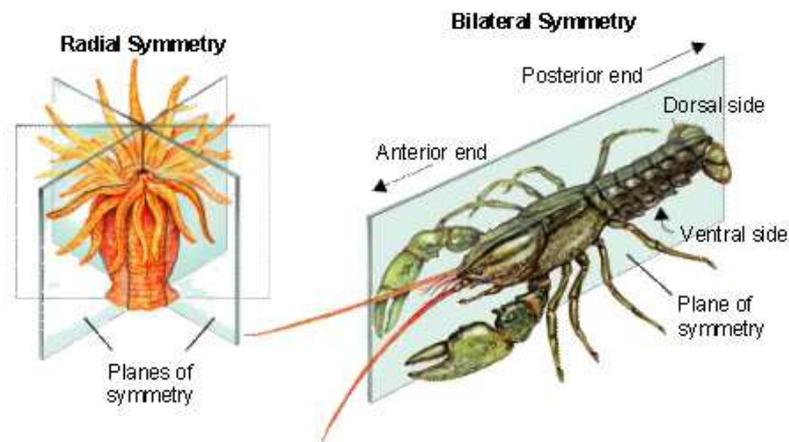


## Structural Organisation in Animals

### Very Short Answer Questions:

1. **What is tissue level of organization among animals? Which metazoans do exhibit this organization?**
  - A. i) Tissue level of organization is the lowest level of organization among the eumetazoans.  
ii) It is exhibited by diploblastic animals like cnidarians.
  
2. **Animals exhibiting which level of organization lead relatively more efficient way of life when compared to those of the other levels of organization? Why?**
  - A. i) Animals exhibiting organ – system level of organization among the animals and it is exhibited by the triploblastic animals.  
ii) Organ level of organization is more efficient over the tissue level due to the presence of structural complexity because of **mesoderm** in the evolution of levels of organization.
  
3. **What is monaxial heteropolar symmetry? Name the group of animals in which it is the principal symmetry?**
  - A. Radial symmetry is known as monaxial heteropolar symmetry. When any plane passing through the central axis of the body divides an organism into two identical parts is called Monaxial heteropolar symmetry. It is the principal symmetry of the diploblastic animals like **Cnidarians and ctenophores**.
  
4. **Radial symmetry is an advantage to the sessile or slow moving organisms. Justify this statement.**
  - A. Animals showing radial symmetry live in water and they can respond equally to stimuli that arrive from all directions. Thus, radial symmetry is an advantage to sessile or slow moving animals.



5. **What is Cephalization? How is it useful to its possessors? (May, March – 2013)**

A. **Cephalization:** Concentration of nerve (Brain) and sensory cells at the anterior end of the body is called as Cephalization.

As a result of cephalization, these animals can sense the new environment and move efficient than the other animals in seeking food, locating mates and in avoiding or escaping from predators.

6. **Mention the animals that exhibited a 'tube-within-a-tube' organization for the first time? Name their body cavity?**

**Nematodes, Rotifers** of the phylum Aschelminthes are the first animals to exhibit a 'tube-within-a-tube' organization. Body cavity is pseudocoelom in these animals.

7. **What are retroperitoneal organs?**

A. Certain organs such as the **kidneys** of the vertebrates are covered by the **parietal peritoneum** only on their **ventral side**.

Such as peritoneum is called the 'retroperitoneum' and the organs lined by it are called 'retroperitoneal organs'.

8. **What is enterocoelom? Name the enterocoelomate phyla in the animal kingdom?**

A. Animals in which the body cavity is formed from the **mesodermal pouches** of archenteron are called 'enterocoelomates'. Echinoderms, hemichordates and **chordates** are the enterocoelomates.

9. Distinguish between exocrine and endocrine glands with examples. (May – 2013)

- A. i) Exocrine glands are provided with ducts. Secrete mucus, saliva, earwax, oil, milk, digestive enzymes and other cell products.
- ii) Endocrine glands are ductless and their products are hormones which are not sent out via ducts, but are carried to the target organs by blood.

Ex: Pituitary Gland

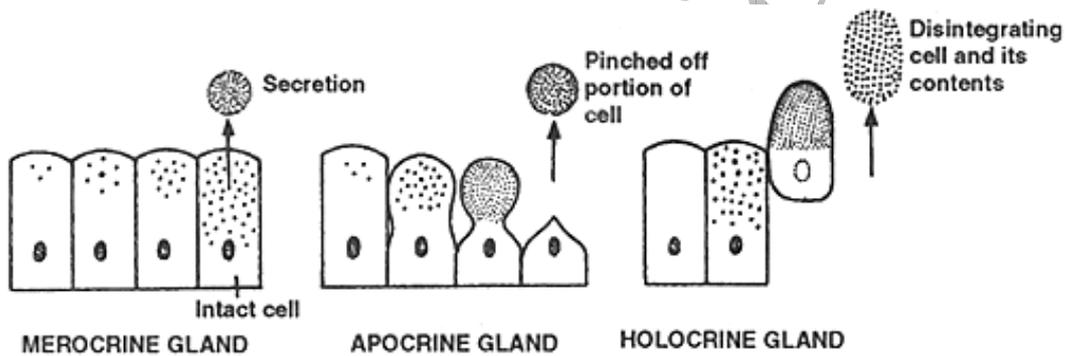
10. Distinguish between holocrine and apocrine glands?

- A. Apocrine glands in which the apical part of the gland cell is pinched off along with the secretory product.

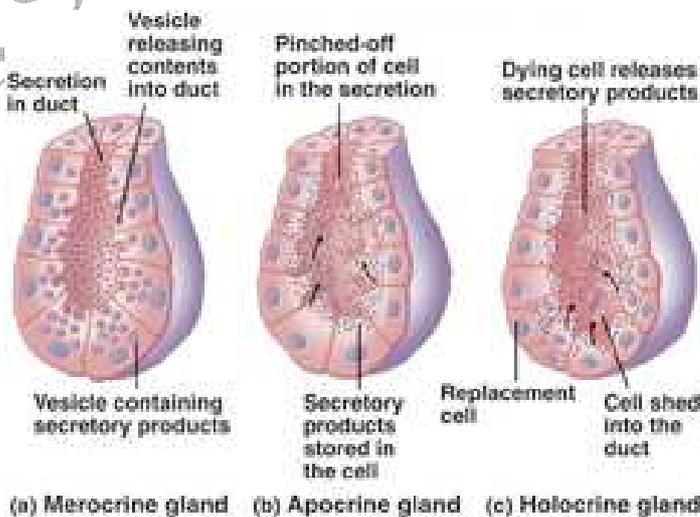
Ex: mammary glands.

Holocrine glands, in which the entire cell disintegrates to discharge the contents.

Ex: Sebaceous glands

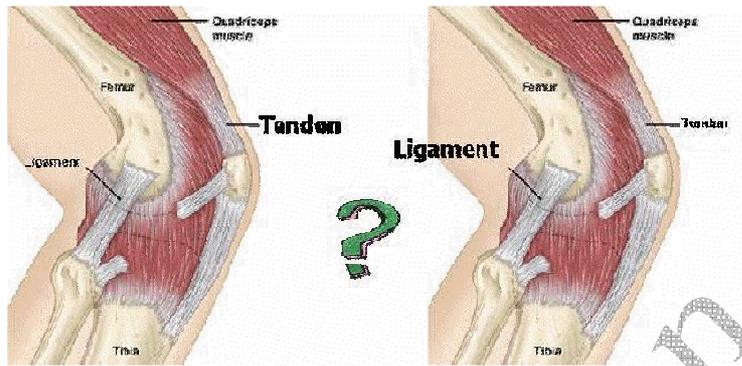


Types of exocrine glands according to modes of secretion



**11. Distinguish between a tendon and a ligament?**

- A. i) Tendons are the collagen fibrous tissue of dense regular connective tissue which attach the skeletal muscles to bones.  
ii) Ligaments are also the collagen fibers tissue of dense regular connective tissue which attach bones to other bones.



**12. What is the strongest cartilage? In which regions of the human body, do you find it?**

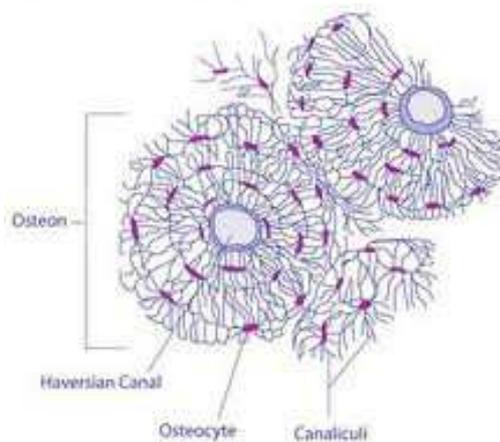
(May – 2013)

- A. i) The fibrous cartilage is the strongest of all types of cartilages.  
ii) It occurs in the intervertebral discs and pubic symphysis of the pelvis.

**13. Distinguish between Osteoblasts and Osteoclasts?**

- A. Osteoblasts are immature bone cells and secrete the organic components of matrix and also play an important role in mineralization of bone and become Osteocytes. Osteoclasts are phagocytic cells involved in resorption of bone.

Cross-section of an Osteon



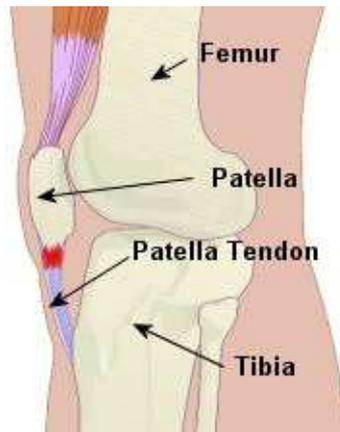
**14. Define Osteon?**

A. In compact bone structure a haversian canal and the surrounding lamellae and lacunae are collectively called a Haversian system or Osteon.

**15. What is a Sesamoid Bone? Give an example.**

A. Sesamoid bones are formed by ossification in tendons.

**Ex:** Patella (Knee cap) and Pisiform bone of the wrist of a mammal

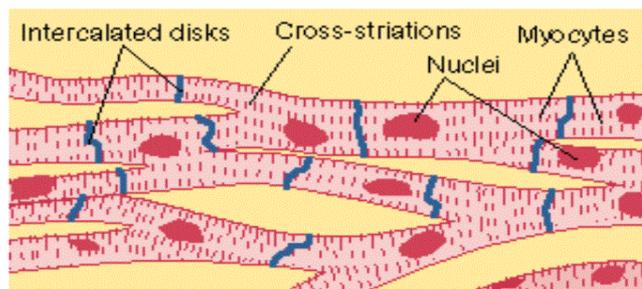


**16. What is the haematocrit value?**

A. The percentage of total volume occupied by RBCs in blood is called haematocrit value.

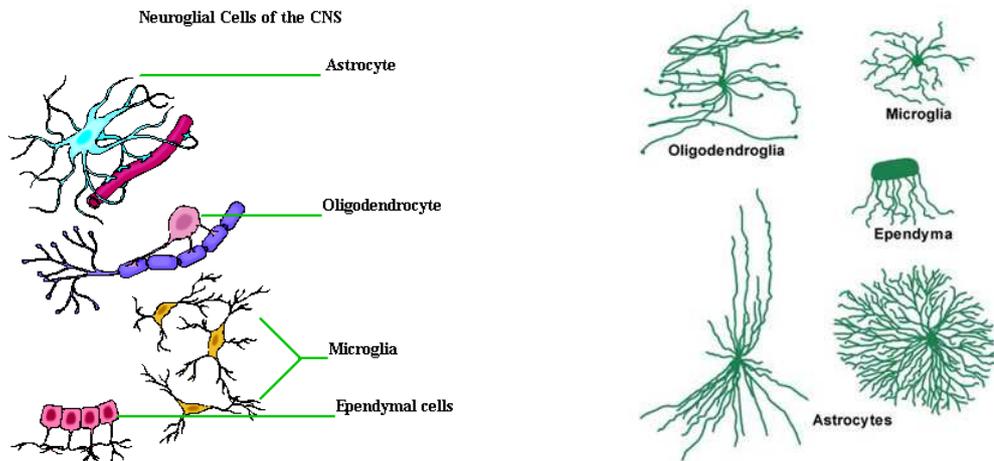
**17. What are intercalated discs? What is their significance?**

A. The dark lines across cardiac muscle are called intercalated discs (IDS). These are communication junctions. Intercalated discs contain 3 types of cell junctions and the gap junctions which are responsible for rapid conduction of action potentials among cardiac muscles.



**Cardiac Muscle**

18. Name the glial cells that form myelin sheath around the axons of central peripheral system and peripheral nervous system respectively.



- A. i) In the central nervous system, the glial cells called ‘Oligodendrocytes’ form myelin sheath.  
ii) In peripheral nervous system, the glial cells known as ‘Schwann cells’ form myelin sheath.

19. What are microglia and what is their origin and add a note on their function?

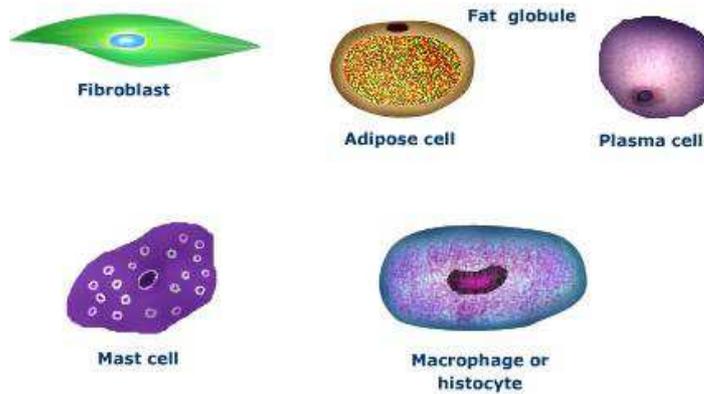
- A. i) Microglial cells are the Neuroglia (supporting cells) of cells of CNS.  
ii) They are phagocytic cells and mesodermal origin.

20. Why is the true Coelom considered as a secondary body cavity?

- A. During the embryonic development of the eucoelomates, the blastocoel or primary body cavity is replaced by true coelom derived from the mesoderm. So true coelom is considered as secondary body cavity.

21. Mention any two substances secreted by mast cells and their function?

- A. Mast cells of connective tissue secrete Heparin, histamine, bradykinin and serotonin.  
Heparin acts as an anticoagulant. Histamine and bradykinin act as vasodilators. Serotonin acts as vasoconstrictor



**22. “Cardiac muscle is highly resistant to fatigue”. Justify?**

A. Cardiac muscle has numerous sarcosomes, many molecules of myoglobin (oxygen storing pigment) and rich supply of blood which facilitate continuous aerobic respiration. Thus cardiac muscle is highly resistant to fatigue.

**23. Distinguish between Nucleus and Ganglion with respect to the nervous system?**

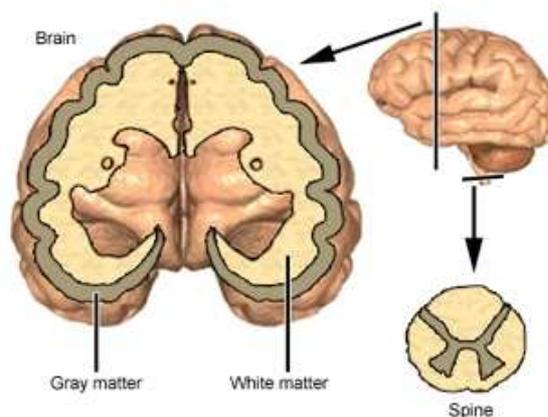
- A. i) Nucleus is the group of cell bodies in the central nervous system.  
ii) Ganglion is the group of cell bodies in the peripheral nervous system.

**24. Distinguish between ‘tracts’ and ‘nerves’ with respect to the nervous system?**

- Tracts are the groups of axons/nerve fibres in the central nervous system.
- Nerves are the groups of axons in the peripheral nervous system.

**25. Distinguish between white matter and grey matter of CNS?**

- White matter of CNS consists of myelinated axons.
- Grey matter consists of cell bodies and unmyelinated axons



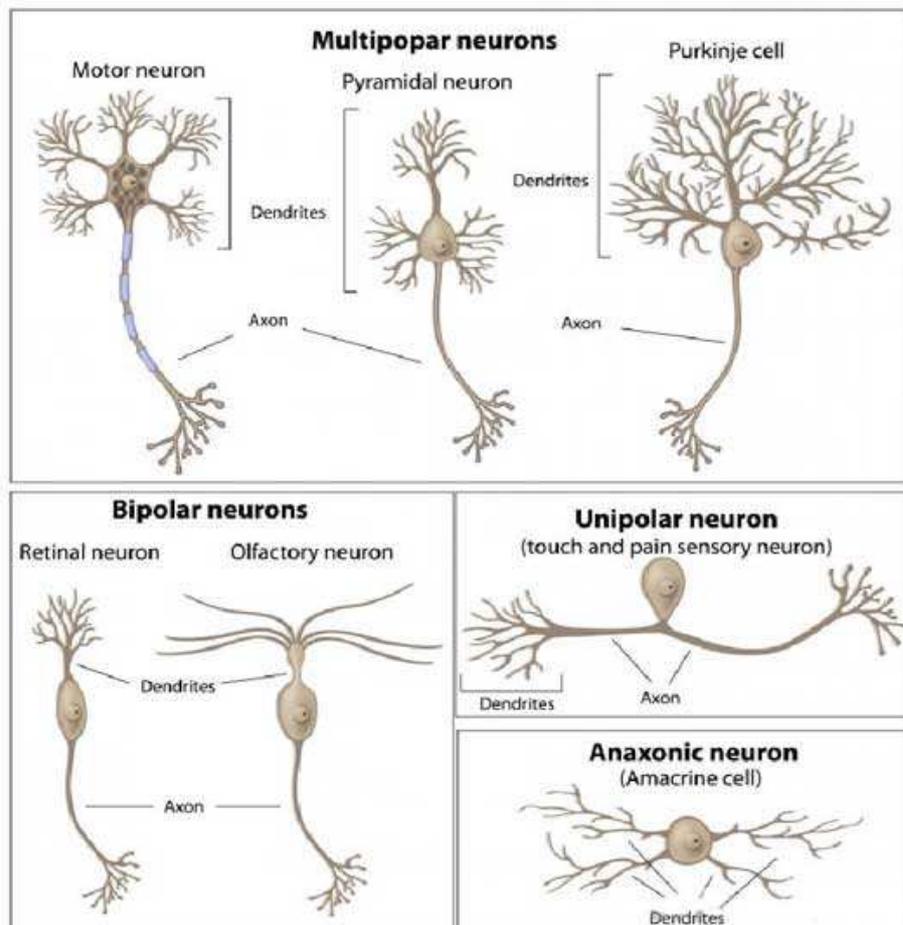
**26. What are microglia? What is their origin and add a note on their function?**

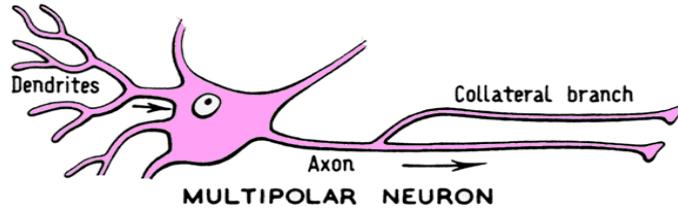
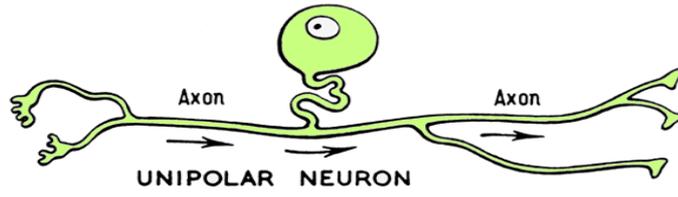
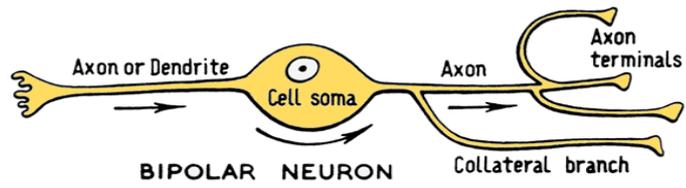
- Microglial cells are the phagocytic cells of CNS.
- They are derived from mesoderm.

**27. What are pseudo unipolar neurons? Where do you find them?**

- Pseudounipolar neurons or unipolar neurons are sensory neurons having a single process arising from the cell body.
- It divides into two branches, one of which acts as a dendrite and other as an axon. They are present in dorsal root ganglion of spinal nerve.

**Types of Neurons**





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## Short Answer Type Questions

### 1. Mention the advantages of Coelom over Pseudocoelom?

#### A. Advantages of Coelom over Pseudocoelom:

1) Visceral organs of eucoelomates are muscular (because of their association with mesoderm) and so they can contract and relax freely independent of the muscular movements of the body wall in the coelomic space.

**E.g.** Peristaltic movements of alimentary canal.

2) Gametes are released into the coelom in some invertebrates (which do not have gonoducts) and in the female vertebrates.

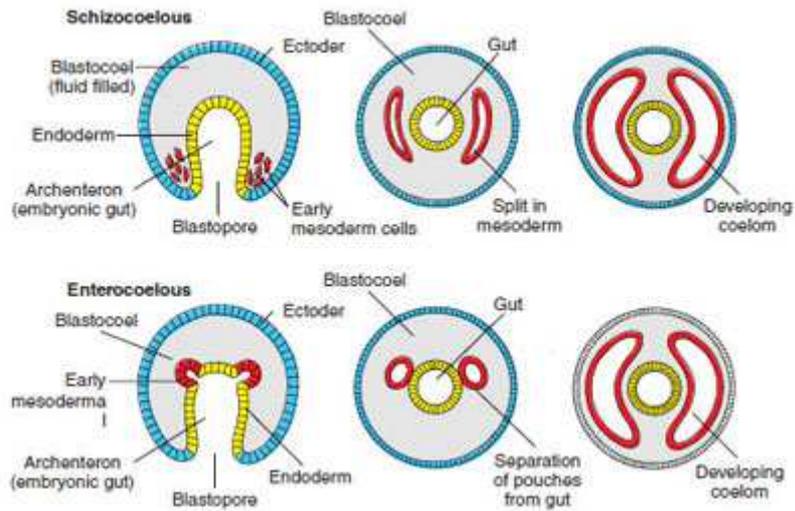
3) Coelomic fluid receives excretory products and stores them temporarily before their elimination.

4) In the eucoelomates, the mesoderm comes into contact with the endoderm of the alimentary canal, and it causes 'regional specialization of the gut', such as the development of gizzard, stomach, etc. This is referred to as '**primary induction**'.

In the case of the pseudocoelomates, due to the absence of such a contact between the gut and the mesoderm, the wall of the gut does not show complex and highly specialized organs.

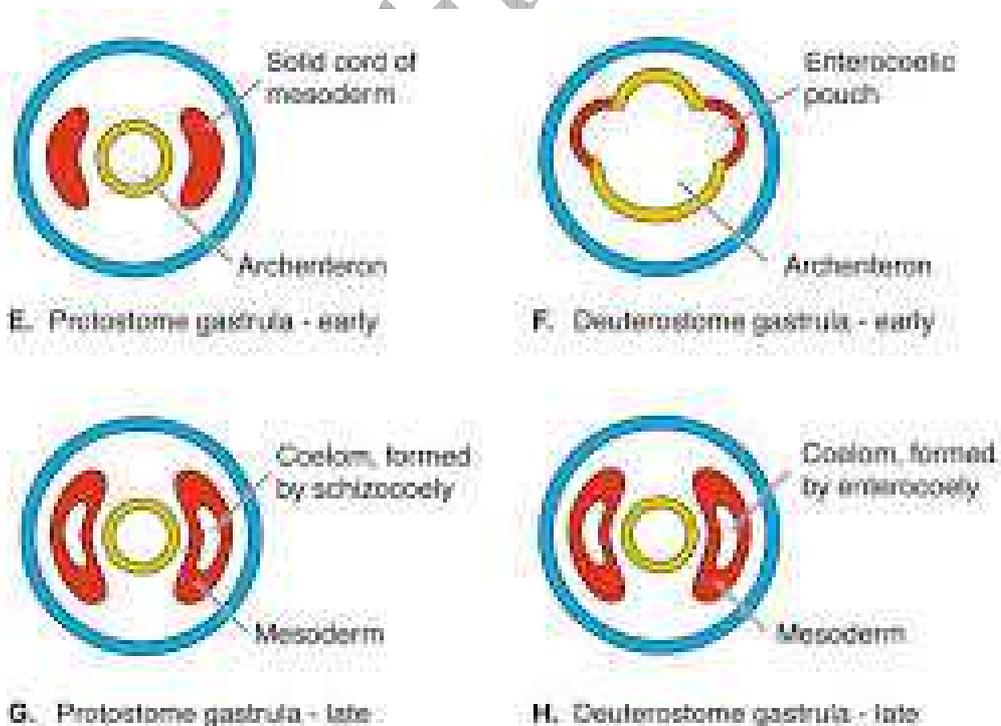
### 2. Describe the formation of schizocoelom and enterocoelom? (March – 2013)

A. **Schizocoelom:** During embryonic development a specialized cell called 4d blastomere is formed. The cells formed from these cells divide and re divide and develop blocks of mesoderm in blastocoels. The blocks fuse and form the mesodermal band which later on splits to form the Schizocoelom. This type of coelom is present in Annelida, Arthropoda and Mollusca.



**Enterocoelomates:** Animals in which the body cavity is formed from the mesodermal pouches of archenteron are called enterocoelomates. Echinoderms, hemichordates and chordates are the enterocoelomates.

In these animals, mesodermal pouches that evaginate from the wall of the archenteron into the blastocoels are fused with one another to form the enterocoelom. All the enterocoelomates are deuterostomes and they show radial and indeterminate cleavage.



### 3. Give a brief account of the cells of Areolar Tissue?

A. **Areolar Tissue:** It is one of the most widely distributed connective tissue in the body. It forms the packing tissue in almost all the organs. Areolar tissue forms subcutaneous layer of the skin. It has cells and fibres. Cells of the areolar tissue are fibroblasts, mast cells, macrophages, adipocytes and plasma cells.

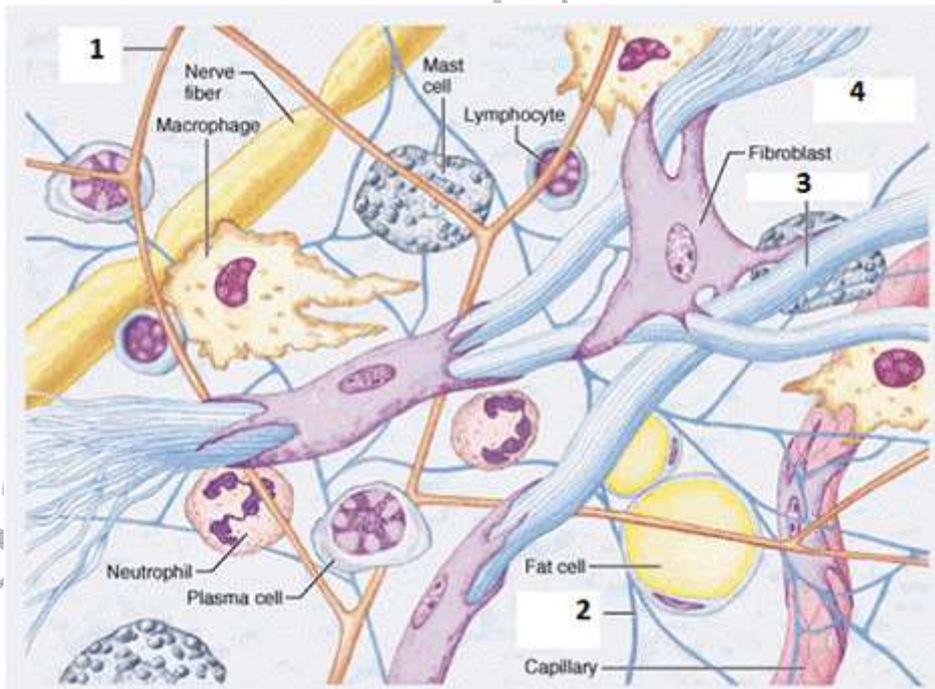
1) **Fibroblasts** are the most common cells which secrete fibers. The inactive cells are called fibrocytes.

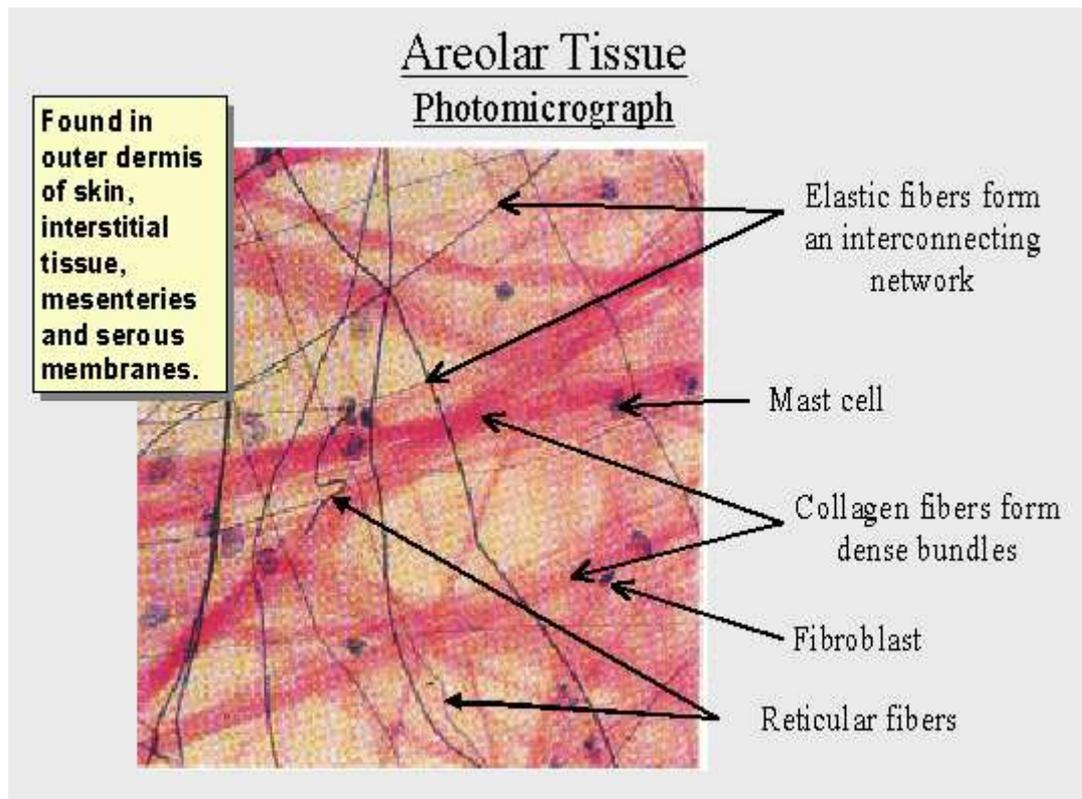
2) **Mast cells** secrete heparin (an anticoagulant), histamine, bradykinin (vasodilators), and serotonin (vasoconstrictor). Vasodilators cause inflammation in response to injury and infection.

3) **Macrophages** are amoeboid cells, phagocytic in function and act as internal scavengers. They are derived from the monocytes of blood. 'Tissue fixed macrophages' are called histiocytes and others are known as 'wandering macrophages'.

4) **Plasma cells** are derived from the B – lymphocytes and produce antibodies.

5) **Adipocytes** are specialized cells for the storage of fats.





#### 4. Describe the three types of cartilage?

A. Cartilage is a solid, but semi – rigid (flexible) connective tissue.

Cartilage is a solid, but semi – rigid (flexible) connective tissue. It resists compression. Matrix is firm, but some what pliable. It has collagen fibres, elastic fibres (only in the elastic cartilage) and matrix secreting cells called chondroblasts. These cells are enclosed in fluid filled spaces called lacunae. Chondrocytes are the inactive cells of a cartilage. Cartilage is surrounded by a fibrous connective tissue sheath called perichondrium. Cartilage is of three types, which differ from each other chiefly in the composition of the matrix.

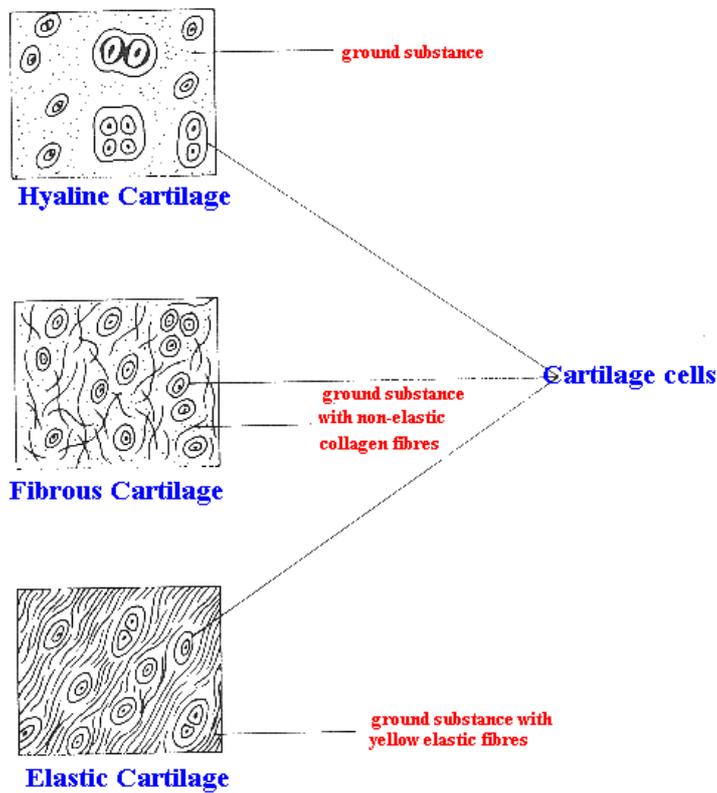
**1. Hyaline Cartilage:** It is bluish – white, translucent and glass – like cartilage. Matrix is homogeneous and shows delicate collagen fibres. It is the weakest and the most common type of all the cartilages. It forms the embryonic endoskeleton of bony vertebrates, endoskeleton of cyclostomes.

i) It forms the articular cartilages, costal cartilages and epiphyseal plates.

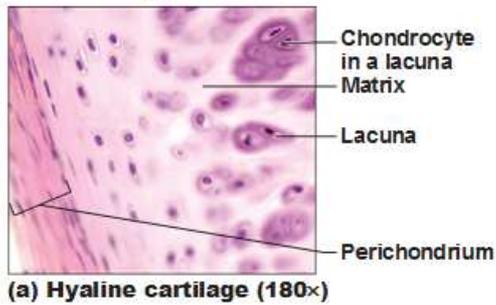
ii) It forms the nasal septal cartilage, cartilaginous rings of trachea, bronchi and cartilages of larynx..

2. **Elastic Cartilage:** It is yellowish due to elastic fibres. Matrix has abundance of yellow elastic fibres in addition to collagen fibres. It provides strength and elasticity. Perichondrium is present. It is found in the pinnae of the external ears, Eustachian tubes and epiglottis.

3. **Fibrous Cartilage:** Matrix has bundles of collagen fibres. Perichondrium is absent. It is the strongest of all types of cartilages. It occurs in the intervertebral discs and pubic symphysis of the Pelvis.



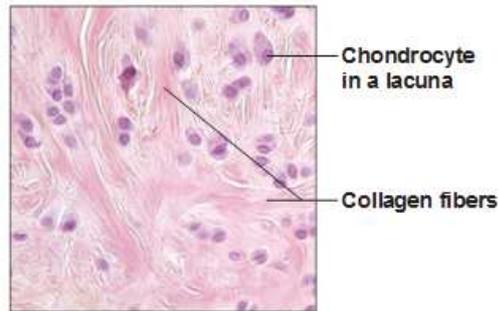
## Cartilages in the Adult Body



(a) Hyaline cartilage (180×)



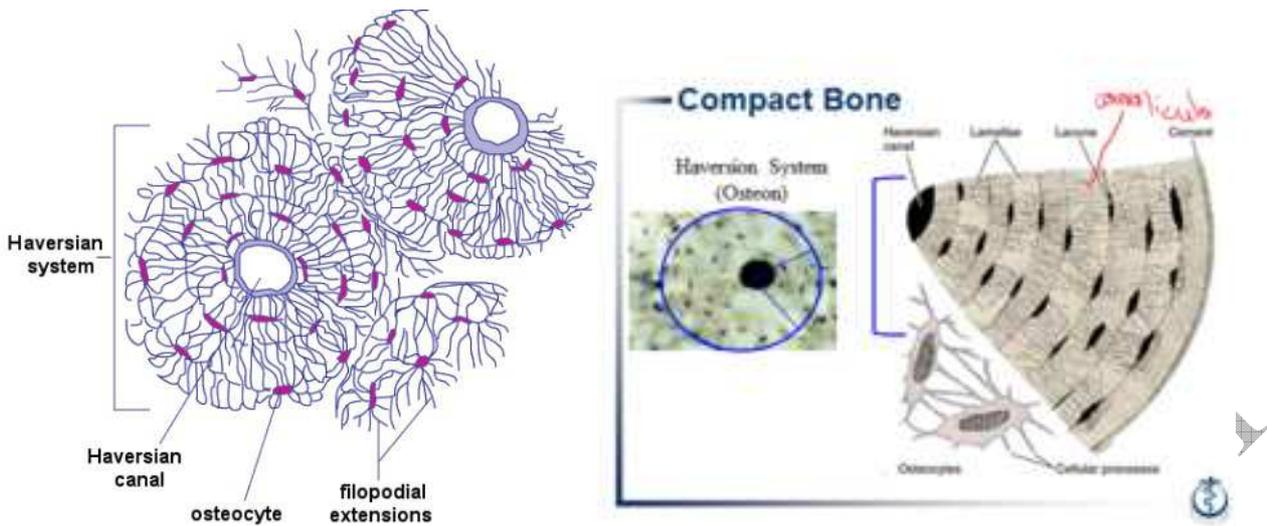
(b) Elastic cartilage (470×)



(c) Fibrocartilage (285×)

### 5. Explain Haversian system?

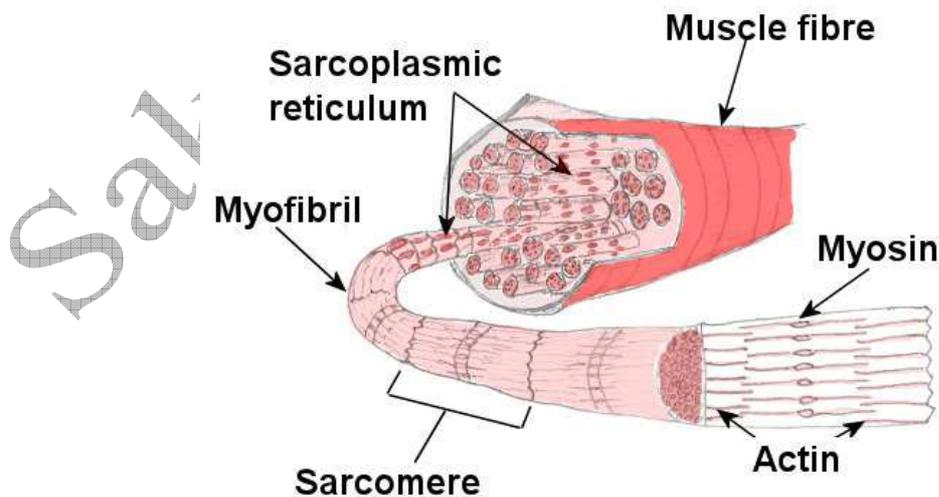
- A.
- The compact bone consists of several structural units called Osteons or Haversian systems arranged around and parallel to the bone marrow cavities.
  - Haversian system consists of a Haversian canal that runs parallel to the marrow cavity. It contains an artery, a vein and a lymphatic vessel. Haversian canal is surrounded by concentric lamellae. Small fluid filled spaces called 'lacunae' provided with minute canaliculi lie in between the lamellae.
  - Canaliculi connect the lacunae with one another and with Haversian canal. Each lacuna encloses one osteocyte (inactive form of osteoblast). The cytoplasmic processes of osteocytes extend through canaliculi.
  - A Haversian canal and the surrounding lamellae and lacunae are collected called a Haversian system or osteon.
  - The Haversian canals communicate with one another, with the periosteum and also with the marrow cavity by transverse or oblique canals called Volkmann's canals. Nutrients and gases diffuse from the vascular supply of Haversian canals.



6. Describe the structure of a skeletal muscle? (May – 2013)

A. Skeletal (Striped and Voluntary) Muscle:

- i) Skeletal muscle is usually attached to skeletal structures by 'tendons'. In a typical muscle such as the 'biceps' muscle, skeletal muscle fibre is surrounded by a thin connective tissue sheath, the endomysium.
- ii) A bundle of muscle fibres is called a fascicle. It is surrounded by a connective tissue sheath called perimysium. A group of fascicles form a 'muscle' which is surrounded by an epimysium (outer most connective tissue sheath).
- iii) These connective tissue layers may extend beyond the muscle to form a chord – like tendon or sheet – like aponeurosis.



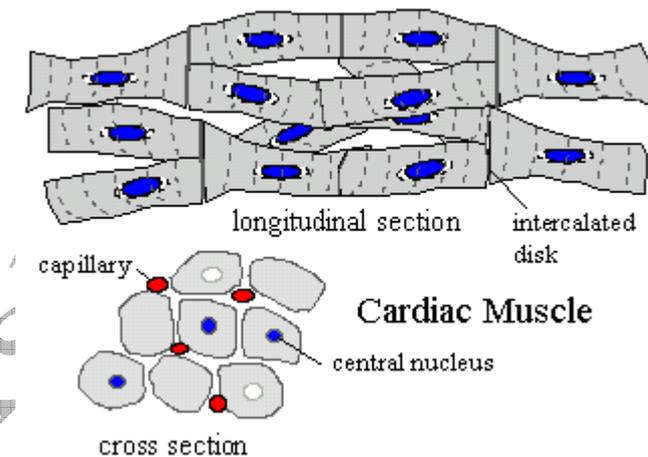
iv) A skeletal muscle fiber is a long, cylindrical and unbranched cell. It is a multinucleate cells with many oval nuclei characteristically in the 'peripheral' cytoplasm (a syncytium formed by fusion of cells).

v) Sarcoplasm has many myofibrils which show alternate dark and light bands. So it is called striped or striated muscle.

## 7. Describe the structure of a cardiac muscle?

A. **Cardian (striped and involuntary) muscle:** The cardiac muscle is striated like the skeletal muscle (shows sarcomeres). Cardiac muscles are found in the 'myocardium' of the heart of vertebrates. The cardiac muscle cells or the 'myocardial cells' are short, cylindrical, mononucleate or binucleate cells whose ends branch and form junctions with other cardiac muscle cells.

Each myocardial cell is joined to adjacent myocardial cells by 'electrical synapses' or 'gap junctions'. They permit 'electrical impulses' to be conducted along the long axis of the cardiac muscle fiber. The dark lines across cardiac muscle are called intercalated discs (IDs). These discs are highly characteristic of the cardiac muscle.



## 8. Describe the structure of a multipolar neuron?

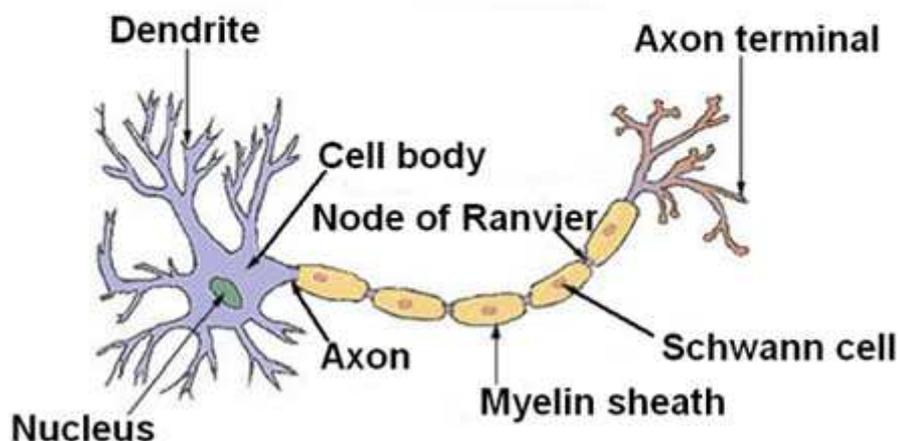
A. Multipolar neurons have one axon and two or more dendrites. Most neurons in our body are multipolar neurons. A neuron usually consists of a cell body with one to many dendrites and a single axon.

**Neurons:** Neurons are the 'functional units' of nervous tissue. These are electrically excitable cells which receive, initiate and conduct/transmit impulses. When a neuron is stimulated, an electric disturbance (action potential) is generated which swiftly travels along

its plasma membrane. A neuron usually consists of a “cell body” with one to many dendrites and a single axon.

**Cell Body:** It is also called perikaryon, cyton or soma. It contains abundant granular cytoplasm and a large spherical nucleus. The cytoplasm has Nissl bodies (they represent RER, the sites of protein synthesis), neurofibrils and lipofuscin granules.

## Structure of a Typical Neuron



**Dendrites:** Several short, branched processes which arise from the cyton are called dendrites. They also contain Nissl bodies and neurofibrils. They conduct nerve impulses towards the cell body (afferent processes).

**Axon:** An axon is a single, long, cylindrical process that originates from a region of the cyton called axon hillock. Plasmalemma of an axon is called axolemma, and the cytoplasm is called axoplasm, which contains neurofibrils. However, Nissl bodies are absent. An axon may give rise to collateral branches. Distally it branches into many fine filaments called telodendrites, (axon terminals), which end in bulb like structures called synaptic knobs or terminal boutons. Synaptic knobs possess ‘synaptic vesicles’ containing chemicals called neurotransmitters.

### 9. Give an account of the supporting cells of nervous tissue?

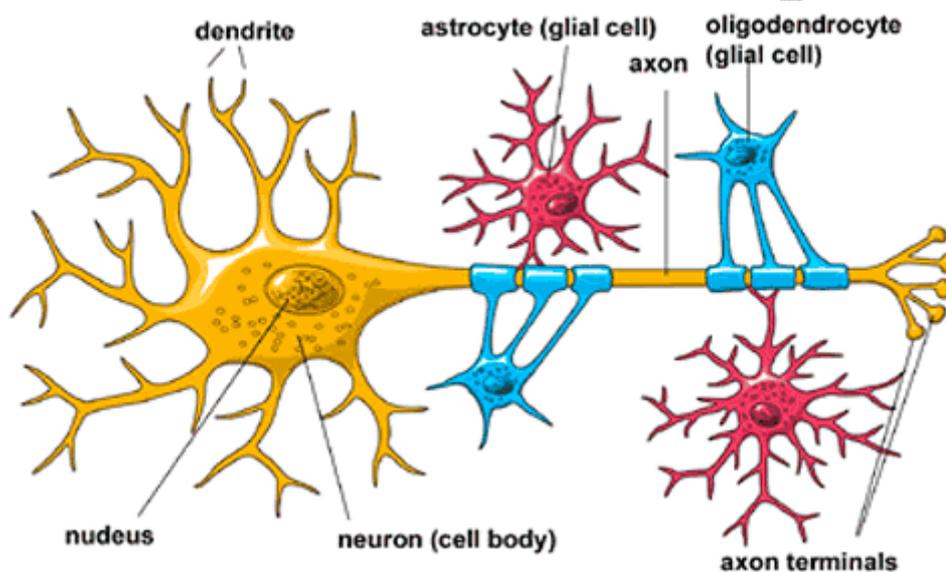
A. Neuroglia are the supporting and non-conducting cells of nervous tissue.

These cells can divide.

\*\* Neuroglial cells of central nervous system are Oligodendrocytes, astrocytes, ependymal cells and microglia. Oligodendrocytes form myelin sheath of CNS. Astrocytes are star shaped cells with interconnected network and bind neurons and capillaries and help in blood-brain barrier. Ependymal cells are ciliated cells that line the cavities of brain and spinal cord which help in the movements in cerebrospinal fluid. Microglial cells are phagocytic cells and derived from mesoderm.

\*\* Neuroglial cells of peripheral nervous system are satellite cells and Schwann cells.

Satellite cells surround the cell bodies in ganglia. Schwann cells form neurilemma around axons.



### 10. In which group of bilaterians do you find solid bauplan? Why is it called so?

A). Platyhelminthes is the group of bilaterians with solid bauplan. Body cavity is absent in these animals. In these animals, the mesenchyme derived from the third germinal layer, mesoderm occupies the entire blastocoels between the ectoderm and endoderm. As there is no body cavity, the acoelomates exhibit solid body plan.

### 11. Describe briefly about the three types of intercellular junctions of epithelial tissues?

A). Intercellular junctions in epithelial tissues provide both structural and functional links between the individual cells of an epithelium. They are of three types.

I) **Tight Junctions:** They prevent leakages of body fluids. Plasma membrane of adjacent cells are tightly pressed against each other and are bound together by specific proteins.

II) **Desmosomes :** These are known as anchoring or adhesion junctions which act as rivets binding the cells together into strong sheets. Intermediate filaments with the protein 'Keratin' anchor the desmosomes.

III) **Gap junctions (communication junctions):** they provide cytoplasmic channels between adjacent cells. They allow the movement of ions, sugar molecules, amino acids etc. from a cell to adjacent cells.

