyribose sugar and uracil b) ribose sugar and cytosine
c) deoxyribose sugar and thymine d) ribose sugar and adenine
8. _____ What is the correct order to make a protein?
a) Protein, DNA, RNA b) RNA, DNA, Protein c) DNA, RNA, Protein
d) Protein, RNA, DNA
9. _____ Which of the following represents a testcross:
a) WW x Ww b) Ww x ww c) WW x WW d) Ww x Ww
10. _____ What type of cross produces a 1:1:1:1 phenotypic ratio?
a) AaBb x aabb b) AaBb x AaBb c) AABb x aabb d) AaBb x Aabb
11. _____ Transcription and translation take place in the ____ and _____, respectively.
a) nucleus; cytoplasm b) nucleolus; nucleus c) cytoplasm; nucleus
12. _____ What is a phenotype?
a) All the genes in an organism b) All the genes and characteristics shown by an organism c) All the characteristics shown by an organism
13. _____ Chiasmata and crossing over occurs during the following phase of meiosis:
a) Prophase I b) Prophase II c) Metaphase I d) Metaphase II
14. _____ Chromatin contains protein components called:
a) ribosomes b) centromeres c) centrioles d) histones
15. _____ Polydactyly is an inherited condition, due to a dominant allele, causing extra fingers or toes. What is the chance of a child having polydactyly if their parents are Pp and pp? a) 25% b) 50% c) 75% d) 1000%
16. _____ Every three letters (example: ATC) in DNA codes for what?
a) Amino Acid b) Nucleotide c) Lipid d) Carbohydrate
17. _____ A man who has type BB blood and a woman who has type AA blood could have children of which of the following phenotypes?
a) A or B only b) AB only c) A, B or O group d) A, B, AB or O group
18. _____ Test cross is crossing between
a) genotype with dominant trait b) genotype with recessive trait c) F_1 hybrid with double recessive d) two F_1 hybrids
19. _____ **All the terminator codons being with**
a) Adenine b) Cytosine c) Uracil d) Guanine
20. _____ On crossing two similar hybrids, the percentage of dominant is
a) 50% b) 75% c) 25% d) 1000%

Test control example 3

1. _____ What pattern of inheritance is shown in the pedigree?



a) Autosomal dominant b) Autosomal recessive
c) Sex linked dominant d) Sex linked recessive

2. _____ Which of the following would be a nucleotide found in DNA

a) Ribose + phosphate + uracil b) Deoxyribose + phosphate + uracil
c) Deoxyribose + phosphate + adenine d) Ribose + phosphate + adenine

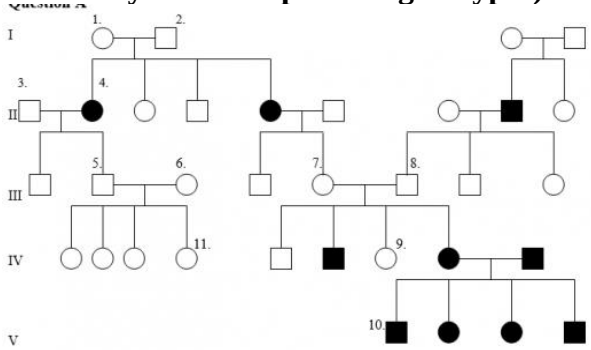
3. _____ Which of the following would complete the mRNA strand for CAG (DNA)

a) CAG b) AUG c) GUC d) UAC

4. _____ Polydactyly is an inherited condition, due to a dominant allele, causing extra fingers or toes. What is the chance of a child having polydactyly if their parents are Pp and pp?

a) 25% b) 50% c) 75%

5. _____ In the above pedigree, the affected individuals are shown shaded. *None of the marriage partners from outside these two families are heterozygous for the trait.* Indicate the genotype(s) of individual # 5(Allow the dominant trait to be "A" and the recessive trait to be "a" – NOTE: Some may have two possible genotypes)



a) AA b) Aa c) aa

6. _____ A Cell builds it's proteins from the Instructions encoded in its?

a) Cytoplasm b) Cell Membrane c) Amino acid d) Lysosome e) Genome

7. _____ What is the correct order to make a protein?

a) Protein, DNA, RNA b) RNA, DNA, Protein c) DNA, RNA, Protein
d) Protein, RNA, DNA

8. _____ Every three letters (example: ATC) in DNA codes for what?

a) Amino Acid b) Nucleotide c) Lipid d) Carbohydrate

9. _____ What has DNA?

a) animals b) plants c) bacteria d) all of the above

10. _____ What is a phenotype?

a) All the genes in an organism b) All the genes and characteristics shown by an organism c) All the characteristics shown by an organism

11. _____ Which of the following is *not* a difference between DNA and RNA?

a) DNA contains thymine whereas RNA contains uracil b) DNA contains deoxyribose and RNA contains ribose c) DNA contains alternating sugar-phosphate molecules whereas RNA does not contain sugars d) RNA is single stranded and DNA is double stranded

12. _____ Factors that control traits are called

a) genes b) purebreds c) recessives d) parents

An example of tasks in genetics

1. Determine the number and types of gametes. The number of gametes depends on the homo- or heterozygosity of the location of genes in one or different pairs of chromosomes. All homozygotes form one type of gamete. The number of gamete types in heterozygotes is determined by the number of alleles in its genotype and is equal to 2n, where n is the number of heterozygous alleles. In an individual with the AaBb genotype, 4 (22) types of gametes are formed: AB, Ab, aB, ab.

2. In humans, the frizzy hair gene is a gene of incomplete dominance over the straight hair gene. From the marriage of a woman with straight hair and a man with wavy hair, a child with straight hair is born. Heterozygotes are known to have wavy hair. Can a child with wavy hair appear in this family? With frizzy hair?

3. A man suffering from color blindness and deafness married a woman with normal vision and good hearing. They had a son who was deaf and color-blind, and a daughter who was color-blind, but with good hearing. Determine the probability of the birth of a daughter with both anomalies in this family, if it is known that color blindness and deafness are transmitted as recessive traits, but color blindness is linked to the X chromosome, and deafness is an autosomal trait.

4. A husband and wife, who are second cousins, came to the medical genetic consultation. Their first child is sick with phenylketonuria, parents are healthy. How can you confirm the diagnosis and how to help the child? Determine the possibility of the birth of healthy children in these parents, if it is known that phenylketonuria is inherited in an autosomal recessive manner.

5. Convert the mRNA sequence into a protein: AUG-UAC-CGU-AUU-CCA-GAG-CAU. Record the resulting protein. And now replace C with G in the 6th position and get another peptide. Write down the resulting peptide and compare with the first one.

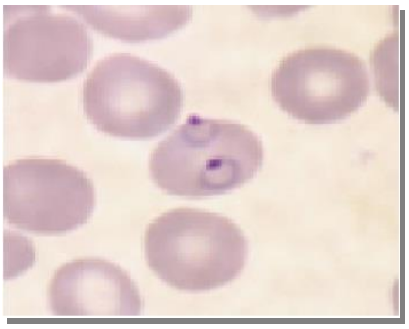
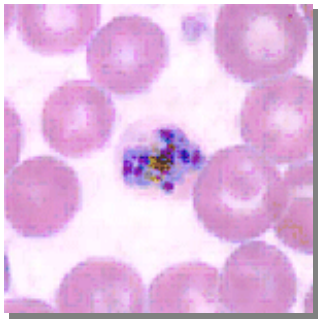
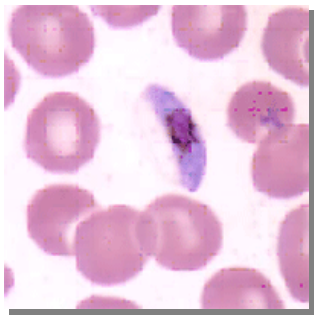
Example of theoretical questions

1. Stages of implementation of genetic information in eukaryotes. Translation and folding of the polypeptide.

2.Features of a person as an object of genetic analysis. Methods for studying human genetics: DNA analysis, prenatal diagnosis

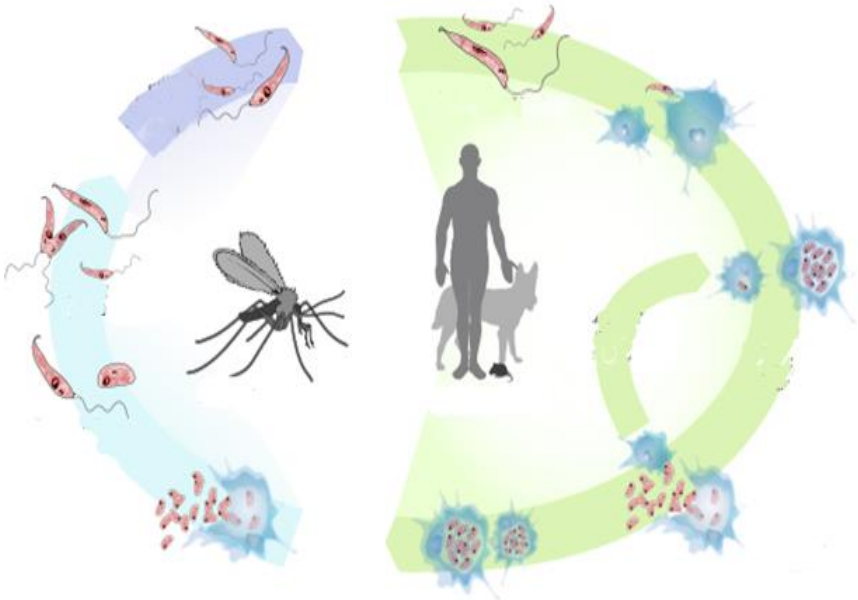
Modul control example

I. Describe the parasite

1) Give the English and Latin name of parasite _____
_____
2) Parasite classification (Kingdom, Phylum, Class, Order, Species) _____
_____
3) Name of disease _____
4) Parasite geographical distribution _____
5) Life forms of parasite _____
6) Place of localization in the human body _____
7) Life cycle (definitive and intermediate host, vector, reservoir) _____
_____
8) Invasive form for human _____
9) Mode of transmission or partway of parasite into person _____
10) Pathogenicity or symptoms _____
_____
11) Medical laboratory examination _____
_____
Prevention and control _____

II. Whose life cycle is here



Describe the parasite life cycle

CASE STUDY 16.

A young man who is an employee at a travel company (guide), came to the clinic complaining of chills. Under the microscope examination in red blood cells found the ring-shaped parasites.

1. Which disease can be suspected in a patient? _____
2. What is the possible mode of transmission to the patient? _____
_____
_____
3. Name of diseases _____

CASE STUDY 17.

In a sick youth of 15 years, periodic bouts of fever up to 40°C. He was ill with parents in one of the African countries. Patient expressed anemia, enlarged liver and spleen.

1. What needs to be done for diagnosis? _____
_____
_____
_____
3. Name of diseases _____

CASE STUDY 18.

During routine inspection of food employees' enterprises, in the feces of one of them found: round cysts moulds with a diameter of 12 μm, having a single-layer shell and 4 large nucleuses.

1. What is the name of parasite whose cysts are found in the worker? _____
_____
2. What is the possible mode of transmission to the patient? _____
_____
_____
3. Name of diseases _____

CASE STUDY 19.

A patient with suspected malaria, thin blood smear found in an erythrocyte schizonts in the form of a "ribbon" and merozoites which located in the form of a "garden daisy".

1. Define parasite pathogen form _____
_____
2. What is the possible mode of transmission to the patient? _____
_____
_____
_____
3. Name of diseases _____

Attachment 5

An example of the design of the title page of an abstract in biology

Ministry of Education and Science of the Kyrgyz Republic
Kyrgyz-Russian Slavic University

Department of Physics, Medical Informatics and Biology

Essay
Subject: Biology

on the topic: "Mutations and genetic diseases of mankind"

Medical student(s)
Groups: _____
FULL NAME _____
_____

Checked: scientific degree, title (if any),
Full name of the teacher

Bishkek - 2023

Topics for Abstracts and Essays in Biology

The history of the study of the cell, the invention of the microscope.

Cell research methods.

Types of mitochondria, mitochondrial diseases and their types

Problems associated with disruption of the mitotic cycle in the body

Medical significance of mutations for humans, diseases caused by mutations

The use of genetically engineered products in medicine

The role of heredity and environment in the formation of the human phenotype.

The frequency of hereditary diseases

The cell as an open system. Organization of the flow of energy, information and matter

Postnatal ontogeny.

Gerontology and geriatrics

Questions of ecological parasitology.

Population level of interaction between parasites and their hosts

Ecological principles of combating parasitic diseases

Attachment 6

Example of a workbook page for coloring in preparation for a lesson

REGULARITIES OF CELL EXISTENCE IN TIME

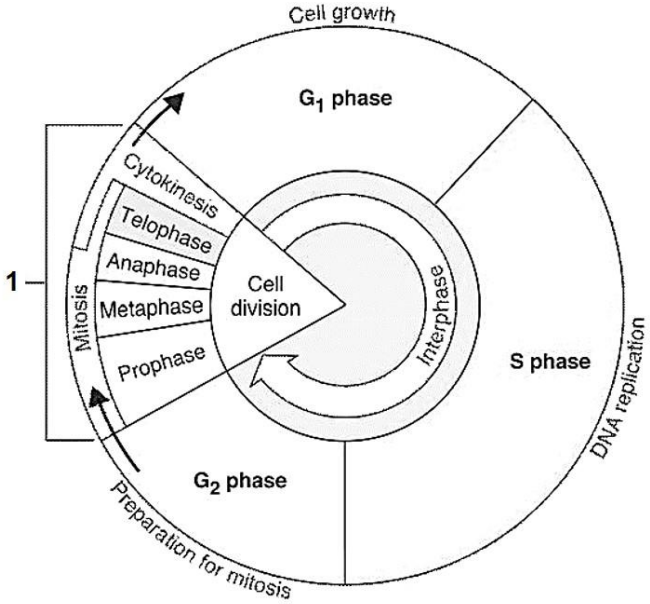


Fig. 36. Cell cycle: 1. cell division.

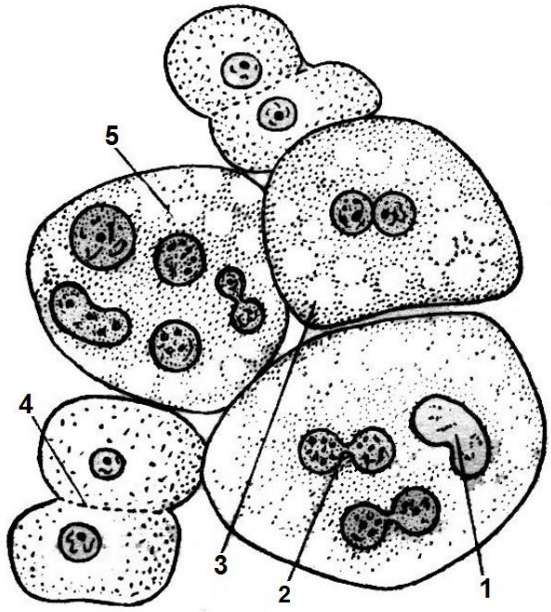


Fig. 37. Amitosis in epithelial cells: 1 – nucleus; 2-constriction; 3 - binuclear cell; 4 – cytokinesis; 5 – multinucleated cells.

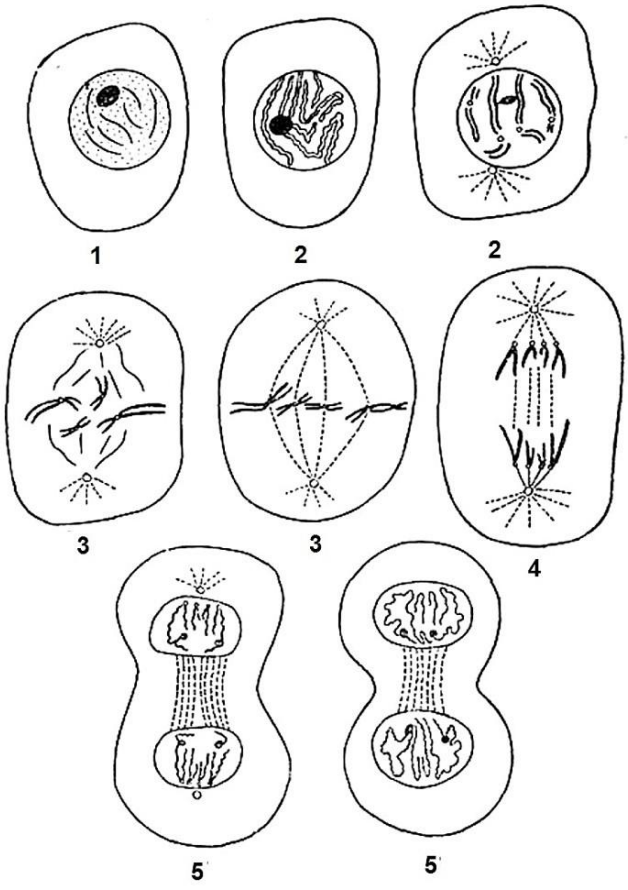


Fig. 38. Mitosis phases: 1. interphase; 2. prophase; 3. metaphase; 4. anaphase; 5. telophase.

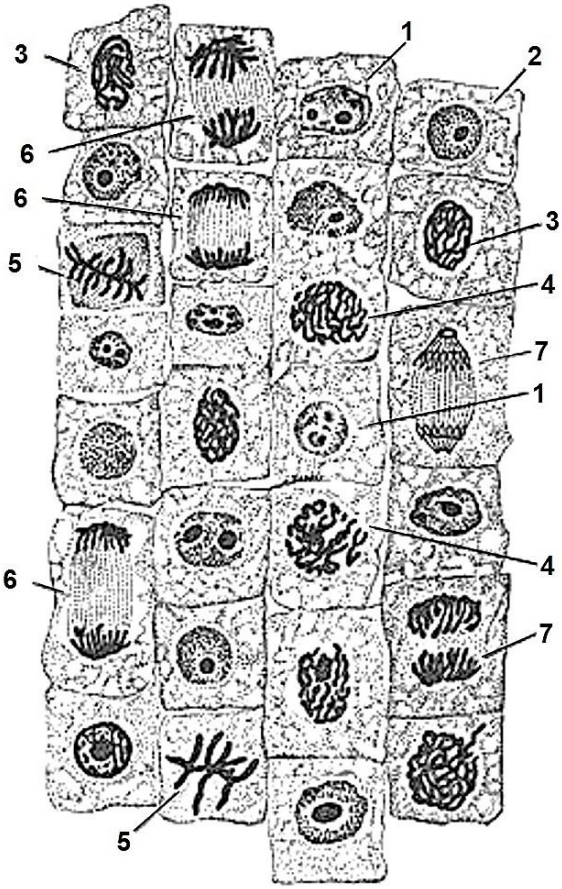


Fig. 39. Mitosis phases in onion root tips: 1-2. interphase; 3-4. prophase; 5. metaphase; 6. anaphase; 7. telophase.

Attachment 7

En example of lesson

Lesson 1.
METHODS OF MEDICAL AND BIOLOGICAL RESEARCH: MICROSCOPE, TECHNOLOGY OF MANUFACTURING MICRO PREPARATIONS
THE PURPOSE: explore the device of light microscope, learn the rules of microscopy and the technique of making temporary micropreparations.
The tasks:
1) To be able to work with a light microscope under: a) low magnification –x8, b) large magnification –x40;
2) To be able to work with a hand lens;
3) To be able to make temporary micropreparations.
Quest for self. A student should know: a) main parts of light microscope, its purpose and the device; b) components of mechanical, magnifying and illuminating units; c) rules for working with the microscope; d) method of temporary slides preparation.
Educational questions:
1) Place and tasks of biology in the system of training of a doctor;
2) Scientific method – microscopy;
3) Study the methods of preparation of temporary slides.
4) Cell – elementary unit of life. Study of structural components of a cell by examinations of temporary and permanent slides.
Equipment: light microscope, Petri's cup, glass slide and cover slip, bottle with distilled water, cotton wool, onion, hair of a man. Permanent slides: cells of the thin inner epidermis of onion, cells of the frog skin, high and low epithelium.

Independent work: independently to study a theoretical material under the specified literature

INDEPENDENT PRACTICAL WORK:
Work 1. **The device is Compound Light Microscopes**

Compound light microscope consisting: mechanical parts (used to support and adjust the parts), magnifying parts (used to enlarge the specimen), illuminating parts (used to provide light).

Mechanical parts base: *Body Tube* – attached to the arm and bears the lenses. *Revolving* (Rotating Nosepiece) – rotating disc where the objectives are attached. *Arm* (Neck) – curved slanted part which is held while carrying the microscope. *Stage* – platform where object to be examined is placed. *Stage Clips* – secures the specimen to the stage. *Coarse Adjustment Knob* – geared to the body tube which elevates or lowers when rotated bringing the object into approximate focus. *Fine Adjustment Knob* – a smaller knob for delicate focusing bringing the object into perfect focus.

Magnifying parts: *Ocular* (Eyepiece) – another set of lenses found on top of the body tube which functions to further magnify the image produced by the objective lenses. It usually ranges from 5X to 15X. *Objectives* – metal cylinders attached below the nosepiece and contains especially ground and polished lenses. *Low Power Objective* (LPO) – gives the lowest magnification, usually 10x. *High Power Objective* (HPO) –

gives higher magnification usually 40X or 60X. *Oil Immersion Objective* (OIO) – gives the highest magnification, usually 90X or 120X, and is used wet either with cedar wood oil or synthetic oil.

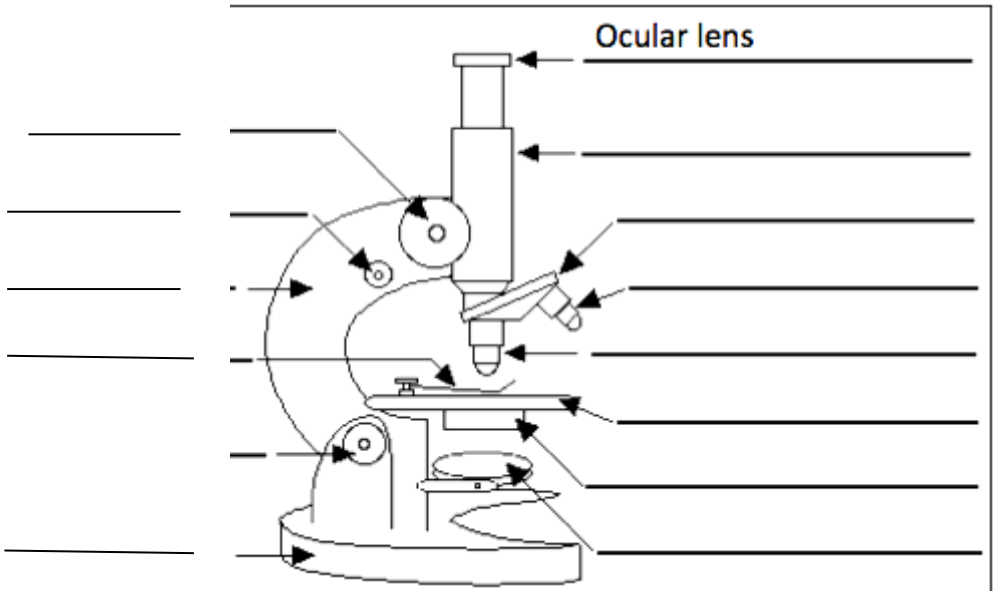
To calculate the total magnification of the image with each objective, use the following equation:

Total magnification = Magnification of ocular x Magnification of objective

For example: ocular magnify 10X and the objective magnify 10X, for a total magnification of 100X.

Illuminating Parts: *Mirror* – located beneath the stage and has concave and plane surfaces to gather and direct light in order to illuminate the object. *Lamp* – a built in illuminator beneath the stage that may be used if sunlight is not preferred or is not available. *Iris Diaphragm* – regulates the amount of light necessary to obtain a clearer view of the object. *Condenser* – a set of lenses between the mirror and the stage that concentrates light rays on the specimen.

Work 1.1. Write the name of the microscope part next to the correct line in the picture.



Work 1.2. How to use of the compound light microscope:

1. Always carry the microscope by the arm with one hand and supporting the base with the other hand. Carry it close to your body.

2. Position the microscope so that the arm is facing toward you, and turn on the light. Be gentle.

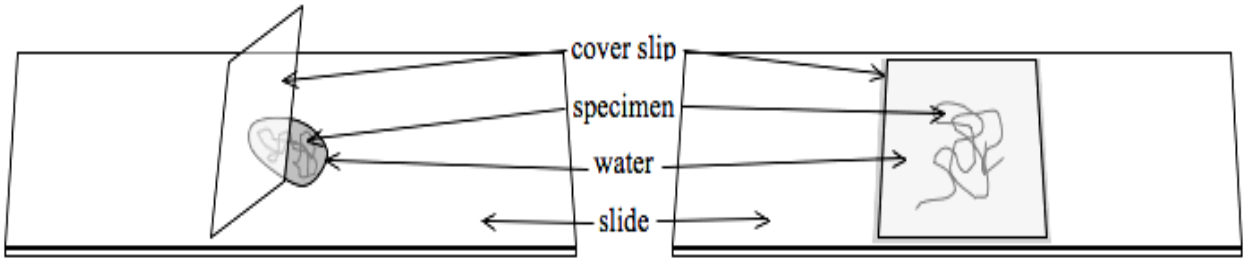
3. Make sure that the low–power objective is in position when you start, after that use high–power objective (if it is necessary) and end work low–power objective.

4. Place a slide on the microscope stage such that the specimen is in the field of view (directly over the light).

5. Move the stage as close to the low-power objective as it will go. Next, while you are looking through the eyepiece, slowly turn the coarse focus knob until the slide comes into focus. Since your specimen might not be centered on the slide, keep one hand on

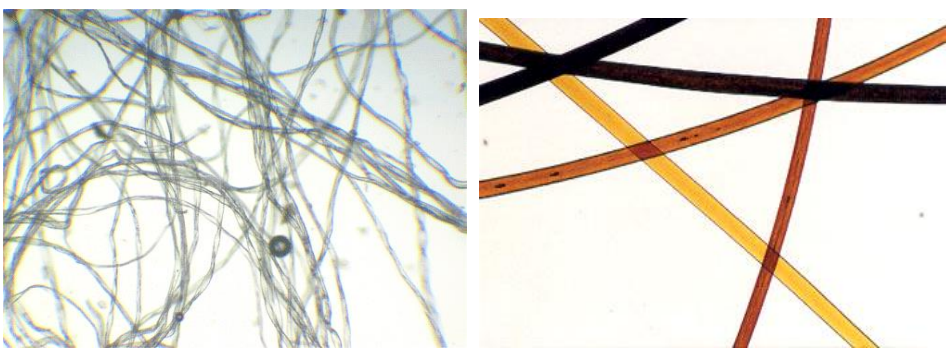
the slide to move it while you are focusing. You will only see the movement through the eyepiece when the slide is nearly in focus.
6. Only after the specimen is in focus can the high-power objective be used (otherwise, the lens could hit the slide). Use only the fine focus knob when using the high-power objective.

WORK 2: How preparing a Wet Mount Side
Microslide - is a slip of glass on which a preparation is mounted for microscopic examination, or microslide is the slide on which objects for microscopic examination are mounted.
Wet mounts are microscope slides that contain a specimen mounted in water. **Glass Slide** – thin flat piece of glass, typically 75 by 25 mm (3 by 1 inches) and about 1 mm thick, used to hold objects for examination under a microscope. A **Cover Slip** (or Cover Glass) is used to flatten the specimen and the water drop. This makes focusing easier, dampens vibrations, prevents fogging of lenses, and protects the high–power objective from touching the sample.
1. Obtain a clean microscope slide and cover slip. Hold cover slips only by the edges.
2. Add a small drop of water to the slide.
3. Place the specimen in the drop of water.
4. Hold the coverslip at an angle next to the drop of water and slowly lower it onto the water. This helps prevent air bubbles. (See the figure below.)

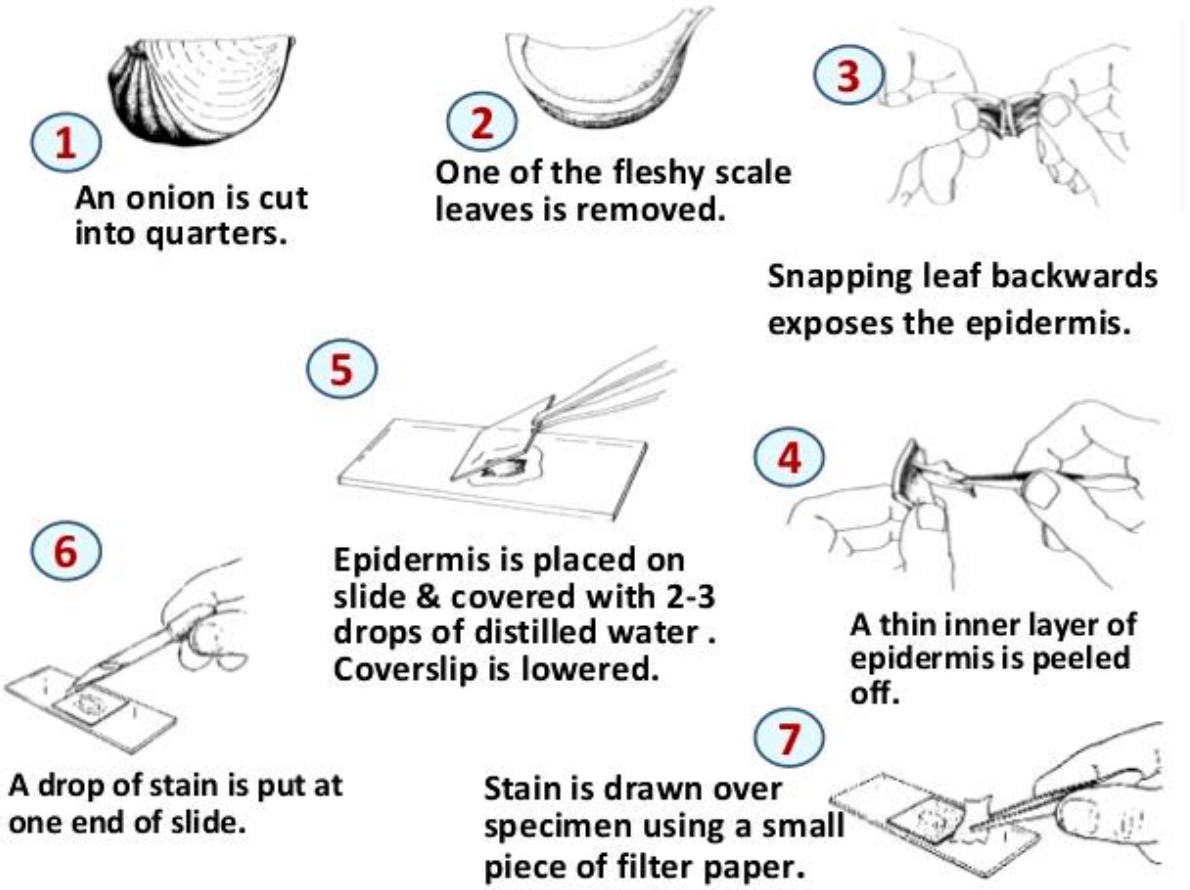


Preparing a wet mount The finished wet mount

Work 2.1. Extraneous particles
On middle of a Glass Slide put a drop of water, in which place some fibers of cotton wool and hair of a man, having made from them cross. Lower Cover slide on the sample and consider a preparation under small increase. Moving a preparation put it so that cross was at the centre of a field of sight.
Sketch and designate: 1) hair of a man, 2) fibers of cotton wool, 3) bubble of air

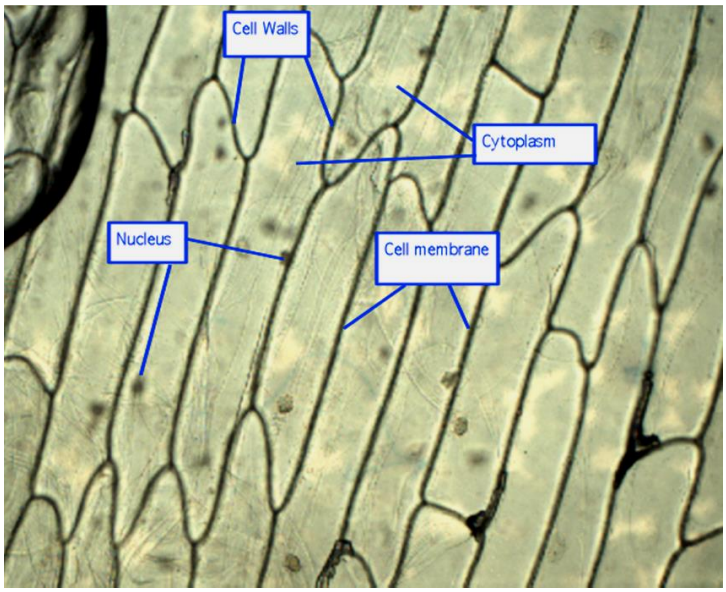

Fiber of cotton wool Hair of a man

WORK 3: Temporary micropreparation – Onion cells
Please follow the instructions bellow.



In preparation is visible group of elongated, almost rectangular cells. Round-oval nucleus usually occupies a central position in the cell. Sometimes it is displaced to the shell and gets flattened shape

Sketch and designate: 2 – 3 cells, label: 1) cell wall, 2) cytoplasm, 3) nucleus.



Onion cells – Temporary micropreparations

Permanent micropreparations

Literature

1. Campbell M. R. Biology concepts and connections, University of California, Riverside,2015 https://ru.b-ok2.org/book/1272097/bed075?dsource=recommend
2. Life, the science of biology / David Sadava .. [et al.]. — 11th ed. Life, the science of biology / David Sadava .. [et al.]. https://ia803004.us.archive.org/8/items/lifethescienceofbiology10thedition2012davidsadavadavidm.hillish.craighellermayr.berenbaum120mb/Life%20The%20Science%20of%20Biology%2010th%20edition%20%282012%29%20David%20Sadava%2C%20David%20M.%20Hillis%2C%20H.%20Craig%20Heller%2C%20May%20R.%20Berenbaum%20120mb.pdf
3. Purves W.K., Sadava D., Orians G.H., Heller H.C. Life the science of biology, 2010, 6-th Edition, P. 1-4.
4. The lecture materials