GENERALIZED ANIMAL CELL

- Cells are the basic organizational units of life
- A typical animal cell has a plasma membrane surrounding the nucleus and the cytoplasm.
- Plasma membrance is a phospholipid bilayer that forms a fluid sea in which specific proteins float like icebergs.
- Membrance proteins include **peripheral proteins and intrinsic proteins**
- Proteins help to move ions or molecules across the membrance are some intristic proteins.
- **Plasma membrane is selectively permeable** and helps in the maintenance of cellular homeostasis.
- Molecules can move across the plasma membrane by simple diffusion, faciliated diffusion, osmosis, filtration, active transport, exocytosis, and by three types of endocytosis i.e pinocytosis (cell - drinking), hagocytosis (cell - eating), and receptor - mediated endocytosis.
- Fluid portion of the cytoplasm is called the cytosol.
- Cytomembrane system is suspended with in the **cytosol.**
- Cytomembrane system include endoplasmic reticulum, Golgi apparatus, vesicles, vacuoles, etc.
- Non-membrane-bound ultramicroscopic structures of cytosol are **ribosomes.**
- Animal cells has both 80S ribosome 70S ribosomes occur in mitochondrial matrix.
- 80S ribosomes present in the cytoplasm, 70S ribosomes occur in mitochodrial matrix.
- The clusters of ribosomes connected by a strand of mRNA are called **polyribosomes or polysomes.**
- Ribosomes are the **workbenches** of the cells, **carry out protein synthesis**
- Endoplasmic reticulum (ER) is a network of membrane - bound cisternae (flattened sacs), and tubules.
- The ER with attrached ribosomes is **rough ER,** it is the site for **protein synthesis.**
- ER without ribosomes is **smooth ER,** is a site for lipid production and detoxification of drugs.
- Proteins formed by ribosomes sealed off in little packets called **transition vesicles.**
- The cell organelles which are most abundant in secretory cells are Golgi apparatus.
- Transition vesicles formed from the ER fuse wikth Golgi apparatus at the cis - face.
- In the Golgi apparatus the proteins are **concentrated, modified and are packaged** into secretory vesicles.
- Secretory vesicles formed from Golgi reach the plasma membrane and release contents to the outside of the cell by exocytosis.
- Secretory vesicles are formed from the trans-face of Golgi apparatus.
- Membrane - bound spherical organelles that contain enzymes called acid hydrolases are **lysosomes.**
- Lysosomes are involved in **intracellular digestion.**
- Lysosomes are also called **suicidal bags, due to their role in autolysis of injured or diseased cells.**
- Lysosomes helpful to recycle worm-out cellular components.
- Mitochondria are the **semiautonomous** organelles.
- Enzymes involved in Kreb's cycle are present in **mitochondrial matrix.**
- Enzymes of the electron transport chain and the ATP synthetase are present in the inner membrane of the mitochondria.
- Mitochondria are the **power houses** of the cell
- The thickest cytoskeleton is microtubules and the thinnest cytoskeleton is microfilaments.

- Microtubules are hollow, slender, cylindrical structures, made up of spiralling subunits of globular proteins called **tubulin subunits**.
- Microtubules help in movement of organelles, movement of chromosome and form a part of transport system within the cell.
- Microtubules are involved in the overall shape-changes of the cell during the periods of specialization.
- Intermediate filaments are made up of various types of proteins.
- Intermediate filament help in maintaining the cell shape and the position of organelles.
- Intermediate filaments also promote mechanical activities withing the cytoplasm.
- Microfilaments are solid strings, made up of actin molecules.
- Microfilaments are most highly developed in muscle cells.
- In non muscle cells microfilaments provided mechanical support for various cellular structures.
- Amoeboid movement are due to microfilaments.
- Microtubule - organizing centre (MTOC) of the cell is **centrosome.**
- Centrosome has a pair of centrioles that lie at right angles to each other.
- Centrioles are absent in plant cells
- The control - and - information centre of the cell is **nucleus.**
- Nucleoplasm has a semifluid matrix called karyolymph.
- Chromatin consists of a combination of DNA and protein.
- The non-membrane - bound structure in the nucleoplasm is nucleolus.
- Nucleoli are involved in the biosynthesis of ribosomes.

ANIMAL TISSUES
EPITHELIAL TISSUES

- Study of tissue is **microanatomy or histology.**
- A group of similar cells and cell products that arise from the same region of the embryo and work together to perform a specific function in an organ is **tissue.**
- Tissues are made up of **cells** and extracellular **matrix.**
- The human body is compoded of four basic types of tissues they are epithelial, connective, muscular, and nervous.
- In connective tissues, the matrix usually occupies much more space than the cells do.
- Matrix is small in epithelial tissue, muslce tissue and nervous tissue.
- Tissues that are drived from any of the three primary germ layers are **epithelial tissues.**
- Extracellular substance is very little hence cells are joined by intercellular junctions in the epithelial tissues.
- Cells of the epithelium rests on a **basement membrane.**
- Basement membrane consists of a **basal lamina and a reticular lamina.**
- Basal lamina is secreted by epithelial cells and lie closer to the cells
- Reticular lamina is closer to the underlying connective tissue.
- Epithelial tissue is **avascular** hence obtain nutrients from undrline connective tissue by **diffusion.**
- Long nonmotile extensions of cells that arise from fre or apical surface of epithelial cells are called stereocilia.
- In simple epithelium all the cells occur in a single layer and all the cells rest on the basal lamina.

- Cells are flat and tile - like with centrally located oval and flattended nucleus is seen in simple squamous epithelium.
- Endothelium of blood vessels and heart mesothelium of body cavities wal of Bowman's capsule lining of alveoli of lungs are made up of **simple squamous epithelium.**
- Cells are cuboid with spherical centrally located nucleus is seen in **simple cuboidal epithelium**.
- Germinal epithelium of ovary, thyroid vesicles, proximal and distal convoluted tubules of nephron are made up of **simple cuboidal epithelium.**
- Cells are pillar - like with oval nucleus located at the base is seen in **simple columnar epithelium.**
- Nonciliated simple columnar epithelium is located in **mucosa of stomach and intestine.**
- Location of ciliated simple columar epithelium is **lining of fallopian tubes, uterus, central canal of spinal cord and ventricles of brain.**
- Mucus secreting goblet cells may occur in nonciliated simle columar epithelium, ciliated simple columnar epithelium and psuedostratified ciliated columnar epihthelium.
- Cells occur in two are more layers in **stratified epithelium.**
- In stratified squamous epithelium cells of basal layer are cuboidal or columnar but superficial cells are squamous.
- Staratified squamous keratinized epithelium found in epidermis of skin.
- The cells of apical layers are stratified squamous keratinized epithelium contain keratin and constitute **stratum corneum.**
- Stratified squamous non keratinized epithelium covers wet surfaces such as oesophagus and vagina, without keratin.
- Stratified cuboidal epithelium **ducts of sweat glands.**
- Stratified columnar epithelium located in **conjunctiva of the eye.**
- Epithelium specialized to withstand a greater degree of stretch is **transitional epithelium.**
- The relative position of nuclei of cells are at various levels in **pseudostratified columnar epithelium.**
- Pseudostratified ciliated columnar epithelium occurs in **trachea.**
- Pseudostratified nonciliated columnar epithelium occurs in **epididymis and a part of urethra.**
- Goblet cells of the lining of the small intestine are unicellular glands
- Multicellular glands are composed of clusters of cells, arise during development by the invagination of covering epithelia into the connective tissue.
- If the secretory portion of the exocrine glands are tubular they are called **tubular glands.**
- If secretory portion is rounded they are called **acinar or alveolar glands.**
- If the duct that transports the secretions is unbranched they are called **simple glands.**
- If the duct is branched, they are called **compound glands.**
- If the duct is unbranched but secretory portion is branched they are called **simple branched glands.**
- If the glands release the secretory granules by exocytosis with no loss of other cellular material they are called **merocrine glands** (e.g., pancreas)
- The entire cell distintegrates to secrete its substance they are **holocrine glands eg. sebaceous glands.**
- If apical portion of the cell is pinched off along with the secretory product they are **apocrine glands (eg., mammary gland)**

CONNECTIVE TISSUE

- Connective tissues are **mesodermal** in origin.
- The major constituent of connective tisue is the **extracellular matrix.**
- Matrix consists of **ground substance and fibres**.
- With few exceptions, connective tissues are **vascular.**
- Cells of the connective tissue are fibroblasts, mast cells, macrophages, plasma cells, adipocytes and leucocytes.
- Fibre secreting cells are **fibroblasts,** inactive fibro blasts are called **fibrocytes.**
- Mast cells produce heparin, histamine and bradykinin.
- Heparin is an **anticoagulant,** histamine and bradykinins are **vasodilators.**
- Histamine and bradykinin play a role in **inflammation.**
- Monocytes of the blood enter connective tissue matrix, and become **macrophages.**
- Macrophage may be tissue fixed (histiocytes) or wandering, phagocytic and act as **internal scavengers.**
- Large ovoid cells with spherical and eccentric nucleus are **plasma cells.**
- Plasma cells derived from B cells and synthesize antibodies.
- Fat storage cells of connective tissue are **adipocytes.**
- Leucocytes migrate from the blood vessels into connective tissues by **diapedesis.**
- Three main types of connective tissue fibres are collagen, reticular, and elastic.
- Collagen and reticular fibres are formed by collagen protein and elastic fibres are composed of elastin protein.
- Fibres which are arranged parallel to one another in bundles are **collagen fibres.**
- Elastic fibres are branched and join together to form a network.
- The three main types of connective tissues are **connective tissue proper, supportive tissue, fluid connective tissue.**
- Embryonic connective tissue is present primarily in embryo and foetus.
- Embryonic connective tissue includes **mesenchyme, mucous connective tissue.**
- All other connective tissues are derived from mesenchyme.
- Mucous connective tissue mainly found in the **umbilical cord.**
- Mucous connective tissue in umbilical cord where it is referred to as **Wharton's Jelly.**
- Mature connective tissue is present in the newborn and in the adult.
- Loose connective tissue are Areolar tissue, adipose tissue and reticular connective tissue.
- One of the most widely distributed connective tissues in the body is **areolar connective tissue.**
- Subcutaneous layer that binds skin to underlying tissues is **areolar connective tissue.**
- Fat-storing tissue, contributes to thermal insulation of body is **adipose tissue.**
- Blubber of marine mammals like whales and sea cows is made up of adipose tissue.

- Adipose tissue acts as shock absorber, gives body contour.
- Adipose tissue is also found in **yellow bone marrow.**
- White adipose tissue (WAT) is predominate type in adults.
- Brown adipose tissue (BAT) is widespread in foetus and infant.
- The cell of WAT has a single large lipid droplet, and that of BAT has numerous lipid droplets.
- BAT generates considerable heat and maintains body temperature in the new born.
- Reticular connective tissue consists of reticular fibres and fibroblasts called reticular cells.
- Reticular connective tissue is located in **haemopoietic organs lymphoid organs, and reticular lamina of basement membrane.**
- Good examples for dense regular connective tissue are **tendons and ligaments.**
- Dense irregular connective tissue occurs in **periosteum, perichondrium paricardium, heart valves, joint capsules, and in deeper region of dermis of skin.**
- The tissue that can recoil to its original shape after beging stretched is elastic connective tissue.
- Elastic connective tissue occurs in the wall of **arteries, vocal cords, trachea, bronchi and few ligaments called elastic ligaments (between vertebrae).**

SUPPORTIVE TISSUE

- Supportive tissue forms the endoskeleton.

Cartilage

- Cartilage is also called **gristle.**
- Cartilage forms endoskeleton of cyclostomes and cartilaginos fishes.
- Cartilage is surrounded by **perichondrium.**
- Cartilage is **avascular** and is nourished by the **diffusion** of nutrients from capillaries in **perichondrium.**
- Matrix secreting cells of cartilage are chondroblasts.
- Each lacuna of cartilage may contain upto eight chondroblasts.
- Growth of cartilage is either **interstitial growth,** or more commonly **appositional growth.**
- Growth of cartilage resulting from the mitotic division and reactivation of preexisting chondrocytes is **interstitial growth.**
- Growth of cartilage resulting from the differentiation of perichondrial cells is **appositional growth.**

Hyaline Cartilage

- Bluish - white and translucent cartilage is **hyaline cartilage.**
- The weakest cartilage is **hyaline cartilage.**
- Hyaline cartilage is located in the walls of nose, larynx, trachea, bronchi, in the ventral ends of ribs (costal cartilage), epiphyseal plate, and articular cartilage in joints and in embryonic skeleton of bony vertebrates.
- In Hyaline cartilage perichondrium is absent in **articular cartilages and epiphyseal plates.**

Elastic Cartilage

- The cartilage with elastic fibres along with collagen fibres is **elastic cartilage**

- Elastic cartilage is found in the **ear pinna, eustachian tubes and epiglottis.**

Fibrous Cartilage

- The strongest of all the three cartilages is **fibrocartilage.**
- Fibrocartilage found in **intervertebral disesand in the public symphysis.**

BONE

- Strongest of all connective tissue is **bone.**
- Bone tissue is **highly vascular**
- Cells of the bone found in lacunae within the matrix are **osteocytes.**

Types of Bones

- The cells of bone that synthesize the organic components of the matrix are **osteoblasts.**
- As osteoblast is gradually surrounded by newly formed matrix and becomes osteocyte.
- The cells of the bone that are involved in the resorption and remodelling of bone tissue are **osteoclasts.**
- Bones of the cranium are **membrane bones or investing bones or dermal bones.**
- Membrane bones are formed by intramembranous ossification of **mesenchyme.**
- Short bones and long bones are **endochondral bones or cartilage bones or replacing bones.**
- Endochondral bones are formed due to ossification within **hyaline cartilage.**
- Bones develop within tendons are **sesamoid bones.**
- E.g. for sesamoid bone is patella (knee-cap)
- The part of the long bone between two expanded ends (epiphyses) is **disphysis or shaft.**
- The region between diaphysis and epiphysis is **metaphysis.**
- Bones can grow in thickness only by **appositional growth.**
- Appositional growth of bone is resulting from the differentiation of **periosteal cells.**
- Short bones are carpals and tarsals
- Bones of cranium are **flat bones**
- Vertebrae are irregular bones
- Diaphysis of long bones is almost entirely composed of **compact bones.**
- Trabeculae (columns of bone) found in **spongy or cancellous bone.**
- Space between trabeculae are filled with **red bone marrow.**

STRUCTURE OF COMPACT BONE

- Haversian system is present in compact bone of mammals.
- Compact bone is lined by **endosteum** on the internal surface and **periosteum** on the external surface.
- Each lacuna of bone enclose **one osteocyte.**
- Haversian canals communicate with the marrow cavity, the periosteum, and one another through transverse or oblique **volkmann's canals.**

Chemical Composition of Bone

- Dry weight of bone has 65% inorganic material and 35% of organic material.
- The major mineral of bone is **calcium phosphate.**
- Calcium phosphate of bone is present in the form of **hydroxyapatite crystals.**

- The major organic substance of the bone is **collagen.**

FLUID TISSUES

BLOOD

- The total volume of blood in adult human being is about **5 to 6 litres.**
- In the centrifuged blood sample the bottom layer has RBC.
- In centrifuged blood sample the white or greyish layer immediately above the bottom layer is called **buffy coat.**
- Buffy coat consists of **leucocytes.**
- The percentage of total blood volume occupied by RBCs is called **haematocrit.**

Plasma

- Liquid matrix of the blood is **plasma.**
- Plasma is with 92% of water and 8% of solutes.
- The main plasma proteins of blood are **albumins, globulins, fibrinogen and prothrombin.**
- The blood's colloidal osmotic pressure is due to **albumin.**
- Fall in the vel of **albumin** in blood plasma results in accumulation of fluid in tissues called **oedema.**
- Antibodies are immunoglobulins and are γ **globulins**
- Proteins useful in blood clotting are fibrinogen and prothrombin.
- pH of blood plasma 7.4

Formed Elements

- Production of blood cells from stem cells is termed as **haemopoiesis or haematopoiesis.**
- In the earliest stages of embryogenesis, blood cells arise from the **yolk sac mesoderm.**
- Temporary hematopoietic tissues in the later stages of embryogenesis are **liver and spleen.**
- The primary site of haemopoiesis in the final stages of development after birth is red bone marrow.

RBC

- Number of RBC per mm^3 or μ L of blood is **about 5 million in men and 4.5 million in women.**
- Decreased number of erythrocytes is termed **erythrocytopenia.**
- An increased number of erythrocytes is termed **erythrocytosis or polycythemia.**
- Mammalian erythrocytes are **enucleate and biconcave.**
- The biconcave shape provides a large surface-to-volume ratio, thus facilitating gas exchange.
- Nucleus and other organelles are lost during development and maturation of RBC.
- Life span of human erythrocytes is about **120 days.**
- Old RBC's are phagocytosed by macrophages in spleen, liver or red bone marrow.

WBC

- The number of leucocytes is roughly 6000 - 10,000 / μ L

- Movement of leucocytes into the connective tissue by dispedesis.
- Granulocytes are also called polymorphonuclear leucocytes
- Microscopic policemen of blood are **neutrophils.**
- Neutrophils constitute about 62% of WBC
- Nuclear lobes in neutrophils are two to five (usually three)
- In the cytoplasm of neutrophils **specific granules are more abundant than azurophilic granules, stained by neutral dyes.**
- Pus is a viscous fluid composed of **dead neutrophils, bacteria and tissue fluid.**
- Eosinophils constitute about 2.3% of WBC.
- Nucleus of eosinophils is **bilobed.**
- An increase in the number of eosinophils in blood is **eosinophilia.**
- WBC increase in number during allergic reactions and helminthic infections are **eosinophils.**
- Leucocytes which engulf antigen - antibody complexes are **eosinophils.**
- Basophils constitute about 0.4% of WBC.
- Nucleus of basophils is irregular lobed.
- Specific granules are fewer and irregular in size and shape and stain with the basic dyes in basophils.
- The cells of blood that supplements the functions of mast cells are basophils.
- WBC which do not have specific granules, but they contain azurophilic granules are **agranulocytes.**
- A granulocytes are lymphocytes and monocytes.
- Lymphocytes constitute 30% of WBC.
- WBC with spherical nucleus and scanty peripheral cytoplasm are lymphocytes.
- The leucocytes that play important role in immune reactions are lymphocytes.
- The leucocytes that live only few days are lymphocytes.
- The only type of leucocytes that return from the tissues back to the blood, after diapedesis are **lymphocytes.**
- Monocytes constitute about 5.3% of WBC.
- The leucocytes with kidney shaped nucleus are monocytes.

Plateletes

- Enucleated disk - like cell fragments of blood are platelets (thrombocytes)
- Number of blood platelets is 200,000 to 400,000 per microlitre of blood.
- Blood platelets are formed by the fragmentation of giant megakaryocytes in the bone marrow.
- Life span of platelets is 10 days.

LYMPH

- Extra cellular fluid (ECF) includes the interstitial fluid (tissue fluid) present in tissues and the blood plasma.
- Most of the plasma proteins cannot escape through the capillaries so that the concentration of proteins is greater in the plasma that in the interstitial fluid.
- ECF that flows through lymphatic system is called lymph.
- Lymph passes through lymph capillaries, lymphatic vessels and eventually enters thoracic (left lymphatic) duct and right lymphatic duct which drain into subclavian veins.
- Lymph differs from the blood plasma by the absence of RBCs.

MUSCULAR TISSUES

Skeletal muscle

- Muscle cells are **mesodermal origin**
- Muscles derived from ectoderm are **iris muscles in the eye.**
- **Muscle spindles** of skeleton muscles and **Golgi tendon organs** detect tensional differences and monitor muscle constraction
- Muscles usually attached to the bones occurs in the diaphragm, tongue, pharynx, and the beginning of oesophagus are skeletal muscles.
- Skeletal muscle are striated and voluntary.
- Each skeletal muscle fibre is surrounded by a delicate layer called endomysium.
- A bundle of muslce fibres (fascicle) is surrounded by a dense connective tissue layer called parimysium.
- A dense irregular connective tissue layer surrounding the whole muscle is called epimysium.
- Muscle attach to the bones by chord - like tendon or sheetlike aponeurosis.
- Tendon, aponeurosis are formed by extensions of endomysium, perimysium, epimysium.
- The site of attachment of tendon to a fixed bone is called the origin of muscle
- The site of attachment of tendon to a movabnle bone is called the insertion of muscle
- Muscle fibre of skeletal muscle is a long, cylindrical, multinucleated cell.
- Each fibre is formed by the fusion of emryonic mononucleated myoblasts.
- Skeletal muscle can undergo limited regeneration due to satellite cells.
- Satellite cells are inactive myoblasts but cells become activated, proliferated and fuse to form new skeletal muscle fibres.

VISCERAL MUSCLE

- Smooth muscles are unstriated and involuntary
- Muscles located on the walls of visceral organs such as blood vessels, trachea, bronchi, stomach, intestine, urinary, bladder, etc.
- Iris and ciliary body of eye and arrector pili muscles of dermis are smooth muscle.
- Smooth muscle cells are fusiform.
- When smooth muscle contracts the nucleus has the apperance of a corkscrew.
- Thick and thin myofilaments are not regularly arranged hence smooth muscle fibres are unstriated.
- Skeletal muscle cells are arranged in bundles where as smooth muscles occurs in large sheets.
- Smooth muscle cells may remain contracted for long period without fitigue.

- Contraction of skeletal muscle is regulated by somatic nervous system where as smooth muscles is by autonomic nervous system.
- The muscle which have greater powers of regeneration are smooth muscles.
- New smooth muscle fibres can arise from stem cells called pericytes.
- Certain smooth muscle fibres, which can divide can be seen in uterus.

CARDIAC MUSCLE

- Cardiac muscles are straited and involuntary
- Cardiac muscles fibres are branched forming a network, present in the wall of heart.
- A cardiac muscle fibre is a short cylindrical cell with single centrally located nucles (rarely two nuclei)
- Mitochondira are more numerous in cardiac muscle than skeletal muscle fibre.
- Cardiac muscle fibre are joined end to end by transverse thickenings of plasma membrane called intercalated discs.
- Intercalated discs contain gap junctions and desmosomes.
- Ionic continuity between adjacent cells of cardiac muscle are due to gap junctions.
- Cardiac muscle acts as a functional syncytium due to gap junctions.
- Contraction of cardiac muscles is spontaneous, involuntary, vigorous, and rhythmic.
- Pace maker of heart formed by cardiac muscle.
- Function of pace makers is initiation of action potentials.
- Rhythm of cardiac muscle can be modified by autonomic nervous system and hormones like epinephrine.
- Muscle which have almost no regenerative capacity in adults are cardiac muscles.

NERVOUS TISSUES

- Nervous tissue derived from ectoderm
- Function of nervous tissue is to react to stimuli by propagation of action potential.
- Cells of nervous tissue that can undergo mitosis are glial cells
- Nervous tissue is composed of nervous (nerve cells) and suppporting cells called glial cells

COMPONENT OF NERVOUS SYSTEM

NEURON

- Structural and functional unit of nervous tissue is neuron.
- Cell body of neuron is also called perikaryon or soma or cyton
- Perikaryon has nucleus and cytoplasm that contains nissl bodies.
- Nissl bodies are formed of REP and ribosomes.
- Occasionally pigments present in the cytoplasm of cell body are lipofuscin.
- Short branches arise from cell body of neurons are dendrites
- Dendrites conduct the impulse to the cell body.
- Single long cylindrical process arise from the cyton is axon.
- Axon originates from the short cone-shaped-region of perikaryon called the axon hillock.

- Plasma memberane of axon is called axolemma and cytoplasm is called axoplasm.
- Axon conducts nerve impulses away from cell body to other nerve cells, and effectors.
- The axon terminates on other neurous or effectors by small branches called the terminal arborization.
- The small branches of axon end in small swellings called terminal boutons.
- A region formed by an axon terminal on the surface of dendrite of another nerve cells is ynapse.
- Synaptic vesicles present in presynaptic terminal and contain neurotransmitters and numerous mitochondria.
- Most synapses transmit information to the next neuron by releasing chemical neurotransmitters.
- Nerve tissue has only a very small amount of extracellular matrix.

GLIAL CELLS

- Glial cell of the central nervous system are oligodendrocytes, astrocytes, ependymal cells and microglia.
- Glial cells of the peripheral nervous system of satelite cells and schwann cells.
- The cells that produce the myelin sheath are oligodendrocytes.
- Star - shaped glial cells are astrocytes.
- The glial cells which hind neurons to capillaries are astrocytes.
- The glial cells which form blood - brain barrier are astrocytes.
- Columnar epithelial cells lining the ventricles of the brain and central canal of the spinal cord are ependymal cells.
- The cells which facilitates the movement of cerebrospinal fluid are ependymal cells.
- Small elongated cells derived from mesoderm are microglia.
- The cells that represent mononuclear phagocytic system of nerve tissue are microglia.
- Microglia are derived from precursor cells in the bone marrow.
- Phagocytic glial cells are microglia.
- The glial cells of peripheral nervous system surrounding the cell bodies of ganglia are satelite cells.
- The glial cells of peripheral surrounding axons are schwann cells.
- The layer of cell membrane of schwann cell unite and form a whitish myelin sheath around axon called myelin sheath.
- Outer most layer of schwann cells that contains cytoplasm and nucleus is called neurilemma or sheath of schwann.
- Gaps in the meylin sheath are called the nodes of Ranvier.
- The distance between the nodes is called an internode and consists of one schwann cell.
- Supporting cells are absent around the unmyelinated axons of the central nervous system.

TYPES OF NEURONS AND NERVE FIBRES

- Most neurons of the body are multipolar.
- Multipolar neurons have one axon and two or more dendrites.
- Bipolar neurons have one dendrite and one axon.
- Bipolar neurons are found in the retina of eye, inner ear and olfactory membrane.
- Unipolar neurons have a single process.
- Cytons of unipolar neurons found in the dorsal root ganglia of the spinal nerves.

- Neurons of dorsal root ganglia of the spinal nerves also called pseudounipolar neurons (they are sensory)
- Neurons that control effector organs by carrying impulses are motor (afferent) neurons.
- Neurons involved in the reception of sensory stimuli from the environment are sensory neurons (afferent)
- Sensory and motor neurons are connected by interneurons.
- Motor neurons and interneurons are multipolar.
- White matter of the brain and spinal cord contains myelinated axons and oligodendrocytes.
- Grey matter contains neuronal cell bodies, dendrites and the unmyelinated axons and glial cells.
- White appearance of white matter is due to myelin, grey apperance of grey matter is due to nissl bodies.
- Groups of nerve fibres in the central nervous system are called tracts.
- Aggregates of neuronal cell bodies in the central nervous system are called nuclei.
- Aggregates of neuronal cell bodies in the peripheral nervous system are called ganglia.
- Nerve is a bundles of nerve fibres.
- Loose connective tissue sheath surrounding a nerve fibre is endoneurium.
- A bundle of nerve fibres is called fascicle.