S.A.RAJA PHARMACY COLLEGE

VADAKANGULAM- 627 116

TIRUNELVELI DISTRICT

SUBJECT:REMEDIAL BIOLOGY

PRACTICAL MANUAL BOOK

Exp No: 01

STUDY OF COMPOUND MICROSCOPE

Aim: To study the care, use and handling of compound microscope

Compound microscope:

It consist of two sets of lenses. Here one set of lenses of short focal length is used to produce an enlarged image of an illuminated object at a short distance, which is further enlarged by the second set of lenses placed approximately.

A compound microscope consist of the following parts

The base: usually "U" or "V" shaped , which rests on the table

The pillar: an upright bar supported the rest of the instrument on an inclination joint.

The stage: a horizontal shelf with graduated mechanical slide holder with X and Y movement for holding the slide to be examined

The mirror : it is situated below the stage, reflects the light upward through the hole in the stage. The mirror is usually double faced. The plane face is for initial light intensity and the concave for concentrating the light on the object.

The diaphragm: it is situated in between the hole on the stage and the mirror. It regulates the amount of light reflected by the mirror.

The body tube: it is cylinder in shape holding the draw tube and the lenses and move up and down vertically above the hole of the stage.

The coarse adjustment: the body tube is raised or lowered by the coarse adjustment knob and is used for finding the focus.

The fine adjustment: this on being turned produces a very slow motion of the entire frame work, which holds the body tube and is used for exact focusing on the higher power lenses.

The ocular eye piece: it is to be inserted into the upper end of draw tube . it consists of two plane convex lenses the lower and larger one.

The stage: this is a square plat form with an aperture at its centre on which the slide to slide forward and backward.

Note: left hand is used for coarse and fine focusing while right hand is used for mechanical stage is to move the slide in various direction.

Optical system: in body tube by which the light passes through the eye piece which formed the magnified image of the specimen and it can be raised or lowered.

Nose piece: it spitted at the lower end of the body tube and its it has two parts

1. Fixed nose piece
2. Revolving nose piece

Objective lenses: there are three types of objective lenses revolving nose piece, the magnifying power of each objective lenses is indicated below

a) **Low power objectives** (10×)
   It magnifies the image 10 times

b) **High power objectives** (45×)
   It magnifies the image 45 times

c) **Oil immersion** (100×)
   It magnifies the image 100 times

The eye piece fits into the top of the body tube. Each eye piece has two lenses one is mounded in the top lens and other lens is fitted at the bottom.

Mechanical stage: It is calibrated by a metal frame fitted on the top of the weight edge of the fixed stage. There is a spring mounted chip to hold the slide or counting chamber in position.

Source of light:

Natural day light reflected and scattered by atmosphere , if a day light is not available fluorescent tube, fitted in front of the working table can provide enough space.

There are two surface one s flat can plane and other concave it can be adjusted in any direction . plane mirror is used with a distance source light and concave mirror is used when the light is near the microscope.

The mirror: Two mirror one is flat or plane and the other is concave fitted back in a metal frame located below the condenser. The plane mirror is used with a distant of light . the paralled rays of light are reflected paralled into the condenser.

The concave mirror on the other hand is employed when the light source is near the microscope.

The lense system: the two condense paralled rays of high reflected from the mirror into the solid cone by the hight. The focus of the beam can be changed lowering or raising the condenser.

Iris diapharm: The condenser being mixed down and the iris diaphragm adjusted so that there is no glare.

A small lower on the slide of the condenser can adjust the size of the light should be regulated.

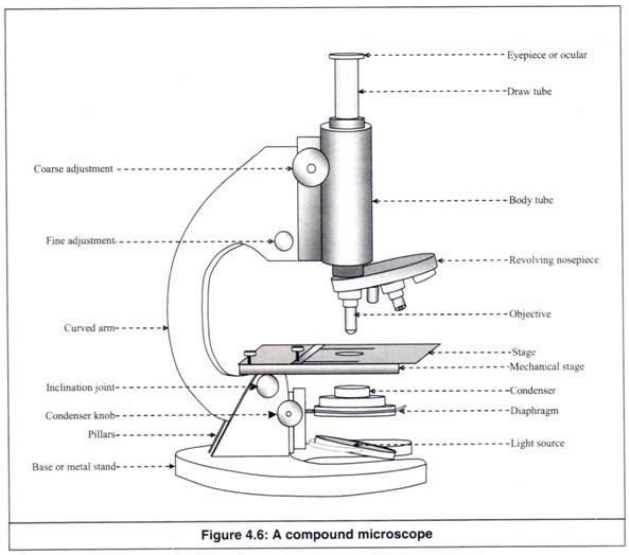


Figure 4.6: A compound microscope

Exp No: 02

STUDY OF SECTION CUTTING, STAINING & MOUNTING

Aim :

To understand technique of section cutting , staining, and mounting

Requirements:

Fresh or preserved material of sunflower stem , root, fresh or preserved materials of maize stem and root, a sharp blade, microscope, slide, cover slips, watch glass, saffranin(1gm in 100 ml of 50% of ethanol), glycerine, brush, blotting paper.

Section cutting:

Section cutting is a art , where selection of appropriate shape and size of a crude drug sample.

Steps:

- Cut the cube of pith
- With the help of a blade give vertical cut upto 2/3rd height
- Slightly pull one side of the cube apart to make a wedge opening .
- Insert the leaf sample prepared into the wedge and press two sides of pith.
- The vertical side side of pith may be tapered off upwards for convenience in section cutting.
- Take sections by moving the blade back and froth.
- Section ready for staining.

Staining process:

Steps

- Take a clean watch glass and add the staining solution to it.
- With the help of a brush, transfer the section taken from water to strain solution and keep for 2-3 minutes.

- Pick up the section after 2-3 min and transfer it to watch glass containg plain water.

Mounting process:

Steps

- Take a clean micro slide
- On this slide transfer the section to be mounted with the help of the brush
- Add one or two drops of glycerine –water on the section with a dropper.
- Take a clean cover slip , if any air bubbles slightly lift the cover slip and add a drop of glycerine-water and replace the cover slip till the air bubble is removed
- With the help of a blotting paper, wipe off excess present in the cover slip. The slide is ready for observation.

Ex.No:3

PREPARATION OF PERMANENT SLIDES

Aim: to prepare permanent slides using the given sections like leaf, stem and root.

Requirements: leaf, stem, and root.

Theory:

Dehydration preserves the cells and protects them from decaying. There are various dehydration agents but in this experiment, we will employ the simplest using ethyl alcohol. Specimens that are already dry. When dehydrating the specimen with alcohol , the objective is to slowly replace the water in the cell with alcohol. Since pure alcohol will harden the cell wall and make an impenetrable barrier, it must be done gradually.

Materials and reagent:

Pre cleaned glass, slides, cover slips, lab brush, dissecting needle, compound microscope, ethyl alcohol,

Procedure:

- Prepare a thin stem section using a new blade or scalpel without damaging the tissues
- Take a cleaned watch glass add 3 drops of distilled water and 1 drops of ethyl alcohol.And transfer the stem section into watch glass and incubate for 15 min
- After incubation remove the stem section and transfer to new watch glass containing 2 drops of ethyl alcohol and 2 drops of distilled water, leave it for 15 min
- Now again transfer sections into new section inot new watch glass containing 3 drops of ethyl alcohol 1 drops of distilled water , leave it for 15 min
- Again transfer section into another watch glass containing 4 drops of ethyl alcohol and incubate for 15 min
- Eventually transfer the dehydrated section into centre of the pre cleaned glass slides and add a drops of safranin and coverwith cover slips. Then seal or cement the cover slips with nail polish.

Ex.no:4

STUDY OF CELL

Aim: to study about the cell and its inclusions

Requirements:

Chart or model of cell

Theory:

Cell : the smallest units of structure and functions of cell. There are many different types of human cell, though they all have certain similarities. Each type of cell is made up of chemical and carries out specific chemical reaction. The basic living unit of the body is the cell. Each organ is an aggregate of many different cells held together by intercellular supporting structures.

Each type of cell is specially adapted to perform one or few particular functions. Transport oxygen from the lungs to the tissues . although the red cells are the most abundant of any single type of cell in the body , there are about 75 trillion additional cells of other types that perform functions different from those of the red cell. The entire body, contains 100 trillion cells.

Although many cells of the body often different markedly from one another , all of them have certain basic characteristics that are alike. For instance, in all cells, oxygen reacts with carbohydrate, fat , protein to release energy required for cell function. Further, the general chemical mechanism for changing nutrients into energy are basically the same in all cells, and all cells deliver end products of their chemical reaction into the surrounding fluids.

Almost all cells also have the ability to reproduce additional cells of their own kind.

Cell and its organells

Cell membrane: the cell membrane keeps the cell together by containing the organelles with it.cell membranes are selectively – permeabile, allowing materials to move both into and outside of the cell.

Cytoplasm: cytoplasm is a jelly- like substance that is sometimes described as the cell matrix. It holds the organelles in place with the cell.

Nuclear membrane: the nuclear membrane separates the nucleus and the nucleolus from the rest of the contents of the cell.

Nuclear pore: nuclear pore permits substances to pass both into , and out of the nucleus

Nucleolus: the nucleolus is responsible for the synthesis of precursor of ribosomes and their storage.

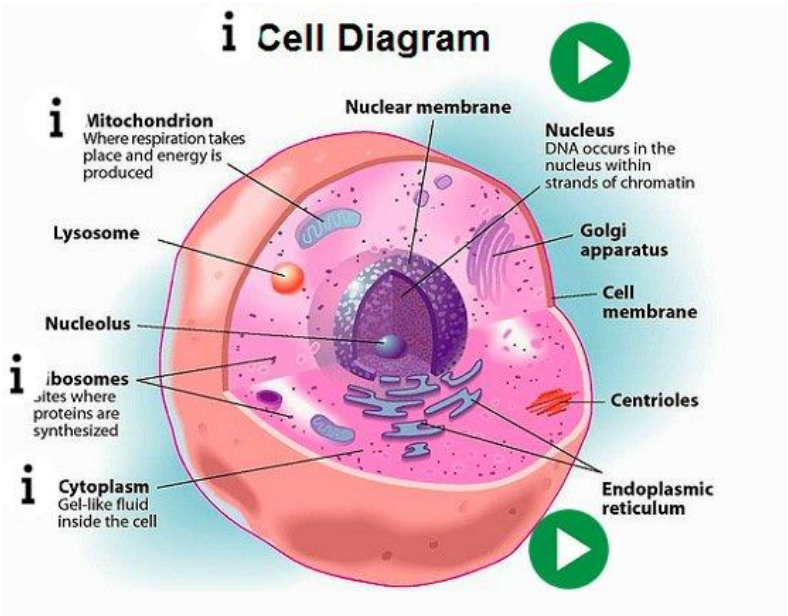
Nucleus : the nucleus is the control centre of the cell , which contains DNA in the form of genes, and also information for the formation of proteins.

Mitochondria: mitochondria is a plural term, which is appropriate as these are not found alone. The number of mitochondria within the cells varies with the type of cells. These are the energy producers with in the cells. They generate energy in the form of adenosine triphospate.

Ribosomes: ribosomes interpret cellular information from the nucleus and so synthesis appropriate protein as required

Golgi apparatus: the golgi apparatus of a cell is usually connected to an endoplasmic reticulum(ER)

Centrosomes: the centrosomes contain the centrioles , which are responsible for cell division.



Ex.No: 5

MODIFICATION OF LEAF

Aim: to study the different modification of leaf

Requirement: preserved specimen of modified leafs

Theory: leaf is the most important vegetative organ of the plant. The leaf modification are

1. Leaf tendrils: these are thin and sensitive thread like structure that help the plant in climbing up against some support. The entire leaf is modified into tendril in similax the stipules become modified into dendrites.
2. Leaf hooks: the leaf are modified into hooks and help the plant to climb the support.
3. Leaf spines: in some plants the whole leaf or its parts get modified to hard pointed structure called spine. This modification helps the plant to cut down transportation and also protect the plants against the attack of grazing animals.
4. Phyllode: the lamina of leaf falls off its petiole gets flattened and takes on the function and shape of the leaf. this modification petiole is called phyllode.
5. Leaf pitcher: in the pitcher plant the leaf becomes modified into a pitcher. There is a slender walk which coils like a tendril holding the pitcher vertical and the basal portion is flattened like a leaf. The insect are attracted by these structure and falls inot the pitcher to be killed and digested by the plants with the secretion of the hydrolytic enzymes.
6. Leaf bladder: some of the leaf segments are modified to form bladder. These bladders serve as floats for the aquatic plants and for trapping the insects

Ex.No: 6

MODIFICATION OF STEM

Aim: to study different modification of stem

Requirements: preserved specimen of modified stem

Theory: the upright part of the plant which grows from plumule of seed is called stem. Stem bears nodes, leaves and branches. The stem , its branches, leaves, flowers, and fruits constitute the shoot system of the plant. Some stems are modified to perform various functions.

A. UNDERGROUND SYSTEMS

- Rhizomes: they are horizontal , thick, shout, underground stem. They are swollen with the storage of food materials. They have nodes. These perennial structure bear auxillary buds. The branching of the stem may be recemose (ex. saccharum)
- Corm: fleshly, spherical stem with flattened base, grows vertically ; bears many scale leaves, distinct nodes and internodes, buds and adventitious roots.
- Tubers: swollen tips of underground lateral branches of stem store food as starch , bear, eyes. Each eye is a node which bears bud and scar of scale leaves. Ex.potato

B. SUB AERIAL SYSTEM:

Stems are weak , therefore lie prostrate on the ground or my get partially buried in the top soil. The plants bearing such system are called creepers.

- Runner: it has long and thin internodes and the branches creep over the surface of the soil. They develop adventitious roots from the lower sides of the nodes. Ex. Grass oxalis.
- Stolen: weak lateral branches which grows upwards then arches down to meet the soil, strike roots are produce daughter plants. Ex. Mint.

- Offset: it is a short runner with one internodes long. It originates from leaf axil, grows as a short horizontal branch .

C. AERIAL STEMS

- In certain plants, the aerial stems or buds get modified to perform special function like climbing production, protection food storage, vegetative propagation etc
- Stem tendrils: stem are its branches get modified into thread like sprilally coiled leaf like structure which twin around neighbouring objects and health weak plants to climb. Ex. Grape wine
- Thorns: straight pointed hard structures modifications of auxiliary or terminal but act as defence organs or as climbing organs.

Ex.No: 7

MODIFICATION OF ROOT

Aim: to study different modification of root

Requirements: preserved specimen of modified root

Theory: the plant body consist of root and shoot systems. Different parts of the plant perform different function

A. Tap root modification:

tap root are modified into different structures , these modified structures carried out specific functions like food storage. There are different types of modified tap roots like fusiform, napiform, conical, tuberous..etc.

B. Adventitious root system:

In some plants the adventitious roots store food and become fleshy and swollen. It may assume the following shapes.

C. Vital Functions:

- Clinging roots: these cling to the host plant for support
- Aerial roots: these roots hang downward. Aerial roots are green in colour and have a special outer covering called velamen.
- Photosynthetic root: these are green due to the development of chlorophyll in them.
- Parasitic roots: theses roots grown into the host and come in contact with its conducting tissues. As they absorb nourishment from the plant and are therefore called suckling roots.

Ex.No: 8

T.S OF MONOCOT STEM

Aim: to cut a transverse section of a given monocot stem and make a temporary stained mount to study its structure

Requirements: monocot stem of maize, blade petri dish, watch glass, brush, filter paper, glycerine, safranin, slides, cover slips

Procedure:

- Take a piece of monocot stem of maize and cut a transeverse section of it with the help of sharp blade.
- The section should be thin and straight. Cut above 8-10 sections and place them in a petri dish containing water.
- Take 2-3 sections and place them on a glass slide in a drop of water and observe them under microscope
- If the section visible in the microscope are clear, then stain them with safranin in a petri dish.
- Now ash the section with water and mount them in glycerine. Place the cover slip on the slide and ready to mount.

Observation:

1. Epidermis: it is the outermost covering of the stem represented by a single layer of compactly arranged, barrel shaped parenchyma cells
2. Hypodermis: it lies immediately below the epidermis. It is represented by a few layers of compactly arranged sclerenchyma cells.
3. Ground tissue: the ground tissue is represented by several layers of loosely arranged parenchyma cells enclosing prominent intercellular spaces.
4. Vascular bundle: they are found irregularly scattered in the ground tissue. Each bundle is conjoint, collateral and closed.

Ex.No: 9

STUDY OF STOMATAL INDEX

Aim: To study the distribution of stomata on upper and lower surface of leaves and calculate the stomatal index.

Requirements: potted plants, filter paper, coverslips, desiccators, cobalt chloride paper, microscope.

Procedure: remove the peel of a leaf taken from a potted plant and place it on a slide containing a drop of water or glycerine. Observe it under the microscope. Now take the peel from the other surface and repeat the procedure. Compare upper and the lower surface.

Observation: polygonal cells of epidermis are seen under the microscope stomata with kidney shaped guard cells are also seen here and there. Count the total number of epidermal cells as well as the total number of stomata visible in one filed.

Stomatal index % = total number of stomata /total no of epidermal cells+no of stomata ×100

Ex.No: 10

STUDY OF PLANT TISSUES

Aim: to study the plant tissue- palisade parenchyma, collenchymas, sclerenchyma, xylem, and phloem from permanent slides.

Theory: the organ of plants consist of different tissues. The study of tissues is called histology. A tissue is a group of cells which are similar in origin, structure and function. mainly tissues are of two types

Meristematic tissues

Permanent tissues

1. **Parenchyma**

   Features:

   - Cells are spherical or oval and isodiametric
   - There are intercellular spaces between the cells
   - Cells containing prominent nucleus and reserved food materials
   - These are living and thin walled

2. **Collenchymas**

   Features:

   - Tissues are made up of iso diametric cells
   - Their cell wall is thick more so in corners of the cell
   - There is no intercellular spaces
   - It provides strength and flexibility to the young stem.

3. **Sclerenchyma**

   Features:

   - The cells are long and highly thick walled due to deposition of lignin
   - Protoplasm is crushed and the cells become dead at maturity
   - The ends of the cell tapers into sharp point
   - The cell cavity is very small

4. **Xylem**

Features:

- It is a complex tissue
- It is made up of four kinds of elements like tracheids, vessles, xylem, parenchyma and xylem fibres.

5. **Phloem**

Features:

- These compounds are formed of four types of cells
- They are sieve tube cells, companion cells, phloem parenchyma and fibres

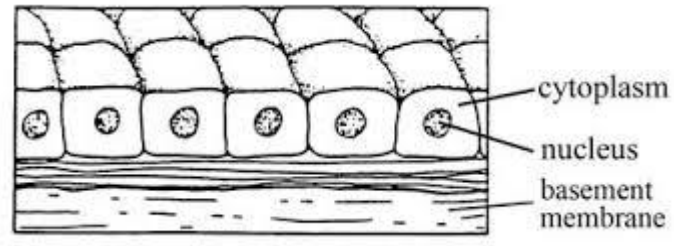
Ex.No: 11

STUDY OF ANIMAL TISSUE

1. Ciliated Epithelium tissue :

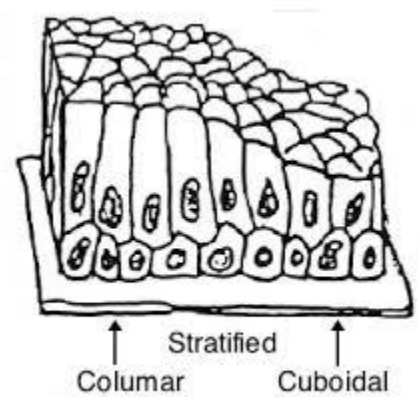
Ciliated columnar epithelial cells are rectangular in shape and have between 200 to 300 hair-like protrusions called cilia. The mitochondria are found toward the apical region of the cell while the cell nuceli are found towards the base and are often elongated. Cells are interconnected via desmosomses and tight junctions, creating a semipermeable membrane that is more selective that membrane found in other types of cell.

2. Cuboidal Epithelium :



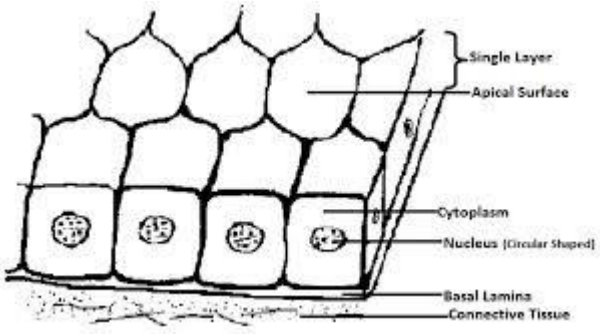
Cuboidal epithelia are epithelial cells having a cube-like shape; that is, their width is approximately equal to their height. They may exist in single layers (simple cuboidal epithelium) or multiple layers (stratified cuboidal epithelium) depending on their location (and thus function) in the body.

3. Stratified Columnar Epithelium :



Stratified columnar epithelia are found in the ocular conjunctiva of the eye, in parts of the pharynx and anus, the female's uterus, the male urethra and vas deferens. Also found in Lobar ducts in salivary glands. The cells function in secretion and protection. In simple terms, we can say that the upper and lowermost layer of cells are columnar in shape. The middle layer contains cuboidal cells. It forms the lining of respiratory tract, ureter, ovi duct ,etc.

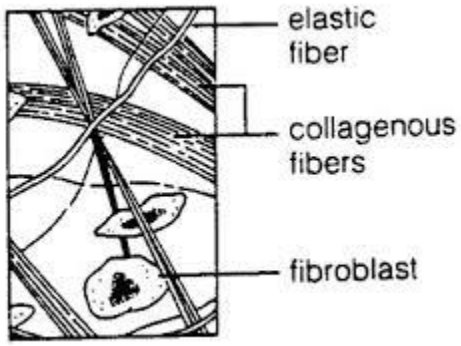
4. Stratified Cuboidal Epithelium :



Stratified cuboidal epithelium is a type of epithelial tissue composed of multiple layers of cube-shaped cells.

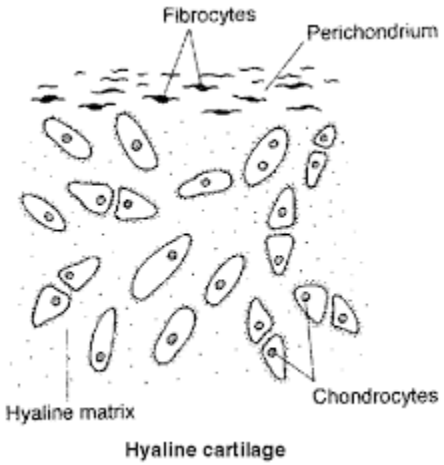
Only the most superficial layer is made up of cuboidal cells, and the other layers can be cells of other types. This is because, conventionally, naming of stratified epithelium is based on the type of cell in the most superficial layer.

5. Areolar connective tissue :



Loose connective tissue is the most common type of connective tissue in vertebrates. It holds organs in place and attaches epithelial tissue to other underlying tissues. It also surrounds the blood vessels and nerves. Cells called fibroblasts are widely dispersed in this tissue; they are irregular branching cells that secrete strong fibrous proteins and proteoglycans as an extracellular matrix. The cells of this type of tissue are generally separated by quite some distance by a gelatinous substance primarily made up of collagenous and elastic fibers.

6. Hyaline cartilage :



Hyaline cartilage

Hyaline cartilage is covered externally by a fibrous membrane, called the perichondrium, except at the articular ends of bones and also where it is found directly under the skin, i.e. ears and nose. This membrane contains vessels that provide the cartilage with nutrition.

Hyaline cartilage matrix is mostly made up of type II collagen and chondroitin sulfate, both of which are also found in elastic cartilage.

Hyaline cartilage exists on the ventral ends of ribs; in the larynx, trachea, and bronchi; and on the articular surface of bones.

7. Tendon :

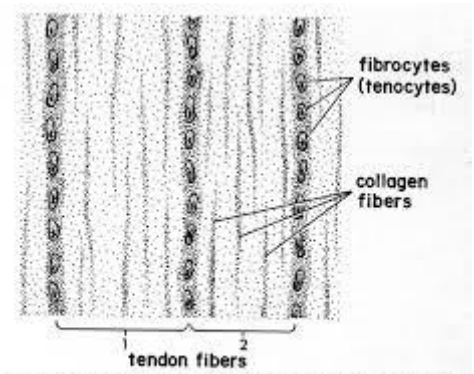
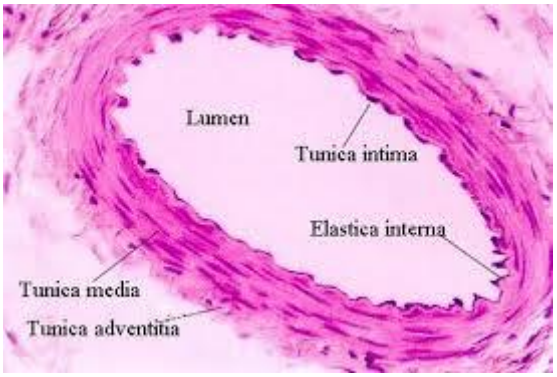


FIG. 69-2 A ligament is a band of relatively nonelastic tissue that unites two or more bones and is composed predominantly of long parallel collagenous fibers.

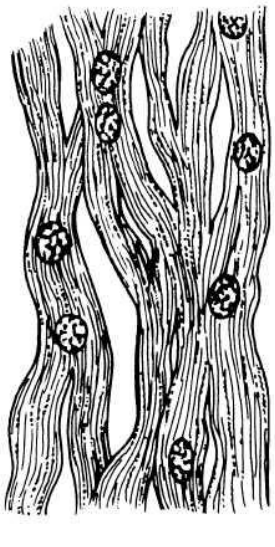
A **tendon** (or **sinew**) is a tough band of fibrous connective tissue that usually connects muscle to bone and is capable of withstanding tension. Tendons are similar to ligaments and fasciae; all three are made of collagen. Ligaments join one bone to another bone; fasciae connect muscles to other muscles. Tendons and muscles work together to move bones.

8. Human Vein :



Veins (from the Latin *vena*) are blood vessels that carry blood toward the heart. Most veins carry deoxygenated blood from the tissues back to the heart; exceptions are the pulmonary and umbilical veins, both of which carry oxygenated blood to the heart. In contrast to veins, arteries carry blood away from the heart. Veins are less muscular than arteries and are often closer to the skin. There are valves in most veins to prevent backflow.

9. Cardiac Muscle :



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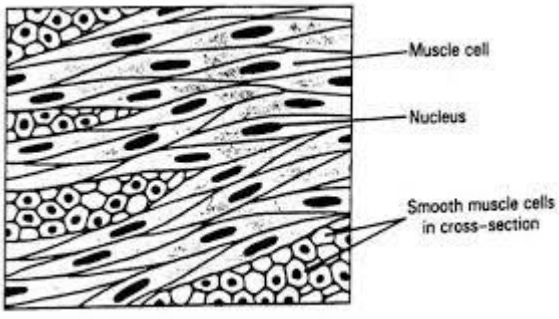
Cardiac muscle (**heart muscle**) is involuntary, striated muscle that is found in the walls and histological foundation of the heart, specifically the myocardium. Cardiac muscle is one of three major types of muscle, the others being skeletal and smooth muscle. These three types of muscle all form in the process of myogenesis. The cells that constitute cardiac muscle, called cardiomyocytes or myocardiocytes, contain only three nuclei.[1][2][*page needed*] The **myocardium** is the muscle tissue of the heart, and forms a thick middle layer between the outer epicardium layer and the inner endocardium layer.

10. Smooth Muscle :

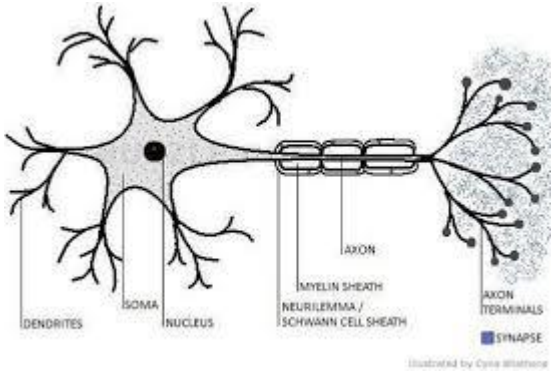


Smooth muscle is an involuntary non-striated muscle. It is divided into two subgroups; the single-unit (unitary) and multiunit smooth muscle. Within single-unit cells, the whole bundle or sheet contracts as a syncytium (i.e. a multinucleate mass of cytoplasm that is not separated into cells). Multiunit smooth muscle tissues innervate

individual cells; as such, they allow for fine control and gradual responses, much like motor unit recruitment in skeletal muscle.

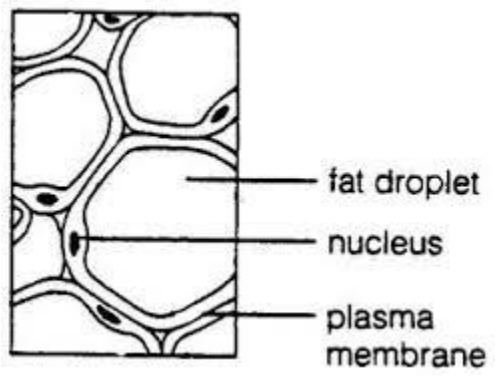
Smooth muscle is found within the walls of blood vessels (such smooth muscle specifically being termed vascular smooth muscle) such as in the tunica media layer of large (aorta) and small arteries, arterioles and veins. Smooth muscle is also found in lymphatic vessels, the urinary bladder, uterus (termed uterine smooth muscle), male and female reproductive tracts, gastrointestinal tract, respiratory tract, arrector pili[1] of skin, the ciliary muscle, and iris of the eye. The structure and function is basically the same in smooth muscle cells in different organs, but the inducing stimuli differ substantially, in order to perform individual effects in the body at individual times. In addition, the glomeruli of the kidneys contain smooth muscle-like cells called mesangial cells.

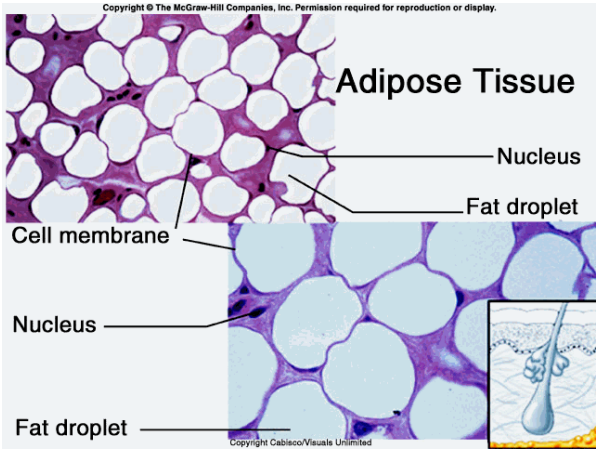
11. Neuron :



Nervous tissue is the main component of the two parts of the **nervous** system; the brain and spinal cord of the central **nervous** system (CNS), and the branching peripheral **nerves** of the peripheral **nervous** system (PNS), which regulates and controls bodily functions and activity.

12. Adipose tissue :

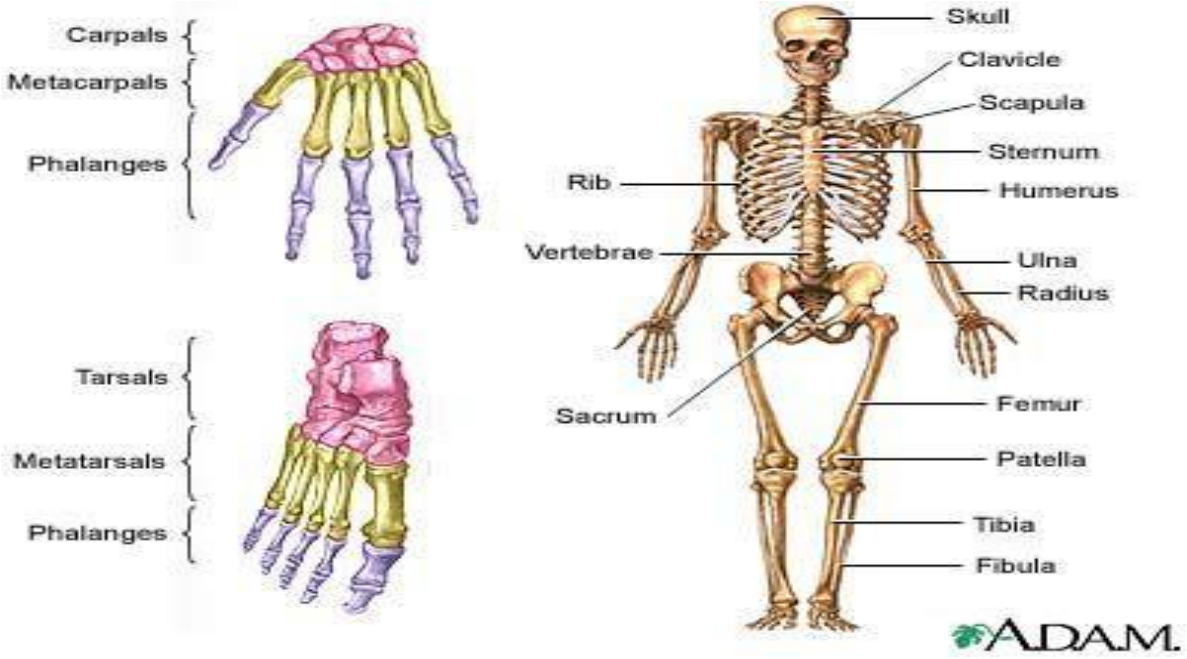




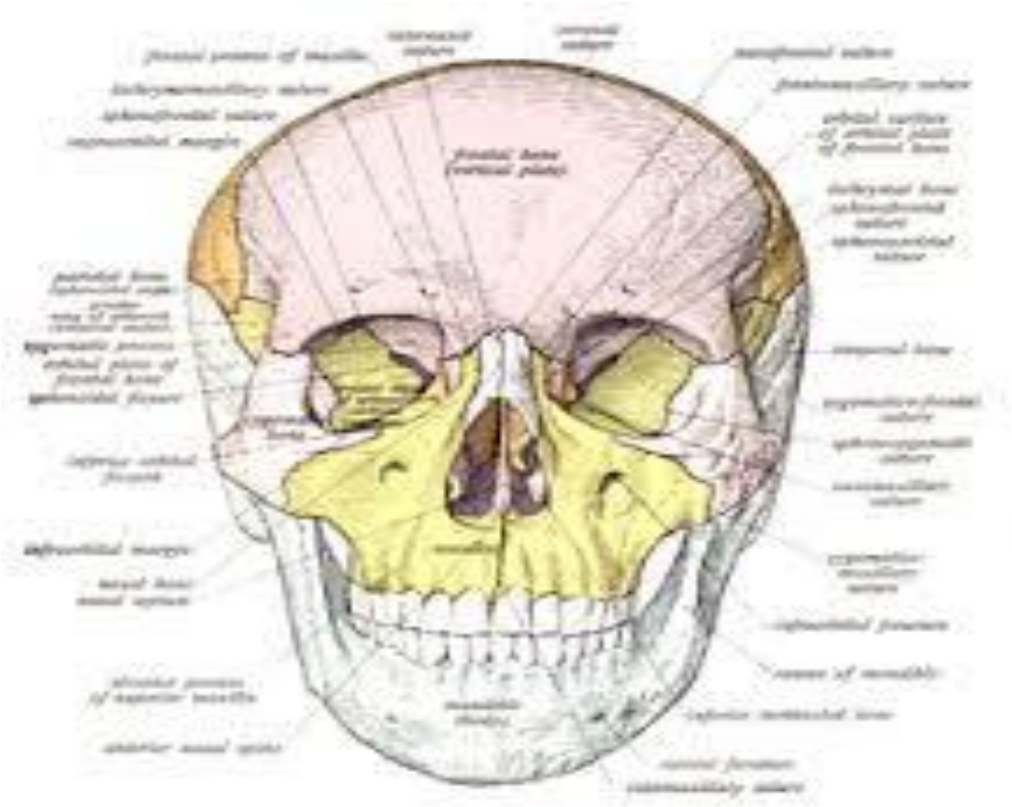
Adipose tissue or **body fat** or just **fat** is loose connective tissue composed mostly of adipocytes. In addition to adipocytes, adipose tissue contains the stromal vascular fraction (SVF) of cells including preadipocytes, fibroblasts, vascular endothelial cells and a variety of immune cells (i.e., adipose tissue macrophages [ATMs]). Adipose tissue is derived from preadipocytes. Its main role is to store energy in the form of lipids, although it also cushions and insulates the body. Far from hormonally inert, adipose tissue has, in recent years, been recognized as a major endocrine organ,[1] as it produces hormones such as leptin, estrogen, resistin, and the cytokine TNFα. Moreover, adipose tissue can affect other organ systems of the body and may lead to disease. The two types of adipose tissue are white adipose tissue (WAT), which stores energy, and brown adipose tissue (BAT), which generates body heat.

Ex.No: 12

SKELETAL SYSTEM

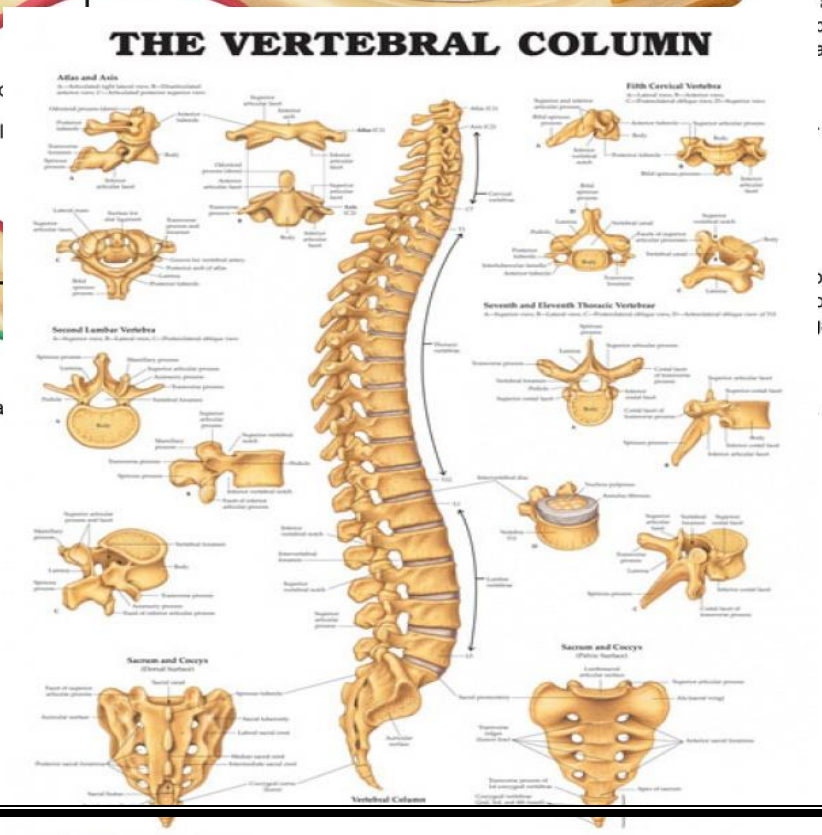


SKULL

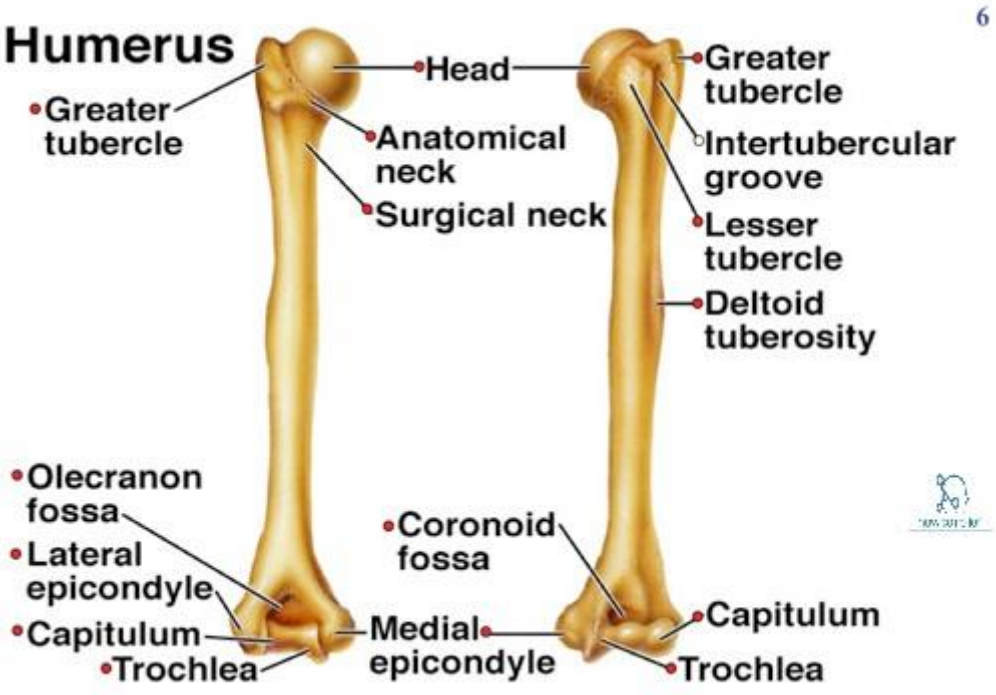


CLAVICLE

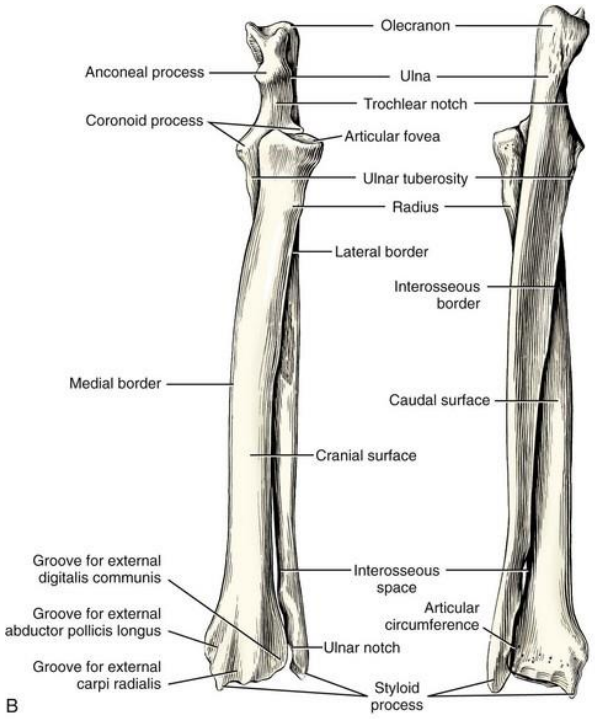

Trapezius m.
Sternohyoid m.
Superior view
Sternocleido-
mastoid m.
Sternoclavicular
and
clavicular
aments
Acromio-
clavicular
ligament
Delto
Del
ligament
Trapezoid
ligament
osterior
oclavicular
ament
Tra


THE VERTEBRAL COLUMN
Atlas and Axis
Fifth Cervical Vertebra
Seventh and Eleventh Thoracic Vertebrae
Second Lumbar Vertebra
Sacrum and Coccyx
Sacrum and Coccyx
Vertebral Column

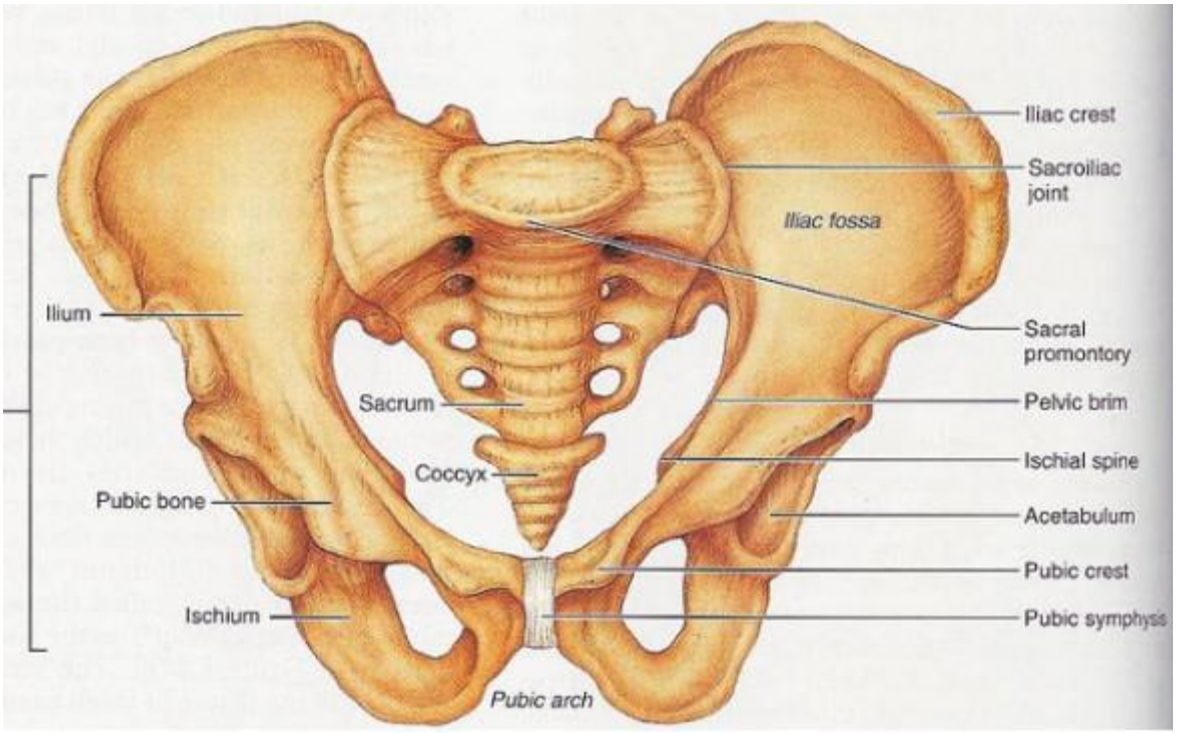
HUMERUS


Humerus
6
Head
Greater tubercle
Greater tubercle
Anatomical neck
Surgical neck
Intertubercular groove
Lesser tubercle
Deltoid tuberosity
Olecranon fossa
Lateral epicondyle
Capitulum
Trochlea
Coronoid fossa
Medial epicondyle
Capitulum
Trochlea

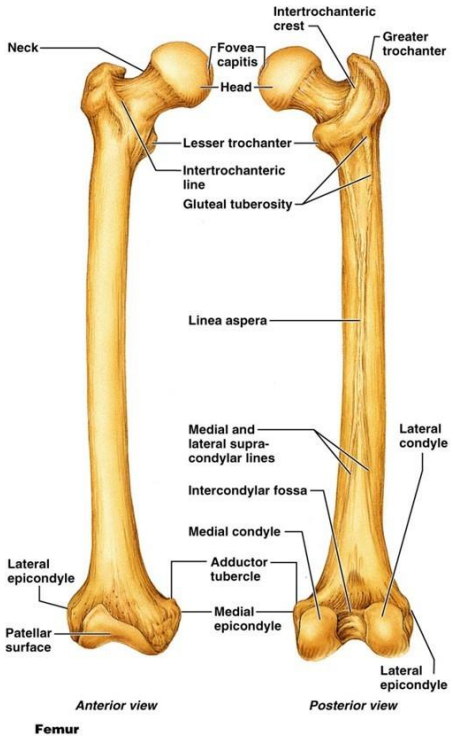
RADIUS ULNA



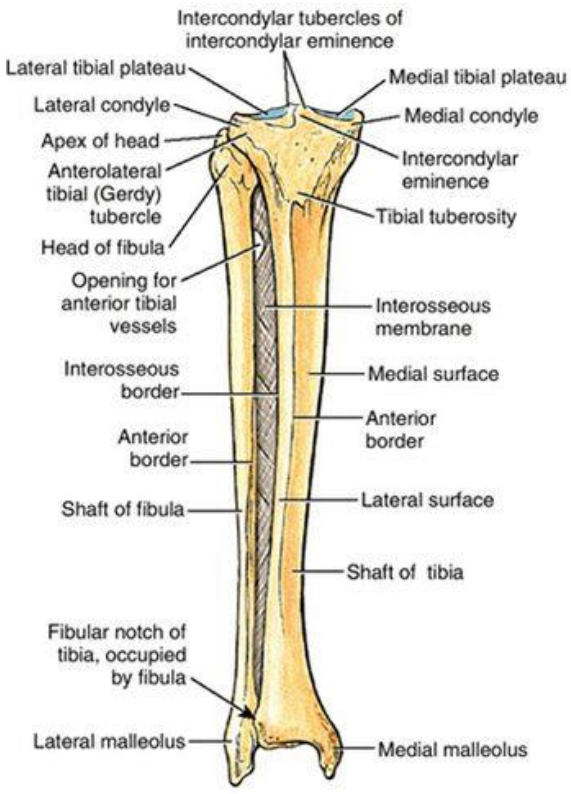
PELVIC GIRDLE



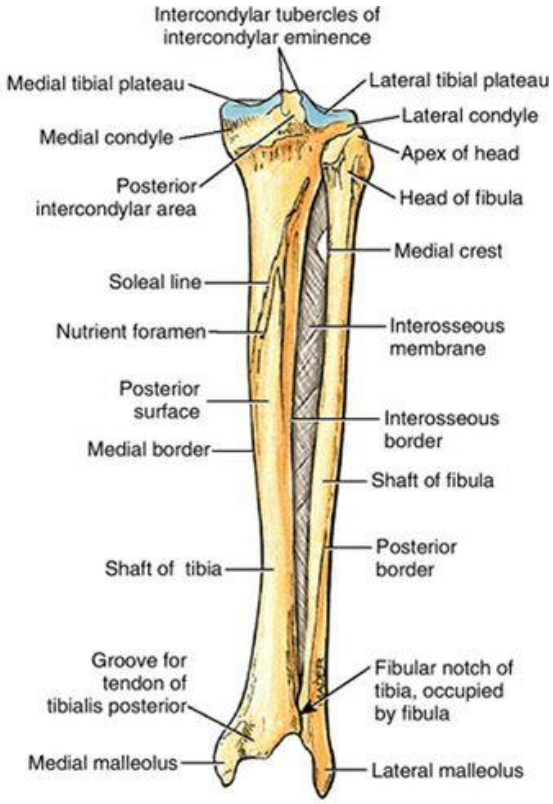
FEMUR



TIBIA FIBULA



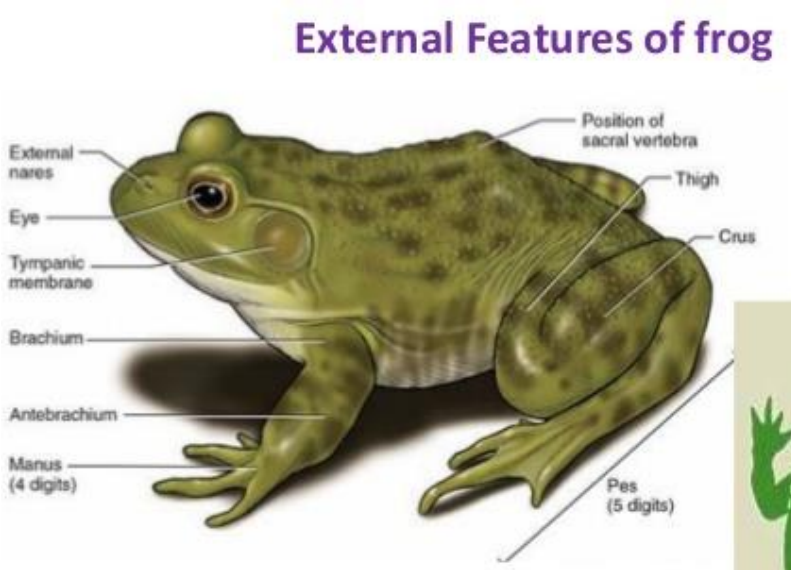
A **Anterior view**

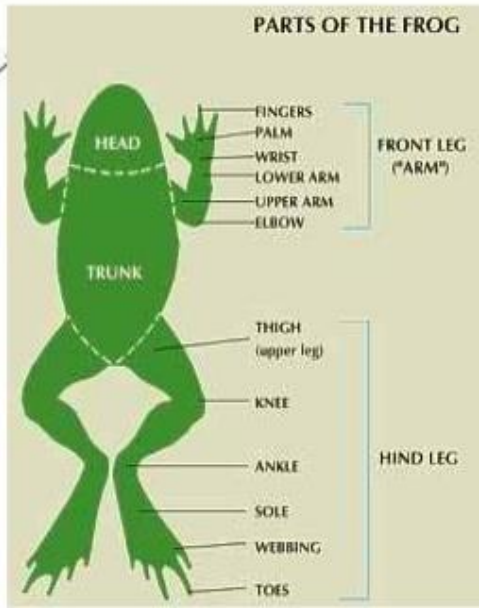


B **Posterior view**

EX.NO:13

TO STUDY THE EXTERNAL MORPHOLOGY OF FROG THROUGH PERMANENT SLIDES





Ex.No:14

IDENTIFICATION OF BLOOD GROUPS

ABO blood group system, the classification of human blood based on the inherited properties of red blood cells (erythrocytes) as determined by the presence or absence of the antigens A and B, which are carried on the surface of the red cells. Persons may thus have type A, type B, type O, or type AB blood. The A, B, and O blood groups were first identified by Austrian immunologist Karl Landsteiner in 1901. *See* blood group.

Blood containing red cells with type A antigen on their surface has in its serum (fluid) antibodies against type B red cells. If, in transfusion, type B blood is injected into persons with type A blood, the red cells in the injected blood will be destroyed by the antibodies in the recipient's blood. In the same way, type A red cells will be destroyed by anti-A antibodies in type B blood. Type O blood can be injected into persons with type A, B, or O blood unless there is incompatibility with respect to some other blood group system also present. Persons with type AB blood can receive type A, B, or O blood.

The ABO and Rh groups in transfusion

system	recipient type	donor red cell type	donor plasma type
ABO	A	A* or O	A or AB
ABO	B	B or O	B or AB
ABO	O	O only	O, A, B, or AB
ABO	AB	AB*, A*, B, or O	AB
Rh	positive	positive or negative	positive or negative
Rh	negative	negative or positive**, ***	negative or positive**

*Not if the patient's serum contains anti-A1 (antibody to common type A red cell in subgroup A patients).
**Not if the patient is a female less than 45 years old (childbearing possible), unless life-threatening hemorrhage is present and transfusion of Rh-positive blood is lifesaving.
***Not if the patient's serum contains anti-D (antibody to positive red cells), except under unusual medical circumstances.

Blood group O is the most common blood type throughout the world, particularly among peoples of South and Central America. Type B is prevalent in Asia, especially in northern India. Type A also is common all over the world; the highest frequency is among the Blackfoot Indians of Montana and in the Sami people of northern Scandinavia.

The ABO antigens are developed well before birth and remain throughout life. Children acquire ABO antibodies passively from their mother before birth, but by three months of age infants are making their own; it is believed that the stimulus for such antibody formation is from contact with ABO-like antigenic substances in nature. ABO incompatibility, in which the antigens of a mother and her fetus are different enough to cause an immune reaction, occurs in a small number of pregnancies. Rarely, ABO incompatibility may give rise to erythroblastosis fetalis (hemolytic disease of the newborn), a type of anemia in which the red blood cells of the fetus are destroyed by the maternal immune system. This situation occurs most often when a mother is type O and her fetus is either type A or type B.

Ex.No:15 **BLOOD GROUPING**

RECORDING OF ARTERIAL BLOOD PRESSURE

Definition of Blood Pressure Arterial blood pressure is the force exerted by the blood on the wall of a blood vessel as the heart pumps (contracts) and relaxes. Systolic blood pressure is the degree of force when the heart is pumping (contracting). The diastolic blood pressure is the degree of force when the hearts relaxed.

Method of Measuring Arterial Blood Pressure

In the measurement procedure a cuff is wrapped around a person's arm with an inflatable rubber bag inside the cuff centered over the brachial artery. Enough air pressure is pumped into the cuff to close the artery. Air pressure is then released by opening the thumb valve. When the pressure in the cuff is equal to the pressure on the artery, the artery opens and the blood begins to return to the part of the artery that was closed. As the blood returns to the artery, pulse sounds begin. These sounds can be heard through a stethoscope placed over the brachial pulse point. The sounds continue for a time while the cuff deflated slowly, eventually becoming too faint to hear.

The cuff is connected by tubing to a manometer, which shows the amount of pressure on the artery. When the first pulse sounds are heard, the reading on the manometer measures the systolic blood pressure. The last sound heard is the diastolic blood pressure. In children, the muffling of sound or fourth sound is often used as the diastolic blood pressure rather than the disappearance of sound.

Reference ranges for blood pressure in children[17]

Stage	Approximate age	Systolic	Diastolic
Infants	1 to 12 months	75–100	50–70
Toddlers and preschoolers	1 to 5 years	80–110	50–80

School age	6 to 12 years	85–120	50–80
Adolescents	13 to 18 years	95–140	60–90

Ex.No:16

DETERMINATION OF VITAL CAPACITY

Vital capacity is the maximum amount of air a person can expel from the lungs after a maximum inhalation. It is equal to the sum of inspiratory reserve volume, tidal volume, and expiratory reserve volume.

A person's vital capacity can be measured by a wet or regular spirometer. In combination with other physiological measurements, the vital capacity can help make a diagnosis of underlying lung disease. Furthermore, the vital capacity is used to determine the severity of respiratory muscle involvement in neuromuscular disease, and can guide treatment decisions in Guillain-Barré syndrome and myasthenic crisis.A normal adult has a vital capacity between 3 and 5 litres. A human's vital capacity depends on age, sex, height, mass, and ethnicity.

Lung volumes and lung capacities refer to the volume of air associated with different phases of the respiratory cycle. Lung volumes are directly measured, whereas lung capacities are inferred from volumes.

Equipment Setup and use of Spirometer:

1. The equipment and screen should already be set up (see instructor for settings).
2. The tubes of the flow head should always be in the upright position (coming off of the *top* of the flow head) to avoid problems with condensation.
3. Avoid turbulent airflow, when breathing into the spirometer make sure no air is escaping around the mouthpiece or through the subject's nose.
4. The spirometer will display flow on channel three; volumes, in liters, will be displayed
5. Convert all values into **milliliters** as you record them.
6. Do not discard your mouthpieces until the end of the lab, you will be using them several times.

Activity: Measuring Respiratory Volumes:

A. Lung Volumes: TV, IRV and ERV

Each student should collect the following lung volumes and capacities:

TV	**=**	**Tidal Volume**
IRV	**=**	**Inspiratory Reserve Volume**
ERV	**=**	**Expiratory Reserve Volume**
VC	**=**	**Vital Capacity**
FVC	=	**Forced Vital capacity**