Lab. 1: Equipment, Lab Safety and Animal Collection

Equipment:

Equipment Familiarized yourself with the various supplies and equipment in the lab room. Keep this sheet accessible throughout the semester. Assume the blackboard is at the "front" of the room and the windows are on the "left" side

- latex gloves
- safety glasses/goggles
- eyewash station
- Sinks
- disinfectant spray bottles
- paper towels
- biohazard bag
- glass disposal boxes
- deionized water spigots
- fire extinguisher
- first aid kit
- hazardous materials spill kit
- dissecting kits **(**Light weight, Strong design and High strength)
- **Microscope** Easy to use, Quality lens and Portable**)**
- blank slides & coverslips

Lab Safety and Animal collection:

Animal Collection You will make a small animal collection consisting of 5 different animals, from 5 different phyla or subphyla. You will NOT get these items back so please don't include a keepsake or treasure that you want to hold onto. provide nets, vials, jars preservative, insect pins, some labels, etc. The goals for this collection are to:

- Learn to visually recognize some of the animals common to the area
- Learn something about the ecology and behavior of these animals
- Learn how to use identification manuals and keys
- Become acquainted with the taxonomy and classification of animals, and
- Learn how to properly preserve and label museum specimens

Your grade for the collection will be based on the following criteria:

- diversity and originality of your collection

- ability to follow correct procedures for preserving and displaying specimens as described in the materials
- quality of the preservation technique
- accuracy of identification (usually to species) & common name

You do not need to kill anything to make this collection. Some examples of the kinds of collections you can make:

- Soil and leaf litter organisms
- aquatic organisms
- shells
- skeletons and/or skulls
- nests, burrows , tunnels, etc
- plaster casts of footprints or tracks
- photographs
- parasites
- fossils

The preservation method that you choose depends on the type of collection that you do. For example:

- Permanent Slides: are used for small or microscopic
- animals 70% alcohol/10% formalin: is used for most invertebrates including insect larvae, larger invertebrates and some vertebrates will need to be injected
- Study Skins: for birds and mammals
- Dried Specimens: for bones, shells, nests, etc
- Pinned Specimens: adult insects are generally dried on insect pins and mounted in an insect box

Each and every specimen must be properly labeled. The type and location of the label depends on the kind of collection and preservation that you do. All labels must include the following information:

- Collection Locality (including nearest city)
- General Habitat (eg. woods, pond, soil, treebark, grass, etc)
- Scientific Name & Common Name
- Your Name
- Date of collection

Lab. 2: Microscope

The microscope

- **Compound microscope**
- **Dissecting microscope**
- **Scanning electron microscope**
- **Transmission electron microscope**
- **Inverted Microscope**

The Compound Microscope

A microscop: It is a tool that is used to study things that can not be seen with the naked eye.

Microscope parts

1- **Eye piece (ocular lens)** : contains the magnifying lens you look through, and may be provide with pointer to point on indicated parts from the body we need to exam.

2- **Body tube** : It holds the eye piece.

3- **Arm** : Supports the body tube & it holds the microscope.

4- **Revolving nose piece** : Holds high & low power objectives ; can be rotated to change magnification .

5- **Objective lens :** we can divided it to :

a) Low power objective (L.P.) :- Provides the least magnification, usually it power is (4.5 X) and (10 X).

b) High power objective (H.P.) :- Provides the most magnification, usually it power is (40 X).

c) Immersion oil :- magnification usually (100 X), it is used only with oil drop.

6- **Coarse adjustment** : moves the body up & down for focus, it is used with (L.P.) objective.

7- **Fine adjustment :** used to sharpen the image, moves the body tube slightly , it is used with (H.P.) objective.

8- **Condenser:-** It condense the light.

9- **Stage**:- Supports the microscope slide.

10- **Stage clips**:- Holds the microscope slide in place.

11- **Diaphragm** :- Regulates the amount light which enter the body.

12- **Mirror** :- Reflects the light upward through the diaphragm to the objective & the eye piece.

13- **Base** :- Supports the microscope.

How to keep your microscope
(Use of the microscope)

1- Always carry the microscope with both hands , holds the arm with one hands & place the other hand under the base.
2- Place the microscope on the table gently with the arm towards you and the stage facing a light source.
3- Turn on the light from the swich.

4- Look through the eye piece & adjust the diaphragm so that the greatest amount of light comes through the opening in the stage. The circle of light is called the field of view.

5- Turn the revolving nose piece so that the low power objective lens clicks in to place.

6- Always focus first with the coarse adjustment & the low power objective lens.

7- Turn the revolving nosepiece until the high power objective (H.P.) clicks into place. Use only the Fine adjustment knob with this lens.

8- Use only special lens paper to clean lenses.

9- Before putting the microscope away, always turn the low power into place over the stage.

10- Be sure that the distance between the low power & the stage is about tow or three centimeters.

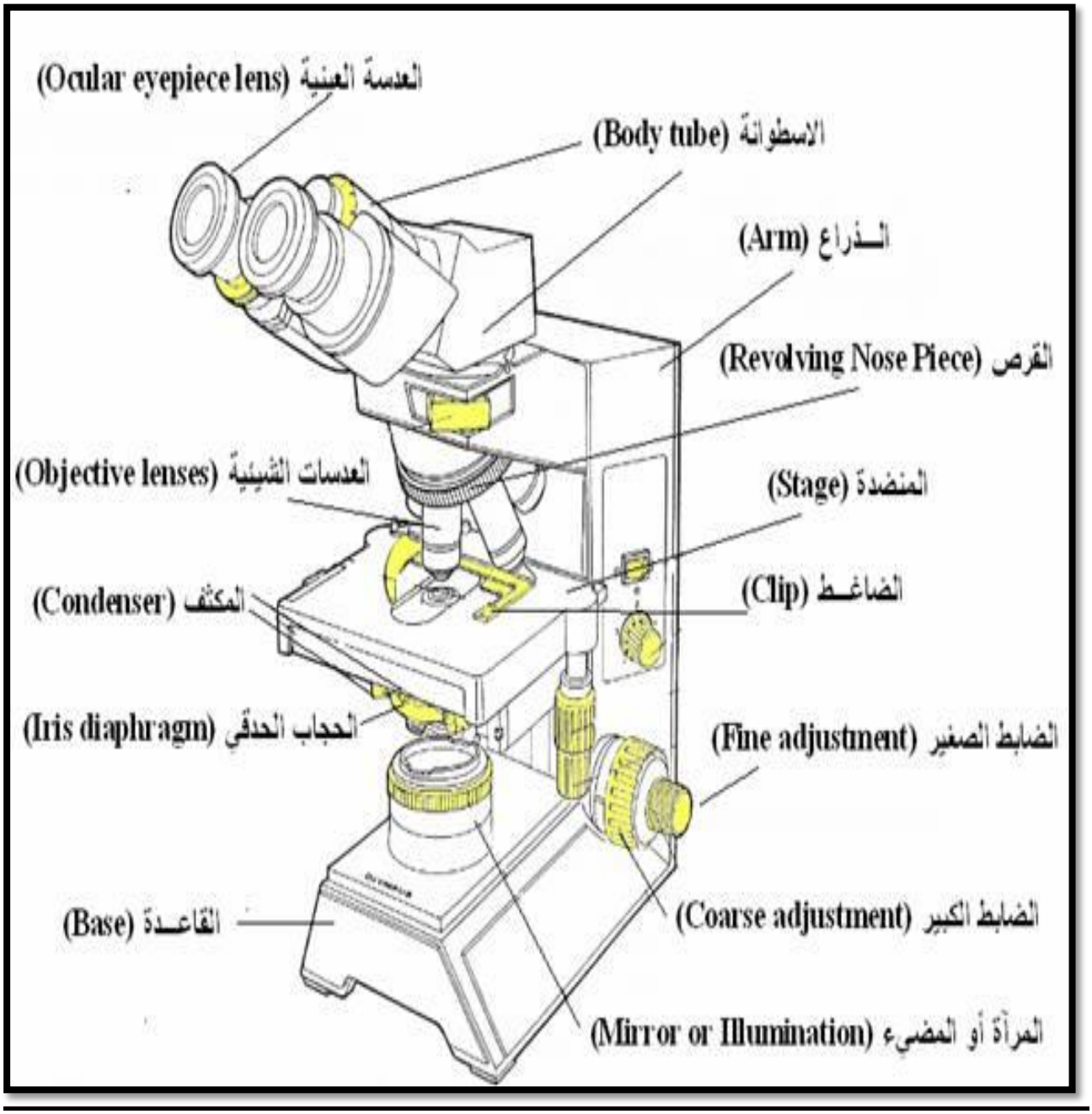
11- Turner off the swich.

The partical part

How to see your field:

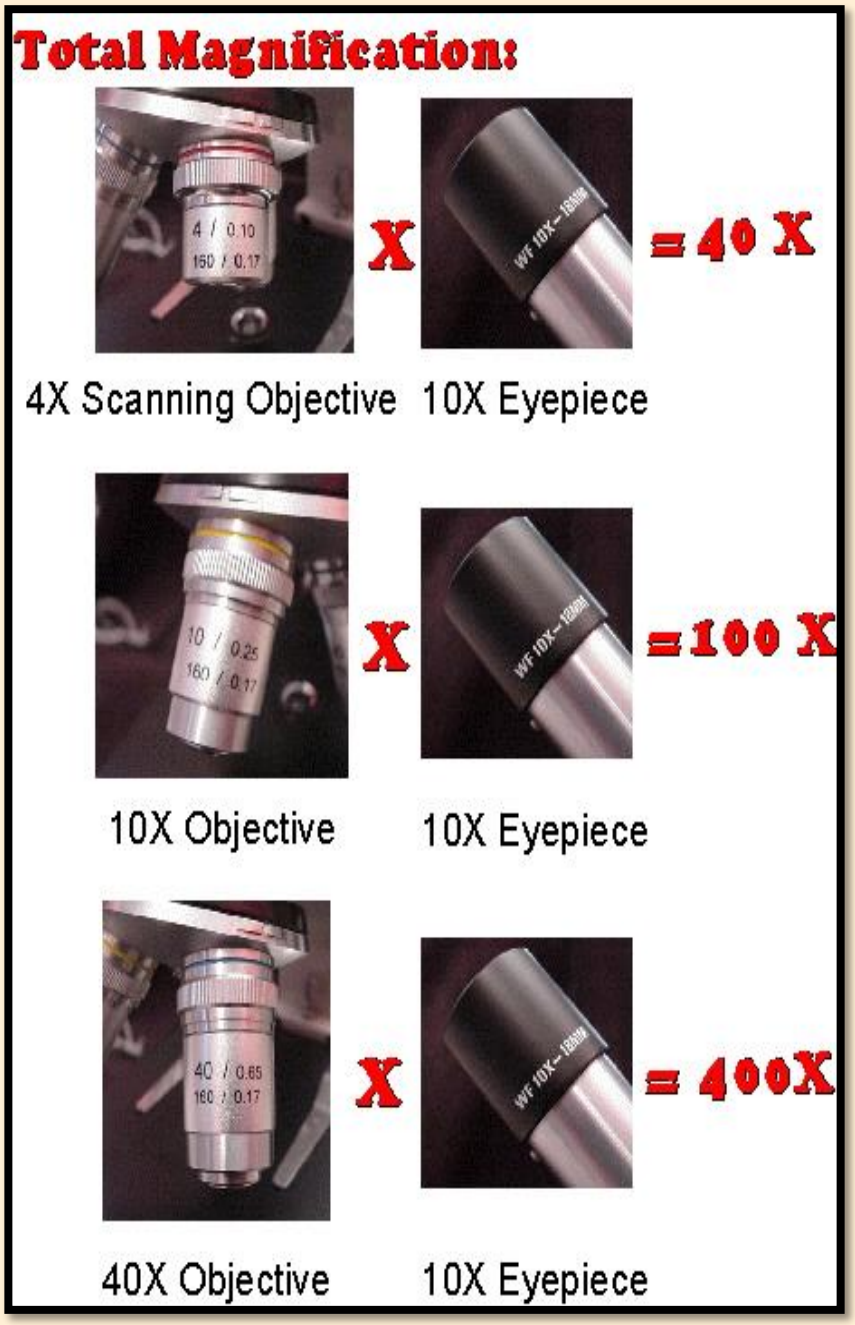
1- Gently scrape the inside of your mouth with the flat side of a toothpick .
2- Place the sampil in the middle of slide.
3- Stain the sampil with methylene blue or iodine.
4- Hold a cover slip at a 45 degree angle to the slide and lower the cover slip onto the sampil.
5- Place the slide on the microscope stage.Use the stage clips to hold the slide in place.
6- Use the mirror or light to send light upward through the slide.
7- View the microscope from the slide and the low power objective with the coarse adjustment knob until it is closed to the cover slip.
8- Look through the eye piece until you can see the cell,then focus with the fine adjustment knob.

Total Magnification:



The compound microscope

To figure the total magnification of an image that you are viewing through the microscope is really quite simple. To get the total magnification take the power of the objective (4X, 10X, 40x) and multiply by the power of the eyepiece, usually 10X.



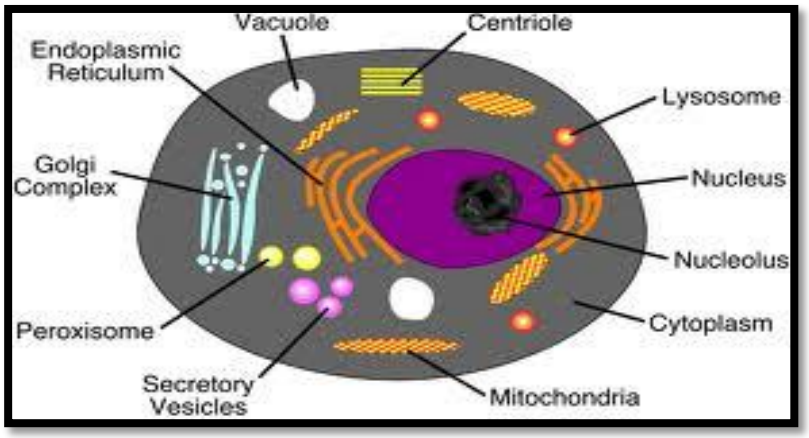
Lab :3

The animal cell

Cell: It is the basic unit of structure & function in an organism.

Cell theory: Every living organism is composed of cell and every cell in an organism produced by another cell.

The main parts of cell (cell structure) :



Living &non living component in cell

A- Living component

1-**Cell membrane** : surrounds the part of a cell together ,it controls the movement of material into and out of a cell.

2- **Cytoplasm** : is protoplasm inside the (cell membrane). It makes up most of the mass of many cells, different cell materials are produced in the cytoplasm.

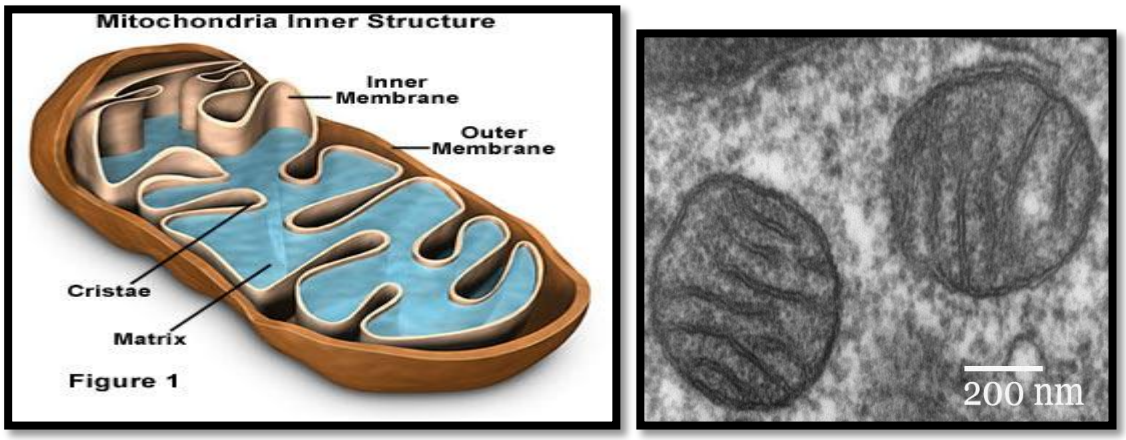
Function : produces variety of cell materials.

3- **Nucleus** : It controls cell activities, it is often in or near the center of a cell material .That nucleus is separated from the cytoplasm by a thin membrane is called (nuclear membrane).

Function : Controls cell activities.

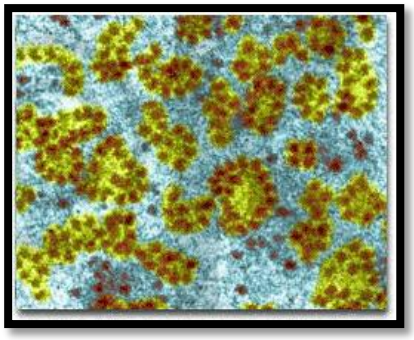
4- **Mitochondria** : Are rod- shaped in the cytoplasm .

Function : Release energy & it is called (power house of cell)



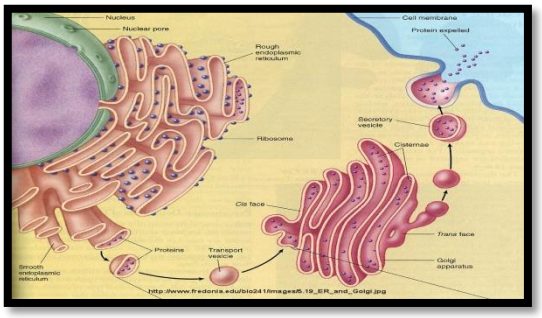
5- **Ribosomes** : Are tiny- particles, so small . They can seen only with an electron microscope.

Function : Parts of cells where proteins are made.



6- **Endoplasmic reticulum** : Structures like tubes in the cytoplasm of the cell.

Function : Moves materials within cells.



7-Lysosome:round organelles surrounded by a membrane and containing digestive enzymes.

B- Non Living component

Vacuoles : is a liquid- filled sphere surrounded by a membrane.

Function : stores water &dissolved materials.

Note: You can see these types of structures in Amoeba or Paramecium

- **Organisms are divided according to number of cells:**

1- **Unicellular Organisms**: some Organisms are single cells are called unicellular e.x. : Bacteria , Amoeba , Euglena .

2- **Multicellular Organisms**: some Organisms have many cells are called multicellular e.x. : Animal tissue & Plant tissue .

We can divide the organisms to:

1-Eukaryotic

2-Prokaryotic

	Eukaryotic	**Prokaryotic**
1-nucleus	present	absent
2-number of chromosomes	More than one	one
3-number of cells	multicellular	unicellular
4-nucleous membrane	present	absent
5-mitochondria	present	absent
6-ribosomes	larger	smaller
7-ex:	Animal, plant	Bacteria

Lab:4

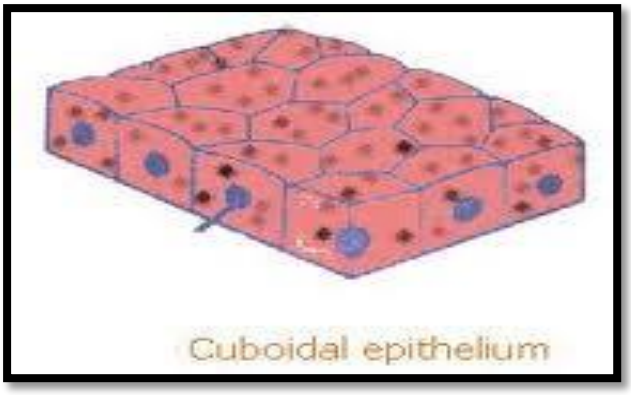
Cell shape

1- Squamous shape / Irregular – shaped cell forming a continuous surface with small nuclei.

[ex. Squamous epithelial tissue in Skin , mouth].

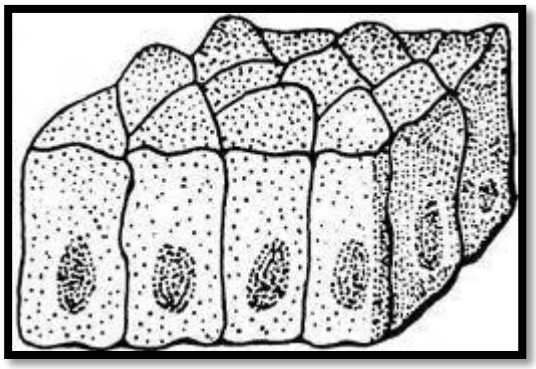
2- Cuboidal shape / The cells appear square & the nuclei is in the middle of cell .

[ex. Cuboidal epithelial tissue in c.s in Kidney , Urinary bladder & pancreas].



3- Columnor shape / is similar to Cuboidal epithelialium except that the cell are taller & appear columnar in section, the nuclei may be located towards the base .

[ex. Columnor epithelial tissue in Stomach , Trachea]



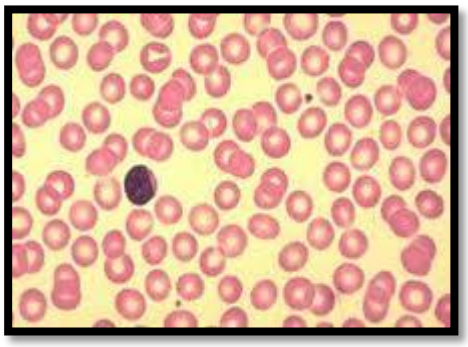
4- Spindle cell / The cell elongated spindle shaped with pointed end .

[ex. Smooth muscle]

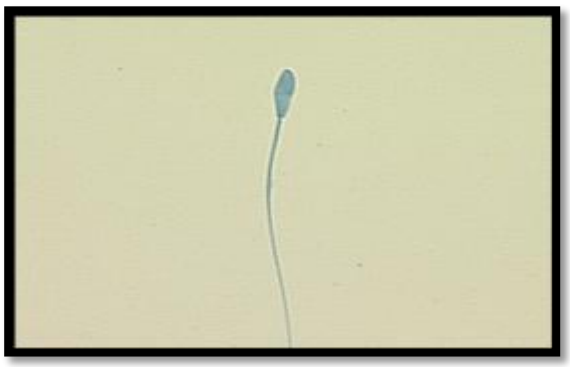
5- Stellate (Asteriodal shape) [ex. Neuron]

6- Circular (Discoid shape)

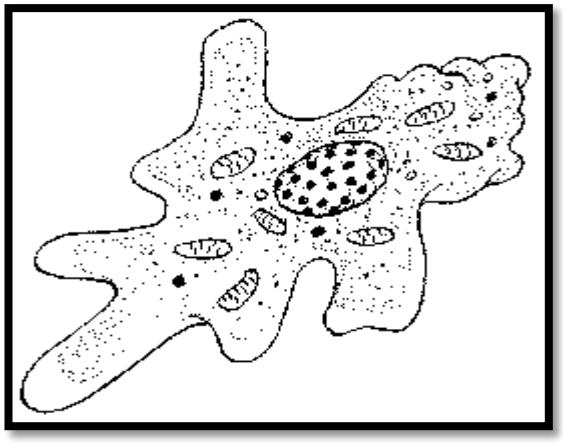
[ex. Red blood cell(R.B.C) in Human blood]



7- Sperm shape [ex. Rabbit sperm]



8- Amoeboid shape [ex. Amoeba]



Lab:5

Cell Division

Cell division: Is the process in which a cell reproduces.

- During cell division a cell divides to form two cells.
- Cell division produces new cells as an organism grows in size.
- Also cell division replaces cells that wear out die.

Ex. : Cells in your skin divide to replaces the dead skin cells.

The name is given to the process in which a cell divides to form two cells, that is called Mitosis.

Interphase: is this phase the cell spends the majority of its time and performs the majority of its purposes including preparation for cell division. In preparation for cell division, it increases its size and makes a copy of its DNA. Interphase is also considered to be the 'living' phase of the cell, in which the cell obtains nutrients, grows, and conducts other "normal" cell functions. The majority of eukaryotic cells spend most of their time in interphase. Interphase does not describe a cell that is merely resting but is rather an active preparation for cell division.

Mitosis or Karyokinesis

During mitosis the cell material passes through four stages:

1- **Prophase**: A stage of mitosis which the chromosomes first become visible in the nucleus, chromates become shorter & thicker by process of coiling. The tow chromates of each chromosome are joined by a small region called" Centro mere" . As mitosis progresses, the nuclear envelope & the nucleus being to disappear.

2- **Metaphase**:A stage of mitosis during which the chromosomes come to lie in a centrally located plane in spindle. The spindle composed of microtubules & has tow distinct poles. The orientation and shape of the spindle is responsible for the later movement of chromosomes to the poles .

3- **Anaphase**: A stage of mitosis in which the chromatids of each chromosome separate &move to opposite poles.

4- **Telophase** : A stage of mitosis in which the chromatides (now called chromosomes) reach the poles of the spindle The spindle dissolve & the nuclear envelop nucleolus reform.

A cell membrane begins to form the center of the cell. The membrane divides the cytoplasm between the two nuclei which is called (cytokinesis).

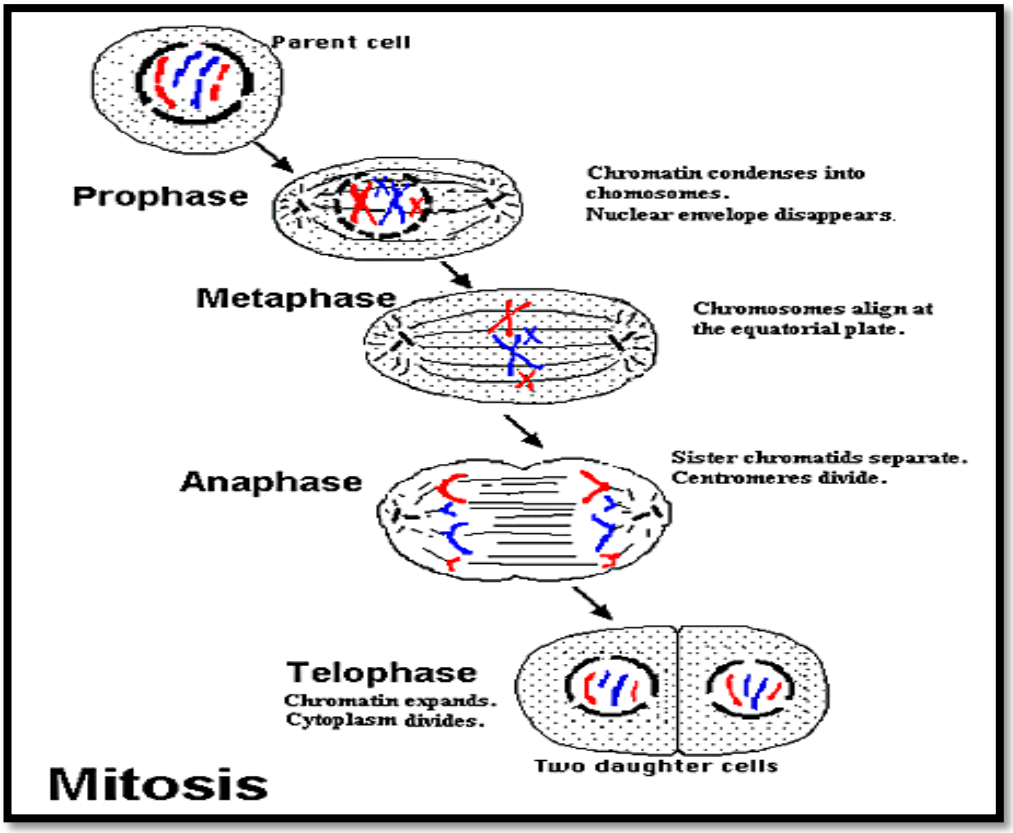
Now the chromosomes are no longer visible when the cell membrane is completed, two cells have been formed from one cell.

*In the animal cell constricting the cell membrane to form a cleavage furrow.

* Mitosis normally results in tow cells with the same number & kinds of chromosomes.

- Mitosis can last five minutes to several hours depending on the species.
- The chromosomes inside the nucleus contain the cell life code.
- Mitosis is copies of the cell from which they were formed.

Mitosis in Animal cell



Lab:6

Tissues

Tissue: It is a group of cells similar in shape and function .

There are four main chief tissues in the body.

1- **Epithelial tissue**
2- **Connective tissue**
3- **Muscular tissue**

4- Nervous tissue

Epithelial tissue

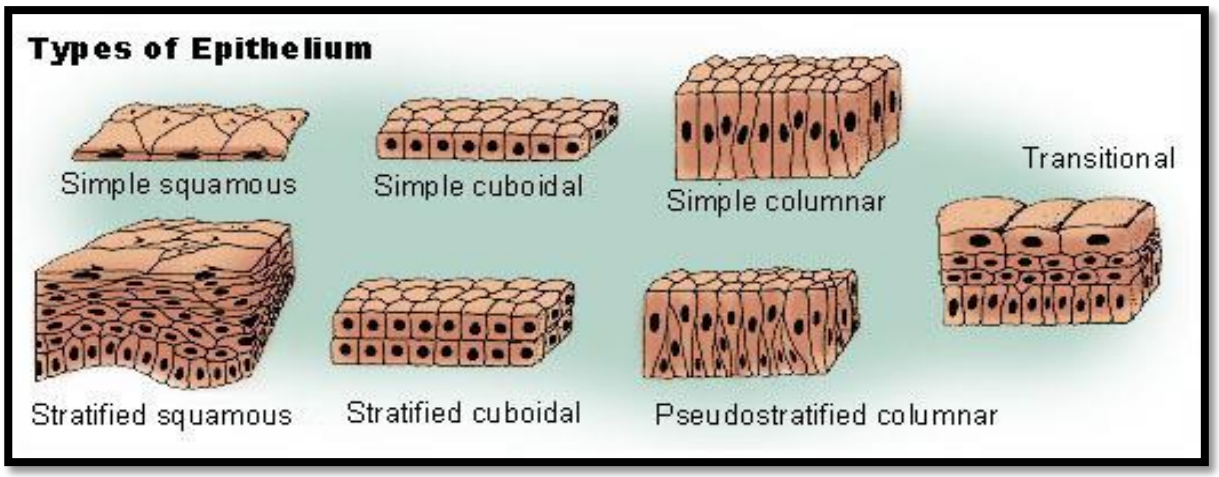
Epithelium is divided into two types:

a. Simple epithelium:

1) One cell layer thick
2) All cells rest on the basement membrane (basal surface) and all cells face the free surface.
3) Types of simple epithelium are: Squamous, Cuboidal, Columnar, Pseudostratified .

b. Stratified epithelium:

1) More than one cell layer thick
2) Only the deepest layer of cells contacts the basement membrane and only the superficial-most cells have a free surface.
3) Types of stratified epithelium are: Squamous, Cuboidal, Columnar, Transitional.



Connective tissue

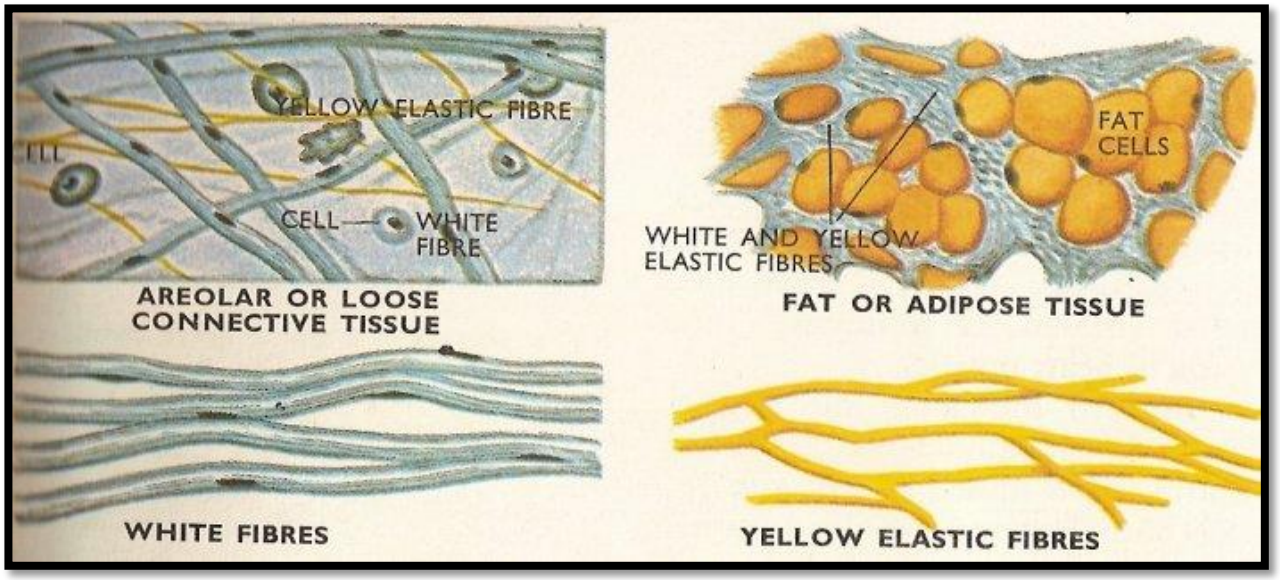
The connective tissue have an important function include connecting, supporting and protection.

Classification of connective tissue:

Proper connective tissue

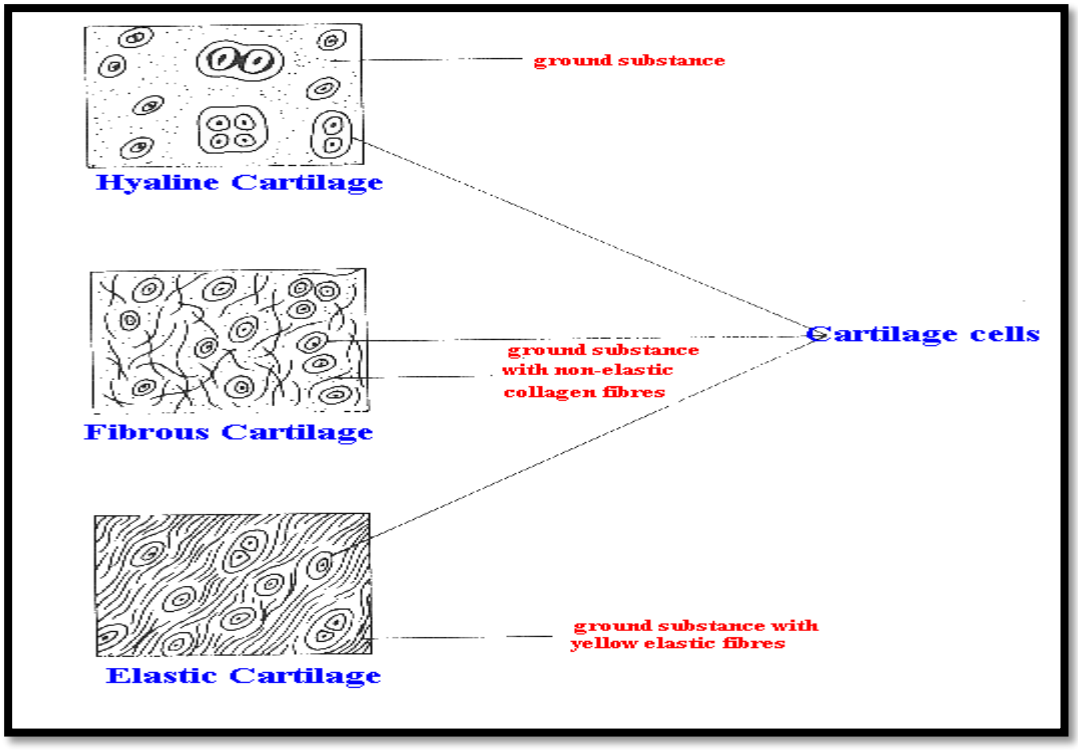
1-Loose connective tissue: areolar, **reticular** and **adepose.**

2-Dense connective tissue: regular and **Irregular**

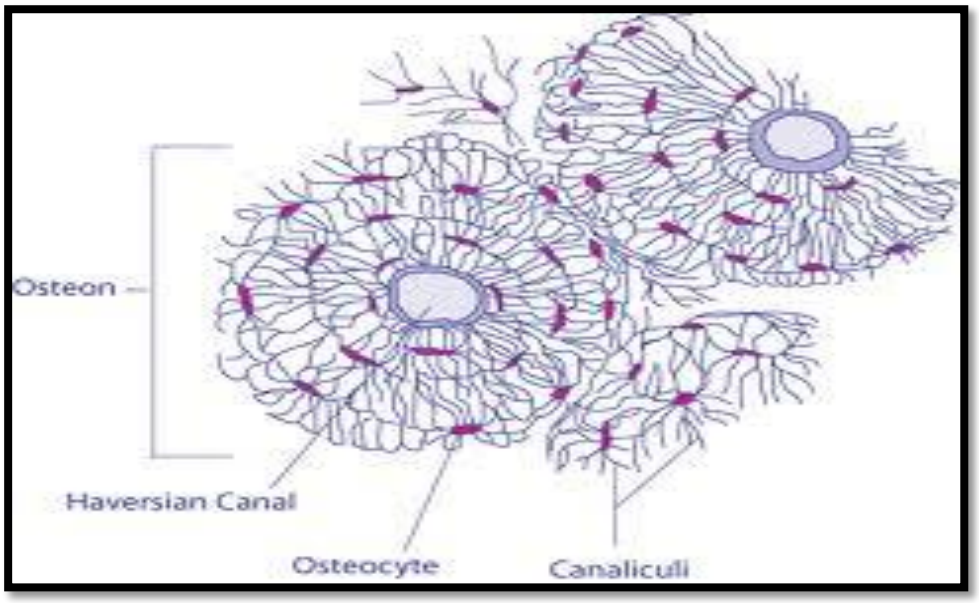


Special Connective tissue

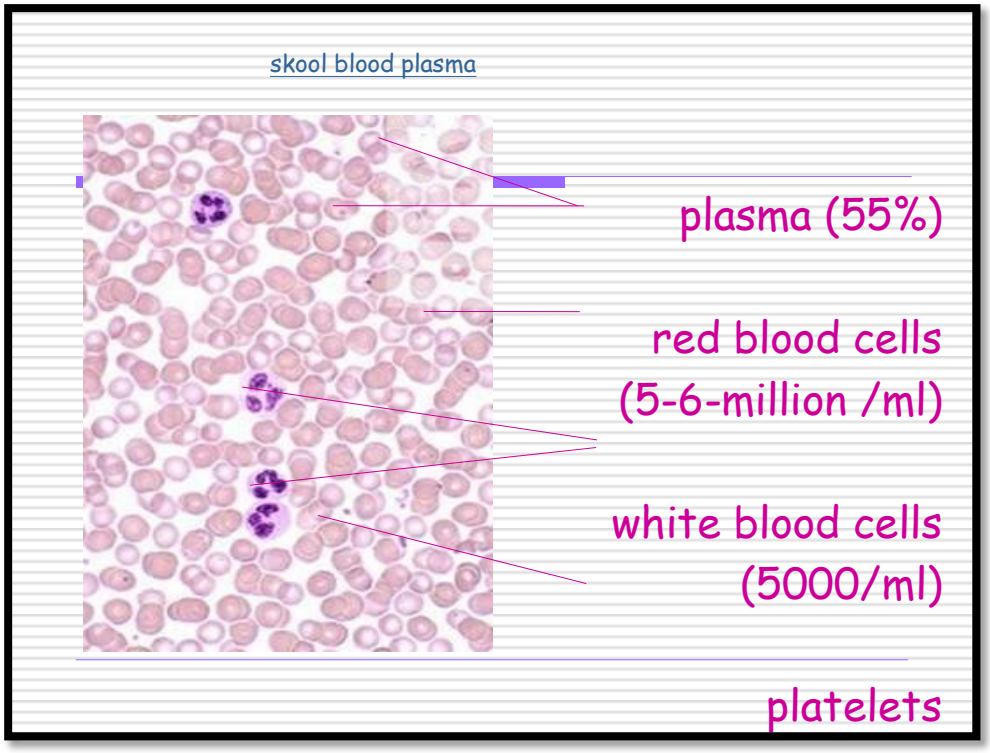
1-Cartilage: There are three types of cartilage: **hyaline**, **fibro** and **elastic**.



2-Bone: There are two types of bone**:compact** and **spongy**

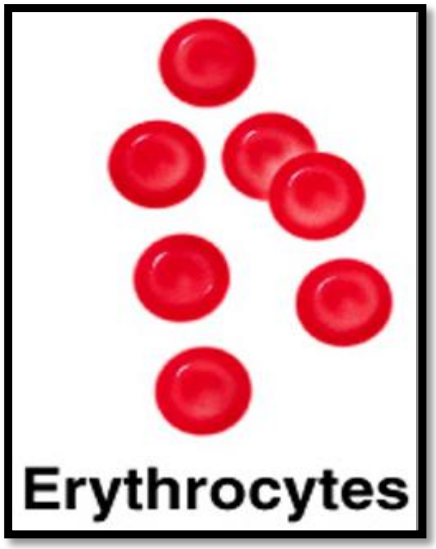


3- Blood: Consists of formed elements (cells) Are erythrocytes (RBCs) ,leukocytes (WBCs)& platelets suspended & carried in plasma (fluid part)



Erythrocytes

RBCs are flattened biconcave discs, Lack nuclei & mitochondria



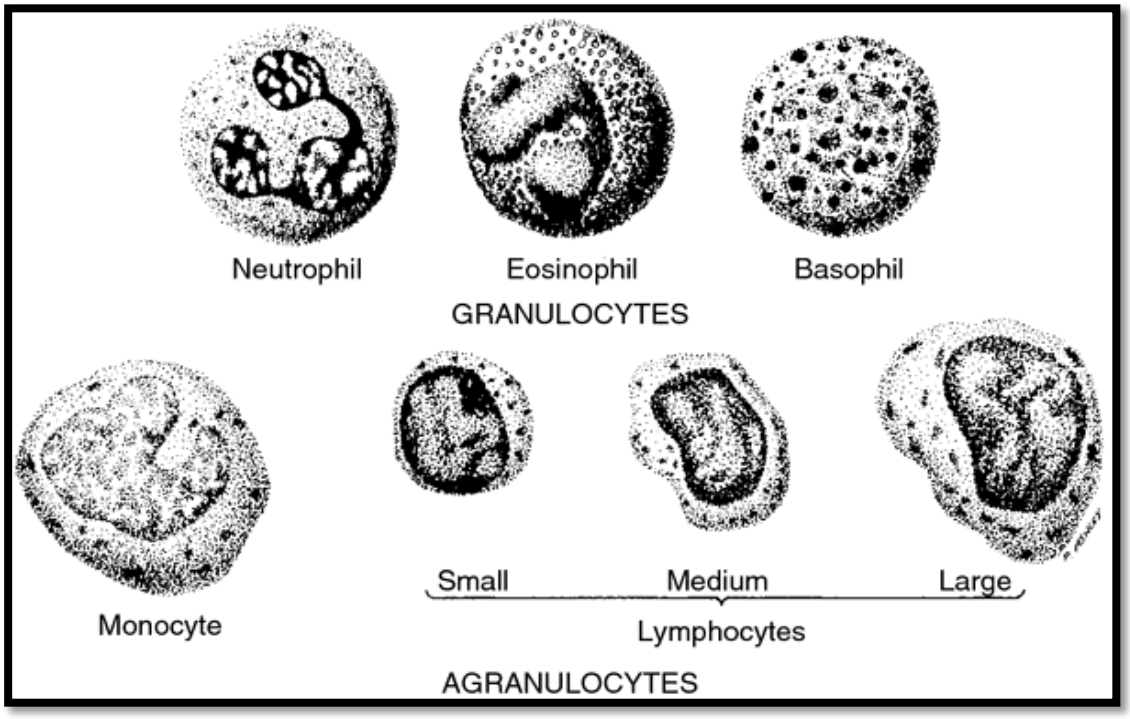
Leukocytes

1. **Granular leukocytes.**

Include: eosinophils, basophils & neutrophils

2.Agranular leukocytes.

Include: lymphocytes & monocytes



Platelets (thrombocytes): Are smallest of formed elements, lack nucleus

Lab: 7

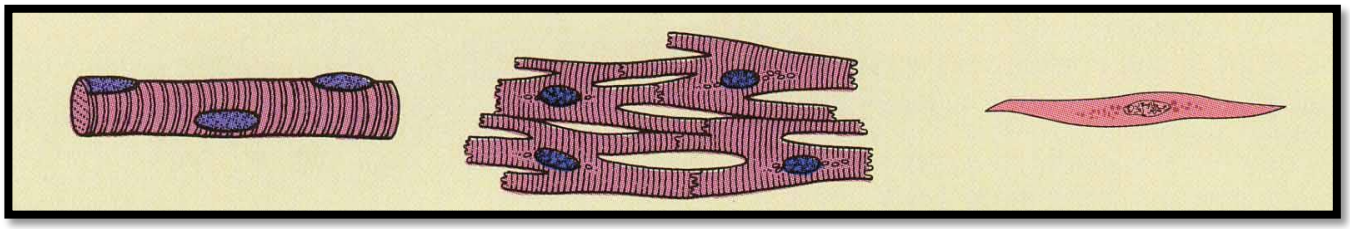
Muscle tissue

Classification of Muscle tissues

a. **Skeletal muscle**
   1) Striated and voluntary
   2) Found mostly attached to the skeleton
   3)Nuclei are peripherally located

b. **Cardiac muscle**
   1) Striated and involuntary
   2) Composes the majority of the heart wall (myocardium)
   3) one central nucleus

c. **Smooth muscle**
   1) Nonstriated and involuntary
   2) Found mostly in the walls of hollow organs and vessels
   3)one central nucleus

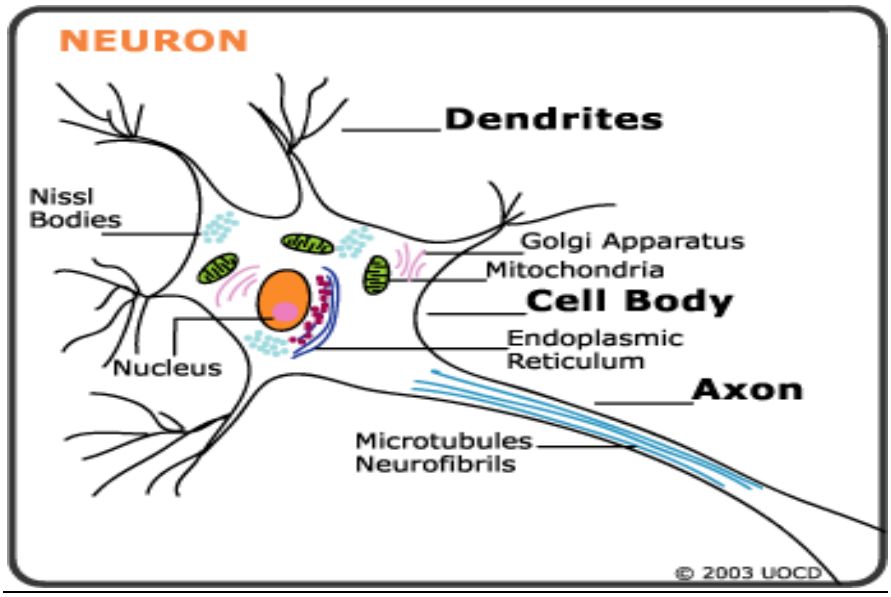


Skeletal muscle Cardiac muscle Smooth muscle

Nervous tissue

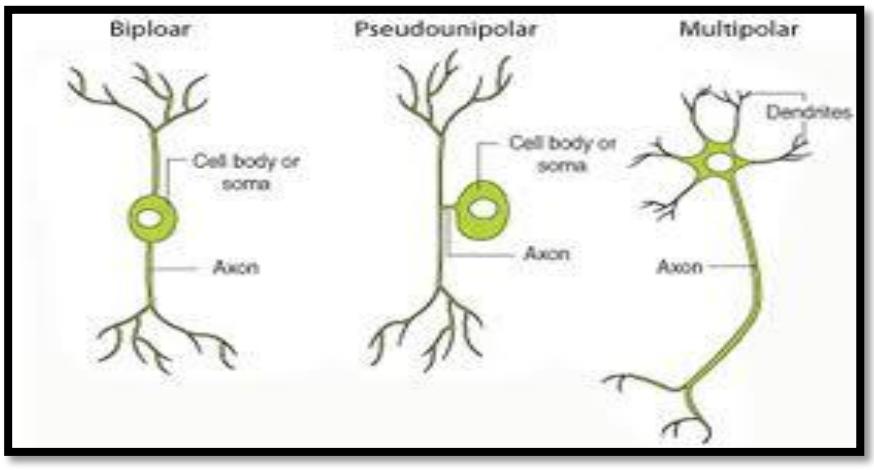
Is a tissue that are specialized for receiving different types of stimuli.
Neuron Consists of:

- **Cell Body** : contains nucleus, mitochondria,nissl bodies
- **Dendrites**: highly branched extensions of the cell body. Conduct impulses towards the cell body
- **Axon**: a single long process. Conducts impulses away from the cell body.



Structural of Neurons:

1. **multipolar neurons**: more than two processes one is the axon and the rest are denderites
2. **bipolar neurons**: have two processes one is axon and other one is denderites
3. **pseudounipolar neurons** : have a single process close to the perikaryon.



Lab: 8

Biology: The science that deals with life.

Characteristics of life:

Living things show 4 Characteristics that the non living do not display.

1- Metabolic processes: The total of all chemical reaction within an organism. For example Nutrient up take, processing, and waste elimination.

2- Generative processes: Action that increase the size of an individual organism (growth), or increase the number of individual in population (reproduction).

3- Responsive processes: Those abilities to react to external and internal change in the environment, for example irritability individual adaptation , and evolution.

4- Control processes : Mechanisms that ensure that an organism will carry out all metabolic activities in the proper sequences (coordination) and the proper amount.

Scientific Name

- It Started with a system developed by Carlous Linnaeus.
- Linnaeus developed a two – part name system.
- Each known plant or animal is given with two parts.
  First part: Genus name.
  Last part: Species name.
- Linnaeus used Latin when he named plant & animal.
- The genus name is spelled is with a Capital letter.

- The species name is spelled is with a Small letter.
- When imprint both name are in italics.
- When written a scientific name under lined.

Ex. Fasciola hepatica

Classification

Classification : Means to put things into group.

*Classifying organisms makes it easier to study & learn about them.

* The groups are classified according to the similar & different from each other.

* life characteristics are used to divide all things into two groups non living & living things.

*living things are classified into five main groups. Each main group is called a Kingdom.

The 5 Kingdom are:

1-Monera Kingdom

2-Protista Kingdom

3- Fungi kingdom

4- Plant Kingdom

5- Animal Kingdom

Kingdom: Monera

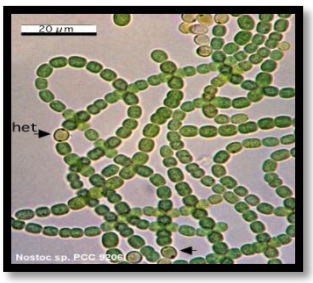
1- These organisms have cell walls.

2- They do not have true nucleus & the nuclear material in the cells is not surrounded by a nuclear membrane.

3- Chlorophyll may be present in the cells but there are no chloroplasts.

4- The Monera kingdom is divided into two phylum:

A- Blue- Green Algae.(e.x: Nostoc , Oscillatoria)



B- Bacteria.(Bacteria)

Bacteria

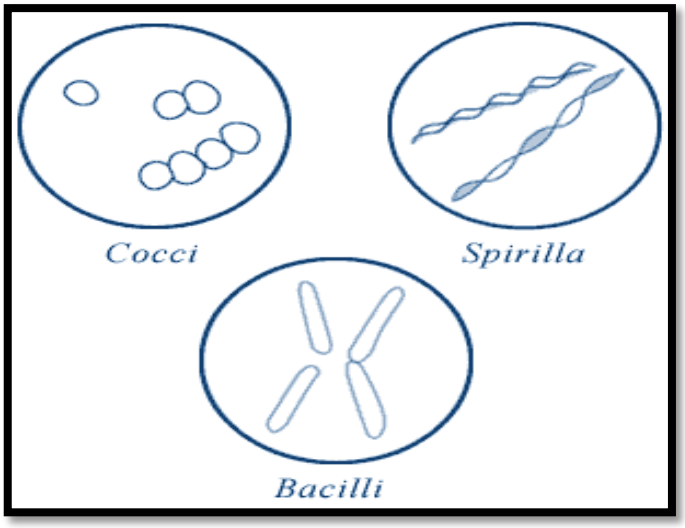
One- celled, most of them have no chlorophyll ,it have three basic shape (Coccus, Spherical, Bacillus)

* Bacteria are found deep in Oceans & high in the atmosphere.

* Some bacteria cause disease in the plant & animal. And some bacteria are useful.

* Most bacteria need oxygen, warmth & food & water to grow.

* Bacteria that have chlorophyll can make their food by (photosynthesis) but other bacteria did not have chlorophyll so they obtain food by growth on living thing & called Parasites or by dead organic and called Saprophytes.



Kingdom: Protista

1- Most of the protista are unicellular .

2- Some of protista make their own food & others obtain their food from plants, animals, or dead organic matter.

3- They have a true nucleus. (Eukaryotic) .

4- The protista kingdom is divided into eight phylum. Three of these phylum are simple algae, four are different groups of Protozoa, one phylum consist of species of slim molds.

The phylum of Protista Kingdom:

1- Euglenophyta → Euglena

2- Chrysophyta (golden algae) → Diatoms

3- Pyrophyta →Ceratium

4- Sarcodina → Amoeba

5- Ciliophora (Ciliates) → Paramecium

6- Mastoigophora → Trichomonas , Trypansoma

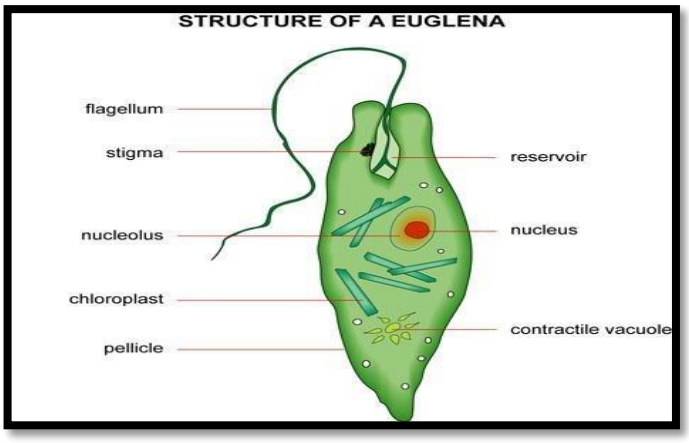
7- Sporozoa → Plasmodium

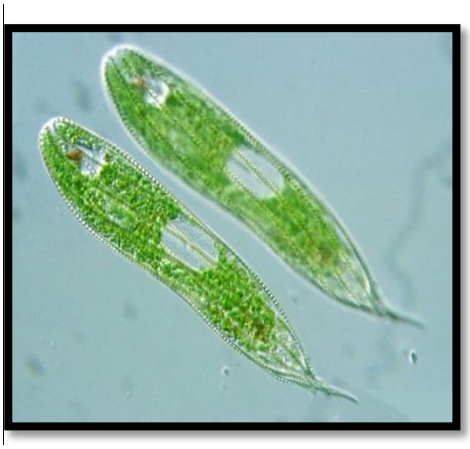
8- Myxomycota (Slime Molds) → Physarum

Some examples about Protista:

Euglena:

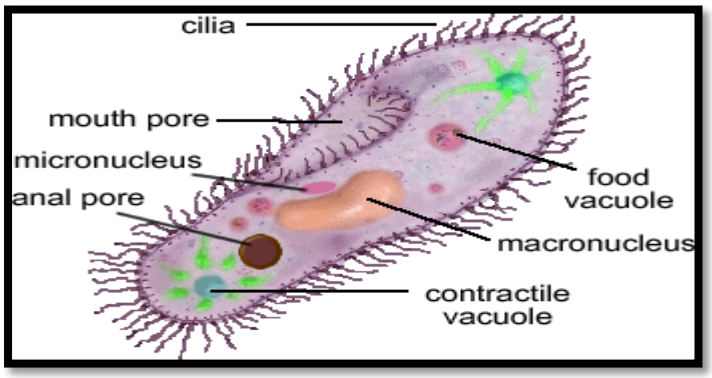
1- Are unicellular, live in water
2- When present in large amount they may color the water green.
3- Euglena have tail called a flagellum
4- The shape of Euglena may change sometimes as it swims
5- Euglena responds to light by swimming towards it because it has the stigma.
6- Euglena has chloroplast and can make its own food.
7- Euglena reproduces a sexually through cell division.
8- Euglena lack cell wall and can move about.





Paramecium:

1- Paramecium is a Sporozoa with two nucleuses, large nucleus controls cell activities and small nucleus is involved in reproduction.
2- Ciliated do not have cell wall, but they have cell membrane.
3- Cilia of Paramecium are short, hair like parts on the out side of the cell.
4- Cilia are useful for swimming & in obtaining food.



Lab: 9

Kingdom: Animal

1- Animals can not make their own food, so they eat other organisms for food.
2- Most animals can move about.
3- Multicellular
4- Animals with backbones are called vertebrates but the animals without backbones are called invertebrates.
5- Animals reproduction can be a sexual or Asexual , ex: Hydra
It can reproductive with both ways.
6- Animal Kingdom is classified into nine phylum,
Vertebrates animal belong to one phylum & invertebrates belong to eight phylum.

The phylum of Animal Kingdom:

1- **Porifera (Sponges)** →(ex. Sponge)

also named sponges:means animal that contains holes,are sessile feeders(struck to the ground eating what comes near them).

Body symmetry: asymmetric

Ex: yellow Tube spongy.

2- **Cnidaria**→(ex. Hydra)

Contains cnidocyte or Venomous cells that helps collect and

transmit sensory information .

body symmetry: radial

ex :Jelly fishes

3- **Platy helminthes (flat worms)** →(ex. Liver fluke)

also named flat worms lack a coelom and other body cavities, can be found in marine of fresh water.

Body symmetry: bilateral

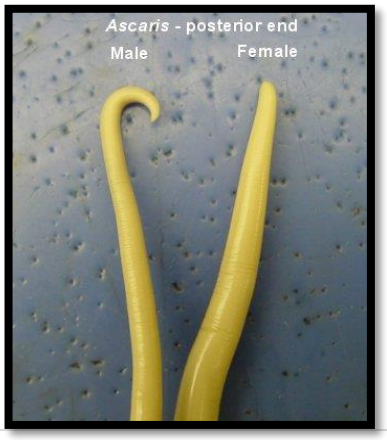
Ex: tapeworms .

4- **Nematoda (round worms)** →(ex. Ascaris)

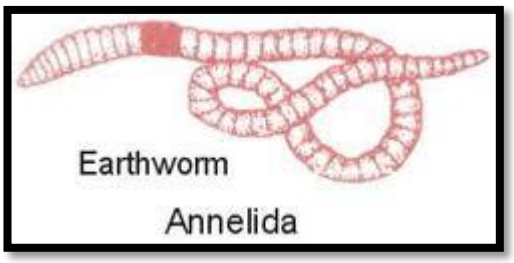
also named round worms, very long and narrow.

Body symmetry: bilateral

Ex: Ascaris .



5-**Annelida** →(ex. Earth worm)



have long bodies that have segments divided externally by shallow rings.

Body symmetry: bilateral

Ex: earthworms

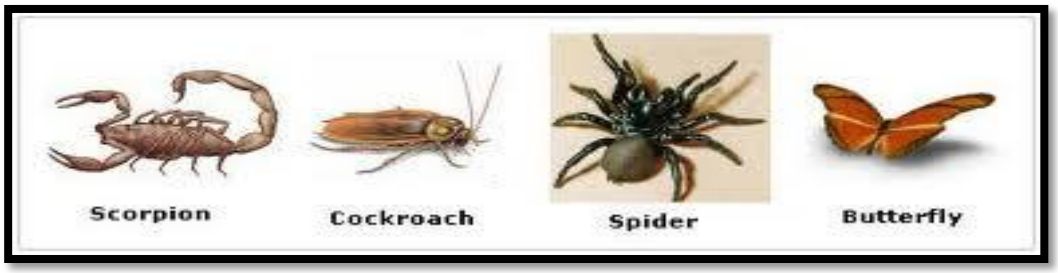
6- **Mollusca** →(ex. Octopus & Snail)

One of the largest phylum composed of many diverse organisms, all have a soft body, body structure composed of three parts.

Body symmetry: bilateral

Ex: snails , octopus

7-**Arthropoda** →(ex. Butterfly, Spider,Scorpion & Cockroach)



Have jointed appendages (body extensions that give them a wide range of controlled motion) , most successful because they are the most divers, living in a great range of habitats.

Body symmetry: bilateral.

8-**Echinodermata** →(ex. Sea cucumber , Sea urchin & Sea star)

means spiky skin, dwells at the bottom of the ocean floor.

Body symmetry: radial

9- **Chordate** → Vertebrate (ex. Fish, Frog, mouse & Birds)

Has internal skeletal rod, a complete digestive System, a ventral heart, a closed blood system and a tail

Body symmetry: bilateral.

Frog

An adult frog has a stout body, protruding eyes, cleft tongue, limbs folded underneath, and no tail. Frogs have glandular skin, with secretions ranging from distasteful to toxic. Their skins varies in colour from well-camouflaged dappled brown, grey and green to vivid patterns of bright red or yellow and black to show toxicity and ward off predators. Adult frogs live in fresh water and on dry land; some species are adapted for living underground or in trees.

Classification of Frog:

Scientific name: *Anura*

Kingdom: Animalia

Subkingdom: Metazoa

Phylum: Chordata

Class: Amphibia

Order: Anura; Duméril, 1806 (as Anoures)

Lifespan: Common toad: 10 – 12 years.

Dissection of Frog

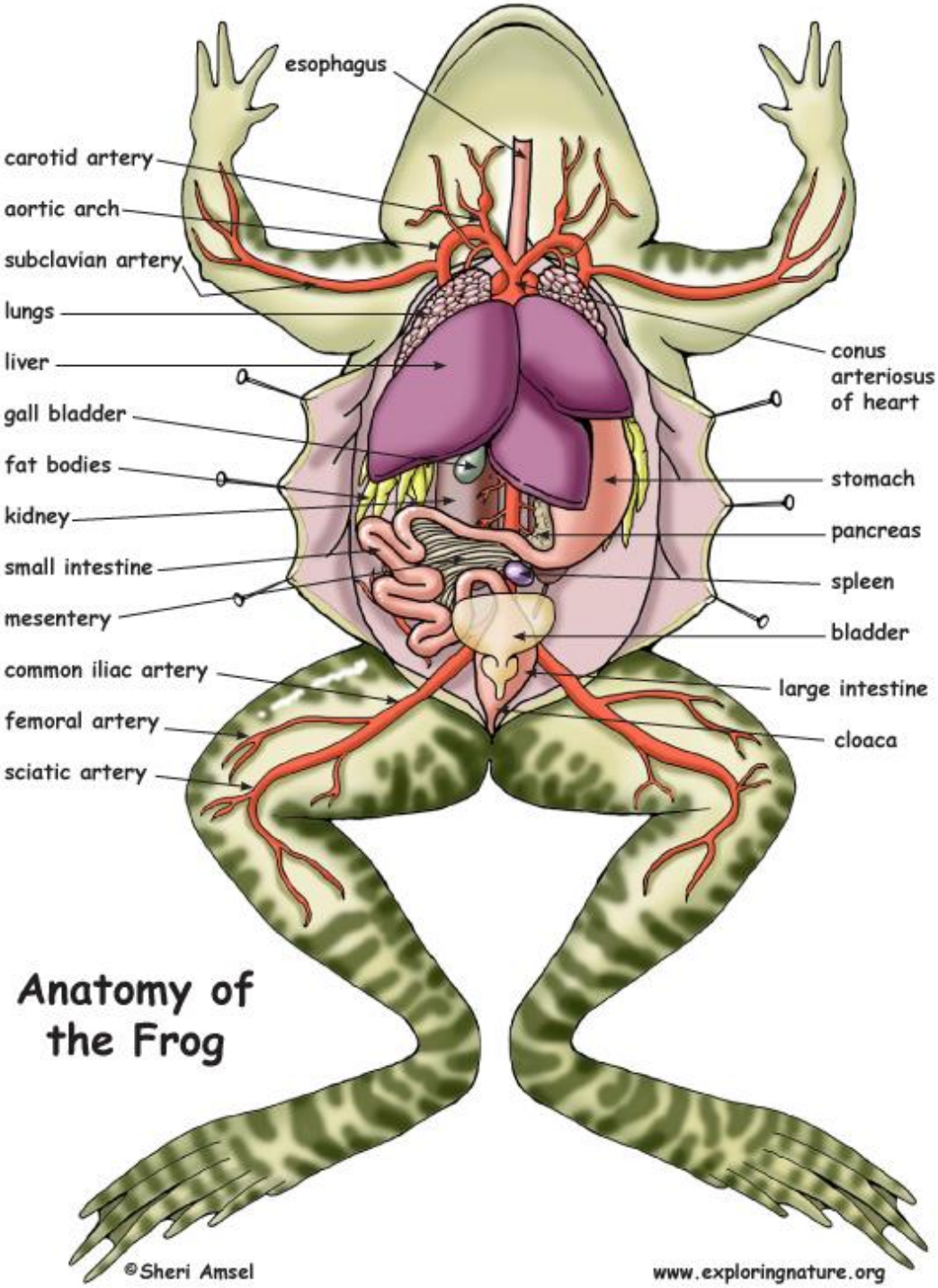
Procedure:

1. Put on safety goggles, gloves, and a lab apron.
2. Place a frog on a dissection tray. To determine the **frog's se**x, look at the hand digits, or fingers, on its forelegs. A male frog usually has thick pads on its "thumbs," which is one external difference between the sexes, as shown in the diagram below. Male frogs are also usually smaller than female frogs. Observe several frogs to see the difference between males and females.
3. Use the diagram below to locate and identify the external features of the head. Find the **mouth**,**external nares, tympani, eyes, and nictitating membranes.**

4. Turn the frog on its back and pin down the legs. Cut the hinges of the mouth and open it wide. Use the diagram below to locate and identify the structures inside the mouth. Use a probe to help find each part: the **vomerine teeth**, the **maxillary teeth**, the **internal nare**s, the **tongue**, the openings to the **Eustachian tubes**, the **esophagus**, the **pharynx**, and the slit-like **glottis**.

5. Look for the opening to the frog's **cloaca**, located between the hind legs. Use forceps to lift the skin and use scissors to cut along the center of the body from the cloaca to the lip. Turn back the skin, cut toward the side at each leg, and pin the skin flat. The diagram above shows how to make these cuts

6. Lift and cut through the muscles and breast bone to open up the body cavity. If your frog is a female, the abdominal cavity may be filled with **dark-colored eggs**. If so, remove the eggs on one side so you can see the organs underlying them.
7. Use the diagram below to locate and identify the organs of the digestive system: **esophagus, stomach, small intestine, large intestine, cloaca, liver, gallbladder, and pancreas.**
8. Again refer to the diagram below to identify the parts of the circulatory and respiratory systems that are in the chest cavity. Find the **left atrium, right atrium, and ventricle** of the heart. Find an **artery**attached to the heart and another artery near the backbone. Find a **vein** near one of the shoulders. Find the **two lungs**.
9. Use a probe and scissors to lift and remove the **intestines** and **liver**. Use the diagram on the next page to identify the parts of the urinary and reproductive systems. Remove the **peritoneal membrane**, which is connective tissue that lies on top of the red kidneys. Observe the yellow **fat bodies** that are attached to the kidneys. Find the **ureters; the urinary bladder; the testes** and **sperm ducts** in the **male;**and the **ovaries, oviducts**, and **uteri** in the **female.**
10. Remove the **kidneys** and look for threadlike **spinal nerves** that extend from the spinal cord. Dissect a thigh, and trace one nerve into a **leg muscle**. Note the size and texture of the leg muscles.
11. Dispose of your materials according to the directions from your teacher.
12. Clean up your work area and wash your hands before leaving the lab.


esophagus
carotid artery
aortic arch
subclavian artery
lungs
liver
gall bladder
fat bodies
kidney
small intestine
mesentery
common iliac artery
femoral artery
sciatic artery
conus arteriosus of heart
stomach
pancreas
spleen
bladder
large intestine
cloaca
Anatomy of the Frog
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Mouse

Claasification of Mouse

Scientific name: *Mus musculus*
Kingdom: Animalia
Subkingdom: Metazoa
Phylum: Chordata
Class: Mammalia
Sub class: Eutheria
Order: Rhodentia
Lifespan: Common toad :

Mouse Dissection

1. Check to see if the mouse is okay on the outside. There should be no obvious wounds, punctures or cuts. If so, notify staff.
2. First, pin the animal down with his/her belly facing up. With ethanol, wet the animal down. By washing the carcass with ethanol, you are protecting the tissues from artifacts caused by hair dragging through them.
3. With your forceps, grab hold of the skin anteriorly to the urethral opening. Using your scissors- cut along the ventral midline from the groin to the chin, being careful to only cut the skin and not the muscle wall underneath
4. Next, make an incision from the start of the first incision downward to the knee on both sides of the animal. Basically, you will end up with an incision that looks very similar to an upside down "Y.
5. Pull the skin back on the sides and you are ready for the examination. You can see the underlying organs through the peritoneal wall. .
6. If the animal is male, the penis and the prepuital gland will lie on top of the muscle. By cutting between the prepuital gland and the muscle wall via the penis, the gland is

left intact for inspection or preservation. 7. Try to identify the axillary and inguinal lymph nodes (Figure 3). If the animal is healthy, the bean-shaped structures are about the size of a single grape nut. They can range in color from yellowish white-to-tan. Carefully remove the nodes and lay them on a piece of paper towel. Examine. 8. If your mouse is a female, you can examine the mammary tissue of the animal (Figure 4). If the animal is pregnant or lactating, the tissue is readily identifiable. However, our mice will not be in such a state. The mammary tissue will look as if cottage cheese has been placed between layers of epithelium on the internal surface of the skin. If your animal is not "in the family way" but still looks like a mascot for the dairy industry, there might be a pituitary lesion to blame. A nonpregnant, nonlactating, or male mouse should not have a great deal of visible mammary tissue. 9. You are going to make a similar incision as was done in Figure 2. Now you are going to be cutting through the peritoneal muscle wall and opening up the body cavity. Since the muscle wall is slightly

transparent, you can easily avoid the delicate anatomy underneath (Figure 5). 10. Fold the muscle back or simply cut it off so you can have easy access to the structures in the body cavity (Figure 5). 11. Before any cuts are made, there are a few things to think about. a. First, notice the anatomical relationships between different organs. Does everything appear to be in the right place? b. Is everything the right color and shape? Check the color of the liver now before it has a chance to bleed out. It should he a shade of rich reddish brown. c. Just pretend what you have in front of you is a completed jigsaw puzzle and your job is to take the puzzle apart with the utmost care In the end, you should be able to put the puzzle together with every piece fitting together perfectly. In other words- no slicing and dicing! 12. Identify the 5 structures listed in Figure 5. What anatomical and physiological role do they play? 13. After opening up the body cavity, you are going to start with what presents itself first, in this case the easiest object to

extract from the mouse urogenital system. You will see a pouch budding up under the intestines, this is the Urinary bladder. What is it's function? 14. The next obvious group of tissues to tackle is the intestines and all other organs which are attached for the ride (Figure 6). a. Sever the intestines from the body as far down as possible on the colon. b. If you want to preserve the rectum and colon it may be beneficial if you simply cut the skin around the anus. c. Free the intestines from any fatty anchors until you reach the stomach. d. The caudate lobes of the liver are going to be on the lateral sides of the stomach. Careful cutting of the connective tissue is required to leave the liver intact. e. Cut the esophagus directly above the stomach in the abdominal cavity, leaving 0.25-0.5 cm of esophagus left connected to the stomach. At this point the whole organ system can be removed from the abdominal cavity. 15. Intestines: Starting at the rectum/colon, unzip the coiled intestines by pulling gently, using your scissors for help whenever

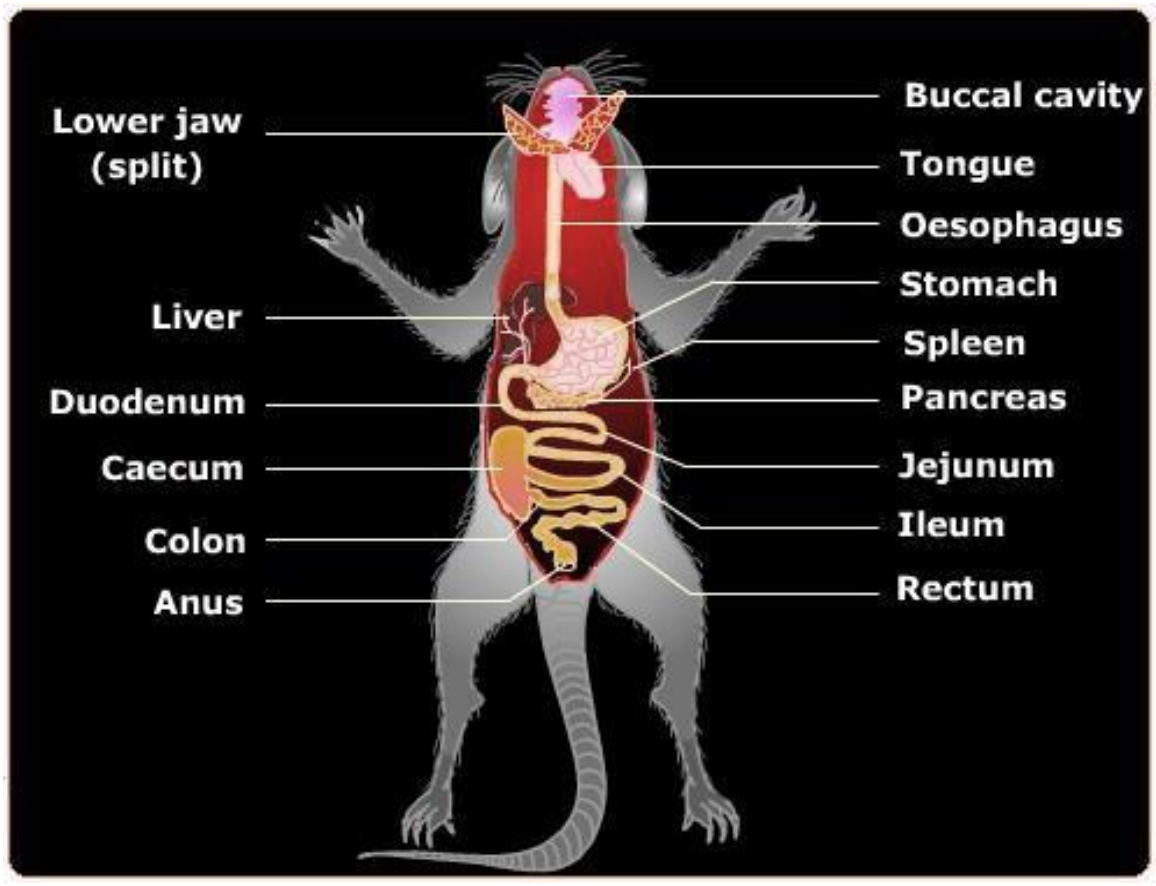
you feel it is necessary. As you do so, check the surface of the entire intestines for enlarged Peyers patches. There are many different parts of the intestine (Figure 7). Unfortunately, the large majority of them cannot be differentiated from each other grossly. What is the function of stomach, small intestine, and large intestine? 16. Pancreas/Spleen: 1. At one point, the ease at which the intestines can be pulled apart will change as you hit the pancreas. The pancreas is tan in color and can be easily identifiable from the surrounding fat. First cut the stomach away at the duodenal junction and remove the spleen. 2. Cut a section of the small intestine the pancreas is attached to, using the intestine as a handle. 3. Spread the pancreas out on flat piece of paper towel. Within the tissue, lies the pancreatic lymph nodes, identifiable only if enlarged. What are the functions of the pancreas and spleen? 17. Kidneys: The kidneys are located on the dorsal wall of the abdominal cavity, held securely in place by the tough capsules that surround

them (Figure 8). The adrenals are located anterior to them, If you are interested in the ureters, excise the entire system, including the surrounding fat where the ureters are hiding To look at the ureters, simply remove the kidney and adrenal together. The kidney is surrounded by its capsule and be careful not to gouge the kidney, slide the tips of your scissors underneath the clear, fit layer of the capsule near the renal pelvis and slip it off. It is very similar to taking the coat off of the kidney bean or any other bean. The cortex of the kidney is finely granular or "dotted" looking. It should have a rich, brownish red color and be firm in consistency. A great safety net with this step is the fact that there are two kidneys. If you mess up one of them, you get a second chance with the other. What are the functions fo the kidneys and ureters? little bifurcation of the median lobe. Separate the lobes from each other at the junctions, examine for any lesions. What are several functions of the liver? 20. Thoracic Organs: You have the heart,

thymus, lungs, thyroid, esophagus, larynx, mediastinal nodes, and trachea in front of you in one nice little package (Figure 11). Try to examine them all. Remove the esophagus from the system. The thyroids are flanking the trachea on the anterior end of the system and should have a thee tannish color. Check to see if the color is consistent and they are symmetric in size and shape. The parathyroids. are not visible grossly. They are located around or within the thyroids and can only be seen histologically. What are the functions of the heart, lungs, thyroid, esophagus, and larynx? 21. The thymus lies directly on top (or ventrally) to the heart. In younger animals, the thymus is going to be rather large. As the animal ages, the thymus shrinks in size. It should be a nice whitish-translucent color without any inconsistencies in color. What is the function of the thymus gland? 22. Lungs: Time to examine the lungs. The lungs should have a pink bubble gum color. The surface should be smooth and fresh looking. Examine

each lobe (see Figure 12) to see if any lesions are lurking in junctions or hidden from view. Place the lungs in water. The lungs are not as dense as water and will float on the surface. If for some reason, the lungs sink, something is wrong and it should be noted. The only thing that you removed in this whole process is the esophagus and the lungs, heart, thyroids, trachea, thymus, and mediastenial nodes (lymph nodes that drain the lungs) have remained together. a. You will not need to separate the heart from the lungs. The blood vessels are small and difficult to see without magnification. However, Figure 13 illustrates the major structures of the heart that one needs to know and what the function of each is. b. If you noticed the heart is touching or was near touching the diaphragm at the time you removed the sternum, it is a good sign that the heart is enlarged. As the diaphragm is punctured, the pressure in the thoracic cavity is going to change causing the heart to retract, so it is a good observation to make early during the

dissection. As with humans who don't get a great deal of exercise, are obese or are getting old, the heart will be enlarged. Hear enlargement and heart lesions are typical in older animals. Then mice we are using are relatively young and this should not be a problem. Also, don't be alarmed if the heart is still beating. Due to electric currents running through the body after death, some movement of the heart and other muscles will continue to occur after euthanasia. Can you name the structure that induces the heart to beat and maintain rhythm?


Lower jaw (split)
Liver
Duodenum
Caecum
Colon
Anus
Buccal cavity
Tongue
Oesophagus
Stomach
Spleen
Pancreas
Jejunum
Ileum
Rectum