MARRI LAXMAN REDDY INSTITUTE OF PHARMACY
(Approved by AICTE & PCI, New Delhi and Affiliated to JNTUH)
Dundigal - Gandimaisamma (V) &(M), Medchal (Dt), Hyderabad, Telangana - 500 043.

HUMAN ANATOMY AND PHYSIOLOGY – I

LAB MANUAL

B. PHARMACY I-I

About MLRIP

To be an educational Institute of par excellence and produce competent pharmacy professionals to serve the community through research and the ever-increasing needs of Industry.

1. Imparting quality education and innovative research for various career opportunities.
2. Creating conducive academic environment to produce competent pharmacy professionals.
3. Indoctrination of students adorned with high human values and make them aware of their responsibility as health care professionals.

Program Educational Objectives

PEO 1: To produce graduates with sound theoretical knowledge and technical skills required for their career opportunities in various domains.

PEO 2: To incite the students towards research and to address the challenges with their innovative contributions for the benefit of the mankind.

PEO 3: To instill the essence of professionalism, ethical commitment to become a health care professional with sound integrity and adherence to the core human values in the service of the society.

1. **Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.
2. **Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
3. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
4. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
5. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.
6. **Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
7. **Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
8. **Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
9. **The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
10. **Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
11. **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

STUDY OF COMPOUND MICROSCOPE

AIM: To study the structure of working procedure for the use of Compound Microscope.

PRINCIPLE:- It's on optical instrument having a magnifying lens (or) a combination of lenses for inspecting objects fir small to be seen distinctly and in details by the unaided eye. It's used in the study if morphology of blood cells and counting their number also used in histology, histopathology of microbiology and later in various clinical disciplines.

Parts of Microscope:

A. **Support System**: - Functions as a frame work to which various functional units are attached.

i) Base:-It's a heavy metallic u/horseshoe shaped base (or) foot, supports microscope on work table.

ii) Pillars: -To upright pillars project up from the base of are attached to C-shaped handle. The Hinge joint allows microscope to be tilted at a suitable angle for comfortable viewing.

iii) Handle (The arm (or) limb): - The curved handle which project up from hinge joint supports focusing of magnifying systems.

iv) Body Tube: -Fitted at upper end of handle, either vertically (or) at an angle, it's part through which light passes to eye p, thus conducting the image to eye of observer. It's 16-17Cm in length and can be raised (or) lowered by focusing system.

v) The Stage: - It has to components a) Fixed Stage and b) Mechanical Stage.

a) Fixed Stage: -Square platform which an aperture in its centre of fitted to limb below objecting lens. Slide is placed and centred over aperture for viewing converging cane of light emerging from condenser passes through slide and to body tube.

b) Mechanical Stage: -Calculated metal frame fixed on the right edge of fixed stage. There's a spring mounted clip to hold the slide (or) counting chamber in position. While to screw heads move it from side to side and forwards and backwards. Vernier scale on the front indicates.

B) **Focusing System**:-It consists of case of fine adjustment screw heads (or) Knob. It's employed for raising (or) lowering the optical system with reference to slide (or) study till it comes into focus. There are to coarse and fine adjustment screw working on a double-sided micrometer mechanism, pair on either side. If one coarse/fine adjustment is turned the other one also rotates at same time. The coarse adjustment mores the optical system up (or) down rapidly through a large distance via a rack and pinion arrangement. The fine adjustment works in same, but several rotations of screw-head are required to more the body through a small distance, e.g., one rotation moves the tube by 0.1mm (or) less. It's employed for accurate focusing.

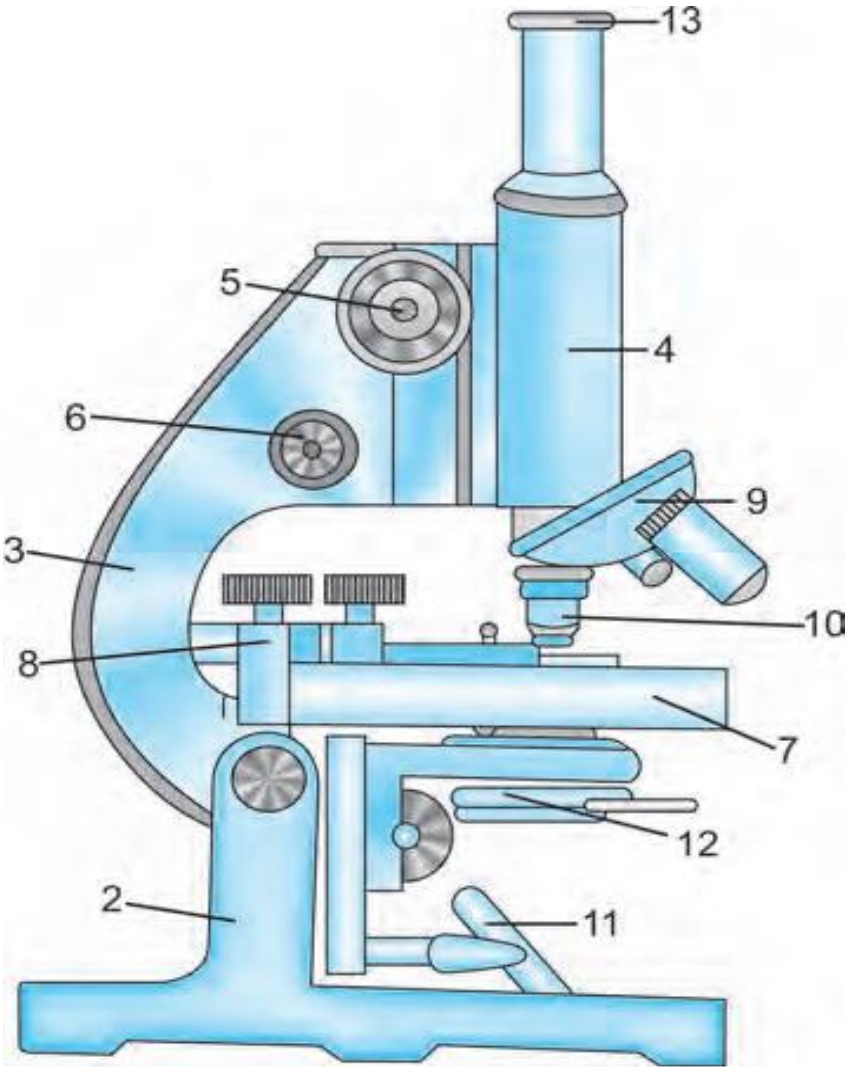


Figure 1-1: Compound microscope: (1) Base, (2) Pillars, (3) Handle, (4) Body tube, (5) Coarse adjustment screw, (6) Fine adjustment screw, (7) Fixed stage, (8) Mechanical stage, (9) Fixed and revolving nose pieces, (10) Objective lenses, (11) Mirror, (12) Condenser, and (13) Eye-piece

C) Optical/Magnifying System:-It consists of body tube, eye piece, nose piece that carries objects. It can be raised (or) lowered as desired.

i) **Body Tube**: - Distance between upper ends of objectives and eye piece is tube length, which is 16-17Cm.Distance between upper local point of eye piece and lower focal point of objective is optical tube length 25Cm.

ii)**The eye Piece**: - It fits into top of body tube. Most microscopes are provided with 5x, 8x, 6x, 10x and 15x. Each eye piece has to lenses – one mounted at top, the' Eye lens' and other the 'field lens 'is fitted at bottom. The field lens collects divergent rays of primary image and passes it to eye lanes which-magnifies the image.

iii)**The Nose Piece**: - Fitted at lower end of body tube and has two parts: -1) Fixed Nose piece and ii) Revolving Nose piece.

Revolving carries interchangeable objective lenses any lens can be rotated into position when desired, correct position is indicated by 'Click Sound'.

iv) Objective/Lenses: -Three springs loaded objectives of varying magnifying powers are usually provided with student microscope. Each objective has a cover glass which forms its outer covering and protects it. Magnifying power of each lens and its numerical aperture (NA) are etched on each objective. These lenses are of 3 types: -

a) Low-Power (L.P) Objective: -10x NA=0.25mm, F. L=16mm in common use L.P objective magnifies 10 times. It's used for initial focusing and viewing the large area of focusing slide. Magnification of 100 times.

b) High Power Objective (H.P): - 45x, NA=0.65mm, FL=4mm. This magnifies the image 45times.Due to this it's used for more detailed study of material Magnification of 450times.

c) Oil Immersion (O.I) :- 100x; N=1.30mm; FL=2mm. It magnifies the image 100times since the lens almost touches the slide it has to be immersed in a special medium (Cedar-Wood Oil). A drop of which is 1st placed on slide. The oil's used to increase NA and thus the resolving power. It's employed for detail study of morphology of blood cells and Tissues. This lens gives a total magnification of 1000 times.

D**) The Illuminating System**: - This system of Bright field microscope consists of a source of light, a mechanism to condense light and to direct into specimen of study.

Source of light: - It may be (external)(out) or within the microscope (internal).

The Mirror: - A double sided mirror one flat (or) plane and other concave mirror, fixed back to back in a metal frame located below condenser, can be rotated in all directions. The plane mirrors used with a

distant source of light, natural (or) day light. Parallel rays of light are reflected parallel into condenser. The concave mirror is employed when the light source is distinct. The divergent rays of

light are reflected as parallel rays and directed into condenser.

iii) The Condenser (or) Sub stage Condenser: - It's a system of lenses fitted in a short cylinder that is ousted below the stage. It can be raised (or) lowered by a racked pinion and focuses the light rays into

a solid cone of light on the material under study. It also helps sin resolving the image.

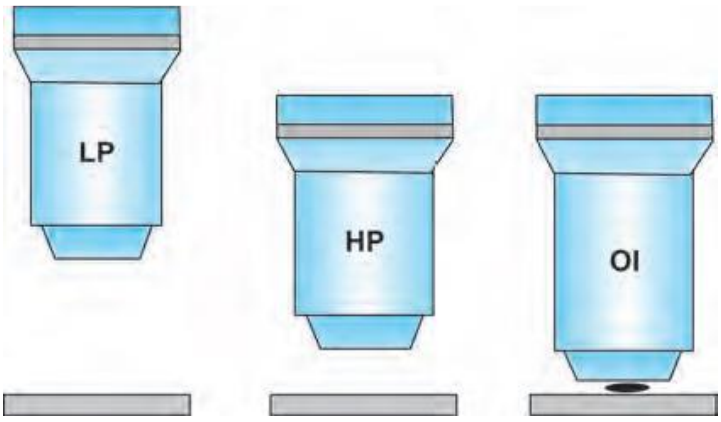


Diagram to show the working distances of LP, HP and OI lenses

a) **Lens system:**- The commonly used sub stage is abbe-type condenser composed of two lenses which should be correct for spherical and chromatic observations. The position of condenser must be

adjusted with each object to get base focus of light.

b) <u>Iris diaphragm:-</u>Fitted within the condenser. A small lever on the side used to adjust the size of aperture of the diaphragm, thus allowing more (or) less light falling on material under study. Reducing

size of field of view (aperture) decreases the numerical aperture of condenser. Thus, proper illumination includes a combination of position of light source, regulation of light intensity, position of condenser and regulation of aperture size.

c) <u>Filter: -</u> A metal ring can accommodate a pale blue or green colour filter since monochromatic light is ideal for microscopy.

2.**Physical basis of microscope<u>:</u>-**

a) <u>Resolving Power (Resolution)</u> :- The ability to show closely located structures as separate and distinct.

b) Numerical aperture: - It's an index of light gathering power of a lens i.e., the amount of light entering into objective. It can be decreased by decreasing amount of light passing through lens. Thus, illumination as to increase as the objects have changed from Low Power to High Power to Oil Immersion.

c) <u>Image Formation</u>: - The objective that starts magnification process. Forms real, inverted & enlarged image in upper part of body tube (a real image is that which can be reached on screen).

The field lens of eye piece collects divergent rays of light of primary image & passes these through eye lens which therefore the image seen by the image is virtual, inverted, magnified & appears to further magnify the image.

Objective	**Condenser position**	**Iris diaphragm**
Low power (10×)	Low	Partly open
High power (45×)	Midway	Half open
Oil-immersion	High	Fully open

d) Working distance: - The distance between objective & slide this distance decreases with increase in magnification. It is 8-13mm in low power, 1-3mm in high power & 0.5-1.5mm in Oil immersion. Lenses respectively

PROCEDURE:

Principle:- A focus beam of light passes through material under study into microscope. Parts of specimen that are optically dense and having a high refractive index are coloured with a stain, cast a

Potential shadow which is magnified in to main stages as it posses into observes eye.

A) Focusing under low power (10x):-

i) Place microscope on the work table in an upright position of raise the body tube 7-8 cm above the stage. Put the slide on stage and using mechanical stage, bring

the specimen over the central aperture.

ii) Select and adjust the mirror (plane (or) concave) so that light falls on the specimen. Rack the condenser well down (low position) and partly close the diaphragm to cut down excess light.

iii) Looking from side and using coarse adjustment bring the body tube down so that the low power lens is about 1cm above the slide. Now look into eye piece and gently raise the tube till the specimen

comes into focus. When the image comes into focus scan the entire field, rocking the fine adjustment all around.

B) Focusing under high power (45x) :-

i) For focusing under high magnification rotate the nose piece so that the high power lens clicks into position. Raise the condenser to mid-position and open diaphragm to adjust. Use fine adjustment as required.

ii) Looking from side bring the lens down to about 1-2mm above the slide. Now look into microscope and raise the tube slowly and gently till image focuses.

C) Focusing under oil immersion (100x):-

i) This objective lens is most frequently in haematology because of high magnification resolution. The to features of this are it is very small aperture through which light enter it, and its defocusing position i.e., about 1mm from side. The reason why it is immersed in oil and not other lenses is the thin layer of air between this objective lens and glass slide when lens is in focus (whithout oil image can be seen but very blurred). Cedar wood oil which has refractive index as that of glass i.e.,1.55 removes this layer of air so that the glass of the slide and objective lens become a continues column and allow in a flight to enter the objective lens.

ii) Raise the body tube so that the oil immersion lens is about 8-10cm above the slide. Place a drop of cedar wood oil on the slide and looking from side slowly bring the objective down till lit just enters the oil drop. The oil will spread out in capillary space between slide and les, thus, effectively removing thin layer of air.

iii) While looking into eye piece, slowly and very carefully raise the objective with coarse adjustment (without taking it out of oil) till the cells come into view-use fine adjustment for fine viewing.

Racking the Microscope:- The cells and their constituents are 3-dimensional structures and lie at different levels. Therefore it's importance note to keep a fixed focus but to continuously "Rack" the microscope by using fine adjustment the specimen has been bought under focus under any magnification.

Precautions:

1) Don't keep the microscope at the edge of the working table. Ensure that all lenses are clean and free from dust and smudge.

2) Never lower any objective from any height while looking into the microscope.

3) Do not use excess mounting medium.

4) Cover the microscope when not inuse.

USES:-

Light microscope can reveal the structure of living cells and tissue as well as in various clinical disciplines.

Study of Tissues of Human body

Aim:- To study the histology of different types of tissues.

Tissue :- It's a group of similar cells that usually have a common embryonic

Origin& function together to carry out specialized activities. The branch of science that deals with the study of tissues is called as Histology.

Development of Tissues: -

Tissues develop from primary germinal layers.

1. **Endoderm**
2. **Mesoderm**
3. **Ectoderm**

Types ofTissues:-

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

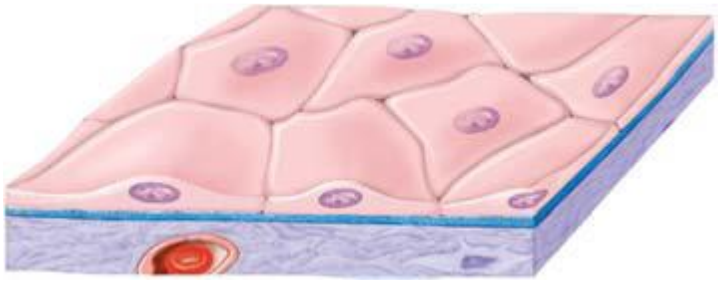
1. EPITHELIAL TISSUE

It is made up of one or more layers of cells that provide covering or lining of body and cavities. It is classified as

1) **Simple Epithelium**
2) **Pseudo stratified Epithelium**
3) **Compound Epithelium**

1) **Simple epithelium tissue :-**

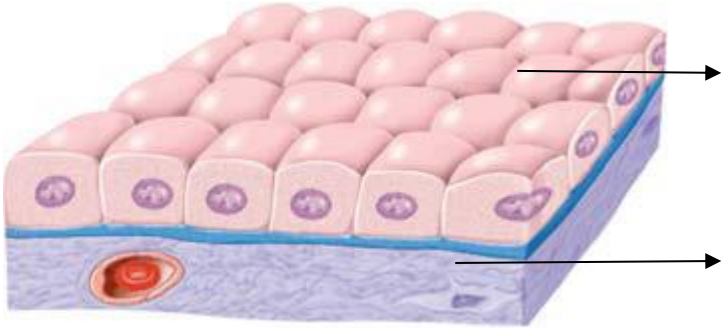
a) Squamous epithelium: -It is made up of single layer. **Nature of cells:**Flat polygonal in surface view centrally located nucleus.



Location :- Lungs, Bowman's capsule, Henle's loop of kidney inner wall of blood vessels, smooth inner lining of heart, blood vessels, lymphatic vessels, lymph vessels as endothelium.

Functions:- Excretion,protection, secretion, absorption, filtration.

b) Cuboidal epithelium:- It's made up of single layer o cubical cells arranged on basement membrane.

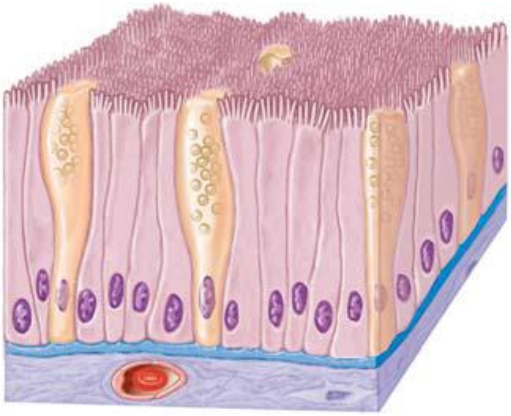


Nature of Cells:- Cube like cells, polygonal in surface view and elongated
Nucleus.
Location: - Stomach, small intestine, large intestine, Gall bladder.

Functions: - Secretion, absorption.

c) Columnar epithelium: - Made up of single layer of pillar shaped cells.

Nature of Cells: - Elongated cells, polygonal in surface view and elongated
nucleus.



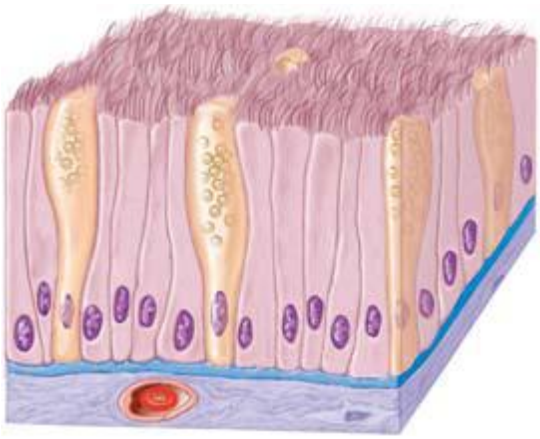
Location: - Stomach, small intestine, large intestine, Gall bladder.

Function: - Secretion, Absorption.

d) Ciliated epithelium: - It's made up of single layer.

Nature of Cells: - The cells may be Cuboidal (or) columnar. The cells have hair like structures called cilia on its border (or) free surface area.

The wave like movement of cilia propels the contents of the tube.



<u>Location</u>:- a) Cuboidal ciliated- urinary tubules.

b) Columnar ciliated – Fallopian tube, Bronchioles**.**

e) Glandular epithelium: -It forms the lining of alveoli and portion of ducts in the glands.

It's made up of cubical cells (or) short columnar cells (or) sometimes polyhedral cells.

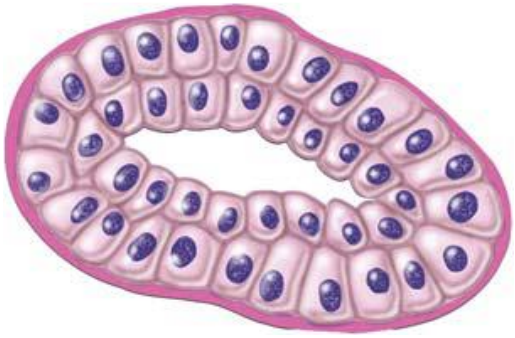
Functions: -Secretion, lubrication, dilution of irritants.

TYPES:

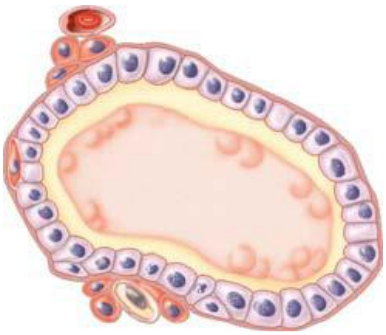
a) **<u>Exocrine gland</u>**:- It may unicellular (or) multi cellular.
   i) Unicellulareg; Gobbler cells.
   ii) Multi cellular eg; Tabular glands-Ileum

Secular gland – two types

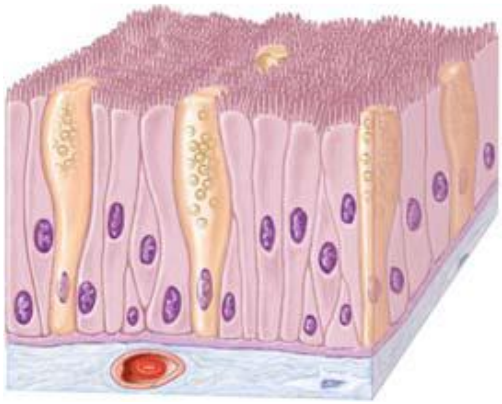
(i) Simple eg; Sebaceous gland
(ii) Compound eg; salivary gland.



b) **<u>Endocrine gland</u>**:- It's a ductless gland, sends secretion into blood by eg; Pituitary, pancreas, pineal etc.



2) **<u>Pseudo stratified epithelium:</u>** - The epithelium is named because it shows two incomplete layers of columnar cells.



In this tissue only on layer of cells are present all the cells touch the basement membrane but some short cells do not reach the surface.

This feature gives falls impression of multilayered appearance.

Location:- Large ducts of digestive glands, salivary glands and trachea.

3) **Compound epithelium**:- It consists of more than one layer of cells. It's divided into five types.
   I) Transitional epithelium.
   II) Stratified squamous keratinized epithelium.
   III) Stratified squamous non-keratinized
   IV) Stratified columnar ciliated epithelium.

I. **Transitional Epithelium:**- consists of three (or) four layers of cells and thereby it occupies inner-mediated position, between simple of compound epithelium.

The superficial layer is made up of large flat cells consists of two nuclei.

The second layer is made up of pyriform cells.

The next one (or) two layers are made up of polyhedral cells.

The cells are deforming capable without any disturbance to the function.

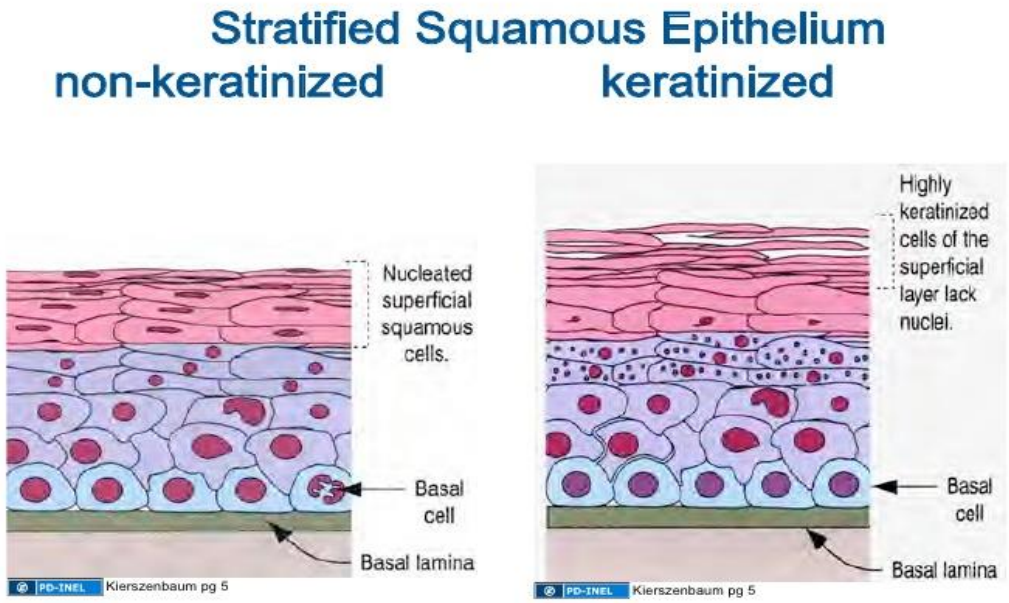
Location:- Pelvis of the kidney, urethra, urinary bladder upper part of the urethra.

2)**Stratified Squamous Keratinized Epithelium**:- It is compound of many layers of cells.

Nature of cells:-The superficial layer of cells are flat type and horny ,while depper layer cells are polyhedral.

Functions:-Horny layers prevents the loss of water and mechanical injury.

Location:-Skin, nails,hair,palms.



3)**Statified Squamous Keratinized Epithelium**:-It is made up of several layers of cells. No keratinisation.

Nature of cells:- living squamous cells.

Functions:-provides moderate protection.

Location:-buccal cavity,pharynx,oesophagus,cornes,vagina etc.

4)**Startified Columnar Epithelium**:-It is made up of many layers of polyhedral calles with superficial column or type of cells.

Nature of cells:-Elongated or columnar.

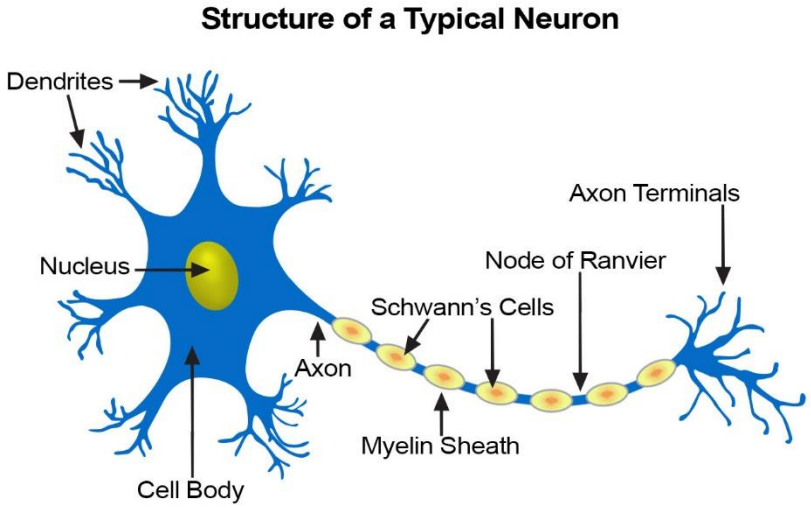
Location:- Epiglottis,urethra,mammary gland,pharynx,fornix of conjunctiva.

5)**Startified Columnar Ciliated Epithelium**:-The superficial layer is only columnar ciliated type of cells. The remaining layers are polyhedral cells.

Location:-Nasal surface of soft palate,some parts of larynx.

NERVOUS TISSUE

- Nerve cells are called Neurons.
- It's structural and functional unit of nervous system.
- Cell body (Cyton) consists of neuroplasm,nucleus, mitochondria and Golgi bodies.



The cell process is two types:

a) Dendron's (Dendrites):- These are much branched process for receiving impulses.

b) Axon: - A single long cylindrical process for conducting impulses away from cyton.

- The nerve fibres are of two types i.e., Myelinated and Non-Myelinated.
- The Myelinated nerve fibre has nodes of Ranvier which helps in rapid transmission of nerve impulses.
- The neurilemma consists of Schwann's cells which produce myelin sheath around the neurons.

Neuroglia: - It is supporting and packing cells found in brain, spinal cord and

Ganglia.

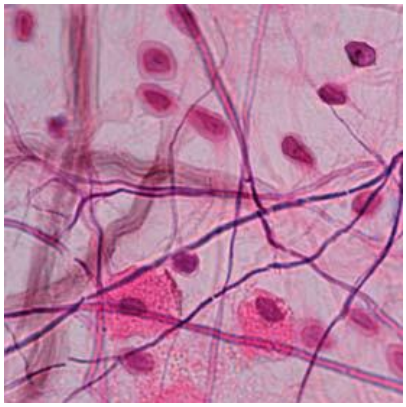
Functions: - To receive, discharge and transmit impulses.

Co-ordination and integration of the various activities of the body.

CONNECTIVE TISSUE

It's developed from mesoderm. They are of many types.

a) **Areolar Tissue**:- Transparent jelly like matrix is found. It contains various of cells like fibroblasts, histocytes, basophiles cells, plasma cells, most cells, pigment cells, mowlytes.



Two type's fibres are present:

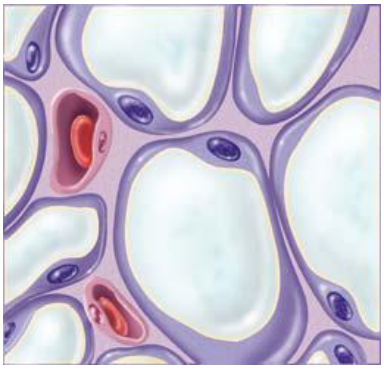
White fibre-Fine, wary flexible and un branched made up of collager proteins.

Yellow fibre- They are thick, straight, flexible, elastic and branched made up of elastic protein.

Function:- It connects the skin with muscle, blood vessels and nerves with the surrounding tissue, serve as packing material.

b) **Adipose tissue**:- It's made up of large round (or) oval flat cells containing fat droplets and fat globules. It's of 2 types.

(i) White adipose tissue (ii) Brown adipose tissue .Matrix contains fibroblasts, macrophages and fibres.



Location:- Sub-Cutaneous areas, mesentery.

Function:- Stores energy in the form of fat, gives shape to the limbs and

Body. Regulation of body Temperature.

c) **White fibrous tissue:-** It consists of white collagen fibres. The tissue is tough and vinelastic due to presence of protections called collagen.

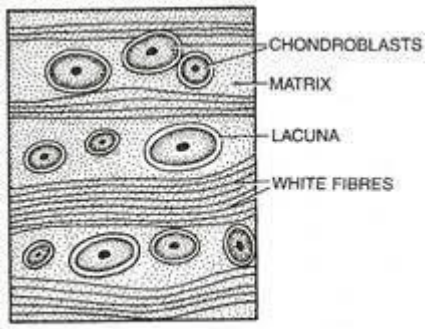


Fig. 7.20. White fibrous cartilage

Location:- It forms tendons, ligaments, articular capsule, capsule etc**.,**

d) **Yellow elastic tissue:**-It's atype of proper connective tissue.

- Fibres are straight, flexible, elastic and occur single and made up of elastic protein.
- They are thicker, branched and yellow in colour.

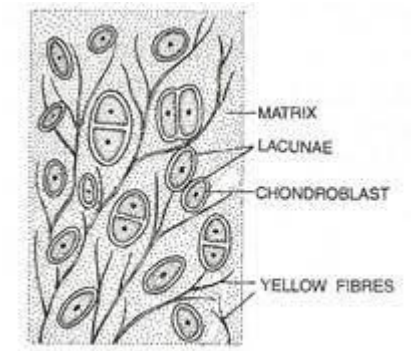
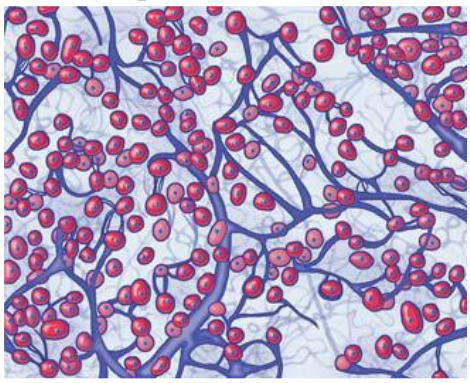


Fig. 7.21. Yellow elastic fibrocartilage.

- **Location**:- Lungs, walls of blood vessels, bronchioles,etc.
- **Function**:- Provides strength, movement of organs and also in expiration.

e) **Reticular tissue**:- It consists of reticular cells and reticular fibres.

- Reticular fibres are thinner than white fibres and branched.
- It's a member of reticular endothelial systems made up of reticular protein.



- **Location**:- Spleen, lymph gland, liver, bone marrow, etc.
- **Function**:- The cells are phagocytic and provide defence to the body.

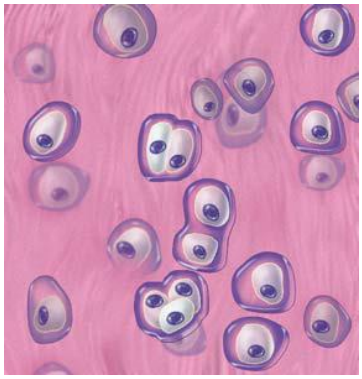
Skeletal tissue:

1) **Cartilage:-** It's more (or) translucent and firm in tenure and some extent elastic. It's made up of large amount of matrix cartilage cells and chondroblasts. It's divided into three types.
   i) Hyaline cartilage.

ii) Fibro cartilage.

iii) Elastic cartilage.

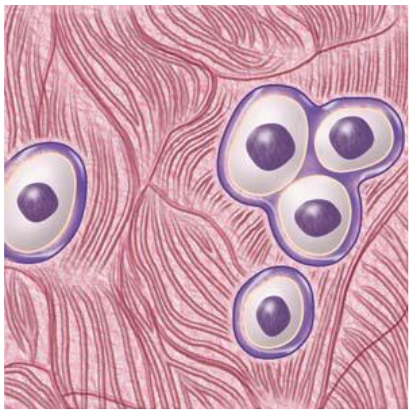
i) **Hyaline cartilage**: - It's made up of cartilage cells. It's made up of (or) it's surrounded by a tough layer of dense connective tissue called perichondrium.



Location: Articular ends of bones, costal cartilages, nose, larynx, Trachea, bronchi.

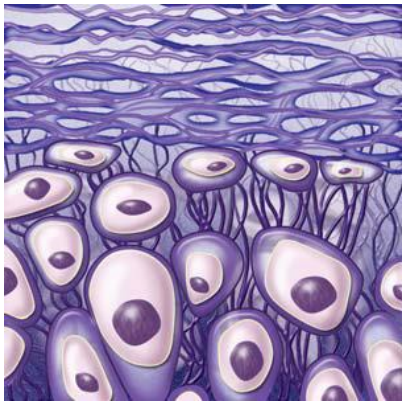
Function:- Maintenance of shape and rigidity of the structure.

ii) **Fibro Cartilage**:-It is present in places where great tensile strength
with flexibility, rigidity as required.



Location: Intervertebral discs, mandibular joint, public symphysis.

iii) **Elastic cartilage**: - It is yellow in colour and contains many elastic fibres and collagen fibres also.



Location:- In external ear, Eustachian tube, epiglottis and in some of the laryngeal cartilage.

Bone:- Compact bone tissue consists of osteocytes in matrix of calcium phosphate minerals.

Location:- From long network that support all organs of human body.

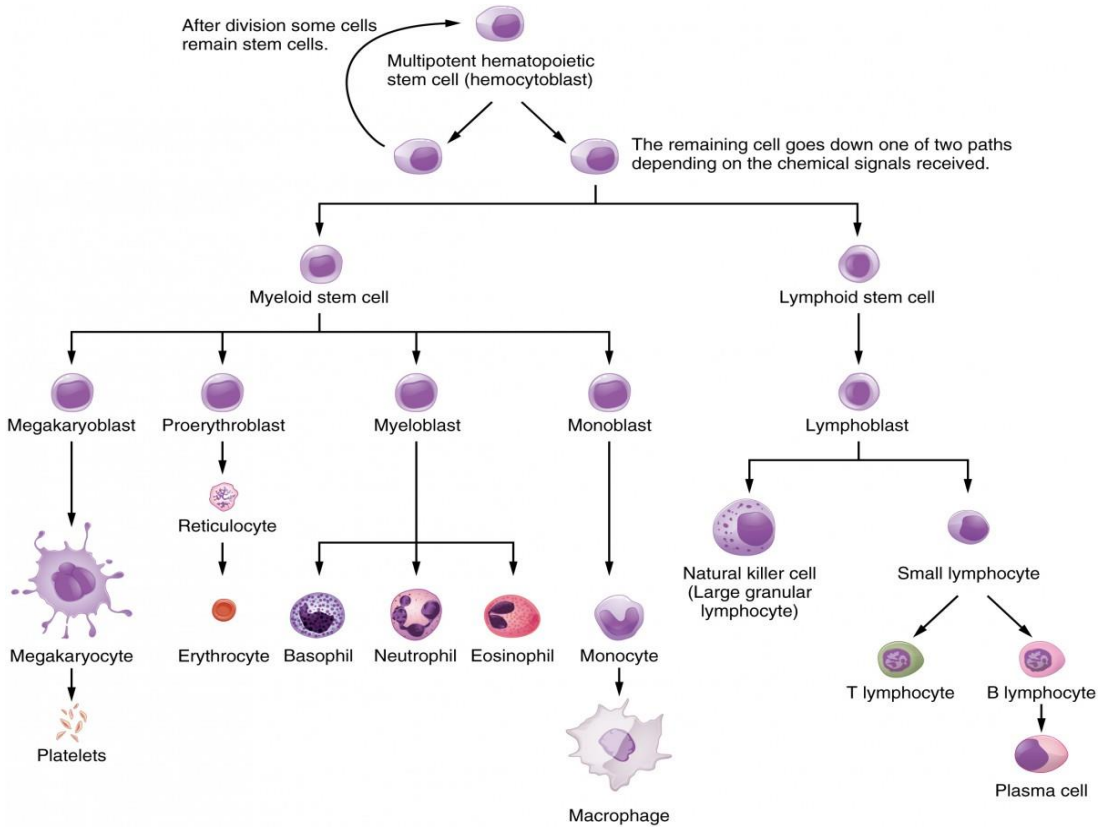
Function:- Support, protection, movement and storage.

Vascular tissue:

Blood: - It's a fluid connective tissue. It provides one of the means of communication between cells of different organs of the body and external environment. Exp. It carries

1) Oxygen from lungs to tissues and C02 from tissues to lungs for excretion.

2) Nutrients from alimentary canal to the tissues and cell waste to the exactor organs like Kidneys Blood consist of a straw coloured transparent fluid called plasma in which in which different types of cells are suspended.



Plasma:-It constitutes about 45-55% of blood vol. and it contains plasma proteins, inorganic salts, nutrients, hormones, gases.

Cellular Components of blood:-There are3 types of blood cells:

1) Erythrocytes (Red blood cells)
2) Leucocytes (White blood cells)
3) Platelets (Thrombocytes)

All the blood cells originate from pluripotent stem cells and go through several developmental stages before entering the blood. The formation of blood cells is called Hemopoiesis which takes place in red bone marrow.

Lymph:

a)The lymph is dear watery fluid present in the lymphatic vessels.

b)Interstitial fluid or tissue fluid an lymph are basically the same. The major difference between the two is location.

c)After entry of the interstitial fluid from the interstitial space into the lymphatic vessels is called as lymph.

MUSCULAR TISSUE

The muscle tissue originates from embryonic mesoderm. The muscle cell is called myocyte. They are of 3 types.

1) Skeletal Muscle.
2) Smooth Muscle.
3) Cardiac Muscle.

1) Skeletal Muscle:

- It's also called striated muscle.
- Shapes cylindrical, Multinucleate.
- Striations (alternate light and dark bands) are present
- Sarcoplasmic reticulum is well developed
- It's voluntary in function and gets fatigue soon.

- Intercalated discs are absent.
- They are innervated by motor nerves.
- Blood supply is abundant.
- Location:- Limbs, biceps and body wall.

2) Smooth Muscle:

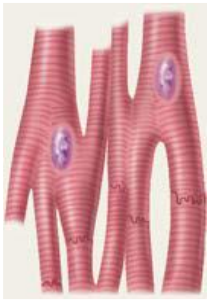
- It's also called visceral and involuntary muscle.
- Shape-Spindle, uninucleate, nucleus at the centre striations is absent.

- Sarcoplasmic reticulum is less developed.
- Involuntary in function and don't get fatigue soon.
- They contract slowly for a long time.
- They are innervated by ANS

Location:- Hollow visceral organs like GIT, blood vessels urinary bladder, biliary body, respiratory system etc.

3)Cardiac Muscle:-

- This tissue forms 3-D network.
- Shape-short, cylindrical and branched.
- Uninucleate –nucleus at the centre.



- Sarcoplasmic reticulum is less developed.
- Intercalated dieses are preset.
- Rhythmic contractions.
- Involuntary in function.
- Myofibrils distinct with faint light and dark band.
- They are innervatedby ANS

Location: Heart

Blood supply is abundant.

SKELETAL SYSTEM

The **human skeleton** is the internal framework of the body. It is composed of around 270 bones at birth – this total decreases to around 206 bones by adulthood after some bones get fused together.[1] The bone mass in the skeleton reaches maximum density around age 21. The human skeleton can be divided into the axial skeleton and the appendicular skeleton. The axial skeleton is formed by the vertebral column, the rib cage, the skull and other associated bones. The appendicular skeleton, which is attached to the axial skeleton, is formed by the shoulder girdle, the pelvic girdle and the bones of the upper and lower limbs.

Axial skeleton

The axial skeleton (80 bones) is formed by the vertebral column (32–34 bones; the number of the vertebrae differs from human to human as the lower 2 parts, sacral and coccyx geal bone may vary in length), a part of the rib cage (12 pairs of ribs and the sternum), and the skull (22 bones and 7 associated bones).

The upright posture of humans is maintained by the axial skeleton, which transmits the weight from the head, the trunk, and the upper extremities down to the lower extremities at the hip joint. The bones of the spine are supported by many ligaments. The erector spine muscles are also supporting and are useful for balance.

Appendicular skeleton

The appendicular skeleton (126 bones) is formed by the pectoral girdles, the upper limbs, the pelvic girdle or pelvis, and the lower limbs. Their functions are to make locomotion possible and to protect the major organs of digestion, excretion and reproduction.

Skull

It is also called as cranium. It forms a hallow structure in which the brain is present and protected. It consists of 22 bones in which they are classified as cranial and facial bones.

Cranial bones: they are 8 in number

Spheboid bone -1

Parietal bone-2

Osscipetal-1

Temporal bone-2

Frontal bone-1

Ethmoid bone-1

Facial bones: they are 14 in number including frontal lobe

Nasal-2

Maxilla -1

Zygotmaic-2

Lacrimal -2

Palatine-2

Inferior nasal chonchoe-2

Vomer-1

Mandible-1

Hyoid bone: the hyoid bone is in shaped bone that doesnot articulate with any another bone

It supports the tongue and provides attachment for some of the tongue muscls and m,uscle of pharynx and neck

Vertebral column: it is also called the back bone which gives support for the body to perfom any physical activity. It has 33 bones called vertebrae. Each individual bone of vertebral column is called vertebrae.

They are named a per their origin

Cervical vertebrae-7

Thoracic vertebrae-12

Lumbar-5

Sacral-1(5 fused vertebrae)

Coccyx-1(4 fused)

A typical characteristic vertebrae consists of vertebral body.

It is a curved supporting part of the body.

Vertebral foramen: hallow tubular hole through which the spinal cord passes

Neural arch: it is a curvature for spinal cord accommodation

Transverse process: these are the extensions of the vertebral body towards the lateral sides

Spinous process: it is an extended sharp line like structure from the vertebrae lamina which adjoins the adjacent vertebrae.

Transverse foramen: these are the small holes present in first 2 vertebrae from where the spinal cord artery passes.

- The first vertebrae is called atlas on which the brain rest. it has two facits on which the skull is placed. it brings about the nodding movement of the head
- The second vertebrae is called axis. It is adjacent to the atlas and has two facts. One for the atlas and other for adjacent vertebrae. It helps in side to side movement of neck
- Thoracic vertebrae present in thoracic region. They are rigid and movement is limited. It aids in the movement of the entire vertebral column.
- Lumbar vertebrae are found in back portion of abdomen.
- The sacrum is fused wedge shaped bone which adjoins with the pelvic girdle forming the ileo-sacral joint. It maintains the weight of the body. Hence, it is fused.
- Coccyx is the tail of the vertebral column and ends in the pelvic girdle

Various movements of the vertebral column:

Flexion, extension, rotation and support to the body.

Ribs and sternum: these are 13 pairs of ribs. The space between the ribs is called interleastal space. The part of the ribs close to the sternum is called hyaline coastal cartilage.

In the thoracic region the sternum consists of spar sterna notch, manubrinm body and xiphoid process.

Appendicular skeletal system:

The parts of the appendicular skeletal system are pectoral girdle, pelvic girdle, bones of upper and lower limb.

- Pectoral girdle: each of the two bodies. Pectoral girdle consists of clavicle and scapula .each pectoral girdle attacks on upper line to the axial skeleton.

- Bones of upper limb: each of two upper limbs contains 30 bones. The bone of each upper limb includes humerous (1), ulna (1), radial (1), carpals (8), metacarpals (5), and phalanges (14).
- Pelvic girdle: the pelvic girdle consists of two hip bones which are ileum, ischium, and pubic. The hip bones contain sacrum and pubic symphasis from the pelvic bone. Support the vertebral column. the pelvic viscera attaches the lower limbs to the axial skeletal.
- Bones of lower limb: each of the two limb consists 32 bones, they include femur (thigh bone), patella, tibia(1), fibula(1), tarsal(7), metatarsals(5), phalanges(14).the bones of the foot are arranged in two arches i.e. the longitudinal arch and transverse arch to provide the movement.

RECORDING OF BASAL MASS INDEX

Aim: to record the basal mass index

Principle: The basal mass index also known as Quetelet index is derived from the weight and height of an individual. This used to access the body composition and provide an estimate on the content of fat in the body. The values obtained by the calculation helps in determining if the subject is underweight, normal weight or over weight. This is mainly used as a screening tool and not a diagnostic test.

The BMI is calculated by dividing weight by height square. The BMI is categorized as 18.5 kg/m^2 for underweight, 18.5-25 18.5 kg/m^2 is normal weight and 25 to 30 kg/m^2 is overweight and >30 kg/m^2 is obese.

The calculation of BMI has its limitations. It does not depend on age and gender. It only uses height and weight for calculations.

Requirements: height scale and weighing scale.

Procedure:

1. Measure the height of the subject using a height scale in metres.
2. Weight the subject on a weighing scale in kgs.
3. Calculate the BMI of the subject using the formula weight (kgs) / height (m^2).

Observation: The BMI of the subject was found to be ……..

Report :

Name:

Age:

Gender:

Date :

Normal BMI:

Observed BMI:

Demonstartion of Reflex Activity

A reflex may be defined as a response to a stimulus that does not require the intervention of consciousness. A simple reflex involves only a small part of the central nervous system, perhaps just one segment of the spinal cord or one small nucleus in the brain. A reflex, or reflex action, is an involuntary and nearly instantaneous movement in response to a stimulus. A reflex is made possible by neural pathways called reflex arcs which can act on an impulse before that impulse reaches the brain. The reflex is then an automatic response to a stimulus that does not receive or need conscious thought.

They developed the concept of synaptic states of excitation and inhibition, elucidating the principles of the transmitting process and demonstrating the dependence of reflex function on the character of receptor discharges. All varieties of reflexes serve a common purpose-to carry out an organized function of a particular organ for the protection and well-being of the body. In higher animals and in the human being, the spinal reflexes are under so much control of brain mechanisms that their own individual role is apt to be overlooked. Nevertheless, many actions are performed involuntarily with perfect ease and coordination when there is no obviously conscious direction.

The reflex arc

All reflexes have three essential components-an **afferent limb, a reflex center and an efferent limb.**

1. Afferent limb. This comprises a receptor and its sensory axon. The nutrient cell lies in a dorsal root ganglion (or cranial equivalent), and the central process passes into the spinal cord via the dorsal root.

2. Reflex center. This lies in the gray matter of the anterior horn, connecting the two limbs of the arc. A two-neuron arc reflex is one in which the afferent limb makes a direct connection with the center and only one synapse is involved. Such reflexes are also termed monosynaptic. If the afferent limb ends in the dorsal horn, one or more interneurons link it to the center to form a multi-neuron reflex arc in which many synapses may be involved. Such reflexes are therefore called polysynaptic.

3. Efferent limb. This consists of an anterior horn cell, its axon or motor nerve fiber, and the muscle fibers it supplies. The skeletal muscle that responds to reflex stimulation is termed the effector organ. The knee jerk is an example of a simple monosynaptic reflex. When the patella tendon is tapped, the quadriceps muscle is stretched and impulses generated by the muscle spindles enter the spinal cord by the lumbar dorsal roots. As a result of this the motoneurons supplying the quadriceps are excited and the muscle contracts. The afferent impulses entering the dorsal horn may pass up or down the spinal cord through many segments before reaching their motoneurons.

Myotatic reflexes:

The myotatic reflexes (also known as deep tendon reflexes), provide information on the integrity of the central nervous system and peripheral nervous system. Generally, decreased reflexes indicate a peripheral problem, and lively or exaggerated reflexes a central one. A stretch reflex is the contraction of a muscle in response to its lengthwise stretch.

Biceps reflex (C5, C6)

Brachioradialis reflex (C5, C6, C7)

Extensor digitorum reflex (C6, C7)

Triceps reflex (C6, C7, C8)

Patellar reflex or knee-jerk reflex (L2, L3, L4)

Ankle jerk reflex (Achilles reflex) (S1, S2)

While the reflexes above are stimulated mechanically, the term H-reflex refers to the analogous reflex stimulated electrically, and tonic vibration reflex for those stimulated to vibration.

Tendon reflex

A tendon reflex is the contraction of a muscle in response to striking its tendon. The Golgi tendon reflex is the inverse of a stretch reflex.

Reflexes involving cranial nerves

Name	**Sensory**	**Motor**
Pupillary light reflex	II	III
Accommodation reflex	II	III
Jaw jerk reflex	V	V
Corneal reflex, also known as the blink reflex	V	VII
Glabellar reflex	V	VII
Vestibulo-ocular reflex	VIII	III, IV, VI +
Gag reflex	IX	X

Many of these reflexes are quite complex requiring a number of synapses in a number of different nuclei in the CNS (e.g., the escape reflex). Others of these involve just a couple of synapses to function (e.g., the withdrawal reflex). Processes such as breathing, digestion, and the maintenance of the heartbeat can also be regarded as reflex actions, according to some definitions of the term.

Grading

In medicine, reflexes are often used to assess the health of the nervous system. Doctors will typically grade the activity of a reflex on a scale from 0 to 4.While 2+ is considered normal, some healthy individuals are hypo-reflexive and register all reflexes at 1+, while others are hyper-reflexive and register all reflexes at 3+.

Grade	Description
0	Absent
1+ or +	Hypoactive
2+ or ++	"Normal"
3+ or +++	Hyperactive without clonus
4+ or ++++	Hyperactive with clonus

Demonstration of Visual Acuity

Definition of Visual Acuity

Visual acuity is a measurement of central vision only. It is the assessment of total visual system from cornea to occipital cortex.

Visual acuity can be tested for both distance and near vision. Distance visual acuity is the most common test.

Normal Vision 6/6 :

Normal vision relies on the following:

• Both eyes in alignment (extraocular muscles functioning)

• Clear cornea

• Clear lens of the eye

• Clear ocular media (aqueous and vitreous)

• Intact retina, optic nerve, visual pathway

Why do a visual acuity test?

• Diagnostic tool

• Baseline data

• Measures progression of disease

• Evaluates treatment

• Legal requirement

Vision Testing Tools: The **Snellen** Chart is used in most facilities for testing distance vision. They are designed to be read at 6 metres or 3 metres (usually indicated on chart)

How is the Visual acity test or Snellen test performed?

This test may be done in a health care provider's office, a school, workplace, or elsewhere.

The person will be asked to remove your glasses or contact lenses and stand or sit 20 feet (6 meters) from the eye chart. He/she will keep both eyes open. He/she will be asked to cover one eye with the palm of your hand, a piece of paper, or a small paddle while you read out loud the smallest line of letters you

can see on the chart. Numbers, lines, or pictures are used for people who cannot read, especially children.

If the person is not sure of the letter, he/she may guess. This test is done on each eye, and one at a time. If needed, it is repeated while one wears your glasses or contacts. One may also be asked to read letters or numbers from a card held 14 inches (36 centimeters) from your face. This will test near vision.

Visual acuity is expressed as a fraction.

- ✓ The top number refers to the distance you stand from the chart. This is often 20 feet (6 meters).
- ✓ The bottom number indicates the distance at which a person with normal eyesight could read the same line you correctly read.

For example, 20/20 is considered normal. 20/40 indicates that the line you correctly read at 20 feet (6 meters) away can be read by a person with normal vision from 40 feet (12 meters) away. Outside of the United States, the visual acuity is expressed as a decimal number. For example, 20/20 is 1.0, 20/40 is 0.5, 20/80 is 0.25, 20/100 is 0.2, and so on.

Even if you miss one or two letters on the smallest line you can read, you are still considered to have vision equal to that line.

What do Abnormal Results Mean?

Abnormal results may be a sign that you need glasses or contacts. Or it may mean that you have an eye condition that needs further evaluation by a provider.

Distance Correction:

Visual acuity is a measure of best corrected distance vision

- ✓ People who are short-sighted and normally wear glasses or contact lenses should have their visual acuity tested wearing their glasses, i.e. their vision has been corrected
- ✓ If glasses or contact lenses are prescribed and available, testing without them provides no relevant information
- ✓ If glasses or contact lenses are prescribed but not available document before testing
- ✓ Always ask if patients have distance glasses (e.g. to drive or watch TV) as some people do not wear them all the time

- ✓ Reading glasses (magnifiers) should not be worn during distance testing
- ✓ Reading glasses can distort distance vision
- ✓ Contact lenses should be documented but not removed for the test

Determination of Heart Rate and Pulse Rate

Aim: To determine the heart rate and pulse rate of an individual

Principle: The alternate expansion and recoil of elastic arteries after each systole of the left ventricle creates a travelling pressure wave that is called 'pulse'.

The pulse is the surge of blood that is pushed through the arteries when the heart beats. Pulse rate is the number of times your heart beats every minute or the number of times your heart beats in one minute. Pulse is lower when a person is at rest and higher when you exercise.

Heart Rate is the number of pulses over a minute and is the standard heart measurement. Heat rate can vary from person to person. The heart rate can be taken at any spot on the body at which an artery is close to the surface and pulse can be felt.

The most common place to measure the heart rate using the palpitation method is at the wrist (radial artery) and neck (carotid artery). Other places that are used sometimes are the elbow (brachial artery) and the groin (femoral artery), ankle and foot.

One should always use his/her fingers to take a pulse, not the thumb in particular when recording someone's pulse as you can sometimes feel your own pulse through your thumb.

A healthy pulse is between 60 and 100 beats per minute (bpm). Besides the pulse rate, other indicators of how a person is doing come from the regularity and strength of the pulse.

Many factors can influence heart rate including activity level, fitness level, air temperature, body position, emotions, body size and medications.

Procedure:

Manual Method – Radial pulse (wrist)

1. **Locating the pulse**

a. Have the patient hold his or her hand out with palm facing upwards
b. Place two fingers (index and middle finger) between the bone and tendon on your radial artery, which is located on the thumb, side of your wrist about half inch on the inside of the joint in line with the index finger. The pulse feels like a rhythmic thumping.

2. **Count the beats**

a. Compress the artery against a bone or a firm structure. Using a clock or a watch with seconds hand, time yourself counting the pulsating beats for one minute.

Carotid pulse (neck): Place your index and third finger on your neck to the side of your windpipe. Be careful not to press too hard. Then count the number of beats for a minute.

Clinical Significance:

Tachycardia – Increased heart or pulse rate over 100 bpm.

Bradycardia- Slow resting heart or pulse under 50 bpm.

Observation: Heart rate or pulse rate is observed to be
…….

Report:

Name-

Age-

Sex-

Date -

Method -

Normal value-

Observed value-

SENSE ORGANS-EAR

AIM: To study the anatomy and physiology of human ear with the help of chat and model.

It has 3 parts

1. **External Ear:** It consists of the following organs

   Pinna: It is an oval funnel shaped organ. It is made up of elastic cartilage. It collects sound waves.
   External auditory canal: A tube like structure that connects to tympanic membrane.
   Tympanic membrane or Ear drum: A thin oval membranous structure is made up of connective tissue.
2. **Middle Ear:** It concicts of tympanic cavity. It connects with nasopharynx by a passage called Eustachian tube. It controls the air pressure of the cavity by a passage called fenestra ovalis (oval window). The lower window is called fenestra rotendum (round window).

   There are 3 types of ear ossicles- Malleus, incus, stapes.
   Malleus- It is the oute hammer shaped osscile. It is attached to tympanic membrane.
   Incus- One end is connected to malleus and other to stapes.
   Stapes- It fits into oval window.
3. **Inner Ear:** It has the following organs

   Membranous labyrinth and bony labyrinth: Membranous labyrinth is surrounded by bony labyrinth. Both are separated by perilymph space which is filled with perilymph. Membrane labyrinth is also filled with fluid endolymph. Labyrinth consists of 3 structures
   a. **Vestibule:** It is a sac like structure containing utricle and sacula. The vestibule bears macula of utricle and macula of sacula. A macula consists of hair cells and supporting cells.
   b. **Semicircular canals:** There are three semicircular canals-superior, posterior and lateral arranged at right angles to each other. Each canal has enlarged structures called ampulla. Each ampulla consists

of sensory structures called crista ampullaris which helps in maintenance of equilibrium.

c. **Cochlea:** It is a long delicately coiled tube enclosing into the cochlear canal. The cochlear ducts with cochlear canal are collectively referred to as cochlea. The cochlea has 3 chambers

-**Scala media**: Middle chamber
-Scala vestibule: Upper chamber
-Scala tympani: Lower chamber
The middle chamber is filled with endolymph. The floor of the scala media is called basilar membrane which bears organ of corti. Scala vestibule and scala tympani are filled with perilymph. They are joined to each other by helicotrima.
Organ of corti: It consists of receptor cells (hair cells) and supporting cells. The supporting cells have long pillar cells and short dieter's cells.

Physiology of Hearing: The pinna receives the sound wave which is passed through external auditory canal and strikes the tympanic membrane. The vibrations are transmitted to fenestra ovalis through ear ossicles. From there they are finally transmitted to organ of corti through perilymph and endolymph. The nerve impulses are generated which are carried by VIII Cranial nerve to the temporal lobe in the brain.

Equilibrium (Maintenance of Balance)

1. **Dynamic equilibrium** –Cristae controls the dynamic movement. The movement of the head causing bending of hairs of cristae and flow of endolymph to generate impulse. The impulse is carried to the brain through the VIII cranial nerve.
2. **Static equilibrium**- It is controlled by maculae. The change of the head or body with respect to gravity causes deflection of hair cells of maculae. They initiate nerve impulse which carried to the brain through the VIII cranial nerve.

Sense Organs –Nose

The nose consists of the ***external nose*** and the ***nasal cavity***. Both are divided by a septum into right and left halves. The external nose has two elliptical orifices called the naris (nostrils), which are separated from each other by the nasal septum. The lateral margin, the ala nasi, is rounded and mobile.

The framework of the external nose is made up above by the nasal bones, the frontal processes of the maxillae, and the nasal part of the frontal bone. Below, the framework is formed of plates of hyaline cartilage.

Blood supply of the External Nose: The skin of the external nose is supplied by branches of the ophthalmic and the maxillary arteries.The skin of the ala and the lower part of the septum are supplied by branches from the facial artery.

Nerve Supply of External nose: The infratrochlear and external nasal branches of the ophthalmic nerve (CN V) and the infraorbital branch of the maxillary nerve (CN V).

- **The nasal cavity has**
  - **A floor**- Palatine process -maxilla, Horizontal plate palatine bone
  - **A roof**-Narrow, It is formed anteriorly beneath the bridge of the nose by the nasal and frontal bones, in the middle by the cribriform plate of the ethmoid, located beneath the anterior cranial fossa, posteriorly by the downward sloping body of the sphenoid
  - **A lateral wall**-Marked by 3 projections: Superior concha, Middle concha, Inferior concha. The space below each concha is called a meatus.
- **Inferior meatus:** nasolacrimal duct

- **Middle meatus:**
  - Maxillary sinus
  - Frontal sinus
  - Anterior ethmoid sinuses
- **Superior meatus:** posterior ethmoid sinuses
- **Sphenoethmoidal recess:** sphenoid sinus

  - **A medial or septal wall**- The Nasal Septum divides the nasal cavity into right and left halves. It has osseous and cartilaginous parts. Nasal septum consists of the **perpendicular plate of the ethmoid** bone (superior), the **vomer** (inferior) and **septial cartilage** (anterior).

The Paranasal Sinuses: The paranasal sinuses are cavities found in the interior of the maxilla, frontal, sphenoid, and ethmoid bones . They are lined with mucoperiosteum and filled with air. They communicate with the nasal cavity through relatively small apertures

Drainage of Mucus and Function of Paranasal Sinuses: The mucus produced by the mucous membrane is moved into the nose by ciliary action of the columnar cells. Drainage of the mucus is also achieved by the siphon action created during the blowing of the nose.

Functions: Resonators of the voice, they also reduce the skulls weight**,** help wam and moisten inhaled air **and** act as shock absorbers in trauma.

Maxillary Sinuses: Pyramidal in shape, Paired & symmetric, Located within the body of the maxilla behind the skin of the cheek. The roof is formed by the floor of the orbit, and the floor is related to the roots of the 2^{nd} premolars and 1^{st} molar teeth. The maxillary sinus opens into the middle meatus of the nose.

Frontal Sinuses: Rarely symmetrical, Contained within the frontal bone. Separated from each other by a bony septum.Each sinus is roughly triangular. Extending upward above the medial end of the eyebrow and backward into the medial part of the roof of the orbit. Opens into the middle meatus.

Sphenoidal Sinuses: Lie within the body of the sphenoid bone, Below sella turcica, Extends between dorsum sellae and post clinoid processes, Opens into the sphenoethmoidal recess above the superior concha.

Ethmoid Sinuses : They are anterior, middle, and posterior. They are contained within the ethmoid bone, between the nose and the orbit. Anterior & middle-drains into middle nasal meatus, Posterior-drain into superior nasal meatus. Separated from the orbit by a thin plate of bone so that infection can readily spread from the sinuses into the orbit.

STRUCTUREOF THE EYE

AIM: To study the anatomy and physiology of human eye with the help of chart and model.

PRINCIPLE: A pair of eye (organ of vision)is situated in the orbits of the skull.

STRUCTURE: The eye is made up of three coats, or layers, enclosing various anatomical structures. The outermost layer, known as the fibrous tunic, is composed of the cornea and sclera. The middle layer, known as the vascular tunic or uvea, consists of the choroid, ciliary body, pigmented epithelium and iris. The innermost is the retina, which gets its oxygenation from the blood vessels of the choroid (posteriorly) as well as the retinal vessels (anteriorly).

FIBROUS COAT:

Sclera The sclera is the white part of the eye, and its main function is to provide strength, structure, and protection for the eye

Cornea: It is the transparent layer of skin that is spread over the pupil and the iris. The main role of the cornea is to refract the light that enters the eyes

VASCULAR COAT:

- **Choroid:** the middle layer of the eye between the retina and the sclera. It also contains a pigment that absorbs excess light so preventing blurring of vision.
    - **Iris:** regulates the amount of light that enters your eye. It forms the coloured, visible part of your eye in front of the lens. Light enters through a central opening called the pupil.
    - **Pupil:** the circular opening in the centre of the iris through which light passes into the lens of the eye. The iris controls widening and narrowing (dilation and constriction) of the pupil.

- **Ciliary body:** the part of the eye that connects the choroid to the iris.

INNER COAT: also called as retina and is made of four layers

1.pigmented layer: reduces the scattering of light in the eye.

2.receptor layer:contains rods and cones

3. bipolar nerve cells

4.gangilion cells

MACULA LUTEA (YELLOW SPOT):

A small area on the retina which is situated just opposite to the centre of the cornea.Its middle depression is called as fovea centralisis.The blind spot is the point in the retina from where the optic nerve leaves the eye spot.

- **Rod cells** are one of the two types of light-sensitive cells in the retina of the eye. There are about 125 million rods, which are necessary for seeing in dim light.
- **Cone cells** are the second type of light sensitive cells in the retina of the eye. The human retina contains between six and seven million cones; they function best in bright light and are essential for acute vision (receiving a sharp accurate image). It is thought that there are three types of cones, each sensitive to the wavelength of a different primary colour – red, green or blue. Other colours are seen as combinations of these primary colours.
  The aqueous humour is a clear watery fluid that is contained in two areas: the anterior chamberbetween the cornea and the iris, and the posterior chamber between the iris and the lens

WORKING OF EYE:

The lens along with the cornea,aqueous and vitrous humour acts as focusing part.It refracts light rays passing through the eye.The image is focused by retina and created by rods and cones. Finally carried through optic nerve to the occipital lobe of the brain where he real perception of upright vision is experienced.

HUMAN TONGUE

It is of importance in the digestive system and is the primary organ of taste in the gustatory system. The **tongue's** upper surface (dorsum) is covered by taste buds housed in numerous lingual papillae. ... The **human tongue** is divided into two parts, an oral part at the front and a pharyngeal part at the back.

Surface Features of the Tongue

The **lingual papillae** contain the taste buds and are located on the anterior surface (body and tip) of the tongue :

1. **Vallate papillae** are large and flat papillae arranged in a V-shaped row just in front (anterior) of the terminal sulcus.
2. **Foliate papillae** are poorly developed folds on the side of the tongue.
3. **Filiform papillae** are long, conical, pinkish gray projections that are sensitive to touch.
4. **Fungiform papillae** are pink to red spots distributed between the filiform papillae and are most dense at the apex and margins of the tongue.

Parts of the Tongue

The top of the tongue (superior surface) has a V-shaped line known as the terminal sulcus that divides the tongue into the anterior and posterior surfaces.

- The **anterior** surface is made up of the apex at the tip and body.
- The **posterior** surface is made up entirely of the root.

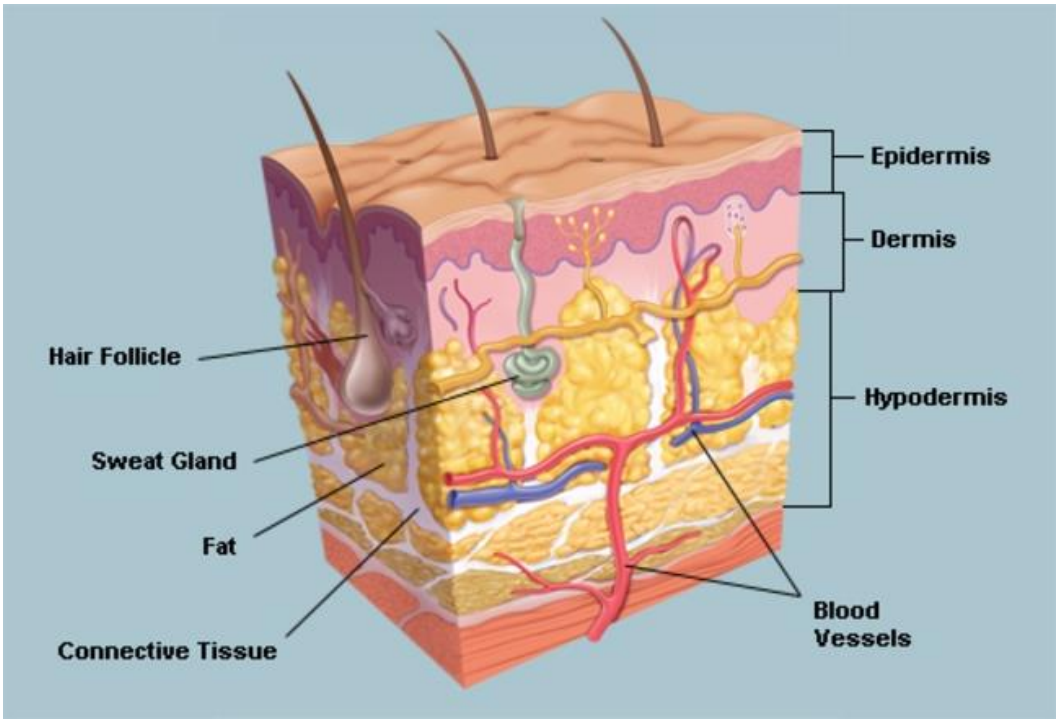
The inferior surface of the tongue (underside) is also made up of the body and apex.

Functions of the Tongue

1. **Taste**. The taste buds, the sensory receptors for taste, are located on the tongue.
2. **Speech**. The movements of the tongue are crucial for articulation.
3. **Chewing** and **swallowing**. The tongue helps the teeth and other parts of the mouth with chewing food and passing it down the throat as the first part of the swallowing process.
4. **Cleaning**. The movements of the tongue dislodge food particles stuck between the teeth, gum and cheek so that it can be spat out or swallowed.

SKIN

The skin is considered the largest organ of the body and has many different functions. The skin functions in thermoregulation, protection, metabolic functions and sensation. The skin is divided into two main regions, the epidermis, and the dermis, each providing a distinct role in the overall function of the skin. The dermis is attached to an underlying hypodermis, also called subcutaneous connective tissue, which stores adipose tissue and is recognized as the superficial fascia of gross anatomy.



STRUCTURE OF THE SKIN

Skin has three layers:

- The epidermis, the outermost layer of skin, provides a waterproof barrier and creates our skin tone.
- The dermis, beneath the epidermis, contains tough connective tissue, hair follicles, and sweat glands.
- The deeper subcutaneous tissue (hypodermis) is made of fat and connective tissue.

The skin's color is created by special cells called melanocytes, which produce the pigment melanin. Melanocytes are located in the epidermis.

FUNCTIONS OF THE SKIN

The skin has very important vital functions for keeping the physiological and biochemical conditions of the body in its optimum state. The most important functions of the skin are:

1. Regulates body temperature.
2. Prevents loss of essential body fluids, and penetration of toxic substances.
3. Protection of the body from harmful effects of the sun and radiation.
4. Excretes toxic substances with sweat.
5. Mechanical support.
6. Immunological function mediated by Langerhans cells.
7. Sensory organ for touch, heat, cold, socio-sexual and emotional sensations.
8. Vitamin D synthesis from its precursors under the effect of sunlight and introversion of steroids.

RESPIRATORY SYSTEM

Respiratory system which involves respiration and defined as exchange of gases between body tissues and external environment supply of oxygen to the tissues and elimination of carbon dioxide occurs only through respiration

PARTS OF RESPIRATORY SYSTEM

The respiratory system consists of following parts

Nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles, alveoli.

FUNCTIONS

- Transport of oxygen to tissues and elimination of carbon dioxide.
- Elimination of volatile substances like ammonia.
- Regulation of temperature through loss of heat in the expired air.
- Maintainence of ph of the body.
- Regulation of water balance through elimination of water vapour.

URINARY SYSTEM

Urinary system is the main excretory system of the body. It consists of kidneys 2ureters, urinary bladder, and 1urethra.

KIDNEY:

They are bean shaped organs living on posterior abdominal wall one on each side of vertebral column. The kidneys extend from level oflast thoracic vertebrae by an to 3rd lumbar vertebrae kidney is surrounded by an outer fibrous capsule outer cortex and inner medulla and upper expanded end of uterus called pelvis.

URETER:

It is the duct which carries urine from the kidney to bladder. It is tube like structure and comes from the pelvis of kidney.

URINARY BLADDER:

It is a pear shaped muscular sac which acts as a reservoir for urine. It lies in the pelvic cavity and lower part is bone and upper part is fundus.

URETHRA:

It is a canal in which urine passes bladder to that outside. It is different in males and females but a spintcer is present in both.

FUNCTIONS

Excretion of water and waste products of protein metabolism, excretion of excess salt, excretion of harmful substances, drugs and toxins, regulation of ph of blood.

CARDIO VASCULAR SYSTEM

LOCATION OF HEART: The heart lies in thorax between the lungs and behind sternum. 2/3rd of heart is on left side. It lies obliquely. It is divided more towards the left side on right side. The apex of heart lies at level of 5th inter coastal space, 9cm to right of midline.

STRUCTURE OF HEART:

Heart is surrounded by outer covering called pericardium in which two layers are called as visceral pericardium, parietal pericardium is present. Pericardial Fluid is present between the middle layer is made up of heart muscle called myocardium. The heart contains 4 chambers mainly right atrium, right ventricle, left atrium, left ventricle. They are divided by artery venous drain by coronary veins.

Blood supply- Nerve supply is by sympathetic and parasympathetic nerve.

FUNCTIONS:

- Heart acts as a pump.
- It maintains constant circulation of blood throughout the body.

STUDY OF DIGESTIVE SYSTEM

DIGESTIVE SYSTEM

The digestive system of gastrointestinal tract and its glands .The functions of gastrointestinal tract are ingestion, digestion, absorption of food and excretion of waste products.

PARTS OF DIGESTIVE SYSTEM

The digestive system consists of the following parts mainly mouth, pharynx, oesophagus, stomach, small intestine, large intestine, rectum and anus.

FUNCTIONS

- The tongue helps in mastication and regulation and speech and taste.
- Saliva acts as a solvent for food and helps in swallowing and also moisture, lubricants and cleans the mouth.

- Pharynx and oesophagus helps in formation of bolus and swallowing
- Stomach acts as temporary storage allowing time for digestive enzyme to act.
- It provides chemical digestion and mechanical breakdown of food and provides nonspecific defence.
- Chemical digestion of carbohydrates, proteins and fats takes place in small intestine.
- It also provides protection against microbes and helps in digestion (absorption of nutrients).
- Absorption and microbial activity takes place in large intestine.
- Defecation and mass movement occurs through rectum and anus.

RECORDING OF THE BODY TEMPERATURE

AIM: To record the body temperature of the patient.

PRINCIPLE: The temperature inside the body defined as “core temperature”, while the temperature of the skin or tissues underlying the skin or tissues is referred as “surface temperature”. The core temperature remains almost constant well with in ± 1 degree F expect when a individual develops a febrile illness. Temperature is maintained by thermoregulators which receive impulses from thalamic receptors that carry core/blood temperature and surface receptors that temperature of the skin. Thermoregulatory center after receiving impulses works with two mechanisms.

- **Heat conservation system**
- **Heat loss system**

Tempertature is maintained normally when homeostasis is attained. No single temperature level can be concluded to be normal, hence the temperature level is expresses in a range- oral temperature – 97 degree F to 99 degree F or 36.11 degree to 37.22 degree C. The body temperature is maintained at a constant level by thermoregulatory mechanism. The body temperature varies with exercise and returns of the surrounding. The body temperature above normal range is defined as ‘fever’.

Harmful effects of temperature:

When the body temperature rises above approximately 106 degree F, the parenchyma of any cells usually begins to be damaged. Pathological findings in a person who dies of hyperpyrexia showed degeneration of cells throughout the entire body. The brain is especially likely to suffer because neural cells or neurons once destroyed cannot be replaced.

PROCEDURE:

Body temperature is measured by clinical thermometer. The bulb of the thermometer is kept either in axilla (arm pits) or mouth. The rise in mercury level column is observed and accordingly temperature is recorded.

REPORT:

Patient Name:

Normal Values:

Body temperature:

Date: