

10.0 : Introduction :

Q.1. What is the average number of cells in human body?

Ans: Average number of cells in human body is about 100 trillion of 200 different types.

Q.2. What is a tissue?

Ans: A group of cells having same embryonic origin, structure and function is called tissue. e.g. Epithelial tissue.

OR

A group of cells having the same structure, function and origin is called a tissue.

Q.3. Define histology.

Ans: The branch of biology which deals with microscopic study of tissues is called histology.

Q.4. Define the following terms:

i. Organs:

Ans: Various tissues combine together in an orderly manner to form large functional units called organs.

e.g. Kidneys.

ii. Organ-system:

Ans: Number of organs work in co-ordination to form an organ-system.

e.g. Respiratory system.

Q.5. How are the cells in a multicellular organism classified?

Ans: In a multicellular organism, cells can be broadly classified under two types, as:

i. Somatic cells ii. Germ cells

i. Somatic cells:

Somatic cells are the body cells present all over the body, except reproductive organs.

They are responsible for all activities in the body. It is non-reproductive and divides by mitosis.

ii. Germ cells:

Sex cells or germ cells are related to reproduction and are present in reproductive system/organ.

Q.6. What are the various types of animal tissues? Explain their functions.

Ans: Animal tissues are of four types, according to their origin and functions:

No.	Type	Origin	Functions
i.	Epithelial tissue	Ectoderm (skin epidermis), Endoderm (gut epithelium), Mesoderm (coelomic epithelium)	Protection, secretion, absorption, excretion and reproduction.
ii.	Connective tissue	Mesoderm	Attachment, support, storage, protection and transport.
iii.	Muscular tissue	Mesoderm	Movement of body parts and locomotion.
iv.	Nervous tissue	Ectoderm	Control and coordination by nerve impulse.

10.1 : Epithelium or Epithelial Itissue :

Q.7. Name the tissue which originates from all the three germ layers.

Ans: Epithelial tissue originates from all the three germ layers.

Q.8. Give the characteristics of epithelial tissue.

Ans: Characteristics of epithelial tissue:

- i. Epithelial tissue covers the body outside and lines the various cavities inside.
- ii. Epithelial tissue lines the hollow organs, body cavities, blood vessels and ducts.
- iii. Epithelial tissue originates from all the three primary germ layers, i.e. ectoderm, endoderm and mesoderm.
- iv. Cells of an epithelial tissue are compactly arranged and having a very little or no intercellular space is seen. They form a continuous sheet.
- v. Cells are rested on thin, doubled layered, non-cellular basement membrane.
- vi. Epithelial tissue has nerve supply of its own.
- vii. Epithelial tissue is avascular (a = without, vascular = vessel), i.e. it lacks its own blood supply and hence, obtains nutrients which diffuse out of blood vessels.
- viii. Epithelial tissue has the power of division and regeneration. The old injured dead cells are sloughed off regularly and are replaced by new ones.

Q.9. Which type of tissue shows the absence of intercellular substance?

Ans: Epithelial tissue shows the absence of intercellular substance.

Q.10. Name the types of epithelial tissues.

Ans: Types of Epithelial tissue.

It is classified into:

i. Simple epithelium:

Epithelial tissue which is only one cell thick is known as simple epithelium.

It is further classified into:

- a. Simple Squamous Epithelium
- b. Simple Columnar Epithelium
- c. Simple Cuboidal Epithelium
- d. Simple Ciliated Epithelium
- e. Simple Glandular Epithelium

ii. Compound or Stratified epithelium:

Epithelium composed of several layers is called compound epithelium or stratified epithelium.

Q.11. What does 'basement membrane' signify?

Ans: Basement membrane is a thin layer of extracellular matrix on which the epithelium rest.

It is also known as basement lamina,

Q.12. Give an account of squamous epithelial tissue.

OR

Write a note on squamous epithelium.

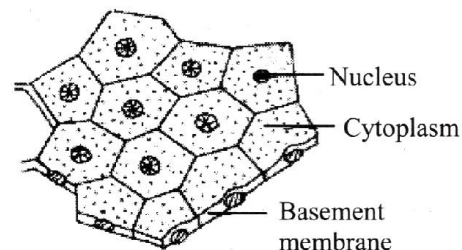
Ans: Squamous epithelium (pavement epithelium):

Location: Squamous epithelial tissue is located in the peritoneum of coelom and endothelium (lining of blood vessels), lung alveoli, oesophagus and lining of mouth.

Structure:

- i. It is composed of single layer of cells.
- ii. The cells are polygonal in shape, thin, delicate and flat.
- iii. These are uninucleated with centrally placed oval nucleus.
- iv. They appear like flat tiles when viewed from above, thus, are also called as pavement epithelium.

Functions: Filtration and diffusion of materials through - selectively permeable membrane.



Squamous epithelium

Q.13. Why squamous epithelium is also called pavement epithelium?

- Ans:**
- i. Cells of squamous epithelium are polygonal, thin and flat.
 - ii. When viewed from top under the microscope, they appear like flat tiles.

- iii. Hence, squamous epithelium is also called as pavement epithelium.

Q.14. Give an account of cuboidal epithelial tissue.

Ans: Cuboidal Epithelium:

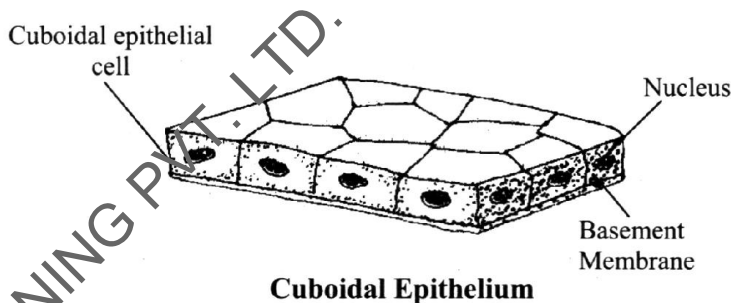
Location: It is generally found in thyroid gland, kidney and ducts of salivary glands. Cuboidal epithelial

Structure:

- The cells are cube shaped.
- They are uninucleated with centrally placed round or spherical nucleus.
- When viewed from the surface, the outline appears pentagonal hexagonal.

Functions:

- It helps in the absorption of useful substances from the urine before it is passed out.
- It helps in the secretion of saliva.



Q.15. Describe briefly about columnar epithelial tissue.

Ans: Columnar Epithelium.

Location:

It forms the inner lining of the stomach, small intestine and gall bladder.

Structure:

- The cells are tall, pillar-like. Their anterior end is free and much more broader than posterior narrow end resting on the basement membrane.
- Nucleus is oval or elliptical near the basal end.
- It can be further classified as ciliated columnar and non-ciliated columnar epithelium.

a. Ciliated columnar epithelium:

It is located in upper respiratory tract, fallopian tube of vertebrates.

Cells are similar to columnar epithelium.

They are tall, pillar-like with anterior free end much more broader than posterior narrow basal end and it is attached to basement membrane.

Large number of thin protoplasmic extensions called cilia are present on anterior free end, which are seen arising from basal granules.

Nucleus is oval and placed at the basal end.

Function: Cilia vibrates and are able to remove foreign particles from the surface.

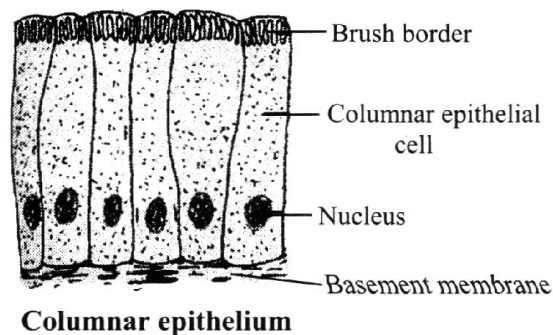
b. Non-ciliated columnar epithelium:

These tissue are without cilia at their anterior free end and hence, are called non-ciliated columnar epithelium.

Finger like protoplasmic projections called microvilli are present at the apical region of columnar cells.

Function:

- They secrete digestive enzymes.
- They play an important role in the absorption of nutrients from digested food.
- The microvilli helps in increasing the surface area for absorption.



Q.16. How are microvilli different from cilia?

Ans: Microvilli are small, finger-like projections (1 – 2 urn long and 0.1 urn wide) and occurs on the exposed surface of epithelial cells to maximize the surface area.

Cilia are short hair-like appendages found on the surfaces of some types of cells and organisms and are used for either propelling trapped materials out of the body or for locomotion.

Q.17. Give the function of microvilli.

Ans: Microvilli increase the surface area for absorption.

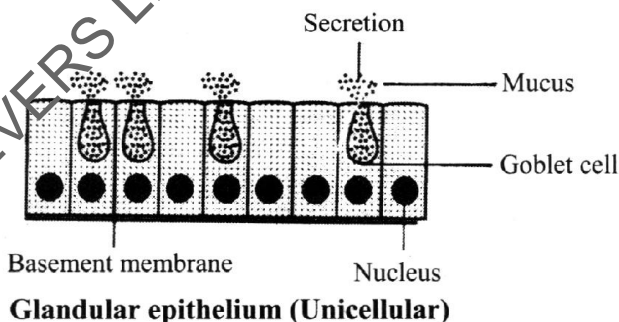
Q.18. Name the type of epithelium that lines the trachea to propel mucus towards larynx.

Ans: Ciliated epithelium.

Q.19. Discuss briefly about glandular epithelium and its types.

Ans: Glandular epithelium and its types:

- Specialized epithelial cells capable of synthesizing substances like enzymes, hormones, sweat, oil, etc., forms glandular epithelium.
- These secretions are carried into ducts (tubes) on the surface or into blood.
- The structure formed by such specialized epithelial cells is commonly called gland.
- Glands are further classified as endocrine and exocrine depending on the mode of secretion.



a. Endocrine glands (Endo = within, crine = secretion):

These glands pour their secretions directly into the blood stream.

Such glands lack duct and are thus, also called as ductless glands.

e.g. Pituitary gland, thyroid gland, parathyroid gland, adrenal gland, ovary, testis, Islets of Langerhans.

b. Exocrine glands (Exo = outside, crine = secretion):

These are glands with ducts.

Their secretion is carried by means of a duct or tube to the site of action.

These are responsible for body secretions.

e.g. Tear glands, salivary glands, gastric and intestinal glands, etc.

They are further classified on the basis of the number of cells as unicellular and multicellular glands.

Unicellular / Goblet glands:

In unicellular glands, an individual epithelial cell is modified into glandular cell.

Location: Goblet cell lines the digestive, respiratory, reproductive and urinary tract.

Function: Goblet cells secrete mucus.

Multicellular glands:

In multi-cellular glands, large number of glandular cells aggregate and form distinct microscopic or macroscopic organ.

e.g. Salivary glands, sebaceous gland (oil gland), sudoriferous (sweat) gland.

They are further classified on the basis of their duct type (branched or unbranched) and the shape of their secretory portions as simple or compound.

Q.20. Define.

- Exocrine glands**
- Endocrine glands**

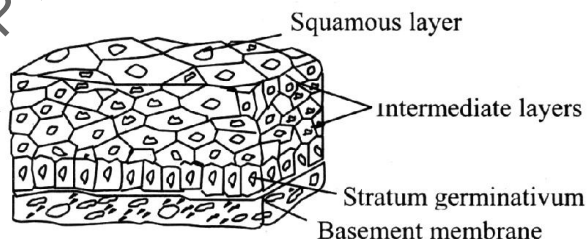
- Ans: i. Exocrine glands:** Those glands who have duct to carry their secretions are called exocrine glands.
ii. Endocrine glands: The glands without ducts pouring their secretion directly into the blood are called endocrine glands.

Q.21. Give one example each of exocrine and endocrine gland.

Ans: Exocrine glands - Tear glands
 Endocrine glands - Pituitary glands

Q.22. Explain compound epithelium with suitable diagram.

- Ans: i.** Compound epithelium is the stratified epithelial tissue which consists of many layers of cells.
ii. Only lowermost layer is based on basement membrane.
iii. This layer is called stratum germinativum, the cells of which- have ability to divide and redivide.



Compound epithelium

Q.23. Enlist the various functions of epithelium / epithelial tissue.

Ans: Functions of epithelial tissue:

- i. The epithelial tissue covers the body surface and provide protection from mechanical injury.
- ii. Large number of epithelial cells are modified which are responsible for body secretions, which are antibacterial (sweat) in nature or useful in metabolic activities.
- iii. Epithelial cells help in removal of excess toxic materials from the body.
- iv. The modified epithelial cells are provided with microvilli. Microvilli increases the surface area of absorption.
 The sensory cells are important site for receiving stimuli which are followed by showing an orderly response.
- vi. Since the epithelial cells lack intracellular spaces, they play an important role in regulating the exchange of substances between the body and external environment (Permeability).
- vii. It serves as a barrier to keep the different body systems separate from each other.

Q.24. Distinguish between simple epithelium and compound epithelium.

Ans: Simple epithelium is unilaminar, while compound epithelium is multi-laminar.

10.2 : Connective tissue :

Q.25. State the origin of connective tissues.

Ans: Connective tissues are mesodermal in origin.

Q.26. What is connective tissue? Write its characteristics.

Ans: The tissue that connects or supports all other tissues of the body and provides internal support is called connective tissue.

Characteristics:

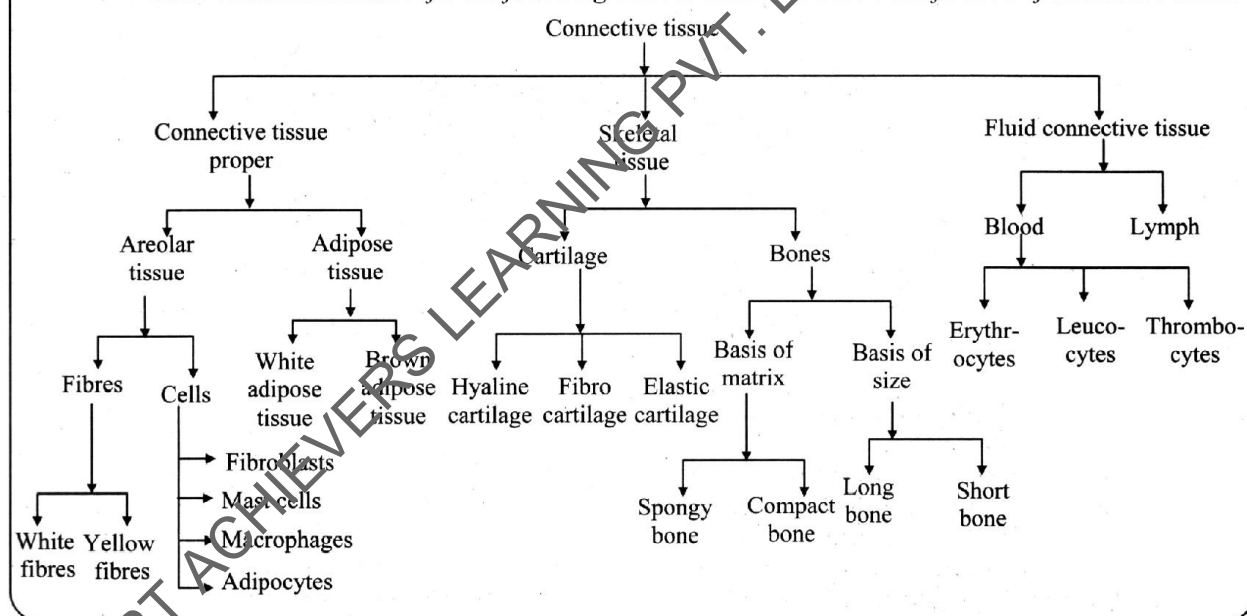
- i. Connective tissue possess large amount of intercellular space filled with ground substance or matrix.
- ii. Matrix is formed by the secretion of the cells present in the connective tissue.
- iii. Connective, 'tissues are characterized by the presence of two important elements - cells and extracellular matrix or ground substance.
- iv. They are not present on body surfaces, but internally different organs are inter-connected by connective tissue.
- v. Almost all connective tissues, except cartilage are highly vascular, i.e. they have a rich supply of blood.

Q.27. How are connective tissues classified?

Ans: Connective tissues can be broadly classified into three groups as:

- i. Connective tissue proper
- ii. Skeletal tissue
- iii. Fluid connective tissue

Note : Students should refer the following chart to understand the classification of connective tissue.



Q.28 Describe various types of cells and fibres present in areolar connective tissue.

OR

Describe in brief about areolar connective tissue with the help of suitable diagram.

Ans: Areolar connective tissue (areol = a small space):

Location: It is found below skin, muscles, bones, around blood vessels, nerves and in bone marrow.

Structure:

- a. The extra-cellular ground substance is jelly-like and made up of gelatin.
- b. It contains two types of fibres: white and yellow.

Structurally, it is divided into:

- A. Fibres
- B. Cells

A. Fibres:

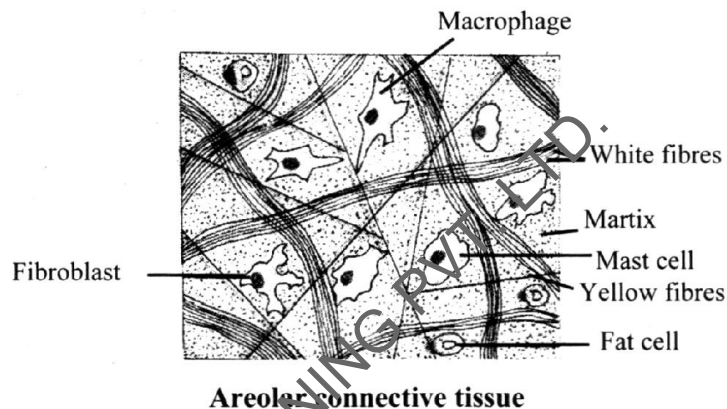
There are two types of fibres:

i. Collagen fibres or white fibres:

- a. They are unbranched, wavy and are arranged in bundles.
- b. White fibres are also called collagen fibres as they contain proteinous substance called collagen (colla = glue).
- c. They give flexibility to tissues.
- d. The fibres are secreted by large, flat, star-shaped fibroblast (or fibrocytes).

ii. Elastic or yellow fibres:

- a. Yellow fibres are very few in number.
- b. They are thin, slender and arranged singly.
- c. These fibres are branched.
- d. These are elastic due to presence of protein called elastin.
- e. They are profusely branched, and are interconnected to form large network.
- f. Thus, yellow fibres act as supporting fibres.

**B. Cells:**

Four main types of cells are found:

i. Fibroblasts (Fibro = fibres):

- a. They are large, flat cells with many branching processes.
- b. They secrete both types of fibres.

ii. Mast cells:

- a. Mast cells are many and surround the blood vessels.
- b. The cytoplasm of mast cell contain heparin and histamine granules.
- c. Heparin prevents clotting of blood and histamine is useful in dilating blood vessel - an inflammatory response to injury or infection.

iii. Macrophages:

- a. They are large cells and phagocytic in action. They are also known as histocytes.

iv. Adipocytes:

- a. They are useful in storage of fats, hence known as fat cells.

Q.29. Name the cells of connective tissue which form the fibres.

Ans: Fibroblasts are the cells of connective tissue which form the fibres.

Q.30. Distinguish between epithelial tissue and connective tissue.

Ans:

No.	Epithelial tissue	Connective tissue
i.	No intercellular space between the cells are present.	Large intercellular space present between the cell.
ii.	Basement membrane present.	Basement membrane absent.
iii.	Function: Covering, protection, secretion	Function: Attachment, support, storage, transportation.
iv.	Examples: Skin, Lung alveoli, Kidney tubules	Examples: Blood, Ligament, Bone

Q.31. Distinguish between white fibres and yellow fibres.

Ans:

No.	White Fibres	Yellow Fibres
i.	They occur in bundles.	They do not occur in bundles.
ii.	They are unbranched.	They are branched.
iii.	They are wavy.	They are straight.
iv.	They are made up of collagen protein.	They are made up of elastin protein.
v.	They give tensile strength.	They give elasticity.

Q.32. Give location, structure and function of adipose tissue.

Ans: Adipose tissue (adipo = fat):

Location: It is found in association with areolar connective tissue. Adipose tissue is present beneath the skin, around the kidneys and between the internal organs in association with areolar connective tissue.

Structure:

- a. It contains large number of adipocytes, i.e. cells specialized for storage of fats.
- b. Due to presence of fats in adipocytes, nucleus and the cytoplasm is shifted towards periphery.

Adipose tissue is of two types:

i. White adipose tissue:

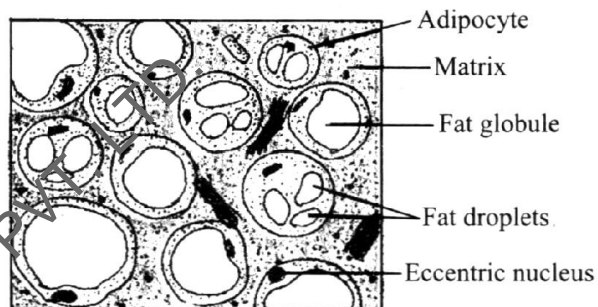
- a. It is opaque due to the presence of large number of adipocytes.
- b. It is normally present in adults.

ii. Brown adipose tissue:

- a. It is reddish brown in colour due to the presence of large number of blood vessels.
- b. It is mostly seen in developing foetus and infants.

Functions:

- i. Adipose tissue is a good insulator and is the major source of energy reserve.
- ii. It supports and protects various internal organs.



Adipose tissue

Q.33. Why does an obese person suffer from high blood pressure more commonly as compared to lean persons?

Ans: i. Obese person has increased amount of adipose tissues.

ii. New blood vessels are formed to supply adipose tissues which leads to increased blood pressure.

iii. Hence, an obese person suffers from high blood pressure more commonly as compared to lean persons.

Q.34. What is tendon?

Ans: A band of white fibres which join muscle to bone is called a tendon.

Q.35. Give two examples of tendon.

Ans: Achielles tendon, Hamstring tendon.

Q.36. Write a short note on tendon.

Ans: i. A band of white fibres which join muscles to bone is called a tendon.

ii. They are formed of bundles of collagen fibres (white fibres).

iii. At one end: they form the core of muscles and the other end is attached to the bone.

iv. Tendons are fibrous with great strength but limited flexibility.

Examples:

i. Achielles tendon (band of tissue connecting the heel bone to the calf muscle of the leg).

ii. Hamstring tendon (A band of inelastic tissue connecting muscles to the back of the bone).

Function: They play an important role in various movements.

Q.37. What is a ligament?

Ans: A band or sheet of strong but elastic fibrous tissue connecting bones or cartilage at a joint is called a ligament.

Q.38. Write a short note on ligament.

Ans: i. A band or sheet of strong but elastic fibrous tissue connecting bones or cartilage at a joint is called a ligament.

ii. They are formed of bundles of yellow fibres with some collagen fibres.

- iii. They bind two different bones at a joint.

Function:

- i. They prevent dislocation of bone.
ii. They provide flexibility to the joints.

Q.39. What is skeletal tissue?

Ans: Skeletal tissue is a type of tissue which supports the framework of the body.

It is of two types viz. cartilage and bone.

Q.40. Explain in brief about various types of cartilages, with the help of suitable diagram.

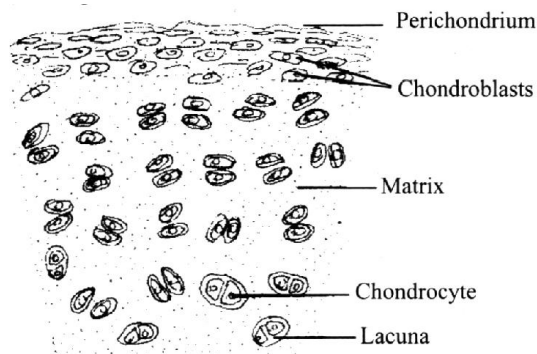
Ans: Cartilage is a type of skeletal tissue. Depending upon the nature of matrix, the cartilage is of four types, as:

i. Hyaline cartilage:

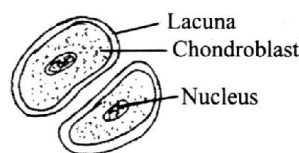
- a. Among the four types of cartilage, hyaline cartilage it is the weakest cartilage.
b. It is found at the ends of long bones, anterior end of ribs, nose tip, larynx, bronchial tree, foetal and embryonic skeleton.
c. It is abundantly found in the body.
d. It is compressible and elastic in nature and is surrounded by perichondrium.
e. The matrix (chondrin) is bluish white gel like and contains very fine collagen fibres and chondrocytes (2-8 in each lacuna).

Functions:

- a. It provides flexibility and support to the body.
b. It helps in reducing friction.
c. It is a good shock absorber.



Hyaline Cartilage



Chondroblast in Lacuna

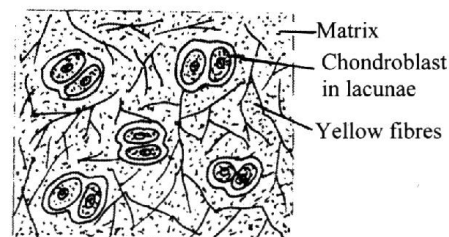
ii. Elastic cartilage:

- a. It is surrounded by perichondrium with matrix (chondrin) rich in thread-like network of elastic fibres.
b. Chondrocytes are few in number and seen encircled by elastic fibres.
c. Elastic cartilage is found in epiglottis (lid on the top of larynx), external ear (auricle), trachea, etc.

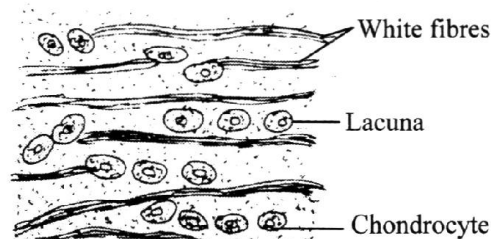
Function: It gives support and maintains shape.

iii. Fibrous cartilage/ Fibro cartilage:

- a. It is the strongest and rigid cartilage present in the body.
b. It is found in pubic symphysis, intervertebral disc, etc.
c. It is not surrounded by perichondrium.
d. The matrix (chondrin) contains bundles of collagen fibres.



Elastic cartilage



Fibrous cartilage

e. Chondrocytes are few in number and are seen scattered in bundles of collagen fibre.

Function: It helps in support and fusion of different organs of the body

iv. Calcified cartilage:

- It is formed due to deposition of various salts in the matrix.
- Cartilage loses its flexibility due to salt deposition.
- This condition is found in old age where joints lose mobility.

Q.41. Distinguish between Fibro cartilage and Elastic cartilage.

Ans:

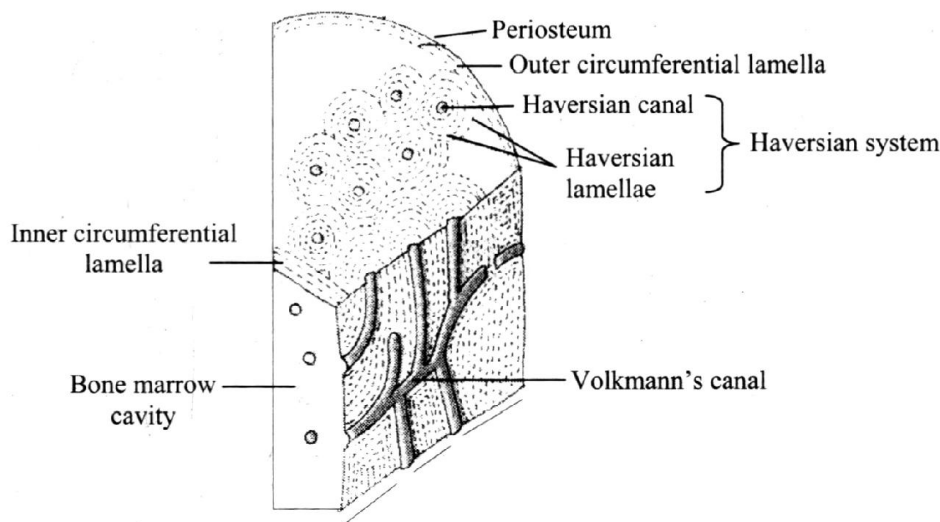
No.	Fibro cartilage	Elastic cartilage
i.	It contains large number of collagen fibres.	It contains large number of elastic fibres.
ii.	Strong, toughest and inflexible.	Elastic and flexible
iii.	e.g. Intervertebral disc, pubic symphysis, etc.	Epiglottis, pinna, Eustachian tube.

Q.42. Describe the structure and function of mammalian bone.

Ans: Bone is the supporting and protective skeletal tissue of vertebrates which protects internal soft and delicate tissue.

Structure:

- Bone is enclosed in thin layer of white fibrous connective tissue (collagen fibre) called periosteum.
- Periosteum is pierced by blood vessels and nerves.
- Endosteum surrounds the marrow cavity.
- Bone shows presence of hard, solid, calcified matrix called ossein.
- The hardness of the bone is due to the deposition of inorganic mineral salt called hydroxy-apatite $[Ca_{10}(PO_4MOH)_2]$.
- In bone, the matrix is arranged in concentric circles called lamellae around the central cavity of bone called bone marrow cavity.
- Each lamella is bounded by small fluid space called lacunae.
- Each lacuna contains cells called osteocytes or osteoblast.
- Osteocytes are inactive and osteoblasts are active bone cells.
- Each lacuna has fine cytoplasmic extensions called canaliculi which pass through lamella and makes connection with adjacent lacunae.
- The structural unit of bone is Haversian system or osteon which is the characteristic feature of mammalian bone.



3D structure of Mammalian bone

Q.43. Distinguish between cartilage and bone.

Ans:

No.	Cartilage	Bone
i.	It is covered by tough fibrous membrane which is called perichondrium.	It is covered with thick layer called periosteum.
ii.	Cartilage is flexible.	Bone is not flexible.
iii.	Haversian system absent.	Haversian system present.
iv.	Haematopoiesis does not occur in cartilages.	Haematopoiesis occurs in bones.
v.	Matrix in the cartilage is made up of chondrin.	Matrix in the bone is made up of ossein.
vi.	In the matrix, delicate network of collagen or elastic fibres, chondrocytes and lacunae are scattered irregularly.	In the matrix osteocytes, lacunae, canaliculi remain arranged in different rows known as lamellae.

Q.44. Name two types of cells found in a bone.

Ans: Osteoblasts and osteocytes

Q.45. Name the protein present in the bone matrix.

Ans: Ossein is the protein present in the bone matrix.

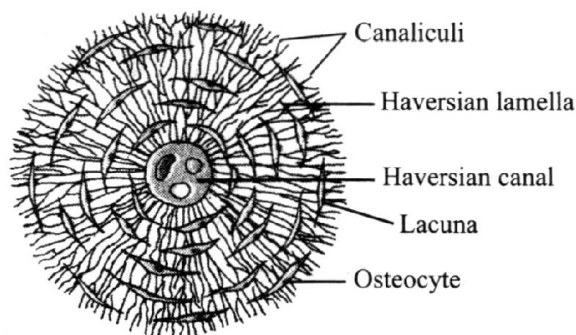
Q.46. Describe the Haversian system.

OR

Write short note on Haversian system.

Ans: Haversian system:

- The structural unit of bone is known as Haversian system or osteon.
- Presence of Haversian system is the characteristic feature of mammalian bone.
- Haversian system shows Haversian canal in the centre.
- Haversian canal consists of blood vessels both artery and vein, lymph vessel and a nerve.
- Lacunae containing osteoblasts or osteocytes are seen arranged concentrically around Haversian canal.
- The two adjacent Haversian systems are inter connected by Volkmann's canal.



Haversian system

Q.47. Explain in detail about the various types of bones.

Ans: Bones are classified:

i. On the basis of matrix:

a. Spongy bones:

It is seen at the expanded ends (epiphysial region) of long bones.

The matrix or ossein is web-like containing columns of bone called trabeculae with many spaces in between.

It is filled with soft tissue called red marrow responsible for haernopoiesis.

It lacks Haversian system.

b. Compact bones:

It is seen in the shaft of long bones.

The matrix is hard, solid, dense, without space.

It is filled with fatty tissue called yellow marrow which stores fat cells.

It has many haversian systems or osteon which is the basic unit of compact bone.

ii. **On the basis of their size:**

- a. Long bones: e.g. Limb bones, ribs.
- b. Short bones: e.g. Vertebrae, tarsals, meta-tarsals.

Q.48. Distinguish between spongy bone and compact bone.

Ans:

No.	Spongy bone	Compact bone
i.	They lack Haversian system.	Have regular Haversian system.
ii.	It is filled with soft tissue, i.e. red bone marrow.	It is filled with fatty tissue, i.e. yellow bone marrow.
iii.	Matrix of spongy bone is web-like containing columns of bone called trabeculae.	Matrix of compact bone is hard, solid and dense.
iv.	Haemopoiesis takes place in spongy bone.	Storage of fat cells is done in compact bone.

Q.49. What is exoskeleton?

Ans: In some organisms, the supporting framework of the body (skeleton) is present outside the body. It is called exoskeleton. e.g. Outer shell in Pila.

Q.50. Write the functions of skeletal tissue.

Ans: i. Skeletal tissue supports the body by forming endoskeleton of organisms.

ii. It protects internal organs of the body.

iii. It forms the base for attachment of muscles.

iv. In long bones, the yellow marrow cavity helps in storage of reserve food material, while the red marrow cavity is useful in haemopoiesis.

10.3 : Muscular tissue :

Q.51. Which fibres are mesodermal in origin?

Ans: Muscle fibres are mesodermal in origin.

Q.52. Give the characteristics of muscular tissue.

Ans: Characteristics of muscular tissue:

- i. The animal tissue which is highly specialized for the contraction and relaxation is called muscular tissue. Muscular tissue is called muscles.
- ii. Muscles are mesodermal in origin.
- iii. Muscular tissue is made up of thin, elongated contractile muscle fibres, hence, it is called contractile tissue.
- iv. They have the ability to contract due to the presence of protein filaments: myosin and actin.
- v. They play an important role in locomotion and movement.
- vi. Muscle fibres are thin, elongated cells with one or many nuclei.
- vii. They are bound by sarcolemma and contains specialized cytoplasm called sarcoplasm.
- viii. In the sarcoplasm, each muscle fibre contains myofibrils.
- ix. They are made up of contractile proteins-myosin and actin.
- x. This tissue is innervated with nerve fibres.
- xi. They are vascular and are supplied by blood vessel~ which carry nutrients and take away the metabolic waste.
- xii. About 40% of the total body weight is due to muscles in mammals.

Q.53. Mention different types of muscles and give their locations.

Ans: There are three types of muscles in our body, as:

i. Skeletal, striated or voluntary muscles:

These are seen attached to bones in head, trunk and limb region, thus are also called skeletal muscles.

ii. Smooth, unstriated or involuntary muscles:

They are seen in the walls of all visceral organs like stomach, intestine, reproductive and urinary system, etc.

iii. Cardiac or heart muscles:

They are found in the wall of heart or myocardium.

Q.54. With the help of a neat labelled diagram, describe the location, structure and functions of striated muscle fibre.

Ans: Skeletal, Striated or Voluntary muscles:

The skeletal muscles work under the control of animals will. Hence, they are also known as voluntary muscles.

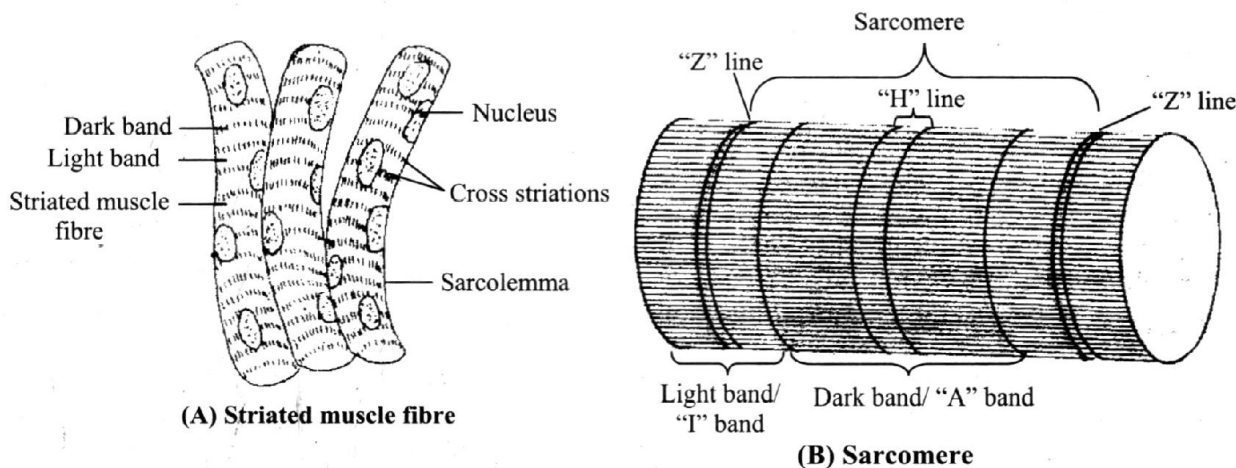
Location: Striated muscle fibres are seen attached to bones in head, trunk and limb region.

Structure:

- i. Light microscopic studies reveal that striated muscles shows cross-striations in the form of light and dark bands.
- ii. These muscles contain large number of peripherally placed nuclei.
- iii. Several muscle fibres are placed parallel to one another and are connected to each other by means of connective tissue to form small muscular bundles.
- iv. Muscle fibres contain large number of myofibrils within the sarcoplasm.
- v. Muscle fibres are covered by sarcolemma.
- vi. It is made up of lipoprotein and polysaccharides.
- vii. Myofibrils are thin, cylindrical and run parallel to axis.
- viii. Myofibrils show alternate dark and light bands.
- ix. Light bands are also called 'I' or Isotropic band. They allow light to pass through and so appear lighter.
- x. A narrow dark line is seen in light band and is called 'Z-line' or Krause's membrane.
- xi. Dark band or 'A' or Anisotropic band does not allow light to pass through and so it appears dark.
- xii. Dark band is interrupted with narrow light line called "H-Line" or Hensen's line.
- xiii. A portion between two adjacent 'Z'-lines is called sarcomere.

Function:

Striated muscles bring the contraction and relaxation of muscles, thus helping in body movement.



Q.55. Define sarcomere.

Ans: Sarcomere is the portion between two adjacent 'Z'-lines of striated muscle fibres.

Q.56. What is the structural and functional unit of striated muscle fibre?

Ans: Sarcomere is the structural and functional unit of striated muscle fibre.

Q.57. Name the type of muscle fibres lining the stomach and intestine.

Ans: Smooth muscles / Non-Striated muscle fibres.

Q.58. Describe the, structure, location and functions of smooth muscles.

Ans: Smooth, Unstriated or Involuntary Muscles:

- The smooth muscles are also called as non-striated / non-striped / involuntary / non-skeletal muscles / visceral muscles.
- These muscles are without striations and hence, also called as non-striated muscles.
- They are involuntary in nature, i.e. their contractions, are not controlled by our will.

Location:

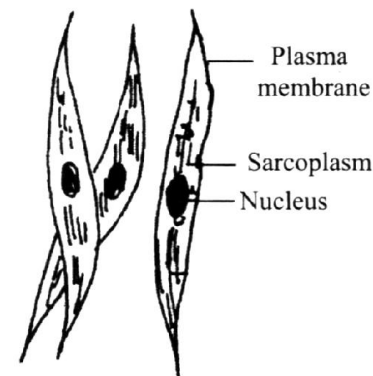
They are seen in the walls of all visceral organs like stomach, intestine, reproductive organs and urinary system. Therefore, they are also known as visceral muscles. They are also found in the iris of the Smooth muscles eye, in ureters and in the bronchi of lungs.

Structure:

- Unstriated muscle fibres are elongated, slender and spindle shaped (with tapering ends).
- They are arranged in sheets or layers and are bound by sarcolemma.
- Cross-striations are absent within the sarcoplasm.
- These spindle fibres show presence of centrally placed single large oval nucleus.
- Each muscle fibre contains many fine contractile myofibrils arranged longitudinally.
- These are innervated by autonomous nervous system (sympathetic and parasympathetic).
- These cells are involuntary in action.
- They undergo prolonged but slow contraction and relaxation.

Function:

They are responsible for the peristaltic movements which help in passage of food in the digestive tract.



Smooth muscles

Q.59. Name the muscle in which intercalated discs are found.

Ans: Intercalated discs are found in cardiac muscles.

Q.60. Describe location, structure and functions of cardiac muscles. OR

Describe the structure and location of cardiac muscle fibres.

Ans: The cardiac muscles contract automatically (involuntarily) and regularly for years together.

It is called cardiac muscle as these muscles are present in the heart wall only.

They do not undergo fatigueness.

Location:

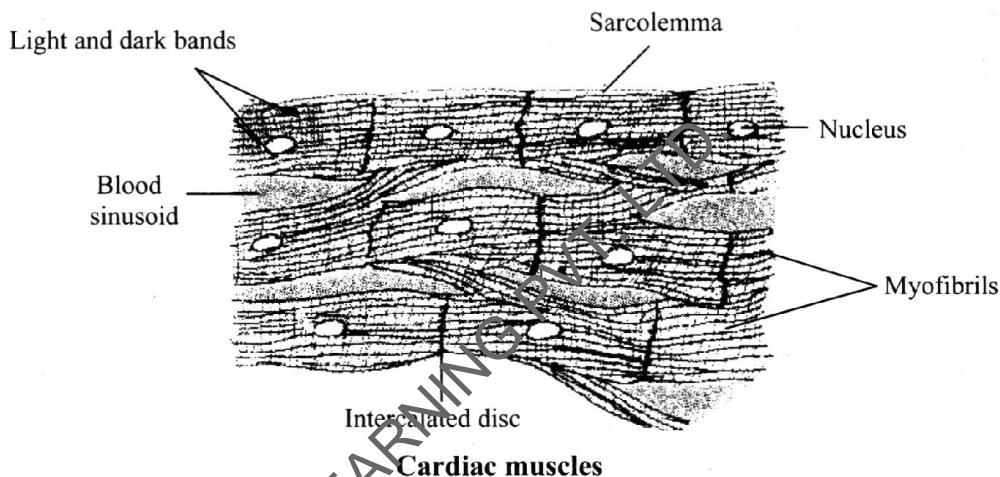
They are found only in the wall of the heart or myocardium.

Structure:

- An individual fibre is intermediate between striated and unstriated muscle fibres.
- These are short, branched fibres with ill-defined sarcolemma.
- Cardiac muscle fibres are uni-nucleated but joined together by neighbouring cardiac muscle fibres, it appears to be multinucleated.
- The branches of different fibres join together to form a network.
- The place where these fibres unite is marked by the presence of special zig-zag junctions called intercalated disc (intercalate = to insert between).
- Intercalated discs are unique features of cardiac muscles and are formed by transverse thickening of sarcolemma.
- They show the presence of alternate light and dark bands.
- They are stimulated by nerve endings of autonomous nervous system.

Function:

Cardiac muscles bring about contraction and relaxation of heart, which helps in circulation of blood throughout the body.



Cardiac muscles

Q.61. What is meant by intercalated disc? Mention its function.

Ans: Intercalated disc is a dark region that marks the junction between adjacent myocardial cells. Intercalated discs support synchronized contraction of cardiac tissues.

Q.62. Differentiate between striated and non-striated muscle fibres.

Ans:

No.	Striated muscle fibre	Non – striated muscle fibre
i.	These are voluntary muscle or skeletal muscles.	These are involuntary or visceral muscles.
ii.	Found in muscles attached to bones.	They are found in hollow organs such as alimentary canal, reproductive tract, etc.
iii.	Alternate light and dark bands are present, hence gives striated appearance.	They do not show any striations.
iv.	They are under one's own control or will.	They are not under one's own control or will.
v.	They are multinucleate.	They are uninucleate.

Q.63. Difference between cardiac and striated muscles.

Ans:

No.	Striated muscles	Cardiac muscles
i.	These are voluntary muscles.	These are involuntary muscles.
ii.	They are attached to bones by tendons.	They are present exclusively in the heart.
iii.	Each striated muscle is covered by a thin elastic covering called sarcolemma.	Sarcolemma is absent.
iv.	Alternate light and dark bands are present, hence gives a striated appearance.	Bands are absent.

Q.64. Which muscle fibre tapers at both the ends and does not show striation?

Ans: Smooth muscle fibre.

10.4 : Nervous tissue :

Q.65. Give the characteristics of nervous tissue.

Ans: i. Nervous system is made up of nervous tissue and supportive cells called glial cells or neuroglia.
ii. Nervous tissue is composed of millions of nerve cells called neurons.

- iii. They provide the quickest means of communication within the body and help the body in giving response to the external stimulus.
- iv. Thus, the neuron is considered as impulse generating and impulse conducting unit.
- v. Two important basic properties are excitability and conductivity.
- vi. Excitability is the excitation by external stimulus by changing the action potential of their membrane.
- vii. Conductivity helps in carrying a wave of elastic impulse from the dendron to axon.

Q.66. Write a note on neuroglial cells.

- Ans:**
- i. In the central nervous system, large amount of supporting non-nervous cells are present in the interneuronal spaces called neuroglial cells (microglial cells and oligodendrocytes).
 - ii. These cells are more in number as compared to neurons.
 - iii. These cells have capacity of regeneration and division which is lacking in nerve cell.
 - iv. The glial cells are useful in supporting the neurons, nourishment of neuron and provide protection to the neurons by engulfing the foreign particles (phagocytosis).

Q.67. Describe the structure of neuron.

Ans: Neuron is the structural and functional unit of nervous system.

It is covered by neurilemma and is made of two distinct regions as cyton and cytoplasmic extensions.

A. Cyton:

- i. Cyton or cell body is called perikaryon or soma. It has granular cytoplasm with large number of network of neurofibrils, various cell organelles like mitochondria, golgi Nissl's granules complex, RER and centrally placed nucleus.
- ii. The granules present in cytoplasm are conical, rich in RNA and are involved in protein synthesis. These are called Nissl's granules.

B. Cytoplasmic extensions:

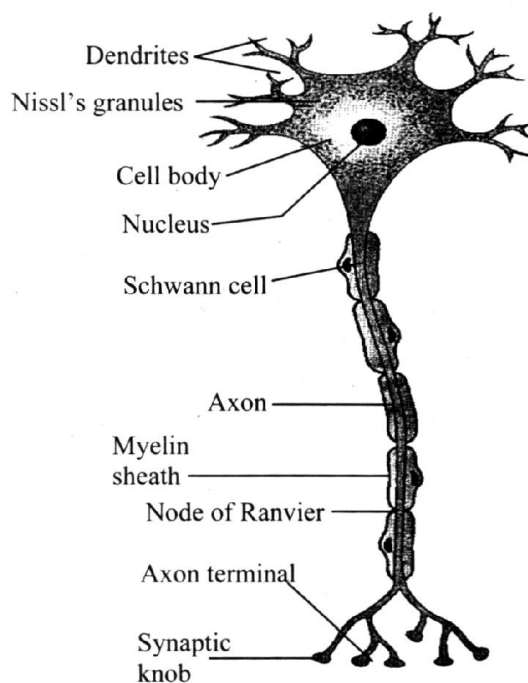
Two types of cytoplasmic extensions are found arising from the cyton, namely dendrons or dendrites and axon.

a. Dendrites:

- i. Dendrites are thin, small cytoplasmic extensions seen in the periphery of the cyton or cell body of neuron.
- ii. These are many in number and break into numerous fine branches which help to carry impulses towards the cell body and are provided with few of the neurofibrils.

b. Axon:

- i. Axon is the long cytoplasmic process useful in conduction of impulse away from the cell body.
- ii. It is lined by axonal membrane and encloses cytoplasm called axoplasm.
- iii. The axoplasm is in continuation with the cytoplasm of cyton.
- iv. It contains large number of mitochondria, RER and neurofibrils, but lacks Nissl's granules and golgi complex.
- v. The axon, throughout the length is wrapped by Schwann cell which forms insulating myelin sheath.
- vi. Neuron with myelin sheath are called myelinated neurons.



Structure of a Neuron

- vii. In certain animals, neuron lacks the myelin sheath and thus, have non-myelinated neurons.
- viii. The terminal end of the axon in both myelinated and non-myelinated neurons shows presence of many swollen knob like structures called telodendrons.
- ix. They are filled with neurosecretory (acetylcholine and adrenaline) material which act as neurotransmitter.

Q.68. What is the basic unit of neural system?

Ans: Neuron is the basic unit of neural system.

Q.69. Why do neurons lack the power of division?

Ans: Neurons do not possess the power of division as they do not have a centriole.

Q.70. Name the small sized branched nerve process of a nerve cell.

Ans: Dendron is the small sized branched nerve process of a nerve cell.

Q.71. Describe in detail the classification of neurons.

Ans: Neurons are classified as follows:

- i. Depending on the number and arrangement of cytoplasmic extensions:
 - a. **Unipolar neurons:**
 - i. They are neurons with single process.
 - ii. They are also called monopolar neuron.
 - b. **Bipolar neurons:**
Bipolar neurons have two processes originating from the opposite poles of the cell body.
 - c. **Multipolar neurons:**
They are with more than two processes.
- ii. **Depending on the function they perform:**
 - a. **Sensory neurons:**
Sensory neurons respond to external stimulus and carry impulse towards the central nervous system.
The axonal part of sensory neuron terminates in the intermediate neuron.
 - b. **Intermediate neurons:**
Intermediate neurons are seen in brain and spinal cord. These are stimulated by the impulses that reach from the sensory neuron or the other intermediate neuron.
 - c. **Motor neurons:**
Motor neurons carry impulse from the central nervous system towards the effector organ which brings about response of-the body.
- iii. **On the basis of presence or absence of myelin sheath:**
 - a. **Medullated neurons/ myelinated neuron:**
 - i. Myelinated or medullated nerve fibre is the one which has its axon surrounded by many cells called Schwann cells.
 - ii. They secrete insulating fatty layer around the nerve fibre which forms myelin sheath.
 - iii. Myelinated neuron is interrupted at regular intervals called Nodes of Ran vier.
 - iv. A thin delicate membrane called neurilemma surrounds the axon.
 - v. Cranial nerves of vertebrates are medullated type of neurons.
 - vi. Myelinated nerve fibres helps in conducting impulse at faster rate. As the impulse jumps from one Node of Ranvier to another, this is called saltatory conduction.
 - b. **Non-medullated neurons/non-myelinated neuron:**
 - i. The axon of the nerve fibre is without myelin sheath as the Schwann cells present around the nerve fibre does not secrete the sheath.
 - ii. Autonomous nerves of vertebrate and invertebrate nervous system shows the presence of non-medullated neurons.
 - iii. These nerve fibres also help in conduction of impulses, but at much slower rate as compared to myelinated nerve fibre.

Q.72. Name the two types of nerve fibres.

Ans: Medullated nerve fibres and non-medullated nerve fibres.

Q.73. Distinguish between myelinated and non-myelinated nerve fibres.

OR

Distinguish between medullated nerve fibre and non-medullated nerve fibers.

Ans:

No.	Medullated nerve fibres	Non-medullated nerve fibres
i.	Medullary sheath is present.	Medullary sheath is absent.
ii.	They have nodes of Ranvier at regular intervals.	They do not have nodes of Ranvier.
iii.	Inter-nodes are present.	Inter-nodes are absent.
iv.	Saltatory conduction takes place in myelinated nerve fibres.	Saltatory conduction is not seen in myelinated nerve fibre.
v.	These conduct the nerve impulse faster.	These conduct nerve impulse at slow rate.

Q.74. Define synapse.

Ans: The functional contact between axons and dendrites of two different neurons is called synapse.

Q.75. Write a short note on synapse.

Ans: i. A junction between two neurons is called synapse.
 ii. Nerve impulses are transmitted from one neuron to the other neuron across the synapse.
 iii. The conduction of impulse is unidirectional.
 iv. Synaptic transmission is effected by release of certain chemicals called neurotransmitters such as acetylcholine.

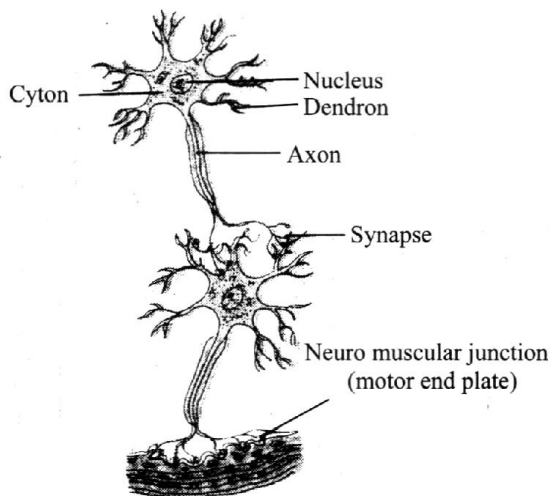


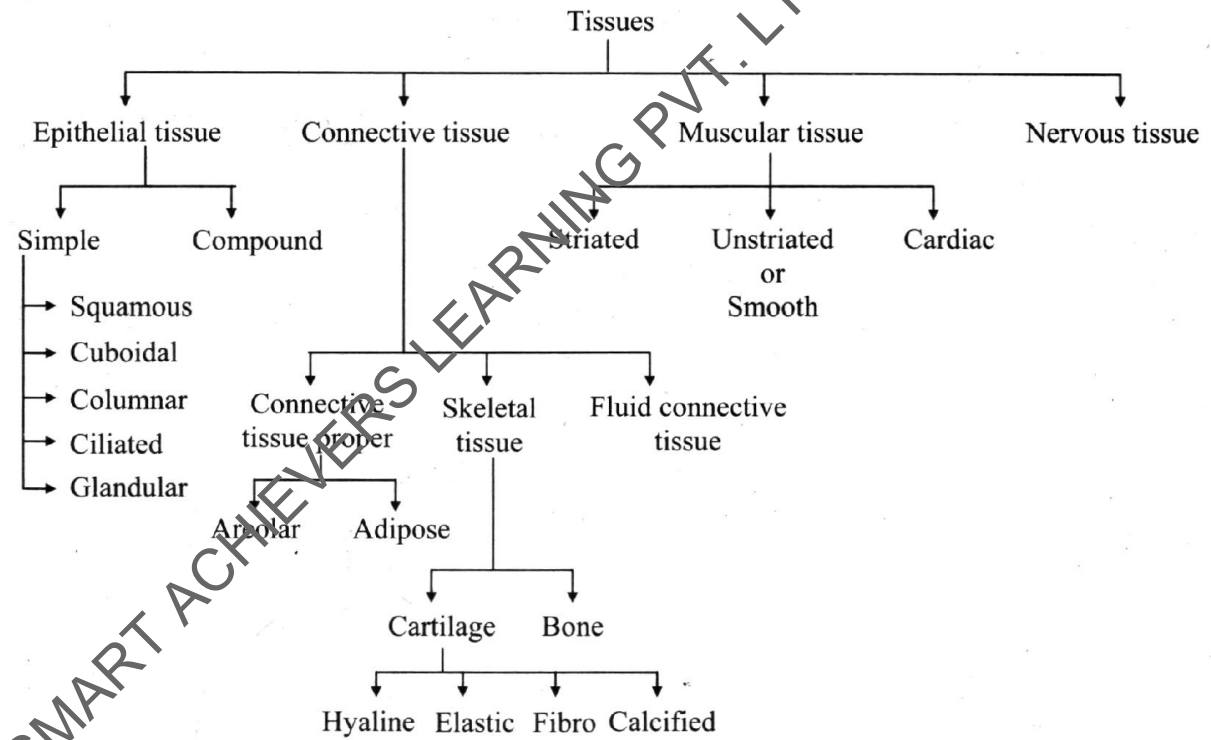
Diagram showing Synapse and neuro-muscular junction

Additional Theory Questions :

- Q.1. Give the characteristics of connective tissue. Refer Q.26.
 Q.2. Describe the structure of hyaline cartilage. Refer Q.40. (i)
 Q.3. Describe, in detail, the fine structure of striated muscle fibre. Refer Q.54.
 Q.4. Write a note on nervous tissue. Refer Q.65.
 Q.5. Sketch and label multipolar neuron. Refer Q.67.

Quick Review :

Quick Review



2015



Multiple Choice Question's

- Branch of biology dealing with study of microscopic tissues is called
 - histology
 - cytology
 - microscopy
 - anatomy
- The non-cellular membrane found in epithelial tissue is
 - perichondrium
 - periosteum
 - endosteum
 - basement membrane
- Intercellular matrix is minimum in
 - areolar tissue
 - bone
 - cartilage
 - muscular tissue
- Epithelium does not show the following:
 - uniform sized cells
 - basement membrane
 - collagen fibres
 - blood vessels
- Ciliated epithelium is found in
 - Fallopian tube and trachea
 - kidney and trachea
 - lung and trachea
 - liver and trachea
- Lining of intestine in man is made up of
 - Squamous epithelium
 - Cuboidal epithelium
 - Columnar epithelium
 - Non-columnar epithelium
- Goblet cells line the
 - digestive tract
 - respiratory tract
 - urinary tract
 - all of the above
- In which of the following, the plasma membrane of the epithelial lining is modified - into microvilli?
 - Tubules of the testis
 - Vagina
 - Intestine
 - Urinary tract
- The actively dividing layer of compound epithelium cells in the epidermis of man is called as the _____
 - stratum granulosum
 - stratum lucidum
 - stratum germinativum
 - stratum corneum
- Which type of tissue forms gland?
 - Epithelial tissue
 - Connective tissue
 - Nervous tissue
 - Muscle tissue
- The colour of the collagen fibres in connective tissue is
 - red
 - yellow
 - white
 - colourless
- The white fibres are chemically composed of
 - myosin
 - elastin
 - collagen
 - actin
- Most abundant connective tissue type is
 - areolar
 - fibrous
 - adipose
 - vascular
- Fat storing tissue in mammal is
 - Adipose tissue
 - Areolar tissue
 - Fat bodies
 - Muscular tissue
- Ligament joins
 - muscle to bone
 - bone to bone
 - skin to muscle
 - nerve to muscles
- Mast cells of connective tissue contain
 - heparin and calcitonin
 - serotonin and melanin
 - vasopressin and relaxin
 - heparin and histamine
- The white fibrous tissue covering the cartilage is known as
 - perichondrium
 - periosteum
 - endosteum
 - peritoneum
- A cartilage is formed by
 - osteoblast
 - fibroblast
 - chondrocytes
 - osteocytes
- Type of cartilage found in tracheal wall is
 - fibro cartilage
 - elastic cartilage
 - hyaline cartilage
 - None of these
- Strongest cartilage is
 - fibrous cartilage
 - elastic cartilage
 - hyaline cartilage
 - simple cartilage
- Active bone cells are called
 - osteoblast
 - osteocytes
 - osteoclasts
 - osteoblasts
- Inactive bone cells are called
 - osteoclasts
 - osteocytes
 - osteoporosis
 - osteoporosis
- The cell which synthesizes and secretes

- intercellular substance of bone is known as
 a) chondroblast b) osteocyte
 c) osteoblast d) osteon
24. Canaliculi are
 a) tubes connecting adjacent osteocytes
 b) tubes connecting Haversian canals with bone marrow
 c) fibres joining adjacent neurons
 d) fibres of ligament connective tissue
25. The longitudinal canals of a bone are called
 a) marrow cavity
 b) Eustachian canal
 c) Volkmann's canals
 d) Haversian canal
26. The bone of a mammal contains Haversian canals, _____ which are connected by transverse canals known as
 a) Semi-circular canals
 b) Inguinal canals
 c) Volkmann's canals
 d) Bidder's canals
27. Matrix of bone differs from that of cartilage in having in it.
 a) Ossein b) chondrin
 c) osteocytes d) chondrocytes
28. Covering of cartilage is perichondrium, while that of bone is
 a) periosteum
 b) endosteum
 c) basement membrane
 d) none of these
29. Which of the following is the contractile protein of a muscle?
 a) Tubulin b) Myosin
 c) Tropomyosin d) Trypsin
30. Cytoplasm of muscle cell is called
 a) sarcolemma b) neuroplasm
 c) axoplasm d) sarcoplasm
31. The structural and functional unit of striated muscle fibres is
 a) sarcomere b) sarcolemma
 c) sarcoplasm d) myofibril
32. Heart is made up of
 a) skeletal tissue
 b) muscular tissue
 c) cardiac muscles
 d) adipose tissue
33. The boundaries of individual cells in cardiac muscle are named as
 a) Inter-calated discs
 b) Z lines
 c) H line
 d) Krause's membrane
34. The efferent process of neuron is called
 a) dendrons b) cytons
 c) axon d) neurofibrils
35. Nissl's granules are found in
 a) cartilage cells b) nerve cells
 c) muscle cells d) osteoblasts
36. Schwann cells and nodes of Ranvier are found in
 a) neurons b) chondroblasts
 c) osteoblasts d) gland cells
37. A bipolar neuron has
 a) 1 dendron and 1 axon
 b) 2 axon and 2 dendrites
 c) 2 dendrites and 1 axon
 d) 2 axon and 1 dendrite
38. Which type of tissue forms the inner surface of a blood vessel?
 a) Epithelial b) Connective
 c) Muscle d) Nervous

2015

Answer Keys

1. a)	2. d)	3. d)	4. c)	5. a)	6. c)	7. d)	8. c)	9. c)	10. a)
11. c)	12. c)	13. d)	14. a)	15. b)	16. d)	17. a)	18. c)	19. c)	20. a)
21. a)	22. b)	23. b)	24. a)	25. d)	26. c)	27. a)	28. a)	29. b)	30. d)
31. a)	32. c)	33. a)	34. c)	35. b)	36. a)	37. a)	38. a)		



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