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 parasitology

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 2 credit point

Course Hours 72
including:
in-class learning 72
individual work 33,7

cope of Testing Semesters:
credit 2

Course Hours Scheduling (per semester)				
Semester Academic Year	2 (1.2)		Total	
Weeks	18			
Type of Traning	AC	CO	CO	AC
Lectures	10	10	10	10
Practical Session	28	28	28	28
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	38	38	38	38
Face to face learning	38,3	38,3	38,3	38,3
Individual work	33,7	33,7	33,7	33,7
Total				

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

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Doctor of Medical Sciences, professor, Toigombaeva V.S. _____

Candidate of Biological Sciences, associated professor, Kalugina O.P _____

The Course Outline
Medical parasitology

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.

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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.

1. COURSE OUTLINE OBJECTIVES	
1.1	to study the basics of parasitism, basics of medical parasitology in the context of ecology, parasite-host relationships at different levels of the hierarchy of biological systems, biology and life cycles of parasites; to acquaint students with the origin and distribution of parasitism in the environment
1.2	to give an introduction to the basics of medical parasitology, the biology and life cycles of animals as agents of major human diseases, modern diagnostic methods, the basics of identification of parasites and vectors, methods of prevention and elimination of parasitic diseases
1.3	to develop the ability and practical skills of working with electronic media of medical and biological information, information sites to solve medical and preventive problems. Developing the ability to use various kinds of reference materials and manuals needed to solve practical problems necessary for doctors

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	Histology
2.2.2	Epidemiology
2.2.3	Immunology
2.2.4	Pathophysiology, clinical pathophysiology
2.2.5	General hygiene
2.2.6	Dermatovenereology
2.2.7	Zymotic diseases
2.2.8	Phthisiology
2.2.9	Forensic medicine
2.2.10	Anesthesiology, resuscitation and intensive care
2.2.11	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 of morphology and development of parasitic animals and their vectors
Level 2	the main scientific - medical and biological features of the development of parasitic animals and their vectors
Level 3	basic methods of comparative analysis of parasitic animals and their vectors
Ability:	
Level 1	to identify morphological features of parasitic animals and their vectors
Level 2	to identify individual representatives of parasitic animals on microslides, photographs
Level 3	to choose appropriate methods of comparative analysis in the study of morphophysiology and development of representatives of individual systematic groups of parasitic animals and their vectors
Skills:	
Level 1	methods of determining species affiliation based on morphophysiological and anatomical features of parasitic animals and their carriers
Level 2	methods of independent work with reference, educational and scientific literature in the study of morphophysiology of parasitic animals and their carriers
Level 3	methods of working with scientific and educational portals, basic skills in using standard software for statistical processing of the results obtained
Final Students' Competences	
3.1	**Know:**

3.1.1	peculiarities of morphophysiology and development of representatives of individual systematic groups of parasitic animals and their carriers;
3.1.2	distinctive features of morphophysiology and development of representatives of individual systematic groups of parasitic animals and their carriers;
3.1.3	methods of comparative analysis in the study of morphophysiology and development of representatives of individual systematic groups of parasitic animals and their carriers понятие сигналов и характер их возникновения;
3.2	**Ability:**
3.2.1	diagnose pathogens of human parasitic diseases on the microslides and photos;
3.2.2	to distinguish features of morphophysiology and development of representatives of separate systematic groups of parasitic animals and their carriers;
3.2.3	to determine the morphophysiology and development features of representatives of individual systematic groups of parasitic animals and their carriers;
3.2.4	choose appropriate methods of comparative analysis in the identification of individual representatives of parasitic animals and their carriers;
3.2.5	use modern computers to process medical information
3.3	**Skills:**
3.3.1	methods of determining species affiliation based on morphophysiological and anatomy features of parasitic animals and their carriers;
3.3.2	methods of comparative analysis in the study of morphophysiology and development of representatives of individual systematic groups of parasitic animals and their carriers;
3.3.3	modern methods of computer processing of medical information

4. COURSE (MODULE) STRUCTURE AND CONTENT

Class Code	Subject Name /Type of Class/	Semester / Academic Year	Hours	Competencies	Literature	Interactive Sessions	Notes
	Section 1. Medical parasitology: helminthology						
1.1	Phylum Flatworms (Platyhelminthes), Class Trematoda (Flukes) - 1. Liver, Cat and Chinese flukes (Pr)	2	2	IC-l	L1.4 L2.1, L2.2, L2.3	0	
1.2	Phylum Flatworms (Platyhelminthes), Class Trematoda (Flukes) - 2. Lancet, Pulmonary and Blood flukes (Pr)	2	2	IC-l	L1.4 L2.1, L2.2, L2.3	0	to solve case tasks
1.3	Phylum Flatworms (Platyhelminthes), Class Tapeworms (Cestodea) - 1. The Pork and Beef tape worms (Pr)	2	2	IC-l	L1.4 L2.1, L2.2, L2.3	0	
1.4	Class Tapeworms (Cestodea) - 2. Dog tapeworm (Echinococcus sp.), Dwarf tapeworm, Broadfish tapeworm (Pr)	2	2	IC-l	L1.4 L2.1, L2.2, L2.3	0	to solve case tasks
1.5	Phylum Roundworms (Nemathelminthes), Class Roundworms (Nematoda) - 1. Ascaris, Pinworm, Human Whipworm (Pr)	2	2	IC-l	L1.4 L2.1, L2.2, L2.3	0	
1.6	Phylum Roundworms (Nemathelminthes), Class Roundworms (Nematoda) - 2. Human Hookworms, Trichinosis (Pr)	2	2	IC-l	L1.4 L2.1, L2.2, L2.3	0	Business game on the subject “Ways of helminth infection” or “Doctor-patient”, “Concilium”

1.7	Phylum Roundworms (Nemathelminthes), Class Roundworms (Nematoda) – 3. Guinea worm, Lymphatic filariasis (Pr)	2	2	IC-l	L1.4 L2.1, L2.2, L2.3		
1.8	Evaluation module work on the subject: “Medical helminthology” (Pr)	2	2	IC-l	L1.4 L2.1, L2.2, L2.3	0	
1.9	The phenomenon of parasitism (SIW)	2	3	IC-l	L1.4 L2.1, L2.2, L2.3	0	
1.10	Diagnostic characteristics of parasites (SIW)	2	10	IC-l	L1.4 L2.1, L2.2, L2.3	0	
1.11	Phylogenesis of systems and organs (Lect)	2	4	IC-l	L1.1, L1.2, L1.3	0	
1.12	Phylogenesis of systems and organs (SIW)	2	6	IC-l	L1.1, L1.2, L1.3	0	
	Section 2. Medical parasitology: arachno-entomology						
2.1	Phylum Arthropoda, Class Crustacea and Class Arachnids, Order Spiders and Scorpions (Pr)	2	2	IC-l	L1.1, L1.2, L1.3, L1.4 L2.1, L2.2, L2.3	0	
2.2	Class Arachnids, Order Mites, Family Ticks, Family Argasides, Family Acariformes (Pr)	2	2	IC-l	L1.1, L1.2, L1.3, L1.4 L2.1, L2.2, L2.3	0	to solve case tasks
2.3	The phenomenon of parasitism. Mites (SIW).	2	4	IC-l	L1.4 L2.1, L2.2, L2.3	0	
2.4	Class Insecta - 1. Order Cockroach, Order Lice, Order Fleas, Order Hemiptera (Pr)	2	2	IC-l	L1.1, L1.2, L1.3, L1.4 L2.1, L2.2, L2.3	0	
2.5	Class Insecta - 2. Order Diptera: mosquito (Pr)	2	2	IC-l	L1.1, L1.2, L1.3, L1.4 L2.1, L2.2, L2.3	0	
2.6.	Mosquitoes as vector of transmissible diseases (SIW)	2	4	IC-l	L1.1, L1.2, L1.3, L1.4 L2.1, L2.2, L2.3	0	
2.7	Class Insecta 2. Order Diptera 2: flies (housefly, Wolfart fly, Tsetse fly) and Sandfly (Pr)	2	2	IC-l	L1.1, L1.2, L1.3, L1.4 L2.1, L2.2, L2.3	0	
2.8	Arthropods - vectors and pathogens of human diseases (SIW).	2	3,7	IC-l	L1.4 L2.1, L2.2, L2.3	0	
2.9	Evaluation test on the subject: “Medical Archaeoentomology” (Pr)	2	2	IC-l	L1.1, L1.2, L1.3, L1.4 L2.1, L2.2, L2.3	0	
2.10	Basics of Human ecology (Lect)	2	2	IC-l	L1.1, L1.2, L1.3	0	

2.11	Problems of environment protection (Lect)	2	4	IC-l	L1.1, L1.2, L1.3	0	Students Conference on environmental pollution
2.12	Problems of environment pollution (SIW)	2	4	IC-l	L1.1, L1.2, L1.3	0	
2.13	Credit	2	0			0	

5. ASSESSMENT FUND

5.1. Advancement Questions and Assignments

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

Know:

- general patterns of direction and factors of evolution to explain the adaptive nature of parasitism;
- diversity of biotic relationships and history of study;
- the prevalence of parasitism and the basis of various types of reproduction of parasites;
- ways of origin of parasitism, anthroponoses, zoonoses;
- habitat of the parasite - a living organism, key adaptations to the environment by parasites;
- pathogenicity of parasites, biohelminth, geohelminth;
- system "parasite - host", types of hosts (basic, intermediate) and adaptation of parasites to the body of the main, intermediate and reservoir hosts;
- the concepts of "occurrence", "index of occurrence", "affection", "abundance", "abundance index", "parasitic load";
- life cycles of the most common groups of parasitic organisms (round and flat worms, arthropods), simple and complex life cycles, comparison of the life cycles of different parasitic organisms.
- ways of penetration of parasites into the host organism;
- morphophysiological adaptations to existence on the surface of the host body, inside its cells, tissues and cavities;
- functional morphology of parasites: size, body shape, organs of attachment. Anatomy of parasites in relation to parasitism;
- principles of nutrition, respiration, reproduction, fertility, longevity;
- adaptation to the spread of the parasite and to the release of invasive stages from the host organism;
- patterns of population ecology, processes of development and functioning of ecosystems and the biosphere as a whole for planning strategies for human existence in the biosphere, as well as for organizing preventive measures and medical care for the population.

Ability:

- general patterns, directions and factors of evolution to explain the adaptive principles of parasitism;
- compare the features of the structure and functioning of different groups of parasites and their adaptation to the human body;
- determine the helminth on microphotographs, micropreparations;
- comparison of different groups of parasites, their adaptation to parasitism and life cycles;
- establishing a sequence of ecological and evolutionary processes, phenomena of parasitism and bioecological habits;
- 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 microscope;
- to identify human parasite on microslide and photos;
- to work with text, drawings, tables, models;
- to solve typical tasks on parasitology;
- use of information resources of Internet sites and sites of official scientific publications;
- useful protocols of parasitic laboratories.

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 problem. 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.

Case problem. A patient has fever, enlarged spleen and liver. It was established, reduction of red blood cells content. Microscopic examination of breast punctuates smears revealed that there is a great number of small nonflagellate parasites in the bone marrow cells. The core is located in cytoplasm. Rod-like kinetoplast is obvious. In parasite cultivation, the artificial medium doesn't turn into flagellant form. Which disease can be supposed in this case?
Standard answer. Visceral leishmaniasis.

Case problem. Patient in the age of 28 years old complains for pain in liver, nausea. According to the medical history in the acute disease phase, he had temperature increase, sharp pain in abdomen, suffocating feeling and respiratory difficulty. On examination of feces, oval eggs with size of 150 × 90 micron with caps are revealed. What is the diagnosis?
Standard answer. Fascioliasis.

Case problem. A patient has periodic febrile attacks and inflammations in the respiratory system. According to the medical history it is known that the patient likes to go mountains for several days sleeping in abandoned mud houses near caves and holes of rodents. What is the specific name of parasite and who is its carrier? What is the diagnosis?
Standard answer. Ornithodoros papillipes.

Solution of case tasks provide the formation of professional thinking which allows you to solve the following problems: 1) mastering the skills of situation analysis; 2) surgical decision-making; 3) be able to use additional information to clarify the initial situation; 4) decide on your own; 5) get experience from your own or others' mistakes.

The main actions when working with situational tasks allow: 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 a solution solution, evaluating and predicting solution options, presenting a solution to a situational problem (written or oral form), participation in a general discussion, receiving assessments and its comprehension.

Credit on diagnostics of parasitic microslides includes 19 slides on helminthology and 23 – on arachno-entomology.

Reference answer. Total microslide of liver fluke (Fasciola hepatica)
Diagnostic character:
1. Body foliated.
2. Length 3-5, width – 0,8–1,2 sm.
3. Two suckers: oral and ventral.
4. Two branches of the intestine – right and left with numerous lateral branches.
5. Uterus branched, egg-filled yellowish-brown.
6. Two branching testes.
7. Branched ovary is located behind and on the right side of the uterus.
8. Numerous vitelline glands are located on the sides.

Reference answer. Total microslide of pubic louse (Phtirus pubis)
Diagnostic character:
1. Body short, broad, trapezoidal, merged, the widest part of the body is chest.
2. Female size - 1,5 mm, male 1,0 mm.
3. Head is big, the eyes lie at the base of the antennae.
4. There are warty growths with long hair on abdominal sides.
5. Legs aren't the same size: more developed is third pair of legs with large claws on the legs; claws bent helically.
6. There are spiracles on the sides of breasts.
7. Females are different from males by bifurcated posterior end of abdomen, the angle between them is blunt.
8. Typhoid vectors, cause skin irritation, itch, scratch, pruritus.

The practical classes on biology have been filling "Workbook for drawings" for Medical parasitology course. Workbook has 120 drawings on all thematic sections of subject of biology.

List of microslides on medical helminthology for credit

1. Total microslide of Liver fluke (Fasciola hepatica).
2. Digestive system of the Liver fluke (Fasciola hepatica).
3. Excretory system of the Liver fluke (Fasciola hepatica).
4. Total microslide of Cat fluke (Opistorchis felineus).
5. Total microslide of Lancet fluke (Dicrocoelium lanceatum).
6. Total micropreparation of female and male schistosomes (Shistosoma sp.)
7. Total microslide of Hookworm (Ancylostoma duodenale) and Necator (Necator americanus).
8. Gravid proglottid of the Pork tapeworm (Taenia solium).
9. Mature proglottid of the Pork tapeworm (Taenia solium).
10. Gravid proglottid of Bovine tapeworm (Taeniarhynchus saginatus).
11. Mature proglottid of the Bovine tapeworm (Taeniarhynchus saginatus).
12. Cysticerci with head evaginated of the Pork tapeworm (Taenia solium).
13. Total microslide of Echinococcus (Echinococcus granulosus, E. multilacularis).
14. Total microslide of Dwarf tapeworm (Hymenolepis nana).
15. Mature proglottid of Broadfish tapeworm (Diphyllobotrium latum).
16. Cross section of Ascaris (Ascaris lumbricoides).
17. Total microslide of male and female of human Whipworm (Trichocephalus trichiurus).
18. Encicysted larvae of Porkworm (Trichinella spiralis) in straited muscles
19. Total microslide of male and female of Pinworm (Enterobius vermicularis).

Questions for answering to the identification of a microslide "Medical helminthology"

1. Name of parasite (microslide);
2. Helminthes systematic position (Phylum, Class, Order) in English and Latin;
3. Disease name;
4. Diagnostic signs of the microslide;
5. Place of Helminth localized in the human body;
6. Life cycle stages (in series);
7. Hosts of helminth: a) the definitive host, b) intermediate; c) reservoir; d) vector.
8. Invasive stage for humans;
9. Partway of infection to the person;
10. Pathogenic effect on human body (symptoms);
11. Laboratory examination;
12. Prevention.

List of microslides on medical arachno-entomology

1. Larva and nymph of Taiga tick (Ixodes persulcatus);
2. Total microslide of Taiga tick (Ixodes persulcatus);
3. Total microslide of Dog tick (Ixodes ricinus);
4. Total microslide of Township mite (Ornithodorus papillipes);
5. Larva of Township mite (Ornithodorus papillipes) and nymph of Ixodes sp.;
6. Total microslide of Dermacentor pictus;
7. Mouthparts of Taiga tick (Ixodes persulcatus);
8. Mouthparts of Black beetle (Blatella germanica);
9. Total microslide of head lice (Pediculus humanus capitis);
10. Total microslide of body lice (P. humanus humanus);
11. Total microslide of pubis lice (Phtirus pubis);
12. Total microslide of human fleas (Pulex irritans);
13. Head of male and female of genus Anopheles;
14. Head of male and female of genus Culex;
15. Eggs, larva and pupa of genus Anopheles;
16. Eggs, larva and pupa of genus Culex;
17. The wings of Anopheles and Culex;
18. The mosquito (Culex pipiens pipiens);
19. The mail of Anopheles maculipenni;
20. Walking legs of the housefly (Musca domestica);
21. Mouthparts of the housefly (Musca domestica);
22. Total microslide of Bed bug (Cimex lectularius);
23. Mouthparts of the Bed bug (Cimex lectularius).

Questions for answering to the identification of a microslide "Medical arachno-entomology"

1. Name of arthropod;
2. Diagnostic characteristic of the arthropod;
3. Systematic position (Phylum, Class, Order) in English and Latin;
4. Special characteristics of imago external structure: a) the body is segmented on, every segment has what? b) number of

pairs of limbs, c) kind of mouthparts, d) wings presence or not;
5. Kind of postembryonic development (direct, indirect), metamorphosis (full, incomplete);
6. Medical significance;
7. Vector of what diseases is?
8. Prevention or control measures.

There are some tasks on student self-training which have been developed for students for preparation of credit on medical parasitology. Students should fill these tasks themselves.

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 1.

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.

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	
6.3. List of Information and Education Technologies			
6.3.1 Competence-based Educational Technologies			
6.3.1.1.	Traditional educational technologies are used for the organization discipline's study, targeted at giving knowledge and means of action, transmitted to the students in a completed form. Lecture material is given to the students with usage of multimedia equipment. Explanatory – illustrative lecture lessons, explanatory – awareness practical trainings refer to the traditional educational technologies.		
6.3.1.2.	Information educational technologies it is: classes in an interactive form, makes systematic thinking and ability to generate ideas in solve different case tasks. In accordance with the requirements of the State Education Standards of Higher Professional Education for students trained for specialty 560001 of KG in the educational process widely used active and interactive forms of learning: conversations, case studies, developing training, explanatory-illustrative training, business games and role-playing games, lectures with elements of discussion, is not less than 50% from classroom activities. Information educational technologies include 5 business games which are controlled in the form of doing 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».

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.

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 parasitology»

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					
Medical helminthology	Formative assessment	Activity; attendance; participation in students' research work. Self-preparation for theoretical issues; homework (description, drawings of the anatomy and parasite development cycles); preparation for practical classes. To solve case tasks. Preparation to interim assessment (theoretical issues).	5	10	
	Midterm examination	Test on the topic: «Medical helminthology». Identification of the parasite in a photograph or microslide. Theoretical question.	15	25	31
Module 2					
Medical entomology	Formative assessment	Activity; attendance; participation in students research work. Self-preparation to theoretical issues; to do homework (description, drawings of the anatomy and parasites development cycles); preparation to practical classes. Solution of case tasks. Preparation for midpoint assessment (theoretical issues).	5	10	
	Midterm examination	Test on the topic: «Medical entomology ». Identification of the parasite in a photograph or microslide. Theoretical question.	15	25	37
TOTAL for semester			**40**	**70**	
Mindpoint assessment (credit)			**20**	**30**	**40**
Mindpoint assessment (exam)					
Summarative assessment			**60**	**100**	

Attachment 2

II semester

Questions to mid-term control 1

1. Natural focal, transmissible helminthosis, methods of prophylaxis.
2. Medical significance of parasitic worms.
3. Basic definitions: definitive host, intermediate host, reservoir, vector,
4. Concept of biohelminths, geohelminths and contact helminths.
5. Main methods of helminthosis control.
6. Concept of dehelminthization and principle of devastation.
7. Detection and identification of helminth ova, main methods.
8. Diagnostic differences of helminth ova structure in human.

Phylum Flatworms (*PLATHELMINTHES*)

1.Type general characteristics.
2. Origin of fluke parasitism, adaptation to the host and strategy of parasite development.
3. Characteristics of Class Trematodea.
4. Characteristic of Class Cestodea.

Class *Trematoda*

1. Diagnostic characteristic of the Class *Trematoda* – adult worm and larva stages for identification on the microslides and on the diagrams. Common helminth development strategy.
2. Liver fluke (*Fasciola hepatica*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
3. Cat fluke (*Opistorchis felineus*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
4. Chinese fluke (*Clonorchis sinensis*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
5. Lancet fluke (*Dicrocaelium lanceatum*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
6. Pulmonary fluke (*Paragonimus westermani*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.

7. Blood flukes. Intestinal schistosomiasis: (*Shistosoma mansoni, S. japonicum*), urogenital schistosomiasis (*S. haematobium*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.

Class *Cestodea*

1. Diagnostic characteristic of the Class *Cestodea* – adult worm and larva stages for identification on the microslides and on the diagrams. Common helminth development strategy.
2. Pork tapeworm (*Taenia solium*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
3. Human cysticercosis (*Taenia solium*), larva stage anatomy, place localization in a human body, parasite life cycle, pathway of infection, medical examination, parasite prevention and control. Phenomenon of an auto invasion.
4. Beef tapeworm (*Taeniarhynchus saginatus*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite. Phenome of the transit eggs.
5. Dog tapeworm (*Echinococcus granulosus*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
6. Alveolar tapeworm (*E. multilocularis*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
7. Dwarf tapeworm (*Hymenolepis nana*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
8. Broad tapeworm (*Diphyllobotrium latum*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, parasite life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.

Phylum Roundworms (*Nematelminthes*)

1. Significance from the point of view of medical parasitology.
2. Type characteristics on the example of class roundworms.
3. Reproduction strategy of individual representatives of the class roundworms.

Class *Nematoda*

1. Diagnostic characteristic of the Class *Nematoda* – adult worm and larva stages for identification on the microslides and on the diagrams. Common helminth development strategy.
2. Ascaris (*Ascaris lumbricoides*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
3. Pinworm (*Enterobius vermicularis*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
4. Whipworm (*Trichuris trichiura*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
5. Hookworm (*Ancylostoma duodenale*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
6. Necator (*Necator americanus*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
7. Trichinella (*Trichinella spiralis*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
8. Guinea worm (*Dracunculus medinensis*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.
9. Lymphatic filariasis (*Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*). Name of diseases, parasite geographical distribution, parasite anatomy, place of localization in a human body, life cycle, pathway of parasite in the human body, pathogenic effect on human, methods of laboratory examination, prevention and control of parasite.

Questions to Mid-term control 2

Phylum *Arthropoda*

1. Arthropods. General characteristics of the Phylum.
2. Progressive features of structure, classification.
3. Arthropod origin.
4. Medical significance of Arthropod.
5. Theory of natural focal diseases.
6. Obligate and facultative transmissional diseases.

Class *Crustaceans*

1. Gill-breathing subtype. General characteristics of Class *Crustaceans*.
2. Medical significance of Class *Crustaceans*.
3. Crayfish (*Potamobius astacus*). Systematic position, geographical distribution of animal, anatomy, life cycle, vector of what pathogen, identification, prevention of pathogen injury and measures of crayfish's control.
4. Cyclops (*Cyclopoidae*). Systematic position, geographical distribution of animal, anatomy, life cycle, vector of what pathogen, identification, prevention of pathogen injury and measures of cyclop's control.

Class *Arachnids*

1. General characteristics of Class *Arachnidae*.

Order *Scorpiones*

1. Scorpion. Animal geographical distribution, anatomy, life cycle, pathogenic effect on human, methods of laboratory examination, prevention and measures of scorpion's control.

Order *Spiders*

1. Spiders. Tarantula (*Lucosa sp.*) and southern black widow or simply black widow (*Latrodectus mactans*). Parasite geographical distribution, parasite anatomy, life cycle, pathogenic effect on human, methods of laboratory examination, prevention injury.

Order Mite or Tick (*Acarina*)

1. Morphological characteristics of the Order *Tick*.
2. Transovarial transmission of pathogen among of ticks, their different stages of development and hosts, its significance.
3. Ticks is the vectors of transmissible disease in human and animals.
4. Family Ixodes ticks (*Ixodidae*). Taiga tick (*Ixodes persulcatus*), Dog tick (*Ixodes ricinus*), Dermacentor (*Dermacentor pictus*) – systematic position, geographical distribution of animal, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of tick's control.
5. Family Argasids ticks (*Argasidae*). Township mite (*Ornithodorus papillipes*) – systematic position, geographical distribution of animal, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of township's control.
6. Family Acariform ticks (*Acariformes*). Scabies mite (*Sarcoptes scabiei*) – systematic position, geographical distribution of animal, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of scabies' control.

Class *Insecta*

1. General characteristics of the Class *Insecta*.
2. Development of insects, complete and incomplete metamorphosis.

3. Order Cockroaches (*Blattodea*). Black beetle (*Blatta orientalis Linnaeus*), German cockroach (*Blatella germanica*) and American cockroach (*Periplaneta americana*) – systematic position, geographical distribution of animal, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of cockroach's control.
4. Order Lice (*Anoplura*). Head lice (*Pediculus humanus capitis*), body lice (*P. humanus humanus*), pubis lice (*Phtirus pubis*) – systematic position, geographical distribution of animal, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of lice's control.
5. Order Fleas (*Aphaniptera*). Human fleas (*Pulex irritans*) – systematic position, geographical distribution of animal, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of flea's control.
6. Order Hemiptera. Bed bug (*Cimex lectularis*) – systematic position, geographical distribution of animal, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of bed bug's control.

Order *Diptera*

1. General characteristics of Order *Diptera*.
2. Diptera as mechanical carrier of human diseases.
3. Peculiarities of protection from Diptera.
4. Fly. House fly (*Musca domestica*), Volfart fly (*Wohlfahrtia magnifica*), Tsetse fly (*Glossina palpalis*). Fly's – systematic position, geographical distribution, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of fly's control.
5. Mosquitos. Features of the structure of the female *Anopheles* mosquito (*Anopheles maculipennis*), female *Culex* mosquito (*Culex pipiens*), female *Aedes* mosquito (*Aedes aegypti*). Mosquitos – systematic position, geographical distribution, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of mosquitos' control.
6. Gnat – Sandfly (*Phlebotomus papatasii*). Systematic position, geographical distribution, anatomy, life cycle, vector of what is pathogen, identification, prevention and measures of sandfly's control.

Attachment 3

Recommended minimum of drawings in the drawing notebook for delivery of modules on medical parasitology

II semester

The mid-term control 1

Trematoda general morphology and strategy of reproduction.
Liver fluke (Fasciola hepatica) – adult worm, egg and invasive larva morphology, worm live cycle.
Cat fluke (Opistorchis felineus) – adult worm, egg and invasive larva morphology, worm live cycle.
Chinese fluke (Clonorchis sinensis) – adult worm, egg and invasive larva morphology, worm live cycle.
Lancet fluke (Dicrocaelium lanceatum) – adult worm, egg and invasive larva morphology, worm live cycle.
Pulmonary fluke (Paragonimus westermani) – adult worm, egg and invasive larva morphology, worm live cycle.
Blood flukes. Schistosoma (*Shistosoma mansoni*, *S. japonicum*, *S. haematobium*) – adult worm, egg and invasive larva morphology, worm live cycle.

Cestoda general morphology and strategy of reproduction.
Pork tapeworm (*Taenia solium*) – adult worm, egg and invasive larva morphology, worm live cycle.
Beef tapeworm (*Taeniarhynchus saginatus*) – adult worm, egg and invasive larva morphology, worm live cycle.
Dog tapeworm (*Echinococcus granulosus*) – adult worm, egg and larva morphology, worm live cycle.
Alveolar tapeworm (*E. multilocularis*) – adult worm, egg and larva morphology, worm live cycle.
Dwarf tapeworm (*Hymenolepis nana*) – adult worm, egg and invasive larva morphology, worm live cycle.
Broad tapeworm (*Diphyllobotrium latum*) – adult worm, egg and invasive larva morphology, worm live cycle.

Nematoda general morphology and strategy of reproduction.
Ascaris (*Ascaris lumbricoides*) – adult worm, egg, worm live cycle.
Pinworm (*Enterobius vermicularis*) – adult worm, egg, worm live cycle.
Whipworm (*Trichuris trichiura*) – adult worm, egg, worm live cycle.
Hookworm (*Ancylostoma duodenale*) – adult worm, egg and invasive invasive larva morphology, worm live cycle.
Necator (*Necator americanus*) – adult worm, egg and invasive larva morphology, worm live cycle.

Trichinella (*Trichinella spiralis*) – adult worm, egg and invasive larva morphology, worm live cycle.
Guinea worm (*Dracunculus medinensis*) – adult worm, egg and invasive larva morphology, worm live cycle.
Lymphatic filariasis (*Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*) – adult worm, egg and invasive larva morphology, worm live cycle.

Total: 84 drawings

The mid-term control 2

Crayfish (*Potamobius astacus*) – morphology and live cycle.
Cyclops (*Cyclopoidae*) – morphology and live cycle.
Morphology of the Indian red scorpion (*Hottentotta tamulus*).
Taiga tick (*Ixodes persulcatus*) – morphology and live cycle.
Dog tick (*Ixodes ricinus*) – morphology and live cycle.
Dermacentor (*Dermacentor pictus*) – morphology and live cycle.
Township mite (*Ornithodorus papillipes*) – morphology and live cycle.
Scabies mite (*Sarcoptes scabiei*) – morphology and live cycle.
German cockroach (*Blatella germanica*) – morphology and live cycle.
Body lice (*P. humanus humanus*) – morphology and live cycle.
Pubis lice (*Phtirus pubis*) – morphology and live cycle.
Human fleas (*Pulex irritans*) – morphology and live cycle.
Bed bug (*Cimex lectularis*) – morphology and live cycle.
House fly (*Musca domestica*) – morphology and live cycle.
Mouth parts of Anopheles, Culex and Aedes.
Eggs of Anopheles, Culex and Aedes.
Wings of Anopheles, Culex and Aedes.
Larva of Anopheles, Culex and Aedes.
Pupa of Anopheles, Culex and Aedes.
Live cycle of Anopheles, Culex and Aedes.
Sandfly (*Phlebotomus papatasii*) – morphology and live cycle.

Total: 36 drawings

Attachment 4

Test control example

Variant …

1. Characteristic features of the flatworm type organization: a) three-layer structure; b) the presence of a skin-muscular sac; c) the absence of a body cavity; d) bilateral symmetry; e) flat shape; f) a + b + c + d + e.
2. The digestive system of flukes includes: a) mouth + muscular pharynx+ midgut+ hindgut; b) mouth + muscular pharynx + midgut; c) mouth + muscular pharynx + midgut + hepatopancreas.
3. Intermediate hosts of the feline fluke: a) man and mollusk; b) fish and shellfish; c) cat and shellfish; d) cat and small cattle.
4. To avoid infection with helminthiases, you must: a) follow the rules of personal hygiene; b) drink boiled water; c) eat washed vegetables and fruits; d) eat thermally processed foods; e) a + b + c + d.
5. Liver fluke belongs to the class: a) ciliary worms; b) flukes; c) tapeworms; d) roundworms proper; e) flatworms.
6. Organs of excretion of roundworms: a) excretory ducts; b) cervical skin glands and phagocytic cells; c) skin and phagocytic cells; d) absent.
7. Pig and bovine tapeworms used to be called tapeworms, which means “lonely” in French, since in the human intestine it parasitizes: a) only one individual; b) several individuals; c) both types; d) only one type.
8. Pork tapeworm reactions to possible diseases: a) teniarinhoz and cysticercosis; b) opisthorchiasis; c) paragonimiasis; d) taeniasis and cysticercosis.
9. Ways of human infection with schistosomiasis: a) fecal-oral route; b) when eating unwashed fruits and vegetables; c) when eating raw crustaceans; d) when eating raw fish; e) when swimming in a pond.
10. What are the differences between male roundworms and females: a) large body size; b) the anterior end is bent to the ventral side; c) the posterior end is bent to the ventral side; d) there is a bulb.
11. Laboratory diagnostics of ankylostomiasis by detention: a) eggs in faeces; b) mature segments in feces; c) larvae in the muscles; d) eggs in scrapings from the perianal folds; e) eggs in the urine.
12. Pinworm parasitizes in: a) bladder veins; b) blood; c) liver; d) lungs; e) small and large intestines.
13. Vlasoglav refers to: a) bio-; b) geo-; c) contact helminths.
14. A child who ate unwashed strawberries, after a week, coughs, and reveals signs of pneumonia. After 2.5 months. during laboratory analysis, helminth eggs were found in smears of feces: a) roundworms; b) pinworms; c) liver fluke; d) pork tapeworm; e) whiplash.
15. When feces of patients were found on helminth eggs, eggs of fasciola vulgaris were found. Is this enough to make a diagnosis of fascioliasis: a) no, these are transit eggs; b) yes?
16. Darwin's evolutionary theory.
17. Genetic polymorphism of natural population. genetic load.

Test control example 2

Variant …

1. Respiratory organs in lice: a) gills; b) lungs; c) trachea; d) coxal glands; e) a + b.

2. Throughout her life, the female body louse lays: a) 300; b) 100; c) 50; d) 400; e) 200 eggs.

3. Parts of the body characteristic of insects: a) head, chest, abdomen; b) cephalothorax and abdomen; c) cephalothorax, abdomen, tail; d) cephalothorax, abdomen and wings.

4. In insects, wings and legs are located on: a) the head; b) chest; c) abdomen; d) tail; e) cephalothorax.

5. Flies are mechanical carriers of more than 60 diseases, including: a) amoebiasis, helminthiases, tuberculosis; b) tuberculosis, typhoid and plague; c) typhus, tuberculosis, amoebiasis; d) relapsing and typhus.

6. All arachnids are characterized by: a) five pairs of legs and two pairs of whiskers; b) four pairs of legs and no pair of whiskers; c) division of the body into head and abdomen; d) subdivision of the body into head, thorax and abdomen.

7. It is known that in ticks, when blood is sucked, the intestine enters without much effort of the parasite. Moreover, the blood is in the stomach, without spoiling or clotting, for quite a long time. Adaptive signs of ticks that provide this process: a) a special structure of the middle intestine, from which blind outgrowths depart; b) the special structure of the body of the female, capable of stretching 100–200 times; c) the piercing-sucking apparatus of the female; d) a special structure of the legs; e) a + b + c.

8. Ancestors of arthropods: a) mollusks; b) roundworms; c) ancient polychaete annelids; d) oligochaete annelids; e) flatworms.

9. Body cavity of arthropods: a) primary (protocoel); b) secondary (as a whole); c) primary, filled with parenchyma; d) mixed (myxocel).

10. The ducts of the excretory system in cancer are located in: a) the tail; b) abdomen; c) head at the base of the antennae; d) cephalothorax; e) limbs.

11. During development with complete transformation, the insect goes through the following stages: a) egg + imago; b) egg + larva + pupa; c) egg + larva + pupa + adult; d) egg + larva + imago.

12. The causative agent of plague is transmitted through a bite: a) mosquitoes; b) lice; c) spiders; d) fleas; e) mosquitoes.

13. What are the distinguishing features in the structure of the larvae of malarial and non-malarial mosquitoes: a) the presence of a respiratory siphon; b) the absence of a respiratory siphon; c) the shape of the respiratory siphon; d) the number of stigmas; e) the structure of the screeds.

14. The stomach of a spider is called: a) chewing; b) sucking; c) filtering; d) varnishing; e) gnawing-sucking.

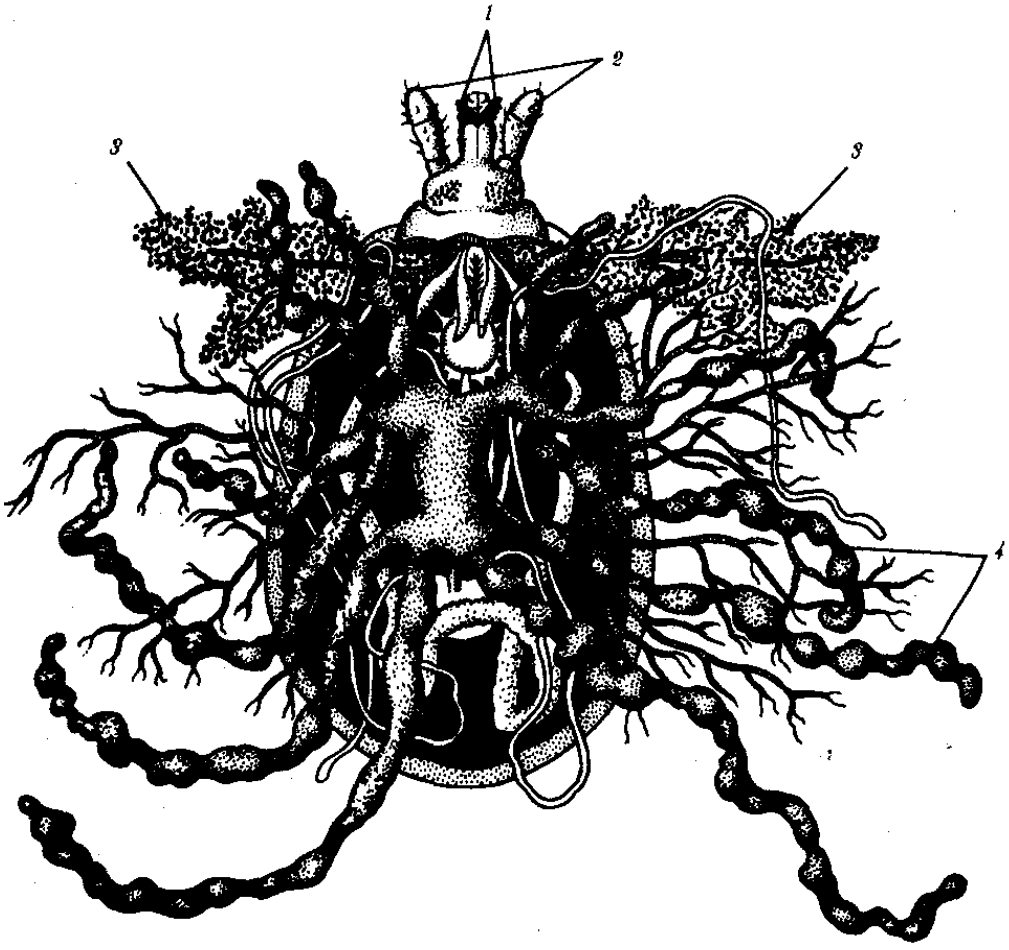
15. A group of scientists turned to the polyclinic, going on an expedition to the region of Eastern Siberia. Suggest possible doctor's tactics: a) you need to take a course of vaccination, take vaccines against taiga encephalitis with you; b) take vaccines against taiga encephalitis with you; c) you need to take a course of vaccination; d) do nothing.

16. Main directions of evolution.

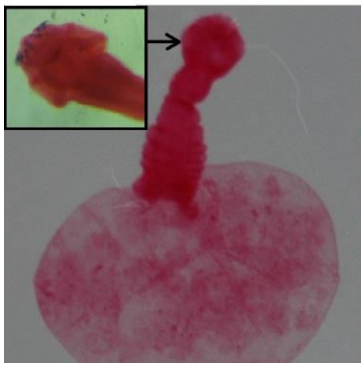
Intermediate control example

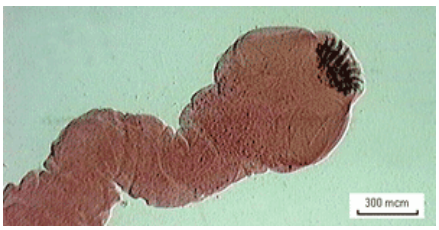
Fig. 1–2. Give the name of the micropreparation and describe the features

Test drawing 3.: Write the name of the drawing and symbols



Intermediate control example



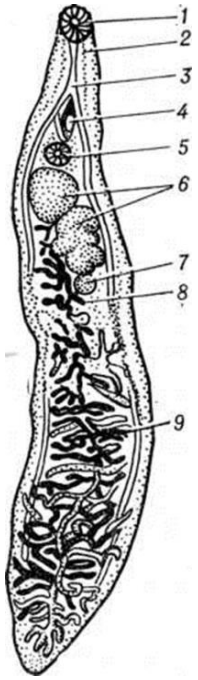


Name the parasite (English and Latin) _____
_____

Write the diagnostic features of the parasite

Write the name of the animal in the picture and its symbols _____
_____

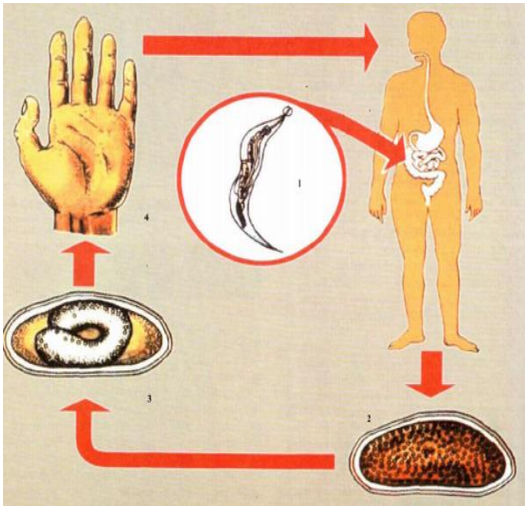
1.
2.
3.
4.
5.
6.
7.
8.
9.



Write whose life cycle it is?

_____

Specify the definitive host -



Specify intermediate host, if any (specify all) -

Vector -

Напишите обозначения жизненного цикла

1.
2.
3.
4.

Case study example

10. When examining the feces of a patient with intestinal disorders, eggs of the causative agent of intestinal schistosomiasis were found. The patient has recently returned from Africa. His wife worries if children can become infected with this helminthiasis? _____
a) Write the English and Latin name of the pathogen _____
_____
b) Can children get intestinal schistosomiasis from their father? _____
c) How does a person become infected with this helminthiasis? _____
_____

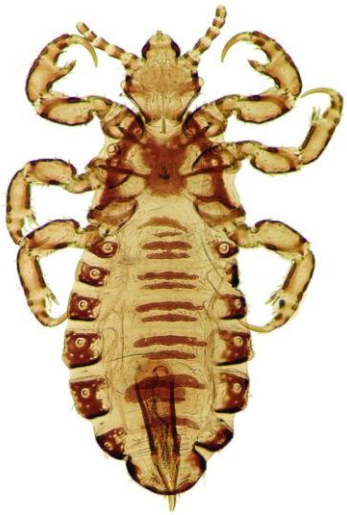
15. A 58-year-old man, a resident of the countryside, was delivered to the clinic with complaints of pain in the liver. The patient works as a shepherd. He is registered with a phthisiatrician for a closed form of pulmonary tuberculosis. Microscopic examination of the patient's feces revealed helminth eggs: small (38 × 45 μm), asymmetrical, yellow-brown in color, with a thick shell and lid.
a) What helminth eggs were found in the patient's feces? _____
Write its English and Latin name _____
_____
b) What is the name of the disease caused by this helminth? _____
c) Explain how infection might have occurred? _____
_____

20. During a mass scatological examination of schoolchildren, medium-sized helminth eggs were found in the faeces of two children. In one schoolboy, they had an oval shape, yellow-brown color, thick, bumpy shell; the other has lemon-shaped, yellowish-brown eggs, with colorless, transparent plugs at the poles.
a) Which helminth eggs were found in schoolchildren? _____
Write their Latin names _____
_____
b) What diseases are caused by these helminths? _____
c) Can other members of the team get infected from these children? _____

30. The nurse, when examining schoolchildren of the 7th grade, found scratches on the hands and elbows, sent them for examination.
a) What did the nurse suspect in children? _____
b) Did she do the right thing? _____
c) Who is the causative agent of this disease? _____
_____
d) Show the causative agent in the micrograph

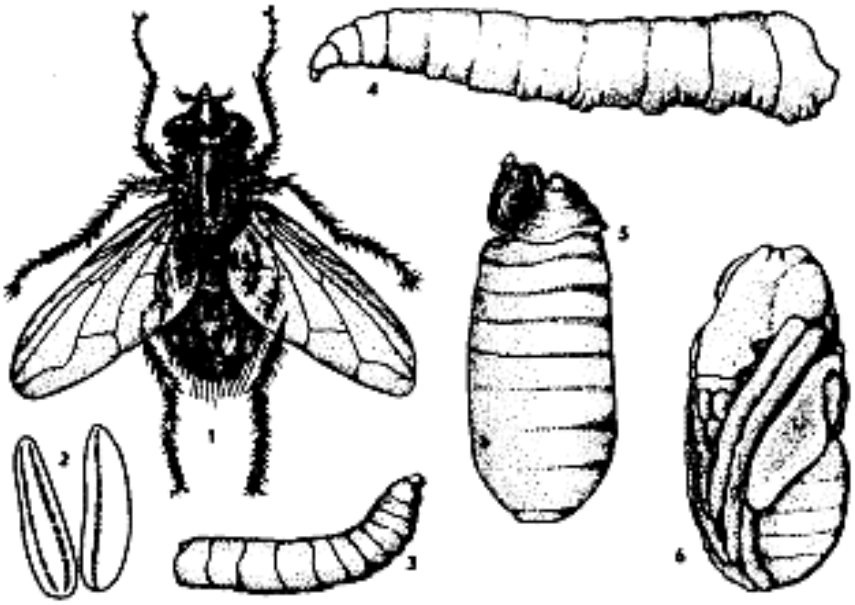
Modular control example

I. Describe the parasite



1. English and Latin name of parasite.
2. Systematic position (Type (Phylum), Class, Order, Species).
3. Disease name.
4. Geographical distribution.
5. Parasite morphology: shape, anatomy, cover, nutrition, reproduction. Which systems are absent?
6. Parasite life cycle: its main host, intermediate host.
7. Parasite localization in human body.
8. People become infected with parasite by ...
9. Parasite invasive stage for human.
10. Disease symptoms.
11. Diagnosis
12. Prevention and Control.

II. Whose life cycle is here, write notation



1 - , 2 - , 3 - , 4 - , 5 - , 6 - ?

Attachment 5

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

PHYLUM *ARTHROPODA*. CLASS *CRUSTACEA* AND CLASS *ARACHNIDA*

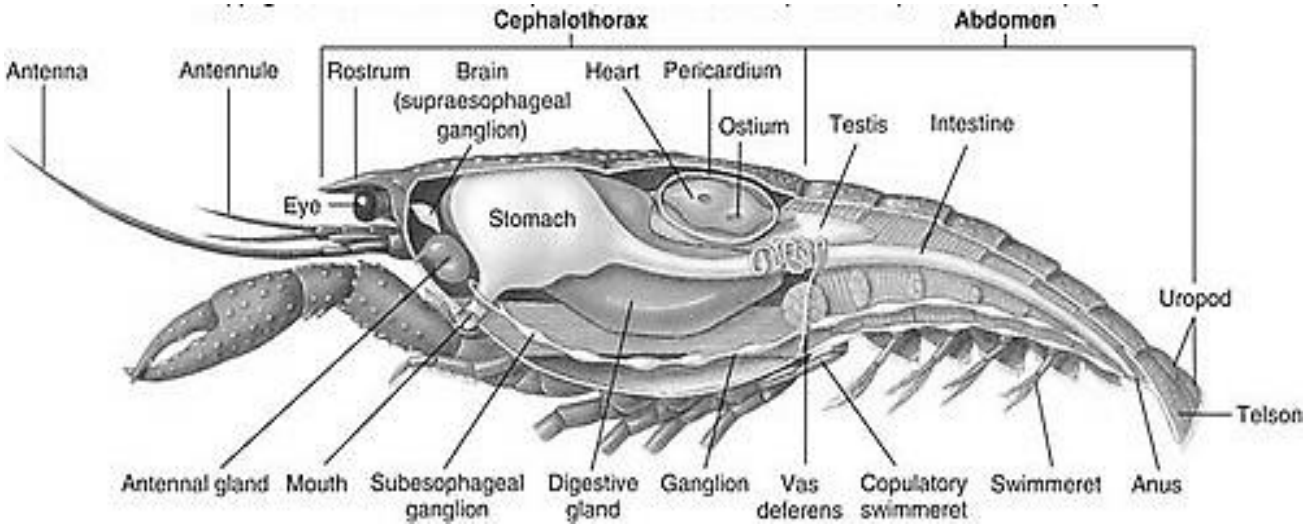


Fig. 186. Structure of crayfish.

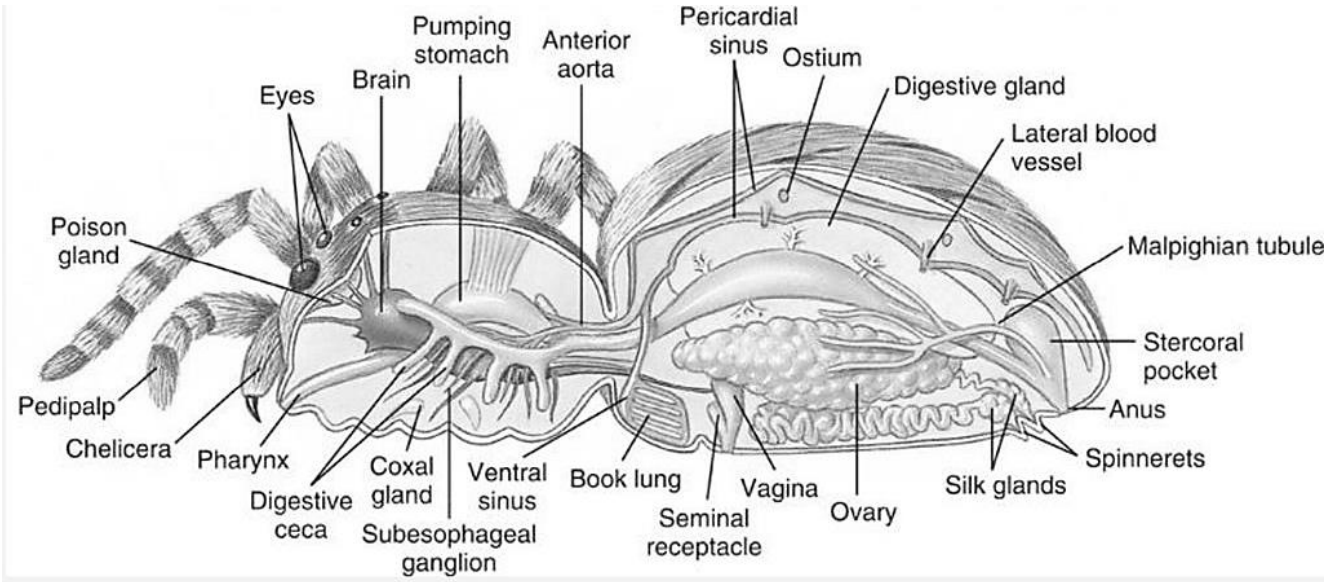


Fig. 187. Structure of spider.

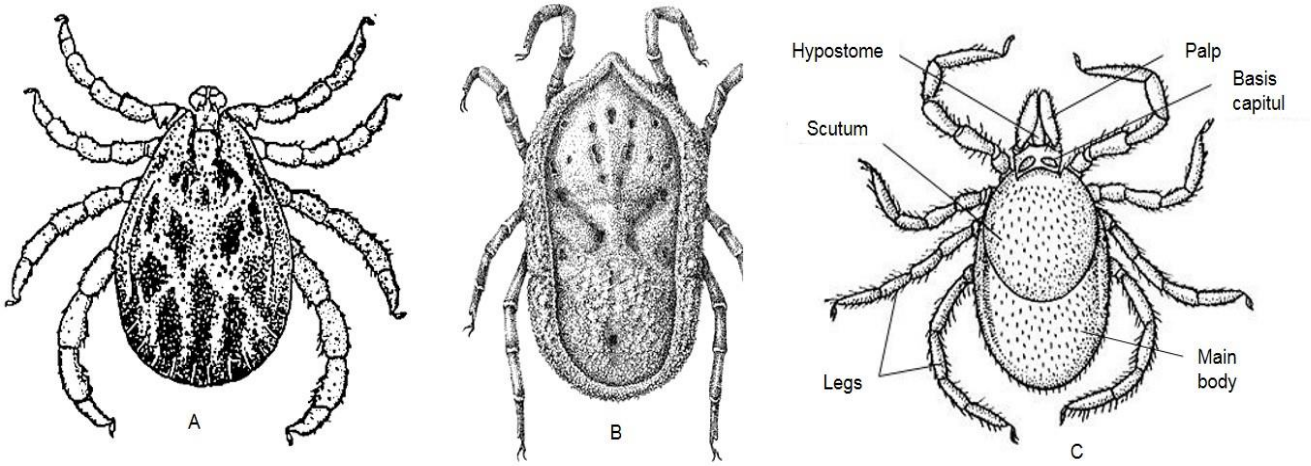


Fig. 188. Ticks**: A – Ornate cow tick (*Dermacentor pictus*); B – Soft tick (*Ornithodorus papillipes*); C – Taiga tick (*Ixodes persulcatus*).**

Attachment 6

En example of lesson

Lesson 1.
PHYLUM FLATWORMS (*PLATHELMINTHES*), CLASS FLUKES (*TREMATODA*). LIVER-FLUKE, CAT FLUKE AND CHINESE FLUKE.

THE PURPOSE: to study the specimens of Phylum Flatworms (*Plathelminthes*), Class Flukes (*Trematoda*): Liver-fluke, Cat fluke and Chinese fluke and to use this knowledge for the prophylaxis and diagnosis.

The tasks:

1. To study of characteristic signs of flukes (Liver, Cat and Chinese) which are typical for Phylum Flatworms (*Plathelminthes*), Class Flukes (*Trematoda*).
2. To be able to apply knowledge on the structure and life cycles of flukes (Liver, Cat and Chinese) for the differential diagnosis and prevention.

Self-study tasks. A student should know: a) general characteristics of Phylum Flatworms (*Plathelminthes*), b) characteristics of Class Flukes (*Trematoda*), c) structure (digestive, excretory, and reproductive) systems, life cycle (larval stage of development – miracidium, sporocyst, redia, cercariae, metacercariae) and marita, transit eggs, definitive and intermediate hosts, invasive stage and methods of laboratory diagnostics of flukes (liver, cat and Chinese), d) Latin name of Phylum, Class and species of animals, which mentioned above, name of the disease caused by them.

Theoretical questions

1. General characteristics of Phylum Flatworms (*Plathelminthes*).
2. General characteristics of Class Flukes (*Trematoda*).
3. Morphological features of the structure (morphology, anatomy, physiology), life cycle, ways of infection of human, pathogenic effect (symptoms), laboratory diagnostics of disease and prevention of the trematodes: a) Liver–fluke (*Fasciola hepatica*), b) Cat fluke (*Opistorchis felineus*), c) Chinese fluke (*Clonorchis sinensis*).

Independent work

Independently to study a theoretical material by the specified literature.

Equipment: microscopes, micro sides of helminths, a set of tables and diagrams.

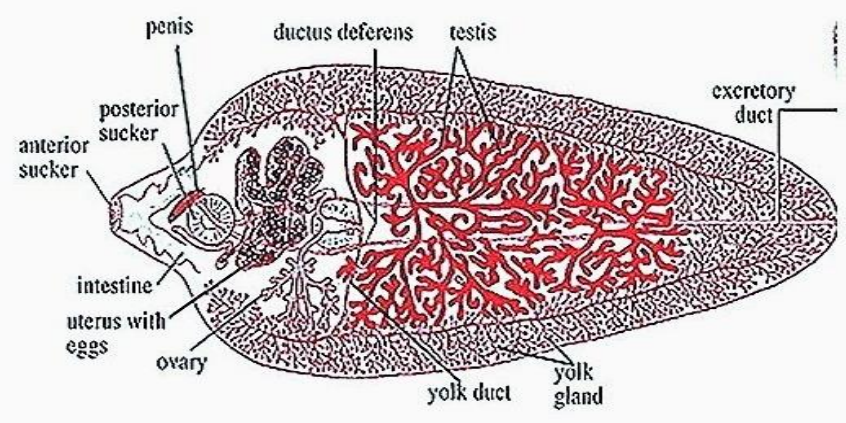
Independent practical work

WORK 1. Slide of the Liver fluke (*Fasciola hepatica*)

Fasciola is a flattened, pinkish, leaf-like, about 25-30 mm in length, 8–12 mm in wide. There are two cup-like suckers, an oral sucker on the anterior end around the mouth and a large ventral sucker on the ventral side, mouth in the middle of anterior sucker is muscular and suctorial, with short pharynx and esophagus. The intestine is bifurcated into two caeca and gives off numerous branches or diverticula.

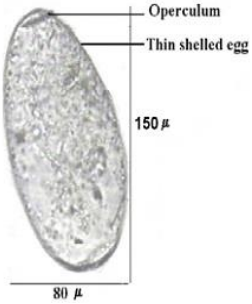
Male Reproductive System consists of testes, vasa deferentia, seminal vesicle, ejaculatory duct, cirrus or penis, prostate glands and genital atrium. Testes are two in number, one anterior and another posterior. They are connected to

seminal vesicle via two vasa deferentia which join to open into seminal vesicle. The genital atrium is a common chamber for male and female genital apertures.
Reproductive system of female consists of uterus, vitelline glands, Mehlis's glands, Laurer's canal, ovary, yolk gland. Uterus is connected to the yolk reservoir and opens by female genital aperture into the genital atrium. Vitelline glands are present on lateral sides and produce albumin, yolk and shell material for the eggs. open by means of minute ducts into a lateral longitudinal vitelline duct on each side that forms the yolk reservoir. The secretion of Mehlis's glands lubricates the eggs in the uterus. A Laurer's canal develops during breeding season that opens on the dorsal side and connects with the oviduct and serves as copulation canal. Reproductive system of male consists of testes, vasa deferentia, seminal vesicle, ejaculatory duct, cirrus or penis, prostate glands and genital atrium.



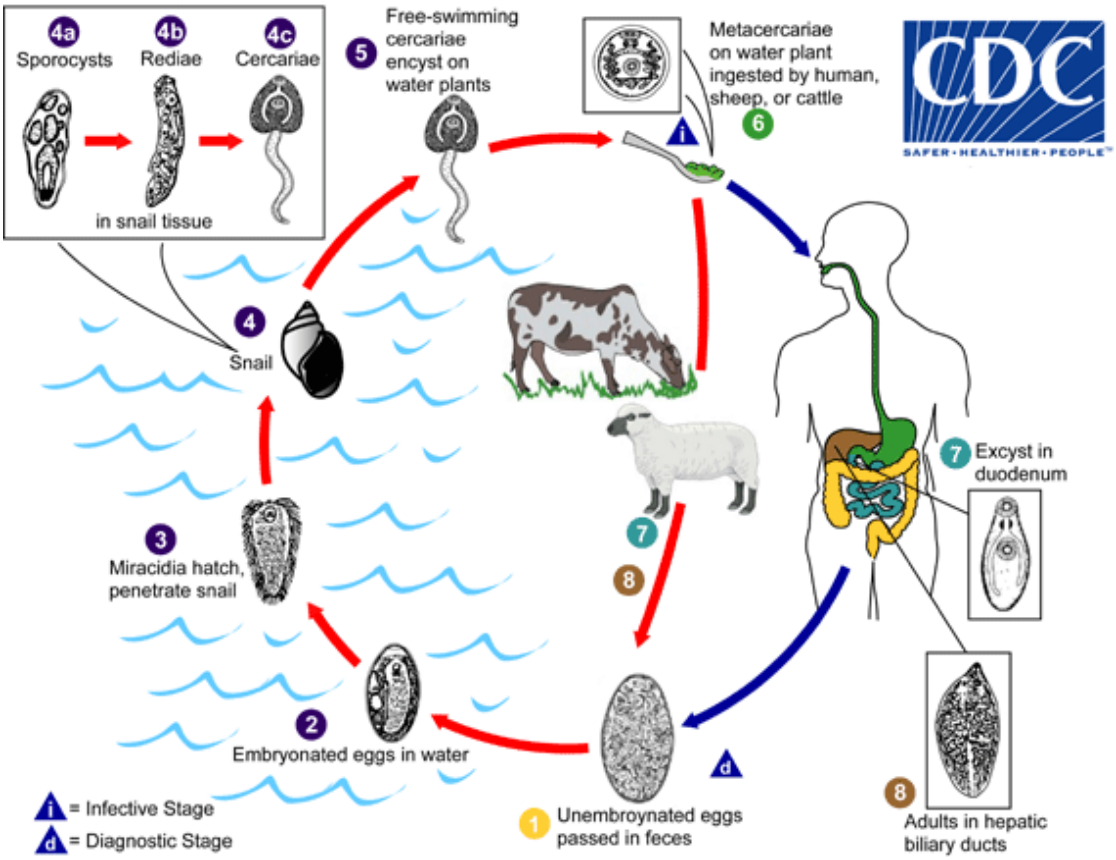
The excretory system is consisting of Flame cells, capillaries that join into the intracellular cavity, excretory ducts and median longitudinal excretory canal. At the posterior end a small excretory opening is present.

WORK 2. Slide of the eggs of Liver fluke (*Fasciola hepatica*)



The eggs are large (length 130-145 µm, width 70-90 µm, regular ellipse, thin shell), yellowish, oval body with a thin, short and straight/flat opercula. The egg shell contains an umbilicus-like invagination at its posterior end. The egg possesses a full matured miracidium. The ratio between the size of egg and the size of mother worm was not proportional.

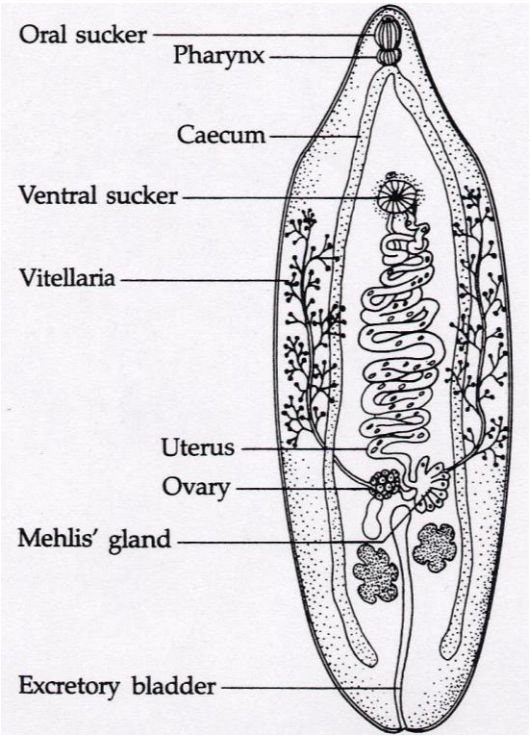
WORK 3. The life cycle of Liver fluke (*Fasciola hepatica*)



Fasciola parasites develop into adult flukes in the bile ducts of infected mammals, which pass immature *Fasciola* eggs in their feces. The next part of the life cycle occurs in freshwater. After several weeks, the eggs hatch, producing a parasite form known as the miracidium, which then infects a snail host. Under optimal conditions, the development process in the snail may be completed in 5 to 7 weeks; cercariae are then shed in the water around the snail. The cercariae lose their tails when they encyst as metacercariae (infective larvae) on water plants. In contrast to cercariae, metacercariae have a hard outer cyst wall and can survive for prolonged periods in wet environments.
Immature *Fasciola* **eggs** are discharged in the biliary ducts and in the stool 1. Eggs become embryonated in water 2, eggs release **miracidia** 3, which invade a suitable snail intermediate host 4, including the genera *Galba, Fossaria* and *Pseudosuccinea*. In the snail the parasites undergo several developmental stages (sporocysts 4a, rediae 4b, and cercariae 4c). The **cercariae** are released from the snail 5 and encyst as **metacercariae** on aquatic vegetation or other surfaces. Mammals acquire the infection by eating vegetation containing metacercariae. Humans can become infected by ingesting metacercariae-containing freshwater plants, especially watercress 6. After ingestion, the metacercariae excyst in the duodenum 7 and migrate through the intestinal wall, the peritoneal cavity, and the liver parenchyma into the biliary ducts, where they develop into adult **flukes** 8.

In humans, maturation from **metacercariae** into **adult flukes** takes approximately 3 to 4 months. The adult fluke *Fasciola hepatica*: up to 30 mm, reside in the large biliary ducts of the mammalian host, infect various animal species, mostly herbivores (plant-eating animals).

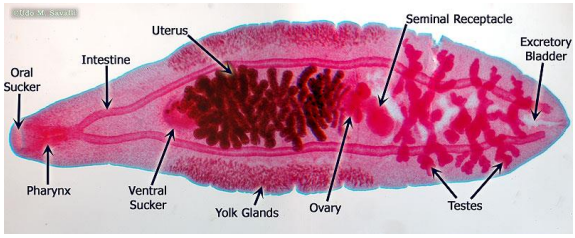
WORK 4. Slide of the Cat fluke (*Opistorchis felineus*)

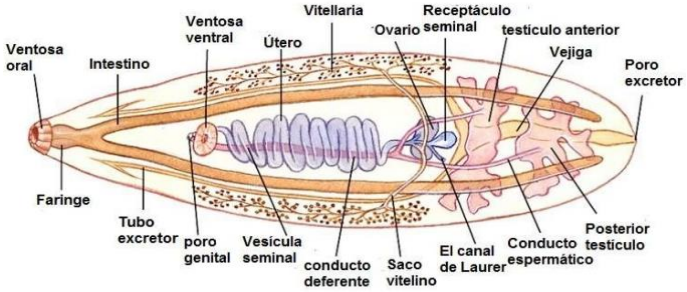


Write a description of the cat fluke using Work 1 as an example. Draw a parasite in to your drawing notebook, use the diagram on the left.

WORK 5. Slide of the Chinese fluke (*Clonorchis sinensis*)

Write a description of the cat fluke using Work 1 as an example. Draw a parasite in to your drawing notebook, use the diagram below.





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