UNIT – 1

DEFINITION OF ANATOMY :

It is a science which deals with the study of normal structure of the living body and its organs.

DEFINITION OF PHYSIOLOGY :

It is a science which deals with the study of normal functioning of living body and its organs.

DEFINITION OF TISSUE :

Tissue may be defined as an organization of similar cells bound by inter-cellular substance for a specialized function.

DEFINITION OF ORGAN :

An organ is a group of two or more tissues functioning for certain specialized purposes. For example stomach. In the stomach, for instance, the organ is covered and lined with epithelial tissue, connective tissue and muscular tissues form its walls, and its entire structure is ramified with nerves.

DEFINITION OF SYSTEM :

A system is a group of organs acting together to do a highly specialized complex function which tissues cannot perform separately.

DEFINITION OF TERMS

1. THE SKELETAL SYSTEM:

The bones together joined to form and gives shape to the organism. Bone protects the inner organs and helps in different movement by different joints.

2. THE MUSCULAR SYSTEM:

The muscles are essential for our all walls of life. The basic movement is possible by the muscles. Muscles together forms a vital organs and it gives shape to the body.

3. CARDIO – VASCULAR OR THE CIRCULATORY SYSTEM:

It is called as cardio-vascular system because it concerned with hear and blood. Blood exchanges the essential food, energy and nutrients to various parts of the body and also the waste products.

4. THE RESPIRATORY SYSTEM:

This is partly associated with circulatory system thus it supplies oxygen to cells which is essential for various parts of the body and absorbs the carbondioxide a toxic material for elimination.

5. THE DIGESTIVE SYSTEM:

It helps to digest the food and supply to various part of the body for various functions of the body.

The organs involved in the digestive system are the mouth includes teeth and tongue, stomach, liver, pancreas, small intestine, large intestine, rectum and anus.

6. THE EXCRETARY SYSTEM:

It helps to remove the poisoness waste products from various parts of the body and thus it saves the individual from disease or death. The organs involved in excretory system are the lungs, kidneys, skin and large intestine.

7. NERVOUS SYSTEM:

It is called an organ of co-ordination. A highly complicated system of receiving stimuli which co-ordinate and conveys messages to the organs which is responsible for that stimuli. This process is called reflex action or automatic action. Thus it is compared to a modern telephone exchange.

8. THE ENDOCRINE SYSTEM:

It is otherwise known as the system of internal secretions. Hormones secreted by these glands are helpful in the growth of the body, development and functions of the body to accelerate or to delay the activity. It helps to govern the most body processes in connection with the nervous system.

PROPERTIES OF A LIVING CELL

The following are the fundamental physiological properties of a living cell

1. Irritability or Sensitivity :

It is the capacity to receive and make response to appropriate stimuli. They are gravitational, mechanical, thermal, electrical, chemical, solar and phonic forces.

2. Metabolism :

It is the series of chemical changes whereby a cell can convert the food material into nutritive material and waste (excrete) materials.

3. Motility :

It is the movement resulting from the response to slimuli Ex: Muscular Contraction.

4. Reproduction or Cell Multiplication :

Every cell has its origin from a parent cell and it undergoes the process if multiplication by which the growth takes place.

Characteristics of Cell Function :

Cell Characteristics are the same as in the total body of the human being. Because the man is composite of cellular activity. The cells hare the following Characteristics.

(i) Metabolism : Which includes all physical and chemical reaction in the body, constructive (anabolism) as well as destructive (Kalabolism)

(ii) Respiration : It is a process of gaseous exchange involving oxygen and carbon dioxide, essential for the oxidation of food material.

(iii) Digestion : It is a process of breakdown of food materials into simpler elements for the body's assimilation, casting off waste products.

(iv) Assimilation : The incorporation of digested material into the body.

(v) Excretion : It is the discharge of indigestible and accumulated waste products from the body.

(vi) Growth : It is a increase in sine by an increase in the hunker of cells due to the developmental process.

(vii) Reproduction : It is a cell multiplication process by which the growth takes place.

(viii) Irritability : It is the capacity to reach to changes in the environment be readiness to react to change.

(ix) It is the capacity to respond to a need to continue a function from one point to another within the organism including excitability.

(x) Contractility : The capacity to shorter on langsyne as response to a stimulus through movement.

(xi) Elasticity : It is the power to return to the original shape or length after contraction or shortening.

(xii) Viscosity : It is a resistance to change in shape.

(xiii) Heredity : It is the capacity that the hereditary factor or traits being transferred from parent to patient.

Types of Cells :

(i) Nerve Cells : It is found in the brain and the spinal cord and are varced in shape. Each cell has a nucleus and several processes which connect with other cells.

(ii) Muscle cells : They are laborers and their work is to contract. By contracting the muscles we more the different parts of the body in some cases contraction of the move fluids dong. For example muscles contraction of the heart and arteries moves the blood through the body and contraction of the walls of the intestinal tract moves the food along.

(iii) Bone cells : They are tiny and irregular shaped and are arranged in concentric rings in a firm cement like substance through which fine blood vessels pass. Bone also is a living tissue and gets its nourishment from the thin walls of the blood vessels.

(iv) Blood cells : They too are workers and float in a colorless flint. The blood flows through the tubes known as asterisk, capillaries end veins. Blood cells are of three kinds, red cells white cells and platelets. The red cells carry the oxygen to the parts the body. The white cells, which are fewer in number, like amoeba, etc. The platelet help in arresting bleeding and healing of wounds in the body.

(v) Epithelial cells : These cover the surfaces of the body forming the slain and line the cahal. The living is calls the mucous membrane

CELL

INTRODUCTION

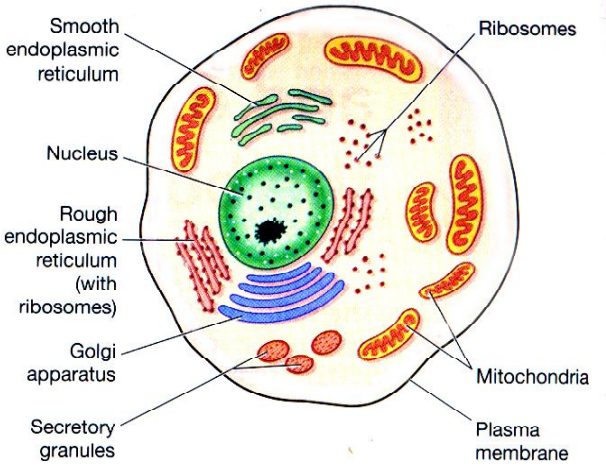
The cell is the physical basis of life in all living body. This study can only be made with high power microscopes in a branch of science called "CYTOLOGY". Physiology the functions of organs is difficult to study without having the knowledge of cell. The human body is formed of different types of cells each having different functions.

All human body is called as "ORGANISM". Because it is made up of collection of "ORGANS'. (Parts of the body having more than one tissue). Organ is made up of different types of tissues. "TISSUES' is a group of cells with definite structure and definite function.

DEFINITION OF CELL :

Cell is a minute mass of protoplasm containing a nucleus held together by a cell membrane and cell is being defined as the fundamental, structural and basic unit of life.

Cell Structure



MICROSCOPIC STRUCTURE OF THE CELL :

The study of cell is called cytology. All living organisms are formed of 1000 of cells. The human body grows from a single structure called cell. A cell is a minute jelly – like mass of protoplasm containing a nucleus held together by a cell membrane. A thickened spherical or cylindrical or round portion inside the protoplasm present inside the nucleus is known as nucleolus and the protoplasm present outside the nucleus is called cytoplasm and it is otherwise called as ground substance.

The cytoplasm contains mitochondria. Golgi apparatus, coatrooms, ribosomes, lysosomex endoplasmic reticular, nucleus and vacuoles. The cell may be of any shape.

*** figure.

CELL MEMBRANE OF CELL WALL :

It protects the cell and it is a semi – permeable membranes i.e, passes or diffuse from higher concentration to lower concentration. So it acts as a sieve allowing certain substances to pass through osmosis. Thus its is important in maintaining the correct chemical composition of protoplasm. Cell wall is the external boundary of a living cell and it is made up of lipids and proteins.

MITOCHONDRIA :

There are small rod-like or thread – like structures which are closely connected with the katabolic process or breaking down of process or respiration of the cell body. These are scattered in the cytoplasm. It stores energy in the cell and thus it is called power house of the cell of store house or power plant of the cell. It change its shape according to the activity. Mitochondria is made up of proteins, acids and enzymes and involved in oxidation. Its number vary from few hundreds to few thousands.

GOLGI APPARATUS :

It is a canal and cup like structure lying close to the nucleus and involved in secretary activities of the cell also the constructive or building up of process of metabolism known as anabolism.

ENDOPLASMIC RETICULUM :

It is an extension of the outer membrane of the nuclear envelope. It involved in lipid production and calcium storage it is of two types. They are granular and a granular.

CENTROSOME

It is a minute dense part of cytoplasm lying close to the nucleus. Two centrioles or central bodies are present inside this which plays and important role during cell division in separating chromosomes.

RIBOSOMES :

It is a protein content and helps in the synthesis of protein molecules.

LYSOSOMES :

It contain enzymes concerned with digesting absorbed material scavenging.

CENTRIOLES :

There are two in number found near the nucleus. They are powerfully surrounded by golgi apparatus. Centrioles are composes of nine triplets of hollow tubules. They participate in nuclear and cell division.

VACUOLE :

Few vacuoles are present in the cytoplasm and is filled with air. It helps to maintain the structure of the cell.

NUCLEUS :

This is situated in the center of the cell, separated from the cytoplasm by the nuclear membrane. It is a pores structure. This allows the substances to escape from the nucleus into the cytoplasm. The nucleus controls the cell and all its activities. A cell dies without a nucleus.

The protoplasm present in the nucleus is called nucleolus which separates protoplasm and nucleus. A spherical body is present inside the nucleus and is known as nucleolus. Inside the nucleus a thread like structure are seen and are known as chromatin reticular or chromatin thread. During cell division there threads are changed into chromosomes. These chromosomes contain bead-like structures called genes. These genes are responsible for transmitting the hereditary characteristics from one generation to the other.

For example:- Height, colour of the skin.

At the time of cell division chromatin condenses into chromosomes.

Different animal cells have different number of chromosomes but for a particular species it will be the same. In man, there are 23 pairs of chromosomes. In the sex cell all the 22 pairs are known as ordinary chromosomes or autosomes and the last pair is known as the sex chromosomes. Male sex chromosomes contain XY chromosomes while the female sex chromosomes contains XX chromosomes. These sex chromosomes determines the sex of an individual or person.

TISSUES

A collection or group of similar cells specialized to perform a particular function is called Tissue. Tissue perform some particular function such as secretion, absorption, contraction, etc. The cells may be of the same type shape and origin in the tissue. For example :- In Muscular Tissue, The tissue are of different types of cells. Example : Connective tissue. Aggregation of tissue forms a organ.

CLASSIFICATION OF TISSUE :

Tissues are classified on the basis of size function, origin and staining characters etc.,

Tissue is classified into 4 types.

1. Epithelial Tissue
2. Connective Tissue
3. Muscular Tissue
4. Nervous Tissue

1. EPITHELIAL TISSUE

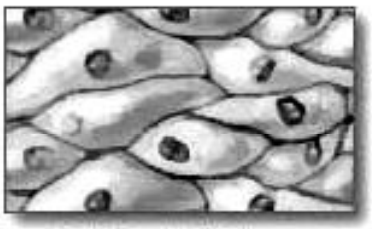
This term refers to the superficials cells that continuous with the epidermis which covers the body and lines its various cavities. It serves for protection, secretion, excretion and absorption.

Epithelium is very cellular and simple in arrangement on a basement membrane with little ground substance called intercellular substance and it serves as a protective covering. It is classified into 2 types.

a. Simple epithelium.
b. Stratified epithelium.

Simple Epithelium again classified into 5 types. It is classified on the basis of shape and on the number of layers of cells.

1. a. Simple squamous epithelium
   b. Stratified epithelium
2. a. Cubical epithelium
3. a. Columnar epithelium
4. a. Ciliated epithelium
5. a. Glandular epithelium
   a. Transitional eqithelium
   b. Nerve epithelium



Epithelial tissue

1. Simple Squamous or pavement epithelium.

It consists of very flat squamous or scaly cells, arrange in a single layer from end to end and it is specially termed as endothelium. It serves for diffusion, lubrication and fluid passage.

For example : It is found in blood vessels, inner lining of the heart and pulmonary alveoli of the lungs, etc.,

2. Stratified epithelium.

In this cells are arranged in several superficial layers called stratified epithelium. In which surface layer is squamous and the lower is cuboidal, elongated or columnar. It protects against abrasion and loss of body fluids. Depending on the type of cells present, it is further classified into:

1. Stratified squamous epithelium.
2. Stratified cuboidal epithelum
3. Stratified columar epithelium

For example : - It is found in the epidermis i.e. skin, inside the mouth, surface of the cornea, pharynx, oesophagus, etc.,

3. Columnar epithelium.

Cells are lined by a layer of elongated cylindrical or prismatic cells arranged with their long axis at right angles to the free surface like a pillar on the basement membrance called columnar epithelium. These cells may be absorptive, secretive or acts as a lining of a duct.

For example :- It is found in the mucous membrane of the stomach, in the intestine, lungs etc.,

1. Ciliated Epithelium.

The free surfaces of the epithelial cells of certain parts are clothed with minute hair-like processes called cilia and it counts 10 – 30 attached to each cell. Cilia are movable. Lashing to and fro. It avoids the entry of foreign bases. Cells are cylindrical or columnar in shape.

For Example:- IT is found in the air passages of the lungs and nostrils, etc.,

4. Cubical Epithelium.

These cells are as tall as they are wide and multisided prismatic or cubical in shape. These are arranged over a basement membrance.

For example : - It is found in the glands and kidney tubules.]

5. Glandular Epithelium.

These cells are morphologically columnar but which have become phramidal by their mutual pressure. Since they are the active agents by which the various secretions are prepared from the blood that circulated in the neighboring capillaries, this cells often known a secretary epithelium or glandular epithelium.

For example :

(a) Uni – cellular glands – stomach, intestine liver, pancreas and kidney tubules. And in respiratory Tracts.

(b) Multi – cellular glands – Salivary gland. The multicellular glands are again classified as,

1. Endocrine glands which contain a duct. They secrete hormones.
2. Exocrine glands which do not contain a duct. They secrete enzymes.

7. Transitional Epithelium

It consists of 2 to 5 layer and superficial cells are slightly flattened.

For example : It is found in the uterus and urinary passages.

8. Neuro Epithelium

It is a modification of columnar epithelium. It constitutes the receptor organs that is the cells are respond to appropriate stimulus.

For example : - It is found in retinal rods and cones, the cells of the taste buds, etc.

MODIFICATION OF EPITHELIUM

Certain structures are different from epithelium they are merely a modification of epithelium found as hair, nails, feather and enamels.

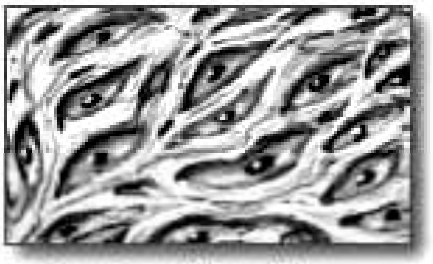
FUNCTIONS OF EPITHELIUM

1. Epithelium cover the surface of the body for protection.
2. Epithelium gives protection of underlying tissues in the production of motion, absorption of digested material and preparation of secretion.
3. Epithelium also serves as a sense organ.
4. Epithelium in particular serves to prevent the loss of tissue fluid from the underlying dermis and muscles.
5. Epithelium protects from extremes of temperature.
6. Epithelium protects from infection.
7. Epithelium provides smooth living for blod vessels.

CONNECTIVE TISSUE

This type of tissue that supports, binds or separates more speciarized tissues and organs and it functions as a packing or defense tissue of the body and transports nutrients to various parts of the body. This tissue is found in all parts of the body. They are of many kinds.

1. Areolar tissue
2. Fatty or adipose tissue
3. Fibrous tissue
4. Elastic tissue
5. Bone tissue
6. Cartilage tissue



Connective tissue

1. Areolar tissue.

It is loose cells of tissue connecting the various parts of organs or forming their framework. It consists of fine interlacing threads with comparatively wide or areolae. It is distributed throughout the body and it is present beneath the sking. Its main function is supporting the muscle tissue.

For Example : - It is found between muscle, blood vessels and nerves.

2. Adipose of Fatty tissue.

Fat cells in the areolae forms a fatty tissue present beneath the skin, throughout the body. The fat cells are embedded in the fat. Its main function is to maintain structures in specific areas, store house for food which can be utilized during starvation. It acts as a insulator since fat is a bad conductor of heart.

For example : - found in yellow marrow of the bone, kidney and heart.

3. Fibrous Tissue.

It is formed of tough and strong flattened bundles of cells. Fibrous tissue join together to form tendon and ligament with blood vessels.

For example : It is found on the wall of the pericardium kidney and in all joints as tendons and ligaments.

4. Elastic tissue.

In this the cells occur singly are much finer and join with others and it is respectively known as white fibres and elastic fibres because it has got elasticity and strength. Its main function is elongation and recoil and maintain posture.

For example : It is present in the internal wall of the arteries, large veins and in respiratory tracts.

5. Bone Tissue.

Hardest of all the connective tissue. It is formed of calcium phosphorous and water. The shape of the bone cell is not regular. It is quite visible under the microscope. It is of 4 types based on the shape.

a. Long bones.

It is found in limbs. A long bone has two ends connected by a shaft or body. In cross section the membrane covering the bone is periosteum. It is followed by a thick layer of compact bone. Inside this is a central medullary canal. Nutrient foramen is the opening through which arteries pierce the medullary canal.

Ex :

i. Tibia and fibula in leg.
ii. Radius and ulna in arm.
iii. Clavricle
iv. Femur in the upper arm and humerus in the leg.

b. Short bones.

These short bones have no shaft. They contain a spongy substance covered by a shell of compact bones.

Ex :

i. Carpus – Wrist bones.
ii. Tarsals – ankle bones
iii. Patellae – in the knee.

c. Flat Bones :

They contain two layers of compact bone with a spongy substance in between.

Ex : Scapula at the back.

d. Irregular bones :

It has no definite shape.

Ex : Bone of the vertebral column, ear and face.

e. Seasmoid bones : These are small bones which develop in the of muscles. For example, patella of

FUNCTIONS OF THE BONE TISSUE.

1. Vital organs like heart, brain, lungs and spinalcord are protected by the bones.
2. Muscles are attached to the bones. It gives shape to the body and movements are performed because of its attachment.
3. Red blood carpuscles are produced in the bone marrow.
4. With the help of the joints we are able to stand, waik and run.
5. It gives strength to the body.

6. Cartilage Tissue. (gristle).

They differ from bone in as much as they do not have calcium and lime in them. Therefore, they are tough flexible, elastic and strong and can easily bend. Cartilage cells are triangular in shape. It acts as a shock absorber. These are bluish white in colour.

For example :

These are found in the external ear, nose, larynx, etc.,

a. Hyaline Cartilage :

It is firm and elastic. It is found in articular surfaces of joints and bones, Costal Cartilages, in the nose larynx, trachea, etc,.

b. White Fibro – Cartilage.

It is composed of bundles of fibres between which cells are arranged. It is found in the sockets of acetabulum the hip bopnes, glenoid carity in the shoulder, scapula, knee – joint, inter – vertebral discs, etc.,

C. Fibro Elastic Cartilage :

It is flexible like spring. It is found In the linings of the ear .i.e. pinna, Epiglottis, etc.,

Uses of Cartilage : -

a. It forms strong but flexible frame work as in thorax & traches.
b. It acts as buffers in deadening shocks as in intervertebral discs.
c. It deepens the sockets of joints as in hip – joint.
d. It covers the articulating surfaces of bones thus reducing friction.

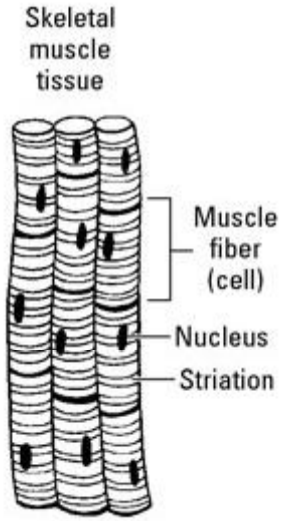
MUSCULAR TISSUE

Muscle tissue consists of bundles of bundles of fibres. These bundles of fibres are made up of cells. The movements of the body based on the muscular tissue. Muscular tissue partly connects with the nervous system. Histrologically it is of three (3) types.

1. Voluntary muscle or striped or striated or skeletal muscle.
2. Involuntary muscle or non-striated or smooth muscle.
3. Cardiac muscle.

1. Voluntary muscle or striped or striated or skeletal muscle.

It is cylindrical in shape and diameter is form throught in this the muscles are having lines of fibres having transverse striations, so it is called striped muscles. These muscles were enclosed in a sheath of connective tissue called sarcolemma. Many number of round nuclei (Poly nuclear) are present in the muscle fibre.



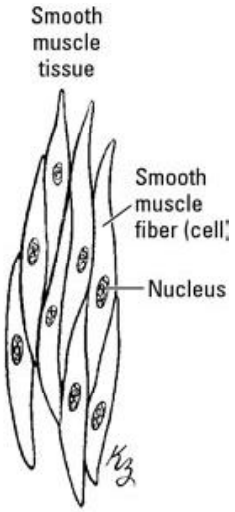
These muscles has stretching, contracting and twisting characters. The movement is under our control so it is called voluntary muscle.

The muscle bundles are simple unbranched and colourless. The voluntary muscle forms the flesh of the limbs and trunk.

For example : - Biceps and triceps.

2. Involuntary muscle or smooth muscle.

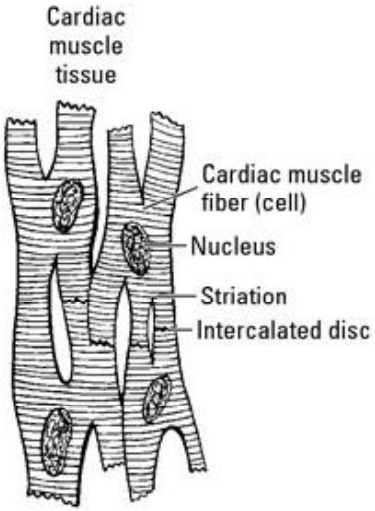
In this the muscle bundles have no striations or stripes and hence it is called smooth muscle. It has no true sarcolemma. In this the cells are fusiform in shape having rod – shaped single nucleus i.e. mono nuclear and has painted ends.



Movements are not in our control hence is called involuntary muscle. The muscle bundles are smooth and colourless.

For example : - Present inside the trachea, in the digestive tract and also in the Iris of the eye, skin, glands and in walls of blood vessesl, uterus and intestine.

3. Cardiac Muscle.

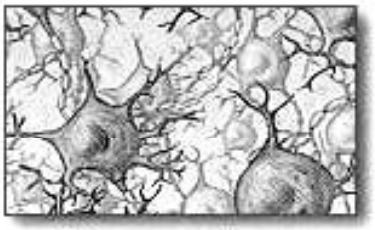


It is differ from the other 2 muscles in having fainted transverse striations or stripes in the muscle fibres and are vague. Histologically it is distinguished from nerve and cardiac muscle by having red colour of the muscle fibres, short and branched and having single nucleus in the center. Hence it is otherwise called as heart muscle. Cardiac fibres posses the power of inherenet contractibility.

For example : - Cardiac muscle transmit impulses from the auriculo – ventricular node of the heart to all parts of heart. It has a power of pumping the blood regularly and rhythmically.

Functions of muscle tissue.

1. It clothes the skeleton and gives it shape.
2. It is the end means by which voluntary movement can be effected.
3. It is the end means by which the automatically controlled functions of the body can take place.
4. It produces heat to keep us warm – blooded.
5. It produces energy through which we do our work.
6. It maintains posture.



Nervous tissue

NERVOUS TISSUE

It has a more specialized structure having a nucleus in the center, with the help of this tissue all the messages taken from the periphery to the brain. Nerve tissue composed of neurons, ganglia and neuroglia.

NEURONE :

The neurone is the histological unit. It consist of (a) Dendrons (b) Nerve cell (c) The Axon (d) The synapse.

a. DENDRONS :-

It is a branched process bringing impulses to a cell body.

b. NERVE CELL : - (Gray Matter)

It is vary in size (up to 120) and multipolar in shape. It has large nucleus, one or more nuclei, nissle's granules present in the cytoplasm.

c. THE AXON :

It carries impulses from cell to periphery i.e synapse or effector organ. It has two coats, they are myelin sheath and neurolemma with its nucleus.

d. THE SYNAPSE :

It is a junctional region between two near by neurons. It Passes impulses to the Ganglia.

GANGLIA :

Ganglia are collection of nerve cells, nerve fibres and their synapses. Ganglia is divided into two groups. They are (i) Cerebro – spinal and (ii) Autonomic ganglia.

(i) Cerebro – spinal ganglia

It is found in the spinal ganglia on the posterior or dorsal roots of the spinal nerves.

(ii) Autonomic ganglia

It may be either parasympathetic or sympathetic.

NEUROGLIA :

It is a specialized connective tissue present in the central nervous system. It is a supporting cell present within the central nervous system. It has several types. They are astroglia oligodendroglia and microglia.

Astroglia :

It has many branching processes. These serves as the true supporting structure of the central nervous system.

Oligodendroglia :

There are small cells with few processes and having branching. These are probably concerned with the maintenance of the myelin.

Microglia : -

These are small deeply staining cells with phagocytic and migratory powers. They are mostly found in the grey matter.

Importance of Anatomy and Physiology in Physical Education

1. It is a fundamental subject to learn and understand other scientific physiology.
2. It is a foundation subject to analyse and modify the body movement and its related subject Bio-mechanics.
3. It forms the base to identify, understand and apply (Therapeutic treatment) and give first and to the sports injury and its related subjects like sports medicine, sports physiotherapy and first aid.
4. This study of anatomy and physiology provides the base for safety management as our body human machine.
5. The subject anatomy and physiology assists the other subjects like thropometry and production management to design and manufacture sports goods and body protective mechanism tools.

6. The subjects anatomy and physiology helps to understand and modify human behaviour pattern and social adjustment adapt and alter through psychology and sociology.
7. This subject anatomy and physiology helps to understand and decide the diet pattern required the individual need.
8. This subject Anatomy & Physiology provides the foundation for adapted physical Education for person with disability.
9. This subject anatomy and physiology enriches the parents and persons associated with the pattern with disability and provides awareness.
10. This subjects provides knowledge and awareness from young and the old towards enrichments of fitness and wellness.

UNIT – 2

Bone is a specialized connective tissue which serves function in many ways. The skeletal system consists of bones, cartilage, tendons and ligaments. The composition of bone.

The composition of bone is roughly calculated as 1/3 organic matter and 2/3 mineral matter or ash.

1) Mineral matter.

It is soluble in Hcl and forms ash when one is burnt. It consists of calcium phosphate 90% Ca (PO) percent and (Calcium Carbonate 10% (CaCO percent).

2) Organic Matter.

It is mostly collagen and it has been partially separated by prolonged boiling and has been converted into gelatin. Devoid of lime, slats, bone becomes flexible and elastic. It provides flexible strength.

Classification of Bones.

There is no two bones are the same shape. Classification is based on the shape of the bone. They are generally classified as 4 types and are as follows,

1. Long Bones. These are found in the limbs, where they are act as levers. It is of slender, Cylindrical shaft. Shaft is hollow and filled with marrow.
2. Short Bones : The great strength combines with limited movement and flexibility movement required will be provided by this short bones. They are thick lump of solid bones which tend towards roundness.

E.g. Carpals in wrist, Tarsals in ankle and patella is made up of a spongy tissue with a thin hard surface.

3. Flat Bones : These are made up of two thin layers of hard surface tissue with spongy tissues enclosed betwee n the layers. These areintended for protective purposes and muscular attachment.

E.g. Bones in the top of the skull, the scapula, Sternum and ribs.

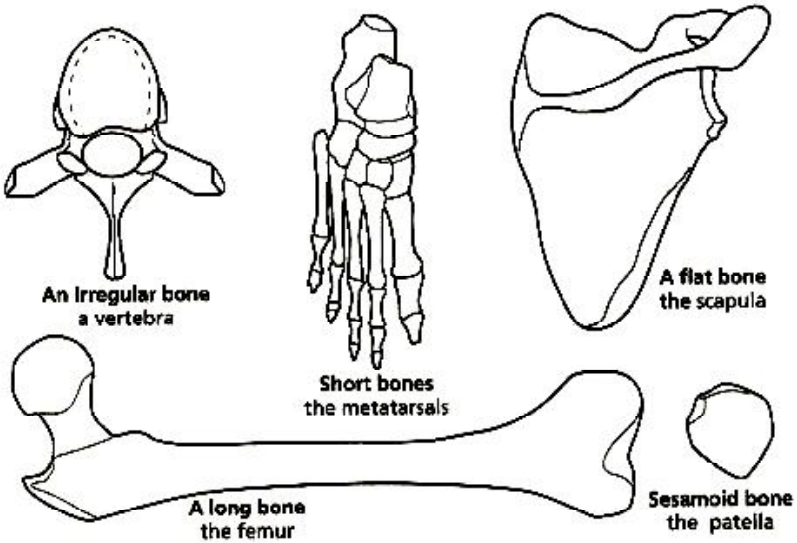
4. Irregular Bones : Irregular bone are those which are not long, short or flat bones. It gives strength and support.

5. Seasmoid Bones : These are small bones which develop in the tendons of muscles.

Eg. : - Patella bone in the knee joint.

Types of Bone

1. Long Bone
2. Short Bone
3. Flat Bone
4. Irregular Bone
5. Seasmoid Bone

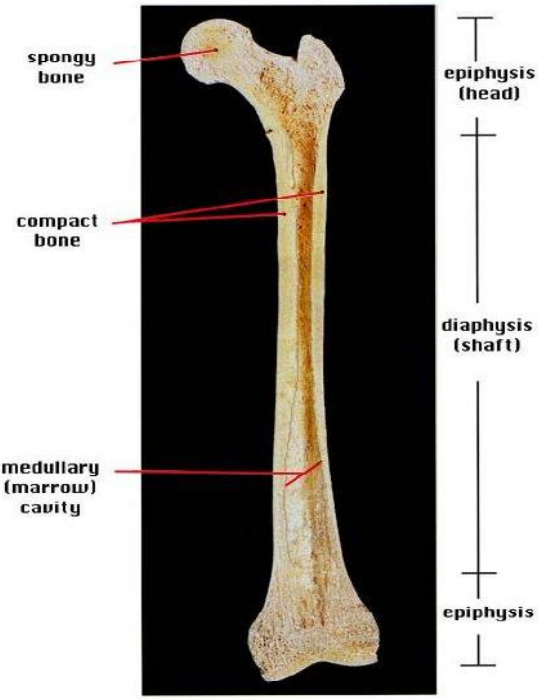


Structure of the Bones :

Bones are covered by cartilage. Ligaments bind the bones together. Synovial membrane helps to lubricate the joint.

Bones have processes or projection, holes or foramen and depressions that are associated with nerves, blood vessels, ligaments and muscles, during life.

Bones are based on the association of soft tissues. If a bone possesses a tubercle (lump) or process (Projection), it is usually because something like a ligament or a tendon was attached to that surface, that surface was part of a joint and was covered with articular cartilege during life. If the bone has a foramen or a hole in int, that hole was occupied by something such as a nerve or blood vessels during life.



Types of bone framework.

The named classified bones are framed to form a structure are divided into two categories.

1. The axial skeleton
2. The appendicular skeleton.

1. The axial skeleton.

The axial skeleton consists of the skull, hyoid bone, vertebral column, skernum and rib cage.

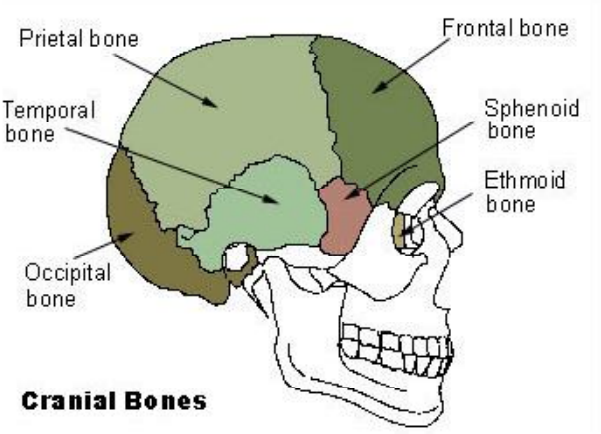
2. The Appendicular skeleton

The appendicular skeletan consists of the limbs both upper and lower limbs and their girdles.

AXIAL SKELETON

The Skull

The skull is composed of the Cranium (brain part) and the face consists of 22 bones. The Cranium holds the brain and consists of 8 bones.



1. Occipital

Present at back and base of the skull which has a large opening called foramen magnum through which passes the spinal cord.

2. Parietal

It is present at the side of the skull forming side walls and root.

1. Frontal : It is the bone of the forehead forms the orbital root of the skull.
2. Temporal : It is present around ears contain organs of hearing and equilibrium.

1. Sphenoid : It is a irregular bat – shaped bone present at the base of the Cranium.

Ethmoid : It is the bone present between orbits and nosal root contains many air sinuses.

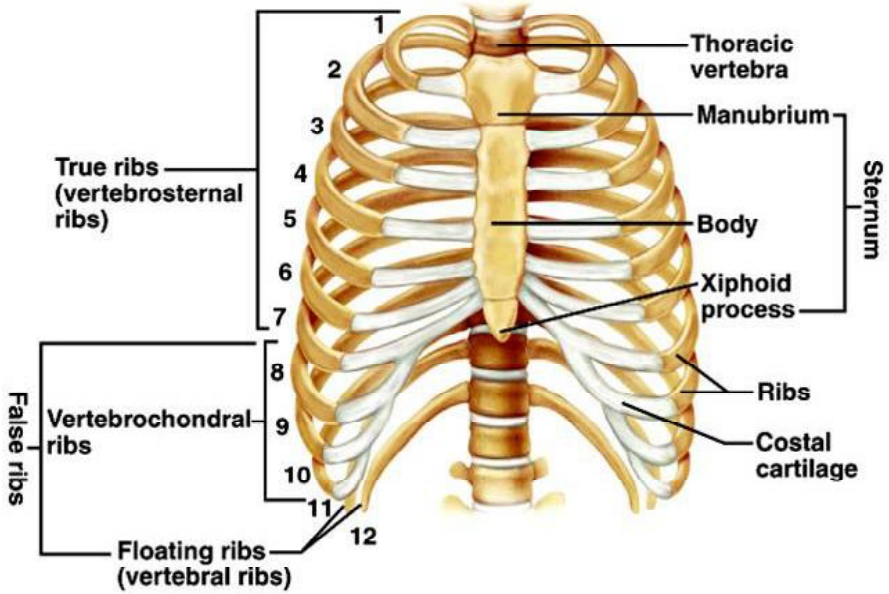
Facial Bones.

The face forms the front lower part of the skull and consists of 14 bones.

1. Maxillae (upper jaw) : It forms the upper set of teeth.
2. Palatine : This two together with the palatine processes of the maxillae form the hard plate.
3. Nasal : This two ones form the bridge of the nose. This will vary greatly in shape with race.
4. Lachrymal : It forms a groove for the lachrymal race.
5. Turbinated or scroll shaped : It increases the nasal respiratory area.
6. Vomer : It is thin like parchment. Together with the vertical plate of the ethmoid. It separates the nasal carvities.
7. Molar or zygomatic : It forms the prominence of the cheek.
8. Mandible : It forms the lower jaw. It is movable and contains the lower teeth changes markedly in shape with age.

STERNUM

Sternum is the chest bone and it is one in number. It is divided into 3 parts namely manubrium, body and xiphoid process. It gives protection to the organs contained in the chest.



Thoracic or Ribcage.

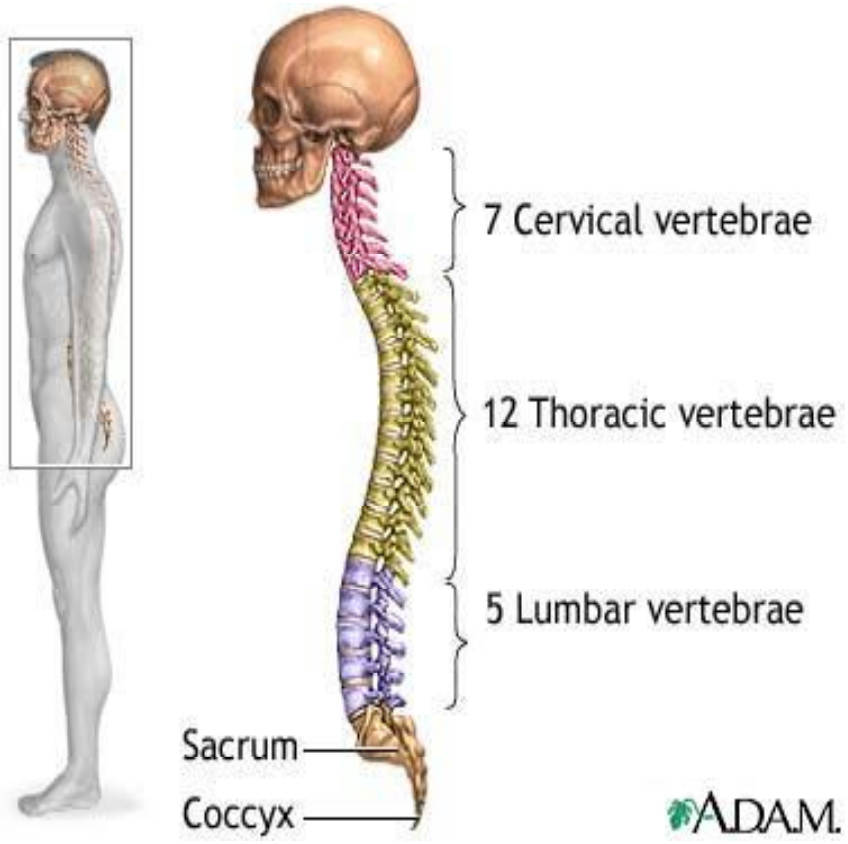
There are 12 pairs of ribs form the thoracic cavity. These 12 pairs are attached with the vertebran column (back bone) at the back. But in front only the upper 7 pairs are attached directly with the sternum with the help of costal cartilage. Because they are attached directly with the sternum, these 7 pairs are known as true ribs. The 8th pair is attached directly with the sternum, these are known as False ribs. The 11th and 12th pairs are not attached with the sternum either directly nor indirectly hence, these 2 pairs are known as floating ribs.

Inter costal muscles are present in between the ribs enables the expansion and relaxation of the thorax is possible during respiration. Because of the intercostals muscles the heart and lungs are protected safely inside the thorax.

VERTEBRAL COLUMN

The vertebra or spinal column is a flexible structure formed by 33 vertebrae. In between each bone, bone pads are present and are known as inter-vertebral discus. This helps to absorle the shock. It allows the forward, backward and sideward movements.

Out of the 33 vertebrae 24 bones are separate and the remaining 9 vertebral are fused to form 2 bones. They are 7 cervical vertebral in the neck region, 12 thoracie vertebral present at the back of the thorax, 5 lumbar vertebral at the region of pelvic region. 5 sacral vertebrale at the region of sacrum and 4 coccygeal vertebrae in the coecyx region or in tail region.

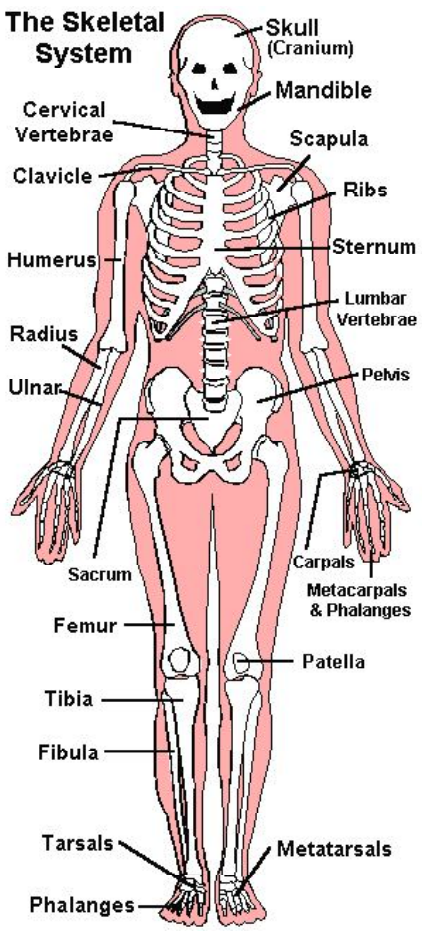


Except the first two vertebrae that is atlas and axis all the other movable vertebrae have similar characteristics. The last two bones sacral and coecygeal are immovable vertebrae in the case of male.

Each and every vertebrae have a body, a neural arch, transverse processes and the neural canal. The spinal cord passes through the neural canal.

The first bone of the vertebral column is known as atlas and it supports the skull. The second bone is known as the Axis. Axis is got an existant portion known as odentoid peg. The ring like atlas rotates round the peg shaped processes of the Axis making a pivot joint.

The thoracic vertebrae are larger than the cervical vertebrae. The lumber vertebral are the largest than the cervical and thorax. The sacrum is a triangular bone situated at the lower part of the vertebrae column. All the five bones are joint together or fused. The coccyx is composed if four rudimentary vertebrae. These are fused to form a single bone. It articulates above with sacrum.



THE APENDICULAR SKELETON

The apendicular skeleton consists of the upper limb.

LIMB :

A limb consists of the following parts such as a central jointed body skeleton, groups of muscles to produce various types of movement and a nervous, vascular and muscular supply.

THE UPPER LIMB :

The upper limb consists of 64 bones and it is ment for locomotion. The upper limb comprises 4 parts namely (a) shoulder joint or girdle (b) upper arm (c) lower arm (d) Hand

The pectoral or shoulder Girdle

It is composed of two bones, such as claricle and scapula forms the shoulder girdle.

(a) Clavicle : -

This articulates with the manubrium and acromion. It has no representative in the lower limb.

(b) Scapula :

It has a blade and spine for muscular altachments. There is a glenoid cavity for articulation with humerus bone.

UPER ARM

Head or upper end of the humerus articulates with the glenoid cavity and the lower end with radius and ulna.

LOWER ARM

It is otherwise called as fore arm. It consists of two parallel bones.

(a) Ulna :

The upper end articulates with humerus and lower end with the radius. It is present medial to the body.

(b) Radious : -

The upper end bound to ulna by articular ligament and lower end articulates with ulna and first row of carpal bones in the wrist joint. It is present lateral to the body.

HAND :

There is a great mobility in this area due to multiplication of joints.

a. **Carpal :** It forms a wrist consists of eight bones arranged in two rows.

b. **Meta Carpal :** It is a palm consists of five bones connecting wrist on one side and with fingers side.

c. **Phalanges :** It forms a finger consists of two bones for thumb and three each for rest of the fingers.

THE LOWER LIMB

The lower limb consist of 62 bones. It is meant for support and locomotion. The lower limb composed of 5 parts namely.

a. Hip joint b. Thigh c. Knee cap d. Leg e. Foot

Pelvic or Hip Girdle.

It is a hollow basin like structure of the bone for support of abdominal organs.

Hip : It is called as ossa innominata each consists of three bones namely ilium, ischium and pubis.

Acetabulum :

It is a cavity for the attachment of rounded head of the femur.

Obturator foramen. It is a passage for nerves and blood vessels to pass through.

Thigh : This bone is called femur. Its head articulates with acetabulum, the lower tibia and patella.

Knee Cap : It is called as patella. It is a sesamoidbone in tendon of the quadriceps femoris. It helps to protect the knee joint.

Leg : It is called as shank. It is made of two parallel bones.

They are a. Tibia b. Figula.

a. **Tibia :** It is the inner and stronger bone. The head of the bone articulates with femur and lower end with fibula and talus.

b. **Fibula :** It is the outer and weaker bone. It is fixed to tibia at both ends. The upper end of the bone articulates with tibia and lower with talus.

FOOT :

It has got great strength and has many joints but less mobility than hand. Calcareous bone of the ankle forms the heel of the foot where as the ball of the foot is the junction between metatarsals and phalanges.

a. **Tarsal :** This is an ankle consists of seven bones in two rows.

b. **Metatarsals :** It is present in the arch of the foot consists of five bones as in hand. The bones are not straight as in hand instead it was slightly arched upward to give forth the arches of the foot.

c. **Phalanges :** It is the toe bones. There is two bone for great toe and three each for other toes.

d. **Arches :** There are two sets of arches that is anteroposterior and transverse. Arches gives great strength combined with elasticity.

Sex differences in the Skeleton :

The differences in the skeleton appear only after the age of 13 years.

MALE	FEMALE
1. Height is more.	Height is less.
2 Strong and more weight	Less strong and less weight
3 Muscular attachments are well marked	In the female cannot see the markings of the muscular Attachment.
4 Skull is bigger in size and weight is about 1500cc.	Skull is smaller in size and the weight is about 1300cc
5 Skull is rough	Skull is smooth
6 Shoulder width is more	Shoulder width is less.
7 The male pelvis is longer and narrower than the female.	The male pelvis is broader or wider and shallower and adapted for child birth.
8. Public arch is narrow and less than 90	The public arch is wide and more than 90
9 Coccyx is not movable	Coccyx is slightly mobavble.
10 The inlet is smaller and heart – shaped.	The inlet is larger and Round.
11 The angle of the elbow joint is less.	The angle of the elbow joint is more.

Functions of the BONE

1. Bone maintains the shape of the body, protects internal organs.
2. Bones acts a lever system for muscles to act upon.
3. Bone is a site for mineral storage and blood and promotes cell formation.
4. Cartilage forms a fetal model of bones covers the ends of bones and provides a firm, flexible support.
5. Tendons attach muscle to bone.
6. Ligaments attach bone to bone.

JOINTS

Definition :

An articulation or joint is a place where two bones come together or connections between two adjacent bones.

Joints are named according to the bones or parts of the bones involved.

Ligaments :

Ligaments are strong, white, fibrous flexible bands which bind the articular surfaces of bones together and are slightly elastic. Being flexible, greater freedom of motion to the bones is possible and at the same time protect the joints from external injury and tend to prevent dislocation. Ligaments bind bone to bone.

Tendons :

Masses of flesh (muscles) are united to the bones by other white bands these are called tendons or sinews. They connect voluntary muscles with bones and are inelastic. Tendons serve to attach skeletal muscles to periosteum and movements around joints are possible.

Cartilage :

Cartilage is a firm, tough and flexible substance which covers the articular surfaces of bones and unites the ribs to the sternum and found in the walls of the trachea.

Cartilage is not supplied with blood, hence it is white and semitransparent. When boiled for some time with water, its helds a substance called chondrin which closely resembles gelatin being soluble in not water and forming a jelly on cooling.

There are two types of cartilages. They are those cartilages which are converted into bone during growth are called emporary cartilage while those which remain unchanged are permanent cartilages.

Ses of cartilage :

(a) Forms strong yet flexible framework.
Eg : - Thorax, trachea.

(b) Acts as a buffers in deadening shocks.
Eg: - Inter vertebral discs.

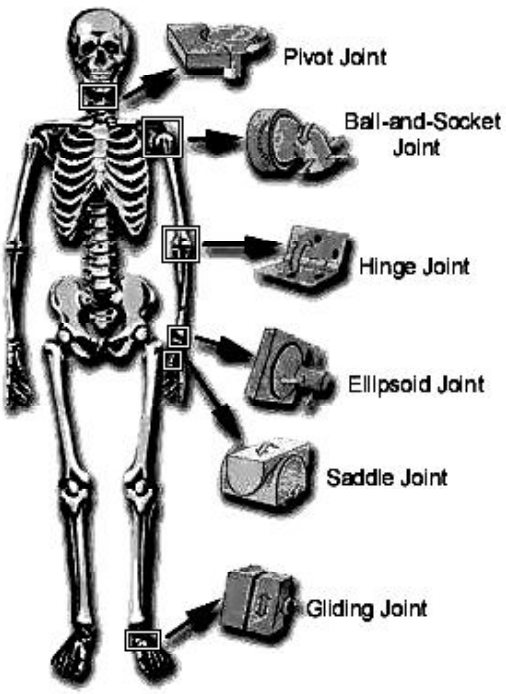
(c) Deepens the sockets of joints.
Eg : - hip – joint.

(d) Covers the articulating, surfaces of bones reducing triction.

CLASSIFICATION OF JOINTS :

Joints are classifies according to the type of connective tissue that binds them together and whether there is between the bones and mobility. The classification are

I. Fibrous or Immovable joints.
II. Cartilaginous or slinghtly movable joints.
III. Synovial or freely movable joints



I. Fibrous or Immovable Joints :

Fibrous joints are those in which bones are in actual contact, ie, connected by fibrous tissue with no joints cavity. They are capable of little or no movement.

For example : - Skull bones and teeth.

II. Cartilaginous or Slightly movable joints :

Cartilaginous joints unite two bones by means of either line cartilage or fibro cartilage. If the bones are joined by line cartilage they are called synchondroses.

For example : Costal cartilage present between most of a ribs and sternum.

If the bones are joined by fibro cartilage they are called symphyses.

For example : Intervertebral discus present between the two vertebrae.

III. Synovial or Freely movable joints :

Synovial joints are those containing syunovial fluid and permits considerabe movement between articulating bones. These bones are anatomically more complex than fibrous and cartilaginous joints.

For example : Appendicular skeleton (Limb Joints)

Characteristica of a synovial joint

(1) Bones are covered by cartilage.

(2) Ligaments bind the bones together.

(3) Synovial membrane lines in the joint cavity and secrete fluid known as synovial fluid to lubricate the joint.

Types of synovial Joints

Synovial joints are those in which the bones are capable of motion against each other. These joints are of six kinds. They are

(1) Gliding or Plane Joints :

It consisting of bones which slide over each other.

Example : Ankle and wrist.

(2) Ball and socket joints :

It consisting of a rounded head which rotates in a hollow socket and so allows of movements in all directions.

Example : Shoulder and hip joint.

(3) Hinge Joints :

It permits movement in one plane only.

Example : Elbow, Knee, Phalanges & ankle.

(4) Pivot Joints :

It is in which a projection of one bone serves as a pivot for the rotation of the other for example. Atlas and Axis, the rotation of radius on ulna.

(5) Saddle Joints :

It consists of two saddle shaped articulationg surfaces oriented at right angles to one so that complementary surfaces articulate with each other. Movement occur in two planes.

For example : Carpo – metacarpal joints of the thumb.

(6) Ellipsoid joints :

It is otherwise called as condyloid joints. These are modified ball and socket joints. The articular surfaces asre elliposoid in shape. The shape of the joint limits its range of movement nearly to a hinge motion, but in two planes.

For Example : Atlanto occipital joint.

JOINT MOVEMENT

Types of movement occurring at a given joint are related to or depend on the structure of that joint. Movement is best described in relasation to the anatomical position are 1. Movement away from the anatomical position. 2. Movement returing toward the anatomical position.

Most of the movements are associated with other movements in opposite direction.

Therefore movements are listed in paidrs.

Types of movements :

1. Movement can occur in relation to the coronal plane. They are Flexion – extension, plantor flexion dorsiflextion and protraction – retraction.
2. Movement can occur in relation to the sasggital plane. They are abduction – adduction, inversion eversion and lasteral excursion.
3. Circular movement can oocur they are rotation. Circumduction and pronation – supination.
4. Special movements include elevation – depression and opposition – reposition.

MOVEMENT IN RELATION TO THE CORONAL PLANE

The coroknal plane divides the body into asnterior and posterior portions. Two sets jof movement usually carry a structure anterior to the plane is flexion and protraction or posterior to the plane is extension and retraction.

Flexion : -

It means to bend eg. Bending of the elbow towards the natomical position.

Extension : -

It means to straighten or extend. eg. Extending or straightening the elbow back to the anatomical position.

Plantar flexion : -

Extension of the toes towards the dorsal surface is called dorsiflexion.

Dorsiflexion :

Extension of the toes towards the dorsal surface is called dorsiflexion.

Protraction :

It consits of moving a structure toward the anterior surface in as straight horizontal line.

Eg. Temporo mandibular.

Retraction :

Moves the structure back to the anatomical position or even more posteriorly.

Movement in Relation to the sagittal plane.

A saggittal plane divides the body into right and left halves thus movement occur in relation to right or left of the plane.

Abduction :

It means to take away. Movement is away from the modline.

e.g. Moving the legs aways from the midline in jumping jog.

Abduction :

It means to bring together movement is toward the midline.

Eg. Bringing the legs back together in jumping jog.

Inversion :

It consists of turing the ankle towards the opposite foor.

i.e. toward the midline.

Eversion : -

It consists of turning the ankle away from the midline to lateral position.

Excursion :

It consists of two movements. They are

(1) Lateral Excursion :

It refers to moving the mandible to either the right or left of the midline such as grinding or chewing the teeth.

(2) Medial excursion returns the mandible to the neutral position.

Circular Movement

Rotation :

Rotation is the turning of a structure around its long axis.

For example : Rotation of the head, the humerous or the entire body.

Circum duction :

Circumduction is a combination of flexion, extension, abduction and abduction.

For example : Shoulder joint.

Pronation :

Prone means lying face down. Pronation is rotation of the palm, so that it faces posteriorly.

Supination :

Supine means lying face up. Supination is the rotation of the palm. So that it faces anteriorly.

Special Movement :

Depression moves a structure inferiorly.

For example : Depression of the mandible opens the mouth.

The mandible and scapulae are the primary examples.

Example : Shrugging the shoulders is an example of scapular elevation.

Elevation :

Elevation moves a structure superiorly.

For example : Elevation is closing the mouth.

Opposition :

Opposition is a unique movement that is confined to the thumb and the little finger. It occurs when these two digits are brought toward each other across the palm of the hand.

Reposition :

Reposition is the movement returning the thumb and little finger to the neutral or anatomial position.

Functions of the skeletal system

1. To support the framework of the body and give it a shape.
2. To serve as a basis for the attachment of muscles.
3. To protect delicate structures in some regions like the thorax.
4. To supply calcium to the blood.
5. To do a haemopoietic function – important for the formation of blood cells.

(Haematopoiesis – blood producing).

UNIT – 3

MUSCULAR SYSTEM

For Classification of muscles follow the muscle tissue.

Almost all movements in the human body involve muscular contractions. The special characteristics of muscle tissue are as follows:

1. Elasticity
2. Contractibility
3. Irritability (Excitability)
4. Extensibility.

1. ELASTICITY :

It is the ability to come back to come back to its original length when the force by which it stretches is removed.

2. CONTRACTIBILITY :

It is the ability to change the shape as a result of stimuli and become shorter and thicker.

3. IRRITABILITY :

It is the ability to receive and respond to a stimulus from the nervous system.

4. EXTENSIBILITY :

It is the ability to extended and stretch beyond its usual length.

Refer Page No. 14, 15 & 16

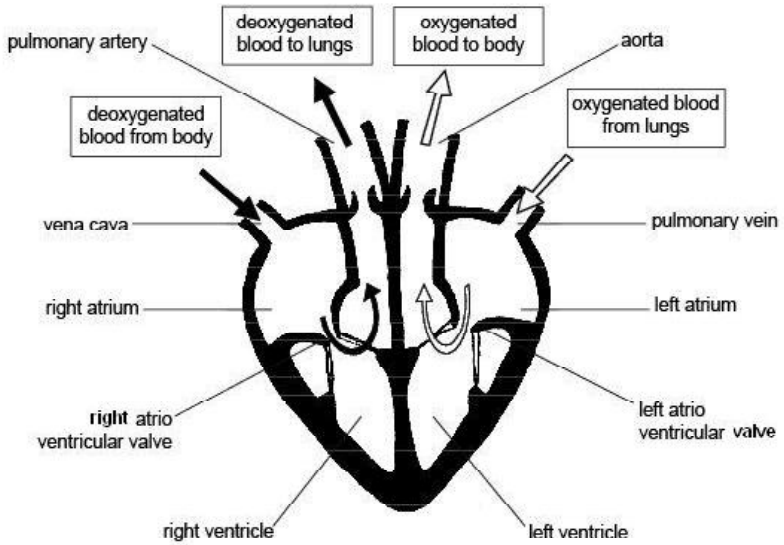
UNIT – 4

CARDIO – VASCULAR SYSTEM :

Circulation of blood is most necessary. There is no life without circulation of blood. This keeps the body alive and active.

LOCATION AND SHAPE OF THE HEART :

The heart is a hollow and muscular conical shaped organ having four parts located on the left side of the thoracic. Cage between the lung and just above the diaphragm. The apex is facing downward and the base of the cone shape situated upward. It is involuntary in action.



STRUCTURE OF THE HEART :

The wall of the heart consists of 3 coats.

1. Inner or Endocardium
2. Middle or Myocardium
3. Outer or Epicardium

The membrane surrounds the whole heart is called pericardium. The space between the epicardium and the pericardium. Is filled with pericardial fluid. The heart is divided into four(4) chambers or partitions.

1. Right Atrium or Auricle.
2. Left Atrium or Auricle.
3. Right Ventricle.
4. Left Ventricle.

There are four valves present inside the heart to ensure oneway traffic.

The values are

Tricuspid –

Pulmonary –

Mitral –

Aortic –

RIGHT AURICLE :

It is made up of thin walls. IT receives the deoxygenated blood from all over the body and supplies the deoxygenated blood from venacava to right ventricle. There are 3 main vessels present in the right auricle.

a. Superior Vena Cava : It carries the deoxygenated blood from head and neck and pours into the right auricle. It has no values.

b. Inferior vena cava; It carries the deoxygenated blood from head and pours into the right auricle. It has rudimentary valve.

c. The coronary sinus: It collect the blood from heart itself and has small valves.

RIGHT VENTRICLE:

It is made up of thick walls of capillary muscles. It collects the deoxygenated blood from the right auricle and passes or pumps onto pulmonary arteries to the lungs. There is a valve called Triuspid valve which separateas right auricle and right ventricle to held in position with chordae tendenae to prevent repouring.

Blood vessels such as right pulmonary artrery and left pulmonary artery emerge goes one each to lung.

Semilunar valves Commences in the right ventricles to prevent auricular reflux.

LEFT AURICLE :

It is of thin walls and collect or receives oxygenated blood from lungs and pumps to leftr ventricle foer distribution. Blood vessesls such as Right lulmonary veins and left pulmonary veins in the left auricle carries oxygenated blood from lungs to hearts.

LEFT VENTRICLE :

It is of thick walls (3 times than R.V) Coronary arteries originated in the left ventricle supplies nourishment ton the heart itself and pumps oxygenated blood to all parts of the body.

Bicuspid valves present to prevent repouring.

Route of blood flow through the heart.

1. Impure blood from the body flows through the right atrium into the right ventricle and then to the lungs for purification.
2. Pure blood returns from the lungs to the left atrium, enters the left ventricle and is being pumped back to the body.

MAJOR BLOOD VESSELS:

It is a closed vascular system for blood circulation. There are 3 major blood vessels present in the body. They are;

1. Arteries: It carries blood from the heart to various parts. The blood in the artery is pulsatile. Larger artweries are more elastic and smaller ones are more muscular much with few exceptions all the arteries contain oxygenated blood.

2. Capillaries: It connects arteries with veins. It is of thin walls made up of endothelium tissue. It is very short and very narrow. It is present in complicated network. It always ready for diffusion of O (in) and Co

(Out) through the walls of the capillaries.

3. Veins : It conveys the blood from periphery to heart. Blood flows very slowly. All the veins carry deoxygenated blood except the pulmonary vein and umbilical veins. Some veins have valves to prevent back flow the neutaralize gravity.

THE MAJOR CIRCULATION:

The circulation of blood may be considered under four headings.

1. Systemetic Circulation.
2. Pulmonary Circulation.
3. Portal Circulation.
4. Coronary Circulation.

SYSTEMATIC CIRCULATION:

It is in which circulation of blood in the heart itself in which the blood flows from the left ventricle to right atrium. This sometimes called the Greater circulation.

It involves the course of blood from right ventricle to left atrium is concerned with taking the impure blood containing Co.... be heart to the lungs and back.

PORTAL CIRCULATION:

It is concerned with the collection of the blood from the stomach, intestine, spleen and the pancreas and carrying it to the liver where the blood fuses with the blood from the heart carried by inferior vena cava.

CORONARY CIRCULATION:

The heart has its own circulatory system and this is called coronary circulation. The coronary arteries play a very ‘significant part in maintaining heart condition all through life.

CARDIAC CYCLE

The upper right auricle receives impure blood from all over the body through superior venacava and inferiorvenacava and sends it to the lower right ventricle, from where it is sent for purification to the lungs throught right pulmonary artery and left pulmonary artery.

The purified blood from the lungsd goes to the upper left auricle of the heart throught right pulmonary vein and hence to the lower left ventricle from where it is pumped all over the body through the arteries. The arteries are thick walled tube-like structures which carry blood from the heart to various capillaries which are thin walled. The capillaries ramify into various muscles. Organs and tissues. Minute sub-branches of veins starts from the

end of the capillaries. The vein are thin walled carry the blood consists of waste materials in to the heart. The impure blood again sent from heart to the lung for deoxygenation. There the vein leaves CO2 and receive 02

And thus becomes a pure blood then it is sent to the heart throught artery. Thus the cardiac cycle continues. This inturn works in co-operation with respiratory system.

The cardiac cycle is a repetitive contraction and relaxation of the heart chambers. Blood moves through the ciruculatory system from areas of high pressure to areas of low pressure. Contraction of the heart produces the pressure.

The cardiac cycle consists of rhythmic contractions and relaxations of the atria and ventricles. These contractions and relaxations of the different parts of the heart take place in a definite order. Accordingly there are 3 phases of cardia cycle.

PHASE – I :

There is simultaneous contraction of both Atria with the blood passing from the Atria into the ventricles which are relaxing.

PHASE – II

There is simultaneous contraction of both ventricles the blood is forced into the Aorta and the pulmonary astery while the Atria relax.

PHASE – III :

Here the ventricles relax and the Atria are also relaxed. This phase of the cardiac cycle is called the general pause. During this process blood enters the Atria form the venus vessels.

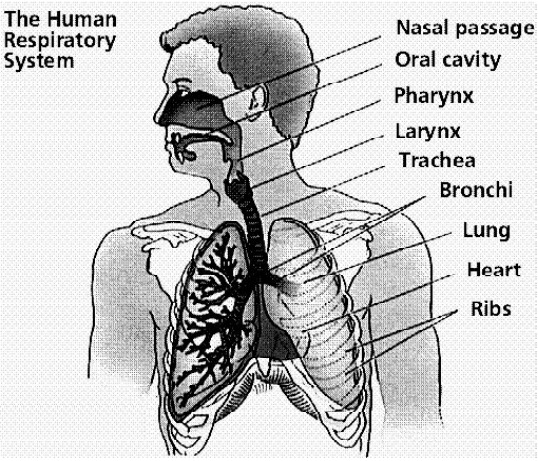
UNIT – 5

RESPIRATORY SYSTEM

RESPIRATION

Respiration is defined as the exchange of gases between body tissues and the external environment. Supply of oxygen to the tissues and excretion of carbondioxide occur through respiration.

STRUCTURE OF THE RESPIRATORY SYSTEM

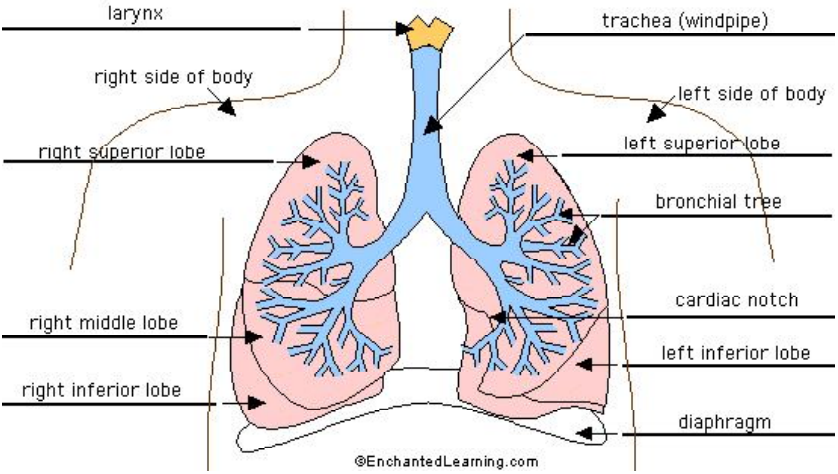


The respiratory system begins at the nasal cavity.

At the entrance of the nasal cavity small hairs are present to filter dust, the cavity leads to the pharynx which is common to both the respiratory as well as the digestive system. From the pharynx larynx starts and it continues down to the trachea. The trachea (wind pipe) divides into two bronches each entering a lung. The right lung is branched into three lobes. The left lung is branched into two lobes. They are placed in the thoracic cavity.

Each lung is divided into segments. The bronchi entering each lung divided into bronchioles. This supplies 02 to each segment. The broncheioles are bronched. This bronchioles are bronched. This bronchioles end in a alveolar duct. The alveolar ducts finally form the alveoli or air sacs.

During inspiration the atmospheric air reaches the alveoli. The venous blood finally reach the alveoli through blood capillaries. The pressure of 02 from the atmospheric air in the alveoli is more, Co2 is Passes out from the capillaries into the alveoli. Then Co2 is expelled through expiration into atmospheric air. Thus the gaseous exchange takes place.



STRUCTURE OF THE LUNGS :

Lungs are the principal organs of respiration. They are two in number lying one on each side of the chest cavity. The two lungs are separated in the middle by heart and other structure of mediastinum.

SHAPE OF THE LUNG

Lungs are conical in shape. The apex of lung is above, rising slightly over the clavicle..The base of the lung is near the diaphragm.

STRUCTURE OF THE LUNG LOBES

Each lung is divided into lobes by means of fissures. The right lung which is bigger has three lobes. The left lung has two lobules. Each lobe is composed of a number of lobules. Each lobe contains a small bronchial tube. This tube divides and subdivides and ends finally in air sacs.

MECHANISM OF RESPIRATION

Respiration consists of rhythmic repeated inhalations and exhalations of air from atmosphere. During respiration the diaphragm plays an important role by descending and ascending mechanism.

INHALATION OR INSPIRATION OR BREATHING IN

During this process the diaphragm descends and the inter costal muscles contract under the influence of nerve impulses and produces elevation

of ribs and sternum. Thus increase in the vertical and horizontal size of the thoracic cavity. So, the capacity of the thorax is increased in all four. Negative pressure develop during the inspiration process in the thoracic cavity and high pressure in the atmosphere favours the air to rush into the lungs to fill it. This process is called active process. The oxygenated air is now passed on the blood capillaries like a osmosis process.

EXHALATION OR EXPIRATION OR BREATHING OUT

During this exhalation process the diaphragm ascends and the intercostals muscles relaxed. The capacity of the thorax comes back to normal size i.e. reduction in the size of the chest cavity.

The expanded lungs becomes compressed and contracted. Now the pressure of air in the lung is expelled out through air passages. This process is called as passive process. The capillaries carries the deoxygenated blood contains Co_2 is being released into the alveoli and it is expelled out into the atmosphere.

Since a single inspiration and a single expiration completes a single breathing of respiration. The rate of respiration is 16 to 18 per minute in adults. The rate is higher in children.

FUNCTIONS OF RESPIRATION

(1) Respiration helps in exchanges of gases.

(2) Respiration assists in the elimination of excess moisture or water vapour regulate water.

(3) Respiration helps in the act of speaking to produce voice.

(4) Coughing and sneezing protective functions are also made possible by the air inspired.

(5) The muscular system and the nervous system play an important role in the mechanism of respiration and thus both systems are strengthened.

(6) Transport of oxygen to tissues and excretion of carbondioxide.

(7) Excretion of volatile substances like ammonia.

(8) Regulation of temperature through loss of heat in the expired air.

(9) Maintenance of pH of blood.

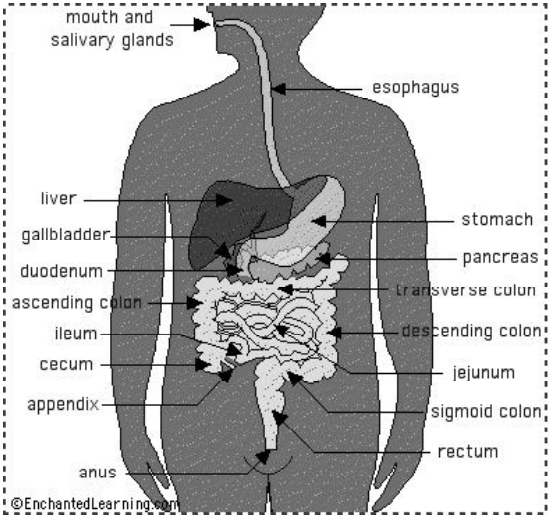
UNIT – 6

DIGESTIVE SYSTEM

INTRODUCTION

The organs constituting this system are the mouth the tongue, the pharynz, the gullet or oesophagus (foodpipt), the stomach, the duodenum and the small and large intestines.

The mouth is the receptor organ of food. The food is cut into pieces with the teeth and is ground into finer forms like paste with the help of the tongue and is moistened with sliva, so that we can be easily passed down the throat. The pharynx is a part of these, one from the mouth, two from the ears, one going down to the lungs and one to the stomach. The masticated food passed through harynx and thought gullet and then to the stomach. The food remains in the stomach for about 2 hours and get mixed with the hydrochloric acid and digestive juices secreted by the stomach cell. Then it is passed to the duodenum which has the shape of an inverted horse-shoe. There are three digestive juices get mixed with it her, namely the pancreatic juice secreted by the glands named pancreas, the bile secreted in the liver and the digestive juice secreted by duodenum itself. As a result of the action of various digestive juices, the constituents of food such as fats, proteins and carbohydrates are broken down to simpler substances per 20 feet long are responsible for absorption of the digested food. The remaining part goes to the large intestine which is of 15 feet long and the waste is eliminated through the anus after absorbing water from it in the large intestine. The assimilated constituents of food are largely stored in the liver and are applied to the tissues, muscles and all the parts of the body through the agency of blood.



The waste products and unassimilated materials are excreted a rectum and lastly through anus that constitutes the excretory stem.

TONGUE

Tongue is essential for speech and taste. Tongue assits is masticastion and swallowing. Tongue is a muscular and movable organ and performs action involuntarily. It is covered with mucous membrane. It consists of 3 parts, a tip, a body and a base. The base of the tongue is attached to the hyoid bone in the neck.

The muscles of the tongue are divided into lingual muscles. Originated from the bones. These muscles alter the shape of the tongue and also help in the movement of the tongue. The mucous membrane on the upper surface of the tongue forms numerous projections called papillac it is otherwise called as taste buds helpful in differentiating the taste. This gives the tongue a velvety appearance.

FUNCTIONS OF THE TONGUE

1. The tongue assists in mastigation
2. It assists in swallowing
3. It helps in articulation
4. It is a sensasry organ for taste, pain and temperature.

SALIVARY GLANDS

The mouth is surrounded by these salivary glands and secrete saliva the first digestive juice to digest the food. It is found in 3 pairs. They are

1. THE PAROTID GLANDS:

It lies below and infront of the ear and discharged their secretion via stenson's duct. That opens into the mouth opposite to the second upper molar teeth.

2. SUB MAXILLARY GLANDS:

This lies at the angel of the jaw and discharged its content under the tongue via Wharton's duct.

3. SUB-LINGUAL GLANDS:

These lies under the tongue and pour their secretion into this area via several small ducts.

The masticated food is passed into the pharynx with the help of saliva and then to trachea and then to the gullet or the food pipe.

FUNCTIONS OF THE SALIVARY GLANDS:

1. Saliva lubricates the food and makes it to a soft mass for easy swallowing.
2. the gland secreted saliva is slightly acidic enables the enzyme ptyaline to act upon cooked starch to convert it to a maltose.
3. Saliva constantly moistens the mouth and tongue and helps in keeping the mouth and teeth clean and free of debris.
4. Saliva dissolves the part of the food which stimulates the taste buds.

GULLET

At the end of the pharynx, trachea is present below this food pipe or gullet is present. Through which the swallowed food is passed on the stomach.

STOMACH

Stomach vary in shape according to the food one takes. It consists of 4 layers. They are

1. THE MUCOUS MEMBRANE:

This is the inner most layer and consists of numerous folds. Gastric glands are embedded in it.

2. SUB-MUCUS LAYER:

This layer is made up of aereolar tissue. Blood vessels, nerves and lymphatics are present in this layer.

3. MUCUS LAYER:

The muscular layer is arranged in 3 patterns. Close to the sub-mucus layer the muscle fibres are arranged obliquely. Next to this the muscle fibres are arranged in a circular fashion. Following this the fibres are arranged longitudinally.

4. SEROUS MEMBRANE OR PERITONIUM

The outer most layer is called as the serous membrane or the peritoneum.

FUNCTIONS OF THE STOMACH:

1. It acts as a reservoir for food.
2. It churns food breaking up and softening them.
3. It acidifies food. The hydrochloric acid is needed for the action of ptyalin to convert the cooked food starch into maltose.
4. The enzyme rennin acts on milk protein and the enzymes pepsin converts proteins into peptones.
5. It secretes the intrinsic factor needed for absorption of vitamin B12.

Now the digested food is passed on to the duodenum.

DUODENUM

It is present at the end of the stomach and of semi-circular and 'C' shaped having 12" or 30 cm in length.

FUNCTIONS OF THE DUODENUM:

Bile juice is secreted by the liver and pancreatic juice secreted by the pancreas gets mixed up with the digested food for further digestion.

SMALL INTESTINE

This long tube is about 5m (16 feet) in length. It is present in a coiled nature. It has got 3 parts namely, duodenum, and illum. It is also made up of 4 layers, namely,

1. Peritonium
2. Muscular layer made up of longitudinal or circular fibres.
3. Sub-mucus layer consists of blood vessels, nerves and lymph vessels.
4. The mucus layer has got special structures called villi. These finger like projections into which blood vessel form capillary

The lymphatic vessel leaving the villus is called as the lactical vessel which is concerned with the absorption of digested fat alone. The rest of the digested food is absorbed in to the blood capillary system.

FUNCTIONS OF THE SMALL INTESTINE:

The intestinal juice produced by the intestinal glands present in the mucus layer contains the following enzymes namely maltose, sucrose, lactose, erepsin and enterokinase. These enzymes act on the party digested food form the stomach and converts them into simpler substances like amino acids.

LARGE INTESTINE

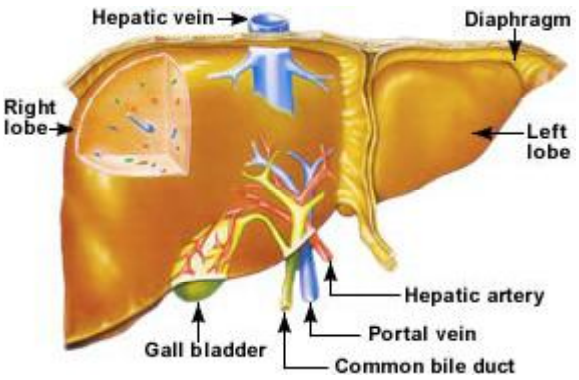
This continues from the ileo caecal valve. It has got 5 parts namely caecum, ascending colon, transverse colon, descending colon, zigmoid colon, Rectum and the Anus. Similar to the small intestine it consists of 4 layers. The mucus layer are arranged as 8 bands giving the large intestine gives the seculated appearance. The mucus membrane does not contain the villi.

FUNCTIONS OF THE LARGE INTESTINE

1. It absorbs a major part of the water content of the indigestible residue.
2. It is essential for the act of defecation.

LIVER

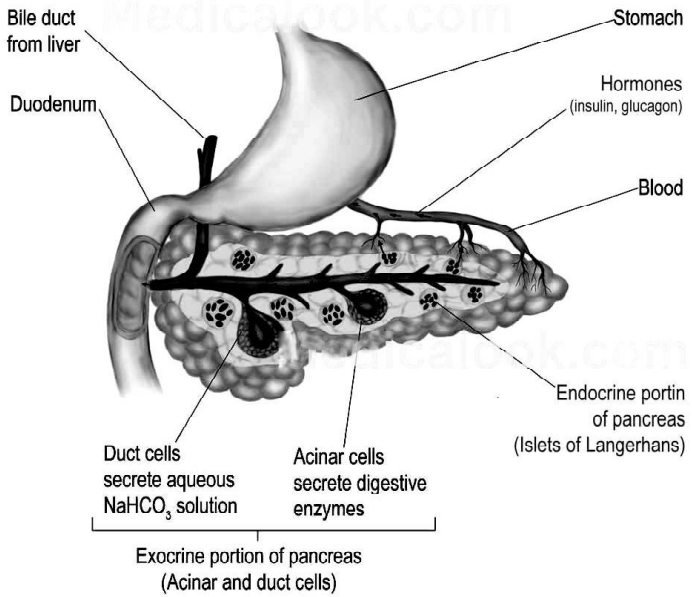
This is the largest gland in the body. It lies underneath the diaphragm on the right side. It is divided into 2 lobes and red in colour. On the under surface of the right lobe is present the Gall bladder which conveys Bile during the digestive process.



The functional structure of the liver is arranged in lobules. Each of these lobules is supplied with blood by two systems namely the portal vein conveys light oxygenated blood but rich in nutrients from the small intestine and the other one is Hepatic artery which supplies oxygenated blood from the lung. Minute ducts leave these lobules carrying bile. Venous blood in the liver is drained by Hepatic veins.

FUNCTIONS OF THE LIVER:

1. It stores vitamin B12 which is released whenever required for the production of Red Blood cells.
2. It stores iron obtained from the dead RBC.
3. It stores glucose as Glycogen.
4. It secretes bile.
5. It synthesis actual proteins namely Albumin.
6. It produces Heparin, Fibrinogen and prothrombin.
7. It acts as a Detoxycating center.
8. It stores food which is absorbed by the small intestine.
9. It helps in the metabolism of fats.



PANCREAS

This is another secretary organ in the digestive process. It is situated behind the stomach. It consists of 3 parts namely, the head, body and tail. It is made up of glandular tissue which produces.

1. The pancreatic juice.

FUNCTIONS OF PANCREAS

1. The pancreatic juice acts on starch, peptones and fats converting them into simpler products for absorption.
2. Insulin regulates the blood sugar and maintains it.

UNIT – 7

ENDOCRINE SYSTEM

The health of the tissues does not only depend on the sufficient supply of protein, fats, salts and oxygen, but also on the internal secretions of the endocrine glands.

The most important of these are the pituitary, pineal gland. Thyroid, parathyroid, adrenal glands and the gonads or sexual glands.

These are called endocrine glands or ductless glands because their secretions are internal and pass directly in to the blood stream, without flowing through channels of their own. Hence, the endocrine glands have no ducts, they are also called "duct less". It has been discovered than an insufficient secretion from any one of them could entail serious consequences.

The different glands produce different hormones and most glands produce several. The hormones are chemicals which act as "messengers" to carry "orders to various parts of the body to regulate bodily processes such as growth, water balance and sexual function. The hormones travel from their "source" to their "target" in the blood stream and since the blood travels all around the body, the hormones may affect other parts of the body as well as their main "target" areas.

PITUITARY GLAND

LOCATION

This pituitary gland is situated inside the skull just behind the nose in the pituitary fossa of the sphenoid.

It has got two lobes such as anterior pituitary and posterior pituitary and are connected by "lobe called para intermedia.

It is the master gland affecting all the others, including the sexual glands. If one eats too many fats and carbohydrates over a number of years, all the glands will weaken, especially the pituitary. This will result in excess fat deposition around the chest and abdomen.

FUNCTIONS OF ANTERIOR PITUITARY

1. **Growth hormone** is necessary for the normal growth and development of the body.
2. **Thyrotrophic hormone** regulates the synthesis of thyroid hormone in the thyroid gland.
3. **Adrenocorticotrophic hormone** stimulates the adrenal cortex of synthesise its hormones.
4. Follicle stimulation hormone stimulates.
    i. Ovary in females to synthesis of strogen.
    ii. Testes in males to produce spermatozoa.
5. Luteinizing hormone stimulates.
    i. Ovary in females to produce progesterone.
    ii. Tests in males to produce testosterone.

DISORDERS OF ANTERIOR PITUITARY

1. Hyper pituitarism : It may occur in the form of:
    i. Gigantism cause by the over production of growth hormone in children.
    ii. Acromegaly caused by the over production of growth hormone in adults.
2. Hypopituitarism : It may occur in the form of dwarfism which is due to decreased production of growth hormone.

POSTERIOR PITUITARY :

The posterior lobe of pituitary secretes two hormones. They are oxytocin and vesopressin.

OXYTOCIN:

It has got two functions:

i. Contraction of uterus during labour (delivery) and to bring about purturition (i.e. birth of baby)
ii. Ejection of milk from the breast.

VASOPRESSIN (Antidiuretic hormone ADH):

Its functions are:

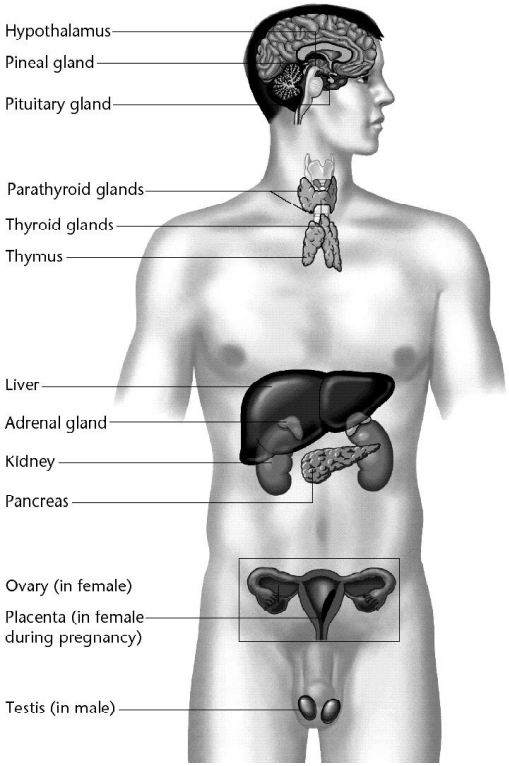
i. Decreasing urine output by increasing tubular reabsorption in the kidney.
ii. Increasing blood pressure by constricting capillaries and arterioles.

THYROID GLAND

LOCATION:

Thyroid gland is situated in the lower part of the neck on the thyroid cartilage. The thyroid gland contains two lobes. One on each side of the trachea. These two lobes are connected by an isthumus which lies in front of the trachea and extends upwards on either side of the larynx.

Each lobe consists of number of lobules and its follicles. These follicles contain a jelly likes substance called colloid. This colloid stores the thyroid hormones and releases when needed.



FUNCTIONS OF THYROID HORMONES:

They thyroid hormones influence growth and metabolism. The major functions are:

1. Increase in oxygen consumption and heat production in tissues.
2. Increase in basal metabolic rate (BME).
3. Increase in the absorption and utilization of glucose.
4. Anabolic effects like growth promotion and protein synthesis.
5. Increase in the rate of cholesterol synthesis in liver.
6. Myelination of central nervous system.
7. Storage of iodine.

DISORDERS OF THYROID FUNCTION

Hypothyroidism

1. Cretinism which occurs due to intra-uterine thyroid deficiency. It produces mental regardation.
2. Myxedema which is due to thyroxin deficiency occurring after birth. It produces retardation of physical growth.

3. Endemic goiter which occurs due to the deficiency of iodine in food. It produces enlargement of the throid gland.Hyperthyroidism

Graves disease which is due to excessive production of TSH. It produces protrusion of eyeballs, rapid pulse and nervousness.

PARATHYROID GLANDS

The parathyroid glands are four in number. They are embedded on the posterior surface of the thyroid gland, two lying on each side.

STRUCTURE

The parathyroid glands are composed of masses of epithelial cells. The cells are of two types: 1. Chief cells 2. Oxyphil cells. The chief cells secrete the parathyroid hormone (PTH) or paratharmone.

FUNCTIONS OF PARATHYROID HORMONE:

PTH increase calcium level of plasma and extracellular fluid. This effect is produced by the following mechanisms:

1. Mobilisationo f calcium of bone into the extracellular fluid.
2. Increased reabsorption of calcium in the renal tubule.
3. Increased absorption of calcium in the gastrointestinal tract.

REGULATION OF SECRETION:

The secretion of PTH is not under nervous or hormonal control. A decrease in calcium level of plasma increase the secretion of PTH and vica versa.

DISORDERS OF PARATHYROID FUNCTION

1. Hyperparathyroidism produces osteitis fibrosa. It is characterized by decalcification of bone leading to loss of strength and fibrous appearance.

ADRENAL OR SUPRARENAL GLANDS

The adrenal glands are two in number. One gland each is situated on the top of each kidney.

STRUCTURE:

The adrenal gland can be divided into two parts which are different in structure and function.

They are : 1. An inner medulla, 2. An outer cortex

The cortex has three distinct layers of cells. They are:

1. Zona glomerulosa – an outer layer
2. Zona fasciculate – a middle layer
3. Zone reticularis – an inner layer

ADRENAL CORTEX

The adrenal cortex secretes three groups of hormones. These hormones are secreted by the three different layers of cortex as follows:

1. Zona glomerulosa secretes mineralo corticoids.
2. Zona fasciculate secretes glucocorticoids.
3. Zona reticular is secretes sex steroids.

MINERALO CORTICOIDS:

The mineralo corticoids are aldosterone and desoxycorticosterone. They influence water and mineral metabol. They help to maintain electrolyte and water balance of the body as follows:

1. By increasing the reabsorption of sodium in the renal tubules:
2. By promoting excretion of potassium

BLUCOCORTICIODS:

The glucocorticoids are cortisol, cortisone and corticosterone. The glucocorticoids influence carbohydrate metabolism. Their important functions are:

1. To increase the synthesis of flycogen
2. To increase the breakdown to protein into aminoacids.
3. Mobilisation and redistribution of fat.
4. Decreasing the production of eosinophils and lymphocytes
5. Anti-inflammatory and anti-allergic effect.

SEX STEROIDS:

They are androgens (in males) and oestrogens (in females). These two hormones are similar to those produced by testes and ovaries. These two hormones influence growth and sex development.

REGULATION OF ADRENOCORTICAL SECRETION:

The secretion of various hormones in the adrenal cortex is controlled by adrenocorticotrophic hormone (i.e ACTH of anterior spituitary).

DISORDERS OF ADRENOCORTICAL FUNCTION:

1. Hypofunction of adrenal cortex produces Addison's disease. It is characterized by loss of weight, hypotension, bigmentation of the skin etc.
2. Hyperfunction produces cushing's syndrome (i.e face). It is characterized by deposition of fat on face, neck, diabetes and hypertension.

ADRENAL MEDULLA:

The adrenal medulla secretes adrenaline and nor adrenaline. These two substances are also liberated from sympathetic nerves.

Action of adrenaline and nor adrenaline:

1. Vasoconstriction and rise in blood pressure.
2. Contraction of splenic capsule and release of RBCs.
3. Dilatation of the pupil.
4. Contraction of nictitating membrane in animals.
5. Relaxation of the intestine.
6. Erection of the hair due to contraction of erector pili muscle (of hair follicles).

DISORDERS OF ADRENAL MEDULLA:

They can occur as pheochromocytoma characterized by tumour in the adrenal medulla. There is an excessive secretion of adrenaline and nor adrenaline in this conditions.

PANCREAS

The pancreas lies on the posterior abdominal wall in front of abdominal aorta and lumbar vertebrae. It extends between the C-shaped curvature of duodenum and the spleen. The pancreas contains a head, body and tail.

STRUCTURE:

The bulk of pancreas contains exocrine cells called acini. These acini secrete the pancreatic juice which is digestive in function. In between the acini, there are some endocrine cells called islets of Langerhans.

ISLETS OF LANGERHANS:

The islets are present more in the tail portion of pancreas. The islets constitute to the extent of 1 percent of the wet weight of pancreas. There are 1 to 2 million islets in the pancreas. The islets contain two types of cells:

1. Alpha cells which secrete glucagon.
2. Beta cells which secrete insulin.

GLUCAGON :

It is a hormone secreted by the alpha cells of islets of Langerhans. Its functions are:

1. Increase in blood sugar level by mobilizing glycogen from the liver.
2. Mobilisation of stored fat.
3. Release of insulin from pancreas.

INSULIN:

It is a hormone secreted by the beta cells of islets of Langerhans. The important action of insulin is to decrease the level of glucose in the blood. This effect is produced as follows:

1. Increasing glycogen synthesis but preventing glycogen breakdown in the liver.
2. By preventing fresh synthesis of glucose (gluconeogenesis)
3. Stimulating the uptake and utilization of glucose in the skeletal muscle.
4. promoting the conversion of glucose into fat in the adipose tissue.

DISORDERS OF INSULIN SECRETION:

Decrease in the synthesis of insulin produces diabetes mellitus.

SEX GLANDS (Gonads):

The sex glands are:

1. Ovaries in the female which secrete oestrogen and progesterone.
2. Testes in the male which secrete androgens.

DESTROGEN:

It is the female sex hormone secreted by the Ovaries. Its functions are:

1. Regulation of menstrual cycle.
2. Development of secondary sex characters.

The secretion of oestrogen is controlled by follicle stimulation hormone (FSH) of anterior pituitary.

PROGESTERONE:

It is also a female sex hormone secreted by Ovary. Its functions are:

1. Maturation and development of uterus and breast.
2. Preparation of the uterus to receive the fertilized Ovum.

ANDROGENS:

They are male sex hormones secreted by the interstitial cells of the testes. The most important androgen is testosterone. The important functions of androgens are:

1. Stimulation of spermatogenesis.
2. Growth of penis, scrotum and prostate.
3. Development of secondary sex characters.

The secretion of androgens is controlled by luteinising hormone (LH) of anterior pituitary.

THYMUS

It is a gland present in the upper chest cavity on the trachea. It lies behind the sternum, but in front of heart and arch of aorta. It consists of two lobes. Each lobe consists of a number of a number of lobules. The thymus is bigger in size at birth. It grows in size until puberty. Later, it gradually decreases in size.

FUNCTIONS:

The thymus mostly contains lymphoid tissue. It takes part in the production of lymphocytes. A hormonal secretion of thymus plays some role in sexual development.

PINEAL GLAND

It is a very gland lying in front of cerebellum, in between the under surfaces of cerebrum and mid brain. It is a vestigial organ in man. Its function is not known for certain.

HORMONES

A hormone is a chemical released by a cell or a gland in one part of the body that sends out message that affect cells in other parts of the organism. Only a small amount of hormone is required to alter cell metabolism hormones are substances that act as a chemical messenger that transports a signal or information from one cell to another that regulate the timing and speed of the processes that take place in the body. a hormone may also regulate the production and release of other hormones. Hormone signals control the internal environment of the body through homeostagis.

ENZYMES

Enzymes are energized protein molecules or substances made by all living cells Enzymes are biological molecules that catalyse that is increase the rates of chemical reactions or regulate all biochemical reactions that occur with in the human body.

Almost all chemical reactions in a biological cell need enzymes in order at rates sufficient for life.

Enzyme activity in increased by activators and decreased by inhibitors. Many drugs and proteins are enzyme inhibitors Activity is also affected by temperature, pressure, chemical environment (pH) and the concentration of substance.

Difference between hormones and enzymes

HORMONES	ENZYMES
1. Hormones involve in chemical process to take place or to regulate, increase or decrease the rate of reaction.	1. Enzymes involve in Biological process such as breathing, vision, movement and digestion.
2. Hormones are metabolites that stimulates or invites growth.	2. Enzymes are needed for every biochemical reactions takes place in the body.
3. In involves in the activation or inhibition of the immune system.	3. Enzymes needed by vitamins and minerals to accomplish their delivery within the body.
4. It prepare the body for making, fighting, feeling and other activity.	4. Enzymes turn the food we eat into energy and unlock this energy for use in the body.
5. Hormone involves in neural and mental activity in mood state and environmental changes of light or performance.	5. Enzymes deliver Nutrients carry away toxic wastes, digest food, purify the blood, deliver hormones by feeding and Strengthening of immune system.

UNIT – 8

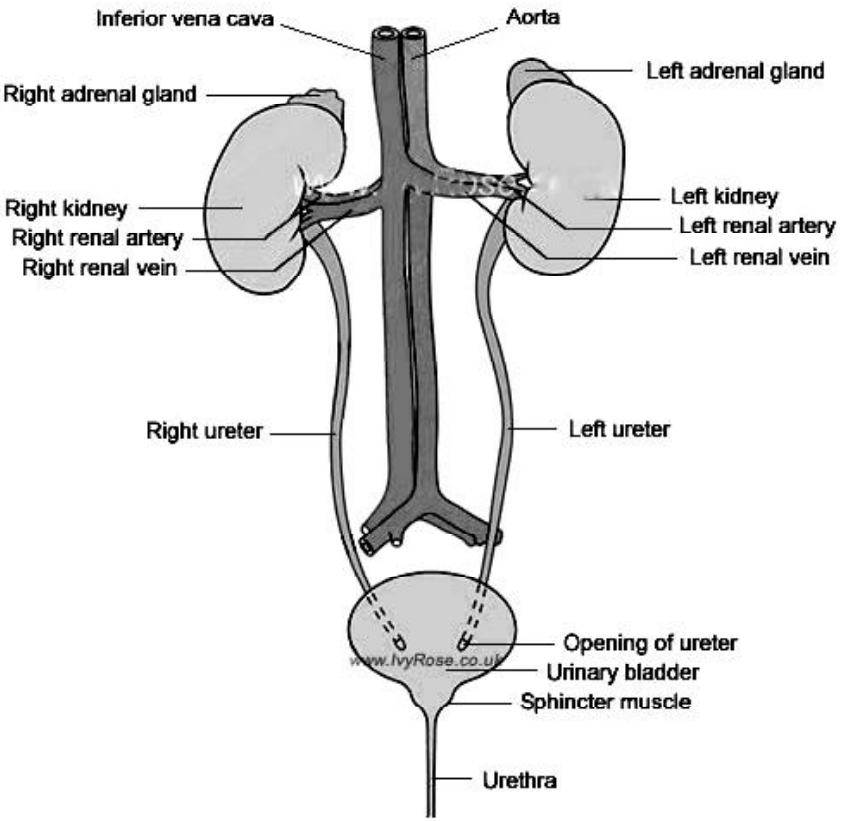
EXCRETORY SYSTEM

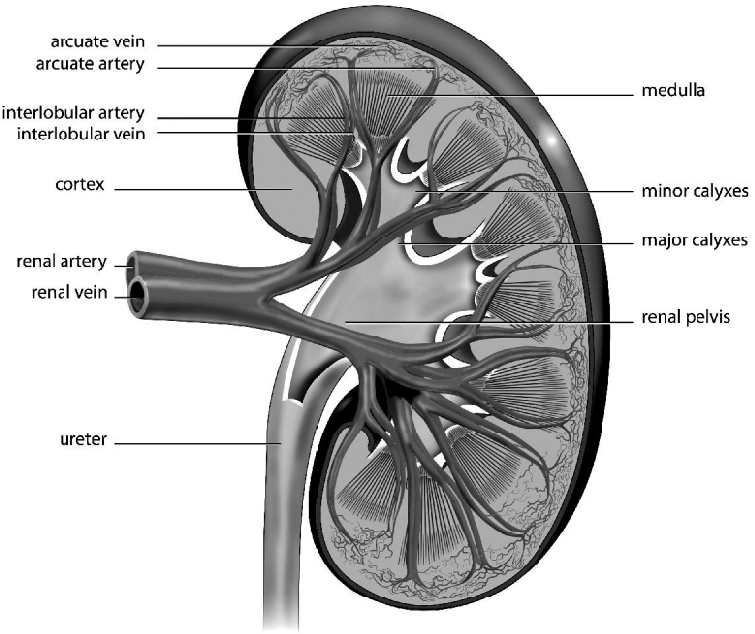
Excretory system is otherwise termed as urinary system as it is the main system which excretes waster in liquid form. To excrete waste water two kidneys are present in the human body.

LOCATION OR POSITION OF THE KIDNEY:

There are two rear shapes ******

dorsal abdominal wall on each size of the vertebra column. These kidneys extend form the level of last (12^{th}) thoracic vertebra to the third lumbar vertebra. Each kidney measures about 11 cm * 5 cm in length and breadth and 3 cm in thickness and weighs about 150 grams.





STRUCTURE OF THE KIDNEY:

The urinary system consists of

(1) two kidneys
(2) two ureters
(3) an urinary bladder
(4) an urethra

The outer border of the kidney is convex. The inner border or medial side of the kidney is called hylum. In this medial side arteries and vein enter inside and ureter leave from the kidney.

The following structures were made found in the cross sectional view of the kidney. They are,

1. The kidneys are enclosed with in a fibrous capsule.
2. An outer cortex which is reddish-brown in colour.
3. Inner medulla which contains pyramids of the kidney.
4. An upper expanded end of ureter called pelvis.

Microscopic structure of the kidney shows a number of structural and functional units called nephrons. There are about million of nephrons in each kidney. A nephron consists of two parts.

1. Malphigian bodies made up of Bowman's capsule and glomerulus.
2. Renal tubules.

STRUCTURE OF MALPHIGIAN BODIES

It is made up of

1. An upper expanded end of the renal tubule called Bowman's capsule.

2. A bunch of capillaries called glomerulus which are packed Bowman's capsule.

These malphigian bodies are present in the cortex.

STRUCTURE OF THE RENAL TUBULES

This is consist of four parts.

1. Proximal convoluted tubule situated in the cortex.
2. Loop of Henle present in the medulla.
3. Distal convoluted tubule present in the cortex.
4. Collecting tubules which pass through the medulla and open into the pelvis of kidney.

BLOOD SUPPLY TO KIDNEY:

Kidney are supplied by renal arteries which are branches of abdominal aorta. Venous blood of kidney is drained by renal veins which open into inferior venacava.

FORMATION OF URINE:

It consist of 3 process. In the first process filtration of water, salts and other substances occurs in the glomeruli being passed into the proximal convoluted tubule.

In the second process the passed filtrate is again being separated as abnormal substances or normal substances.

In the third process the normal substances such as potassium, hydrogen and drugs like penicillin is being reabsorbed in the convoluted tubules and collecting tubule.

Urine is the fluid that results from the above three processes. It enters the collecting tubules and then into the pelvis of kidney. From there, it enters the urinary bladder through ureter.

URETER:

It is a duct commences from the pelvis of kidney carries urine from the kidney to the urinary bladder. Ureter starts from the kidney and continues down in the abdominal cavity and opens in the posterior aspect of urinary bladder. It is made up of (1) an outer fibrous layer (2) middle muscular layer (3) Inner mucous layer.

URINARY BLADDER:

It is a pearl shaped muscular sac which acts as a reservoir for urine. It lies in the pelvic cavity behind symphysis pubis. The lowest part of bladder is called as base and the upper part is called as fundus.

URETHRA:

It is a canal through which urine passes from the bladder to the outside. It differs in the male and female.

COMPOSITION OF URINE:

Urine consists of (1) water 96% (2) Urea 2% (3) Uric acid and salts 2%.

DISEASES OF THE URINARY SYSTEM

1. **GLOMERULO NEPHERITIS:**

   It is an infection of kidney leading to inflammation of glomeruli.

2. **PYELITIS:**

   It is an inflammation in pelvis of kidney due to infections.

3. **POLYUREA:**

   It is the secretion of large quantities of urine.

4. **ANUREA:**

   It is a cessation of urine secretion

5. **RENAL CALCULT:**

   It is the deposition of insoluble substances in urinary tract.

6. **CYSITIS:**

   It is an inflammation of urinary bladder.

7. OEDEMA:

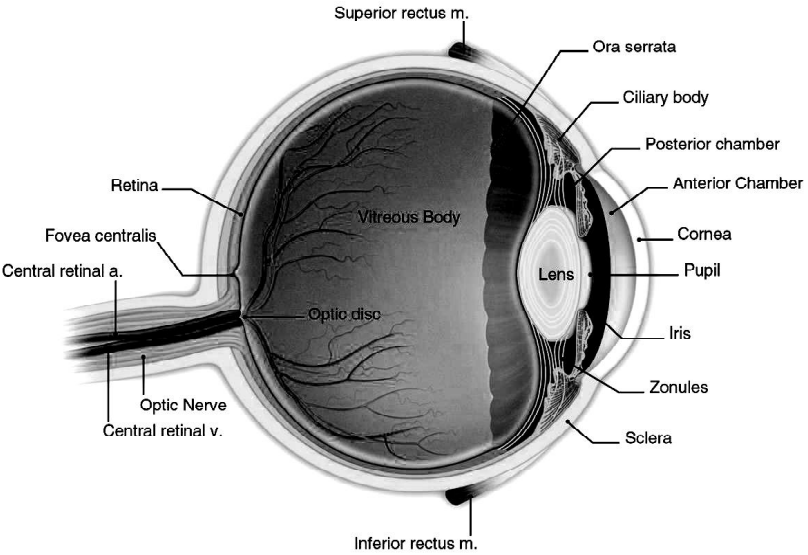
It is an important sign of failure of the kidneys. In this condition the entry of fluid at the venous side is decreased, thus results in swelling called oedema.

FUNCTIONS OF THE KIDNEYS

1. It assists in the adjustment of the acidity and alkalinity of the blood.
2. It helps to regulate the body in water balance.
3. It helps in the excretion of ions.
4. It helps in the excretion of water and waste products of protein metabolism.
5. It helps in the excretion of excess salt.
6. It helps in the excretion of harmful substances, drugs and toxins.
7. It assists in the adjustment of salt and glucose content of the plasma.

UNIT – 9
SENSORY SYSTEM THE EYE

Eye is a sensory organ of vision which is situated in the orbital of the skull. It contains the eye all which is surrounded and supported by a number of accessory structures.



ACCESSORY STRUCTURES OF THE EYE

Accessory structures are

1. Eye brows
2. Eyelids
3. Lacrimal apparatus
4. Extrinsic muscles.

1. EYE BROWS:

There are arches of thicks skin over each eyes and contain thick hairs. It helps in preventing dripping if sweat into the eyes.

2. EYELIDS:

These are the upper and lower eyelids which helps protect the eye. Each eye lashes has short hairs which project from the margin of the eyelids.

3. LACRIMAL APPARATUS:

It is concerned with the production of tear. Lacrimal gland is situated in the lateral end of the upper eyelid. Tear is being carried through lacrimal duct, lacrimal sac and nasolacrimal duct to the nasal cavity.

4. EXTRINSIC MUSCLES OF THE EYE:

The eyeball is moved by six muscles. These muscles arise from the posterior long wall of orbit and inserted into the sclera.

STRUCTURE OF THE EYE BALL:

The eye ball is almost spherical in shape and it is situated in the anterior part of orbital cavity. The eye ball contains 2 parts, namely,

1. Three coats
2. Light- transmitting structures.

[A]. THREE COATS

The three coasts are

a. Outer fibrous coat containing sclera and cornea
b. Modula vascular coat containing, pillary *****
c. Inner nervous coat containing retina.

It consists of two parts or coats. They are i. Sclera ii. Cornea

i. SCLERA:

It forms the posterior five sixths of the outer coat. It forms the white of the eye and it is continuous with cornea in front. Sclera protects the internal structures and also maintains the shape of the eye ball. The optic nerve passes through the posterior aspect of sclera and reaches the retina.

ii. CORNEA:

It forms the anterior one-sixth of the outer coat. It is transparent and has a convex anterior surface. It has no blook supply, but it is richly supplied by sensory nerves.

[B] MIDDLE VASCULAR COAT

It consists of three parts or coats. They are 1. Choroid 2. Ciliary Body 3. Iris

1. CHOROID:

It is a thin, pigmented and highly vascular membrane. It lines the posterior compartment of eye and lies between the inner surface of sclera and retina.

2. CILIARY BODY:

It is the anterior continuation of choroids and it lies between choroids and Iris. The ciliary body contain ciliary muscle. The suspensory ligament of lens is attached to ciliary muscle.

3. IRIS:

It is the anterior continuation of ciliary body. Iris is a pigmented membrane and the colour of the eye is dependent on its pigments. Iris has a central opening called pupil. Two set of iris muscles control the pupil. They are (a) circular muscles which reduce the papillary size. (b) Rapid muscles which increase the papillary size.

[C] INNER NERVOUS COAT:

Retina : It is the inner most nervous coat of eyeball and lies immediately deeper to choroids.

II. LIGHT TRANSMITTING STRUCTURES

There are three light transmitting structures. They are

(i) Aqueous humour

It is a fluid present in the anterior chamber of the eye i.e. It lies in the space between cones in front and iris and ciliary body at the back.

(ii) Lens

It lies immediately behind the iris and pupil. It is attached to the ciliary body by means of suspensory ligament of lens. The lens focuses light entering through pupil on the retina.

(iii) Vitreous humour

It is a jelly like fluid which fills the space between lens and retina. It maintains the shape of the eye. Also, it keeps the retina in contract with choroids and sclera.

MECHANISM OF SIGHT

The mechanism of sight (vision) is as follows :

(1) Light enters the eye through the cornes which acts as an entrance window (curtain) for light.
(2) Iris and the pupil regulates the amount of light entering the eye.
(3) The image is then focused through the lens on the retina.
(4) The pigmented choroids darkens the interior of the eye. This reduce scattering and reflection of light.
(5) The image then stimulates the receptors present in the rods and cones of retina.

(6) These impulses are then carried through optic nerves. The optic nerves of both sides cross at optic chiasma. From the optic chiasma, the impulses are carried optic tract to visual cortex present in the occipital lobe of the brain.

Here the image is perceived.

ACCOMMODATION

Ciliary muscles which are attached to the lens contribute to the mechanism of accommodation. The contraction and relaxation of these muscles alter the focal length of the lens. Contraction of these muscles focuses the lens for near vision. Relaxation of these muscles focuses the lens for distant vision.

POSSIBLE DISEASES OF THE EYE

MYOPIA:

It is otherwise termed as short sight. This occurs due to an increase in the anteroposterior diameter of the eye ball. So the image is formed infront of the retina. The patient can see the near objects without difficulty. But distant objects cannot be seen clearly. This is corrected by using concave lens.

HYPERMETROPIA:

It is otherwise termed as long sight. This occurs due to a decrease in antero-posterior diameter of the eye ball. So the image falls behind the retina. The near objects cannot be seen clearly. This is corrected by using convex lens.

PRESBYOPIA:

It is a defect ain accommodation. It occurs in old age due to loss of elasticity of the lens.

GLANCOMA:

It is an increase in intraocular tension produced due to excessive collection of aqueous humour in the anterior chamber. Unless properly treated, it may lead to blindness due to retinal damage.

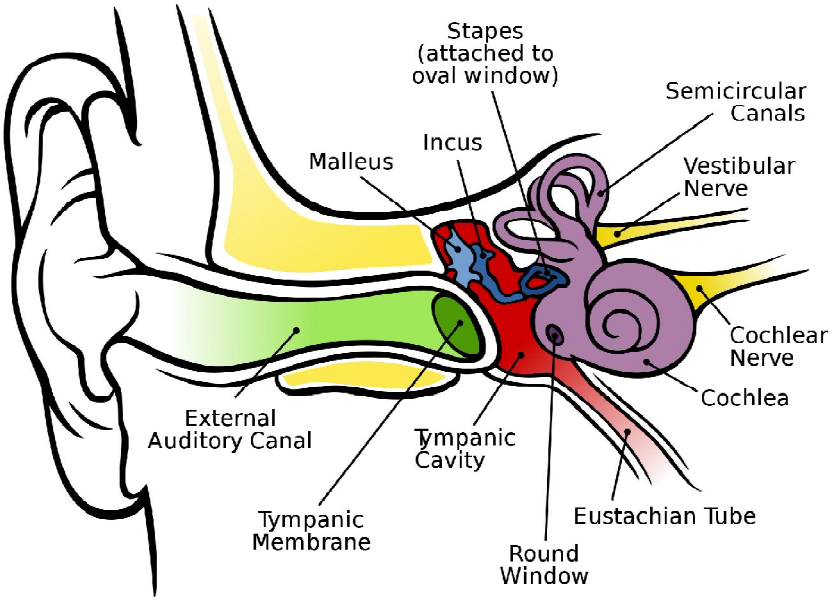
COLOUR BLINDNESS:

It is a defect of retina in which the patient cannot see one or more colour. Some patients are totally colour blind and they see everything only in black and white. Some patients are partially colour blind and can see only a few colour.

THE EAR

Ear is concerned with the functions of bearing and equilibrium. It is divided into the following three parts:

1. External Ear
2. Middle Ear
3. Internal Ear



1. EXTERNAL EAR:

It is the only part of the ear which lies outside the skull. It contains the following structures.

(a) Pinna or auricle
(b) External auditory meatus.

(a) Pinna or auricle

It is a funnel shaped organ made up of elastic fibro cartilage. It helps to collect the sound waves.

(b) External auditory meatus:

It is a small channel lined by skin and wax secreting glands. It conveys the vibrations of sound to the tympanic membrane.

2. MIDDLE EAR:

It is otherwise called as tympanic cavity. It is a small cavity in the temporal bone. It contains the following structures.

a) Tympanic membrane or ear drum which forms the lateral wall.
b) Two foramina in the inner or medial wall called.
   i. Fenestra ovalis or oval window.
   ii. Fenestra rotundum or round window.
   iii. Eustachian tube through which middle ear communicates anteriorly with nasopharynx.

iv. Auditus : It is a narrow channel which connects the middle ear posteriorly with mastid antrum of temporal bone.

v. The auditory ossicles which are three small bones arranged across the middle ear. The three malleus are malleus, incus and stapes. The handle of malleus is fixed to the ear drum. The head of malleus is connected to incul which inturn is connected to stapes.

2. INTERNAL EAR:

The internal ear contains

1. Bony labyrinth which consists of a series of channels contains a fluid called perilymph.

2.Membrananous labyrinth is filled with a fluid called endolymph.

The bony labyrinth contains three structures. They are,

1. Vestibule
2. Cochlea the hearing organ
3. Semicircular canals the organ of equilibrium.

VESTIBULE:

It is the central part. It lies between cochlea infront and semicircular canals behind. It contains utricle and sacccule which are parts of membranous labyrinth.

COCHLEA:

It is a spiral canal which looks like the shell of snail. It consists of three pats. They are.

1. Modiolus is a central column of spongy bone around which the spiral canal twines.
2. Basilar membrane is a membranous septum which divides the cochles into two parts.
   1.An upper part called scale media
   2.A lower part called scale media.

3.Organ of corti is the auditory receptor which rests on the basilar membrae.

The organ of corti contains rows of elongated hair cels. The fibres of cochlea nerve are in contact with these hair cells.

SEMICIRCULAR CANALS:

Each ear has three semicircular canals which are placed at right angles to each other. They are posterior, superior, and lateral semicircular canals. Each semicircular canal has an enlarged and called ampula. The ampula has endings of vestibular nerve and also some hair like projections.

MECHANISM OF HEARNING

The following steps are followed in the hearing process.

1. Sound waves in air are collected by pinna.
2. The external auditory meatus directs these waves to the tympanic membrane which then vibrates.
3. The vibrations are transmitted by malleus incus and stapes to the membrane covering fenestra ovalis.
4. From the inner surface of this membrane, vibrations are transmitted to organ of corti through perilymph and endolymph.
5. From the organ of corti, the impulses produced by vibrations are carried to brain stem through cochlear portion of 8^{th} nerve.
6. The fibres are then carried to auditory center of brain which is present in the temporal lobe of the opposite side.