

**Ministry of Education and Science of the Kyrgyz Republic**

**Osh State University**

**DEPARTMENT OF HUMANITARIAN SCIENCE AND MATHEMATICS**

**WORK COPY BOOK for lab and practical lessons  
of “Medical biology, genetic, parasitology”**

student \_\_\_\_\_

(name)

group № \_\_\_\_\_

**Biology provides you with opportunities to develop the skills required to study sciences at a higher level.**



**2017 year**

## PRACTICAL LESSON №1

**Theme:** **Microscope device.** Chemical composition of the cell.

**Aim:** 1) Get to know microscope device and main rules of working with it.

2) Know the structure and the main prescriptions of the eukaryotic cell compounds and the chemical organization of the cell itself. Be able to distinguish their structure during microscopic analysis.

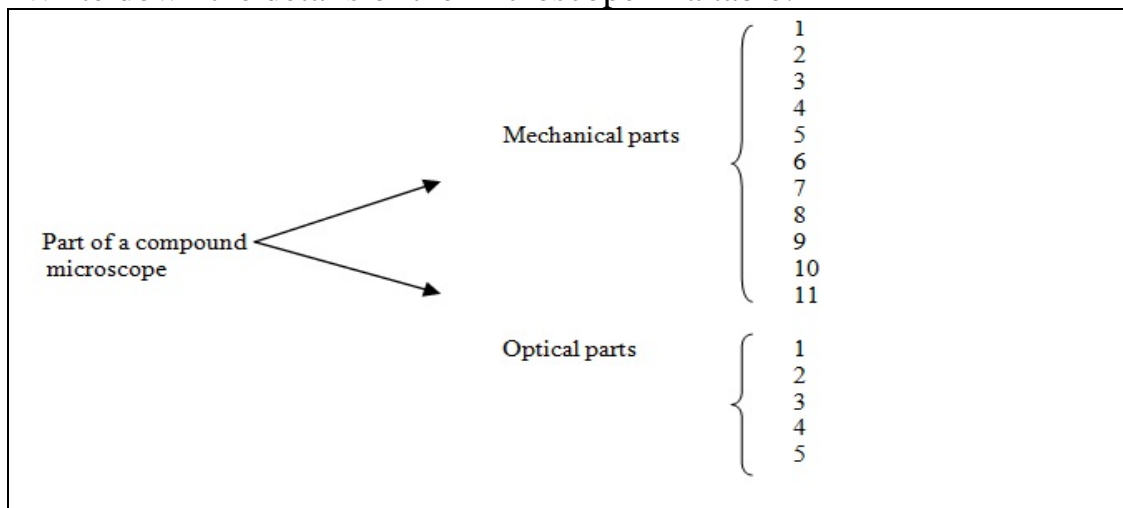
### Practical work

**Task 1. Read and remember the rules of usage of the microscope:**

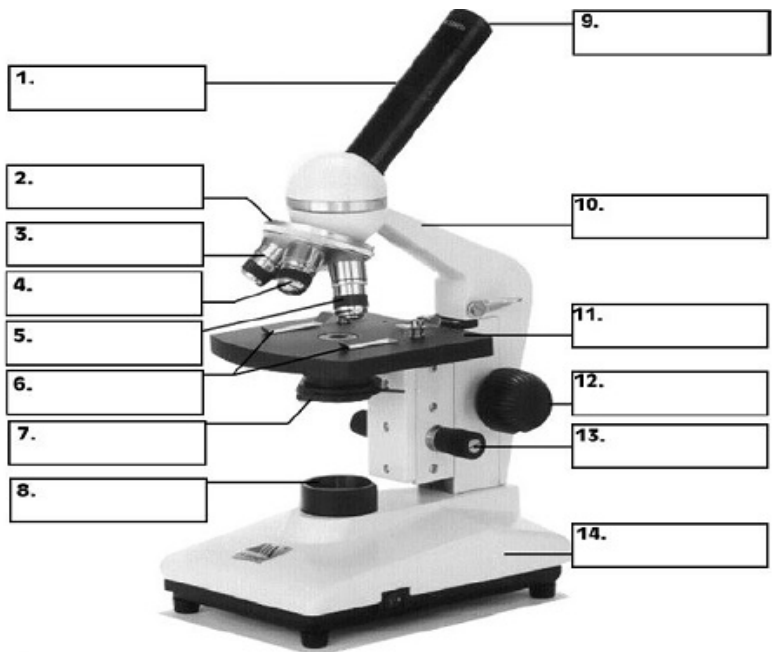
1. Use two hands to carry a microscope, one hand holding the arm, the other holding the base.
2. Only use lens paper and water to clean the lenses.
3. Always start off with the lowest magnification objective and work up to higher power one objective at a time.
4. Always observe the objective as it is rotated into place to ensure it doesn't crash into the slide.
5. Lower the stage to its lowest point before placing a slide on the stage.
6. Raise the stage to its highest point without crashing the slide into the objective.
7. Focus initially by lowering the stage using coarse focus adjustment knob.
8. After getting a close focus with the coarse focus adjustment knob, improve it using the fine focus adjustment knob.
9. Lower the stage to its lowest point.
10. Clean lenses, stage, body, and base if needed.
11. Replace protective cover over microscope.

**Task 2. Explore device of light microscopes using microscopes, tables and workshops.** Remember the name and purpose of their parts. **Nothing twist!!! Do not touch the lens!!!**

Write down the details of the microscope in a table:



**Sign microscope details in the picture:**



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**Task 3. Procedure of the preparation of temporary slide. Plant cell: stained temporary mount of onion peel.**

**Read and remember!** 1. There are two kinds of glasses, which are used to prepare the microscope slides: the **slide** and **cover glass (coverslip)**. Coverslip very thin and fragile. **Be careful!**

### 3.1 To prepare stained temporary mount of onion peel.

#### Materials required:

#### Procedure:



Pour some distilled water into a watch glass.

Peel off a leaf from half a piece of onion and using the forceps, pull out a piece of transparent onion peel (epidermis) from the leaf.

Put the epidermis in the watch glass containing distilled water.

Take a few drops of safranin solution in a dropper and transfer this into another watch glass.

- Using a brush, transfer the peel into the watch glass containing the safranin solution.
- Let this remain in the Safranin solution for 30 seconds, so that the peel is stained.
- Take the peel from the Safranin solution using the brush and place it in the watch glass containing the distilled water.
- Take a few drops of glycerine in a dropper and pour 2-3 drops at the center of a dry glass slide.
- Using the brush, place the peel onto the slide containing glycerine.

- Take a cover slip and place it gently on the peel with the aid of a needle.
- Remove the extra glycerine using a piece of blotting paper.
- Place this glass side on the stage of the compound microscope and view it.

### Observations

- There are a large number of regularly shaped cells lying side by side and each cell has a distinct cell wall.
- A distinct nucleus is present on the periphery of each cell.
- Lightly stained cytoplasm is observed in each cell.
- A large vacuole is present at the centre of each cell, and is surrounded by the cytoplasm.

### Conclusion

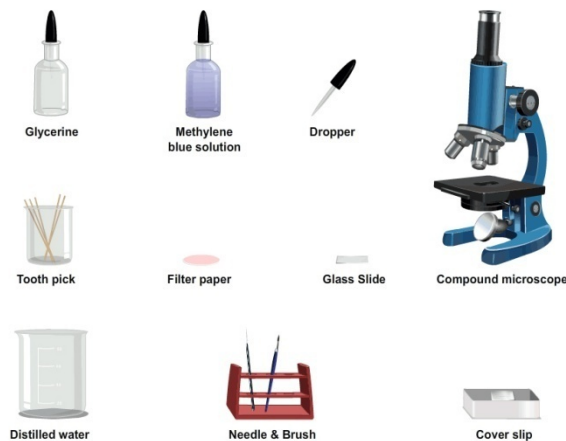
As cell walls and large vacuoles are clearly observed in all the cells, the cells placed for observation are plant cells.

### Precautions

- Use a brush to transfer the peel from one apparatus to another.
- Staining of peel should neither be too dark, nor too light.
- Extra glycerine stain should be removed using blotting paper.

### Task 3.2 To prepare stained temporary mount of human cheek cells.

#### Materials required:



#### Procedure:

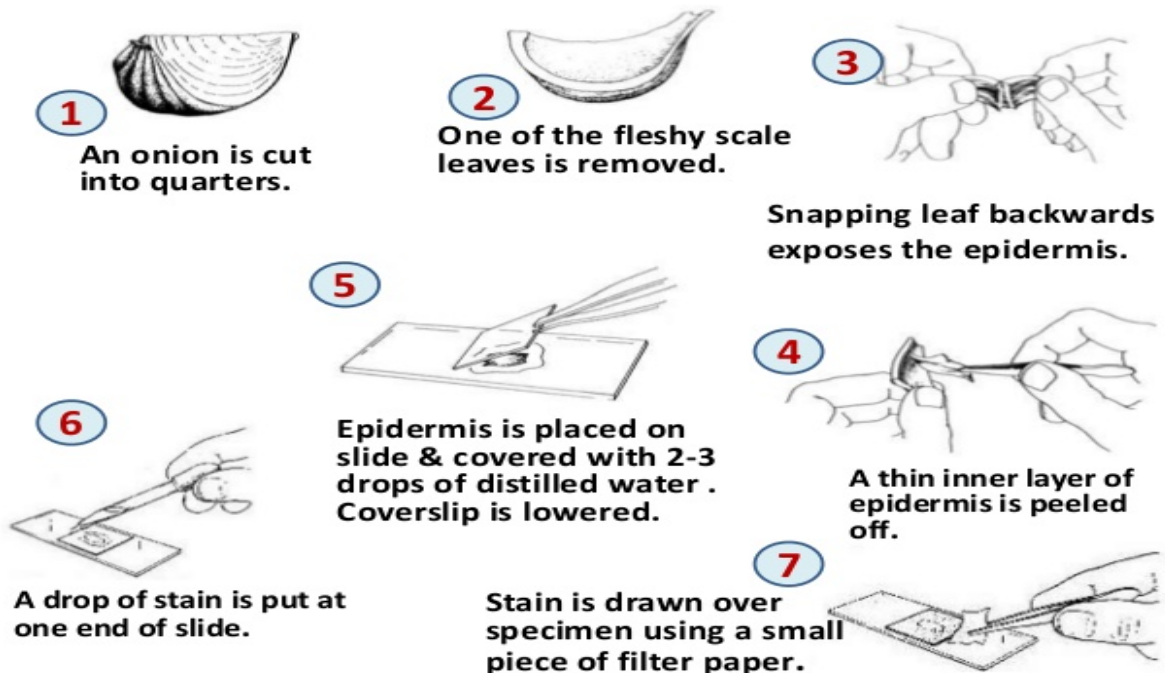
Gently scrape the inner side of the cheek using a toothpick, which will collect some cheek cells.

Place the cells on a glass slide that has water on it.

Mix the water and the cheek cells using a needle and spread them.

Take a few drops of Methylene blue solution using a dropper and add this to the mixture on the slide.

- After 2-3 minutes remove any excess water and stain from the slide using a blotting paper.
- Take a few drops of glycerine using a dropper and add this to the test mixture.
- Take a clean cover slip and lower it carefully on the mixture with the aid of a needle.
- Using a brush and needle, press the cover slip gently to spread the epithelial cells.
- Remove any extra liquid around the cover slip using a blotting paper.
- Place this glass side on the stage of the compound microscope and view it.



### Observations

- A large number of flat and irregular-shaped cells are observed.
- The cells do not have a cell wall. However, each cell has a thin cell membrane.
- A deeply stained nucleus is observed at the centre of each cell.
- No prominent vacuoles are observed in the cells.

**Task 4.** Examine animal and plant cells (demonstration slide) at low and high magnification. Learn how to quickly find objects on permanent micropreparations (finding images).

They have cytoplasm, nucleus and plasma membrane. Cells of animals have smaller sizes in comparison with the cells of plants. Draw the cells.

### Task 5. Compare, contrast and fill the table:

Characteristics	Prokaryotic cells	Eukaryotic cells
	Bacteria and blue-green algae	Protists, fungi, plants, animals
	1 – 10 nm across	10 – 100 nm across
	By some	By many
	No	Yes
	Single strand of DNA that forms circle, DNA without protein	Coiled, linear strands, complexed with protein
	In nucleoids (nucleus like) in cytoplasm	In nucleus
	A single chromosome	Number of chromosomes varies from 2 to several hundred
	Short	Long
	Never formed during cell	Nuclear spindle formed

	division	
	RNA and protein synthesis are not spatially separated	RNA and protein synthesis are spatially separated
	Some	Many
	No	Yes
	Single cells or colonies	Some single-celled, most with differentiation of cell function.

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**Task 7. Write some examples of chemical composition of the cell by dividing to main groups?** \_\_\_\_\_

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## PRACTICAL LESSON №2

**Theme: Cell theory. Morphology of plant and animal cells.**

**Aim:** 1) Get to know cell theory and two exceptions of it.

2) Know the structure and the main prescriptions of the eukaryotic cell compounds.

Be able to distinguish their structure during microscopic analysis.

### Practical work

**Task 1. Conduct debate about Cell theory,** its modern form, includes the following principles:

1. All known living things are made up of one or more cells.
2. All living cells arise from pre-existing cells by division.
3. The cell is the fundamental unit of structure and function in all living organisms.
4. The activity of an organism depends on the total activity of independent cells.
5. Energy flow (metabolism and biochemistry) occurs within cells.
6. Cells contain DNA which is found specifically in the chromosome and RNA found in the cell nucleus and cytoplasm.
7. All cells are basically the same in chemical composition in organisms of similar species.

Cells are of two fundamental types according to presence or absence of a nucleus: prokaryotic and eukaryotic.

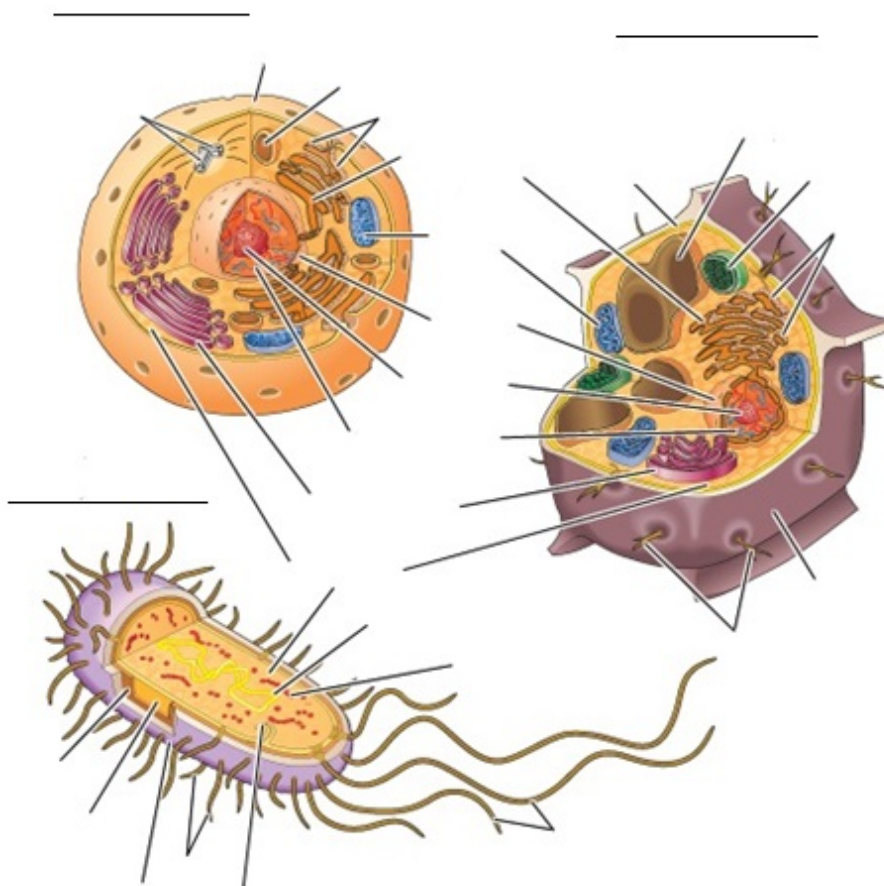
**Task 2. Compare, contrast and fill the table:**

Organelles	Structure	Function
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Ribosomes		
Rough endoplasmic reticulum(RER)		
Smooth endoplasmic reticulum(SER)		
Golgi apparatus		
Lysosomes		
Peroxisomes (microbodies)		
Mitochondrion		
Centrosome (cell center)		
Vacuole		

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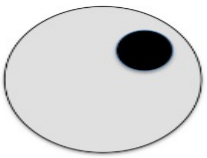
**Task 3. Write down types of the cell. Label cell organelles.**



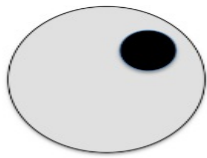
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**Task 4. Complete the following diagrams:**

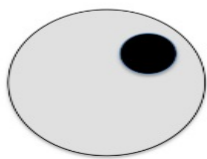
1. I am an animal cell. Add more organelles and label me.



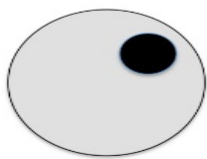
2. Turn me into a labelled sperm cell.



3. Turn me into a labelled plant cell.



4. Turn me into a labelled \_\_\_\_\_ cell.



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**Task 5. Draw lines from the parts of cells to their functions.**

Part of cell	Function
Cell membrane	Tells the cell what to do
Chloroplasts	Keeps the cell together and controls what goes into and out of the cell
Nucleus	A jelly-like substance in which many of the cell's activities happen
Cell wall	A storage space filled with sap
Cytoplasm	Green discs that allow to make own food
Vacuole	Supports the cell

**Task 6. Short answer type questions:**

1. Give two exceptions of the cell theory?
2. Who has invented first simple microscope?
3. Who has propounded the cell theory?
4. “ New cells originate from pre-existing cells.”Who has given this statement?
5. In cell which scientist discovered the nucleus?
6. Give one example of each prokaryotic and eukaryotic cell?
7. Write down two differences of prokaryotic and eukaryotic cells?
8. “Protoplasm is the physical basis of life” which scientist proposed this view?
9. Write the names of two cell organelle enveloped by one cellular membrane?
10. Write the names of two cell organelle which do not posses any membrane?
11. What are capsid and capsomeres?

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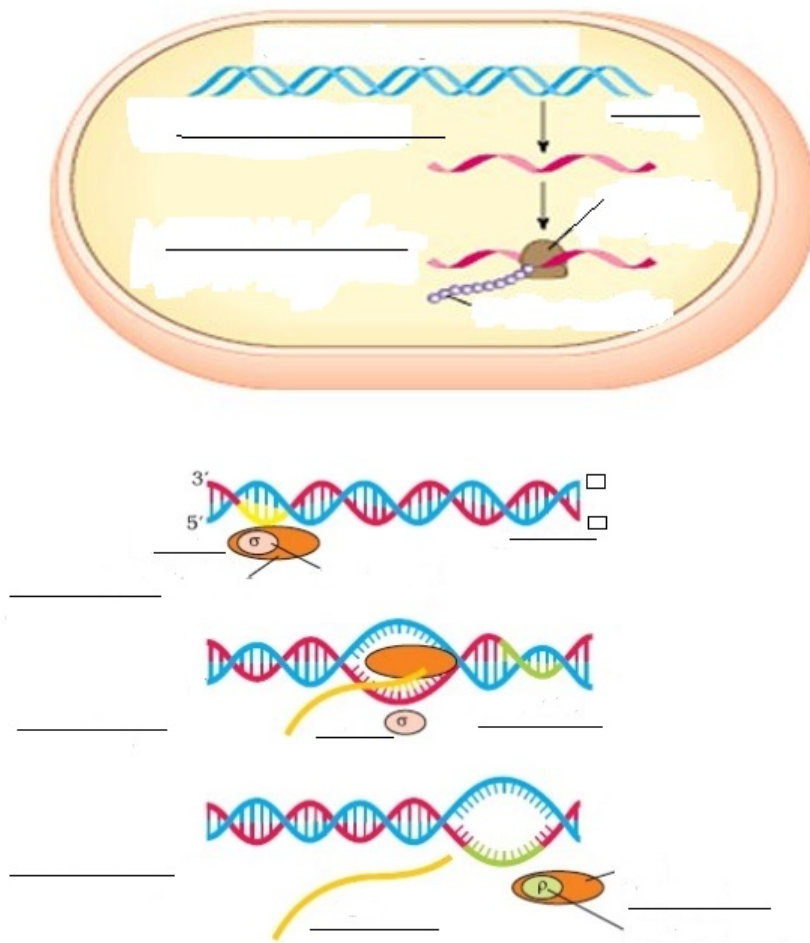


**Theme: Gene expression. Protein synthesis.**

- Aim:** 1) To generate knowledge about the main stages of gene expression: **transcription** (capping, the “poly-A tail”, splicing, the alternative splicing) and **translation**. Control of an expression of genes.  
 2) To classify the role of RNA in gene expression. Types of RNAs. Characteristics of tRNAs, mRNA, rRNA, snRNA.  
 3) To give an idea of the genetic code and its basic properties: triplets, degenerate, nonoverlapping, comma-free, ordered, universal.

**Practical work**

**Task 1. Describe following diagram and labeled:**



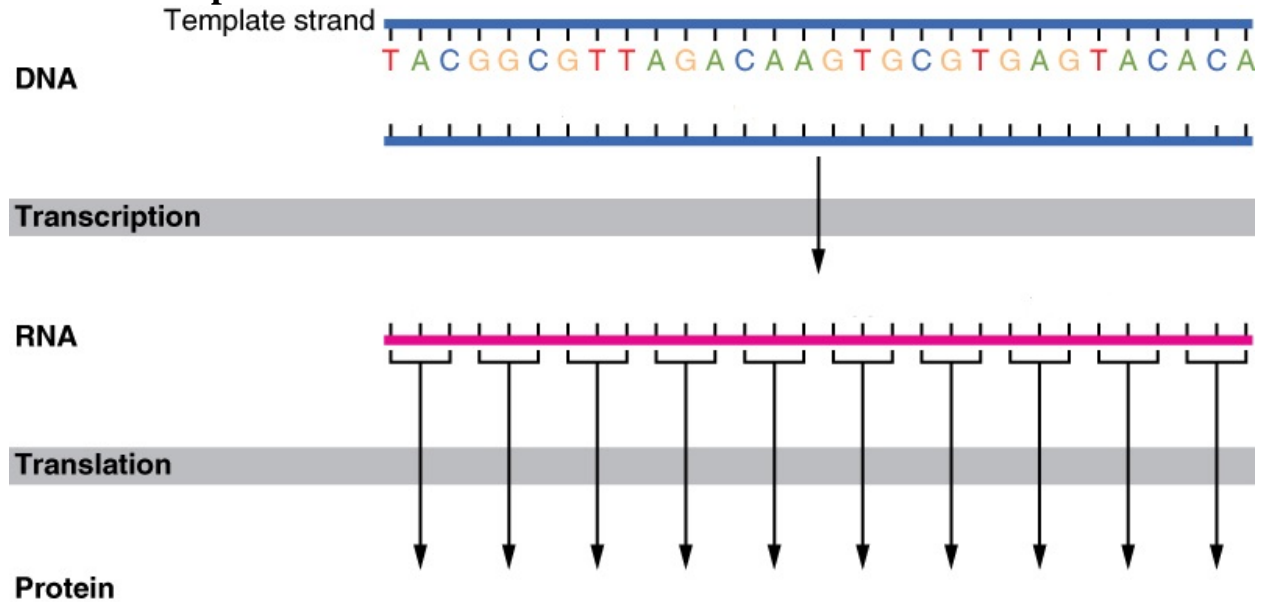
**Task 2. Match the following substances and structures involved in the synthesis of protein and its functions (put the right letter next to the number).**

1. DNA region	a) transfers information to the ribosome's
2. m-RNA	b) the place of protein synthesis
3. RNA polymerase	c) an enzyme that provides the synthesis of m-RNA
4. Ribosome	d) source of energy for reactions
5. Polysome	e) monomers of protein
6. ATP	f) group of nucleotides encoding 1 amino acid
7. DNA triplet	j) gene encoding protein information
8. Amino acid	k) several ribosomes simultaneously transmitting one mRNA molecule

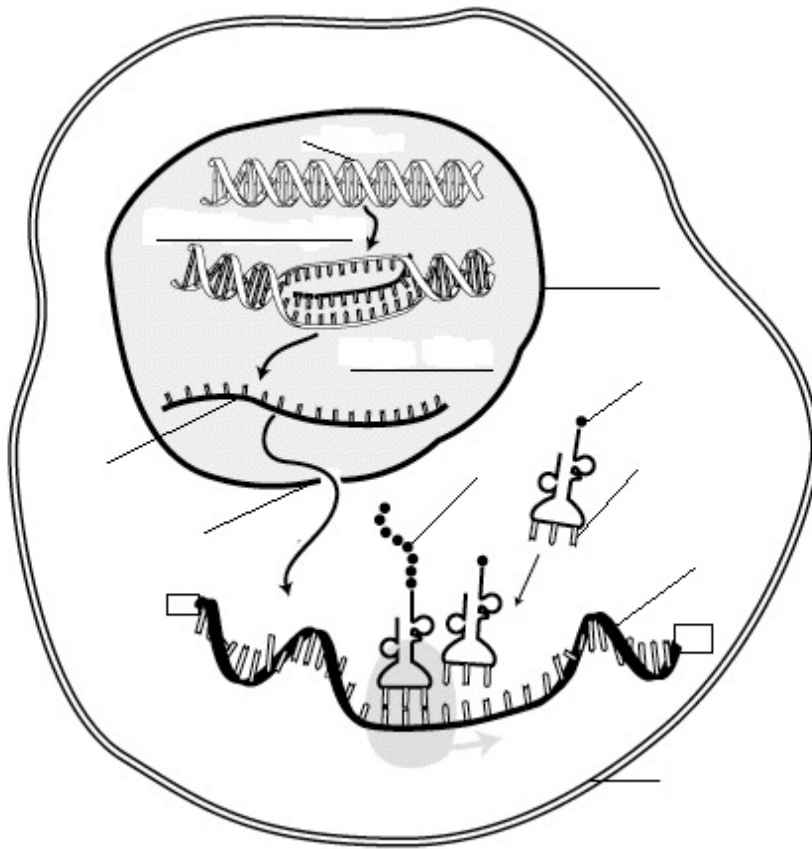
**Task 3.** Fill the table:

Molecules	Role in biosynthesis	Process in the ribosome's
Messenger RNA (mRNA)		
Transfer RNA (tRNA)		
Enzymes – Proteins		
ATP		

**Task 4. Complete the task:**



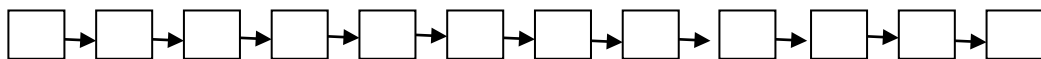
**Task 5. Describe following diagram and labeled:**



**Task 6. Write in the boxes and place them into the correct order to show how protein synthesis occurs.**

In the cytoplasm, protein synthesis is initiated by the AUG codon on mRNA. The AUG codon signals both the attachment of the ribosome with mRNA and also the tRNA with the anticodons (UAC).	A
The ribosome moves along the mRNA one codon. The first tRNA is released without its amino acid.	B
When the ribosome reaches a termination codon the ribosome leaves the mRNA and protein synthesis is complete.	C
During the first step in protein synthesis, the DNA / gene is transcribed into mRNA in the nucleus. The DNA unzips and free nucleotides come in and produce the mRNA strand using the complementary base pairing rule: the enzyme that controls this process is RNA polymerase.	D
The ribosome moves along the mRNA one codon. Again the tRNA is released without its amino acid.	E
The next step is for a second tRNA to approach the mRNA and match with the second codon on the mRNA.	F
A peptide bond forms between the amino acids.	G
Another peptide bond forms between the amino acids.	H
The completed amino acid chain is now ready to be folded into a functional protein.	I
This process called translation continues and causes the amino acid chain to grow.	J
The mRNAs migrate from the nucleus into the cytoplasm.	K
The next matching tRNA brings in the next amino acid.	L

occurs.



Use mRNA Codon chart to solve the following tasks.





	2.
	3.
	4.
	5.
	6.
	7.
	8.
	9.
	10.
	11.
	12.

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**Task 3.** Describe differences and similarity between mitosis and meiosis.

<b>Characteristics</b>	<b>Mitosis</b>	<b>Meiosis</b>
Genetic variation		
Selective Breeding		
Time and energy		
Rapidity		
Mutations		
DNA synthesis		
Crossover		

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**Task 4. Short type questions:**

1) If the cell has been divided what number and time to divide according to genetic information suppose this 2 daughter cells don't have to divide any more. What this cell going to do?

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2) Give examples and characteristics for direct division?

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3) Factors affecting mitosis?

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4) Write down difference between mitosis in plant cells and animal cells?

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5) The cell cycle control system is regulated by both internal and external controls. Describe them?

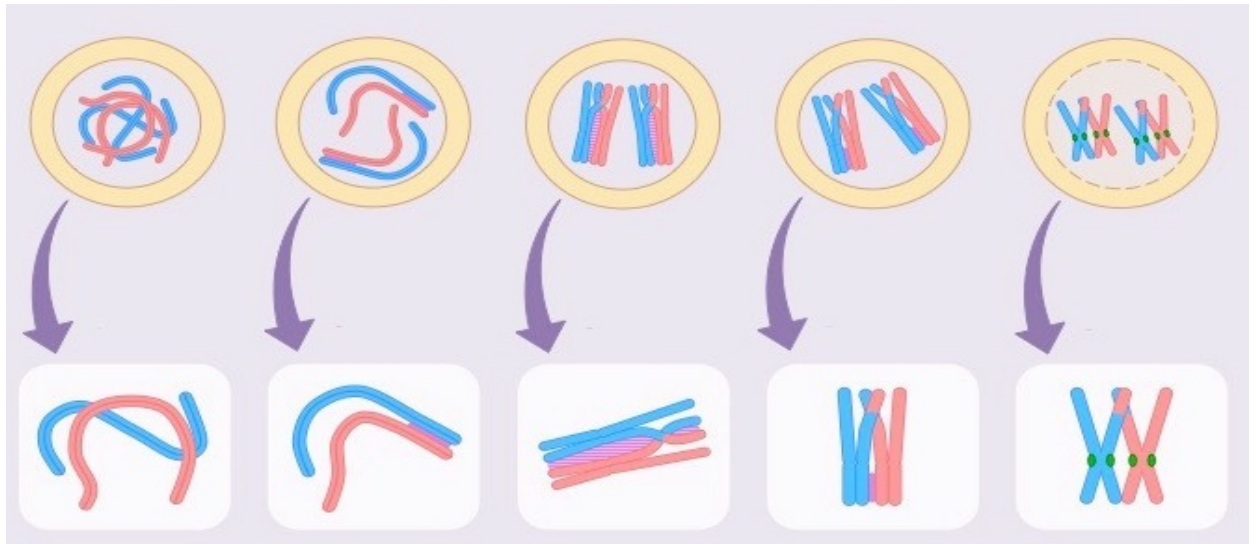
6) If mitosis is not controlled, unlimited cell division occurs causing.....? What process is it?

7) What is the process of apoptosis?

8) What difference has homologous chromosome and non homologous chromosome?

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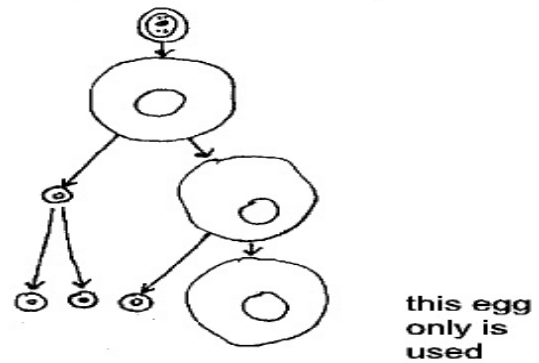
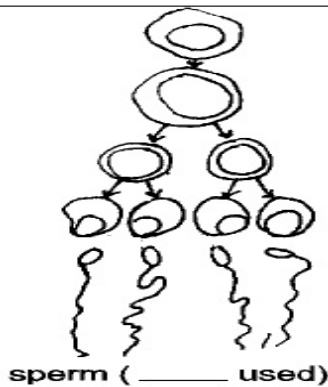
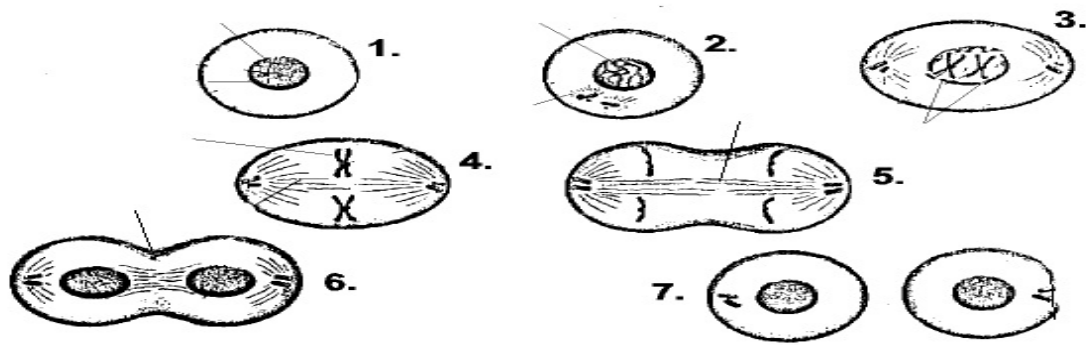
**Task 5.** Write down 5 subphases of prophase I of meiosis. What is occurring in prophase I?



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**Task 6.** Complete the diagrams:



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### PRACTICAL LESSON №5

**Theme: Reproduction in organisms.**

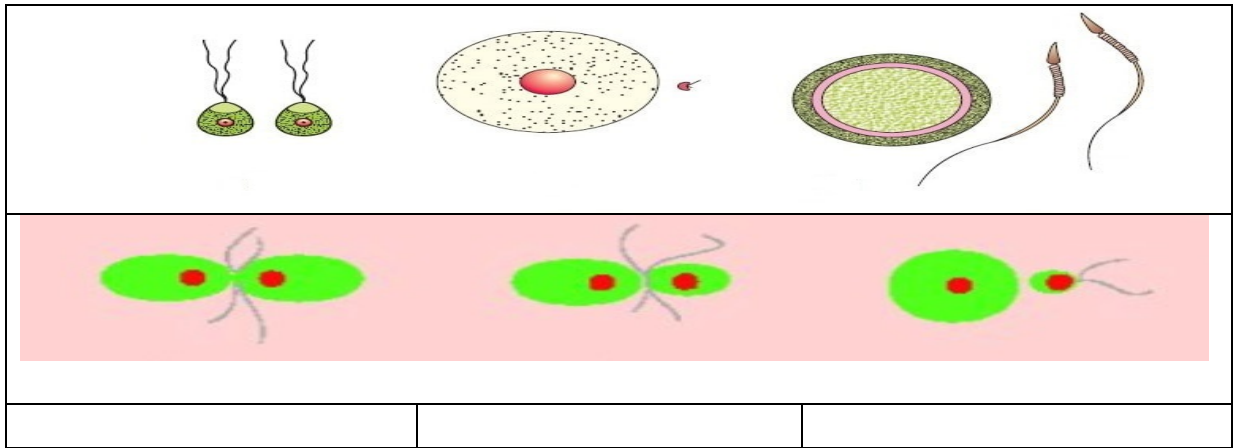
**Aim:** 1) To form knowledge about the essence and forms of reproduction of organisms; to show the biological significance of asexual reproduction. The role of reproduction in evolution.

2) Types of reproduction: asexual and sexual. Types of asexual and sexual reproduction in unicellular and multicellular organisms. Importance of reproduction.

3) Cell reproduction. Gametogenesis: characteristic of stages. Gametes: structure and functions.

#### Practical work

**Task 1. The evolution of sexual reproduction.** Determine the form of the sexual process shown in Figure. Sign drawings: **oogamy, isogamy, anisogamy.**



**1.2. In the following table shown types of asexual and sexual reproduction in unicellular and multicellular organisms. Complete the table with appropriate examples.**

Types of reproduction									
Cell division	Asexual					Sexual			
	Vegetative propagation					Sporulation	Syngamy of unicellular organisms	Syngamy of gametes	Parthenogenesis Developing of offsprings from the egg or female gamete without the prior fertilization from the male gamete.
	In animals		In plants						
Budding	Fragmentation	With roots	With shoots (runner, cutting, bud)	With leaves					

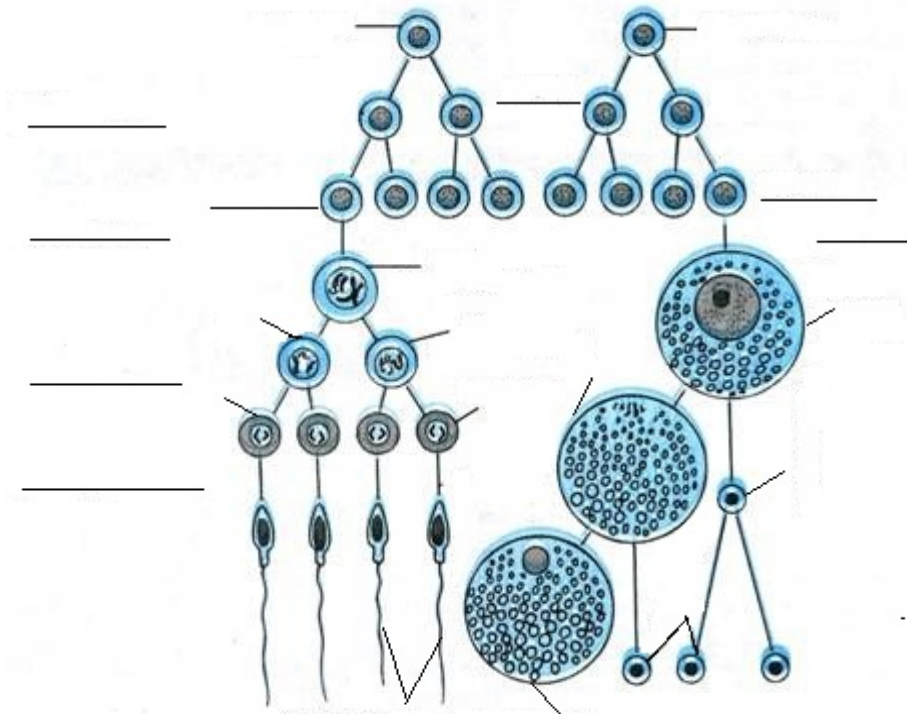
**1.3. Using all data, fill the table:**

No	Species (examples)	Types of reproduction
1	Infusoria	
2	Freshwater hydra	
3	Wild strawberry	
4	Mushroom	
5	Grapes	
6	Currant	
7	Potato	
8	Earthworm	
9	Ameba	

10	Star fish	
11	Yeast	
12	Bee	

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**Task 2. Gametogenesis.** Write down the names of cells and stages of gametogenesis in the diagram. Indicate the number of chromosomes and DNA in the cells.



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**Task3. The structure of sperm.**

Examine the slide using a microscope.

<p>Note in the picture:</p> <ol style="list-style-type: none"> <li>1. head</li> <li>2. neck</li> <li>3. tail</li> <li>4. acrosome</li> <li>5. centrioles</li> <li>6. nucleus</li> <li>7. mitochondria</li> <li>8. basal body</li> </ol>	
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**Task 4. The structure of ovum.** Note the large size of the egg. The cytoplasm of the egg contains a lot of yolk.

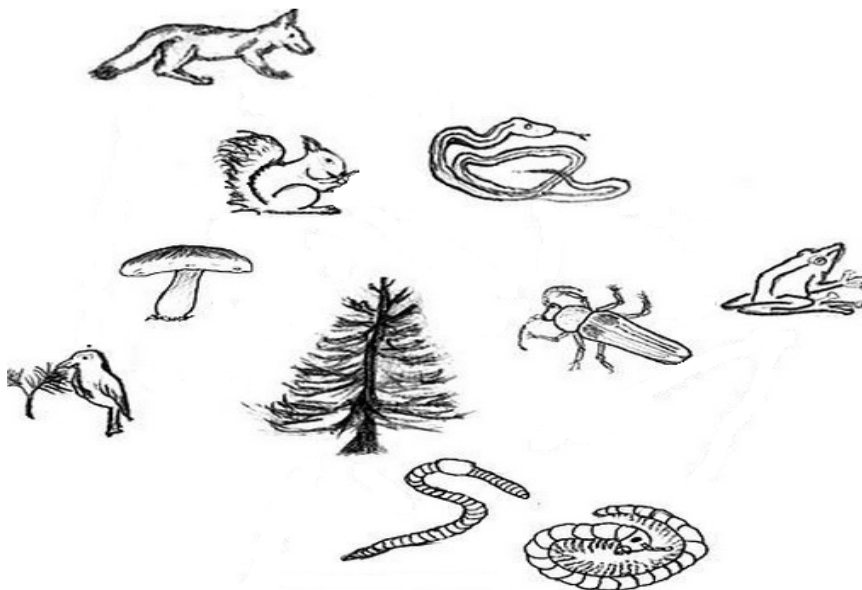






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**Task 3. Use arrow to show food web.**



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**Task 4. Draw 3 types of ecological pyramids:**

Pyramid of energy  
biomass

Pyramid of numbers

Pyramid of

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**Task 5. Types of symbiotic relationships. Look at the picture and characterize with appropriate interaction.**

INTERACTION	TYPE OF SYMBIOSIS	EXAMPLE


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**Task 6. Describe human impact on the environment (biophysical environments, biodiversity and other resources).**

Anthropogenic factor	How is effected? What diseases does it cause due to human impact factor?
Greenhouse effect	
Ozone depletion	
Acid rain	
Desertification	
Deforestation	
Algal blooms and eutrophication	
Air pollution (suspended particles, nitrogen dioxide, sulfur dioxide)	
Water pollution	
Soil pollution	

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**PRACTICAL LESSON №7**

**Theme: Basic concepts in genetics. Mendel’s Laws. Genetic crosses.**

**Aim:** 1) Practice genetic terminology.

- 2) Discuss Mendel’s 1st law: rule of dominance (law of dominance), Mendel’s 2st law (low of segregation), and Mendel’s 3nd law (law of independent assortment).





















































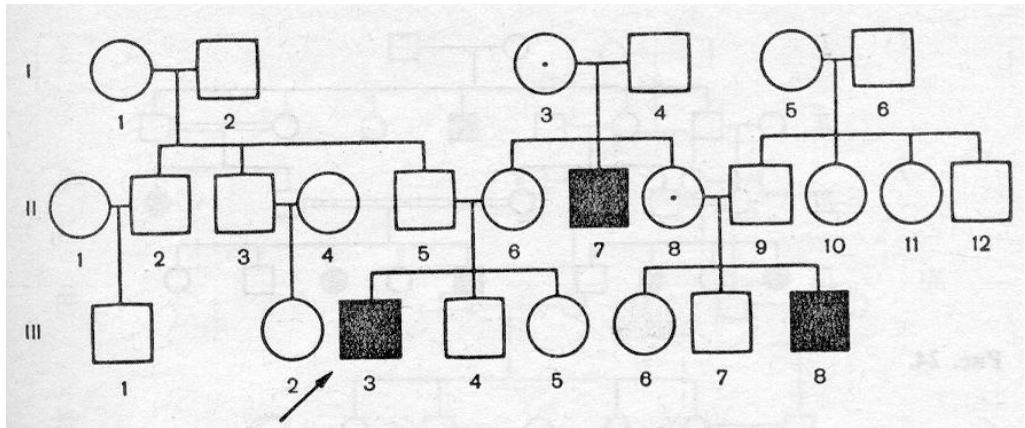







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**Problem 4.**




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**PRACTICAL LESSON №12**

**Theme: Basic concepts of parasitology. Medical protozoology. Phylum Sarcomastigophora .**

- Aim:**
- 1) Formation knowledge about medical parasitology.
  - 2) Classify parasites. Describe life cycle, classification of host, parasitic system, localization, transmission of the parasite.
  - 3) Subkingdom Protozoa. Protozoan classification and its characteristics. Protozoa life cycle.
    - 3.1. Phylum Sarcomastigophora: Subphylum Sarcodina and Mastigophora: Characteristics.
    - 3.2 Non – pathogenic Sarcodina: Ameba proteus, Entamoeba gingivalis, Entamoeba coli
    - 3.4 Pathogenic Sarcodina: Entamoeba histolytica, Acanthamoeba, Naegleria
    - 3.5 Non – pathogenic Mastigophora: Euglena
    - 3.6 Pathogenic Mastigophora: Giardia lamblia (Lamblia intestinalis), Trypanosoma , Leishmania , Trichomonas



for circulating parasites	
Diagnosis	
Prevention	

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**Task 4. Lamblia intestinalis (Giardia lamblia).**

Examine the slide Lamblia intestinalis. Draw the structure of Giardia.

<b>Lamblia intestinalis trophozoite</b>	<b>Lamblia intestinalis cyst</b>
<b>Size:</b>	<b>Size:</b>

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**Task 5. Fill the table:**

Disease	
Pathogen	
Distribution of the disease	
Invasive (Infective) stage	
Source of infection	
Localization	
Transmission mechanism	
Route (pathway)	
Transmission factors	
Vectors – organisms for circulating parasites	
Diagnosis	
Prevention	

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**Task 6. Leishmania.** Examine and draw the slide Leishmania in culture and Leishmania in the cell.

<b>Leishmania in culture (Promastigotes)</b>	<b>Leishmania in the cell (Amastigotes)</b>

<b>Size:</b>	<b>Size:</b>

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**Task 7. Complete the table:**

Disease	Cutaneous leishmaniasis	Visceral leishmaniasis
Pathogen		
Infective stage		
Source of infection		
Distribution of the disease		
Localization		
Transmission mechanism		
Vectors		
Diagnosis		
Prevention		

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**Task 8. Trypanosoma.**

<p style="text-align: center;"><b>Trypanosoma</b></p>          <p><b>Size:</b></p>	<p><b>Note in drawing:</b></p> <ol style="list-style-type: none"> <li>1. nucleus</li> <li>2. plasma membrane</li> <li>3. flagella</li> <li>4. undulating membrane</li> <li>5. erythrocyte</li> </ol>
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**Task 9. Complete the table:**

Disease	African Trypanosomiasis or "sleeping sickness"	American trypanosomiasis or Chagas Disease
Pathogen		
Invasive stage		
Source of infection		
Distribution of the disease		
Localization		
Transmission mechanism		



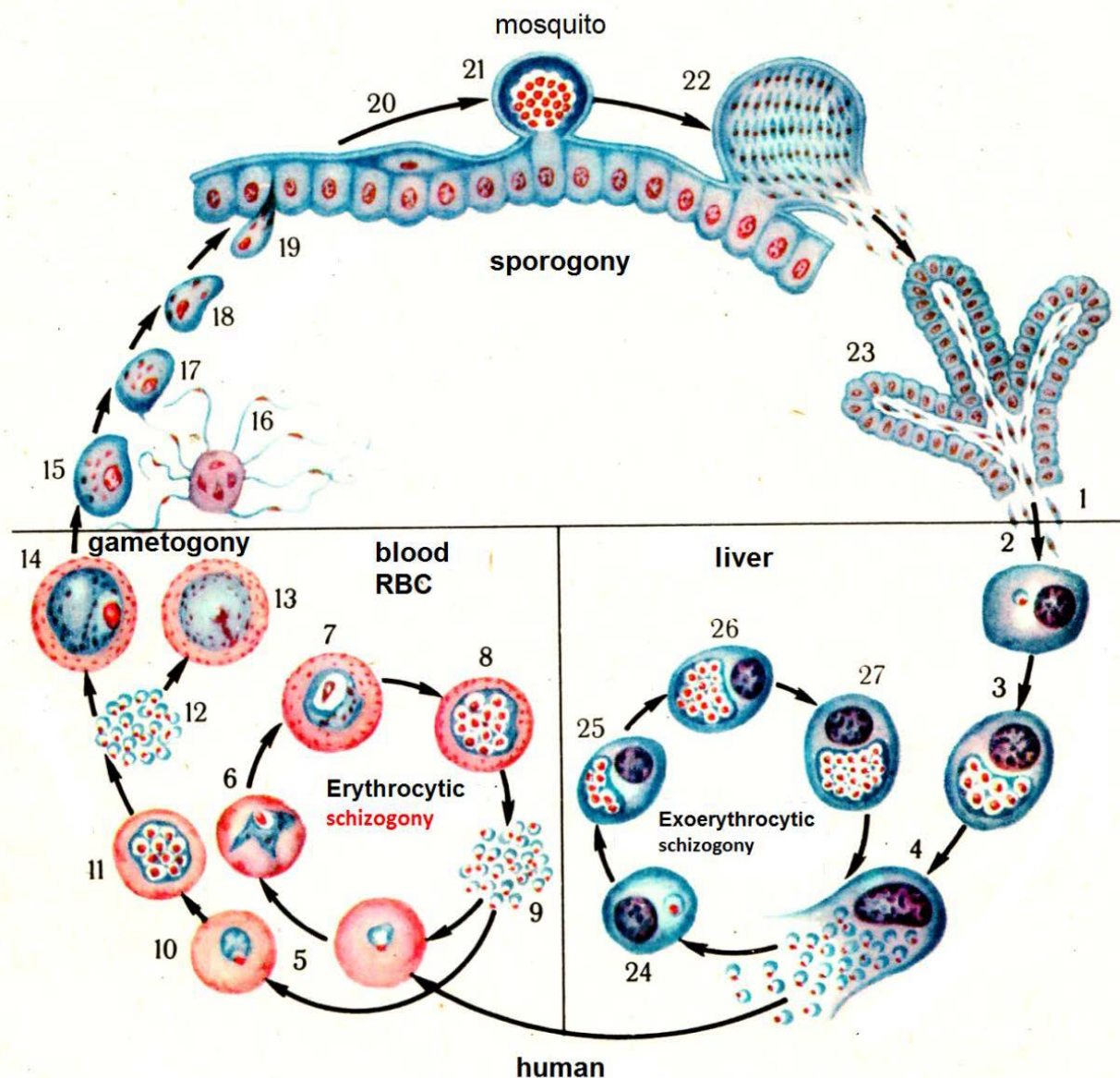




- 2) Study Phylum Ciliophora (Ciliates). Non – pathogenic Ciliates: Paramecium. Describe life cycle, classification of host, parasitic system, localization, transmission of the parasite.
- 3) Pathogenic Ciliates: Balantidium coli

### Practical work

#### Task 1. 1) Life cycle of Plasmodium.



Define the stage of Plasmodium development in the mosquito and human.  
 Draw the life cycle, note and write down the stage name:

1	14
2	15
3	16
4	17
5	18
6	19
7	20
8	21



9	22
10	23
11	24
12	25
13	26

**2) Plasmodium vivax. Examine and draw Plasmodium vivax.**

<b>Size:</b>	<b>Note in drawing:</b> 1. erythrocytes 2. plasmodium
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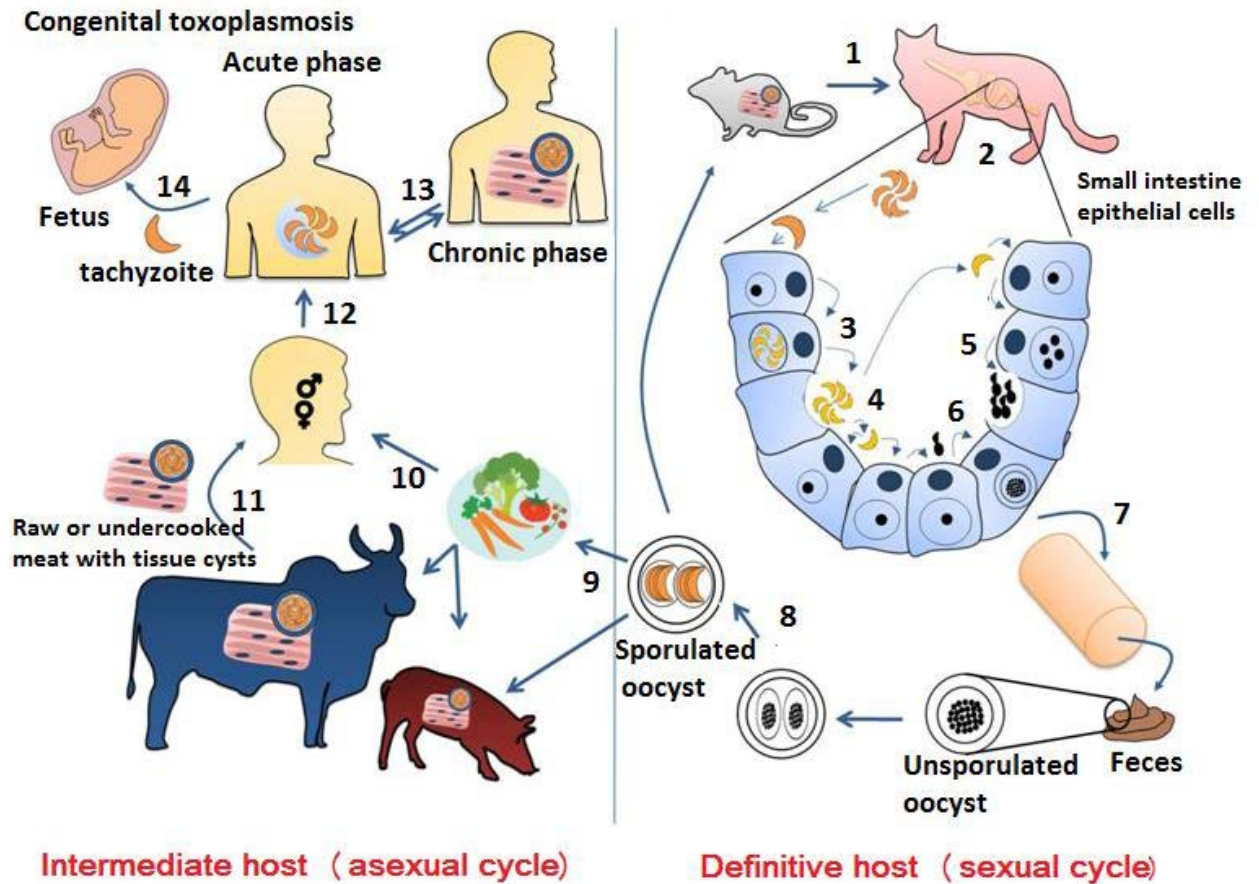
**3) Complete the table:**

Disease	
Pathogen (causal agent)	
Definitive host	
Intermediate host	
Source of infection	
Localization	
Route (pathway, mode of transmission )	
Vectors	
Diagnosis	
Prevention	

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**Task 2. 1) The life cycle of Toxoplasma. Define the stage of Toxoplasma development in the cat and human. Draw the life cycle, note and write down the stage name.**

1	8
2	9
3	10
4	11
5	12
6	13
7	14



**2) Complete the table:**

Disease	
Pathogen (causal agent)	
Definitive host	
Intermediate host	
Source of infection	
Invasive (Infective) stage	
Source of infection	
Localization	
Route (pathway, mode of transmission)	
Transmission factors	
Vectors	
Diagnosis	
Prevention	

**3) Toxoplasma gondii**

	<p><b>Note in drawing:</b></p> <p>1.nucleus</p> <p>2.plasma membrane</p> <p>3.cytoplasm</p> <p>4.</p> <p>5.</p>
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**PRACTICAL LESSON №14**

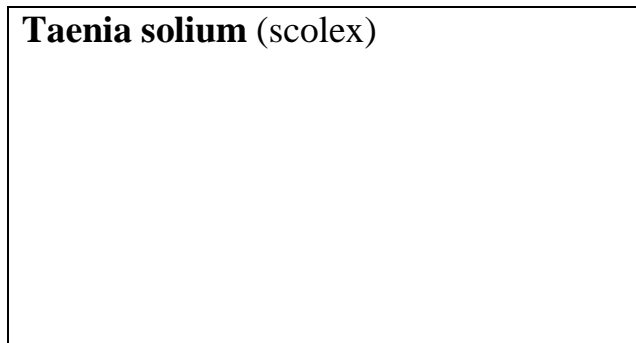
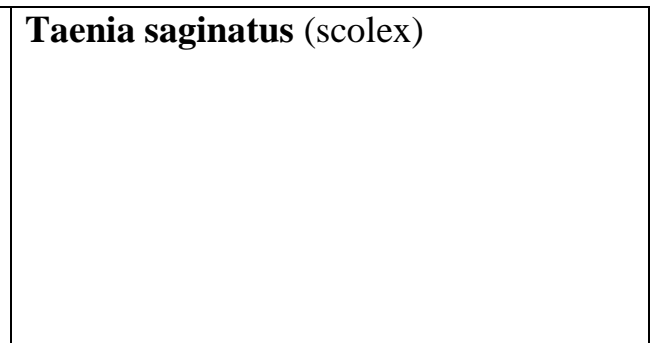
**Theme: Medical Helminthology. Phylum Plathelminthes. Cestoidea infections.**

**Aim:** 1) Formation knowledge about phylum Plathelminthes.  
 2) Study Pathogenic Cestods: *Taenia solium* (pork tapeworm), *Taeniarhynchus saginatus* (beef tapeworm), *Diphyllobothrium latum* (fish tapeworm), *Echinococcus granulosus*, *Alveococcus multilocularis*, *Hymenolepis nana* (dwarf tapeworm). Describe life cycle, classification of host, parasitic system, localization, transmission of the parasite.

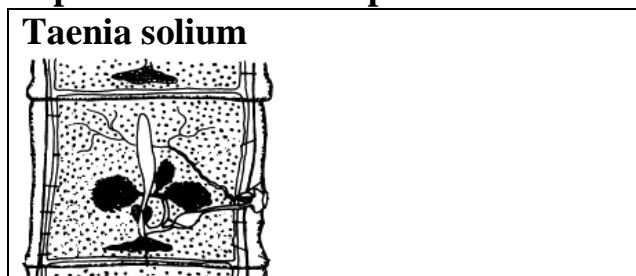
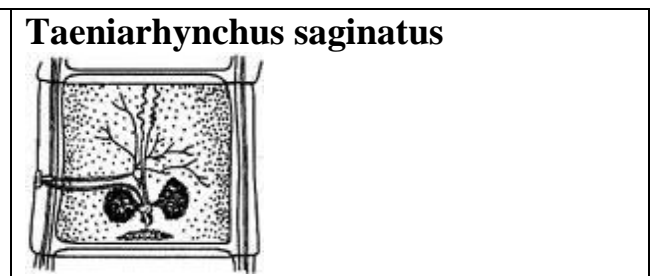
**Practical work**

**Task 1. *Taenia solium* and *Taenia saginatus* (*Taeniarhynchus saginatus*).**

**1) Draw *Cysticercus Taenia solium* and *Cysticercus Taeniarhynchus saginatus*.** Compare scolexes structure. Draw the scolexes. Designate figure of suckers and hooks.

<b><i>Taenia solium</i></b> (scolex)	<b><i>Taenia saginatus</i></b> (scolex)
	
<b>scolex</b> have hooks and 4 suckers that aid in attachment	<b>scolex</b> have only 4 suckers that aid in attachment

**2) Designate mature proglottids.** Remember the differences between **Pork tapeworm** and **Beef tapeworm**.

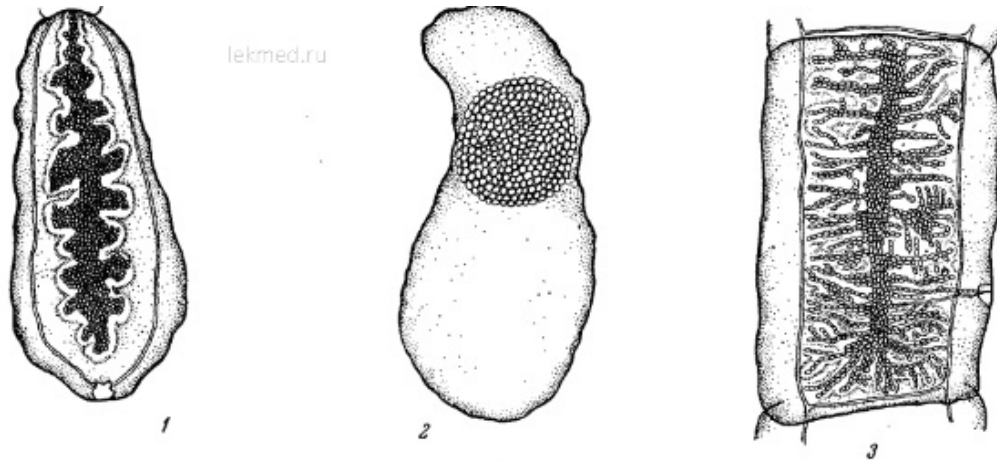
<b><i>Taenia solium</i></b> 	<b><i>Taeniarhynchus saginatus</i></b> 
The <b>germarium (ovary)</b> is divided into 3 lobes	The <b>germarium (ovary)</b> is divided into 2 lobes

**3) Draw gravid proglottids.**

<b><i>Taenia solium</i></b>	<b><i>Taeniarhynchus saginatus</i></b>
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Size:	Size:
The uterus is a blind sac with 8-12 pair lateral branches	The uterus is a blind sac with 17-35 pair lateral branches

The scheme of a structure of a uterus at teniat (original). Sign them:



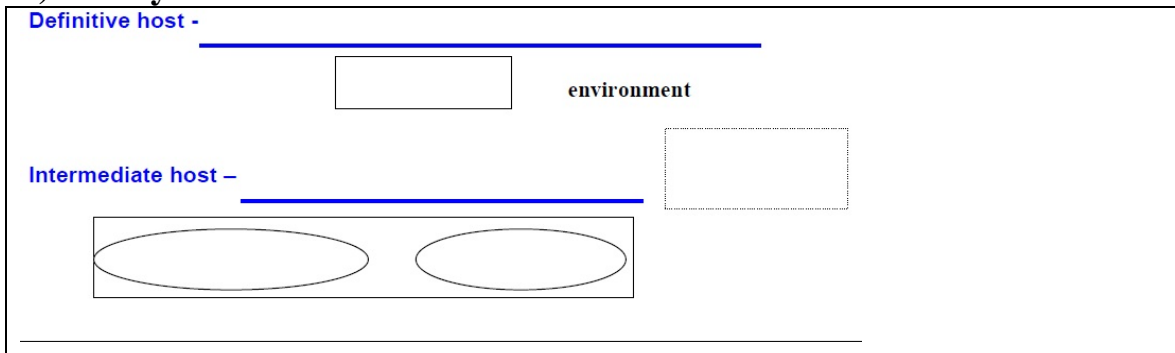
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**4) Draw eggs of Taenia solium and Taenia saginatus.**

**eggs**

Size:

**5) Life cycle of Taenia solium:**



**6) Complete the table:**

Disease	Taeniasis solium	cysticercosis	Taeniasis
---------	------------------	---------------	-----------



			<b>saginata</b>
Pathogen			
Distribution of the disease			
Definitive host			
Intermediate host			
Localization			
Route (pathway)			
Invasive stage			
Diagnosis			
Prevention			

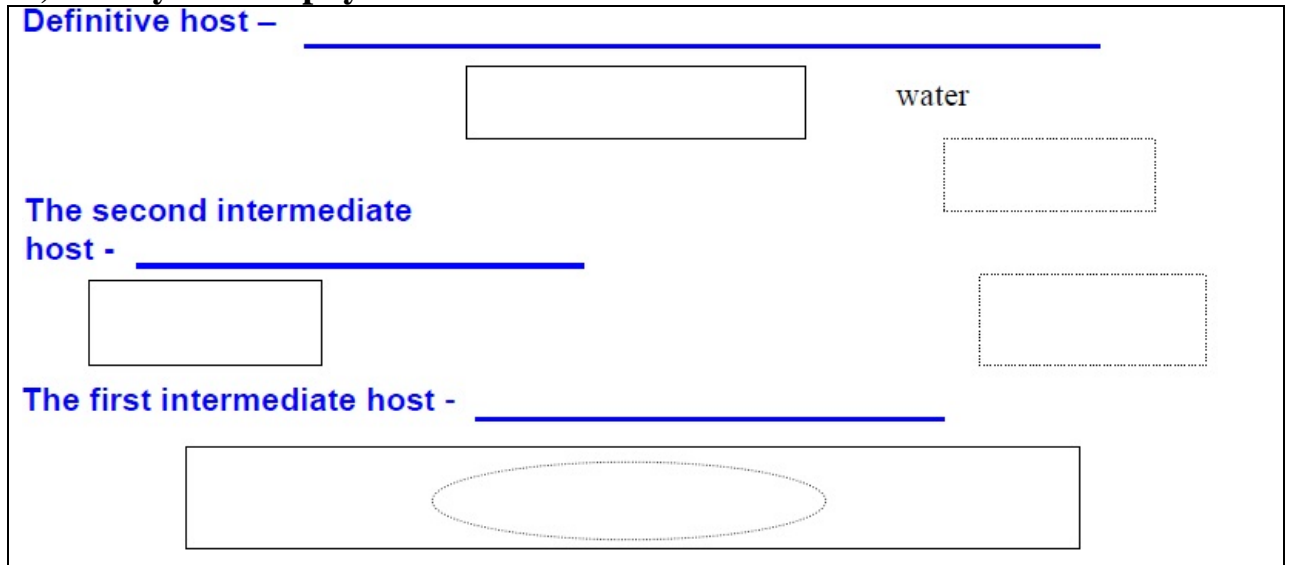
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**Task 2. Diphylobothrium latum.**

**1) Draw gravid proglottids and eggs of Diphylobothrium latum.**

<b>gravid proglottids D. latum</b>	<b>eggs D. latum</b>
Size:	Size:
Note in drawing: uterus	

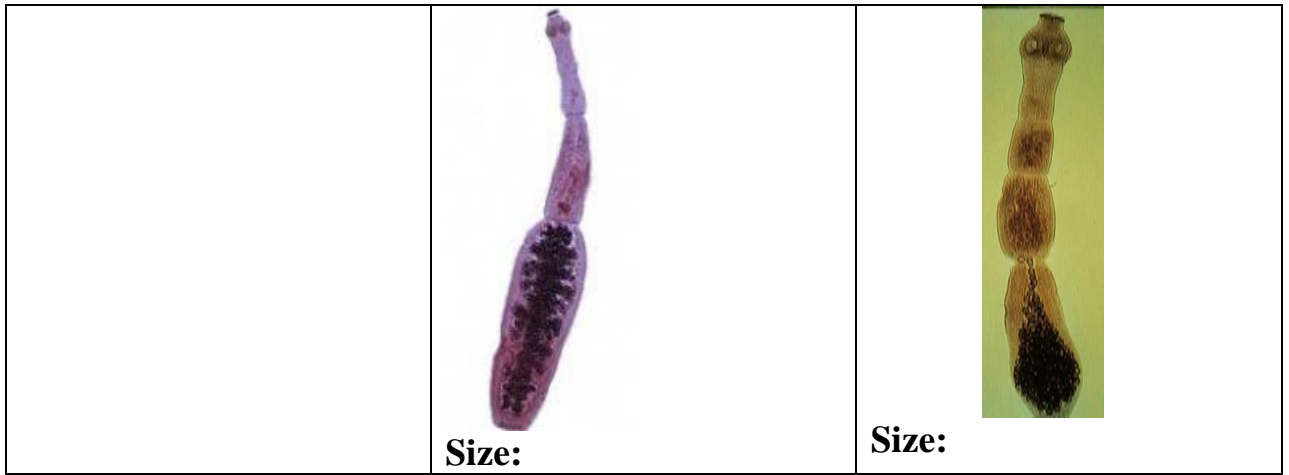
**2) Life cycle of Diphylobothrium latum.**



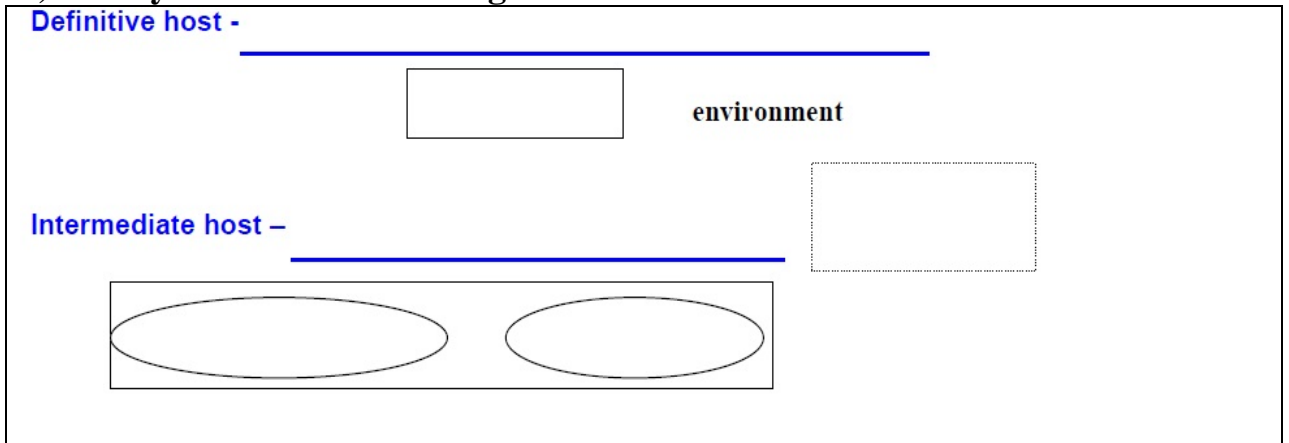
**3) Complete the table:**

Disease	
Pathogen	
Distribution of the disease	
Definitive host	





**2) Life cycle of Echinococcus granulosus.**



**3) Complete the table:**

Disease		
Pathogen	<b>Echinococcus granulosus</b>	<b>Echinococcus multilocularis</b>
Definitive host		
Intermediate host		
Distribution of the disease		
Invasive stage for human		
Source of infection		
Localization		
Transmission mechanism		
Transmission factors		
Diagnosis		
Prevention		

\_\_\_\_\_ **points**













mode of transmission )	
Transmission factors	
Diagnosis	
Prevention	

\_\_\_\_\_points

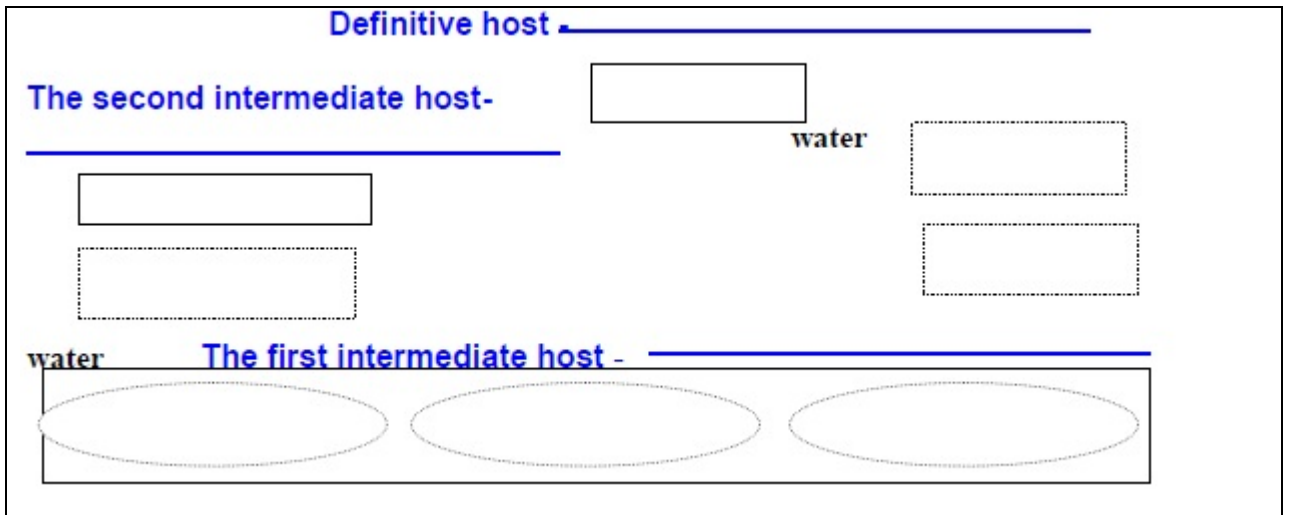
**Task 2. Opisthorchis felineus and Dicrocoelium dendriticum (lanceatum)**

1) Describe and draw **Opisthorchis felineus** and **Dicrocoelium lanceatum**. Find the testes and uterus with eggs. Compare the structure of flukes. Draw the structure **Opisthorchis felineus** and **Dicrocoelium lanceatum**

2) Consider **Opisthorchis felineus** eggs and **Dicrocoelium lanceatum** eggs  
Draw the eggs.

<p><b><u>Opisthorchis felineus</u></b> <b>(adult)</b></p> <p>Size:</p>	<p><b>Note in drawing:</b></p> <ol style="list-style-type: none"> <li>1. testes</li> <li>2. oral sucker</li> <li>3. ventral sucker</li> <li>4. uterus</li> </ol>	<p><b><u>Dicrocoelium lanceatum</u></b> <b>(adult)</b></p> <p>Size:</p>
<p>Egg</p> <p>Size:</p>	<p><b>Note in drawing:</b> operculum of the egg</p>	<p>egg</p> <p>Size:</p>

3) Life cycle of **Opisthorchis felineus**.



**4) Complete the table:**

Disease	Opisthorchiasis	Dicrocoeliasis
Pathogen (causal agent)		
Distribution of the disease		
Definitive host		
Intermediate host		
Invasive (Infective) stage		
Source of infection		
Localization		
Route (pathway, mode of transmission )		
Transmission factors		
Diagnosis		
Prevention		

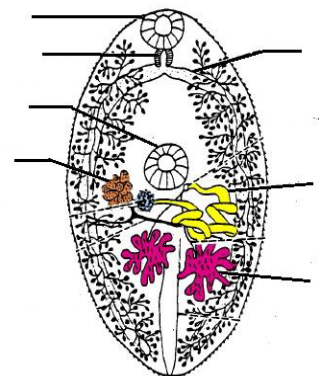
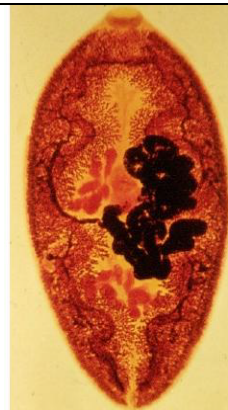
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**Task 3. Paragonimus westermani.**

**1) Look and label in drawing adult**

*Paragonimus westermani*:

1. oral sucker
2. ventral sucker
3. pharynx
4. intestine
5. ovary
6. uterus
7. testis



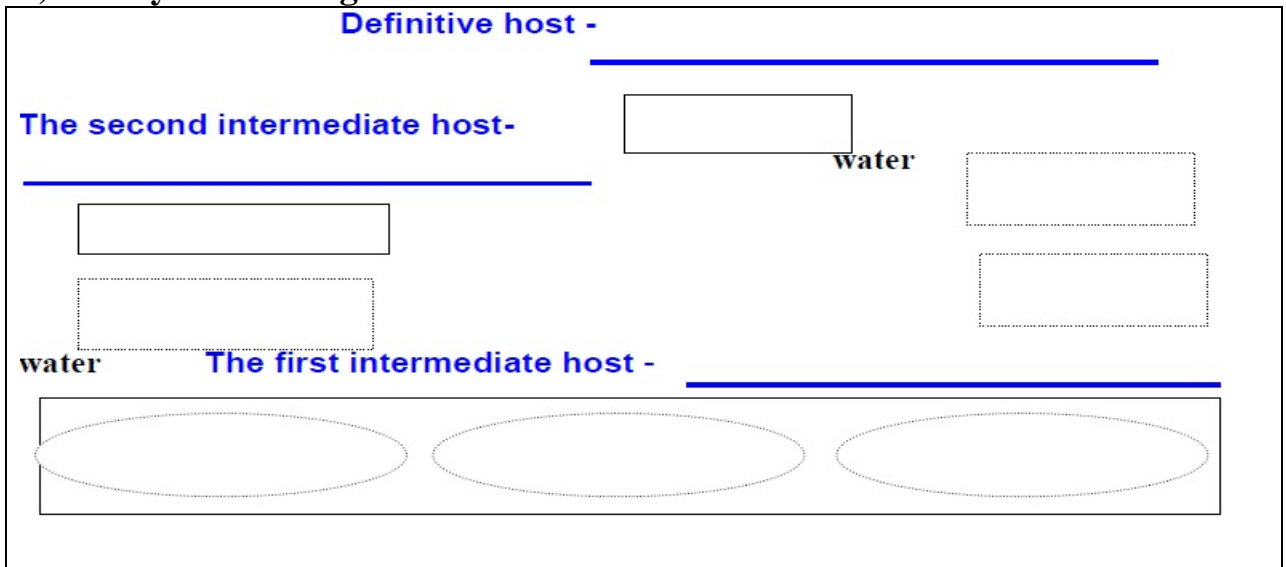
Size:

2) Look in drawing and remember eggs of *Paragonimus westermani*



Size:

3) Life cycle of *Paragonimus westermani*.



4) Fill the table:

Disease	
Pathogen (causal agent)	
Distribution of the disease	
Definitive host	
Intermediate host	
Invasive (Infective) stage	
Source of infection	
Localization	
Route (pathway, mode of transmission )	
Transmission factors	
Diagnosis	
Prevention	

\_\_\_\_\_ points

**Task4. Solving problems of Parasitology.**

1)The patient complains of pain at the end of urination. From history: worked 2 years in Africa. Laboratory analysis revealed admixture of blood in urine of patient. Disease caused by *Trematoda* was diagnosed.









1. anterior end 2. posterior end		

**3) Complete the table:**

Disease	
Pathogen	
Definitive host	
Intermediate host	
Distribution of the disease	
Invasive stage	
Source of infection	
Localization	
Transmission mechanism	
Vector	
Transmission factors	
Diagnosis	
Prevention	

\_\_\_\_\_ **points**

**Task 3. Enterobius vermicularis.**

- 1) Compare and contrast male and female of Trichocephalus trichiurus. Draw it.**
- 2) Classify Eggs of Trichocephalus trichiurus. Draw it.**

Adult		Eggs
Male	Female	
1. anterior end 2. posterior end		

**3) Complete the table:**

Disease	
pathogen	
Definitive host	



Intermediate host	
Distribution of the disease	
Invasive stage	
Source of infection	
Localization	
Transmission mechanism	
Mode of transmission:	
Vector	
Transmission factors	
Diagnosis	
Prevention	

\_\_\_\_\_points

**Task 6. Solving problems of Parasitology.**

1.The child has severe itching at night in the anus area, weakness, irritability, loss of appetite, abdominal pain. Disease caused by Nematoda was diagnosed.

1) What disease has the patient?


2) What is the causative agent of disease


3) What is a pathway (route) of infection? Is this biohelminthes or geohelminthes?


4) How was the patient infected?


5) How many hosts has this parasite? What hosts?


6) What invasive stage?


7) What method of diagnosis was used?


8) What are the preventive measures of the disease?


2. Woman found in your cat's feces fusiform worms, size 5-8cm.

1) What is the kind of parasites?


2) Is the parasite dangerous to humans?


3) What to do with a cat?


3. Child ate unwashed strawberries. What types of roundworms he could infect?


\_\_\_\_\_ points

\_\_\_\_\_ points \_\_\_\_\_ signature of the teacher

### PRACTICAL LESSON №17

**Theme: Medical Helminthology. Phylum Nemathelminthes. Class Nematoda.**

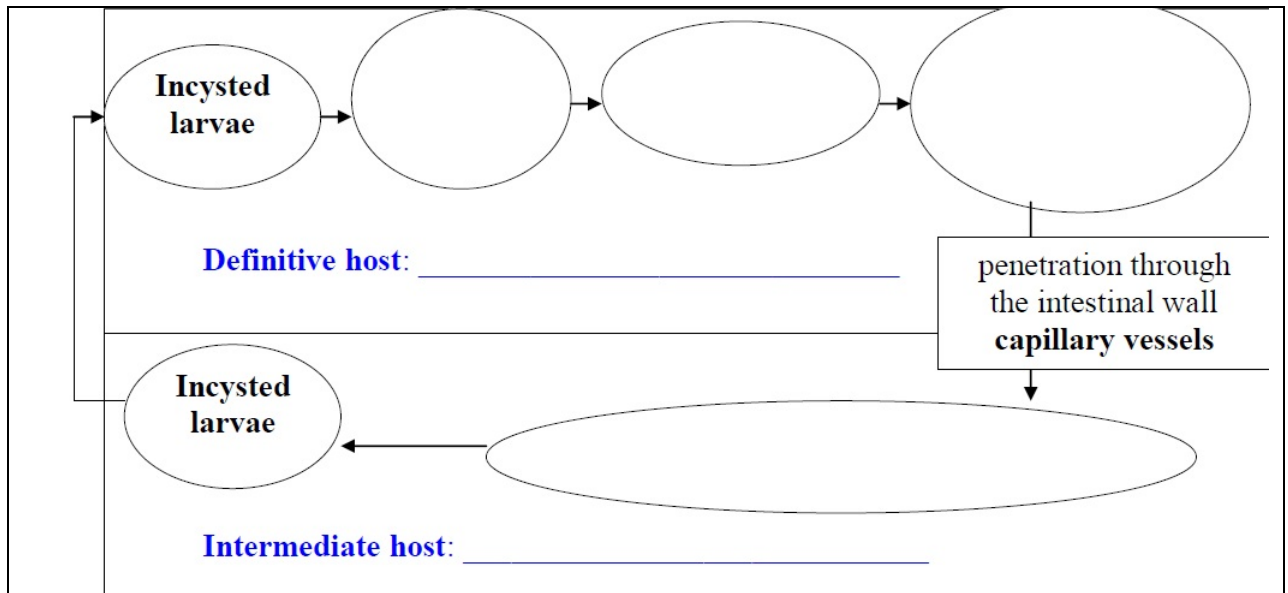
**Aim:** 1) Formation knowledge about phylum Nemathelminthes.  
 2) Study Pathogenic Nematods: *Trichinella spiralis*, *Ancylostoma duodenale* and *Necator americanus* (hookworms), *Strongyloides stercoralis*, *Dracunculus medinensis*, *Toxocara*  
 2.1 Filariasis: *Wuchereria Bancrofti*, *Loa loa*, *Onchocerca volvulus*.  
 Describe life cycle, classification of host, parasitic system, localization, transmission of the parasite.

#### Practical work

##### Task 1. *Trichinella spiralis*.

<p><b>1) Adult</b></p>          <p><b>Size:</b></p>	<p><b>2) Larva in muscular</b></p>          <p><b>Size:</b></p>
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##### 3) Life cycle of *Trichinella spiralis*



**4) Complete the table:**

Disease	
Pathogen	
Definitive host	
Intermediate host	
Distribution of the disease	
Invasive stage	
Source of infection	
Localization	
Transmission mechanism and pathway	
Transmission factors	
Diagnosis	
Prevention	

\_\_\_\_\_ points

**Task 2. Toxocara, Ancylostoma, Strongyloides, Dracunculus, Filaria.**

**Complete the tables:**

Disease	Toxocariasis Visceral larva migrans (VLM)
Pathogen	
Definitive host	
Accidental host	
Distribution of the disease	
Invasive stage	
Source of infection	
Localization	
Transmission mechanism	
Vector	
Transmission factors	
Diagnosis	
Prevention	

Disease	Ancylostomiasis	Strongyloidiasis
Pathogen		
Definitive host		
Intermediate host		
Invasive stage		
Source of infection		
Distribution of the disease		
Localization		
Transmission mechanism		
Transmission factors		
Diagnosis		
Prevention		

Disease	Dracunculiasis
Pathogen	
Definitive host	
Intermediate host	
Invasive stage	
Source of infection	
Distribution of the disease	
Localization	
Transmission mechanism	
Transmission factors	
Diagnosis	
Prevention	

### Filariasis

Species name	<b>Wuchereria bancrofti</b>	<b>Loa loa – the eye worm</b>	<b>Onchocerca volvulus</b>
Name of disease	<b>Wuchereriosis</b> or bancroftosis , Lymphatic filariasis	<b>Loiasis</b> (Subcutaneous or Loa loa filariasis)	<b>Onchocerciasis</b> (river blindness)
Definitive host			
intermediate host (vector)			
Distribution			
Infective stage			
Mode of transmission			
Localization (adult worm)			
Localization			

(larva)			
Diagnosis			

\_\_\_\_\_points

**Task 3. Solving problems of Parasitology.**

**1. Patient: male, 50 years old. Complaints: high fever, severe muscle pain, swelling of the face. From history: working as a forester, like hunting, often eats the meat of wild animals. A blood test revealed eosinophilia. Disease caused by Nematoda was diagnosed.**

1) What disease has the patient?


2) What is the causative agent of disease? Is this biohelminths or geohelminthes?


3) How was the patient infected?


4) What is a pathway (route) of infection?


5) How many hosts have this parasite? What hosts?


6) What invasive stage?


7) What method of diagnosis was used?


8) What are the preventive measures of the disease?


**2. Patient: male 5 years old. Complaints: abdominal pain, vomiting. Mom saw some fusiform worms in the vomit, size 15-20 cm.**

1) What disease has the patient?


2) What is the causative agent of disease? Is this biohelminths or geohelminthes?


3) How was the patient infected?

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\_\_\_\_\_ points

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### PRACTICAL LESSON №18

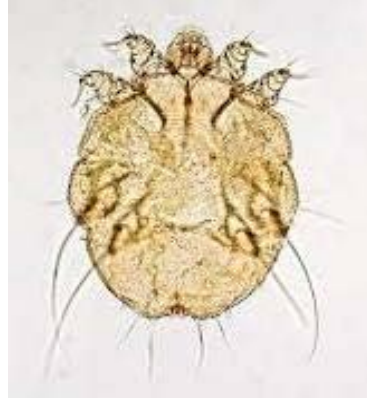
**Theme: Medical Arthropodology. Phylum Arthropoda. Class Crustacea. Class Arachnida. Class Insecta.**

- Aim:** 1) Formation knowledge about phylum Arthropoda.  
 2) Study Class Crustacea. General characteristics, medical significance of Some Crustaceans.  
 3) Study Class Arachnida. General characteristics, medical significance. Order Scorpions, Solifugae (camel spiders), Aranei (Spiders), Acarina (Ticks and mites), Acariform ticks (Acariformes). *Sarcoptes scabiei*, *Demodex folliculorum*.  
 4) Family Ixodidae ("hard ticks"). Genus *Ixodes*, Genus *Dermacentor*, Genus *Rhipicephalus*. Family Argasidae ("soft ticks").  
 5) Class Insecta. Order Phthiraptera (Anoplura). Lice. Order Siphonaptera. Fleas. Characteristics, medical significance.

#### Practical work

**Task 1. Itch-mite – *Sarcoptes scabiei* or *Acarus siro*.**


Examine the slide(see **Atlas of Human Parasitology**) *Sarcoptes scabiei* (adult). Write down their medical significance.

<p>Note in drawing:</p> <ol style="list-style-type: none"> <li>1. four pairs of legs (two pairs in front and two pairs behind)</li> <li>2. Palps and chelicerae (highly specialized mouthparts, capitulum /hypostome).</li> </ol> <p><b>Medical significance:</b></p> <p>_____</p> <p>_____</p>	 <p>Size:</p>
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**Task 2. Head louse (*Pediculus humanus capitis*)**


Examine the slide (see **Atlas of Human Parasitology**) *Pediculus capitis* (adult).

<p>Note in drawing:</p> <ol style="list-style-type: none"> <li>1. head</li> <li>2. thorax</li> <li>3. abdomen</li> <li>4. legs</li> </ol> <p><b>Medical significance:</b></p> <hr/> <hr/> <hr/>	 <p><b>Size:</b></p>
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\_\_\_\_\_points

**Task 3. Human flea /Pulex irritans/**

Examine the slide (see **Atlas of Human Parasitology**) adult *Pulex irritans* .

<p>Note in drawing:</p> <ol style="list-style-type: none"> <li>1. head</li> <li>2. thorax</li> <li>3. abdomen</li> <li>4. legs</li> </ol> <p><b>Medical significance:</b></p> <hr/> <hr/>	 <p><b>Size:</b></p>
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**Task 4. European Sheep tick /I. ricinus/, Taiga tick /I. persulcatus/ and Dermacentor pictus**





Look in the microscope (see **Atlas of Human Parasitology**) adult mites without drawing.

**Task 5. Medical significance of some ticks.**

Examine some of the tick’s species and write down their medical **significance**. Determine sex differences.

<p><b>I. ricinus - European Sheep tick –</b> Europe, Turkey, Iran</p>		<table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>																																																																																																																																																																																				
<p><b>I. persulcatus - Taiga tick- Eurasian</b></p>		<table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>																																																																																																																																																																																				



<b>D. pictus</b>		
<b>D. marginatus</b>		
<b>A. persicus – Fowl tick</b>		
<b>O. papillipes</b>		

\_\_\_\_\_points

**Task 6. Medical significance of some insects:**

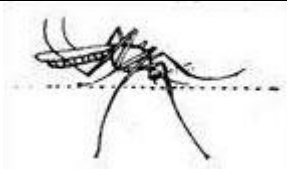
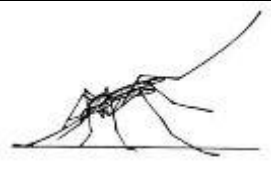
<b>Bug</b>	
<b>Sandfly</b>	
<b>Tsetse fly</b>	

<b>Deer fly</b>																			
<b>Blackfly</b>																			
<b>Housefly Musca domestica</b>																			
<b>Spotted flesh fly Wohlfahrtia magnifica</b>																			

\_\_\_\_\_points

**Task 7. The main differences of the mosquitoes Culex and Anopheles**

Examine and draw the slide (see **Atlas of Human Parasitology**) **head, larva, pupa and egg** of Culex sp. and Anopheles sp.

Features	<b>Anopheles</b> malaria mosquito	<b>Culex pipiens</b> (the common house mosquito)
Landing mosquito	 Rests with body parallel to surface.	 Rest with body at an angle to the surface.
Head of mosquitoes male		
Head of mosquitoes female		
Larvae of mosquitoes		
location in the water		
Pupae of mosquitoes		
Eggs of mosquitoes		

The medical significance of mosquitoes		
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\_\_\_\_\_points

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### Phylum Protozoa

	Scientific species name	Disease	The way of contamination	Parasitic location	Laboratory diagnosis	Prophylaxis	Definitive host	Intermediate host
<b>Class Sarcodina</b>								
1	Entamoeba histolytica							
2	Entamoeba coli							
3	Entamoeba gingivalis							
<b>Class Flagellata</b>								
1	Lamblia intestinalis							
2	Trichomonas							

	hominis							
3	Trichomonas vaginalis							
4	Leishmania tropica							
5	Leishmania donovani							
6	Trypanosoma gambiense							
7	Trypanosoma cruzi							
<b>Class Sporozoa</b>								
1	Plasmodium vivax							
2	Toxoplasma gondii							
<b>Class Infusoria</b>								
1	Balantidium coli							

### Phylum Platyhelminthes

	Scientific species name	Disease	The way of contamination	Parasitic location	Laboratory diagnosis	Prophylaxis	Definitive host	Intermediate host
<b>Class Trematoda</b>								
1	Fasciola hepatica							
2	Opisthorchis felinus							
3	Paragonimus westermani							
<b>Class Cestoda</b>								
1	Taeniarchus saginatus							
2	Taenia solum							

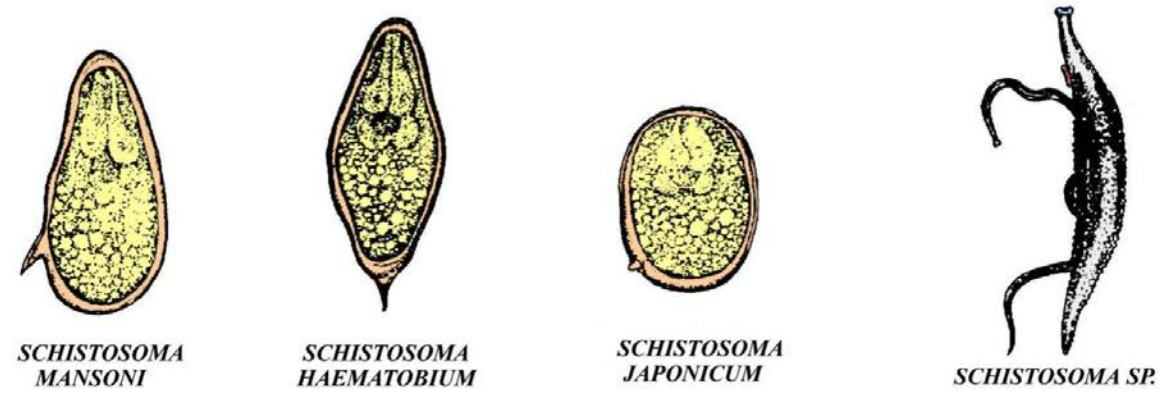
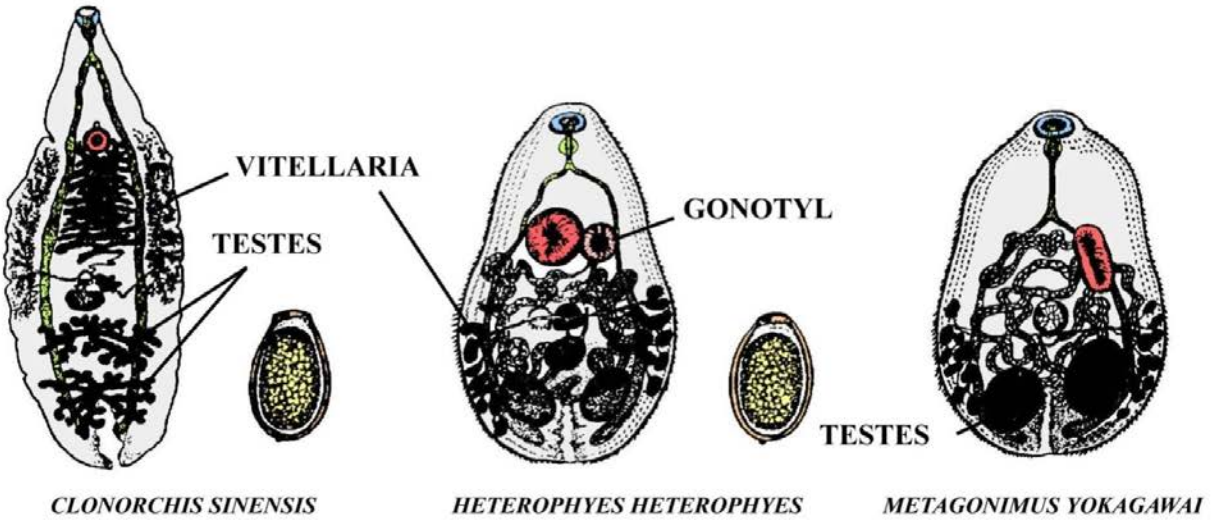
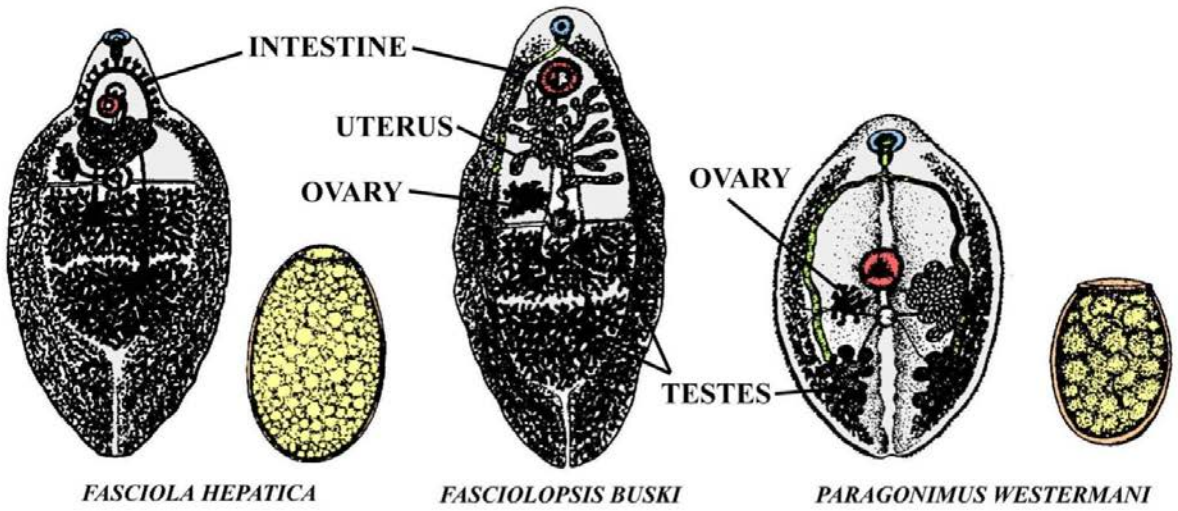
3	Echinococcus granulosus							
4	Alveococcus multilocularis							
5	Hymenolepis nana							
6	Diphyllobothrium latum							

### Phylum Nematelminthes

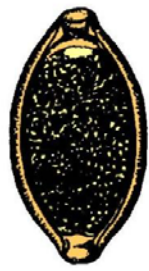
	Scientific species name	Disease	The way of contamination	Parasitic location	Laboratory diagnosis	Prophylaxis	Definitive host	Intermediate host
<b>Class Nematoda</b>								
1	Enterobius vermicularis							
2	Ascaris lumbricoides							
3	Trichocephalus trichiurus							
4	Ancylostoma duodenale							
5	Trichinella spiralis							
6	Dracunculus medinensis							



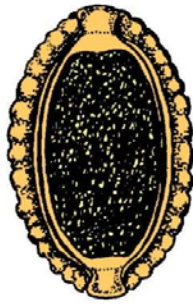
# SOME TREMATODES AND EGGS



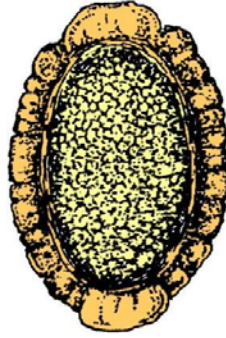
# NEMATODES AND EGGS



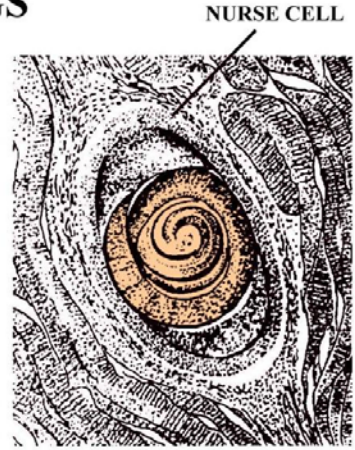
*TRICHURIS*



*CAPILLARIA*



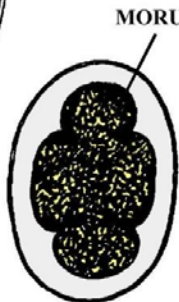
*DICTOPHYMA RENALE*



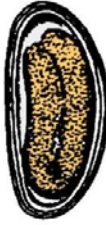
*TRICHINELLA SPIRALIS*



*STRONGYLOIDES*

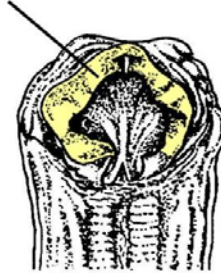


*HOOKWORM*



*ENTEROBIUS*

CUTTING PLATES

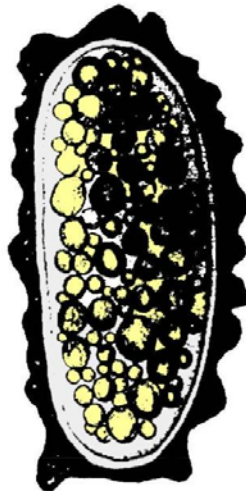


*NECATOR*

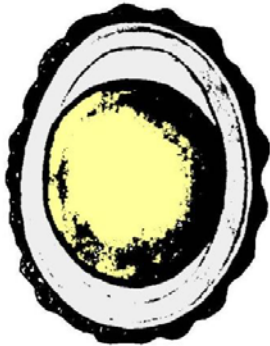
CUTTING TEETH



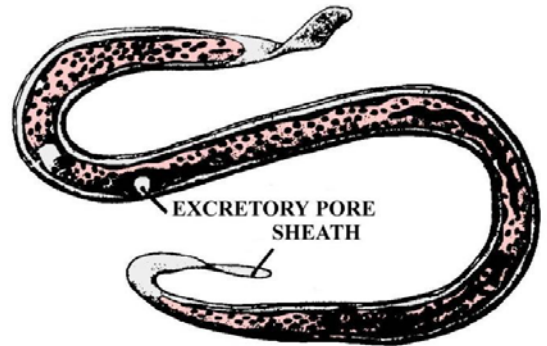
*ANCYLOSTOMA*



*ASCARIS*  
(UNFERTILIZED)






*ASCARIS*  
(FERTILIZED)



*MICROFILARIA*



Nematodes		<i>Capillaria philippinensis</i>		<i>Trichostrongylus</i> spp.
		<i>Enterobius vermicularis</i>		Hookworm
		<i>Trichuris trichiura</i>		<i>Ascaris lumbricoides</i> infertile
		<i>Ascaris lumbricoides</i> fertile		<i>Dipylidium caninum</i>
		<i>Hymenolepis diminuta</i>		<i>Diphylobothrium latum</i>
		<i>Hymenolepis nana</i>		<i>Taenia</i> spp.
	Cestodes			

50 μm

