ЛД-16ИН

Federal State Budgetary Educational Institution of Higher Education
«North-Ossetia State Medical Academy»
of the Ministry of Healthcare of the Russian Federation
(FSBEI HE NOSMA MOH Russia)

Department of Biology and Histology

WORKBOOK

for practical classes and independent work

“PARASITOLOGY, GENETICS”

of discipline “biology”

the main professional educational program of higher education - specialty program in the specialty 31.05.01 General Medicine, approved in 31.08.2020

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PRACTICAL CLASS №1
GENERAL PROBLEMS OF PARASITOLOGY. CLASSIFICATION OF PARASITES

I. THE AIM:

1. To know the classification of parasites.
2. To study host–parasite coevolution
3. To acquire the practical knowledge of work with microscope.

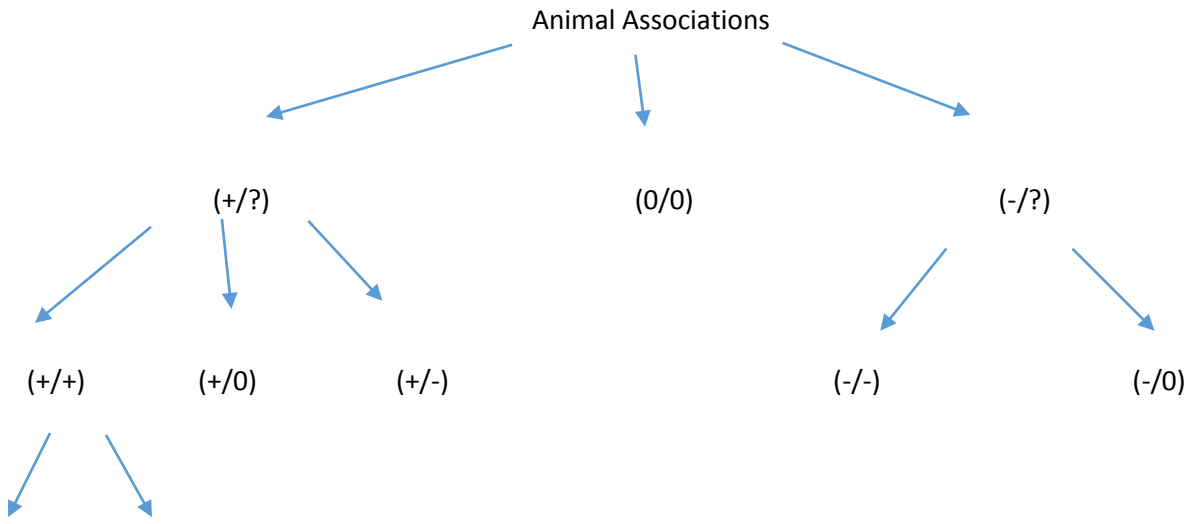
II. THE QUESTIONS FOR SELF-CONTROL.

1. **Animal Associations**
2. **Classification of parasites.**
3. **Classification of hosts.**
4. **Classification of vectors.**

Independent work

GENERAL PROBLEMS OF PARASITOLOGY.

Work 1. Fill out the diagram



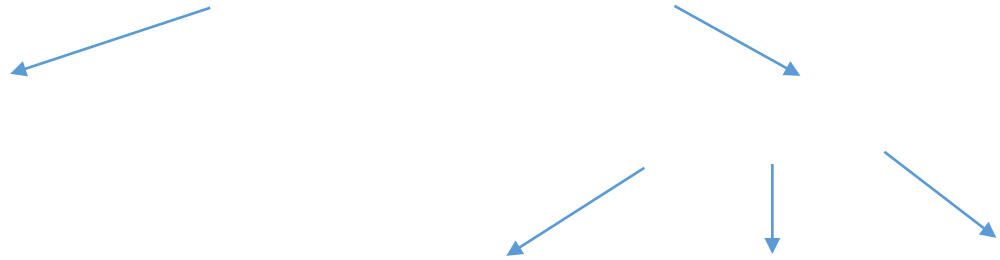
Work 2. Fill out the diagram and give the definition of each type

Classification of Parasites

in according to duration of parasitic stay

Classification of Parasites

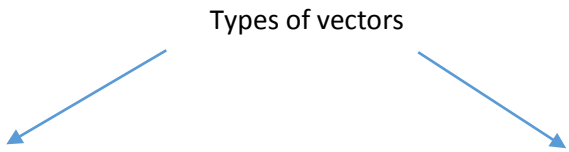
In according to location of parasites



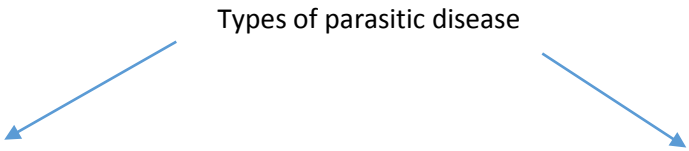
Work 3. Fill out the diagram and give the definition of each type

Types of Hosts

Work 4. Fill out the diagram and give the definition of each type



Work 4. Fill out the diagram and give the definition of each type



PRACTICAL CLASS №2
GENERAL PROBLEMS OF PARASITOLOGY. ADAPTATIONS TO PARASITISM

I. THE AIM:
1. To know the classification of parasites.
2. To study host–parasite coevolution
3. To acquire the practical knowledge of work with microscope.

II. THE QUESTIONS FOR SELF-CONTROL.
5. **Adaptations to parasitism.**
6. **Effects of the parasite on the host.**
7. **Effects of the host on the parasite.**
8. **Describe the main ways of infection with parasitic diseases.**

III. HOMEWORK: PROTOZOA. PHYLUM SARCOMASTIGOPHORA.

PRACTICAL CLASS №3
PROTOZOA. PHYLUM SARCOMASTIGOPHORA.

I. THE AIM:
1. To know the morphology, life cycles of Entamoeba histolytica.
2. To know symptoms, pathogenesis, laboratory diagnosis and prevention of amebiasis.

II. THE QUESTIONS FOR SELF-CONTROL:
1. **Entamoeba histolytica: morphology.**
2. **Entamoeba histolytica: life cycle.**
3. **Entamoeba histolytica: symptoms, pathogenesis**
4. **Entamoeba histolytica: laboratory diagnosis and prevention of amebiasis.**

III. INDEPENDENT WORK.

Work №1. Study of Entamoeba histolytica.

1) Draw the Entamoeba histolytica trophozoit, containing red blood cells and label:
   1 - cytoplasm;
   2 - nucleus;
   3 – erythrocytes.
2) Draw mature cyst of Entamoeba histolytica and label:
   1 – cyst wall;
   2 – nuclei.

IV. HOMEWORK: PROTOZOA. PHYLUM CILIOPHORA.
Markell and Voge's. Medical parasitology. Chapter 4. Page 79-96, 105. Chapter 5. Page 140-148. Page 163 (table).

PRACTICAL CLASS №4
PROTOZOA. PHYLUM SARCOMASTIGOPHORA. PHYLUM CILIOPHORA.

I. THE AIM:
1. To know the morphology, life cycles of Balantidium coli
2. To know symptoms, pathogenesis, laboratory diagnosis and prevention of balantidiasis.

II. THE QUESTIONS FOR SELF-CONTROL:
1. **Balantidium coli: morphology.**
2. **Balantidium coli: life cycle.**
3. **Balantidium coli: symptoms, pathogenesis**
4. **Balantidium coli: laboratory diagnosis and prevention of amebiasis.**

III. INDEPENDENT WORK.

Work №1. Study of Entamoeba histolytica.

3) Draw the Balantidium coli trophozoit and label:
   1 - cytoplasm;
   2 - macronucleus;
   3 – micronucleus
4) Draw mature cyst of 1. Balantidium coli and label:
   1 – cyst wall;
   2 – macronuclus
   3 - vacuoles

IV. HOMEWORK: PROTOZOA. PHYLUM APICOMPLEXA (SPOROZOA) . Plasmodium.
Markell and Voge's. Medical parasitology. Chapter 4. Page 79-96, 105.

PRACTICAL CLASS №5

PROTOZOA. PHYLUM APICOMPLEXA (SPOROZOA). PLASMODIUM

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Plasmodium vivax, Plasmodium ovale, Plasmodium malariae,
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of malaria.

1. To acquire the practical knowledge of work with microscope.

II. THE QUESTIONS FOR SELF-CONTROL.:

1. **Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, Plasmodium falciparum: differences, morphology, life cycle.**
2. **Symptoms, pathogenesis of malaria.**
3. **Laboratory diagnosis and prevention of malaria.**

III. INDEPENDENT WORK

Study of Plasmodium.

Draw Plasmodium inside the red blood cell (stages of ring and schizogony) and label:

1 – nucleus (nuclei);
2 – vacuole;
3 – cytoplasm of plasmodium;
4 – cytoplasm of erythrocyte.

RING FORM	STAGE OF SCHIZOGONY

IV. HOMEWORK: PROTOZOA. PHYLUM APICOMPLEXA (SPOROZOA). Toxoplasma gondii

Markell and Voge's. Medical parasitology. Chapter 5. Page 140-148. Page 163 (table).

PRACTICAL CLASS №6

PROTOZOA. PHYLUM APICOMPLEXA (SPOROZOA)

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Toxoplasma gondii.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of toxoplasmosis.

II. THE QUESTIONS FOR SELF-CONTROL.:

1. **Toxoplasma gondii: morphology, life cycle.**
2. **Symptoms, pathogenesis of toxoplasmosis.**
3. **Laboratory diagnosis and prevention of toxoplasmosis.**

III. INDEPENDENT WORK

Study of Toxoplasma gondii (x630).

Draw in your workbook Toxoplasma gondii trophozoit and label:

	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10 –

IV. HOMEWORK: PROTOZOA. PHYLUM SARCOMASTIGOPHORA . PROTOZOA. PHYLUM SARCOMASTIGOPHORA. GENUS GIARDIA. GENUS TRICHOMONAS. Markell and Voge's. Medical parasitology. Chapter 3. Page 48-59. Page 163 (table).

PRACTICAL CLASS №7
PROTOZOA. PHYLUM SARCOMASTIGOPHORA. GENUS GIARDIA. GENUS: TRICHOMONAS

I. THE AIM:
1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Giardia lamblia, Trichomonas hominis, Trichomonas vaginalis, Trichomonas tenax.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of giardiasis and trichomoniasis.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Giardia lamblia: morphology, life cycle. Symptoms, pathogenesis, laboratory diagnosis and prevention of giardiasis.**
2. **Trichomonas vaginalis: morphology, life cycle. Symptoms, pathogenesis, laboratory diagnosis and prevention of trichomoniasis.**
3. **Trichomonas hominis: morphology, life cycle.**
4. **Trichomonas tenax: morphology, life cycle.**

III. INDEPENDENT WORK.

Study of Giardia lamblia (x630).
Draw Giardia lamblia (trophozoite and cyst) and label:

1 – nuclei;
2 - flagella;
3 – basal bodies;
4 – ventral disc;
5 – median bodies
6 – axonemes

trophozoite	cyst

IV. HOMEWORK: PROTOZOA. PHYLUM SARCOMASTIGOPHORA. Leishmania tropica. Leishmania donovani. Trypanosoma brucei gambience, Trypanosoma brucei rhodesience, Trypanosoma cruzi
Markell and Voge's. Medical parasitology. Chapter 5. Page 107-108, 127-139. Page 163 (table).
Chapter 5. Page 107-127. Page 163 (table).

PRACTICAL CLASS №8
PROTOZOA. PHYLUM SARCOMASTIGOPHORA. GENUS LEUSHMANIA. GENUS TRYPANOSOMA.

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Leishmania tropica, Leishmania donovani.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of cutaneous leishmaniasis, mucocutaneous leishmaniasis visceral leishmaniasis.
4. To know the morphology, life cycles of Trypanosoma brucei gambience, Trypanosoma brucei rhodesience, Trypanosoma cruzi.
5. To know symptoms, pathogenesis, laboratory diagnosis and prevention of african trypanosomiasis, american trypanosomiasis.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Morphologic types in hemoflagellates: amastigote, promastigote, epimastigote, trypomastigote.**
2. **Leishmania tropica: morphology, life cycle. Symptoms, pathogenesis, laboratory diagnosis and prevention of cutaneous leishmaniasis.**
3. **Leishmania donovani: morphology, life cycle. Symptoms, pathogenesis, laboratory diagnosis and prevention of visceral leishmaniasis.**
4. **Trypanosoma brucei gambience, Trypanosoma brucei rhodesience: morphology, life cycle. Symptoms, pathogenesis, laboratory diagnosis and prevention of african trypanosomiasis.**
5. **Trypanosoma cruzi: morphology, life cycle. Symptoms, pathogenesis, laboratory diagnosis and prevention of american trypanosomiasis .**
6.

III. INDEPENDENT WORK.

Work №1. Fill in the table **"The main species of leishmania that cause human disease"**

	visceral leishmaniasis	cutaneous leishmaniasis	mucocutaneous leishmaniasis
Leishmania species			
Reservoir hosts			
Vectors			
Geographical distribution			

Location of parasites in Humans			
symptoms			
Laboratory diagnosis			

Work №2. Draw Leishmania donovani (amastigote) in bone marrow and label:

1 – nucleus;
2 – kinetoplast;
3 - megakaryocytes

Work №3. Fill in the table

	Gambian trypanosomiasis	Rhodesian trypanosomiasis	american trypanosomiasis
Trypanosoma species			
Geographical distribution			
Reservoir hosts			
Vector .			

Location of parasites in Humans			
symptoms			
Laboratory diagnosis			

Work №4

Study of Trypanosoma brucei (x630).

Draw Trypanosoma (trypomastigote) between red blood cells and label:

1 – nucleus;
2 - flagellum;
3 – kinetoplast;
4 – undulating membrane;
5 – erythrocytes.

IV. HOMEWORK: prepare to ROLE PLAY and to major test in PROTOZOOLOGY

PRACTICAL CLASS №9

ROLE PLAY “A DOCTOR&A PATIENT”

THE AIM:
Check the level of students 'assimilation of the material in the section « Protozoology» and practical skills.

PRACTICAL CLASS №10

MAJOR TEST IN PROTOZOOLOGY

I. THE AIM:
Check the level of students 'assimilation of the material in the section « Protozoology».

II. HOMEWORK: PHYLUM PLATYHELMINTHES .CLASS TREMATODA.

Markell and Voge’s. Medical parasitology. Chapter 6. Page 166-167, 178-181, 197-201. Page 204 (table).

PRACTICAL CLASS №11
PHYLUM PLATYHELMINTHES. CLASS TREMATODA. FASCIOLA HEPATICA, PARAGONIMUS WESTERMANI

I. THE AIM:
1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Fasciola hepatica, Paragonimus westermani.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of fascioliasis and paragonimiasis.

II. THE QUESTIONS FOR SELF-CONTROL:
1. **Fasciola hepatica: morphology, life cycle.**
2. **Symptoms, pathogenesis, laboratory diagnosis and prevention of fascioliasis.**
3. **Paragonimus westermani: morphology, life cycle.**
4. **Symptoms, pathogenesis, laboratory diagnosis and prevention of paragonimiasis.**

III. INDEPENDENT WORK.

Work №1. Study of Fasciola hepatica(x63).

1) Put the slide on the stage.
2) Examine the structure of Fasciola under low power magnification.
3) Draw Fasciola hepatica and label: 1 – oral sucker; 2 – ventral sucker; 3 – intestine; 4 – uterus; 5 – ovary; 6 – seminal receptacle; 7 – vitellaria; 8 – testes; 9 – seminal vesicle.

IV. HOMEWORK: PHYLUM PLATYHELMINTHES. CLASS TREMATODA. OPISTORCHIS FELINEUS. CLONORCHIS SINENSIS. DICROCOELIUM DENDRITICUM
Markell and Voge's. Medical parasitology. Chapter 6. Page 173-178, 181-197.

PRACTICAL CLASS №12
PHYLUM PLATYHELMINTHES. CLASS TREMATODA. OPISTORCHIS FELINEUS. CLONORCHIS SINENSIS. DICROCOELIUM DENDRITICUM. GENUS SCHISTOSOMA

I. THE AIM:
1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Schistosoma mansoni, Schistosoma japonicum, Schistosoma haematobium,. Opisthorchis felineus. Clonorchis sinensis. Dicrocoelium dendriticum
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of opisthorchosis, clonorchosis, schistosomiasis and dicrocoeliosis.

II. THE QUESTIONS FOR SELF-CONTROL:
1. **Opisthorchis felineus: morphology, life cycle.**
2. **Symptoms, pathogenesis, laboratory diagnosis and prevention of opisthorchosis.**
3. **Clonorchis sinensis: morphology, life cycle.**
4. **Symptoms, pathogenesis, laboratory diagnosis and prevention of clonorchosis**
5. **Schistosoma mansoni, Schistosoma japonicum, Schistosoma haematobium: morphology, life cycle.**
6. **Symptoms, pathogenesis, laboratory diagnosis and prevention of schistosomiasis.**
7. **Dicrocoelium dendriticum: morphology, life cycle.**
8. **Symptoms, pathogenesis, laboratory diagnosis and prevention of dicrocoeliosis.**

III. INDEPENDENT WORK.

Work №1. Study of Opisthorchis felineus (x63).

1) Put the slide on the stage.
2) Look for the Opisthorchis under low power magnification.
3) Draw Opisthorchis and label: 1 – oral sucker; 2 – ventral sucker; 3 – intestine; 4 – uterus; 5 – ovary; 6 – seminal receptacle; 7 – vitellaria; 8 – testes; 9 – seminal vesicle.

Work №2. Draw Schistosoma eggs

Schistosoma haematobium	Schistosoma mansoni	Schistosoma japonicum

IV. HOMEWORK: PHYLUM PLATYHELMINTHES. CLASS CESTODA. GENUS TAENIA. HYME-NOLEPIS NANA.

Markell and Voge's. Medical parasitology. Chapter 7. Page 207, 211-223, 233-235.

PRACTICAL CLASS №13

PHYLUM PLATYHELMINTHES. CLASS CESTODA. GENUS TAENIA. HYMENOLEPIS NANA

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Taenia saginata, Taenia solium, Hymenolepis nana.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of taeniasis, cysticercosis, hymenolepiasis.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Taenia saginata: morphology, life cycle.**
2. **Taenia solium: morphology, life cycle.**
3. **Symptoms, pathogenesis, laboratory diagnosis and prevention of taeniasis and cysticercosis.**
4. **Hymenolepis nana: morphology, life cycle.**
5. **Symptoms, pathogenesis, laboratory diagnosis and prevention of hymenolepiasis.**

III. INDEPENDENT WORK.

Work №1. Study of Taenia saginata gravid proglottid (x63).

1) Put the slide on the stage.
2) Examine the structure of Taenia saginata gravid proglottid under low power magnification.
3) Draw gravid proglottid and label: 1– central stem of uterus; 2– side branches of uterus.

Work №2. Study of Taenia solium gravid proglottid(x63).

1) Put the slide on the stage.
2) Examine the structure of Taenia solium gravid proglottid under low power magnification.
3) Draw gravid proglottid and label: 1– central stem of uterus;
2– side branches of uterus.

Work №3. Study of Hymenolepis nana(x63).

1) Put the slide on the stage.
2) Examine the structure of Hymenolepis nana under low power magnification. Find the scolex, the neck and proglottids.

IV. HOMEWORK: PHYLUM PLATYHELMINTHES. CLASS CESTODA. DIPHYLLOBOTHRIUM LA-TUM, ECHINOCOCCUS GRANULOSUS

Markell and Voge's. Medical parasitology. Chapter 7. Page 225-231ϭ 207-210. Page 271(table).

PRACTICAL CLASS №14

PHYLUM PLATYHELMINTHES. CLASS CESTODA. DIPHYLLOBOTHRIUM LATUM, ECHINOCOCCUS GRANULOSUS

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Diphyllobothrium latum, Echinococcus granulosus.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of diphyllobothriasis, echinococcosis.

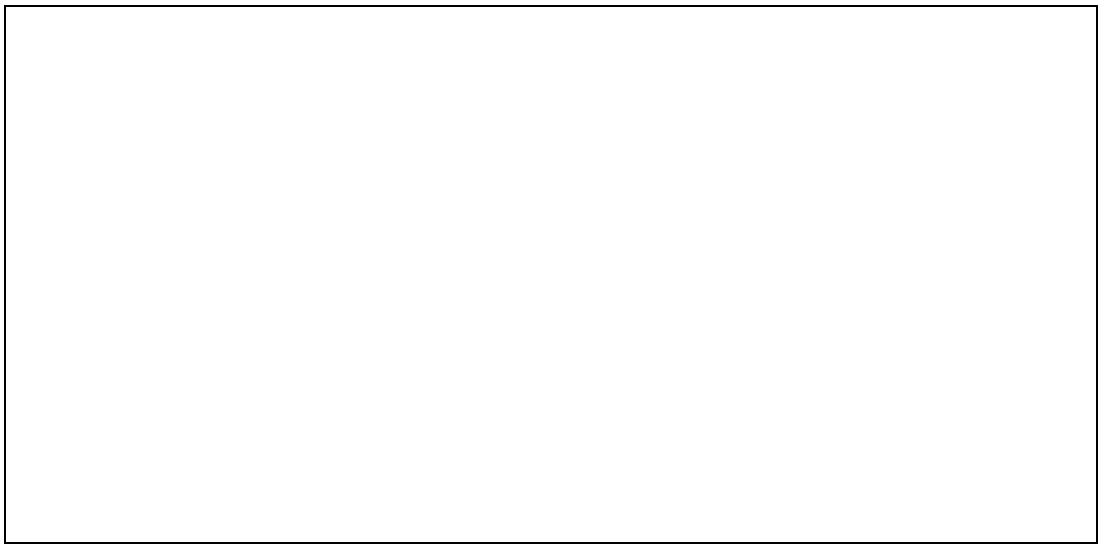
II. THE QUESTIONS FOR SELF-CONTROL:

1. **Diphyllobothrium latum: morphology, life cycle.**
2. **Symptoms, pathogenesis, laboratory diagnosis and prevention of diphyllobothriasis.**
3. **Echinococcus granulosus: morphology, life cycle.**
4. **Symptoms, pathogenesis, laboratory diagnosis and prevention of echinococcosis.**

III. INDEPENDENT WORK.

Work №1. Study of Diphyllobothrium latum gravid proglottid(x63).

1) Put the slide on the stage.
2) Examine the structure of Diphyllobothrium latum gravid proglottid under low power magnification.
3) Draw gravid proglottid and label: 1– uterus; 2– vitellaria and testes.



Work №2. Fill in the table "PHYLUM PLATYHELMINTHES"

species	disease	Definitive hosts	intermediate hosts	way of in-fection	Location of parasites in Humans	Symptoms of disease	Labora-tory diag-nosis	way to prevent infections
Fasciola hepat-ica,								
Paragonimus wester-mani								
Opisthorchis felineus.								

Schistosoma mansoni	Schistosoma haematobium	Dicrocoelium dendriticum	Clonorchis sinensis.

Hymenolepis nana	Taenia solium	Taenia saginata	Schistosoma japonicum,

Diphyllobothrium latum								
Echinococcus granulosus								

IV. HOMEWORK: PHYLUM NEMATODA. ASCARIS LUMBRICOIDES, ENTEROBIUS VERMICU-LARIS

Markell and Voge's. Medical parasitology. Chapter 8. Page 239-248 Page 271(table).

PRACTICAL CLASS №15
PHYLUM NEMATODA. ASCARIS LUMBRICOIDES, ENTEROBIUS VERMICULARIS

I. THE AIM:
1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Ascaris lumbricoides, Enterobius vermicularis
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of ascariasis, enterobiasis.

II. THE QUESTIONS FOR SELF-CONTROL:
1. **Ascaris lumbricoides: morphology, life cycle.**
2. **Symptoms, pathogenesis, laboratory diagnosis and prevention of ascariasis.**
3. **Enterobius vermicularis: morphology, life cycle.**
4. **Symptoms, pathogenesis, laboratory diagnosis and prevention of enterobiasis.**

III. INDEPENDENT WORK.

Work №1. Study of cross section female Ascaris lumbricoides(x63).

1) Put the slide on the stage.
2) Examine the structure of cross section Ascaris lumbricoides (female) under low power magnification. Find the cuticle, body cavity, intestine, uteri, ovaries.

Work №2. Study of Enterobius vermicularis(x63).

1) Put the slide on the stage.
2) Examine the structure of Enterobius vermicularis under low power magnification.
3) Draw it and label: 1– uterus;
2 – intestine;
3 – esophagus;
4 – bulb.

IV. HOMEWORK: PHYLUM NEMATODA. TRICHURIS TRICHIURA, TRICHINELLA SPIRALIS. FILARIAL NEMATODES. DRACUNCULUS MEDINENSIS
Markell and Voge's. Medical parasitology. Chapter 8. Page 263-267, -305-310 Page 271(table). Chapter 9. Page 274-305, Page 317 (table).

PRACTICAL CLASS №16
PHYLUM NEMATODA. TRICHURIS TRICHIURA, TRICHINELLA SPIRALIS. FILARIAL NEMATODES. DRACUNCULUS MEDINENSIS

I. THE AIM:
1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Trichuris trichiura, Trichinella spiralis, Wuchereria bancrofti, Loa loa, Onchocerca volvulus, Dracunculus medinensis
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of trichuriasis, Trichinellosis, filariasis, loiasis, onchocerciasis, dracunculiasis

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Trichuris trichiura: morphology, life cycle.**
2. **Symptoms, pathogenesis, laboratory diagnosis and prevention of trichuriasis.**
3. **Trichinella spiralis: morphology, life cycle.**
4. **Symptoms, pathogenesis, laboratory diagnosis and prevention of trichinellosis.**
5. **Wuchereria bancrofti: morphology, life cycle.**
6. **Symptoms, pathogenesis, laboratory diagnosis and prevention of filariasis.**
7. **Loa loa: morphology, life cycle.**
8. **Symptoms, pathogenesis, laboratory diagnosis and prevention of loiasis.**
9. **Onchocerca volvulus: morphology, life cycle.**
10. **Symptoms, pathogenesis, laboratory diagnosis and prevention of onchocerciasis.**
11. **Dracunculus medinensis: morphology, life cycle.**
12. **Symptoms, pathogenesis, laboratory diagnosis and prevention of dracunculiasis.**
13. **Ancylostoma duodenale: morphology, life cycle.**
14. **Symptoms, pathogenesis, laboratory diagnosis and prevention of ancylostomiasis**
15.

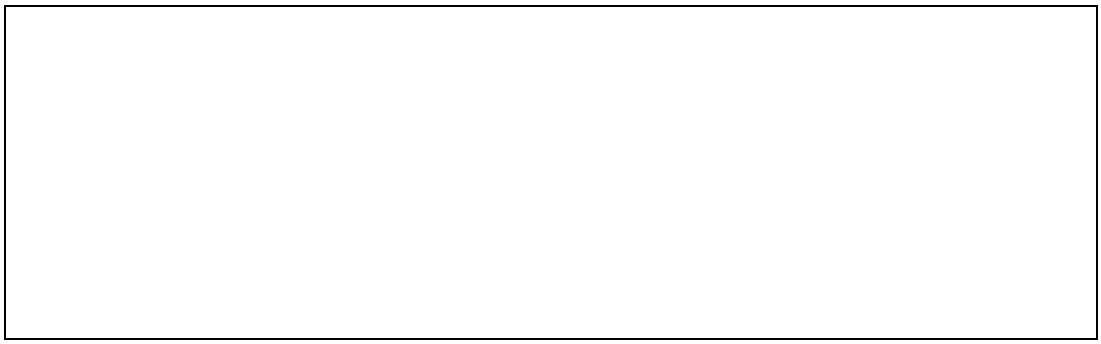
III. INDEPENDENT WORK.

Work №1. Study of Trichuris trichiura (x63).
1) Put the slide on the stage.
2) Examine the structure of Trichuris trichiura under low power magnification.
3) Draw Trichuris trichiura and label:
1 – anterior part of the body;
2 – posterior part of the body;
3 – intestine;
4 – reproductive system.

Work №2. Study of Trichinella spiralis larva(x63).

1) Put the slide on the stage.

2) Examine the structure of Trichinella spiralis larva under low power magnification.
3) Draw it and label: 1– larva; 2 – capsule; 3 – striated muscle fibers.



IV. HOMEWORK: PREPARATION TO MAJOR TEST IN HELMINTHOLOGY.

PRACTICAL CLASS №24
MAJOR TEST IN HELMINTHOLOGY

I. THE AIM:
Check the level of students 'assimilation of the material in the section « HELMINTHOLOGY ».

II. HOMEWORK: PHYLUM ARTHROPODA. CLASS ARACHNIDA.
Markell and Voge's. Medical parasitology. Chapter 10. Page 322-325, 342-343. Page 349 (table).

PRACTICAL CLASS №11-12
PHYLUM PLATYHELMINTHES. CLASS TREMATODA. FASCIOLA HEPATICA, PARAGONIMUS WESTERMANI. OPISTORCHIS FELINEUS. CLONORCHIS SINENSIS. DICROCOELIUM DENDRITICUM. GENUS SCHISTOSOMA

COMPETENCES:
GC-5, GPC-1, PC-1

I. THE AIM:
1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Fasciola hepatica, Paragonimus westermani, Opisthorchis felineus, Clonorchis sinensis, Dicrocoelium dendriticum, Schistosoma mansoni, Schistosoma japonicum, Schistosoma haematobium
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of the diseases.

II. THE QUESTIONS FOR SELF-CONTROL:

5. **Fasciola hepatica: morphology, life cycle.**
6. **Symptoms, pathogenesis, laboratory diagnosis and prevention of fascioliasis.**
7. **Paragonimus westermani: morphology, life cycle.**
8. **Symptoms, pathogenesis, laboratory diagnosis and prevention of paragonimiasis.**
9. **Opisthorchis felineus: morphology, life cycle.**
10. **Symptoms, pathogenesis, laboratory diagnosis and prevention of opisthorchosis.**
11. **Clonorchis sinensis: morphology, life cycle.**
12. **Symptoms, pathogenesis, laboratory diagnosis and prevention of clonorchosis**
13. **Schistosoma mansoni, Schistosoma japonicum, Schistosoma haematobium: morphology, life cycle.**
14. **Symptoms, pathogenesis, laboratory diagnosis and prevention of schistosomiasis.**
15. **Dicrocoelium dendriticum: morphology, life cycle.**
16. **Symptoms, pathogenesis, laboratory diagnosis and prevention of dicrocoeliosis.**

III. INDEPENDENT WORK.

Work №1. Study of Fasciola hepatica(x63).

1) Put the slide on the stage.
2) Examine the structure of Fasciola under low power magnification.
3) Draw Fasciola hepatica and label: 1 – oral sucker; 2 – ventral sucker; 3 – pharynx and front part of intestine; 4 – uterus; 5 – ovary; 6 – seminal receptacle; 7 – vitellaria; 8 – testes, 9 – ootype; vas deferens; 10 - genital atrium; 11 – ejaculatory duct.

Work №1. Study of Opisthorchis felineus (x63).

1) Put the slide on the stage.
2) Look for the Opisthorchis under low power magnification.
3) Draw Opisthorchis and label: 1 – oral sucker; 2 – ventral sucker; 3 – intestine; 4 – uterus; 5 – ovary; 6 – mehlis' gland; 7 – vitellaria; 8 – testes; 9 – seminal vesicle, 10 - excretory bladder

Work №2. Draw Schistosoma eggs

Schistosoma haematobium	Schistosoma mansoni	Schistosoma japonicum

IV. HOMEWORK: PHYLUM PLATYHELMINTHES. CLASS CESTODA. GENUS TAENIA. HYMENOLEPIS NANA. DIPHYLLOBOTHRIUM LATUM, ECHINOCOCCUS GRANULOSUS

Markell and Voge's. Medical parasitology. Chapter 7. Page 207, 211-223, 233-235, Page 225-2316 207-210. Page 271(table).

PRACTICAL CLASS №13-14

PHYLUM PLATYHELMINTHES. CLASS CESTODA. GENUS TAENIA. HYMENOLEPIS NANA, DIPHYLLOBOTHRIUM LATUM, ECHINOCOCCUS GRANULOSUS

COMPETENCES:
GC-5, GPC-1, PC-1

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Taenia saginata, Taenia solium, Hymenolepis nana.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of taeniasis, cysticercosis, hymenolepiasis.
4. To know the morphology, life cycles of Diphyllobothrium latum, Echinococcus granulosus.
5. To know symptoms, pathogenesis, laboratory diagnosis and prevention of diphyllobothriasis, echinococcosis.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Taenia saginata: morphology, life cycle.**
2. **Taenia solium: morphology, life cycle.**
3. **Symptoms, pathogenesis, laboratory diagnosis and prevention of taeniasis and cysticercosis.**
4. **Hymenolepis nana: morphology, life cycle.**
5. **Symptoms, pathogenesis, laboratory diagnosis and prevention of hymenolepiasis.**
6. **Diphyllobothrium latum: morphology, life cycle.**
7. **Symptoms, pathogenesis, laboratory diagnosis and prevention of diphyllobothriasis.**
8. **Echinococcus granulosus: morphology, life cycle.**
9. **Symptoms, pathogenesis, laboratory diagnosis and prevention of echinococcosis.**

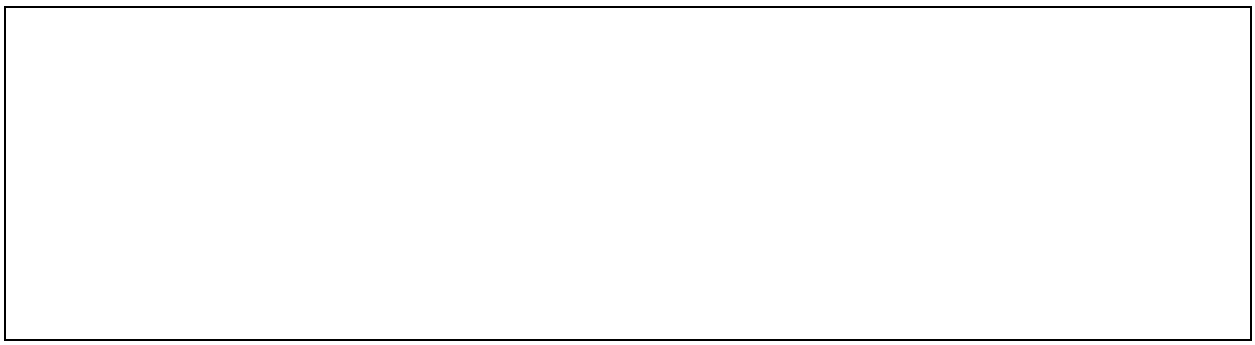
III. INDEPENDENT WORK.

Work №1. Study of Taenia saginata gravid proglottid (x63).

1) Put the slide on the stage.
2) Examine the structure of Taenia saginata gravid proglottid under low power magnification.
3) Draw gravid proglottid and label: 1– central stem of uterus; 2– side branches of uterus.

Work №2. Study of Taenia solium gravid proglottid(x63).

1) Put the slide on the stage.
2) Examine the structure of Taenia solium gravid proglottid under low power magnification.
3) Draw gravid proglottid and label: 1– central stem of uterus; 2– side branches of uterus.

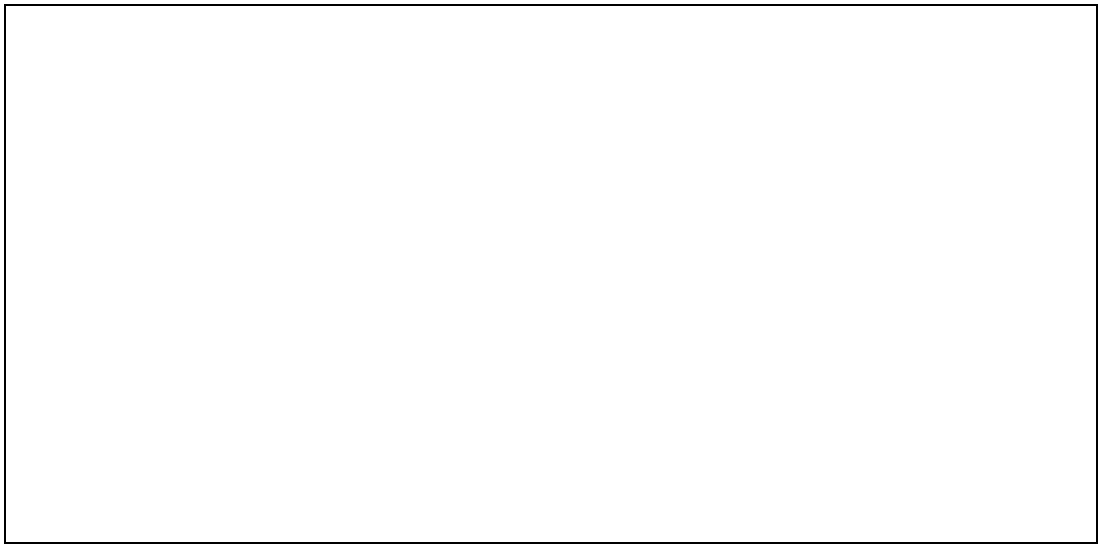


Work №3. Study of Hymenolepis nana(x63).

1) Put the slide on the stage.
2) Examine the structure of Hymenolepis nana under low power magnification. Find the scolex, the neck and proglottids.

Work №1. Study of Diphyllobothrium latum gravid proglottid(x63).

1) Put the slide on the stage.
2) Examine the structure of Diphyllobothrium latum gravid proglottid under low power magnification.
3) Draw gravid proglottid and label: 1– uterus; 2– vitellaria and testes.



Work №2. Fill in the table "PHYLUM PLATYHELMINTHES"

species	disease	Definitive hosts	intermediate hosts	way of in-fection	Location of parasites in Humans	Symptoms of disease	Labora-tory diag-nosis	way to prevent infections
Fasciola hepat-ica,								
Paragonimus wester-mani								
Opisthorchis felineus.								

Schistosoma mansoni	Schistosoma haematobium	Dicrocoelium dendriticum	Clonorchis sinensis.

Hymenolepis nana	Taenia solium	Taenia saginata	Schistosoma japonicum,

Diphyllobothrium latum								
Echinococcus granulosus								

IV. HOMEWORK: PHYLUM NEMATODA. ASCARIS LUMBRICOIDES, ENTEROBIUS VERMICULARIS

Markell and Voge's. Medical parasitology. Chapter 8. Page 239-248. Page 263-267, -305-310 Page 271(table).

PRACTICAL CLASS №15-16
PHYLUM NEMATODA. ASCARIS LUMBRICOIDES, ENTEROBIUS VERMICULARIS, TRICHURIS TRICHIURA, TRICHINELLA SPIRALIS.

COMPETENCES:
GC-5, GPC-1, PC-1

I. THE AIM:
1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Ascaris lumbricoides, Enterobius vermicularis
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of ascariasis, enterobiasis.
4. To know the morphology, life cycles of Trichuris trichiura, Trichinella spiralis.
5. To know symptoms, pathogenesis, laboratory diagnosis and prevention of trichuriasis, Trichinellosis.

II. THE QUESTIONS FOR SELF-CONTROL:
1. **Ascaris lumbricoides: morphology, life cycle.**
2. **Symptoms, pathogenesis, laboratory diagnosis and prevention of ascariasis.**
3. **Enterobius vermicularis: morphology, life cycle.**
4. **Symptoms, pathogenesis, laboratory diagnosis and prevention of enterobiasis.**
5. **Trichuris trichiura: morphology, life cycle.**
6. **Symptoms, pathogenesis, laboratory diagnosis and prevention of trichuriasis.**
7. **Trichinella spiralis: morphology, life cycle.**
8. **Symptoms, pathogenesis, laboratory diagnosis and prevention of trichinellosis.**

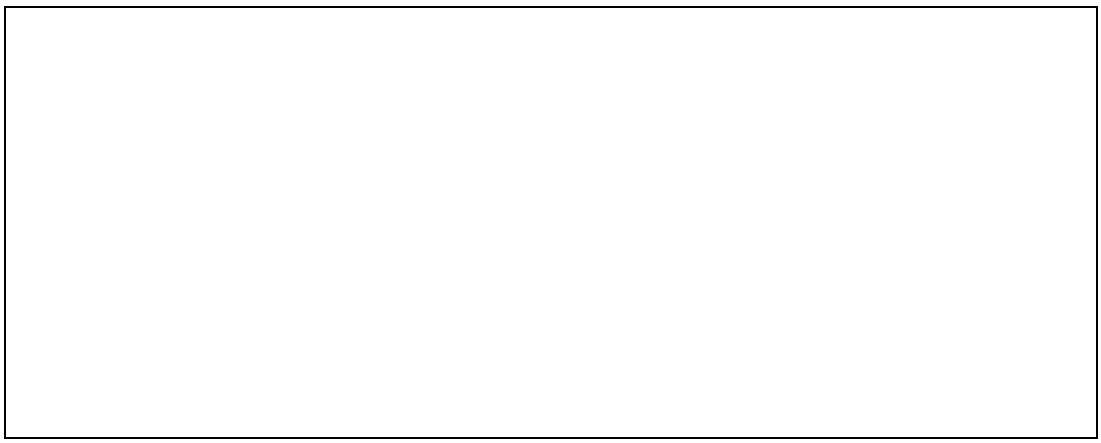
III. INDEPENDENT WORK.

Work №1. Study of cross section female Ascaris lumbricoides(x63).

1) Put the slide on the stage.
2) Examine the structure of cross section Ascaris lumbricoides (female) under low power magnification. Find the cuticle, body cavity, intestine, uteri, ovaries.

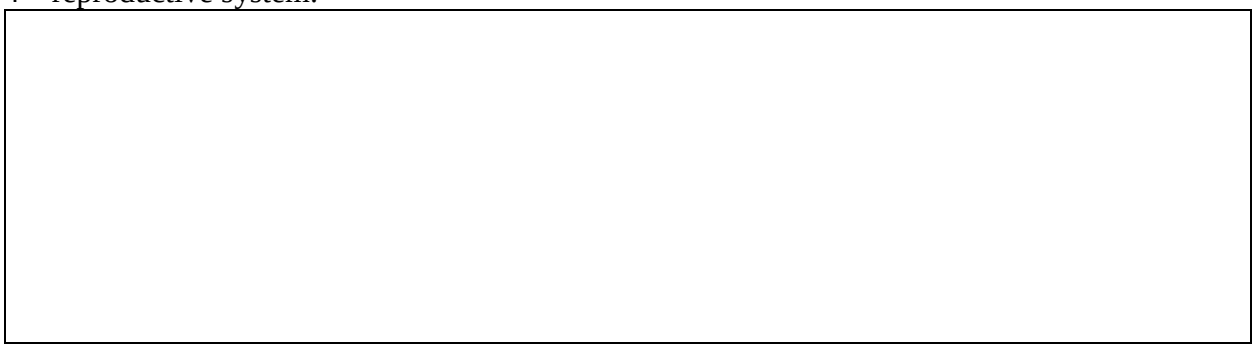
Work №2. Study of Enterobius vermicularis(x63).

1) Put the slide on the stage.
2) Examine the structure of Enterobius vermicularis under low power magnification.
3) Draw it and label: 1– uterus;
2 – intestine;
3 – esophagus;
4 – bulb.



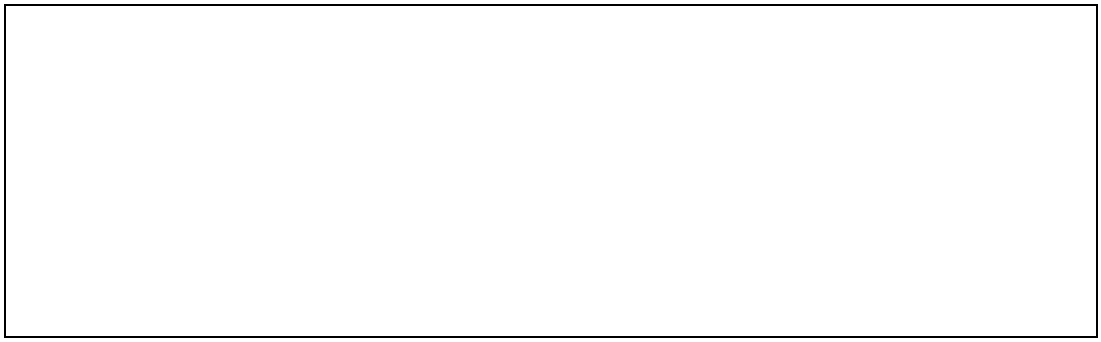
Work №1. Study of Trichuris trichiura (x63).

1) Put the slide on the stage.
2) Examine the structure of Trichuris trichiura under low power magnification.
3) Draw Trichuris trichiura and label:
1 – anterior part of the body;
2 – posterior part of the body;
3 – intestine;
4 – reproductive system.



Work №2. Study of Trichinella spiralis larva(x63).

1) Put the slide on the stage.
2) Examine the structure of Trichinella spiralis larva under low power magnification.
3) Draw it and label: 1– larva; 2 – capsule; 3 – striated muscle fibers.



IV. HOMEWORK: PHYLUM NEMATODA. FILARIAL NEMATODES. DRACUNCULUS MEDINENSIS

Markell and Voge's. Medical parasitology. Chapter 9. Page 274-305, Page 317 (table).

PREPARATION TO MAJOR TEST IN HELMINTHOLOGY.

PRACTICAL CLASS №17

PHYLUM NEMATODA. FILARIAL NEMATODES. DRACUNCULUS MEDINENSIS

COMPETENCES:
GC-5, GPC-1, PC-1

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Wuchereria bancrofti, Loa loa, Onchocerca volvulus, Dracunculus medinensis,
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of filariasis, loiasis, onchocerciasis, dracunculiasis.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Wuchereria bancrofti: morphology, life cycle.**
2. **Symptoms, pathogenesis, laboratory diagnosis and prevention of filariasis.**
3. **Loa loa: morphology, life cycle.**
4. **Symptoms, pathogenesis, laboratory diagnosis and prevention of loiasis.**
5. **Onchocerca volvulus: morphology, life cycle.**
6. **Symptoms, pathogenesis, laboratory diagnosis and prevention of onchocerciasis.**
7. **Dracunculus medinensis: morphology, life cycle.**
8. **Symptoms, pathogenesis, laboratory diagnosis and prevention of dracunculiasis.**
9. **Ancylostoma duodenale: morphology, life cycle.**
10. **Symptoms, pathogenesis, laboratory diagnosis and prevention of ancylostomiasis**

PRACTICAL CLASS №17

ROLE PLAY “A DOCTOR&A PATIENT”

THE AIM:
Check the level of students 'assimilation of the material in the section « HELMINTHOLOGY» and practical skills.

PRACTICAL CLASS №18
MAJOR TEST IN HELMINTHOLOGY

I. THE AIM:
Check the level of students 'assimilation of the material in the section « HELMINTHOLOGY ».

II. HOMEWORK: PHYLUM ARTHROPODA. CLASS ARACHNIDA.
Markell and Voge’s. Medical parasitology. Chapter 10. Page 322-325, 342-343. Page 349 (table).

PRACTICAL CLASS №19

PHYLUM ARTHROPODA. CLASS ARACHNIDA.

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of ixodid ticks, argasid ticks, Sarcoptes scabiei.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of scabies.
4. To know prevention of the infestation of ticks.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Ixodid ticks: morphology, life cycle. Medical importance, prevention of the infestation.**
2. **Argasid ticks: morphology, life cycle. Medical importance, prevention of the infestation.**
3. **Sarcoptes scabiei: morphology, life cycle. Symptoms, pathogenesis, laboratory diagnosis and prevention of scabies.**

III. INDEPENDENT WORK.

Work №1. Study of Ixodes ricinus (x63).

1) Put the slide on the stage.
2) Examine the structure of ixodes tick under low power magnification.
3) Draw it and label:

1– four pairs of legs
2 –dorsal scutum
3 – mouth parts
4 – stigmata

dorsal side	abdominal side

Work №2.*Fill in the table Biological characteristics and medical importance of some ticks and mites.*

You may use any species of ticks and mites

Species	Family	Inhabitance	Morphology	Life - cycle	Medical importance

IV. HOMEWORK: PHYLUM ARTHROPODA. CLASS INSECTA.
Markell and Voge's. Medical parasitology. Chapter 10. Page 327-329, 337 -Page 349 (table).

PRACTICAL CLASS №20

PHYLUM ARTHROPODA. CLASS INSECTA.

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of Pediculus humanus humanus, Pediculus humanus capitis, Phthirus pubis and fleas.
3. To know symptoms, pathogenesis, laboratory diagnosis and prevention of scabies.
4. To know prevention of the infestation of lice and fleas.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Pediculus humanus humanus, Pediculus humanus capitis, Phthirus pubis: morphology, life cycle. Medical importance, prevention of the infestation.**
2. **Fleas as vectors of plague. Morphology, life cycle. Medical importance, prevention of the infestation.**

III. INDEPENDENT WORK.

Work №1. Study of Pediculus humanus capitis (x63).

1) Put the slide on the stage.
2) Examine the structure of Pediculus humanus capitis under low power magnification.
3) Draw it and label:

1– head;
2 – thorax;
3 – abdomen;
4 – legs with claws;
5 – antennae.

Work №3. Study of human flea Pulex irritans (x63).

1) Put the slide on the stage.
2) Examine the structure of Pulex irritans under low power magnification.
Find the three pairs of legs, head, eyes, antennae, thorax, abdomen, stigmata.

IV. HOMEWORK: PHYLUM INSECTA (II).

Markell and Voge's. Medical parasitology. Chapter 10. Page 346-350.

PRACTICAL CLASS №21

PHYLUM ARTHROPODA. CLASS INSECTA. THE ORDER DIPTERA.

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know the morphology, life cycles of flies, gnats and mosquitoes.
3. To know prevention of the infestation of flies, gnats and mosquitoes.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Morphology of mosquitoes.**
2. **Life cycle of mosquitoes.**
3. **Differences between Culex and Anopheles.**
4. **Medical importance of mosquitoes and prevention of the infestation.**

III. INDEPENDENT WORK.

Work №1. Study of female Culex head (x63).

1) Put the slide on the stage.
2) Examine the structure of female Culex head under low power magnification.
3) Find proboscis, small maxillary palps, antennae, eyes.

Work №2. Study of female Anopheles head (x63).

1) Put the slide on the stage.
2) Examine the structure of female Anopheles head under low power magnification.
3) Find proboscis, long maxillary palps, antennae, eyes.

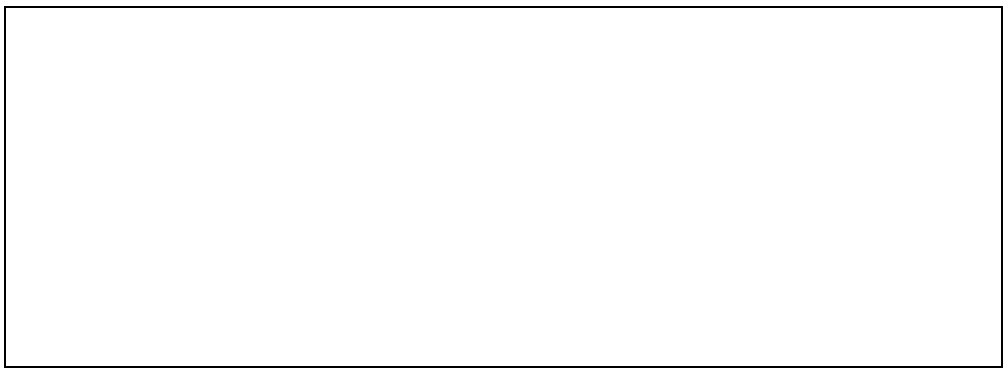
Work №3. Study of Culex larva (x63).

1) Put the slide on the stage.
2) Examine the structure of Culex larva under low power magnification.
3) Find head, thorax, abdomen, feeding brushes, respiratory siphon.

Work №4. Study of Anopheles larva (x63).

1) Put the slide on the stage.
2) Examine the structure of Anopheles larva under low power magnification.
3) Draw it and label:

1– head;
2 – thorax;
3 – abdomen;
4 – feeding brushes;
5 – stigmata.



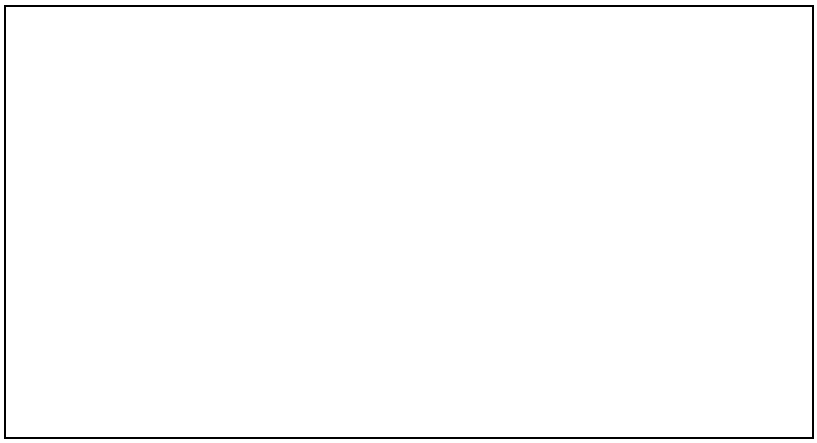
Work №5. Study of Culex pupa (x63).

1) Put the slide on the stage.
2) Examine the structure of Culex pupa under low power magnification.
Find cephalothorax, abdomen, respiratory trumpets.

Work №6. Study of Anopheles pupa (x63).

1) Put the slide on the stage.
2) Examine the structure of Anopheles pupa under low power magnification.
3) Draw it and label:

1– cephalothorax;
2 – abdomen;
3 – respiratory trumpets.



PRACTICAL CLASS №22

PHYLUM ARTHROPODA. CLASS INSECTA. THE ORDER DIPTERA.

I. THE AIM:

1. To acquire the practical knowledge of work with microscope.
2. To know symptoms, pathogenesis, laboratory diagnosis and prevention of myiasis.
3. To know prevention of the infestation of flies, gnats and mosquitoes.

II. THE QUESTIONS FOR SELF-CONTROL:

1. **Musca domestica: morphology, life cycle.**
2. **Medical importance of Musca domestica.**
3. **Wohlfahrtia magnifica: morphology, life cycle**
4. **Medical importance of Wohlfahrtia magnifica**

III. INDEPENDENT WORK.

Work №1. Fill in the table "Flies"

Species	**Medical importance**	**Disease**	**Geographical distribution**
Musca domestica			
Wohlfahrtia magnifica			

IV. HOMEWORK: PREPARATION TO MODULE "PRACTICAL SKILLS"

PRACTICAL CLASS №23
MODULE "PRACTICAL SKILLS"

I. THE AIM:
Check the level of students 'assimilation of the material and of practical skills in the section « PARASITOLOGY».

PRACTICAL CLASS №24
THE MAIN TERMS OF GENETICS. THE TYPES OF INHERITANCE. MONOHYBRID CROSS.

I. THE AIM:
1. To study main terms of genetics.
2. To study the main principles of inheritance of sings and mendelian characters of human being.

II. THE BASIC KNOWLEDGE:
1. The molecular and chromosome levels of organization of hereditary material.
2. The flow of biological information in cell and its realization into the final biochemical products.
3. Genetic differences between somatic and germ cells.

III. THE PLAN FOR THE THEME STUDY:
1. Subject-matter and main goals of genetics. The meaning of "heredity" as a property of living matter.
2. The main terms of genetics: gene (allelic and non-allelic), genotype, phenotype, homozygousity, heterozygousity, hemizygousity, dominance and recessiveness.
3. Monogenic and polygenic inheritance. Mendel and his experiments.
4. Monohybrid cross. The principles of Uniformity (Dominance) and Segregation.

IV. THE QUESTIONS FOR SELF-CONTROL.
1. Genetics as a science, studing of heredity and variability.
2. The subject-matter of genetics.
3. Give the definition to the following genetic terms: gene, alleles, genotype, phenotype, homozygousity, heterozygousity, hemizygousity, dominance and recessiveness.
4. Give the definition to "inheritance" and differentiate it to the "heredity".
5. Hybridological method and its features.
6. Mendel and his experiments with pea plants. Mendel's conclusions:
- **a) Principle of Dominance**
- **b) Law of Segregation (law of purity of gametes)**

8. Test cross for determine the zygosity of individual

V. INDEPENDENT WORK. SOLUTION OF GENETIC PROBLEMS.
1. To study the condition of genetic problem.
2. To write the data using the information about characters and known phenotypes of persons.
3. To solve the genetic problem and give the biological basis of results.

Problem 1. In human being the gene of brown color of eyes dominates over gene of blue color of eyes. Determine the phenotypes of children in the family, in which the father has blue color of eyes and the mother has brown color of eyes (her father was blue-eyed and mother - brown-eyed).

Problem 2. In human being right hand-writing dominates over left hand-writing. In the family the both parents have right hand-writing and are heterozygotes for the gene of hand-writing. Determine the children phenotypes in this family.

Problem 3. Polydactyly is inherited as an autosome dominant character. Determine the probability of the birth of a child with extra fingers in the family, in which the mother has normal structure of hand and the father is heterozygous for the gene of polydactyly.

Problem 4. Phenylketonuria (PKU) is inherited as an autosome recessive disease. In the family, in which both parents were healthy there were born dizygotic twins - the girl with PKU and healthy boy. Determine the parental genotypes and the probability of the birth of the next healthy child in this family.

Problem 5. In human, the albinism is inherited as an autosome recessive character. In the family, in which both parents were healthy there was born albino son. Determine the probability of birth of the next child without anomaly.

Problem 6. The cataract in human is an autosome dominant disease. Woman, whose mother had cataract, got married to healthy man. Determine the probability of the birth of healthy children in this family, if it was known, that woman received anomaly from her mother.

Problem 7. The positive Rh-factor is an autosome dominant character. The woman with Rh-positive factor got married to the man with negative Rh-factor. There were born the boy with Rh-negative factor and the girl with Rh-positive factor. Determine the parental genotypes and the probability of the birth of the next children with Rh-positive factor.

Problem 8. Some forms of deafness and dumbness are inherited as autosome recessive characters. In the family, where both parents had good ear there was born the deaf-and-dumb child. Determine the parental genotypes and the probability of the birth of a child with good ear in this family.

Problem 9. Albinism is recessive to normal body pigmentation in man. It is an autosomal trait. If a homozygous normal man marries an albino girl, what would be the phenotypic and genotypic ratios in offspring of their daughter, if she'll marry man with same genotype?

Problem 10. Albinism, the total lack of pigment is due to a recessive gene. A man and woman plan to marry and wish to know the probability of their having an albino child. What advice would you give to them if…

(a) Both are normally pigmented, but each has one albino parent.

(b) The man is an albino, and woman is heterozygous.

(c) The man is an albino and woman's family includes no albino for at least three generations.

Problem 11. A brown eyed man marries a blue eyed woman and they have eight children, all brown eyed. What are the genotypes of all the individuals in the family?

Problem 12. A blue eyed man, whose both parents were brown eyed, marries a brown-eyed woman. They had one child, who is blue eyed. What are the genotypes of all the individuals in problem mentioned above?

Problem 13. A woman has a rare abnormality of the eyelids called ptosis, which makes it impossible for her to open her eyes completely. The condition has been found to depend on a single dominant gene. The woman's father had ptosis, but her mother had normal eyelids. Her father's mother had normal eyelids. What are the probable genotypes of the woman, her father and mother? What proportion of her children will be expected to have ptosis if she marries a man with normal eyelids?

Problem 14. A woman is Rh positive and both of her parents are Rh positive. She marries an Rh negative man. Is there any chance that they may have any Rh negative children? Explain.

Problem 15. A woman bears a child with erythroblastosis at her second delivery. She has never had a blood transfusion. On the basis of this data, classify the woman, her husband and both children as to Rh type.

VII. HOMEWORK: SEX-LINKED INHERITANCE. THE GENEALOGICAL METHOD.

PRACTICAL CLASS №25
SEX-LINKED INHERITANCE. THE GENEALOGICAL METHOD

I. THE AIM:

1. To study the regularities of sex-linked inheritance (X-link and holandric)
2. To study the genealogical method.

II. THE BASIC KNOWLEDGE:

1. The chemical composition, molecular and morphological organization of chromosomes.
2. The changes of chromosome morphology at the different levels of cell cycle.
3. The structures and functions of intracellular structures and their role in vital functions of a cell.

III. THE PLAN FOR THE THEME STUDY:

1. The role of chromosomes in determination of sex.
2. Homogametic and heterogametic sex.
3. Sex determination in the different biological species.
4. Chromosome and gene basis of sex determination in human. Sex chromatin.
5. Sex-linked inheritance in human, examples.

IV. THE QUESTIONS FOR SELF-CONTROL.

1. **The chromosome determination of sex. Autosomes and sex chromosomes. Role of X and Y chromosomes in sex determination.**
2. **Homogametic and heterogametic sex. Genetic determination of sex in the different biological species. Chromosome and gene basis of sex determination in human.**
3. **Sex-linked inheritance. Examples in human being.**
4. **Holandric signs in man and peculiarities of their genetic determination.**
5. **Testcross, backcross and reciprocal cross.**
6. **Characterize the main types of inheritance (autosomal-dominant, autosomal-recessive, X-linked dominant, X-linked recessive, Y-linked).**
7. **Family Studies, Pedigree Analysis.**
    a) **autosomal dominant inheritance**
    b) **autosomal recessive inheritance**
    c) **X-linked inheritance (dominant and recessive)**
    d) **Y-linked inheritance**

V. INDEPENDENT WORK. SOLUTION OF GENETIC PROBLEMS.

1. To study the condition of genetic problem.
2. To write the data using the information about characters and known phenotypes of persons.
3. To solve the genetic problem and give the biological basis of results.

Problem 1. Hypoplasia of enamel is inherited as X-linked dominant character. In the family, in which both parents had disease there was born son with healthy teeth. What are the possible phenotypes of their second son?

Problem 2. Classical hemophilia is inherited as recessive X-linked disease. Man with hemophilia marries heterozygous healthy woman. In this family were born healthy children. What is the probability of the birth of the sick children in this family?

Problem 3. The gene of daltonism (color blindness) is located in X chromosome and is inherited as a recessive character. Woman with normal sight, whose father had daltonism, got married to healthy man, whose father had daltonism. Determine the phenotypes of children in this family.

Problem 4. A colour blind man marries a woman with normal vision. Her mother was colour blind. What kind of children would you expect from this marriage?

Problem 5. A woman with normal vision marries a man with normal vision and they have a colour blind son. Her husband dies and she marries a colour blind man. Show the type of children that might be expected from the second marriage and the proportions of each.

Problem 6. A man has hypertrichosis of the ears, a condition which is due to a gene on the non– homologous portion of the Y chromosome (hollandria). He marries a normal woman. Show the types of children they may expect.

Problem 7. Suppose a young lady comes to you for advice in your capacity as a marriage counselor. She tells you her brother has hemophilia, but both of her parents are normal. She wishes to marry a man who has no history of hemophilia in his family. She would like to know the probability of having hemophilic offspring. Explain.

Problem 8. Anhydrotic ectodermic dysplasia is inherited as a recessive X-linked disease. Healthy woman gets married to the sick man. In this family there were born sick daughter and healthy son. Determine the probability of the birth of the next child without disease.

Problem 9. When a baemophilic male is mated with a heterozygous baemophilic female, what baemophilic proportion will be resulted in each sex?

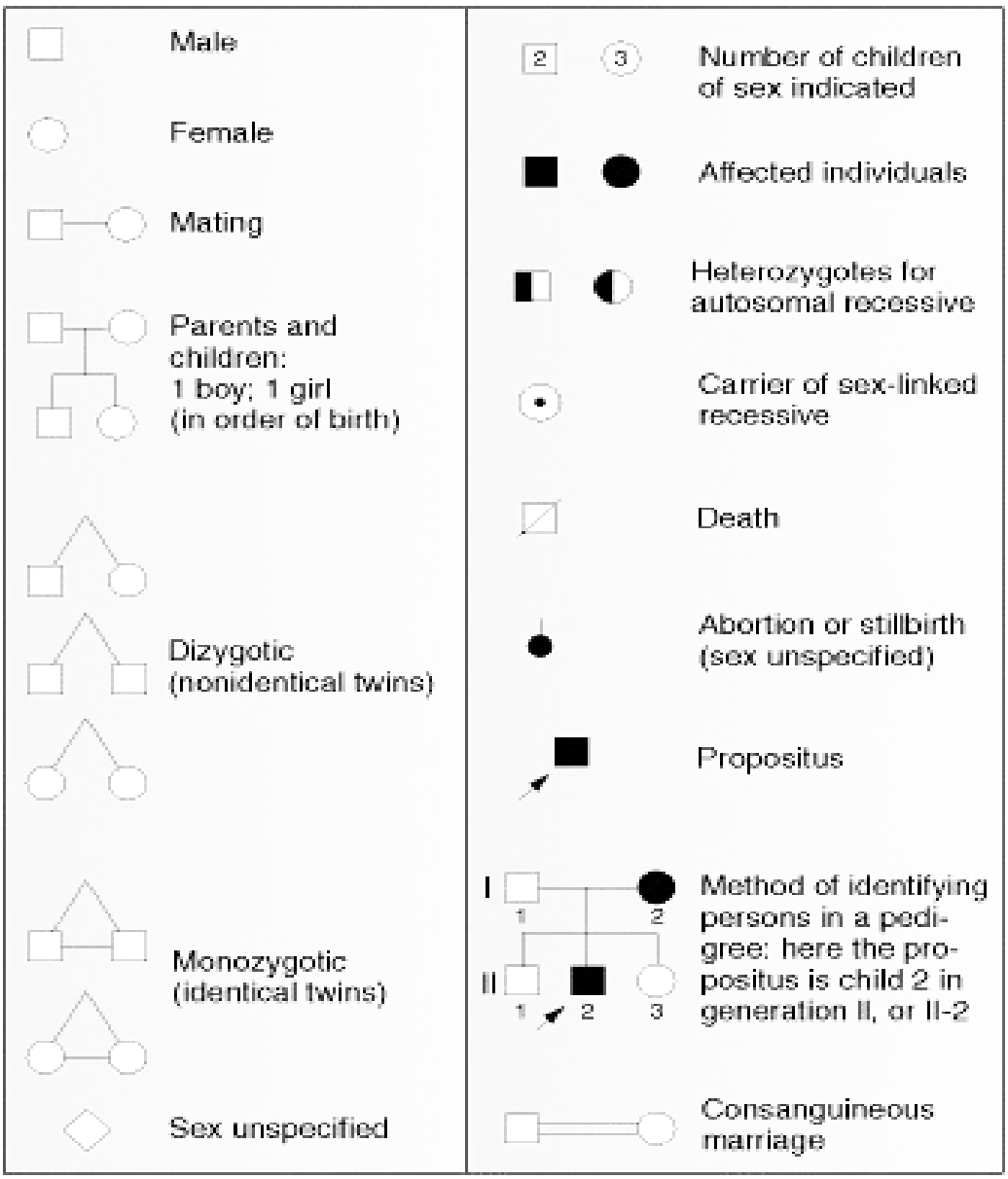
Problem 10. When a haemophilic male is mated with a homozygous non-baemophilic female—What will be the result?

Problem 11. Of what type will be the children with reference to colour blindness, when a woman is colour-blind and her husband is normal?

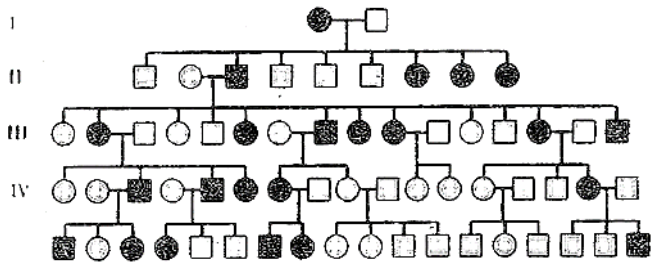
Problem 12. When both the parents are colour-blind, can they produce a normal daughter?

Problem 13. In a cross between a white-eyed female fruit fly and red-eyed male, what percent of the female offspring will have white eyes? (White eyes are X-linked, recessive)

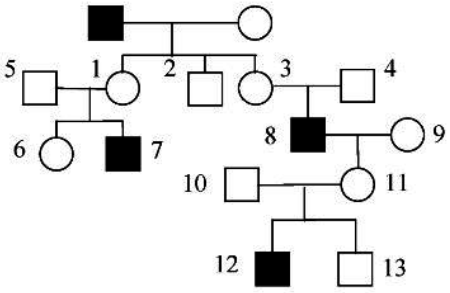
VI. THE GENEALOGICAL METHOD. HUMAN PEDIGREE ANALYSIS



Problem 1. Analyze the Pedigree. Determine the type of trait inheritance



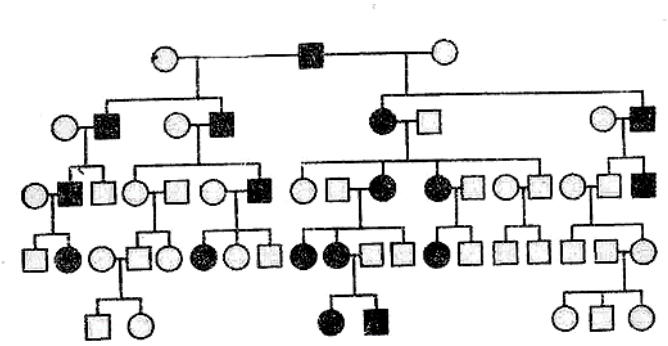
Problem 2. Analyze the Pedigree.



1) What is the most likely mode of inheritance for this pedigree?

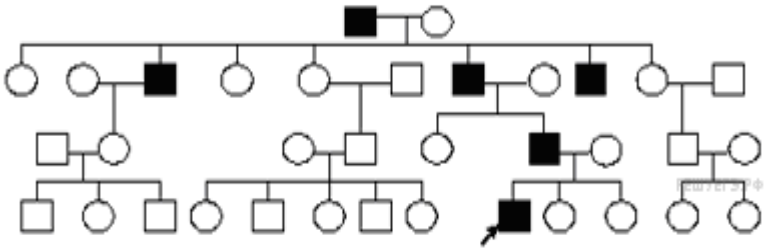
2) State the genotypes of individuals №1-13 in the following table

Problem 3. Analyze the Pedigree.



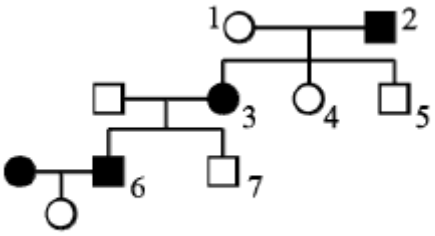
What is the most likely mode of inheritance for this pedigree?

Problem 4. Analyze the Pedigree.



What is the most likely mode of inheritance for this pedigree?

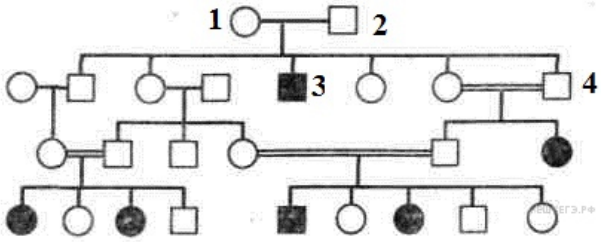
Problem 5. Analyze the Pedigree.



1) What is the most likely mode of inheritance for this pedigree?

2) State the genotypes of individuals №1-6 in the following table

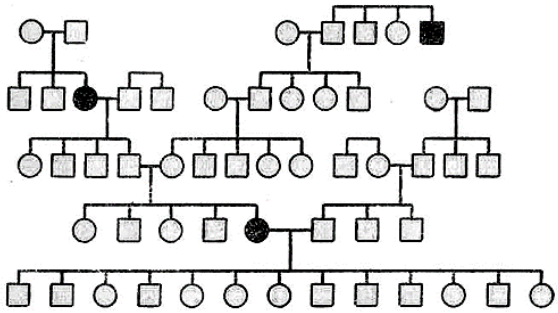
Problem 6. Analyze the Pedigree.



1) What is the most likely mode of inheritance for this pedigree?

2) State the genotypes of individuals №1-4 in the following table

Problem 6. Analyze the Pedigree.



What is the most likely mode of inheritance for this pedigree?

Problem 7.

Draw and analyze the Pedigree
Two normally-pigmented parents have 3 children. The first child (a girl) and their second child (a boy) have normal pigmentation. Their third child (a girl) has albinism. That girl marries a normally pigmented male and they have four children. The first three (two girls and a boy) have normal pigmentation. Their fourth child (a girl) has albinism like her mother. Determine the type of trait inheritance

VI. HOMEWORK: DIHYBRID CROSS. INDEPENDENT INHERITANCE

PRACTICAL CLASS №26
DIHYBRID CROSS. INDEPENDENT INHERITANCE

I. THE AIM:
To study the Mendel's Law of Independent Assortment.

II. THE BASIC KNOWLEDGE:
1. The bases of organization of hereditary material and principles of realization of biological information in the cell till the formation of final biochemical products.
2. The main principles of inheritance and their cytological basis.

III. THE PLAN FOR THE THEME STUDY:
1. Di- and polyhybrid cross.
2. The Mendel's Law of Independent Assortment.
3. Punnett square.
4. Mendelian characteristics in human being.
5. Statistical characters in Mendelian inheritance.

IV. THE QUESTIONS FOR SELF-CONTROL.
1. Combinative variability. The main mechanisms of combinative variability.
2. Principle of independent assortment. Punnett square.
3. Give the characters to dihybrid crosses.
4. Characterize the conditions of Mendelian inheritance.
5. Statistics of di- and Polyhybrid crosses.

V. INDEPENDENT WORK. SOLUTION OF GENETIC PROBLEMS.
1. To study the condition of genetic problem.
2. To write the data using the information about characters and known phenotypes of persons.
3. To solve the genetic problem and give the biological basis of results.

Problem 1. Polydactyly and myopia are inherited as autosome dominant characters. Determine the possible genotypes and phenotypes of the children in the family, in which the mother is healthy and the father has both anomalies and is diheterozygote.

Problem 2. Brown colour of eyes dominates over blue colour of eyes. Blue-eyed woman got married to the brown-eyed man. Their first child has blue colour of eyes and phenylketonuria. Phenylketonuria is autosome recessive disease. Determine the parental genotypes and the probability of the birth of healthy child in this family.

Problem 3 Polydactyly (extra fingers) is inherited as an autosome dominant character, fructosuria - as a recessive character. In the family, in which the man had polydactyly and the woman was healthy, there was born a child with normal structure of hand and fructosuria. Determine the parental genotypes and the probability of the birth of a healthy child in this family.

Problem 4. In man brown eyes (B) are dominant to blue (b) and dark hair (R) are dominant to red hair (r). A man with brown eyes and red hair marries a woman with blue eye and dark hair. They have two children, of whom one has brown eyes and red hair. Give the genotypes of the parents and children.

Problem 5. In Drosophila, vestigial wings and ebony colour are due to two separate recessive genes. The dominant alleles are normal (long) wings and normal (gray) body colour.
1) What type of offspring would you expect from a cross between a bomozygous vestigial ebony female and a normal double homozygous (long–winged, gray–bodied) male?

2) If the F1 are allowed to breed among themselves what types of offspring would you expect in the F2? Show complete genotype and phenotype of both generations.

3) If you made a test cross of the F1 males of the preceding problem what results would you expect to obtain?

Problem 6. About 75% of Americans get a bitter taste from a chemical called phenyl thiocarbamide (PTC); the others do not. A normally pigmented woman who is non–taster has a father who is an albino–taster. She marries an albino man who is a taster, but who has a mother who is non–taster. Show the types of children which this couple may have.

Problem 7. In tomatoes, yellow fruit and dwarfed vine are due to recessive alleles of genes which produce the more common red fruit and tall vine. If pollen from the pure–line dwarf plant bearing red fruit is placed on the pistil of a pure–line tall plant bearing yellow fruit, what type of plant and fruit would be expected in the F1 ? If these are crossed among themselves, what results would be expected in the F2 ?

Problem 8 Some dogs bark while trailing, others are silent. The barking trait is due to a dominant gene. Erect ears are dominant to drooping ears. What kind of pups would be expected from a double heterozygous erect–eared, barker mated to a drooped–eared, silent trailer?

Problem 9. In pigeons, the checkered pattern is dependent on a dominant gene A and plain on the recessive allele a. Red colour is controlled by a dominant gene B and brown by the recessive allele b. Diagram completely a cross between homozygous checkered, red and plain, brown birds. Summarize the expected F2 results.

Problem 10. A checkered–brown female mated with a plain–red male produced 2 checkered–red, 2 plain–red, and 1 checkered–brown offspring. Give the probable genotypes of the parents.

VI. HOMEWORK:

DIHYBRID CROSS. LINKED INHERITANCE. CHROMOSOME THEORY OF INHERITANCE

PRACTICAL CLASS №27

DIHYBRID CROSS. LINKED INHERITANCE. CHROMOSOME THEORY OF INHERITANCE

I. THE AIM:

To study the main types of correlative inheritance (independent, complete linked, incomplete linked)

II. THE BASIC KNOWLEDGE:

1. The bases of organization of hereditary material and principles of realization of biological information in the cell till the formation of final biochemical products.
2. The main principles of inheritance and their cytological basis.

III. THE PLAN FOR THE THEME STUDY:

1. Localization of genes in chromosomes.
2. Phenomenon of linkage. Complete and incomplete linkage.
3. Crossing-over, its biological importance.
4. Gene and chromosome maps.
5. The main states of the chromosome theory of inheritance.
6. Cytoplasmic inheritance.

IV. THE QUESTIONS FOR SELF-CONTROL.

1. **How are the genes localized in the chromosomes?**
2. **Phenomenon of gene linkage. Complete and incomplete linkage.**
3. **Characterize the main types of correlative inheritance (independent, complete linked, incomplete linked).**
4. **Crossing over, its biological role in genetic variation.**
5. **Centimorgan. Its definition.**
6. **The main states of chromosome theory and show its biological essence.**
7. **What is cytoplasmic heredity?**

V. INDEPENDENT WORK. SOLUTION OF GENETIC PROBLEMS.

1. To study the condition of genetic problem.
2. To write the data using the information about characters and known phenotypes of persons.
3. To solve the genetic problem and give the biological basis of results.

Problem 1. Cataract and polydactily in human are autosome dominant characters. The genes are in the same chromosome and show the complete linkage (there is no cross-over). Woman received the cataract from her mother and polydactily – from her father. Her husband is healthy for both diseases. Determine the probability of the birth of healthy children in this family.

Problem 2. The genes determining Rh-factor and erythrocytes shape are in the same chromosome and the distance between them is 3 morganids. Woman received both dominant genes: Rh+ and oblong erythrocyte shape from her father and both recessive genes (Rh- and normal erythrocyte) - from her mother. Her husband had Rh- gene and the gene of normal shape of erythrocytes. Determine the probability of the birth of a child with oblong shape of erythrocyte and Rh- negative factor.

Problem 2. You cross a true-breeding yellow-bodied, smooth-winged female fly with a true-breeding red-bodied, crinkle-winged male. The red body phenotype is dominant to the yellow body phenotype and smooth wings are dominant to crinkled wings. You perform a dihybrid test cross between the F1 flies with a true-breeding yellow-bodied, crinkle-winged fly. The following F2 results are detected: red body and smooth wings - 102; yellow body and smooth wings - 404; red body and crinkled wings - 396; yellow body and crinkled wings - 98. Determine the recombination frequency (%) between the body color and wing surface genes.

Problem 3. One of autosome gene controls wing length in flies. This gene has two alleles, "L or l" where long wings are dominant to short wings. The other autosome gene controls body colour. Red body phenotype is dominant to the yellow body phenotype. Red-bodied, short wing male with yellow-bodied, long wing female. All F1 are red-bodied, long wing. After test cross between the F1 flies above with yellow-bodied, short-winged flies, you get the following F2 results: red body and long wings – 45; red body and short wings – 460; yellow body and long wings - 440; yellow body and short wings – 55. What is the recombination frequency (%) between the genes for body color and wing length?

Problem 2. Myasthenia and Protanopia are inherited as recessive X-linked diseases. The distance between genes is the 10 centimorgans. Healthy woman (her father had myasthenia and her mother had protanopia) gets married to the healthy man. What are the phenotypes of their children?

VI. HOMEWORK:

PRACTICAL CLASS №28
GENOTYPE AS INTEGRATIVE GENETIC SYSTEM

I. THE AIM:

1. To study the types of allelic and non-allelic gene interaction and their influence to phenotype formation.
2. To assimilate the main principles of polygenic inheritance (inheritance of the quantitative signs).
3. To understand the multifactorial principle of phenotype formation as the reflection of the unity of genetic and environmental factors.

II. THE BASIC KNOWLEDGE:

1. The bases of organization of hereditary material and principles of realization of biological information in the cell till the formation of final biochemical products.
2. The main principles of inheritance and their cytological basis.

III. THE PLAN FOR THE THEME STUDY:

1. Meaning of allelic and non-allelic genes. Interaction of genes in the determination of phenotypic signs of an organism.
2. Interaction of allelic genes. Complete dominance. Incomplete dominance.
3. Codominance. The inheritance of blood groups of ABO system in human.
4. Interaction of non-allelic genes. Complementation.
5. Epistasis (dominant and recessive).
6. Polymery (cumulative and non-cumulative).
7. Pleiotropy.

IV. THE QUESTIONS FOR SELF-CONTROL.

1. The definition of the terms of "allelic" and "non-allelic" genes.
2. Biological essence of complete dominance; the examples.
3. The interaction of allelic genes in the incomplete dominance; the examples.
4. The peculiarities of phenotype formation in codominance; the examples.
5. The inheritance of blood groups of ABO system in human.
6. Epistatic and hypostatic genes, their role in the phenotype formation; the examples of epistatic interaction of genes.
7. Biological essence of the complementary interaction of genes and its influence to phenotype formation; the examples.
8. Pleiotropy and its role in phenotype formation; the examples.
9. Polymeric gene action as the base of genetic determination of quantitative signs. Additive effect of polymeric genes.

V. INDEPENDENT WORK. SOLUTION OF GENETIC PROBLEMS.

1. To study the condition of genetic problem.
2. To write the data using the information about characters and known phenotypes of persons.
3. To solve the genetic problem and give the biological basis of results.

Problem 1. Acatalasia is inherited as autosome incomplete recessive character. The heterozygotes have the reduced activity of catalyze. In the family, both parents and their son have the reduced activity of enzyme. Determine the probability of the birth of next child without anomaly. Determine the probable children phenotypes in the family, in which one parent has disease and the other has the reduced activity of catalyze.

Problem 2. In shorthorn cattle, the gene R for red coat colour is not dominant over white r. The heterozygous combination Rr produces roan. A breeder has white, red and roan cows and bulls. What phenotypes might be expected from the following matings and in what proportions:
a. red x red

b. red x roan

c. red x white

d. roan x roan

e. roan x white

f. white x white

Problem 3. In snapdragons, flower colour shows intermediate inheritance rather than dominance. Homozygous plants, RR, are red, heterozygous Rr are pink, and homozygous rr are white.

Diagram a cross between a red–flowered and a white–flowered plant and summarize the F results under the headings of phenotypes, genotypes, genotypic frequency, and phenotypic ratio.

Problem 4. Sickle cell anemia (S-anemia) is inherited as autosome incomplete dominant character. Homozygotes die before puberty, the heterozygotes have subclinic anemia. The plasmodium can not use the S-hemoglobin and human with S-anemia has no malaria.
What is the probability of the birth of children stable to malaria, in family in which one parent is heterozygous for S-anemia and the other is healthy? What is the probability of the birth of children not stable to malaria, in family, in which both parents are stable to malaria?

Problem 5. The human blood groups of ABO system are determined by three allelic genes: I^A, I^B, i^0 . The combination of alleles i^0 i^0 determine the I(O) blood group, I^A I^A or I^A i^0 - II (A); I^B I^B or I^B i^0 - III (B); I^A I^B - IV (AB). In the family, in which mother has II blood group and heterozygote, father - IV blood group. Determine the blood groups of their children.

Problem 6. In the family, in which brown-eyed parents, one of them had I blood group and another one - III blood group there was born blue-eyed child with first blood group. Determine the parental genotypes.

Problem 7. Can a child having blood type A be born to parents having types AB and B respectively? Explain.

Problem 8. A man has blood type A and his wife has type B. A physician types the blood of their four children and is amazed to find one of each of the four blood types among them. He is not familiar with genetics and calls upon you for an explanation. Provide one.

Problem 9. In the family, in which the wife had the II blood group and her husband had the III blood group, there was born the son with colour blindness and the I blood group. Both parents differed colours in norm. Determine the probability of the birth of the healthy son and his possible variants of blood groups. It is known that colour blindness is X-linked recessive disorder.

Problem 10. The pea plant flowers may have white and red colour. This sign is controlled by two pairs of alleles. The red colour of flowers is a result of complementary interaction of genes. In the cross of two pure lines with white colour of flowers, all F_1 progeny have red colour of flowers. There is cross of F_1 hybrid and homozygous recessive for both genes pea plant. Determine the F_2 genotypes and ratio.

Problem 11. Bombay phenomenon: in the family, in which the father had I blood group and mother – II blood group there was born the daughter with I blood group. She got married to the man with II blood group. They had two daughters with the following blood groups – IV and I, correspondently. The appearance of the girl with the IV blood group is impossible, according the

principles of inheritance of blood groups. Geneticists proved that there is recessive epistatic gene, which may inhibit the appearance of genes, determining the blood groups. Determine the probable genotypes of all generations in Bombay phenomenon.

VI. HOMEWORK: Variability**.**

PRACTICAL CLASS №29
VARIABILITY.
HUMAN BEING AS AN OBJECT OF GENETIC ANALYSIS.
INTRODUCTION TO MEDICAL GENETICS

I. THE AIM:

1. To consider the variability to be the character of living organisms.
2. To study the main forms and levels of its manifestation.
3. To appreciate the significance of variability in evolution.
4. To acquire the peculiarities of genetic analysis at human being.
5. To study the main methods of human genetics.
6. To study the subject-matter and goals of medical genetics.
7. To study the hereditary pathologies of human being.

II. THE BASIC KNOWLEDGE:

1. To know the material bases of organization of living being.
2. To have ideas about interaction of heredity and environment in the phenotype formation.

III. THE QUESTIONS FOR SELF-CONTROL.

1. **Give the definition to the "variability".**
2. **Name the main types of variability and show their biological essence.**
3. **Non-hereditary(phenotype) variability.**
4. **What is the base of combinative variability? Give the examples.**
5. **Mutagenesis and its types. Factors of mutagenesis and their characteristics.**
6. **Mutations as the main material for evolution.**
7. **The levels of origin of mutations and their characteristics.**
8. **Biological role of generative and somatic mutations.**
9. **The definitions to "penentrance" and "expressiveness" of genes.**
10. **The subject-matter and goals of human genetics.**
11. **Advantages and difficulties of genetic analysis in human beings.**
12. **Problems solving with the help of genealogical method.**
13. **Methodical principles of drawing of the pedigree and using symbols.**
14. **Reasons of the birth of twins in human being. Types of twins.**
15. **Biological essence of twins method and problems solving with the help of it.**
16. **Meaning of population. Conditions for ideal population. Hardy-Weinberg equilibrium, its biological essence and mathematical expression.**
17. **Biochemical method and its role in study of hereditary diseases of metabolism.**
18. **Cytogenetic method and its role in study of chromosomal diseases.**

IV. INDEPENDENT WORK. SOLUTION OF GENETIC PROBLEMS.

Problem 1. The human hemoglobin consists of two α - and two β - polypeptide chains. In the β - chain, the first 8 amino acids are in the following sequence: val - his - leu - thr - pro - glu - gln - lys. In the human hemoglobin S, the glutamine, located in the 6-th position is replaced by valine. Determine the structure of regions of DNA molecule, encoding the β - chain of hemoglobin molecules A and S and the causes of the replacement of glutamine by valine.

Problem 2. Podagra is determined by autosome dominant gene. It's known, that the penetrance of this gene in man is 20%, but in woman is 0%.
a) What is the probability of the birth of children with disease in the family in which both parents are heterozygotes for podagra?

b) What is the probability of the birth of children with disease in family in which one parent is heterozygote for podagra and the other is healthy?

Problem 3. Some forms of schizophrenia are inherited as autosome dominant characters. The penetrance of the gene in homozygotes is 100%, and in heterozygotes is 20%.
a) Determine the probability of the birth of children with disease in the family, where one parent is heterozygote, and the other is healthy for schizophrenia.

b) Determine the probability of birth of the children with disease in family where the both parents are heterozygotes for schizophrenia.

Problem 4. Arachnodactily is controlled by autosome dominant gene with the penetrance of 50%. Left-hand writing is autosome recessive character with complete penetrance.
Determine the probability of the birth of children with arachnodactily and left-hand writing in the family in which both parents are heterozygous for both characters.

Problem 5. Brown colour of eyes is autosome dominant character and dominates over blue colour. Retinoblastoma is controlled by autosome dominant gene with the penetrance of 60%.
a) What is the probability of the birth of the blue-eyed children with disease in the family in which both parents are diheterozygotes?

b) What is the probability of the birth of brown-eyed healthy children `in the family in which both parents are diheterozygotes?

Problem 6. In the family, where both parents have normal vision, there is the son with daltonism and two daughters with normal vision. The son has the own son with normal vision. The children of the first daughter are the son with daltonism and the daughter with normal sight. The second daughter has five healthy sons. Draw the pedigree of this family. Determine the probability of the birth of healthy sons in the family of first daughter.

Problem 7. The proband is sick man with night blindness. There are no sick persons in the paternal line. The mother of proband is sick. Two sisters and two brothers of proband's mother are

healthy. They have only healthy children. There is sick grandmother, healthy grandfather in the maternal line. The sister of grandmother is sick and her brother is healthy. It is known that the great-grandfather (the grandmother's father) was sick and his sister and brother were sick too. The great-great-grand father was sick, his brother, who had the sick daughter and son, was sick too. The proband's wife and her relatives were healthy. Determine the probability of the birth of sick children in this family.

Problem 3. Two sisters Mary and Margo with polydactily got married to the men with normal structure of hand. In the family of sister Margo, there were 5 children, three of them Igor, Kate, David have normal structure of hand, and tho, Ella, Richard are polydactyl. In family of sister Mary there was one daughter Diana with normal structure of hand. Igor had polydactyl daughter in the first marriage with healthy woman, and six children in the second marriage with healthy woman too. There are two daughters and one son with normal structure of hand and two sons and one daughter with polydactily among six children of Igor. Ella got married to the healthy man. They have two sons and four daughters, all of them are healthy. David got married to the healthy woman, their one son was polydactyl. Richard got married to his cousin Diana, all their children – two daughters and three sons were healthy. Draw the pedigree of this family and determine the probability of the birth of healthy children in Kate's family, if her husband is polydactyl (his father had normal structure of hand).

PRACTICAL CLASS №30

MAJOR TEST IN GENETICS

I. THE AIM:

Check the level of students 'assimilation of the material in the section «Genetics».