MATRIX OLYMPIAD

The Most Innovative Talent Recognition Exam

BIOLOGY

Class - IX

MATRIX

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Few words for the Readers

Dear Reader,

"*Matrix Olympiad is established to encourage school students to go a step further than their regular studies, and get a chance and exposure to competition on a wide scale. It also helps students enhance their learning of basic cognitive skills and deeper knowledge of subjects like Science, Mathematics, English, Mental Ability, Social Studies.“Matrix Olympiad helps students nurture their minds for higher targets of tomorrow and enables them to study School for JEE, NEET, CLAT, NDA, Olympiads , NSEJS, NTSE , STSE etc.*"

The above thought has been our guiding principle while designing and collating the study material for **Matrix Olympiad** . And hence, we hope that this particular material will be helpful towards your preparation for **Matrix Olympiad**.

Our team at **MATRIX** has put in their best efforts for making this particular module interesting and relevant for you. Additional efforts have been made to ensure that the content is easy to understand and error free to the extent possible. However, there might remain some inadvertent errors in answer keys and theoretical portion and we would welcome your valuable feedback regarding the same.
If there are any suggestions for corrections, please write to us at **smd@matrixacademy.co.in** and we would be highly grateful.

Finally, we would like to end this message by a famous quote by Ernest Hemingway - "*There is no friend as loyal as a book*." So, please give your study material the time and attention it deserves, and it will surely help you reach newer heights in your fight with competition examinations.

With love and best wishes !
Team MATRIX

CONTENTS

FUNDAMENTAL UNIT OF LIFE CELL

1

Concepts

INTRODUCTION

All organisms are composed of cells. Some are composed of a single cell and are called unicellular organisms while others, like us, composed of many cells, are called multicellular organisms.

- Unicellular organisms are capable of independent existence and performing the essential functions of life. Hence, cell is the fundamental structural and functional unit of all living organisms.
- First dead cell discovered by - **Robert Hooke** in Cork
- **Anton Van Leeuwenhoek** first saw and described a live cell. **Robert Brown** later discovered the nucleus.

1. MICROSCOPE

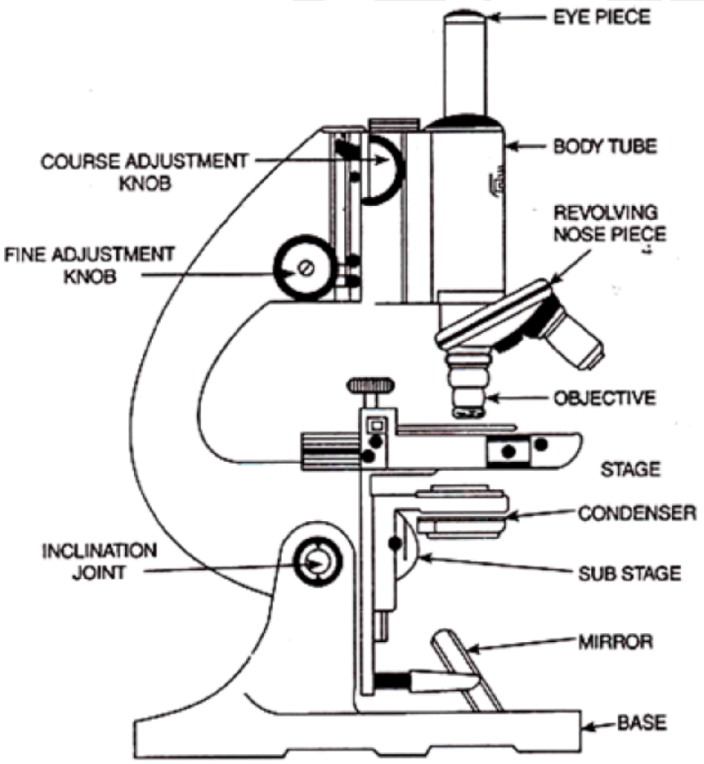


Figure : Microscope

- It is an instrument which is used to study those objects that cannot be seen with the naked eye or with the help of hand lens. A microscope has more than one lens.
- The 1st compound microscope was built by F. Janssen and Zacharias Janseen (1590)

1.1 CELL THEORY

- In 1838, **Malthias Schleiden,** a botanist, examined a large number of plants and observed that all plants are composed of different kinds of cells which form the tissues of the plant. At about the same time, **Theodore Schwann** (1839), a zoologist, studied different types of animal cells and reported that cells had a thin outer layer which is today known as the 'plasma membrane'. He also concluded, based on his studies on plant tissues, that the presence of cell wall is a unique character of the plant cells.
- **Schwann** proposed the hypothesis that the bodies of animals and plants are composed of cells and products of cells.
- **Schleiden** and **Schwann** together formulated the cell theory. This theory however, did not explain as to how new cells were formed. **Rudolf Virchow** (1855) first explained that cells divided and new cells are formed from pre-existing cells **(Omnis cellula-e cellula).** He modified the hypothesis of **Schleiden** and **Schwann** to give the cell theory a final shape. Cell theory as understood today is:
  (i) all living organisms are composed of cells and products of cells.
  (ii) all cells arise from pre-existing cells.

Note:- Virus is an exception of cell theory.

1.2 SIZE AND SHAPE OF CELL

(a) Size :

- Cell differ greatly in size, shape and activites.
- Mycoplasma (Smallest cells) : Only 0.3 μm in length [PPLO (pleuro pneumonia like organisms) is a type of mycoplama having the size about 0.1 μm]
- Bacteria → 3 to 5 μm
- Largest isolated single cell → egg of an ostrich.
- Human red blood cell → 7.0 μm in diameter
- Nerve cell → longest animal cell
- Largest plant cell → Acetabularia
- Longest plant cell → Hemp fibre

(b) Shape :

- The shape of the cell may vary with the funtion they perform.
- They may be disc-like, polygonal, columnar, cuboid, thread like or even irregular.

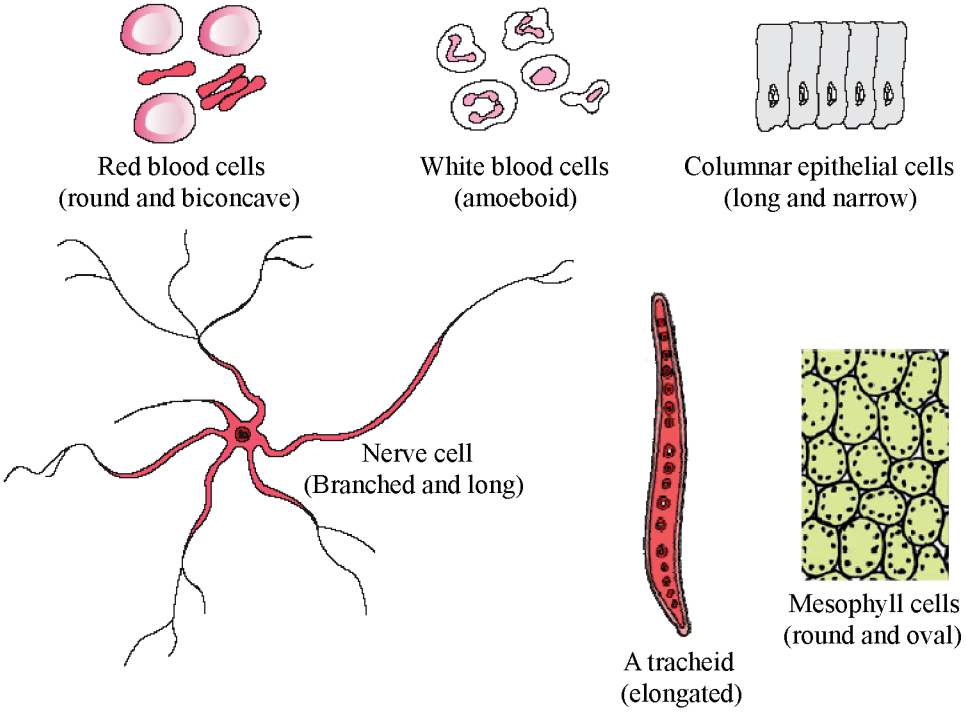


Figure. different shapes of the cell

1.3 TYPES OF CELLS

(a) PROKARYOTIC CELLS

- The prokaryotic cells are represented by bacteria, blue-green algae, mycoplasma and PPLO (Pleuro Pneumonia Like Organisms). They are generally smaller and multiply more rapidly than the eukaryotic cells.

(b) EUKARYOTIC CELLS

- The eukaryotes include all the protists, plants, animals and fungi. In eukaryotic cells there is an extensive compartmentalisation of cytoplasm through the presence of membrane bound organelles.
- Eukaryotic cells possess an organised nucleus with a nuclear envelope. In addition, eukaryotic cells have a variety of complex locomotory and cytoskeletal structures. Their genetic material is organised into chromosomes.
- All eukaryotic cells are not identical. Plant and animal cells are different as the former possess cell walls, plastids and a large central vacuole which are absent in animal cells. On the other hand, animal cells have centrioles which are absent in higher plant cells.

2. STRUCTURAL ORGANISATION OF A CELL

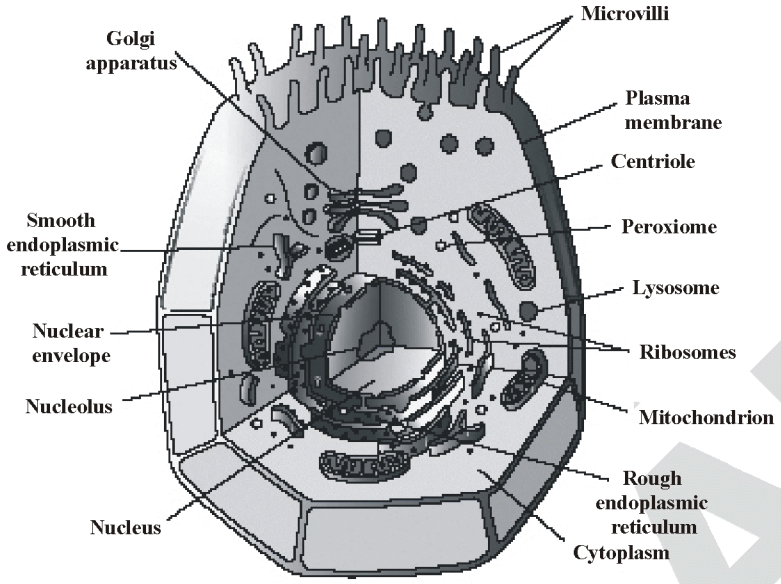


Figure : Animal cell

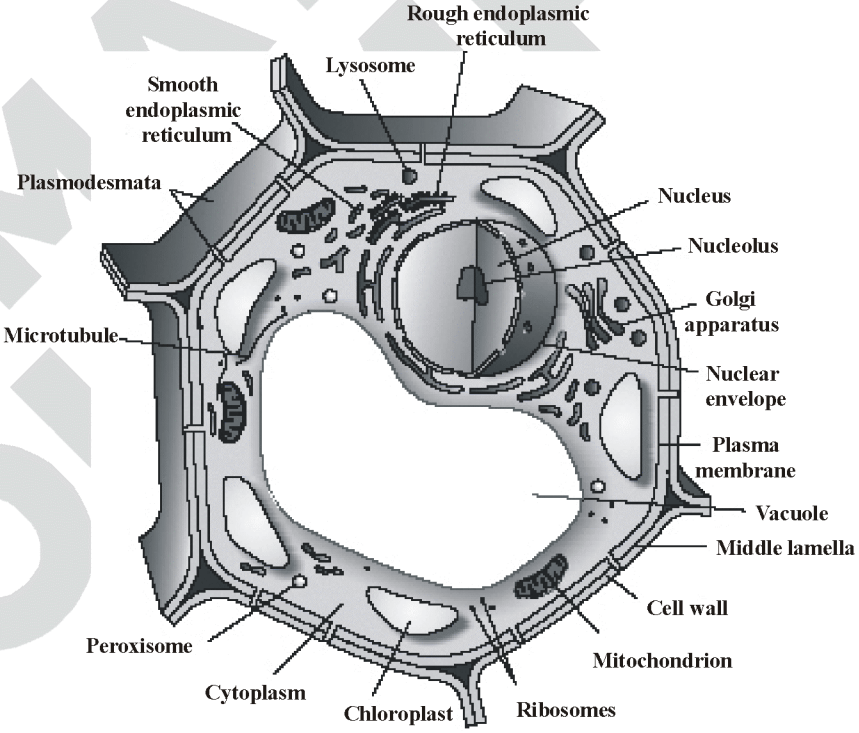
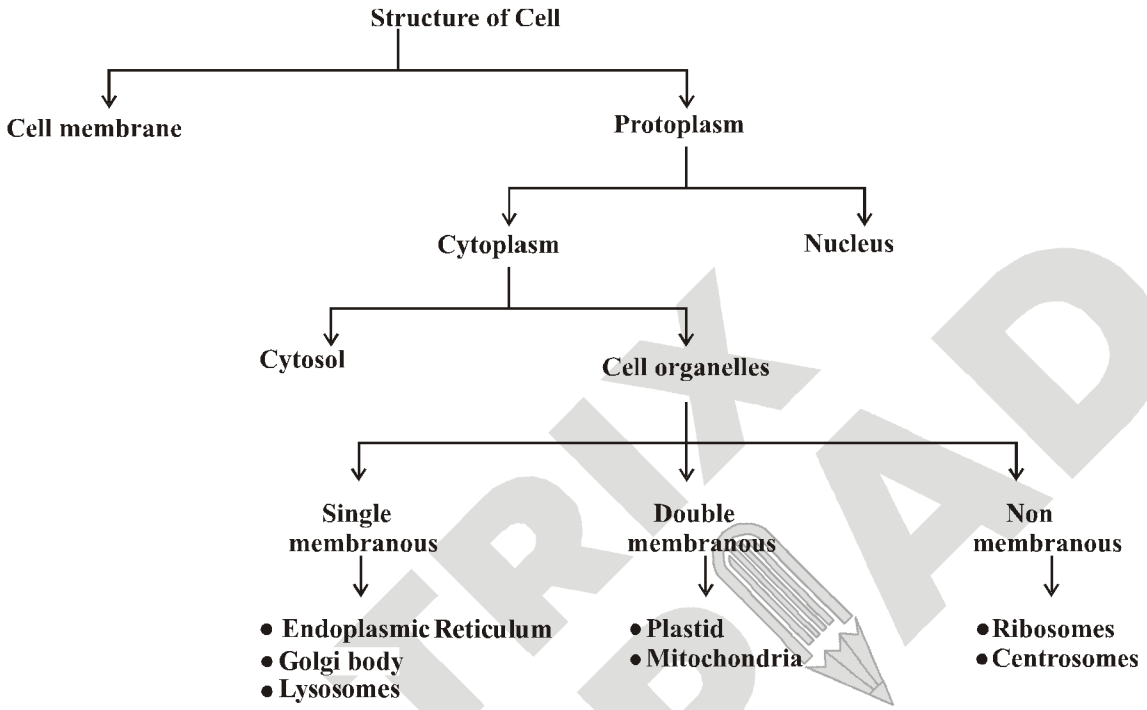


Figure : Plant cell

3. ULTRA STRUCTURE OF CELL



3.1 CELL WALL

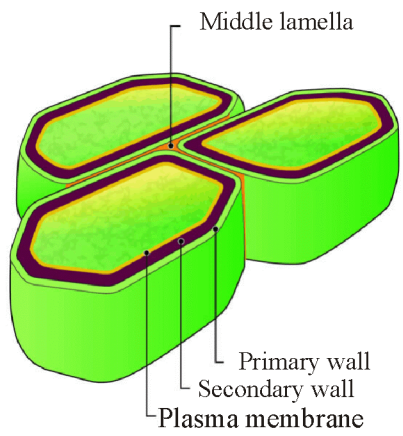


Figure : Cell wall

- A non-living rigid structure called the cell wall forms an outer covering for the plasma membrane of Bacteria Fungi, Algae and Plants.

- Cell wall not only gives shape to the cell and protects the cell from mechanical damage and infection, it also helps in cell-to-cell interaction and provides barrier to undesirable macromolecules.
- Algae have cell wall made of cellulose, galactans, mannans and minerals like calcium carbonate.
- In other plants it consists of cellulose, hemicellulose, pectins and proteins.
- Bacterial cell wall is mainly composed of Peptidoglycans (Polysaccharide + amino acid).
- The cell wall of Fungi are composed of Chitin and Polysaccharides.

3.2 CELL MEMBRANE

- This is the outermost covering of cell.
- It separates the contents of cell from external environment.
- It permits the entry and exit of some material.
- It is called selectively permeable membrane as it prevents movement of some malerral.

→ **TRANSPORT THROUGH PLASMA MEMBRANE**

(a) Passive transport.

- One of the most important functions of the plasma membrane is the transport of the molecules across it. The membrane is selectively permeable to some molecules present on either side of it. Many molecules can move briefly across the membrane without any requirement of energy and this is called the passive transport.
- Neutral solutes may move across the membrane by the process of simple diffusion along the concentration gradient, i.e., from higher concentration to the lower. Water may also move across this membrane from higher to lower concentration. Movement of water by diffusion is called osmosis.

Focus Point

Types of solutions on the basis of concentration :

(A) Isotonic solution : When the concentration of the solution outside the cell is equal to the concentration of cytoplasm of the cell it is called as isotonic solution. Net movement of water is zero.

(B) Hypertonic solution : When the concentration of the solution outside the cell is more than that inside the cell. Due to this cell loose water and becomes plasmolysed.

(C) Hypotonic solution : When the concentration of the solution outside the cell is lesser than that of cytoplasm, the cell swells up and bursts.

- As the polar molecules cannot pass through the nonpolar lipid bilayer, they require a carrier protein of the membrane to facilitate their transport across the membrane.

(b) Active transport

- A few ions or molecules are transported across the membrane against their concentration gradient, i.e., from lower to the higher concentration. Such a transport is an energy dependent process, in which ATP is utilised and is called active transport e.g. Na^+/K^+ Pump.

(c) Bulk transport

(i) Endocytosis

- **Pinocytosis or Cell Drinking :-** Ingestion of liquid material by plasmalemma in the form of vesicles or bag like structure(Pinosome) is called pinocytosis.
- **Phagocytosis or Cell eating :-** Ingestion of solid complex materials by membranes in the form of vesicles (Phagosome) is called Phagocytosis.

(ii) Exocytosis/Emiocytosis/Cell vomitting :- Egestion of **waste materials** from cell through plasma membrane.

→ **FUNCTIONS OF CELL MEMBRANE**

- Plasma membrane regulates the exchange of materials between the cytoplasm and extracellular fluid.
- It allows the movement of selected quantities of selected materials across it.
- It is flexible enough to engulf larger molecules and food particles.
- It protects the cell from injury.

3.3 NUCLEUS (HEADQUARTER OF THE CELL)

→ **DISCOVERY** – Robert Brown (1831)

- "Nucleus is double membrane bound dense protoplasmic body, which controls all cellular metabolism and encloses the genetic information of cell".
- Nucleus is considered as controller or director of the cell.

→ **STRUCTURE :** It is made up of following four components.

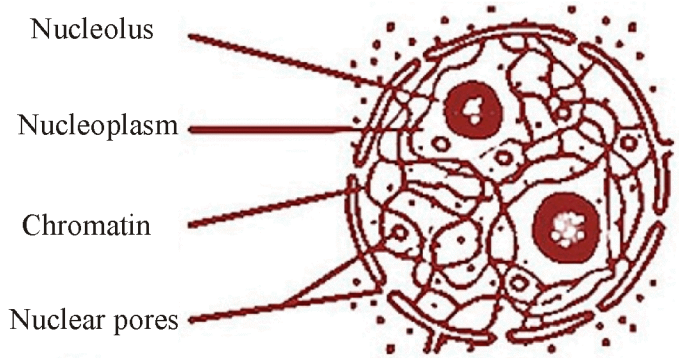


Figure : Structure of nucleus

(a) **Nuclear envelope :** Nucleus is surrrounded by two membranes, that separates nucleoplasm from cytoplasm. The nuclear membrane has minute pores. These are called nucleopores. Nucleopore takes part in exchange of different substanes between nucleoplasm and cytoplasm.

(b) **Nucleoplasm :** The part of protoplasm which is enclosed by nuclear membrane is called nucleoplasm. It contains chromatin threads and nucleolus.

(c) **Nucleolus :** Discovered by Fontana. Usually one nucleolus is present in a nucleus but sometimes more than one nucleoli are present. It is a store house of RNA.

(d) **Chromatin threads :** A darkly stained network of long and fine threads called chromatin threads is present. Chromatin threads are intermingled with one another forming a network called chromatin reticulum. Whenever the cell is about to divide the chromatin material gets organized into chromosomes.

→ **FUNCTIONS OF NUCLEUS**

The nucleus performs following functions :

(i) It controls all the metabolic activities of the cell.

(ii) It brings about growth of the cell by directing the synthesis of structural proteins.

(iii) It regulates cell cycle.

(iv) It contains genetic information and is concerned with the transmission of herditary traits from one generation to another.

3.4 CYTOPLASM

- **Term "Cytoplasm"**, was given by ***Strasburger*** for the part of cell, presents between the nucleus and cell membrane. Cytoplasm can be divided into two parts.
- **Ground plasm / Hyaloplasm / Cytosol** → Liquid matrix of cytoplasm except organelles
- **Trophoplasm** → Part of cytoplasm containing organelles & non living Inclusions.
- Permanent **metabolically active** and **living structures of cytoplasm are called organelles.**

3.5 ENDOPLASMIC RETICULUM

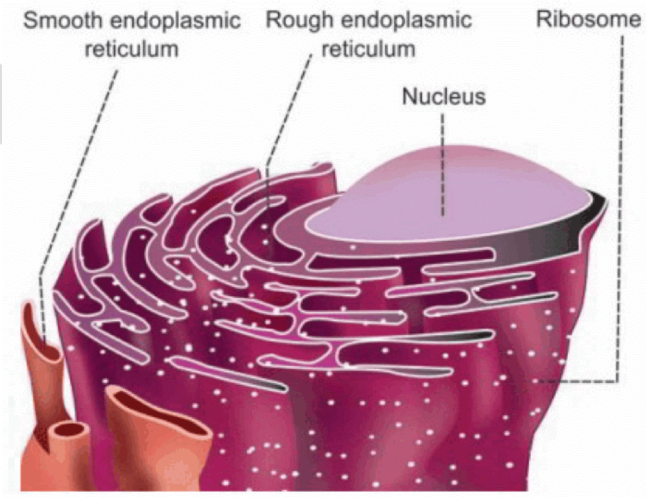


Figure : Endoplasmic reticulum

→ **STRUCTURE**

- Electron microscopic studies of eukaryotic cells reveal the presence of a network of reticulum of tiny tubular structures scattered in the cytoplasm that is called the endoplasmic reticulum (ER)
- Structure of E.R. is like the golgi body but in E.R. cisternae, vesicles and tubules are isolated in cytoplasm and these do not form complex.
- Golgi body is localised cell organelle while E.R. is widespread in cytoplasm. E.R. is often termed as "**System of Membranes**"
- ER divide the intracellular space into two distinct compartment i.e. **Luminal (inside ER)** and **extra luminal** (cytoplasm) compartments.

→ **TYPES OF E.R.**

(a) Rough endoplasmic reticulum (RER) : Ribosomes attached on its surface for synthesising proteins. Thus, RER is engaged in the synthesis and transport of proteins.

(b) Smooth endoplasmic reticulum (SER) : It does not have ribosomes and is meant for synthesis of fat or lipids.

- Some of proteins and lipids, which are synthesised in the cell with the help of ER, are utilised in building the cell membrane. This process is known as **membrane biogenesis**.

Focus Point

Difference between Rough and Smooth E.R.			
	Rough E.R. (Granular)		**Smooth E.R. (Agranular)**
(1)	80s ribosomes binds by their larger subunit, with the help of two glycoproteins (**Ribophorin I** and **II** On the surface of Rough E.R.)	(1)	Ribosomes and Ribophorins absent
(2)	More stable structure	(2)	Less stable structure
(3)	Mainly composed of cisternae and vesicles	(3)	Mainly composed of tubules.
(4)	Abundantly occurs in cells which are actively engaged **in protein synthesis** and **secretion**. e.g. liver, pancreas, goblet cells.	(4)	Abundantly occurs in cells concerned with **glycogen** and **lipid metabolism**. In animal cell lipid like steroidal hormones are synthesied in SER. e.g. Adipose tissue, Interstitial cells, muscles,Glycogen storing liver cells, and adrenal cortex.

→ **FUNCTIONS OF E.R.**

- **Intracellular exchange :–** E.R. forms intracellular conducting system. Transport of materials in cytoplasm from one place to another may occurs through the E.R.
- Rough E.R. provides site for the protein synthesis, because rough E.R., has ribosomes on its surface.
- **Lipid Synthesis :–** Lipids (cholesterol & phospholipids) synthesized by the agranular portion of E.R. (**Smooth E.R.**). The major lipids synthesized by S. E. R. are phospholipids and cholesterol.
- **Cellular metabolism :–** The membranes of the reticulum provides an increased surface for metabolic activities within the cytoplasm.

3.6 GOLGI BODY

- **Camillo Golgi** (1898) first observed densely stained reticular structure near the nucleus. These were later named Gogi bodies after him.
- Golgi body also named as
  - → Dalton complex
  - → Golgi complex
  - → Dictyosome (in plants)

→ **STRUCTURE**

Golgi complex is made up of **four** parts –

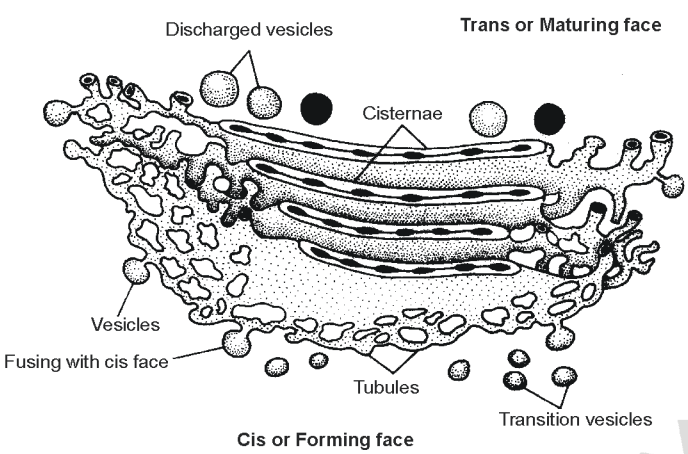
(a) Cisternae :– These are flat disc shaped, sacs like structure many cisternae are arranged in a stack (parallel to each other). Diameter 0.5 μm to 1.0 μm. Dense opaque material inside cisternae is called **Nodes**.

- Varied number of cisternae are present in Golgi complex.
- Convex surface of cisternae which is towards the nucleus is called **cis- face** or **forming face**.
- Concave surface of cisternae which is towards the membrane is called **Trans face** or **maturing face**.
- The cis and trans faces of the organelle are entirely different but inter connected.

(b) Tubules :– These are branched and irregular tube like structures associated with cisternae.

(c) Vacuoles :– Large spherical structures associated to tubules.

(d) Vesicles :– Spherical structures arise by budding from tubules. Vesicles are filled with secretory materials.



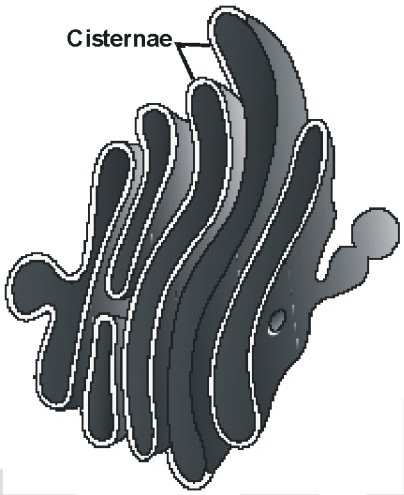


Figure : Golgi Body

→ **FUNCTIONS OF GOLGI BODY**

Cell Secretion :– Chief function of golgi body is secretion (export) of macromolecules.

Secretion involve three steps :

(a) Golgi body recieves the materials from E.R. through it's cis - face.

- All the macromolecules which are to be sent out side the cell, move through the golgi body. So golgi body is termed as "**Director of macromolecular traffic in cell**" or **"middle men of cell**."
- Synthesis of cell wall Material (Polysaccharide synthesis)
- Formation of acrosome during spermiogenesis. (formation of male gametes)
- Formation of lysosome.

3.7 LYSOSOMES

- The term lysosome was introduced by De Duve in 1955.
- Lysosome are simple tiny spherical sac like structures evenly distributed in the cytoplasm.
- Lysosome is small vesicle surrounded by a single membrane and contains powerful enzymes.
- It contain 40 type of enzymes which are called as hydrolases.
- Lysosomes serve as interacellular digestive system, hence called digestive bags.
- Lysosomes also remove the worn out and poorly working cellular organelles by digesting them.
- During disturbances in cellular metabolism i.e. in case of cell damage lysosomes burst and their enzymes are released into the cytoplasm and they digest their own cell so they are also called as "**Suicidal Bags**".

3.8 VACUOLES

- Vacuoles of animal cells arise from Golgi-complex.
- **Tonoplast:–** Plasma membrane that covers the vacuole is called tonoplast.

Vacuoles are of three types :-

a. **Food vacuole** – The vacuole which contain food material.

b. **Sap vacuole** – The vacuole which is filled by liquid material (sap)

c. **Contractile vacuole** – The vacuole that concern with osmoregulation e.g. *Amoeba*

→ **Functions :–**

(i) Storage of food, water and other substances.

(ii) They help in the elimination of excess water from the cell **(osmoregulation)**, and maintains internal pressure of the cell

Focus Point

ENDOMEMBRANE SYSTEM (GERL SYSTEM)

- While each of the membranous organelle is distinct in terms of its structure and function, many of these are considered together as an endomembrane system because their functions are coordinated.
- The endomembrane system **include endoplasmic reticulum (ER), golgi complex, lysosomes** and **vacuoles**. Since the functions of the mitochondria, choroplast and peroxisomes are not coordinated with the above components, these are not considered as part of the endomembrane system.

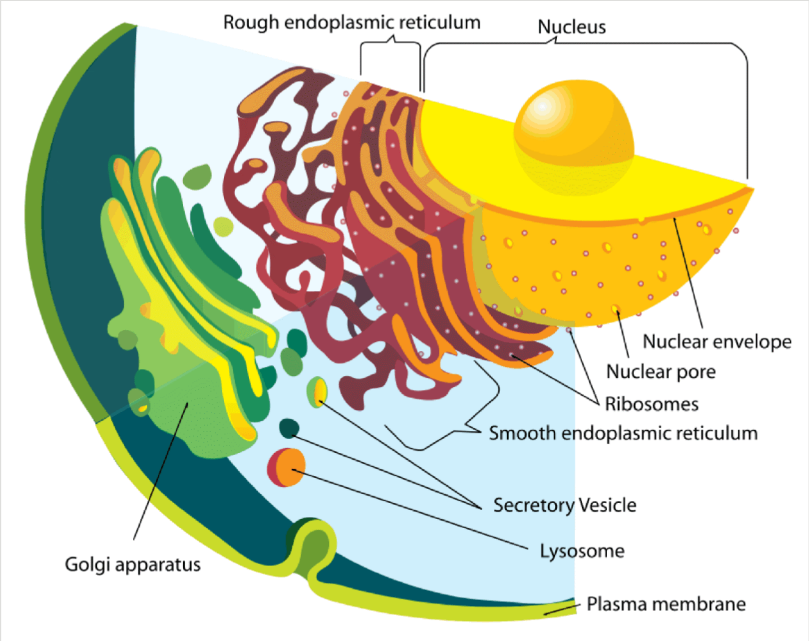


Figure : Endomembrane system

3.9 MITOCHONDRIA

Mitochondria are double membrane bound organelles of eukaryotic cells.

→ **OCCURRENCE**

These are found in all eukaryotic cells except mature mammalian RBCs These are absent in prokaryotic cells.

→ **SHAPE**

The shape may be, fibrillar, spherical (in yeast), oval, sausage shaped discoidal.

→ **ORIGIN**

Mitochondria have a small and circular chromosome and 70S ribosome of their own and make some of their own proteins, showing that they were once aerobic bacteria.

→ **STRUCTURE**

Mitochondria are semi autonomous organelles bound by an envelope of two unit membranes and filled with a fluid matrix. The outer membrane is smooth and has porous proteins which forms channels for the passage of molecules through it. The inner membrane is semipermeable. It usually produces numerous infolds called cristae.The cristae greatly increase the inner surface area of the mitochondria to hold a variety of enzymes. Cristae bear minute, regularly spaced tennis racket shaped particles known as F_0 particles or oxysomes. The membrane of oxysomes have various respiratory enzymes.

→ **FUNCTION**

Mitochondria are the main sites of cellular respiration. They bring about complete oxidation of food stuffs or respiratory substrates into carbon dioxide and water.' They are commonly known as 'power houses of the cell' because they contain enzymes necessary for the complete oxidation of food and for release of high amount of energy in the form of ATP (Adenosine triphosphate) molecules. The body uses energy stored in ATP for synthesis of new chemical compounds and for mechanical work. ATP is also known as energy currency of the cell.

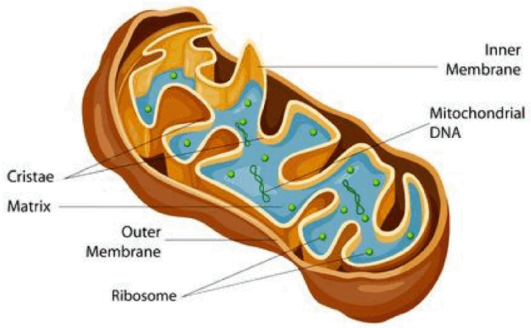


Figure : Mitochondria

3.10 PLASTID

Plastid are double membrane bound organelles of eukaryotic cells.Plastids are major organelles found in the cells of plants and green algae. Plastids are the site of manufacture and storage of important chemical compounds used by the cell. Plastids often, contain pigments used in photosynthesis and the types of pigments present can change or determine the cell's colour. Plastids are responsible for photosynthesis, storage of products like starch.

→ **ORIGIN**

Like mitochondria the chloroplast are self duplicating organelles. They also have circular DNA and 70s ribosome of their of their own. They also have a prokaryotic origin.

→ **TYPES OF PLASTIDS**

(i) Chromoplasts

For pigment synthesis and storage. Chromoplasts are red yellow and orange in colour and are found in petals of flower and in fruits.

(ii) Leucoplasts

Leucoplasts are colourless or white plastid. They occur in plant cell not exposed to light, such as roots and seeds.

They are of three types :- Amyloplast (store starch), Aleuroplast (store protein) and Elaioplast (store oil and fats)

Leucoplasts are the centre of starch grain formation and they are also involved in the synthesis of oil and proteins.

(ii) Chloroplasts

Chloroplasts are probably the most important among the plastids they are directly involved in photosynthesis. They are usually situated near the surface of the cell and occur in those parts that receive suffcient light e.g. the palisade cells of leaves. The green colour of chloroplasts is caused by the green pigment chlorophyll.

→ **STRUCTURE OF CHLOROPLAST**

Chloroplasts are usually disc-shaped and surrounded by a double membrane. Inside the inner membrane there is a watery protein-rich ground substance called as stroma in which is embedded a continuous membrane system, the granal network. The network forms a three-dimensional arrangement of membrane bound vesicles called thylakoids. The thylakoids usually lie in stacks called grana and contain the photosynthetic pigments green chlorophyll. The grana are interconnected by tubular membranes called the stromal lamellae/Fret'z channel.

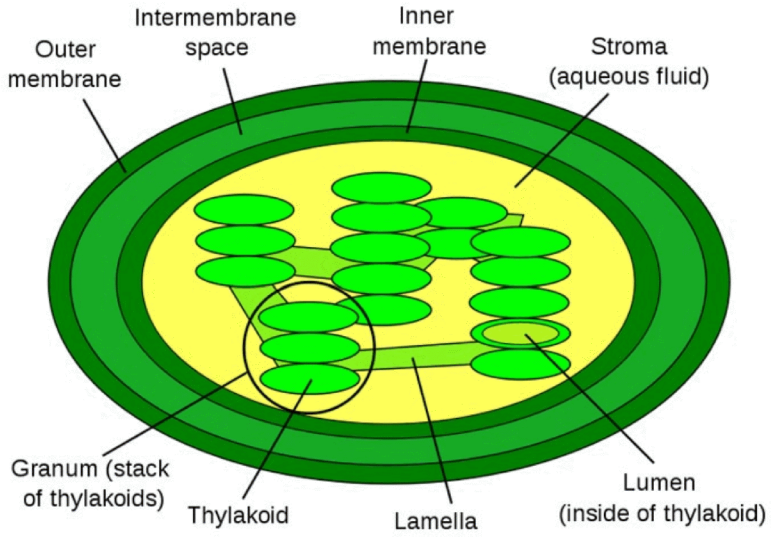


Figure : Chloroplast

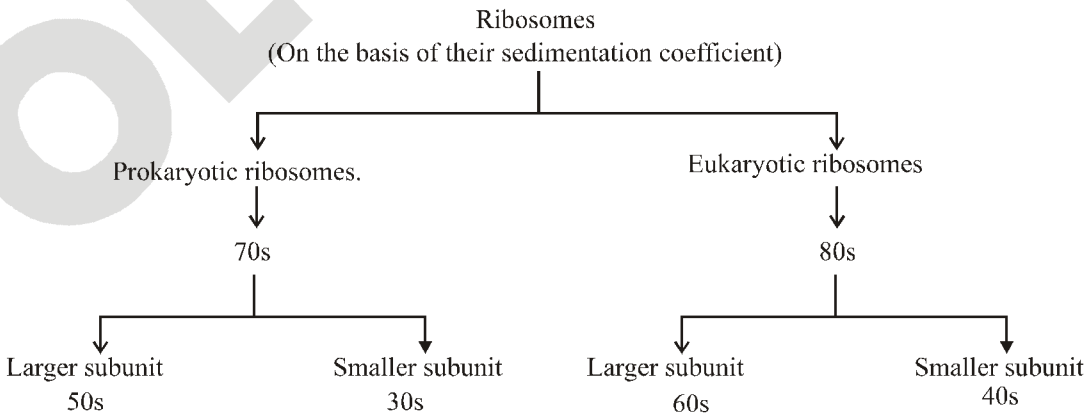
→ **FUNCTIONS OR CHLOROPLAST**

- Chloroplasts are the sites of photosynthesis.
- Grana is the site of light reaction and stroma is the site of dark reaction.
- They contain enzymes and coenzymes necessary for the process of photosynthesis.

3.11 RIBOSOME

- **Claude (1941)** First observed them and called **microsome**.
- **Palade (1955)** coined the term Ribosome. That's why it is also known as Palade's particles.
- All living cells have Ribosomes. [Both prokaryotes & Eukaryotes]
- These are **smallest and membraneless cell organelles.**

→ **TYPES OF RIBOSOMES**



3.12 CENTROSOME

- It is present only in animals cell and it is located near the nucleus. If the differentiated into a clear homogeneous mass of cytoplasm called centrospheres and one or a pair of microtubular centrioles.

→ **FUNCTION OF CENTROSOME :** The centrosome is concerned with cell division and formation of basal bodies of cilia and flagella.

4. CELL DIVISION

- Cell division was first observed by **Prevost** and **Dumas** (1824) in zygote of frog and also by **Nageli** in plant cell (1842).

4.1 CELL CYCLE

- It is a series of programmed cyclic chages by which the cell duplicates its contents and divides into two parts.

4.2 TYPES OF CELL DIVISION

Cell division

- Mitosis
- Meiosis

⇒ **MITOSIS**

- Term mitosis was given by Flemming (1882)
- It is also called as somatic division as it occurs in somatic cells.
- It is studied in plants, meristems, bone marrow, skin and base of nails.
- It is an equational division in which a parent cell divides into two identical daughter cell, each of them contains the same number and kind of chromosomes as are in parent cell.

It occurs in two steps :

(a) Karyokinesis : Division of nucleus. It is divided in four steps :

(i) Prophase (Longest phase)

(ii) Metaphase

(iii) Anaphase (Shortest phase)

(iv) Telophase

→ **SIGNIFICANCE OF MITOSIS :** It is essential for growth, repair, maintenance of chromosome number etc.

(b) Cytokinesis: It is referred to the division of cytoplasm. It begins towards the middle of anaphase and completes with the completion of telophase. By this the complete cytoplasm including matrix as well as organelles divides equally.

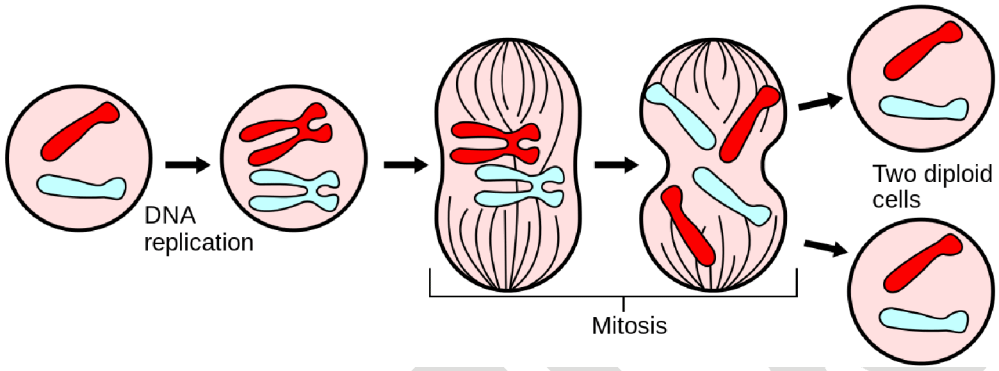


Figure : Mitosis

⇒ **MEIOSIS** : (i) Also called as reductional division. Diploid state changes to haploid state. It occurs in four steps.

(ii) Parent cell divides into four daughter cells.

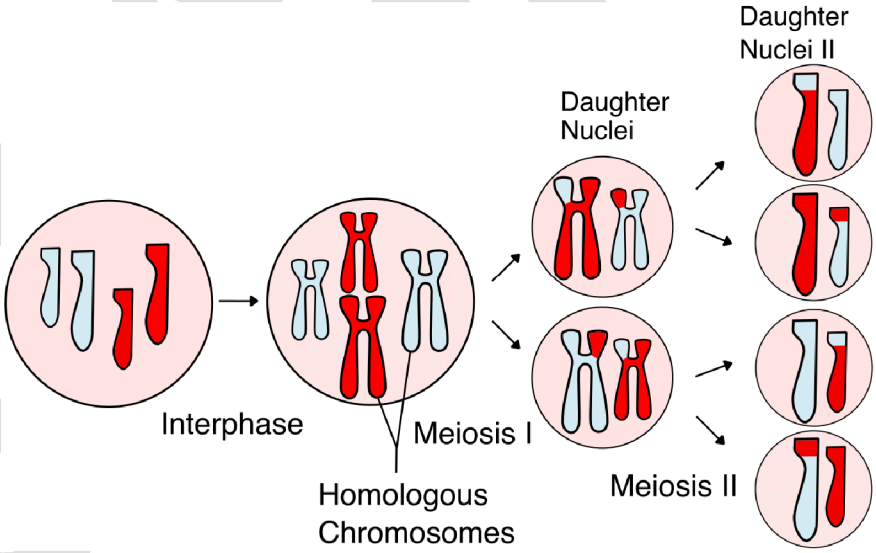


Figure : Meiosis

→ **SIGNIFICANCE OF MEIOSIS**

It produces variations, differentiation, and essential for sexual reproduction. It maintains the chromosome number in each generation of living organisms.

EXERCISE – I

ONLY ONE CORRECT TYPE

1. Powerhouse of cell is -
   (A) Lysosome (B) Ribosome
   (C) Mitochondria (D) Vacuole
2. Who discovered the cell -
   (A) Robert hooke (B) Purkinje
   (C) Robert brown (D) Davson
3. Mitochondria are site of -
   (A) Electron transport
   (B) Cellular respiration
   (C) ATP formation
   (D) All
4. Golgi body take part in -
   (A) Lipid synthesis
   (B) Carbohydrate synthesis
   (C) Protein synthesis
   (D) Oxidative phosphorylation
5. Protein synthesis occurs on -
   (A) Ribosome (B) Lysosome
   (C) Nucleus (D) Chloroplast
6. Which of the following has a single membrane : -
   (A) Nucleus (B) Mitochondrion
   (C) Golgi Bodies (D) Plastid
7. What is the function of ER -
   (A) Nucleus
   (B) Chloroplast
   (C) ATP formation
   (D) Exchange of molecules
8. Grana , Stroma and lamella occur in -
   (A) Ribosome (B) Chloroplast
   (C) Mitochondria (D) Golgi body
9. Kreb's cycle occurs in -
   (A) Matrix of mitochondria
   (B) Nucleoplasm
   (C) Cytoplasm
   (D) Protoplasm
10. Organelle, which remove worn-out cell organelle is
    (A) Lysosome (B) Plastid
    (C) Mitochondria (D) Golgi complex
11. Which of the following organelle is involved in formation of lysommes
    (A) SER (B) Golgi complex
    (C) RER (D) Mitochondria
12. Numerous membrane layer present in plastid known as -
    (A) Cisternae (B) Stroma
    (C) Grana (D) Matrix
13. Chromosomes are made up of -
    (A) DNA (B) Protein
    (C) DNA & protein (D) RNA
14. Cell wall of which one of these is not made up of cellulose-
    (A) Bacteria (B) Hydrilla
    (C) Mango tree (D) Cactus
15. Kitchen of the cell -
    (A) Mitochondria (B) ER
    (C) Chloroplast (D) Golgi complex
16. Membrane biogenesis is related with -
    (A) Cell membrane
    (B) Nuclear membrane
    (C) Cell wall
    (D)None

17. Organelle other than nucleus, containing DNA is -
(A) Endoplasmic reticulum
(B) Mitochondria
(C) Golgi apparatus
(D) Lysosome

18. Amoeba acquires its food through a process termed as -
(A) Exocytosis (B) Plasmolysis
(C) Endocytosis (D)BothA&B

19. The outermost layer of human cheek cell is -
(A) Cell wall
(B) Nuclear membrane
(C) Plasma membrane
(D) Cytoplasm

20. The diffusion of water from external solution into dry raisins is called -
(A) Exosmosis (B) Endosmosis
(C) Imbibition (D) Plasmolysis

21. The plasma membrane of all living cell is -
(A) Impermeable (B) Semi permeable
(C) Permeable (D) Selectively permeable

22. Which cell organelle is not bounded by a membrane -
(A) Nucleus (B) Lysosome
(C) Ribosome (D) ER

23. In plant cells, the cell wall is -
(A) Dynamic & living
(B) Rigid & non living
(C) Dynamic & non living
(D) Rigid & living

24. The outer most covering of amoeba is -
(A) Tonoplast (B) Plasma membrane
(C) Cell wall (D) Neurolemma

25. Oxysomes are present in -
(A) Mitochondria (B) Peroxisomes
(C) Plastid (D) Cytoplasm

26. Cell organelle which differentiates plant cell from animal cell is –
(A) Cell Membrane (B) Plastids
(C) Nucleolus (D) Vacuoles

27. Example of cell organelle which do not have a unit membrane is
(A) Mitochondria (B) Lysosome
(C) Ribosome (D) Plasttid

28. Chromosome reaches the equator during which stage of cell division
(A) Prophase (B) Metaphase
(C) Anaphase (D) Telophase

29. Decreasing order of size is :
(A) DNA, t RNA, m RNA
(B) m RNA, DNA, t RNA
(C) t RNA, DNA, m RNA
(D) DNA, m RNA, t RNA

30. Sequence of cell cycle is ;
(A) G_I, G_{II}, S (B) S, G_I, G_{II}
(C) G_I, S, G_{II} (D) G_I, G_{II}, G_{II}

31.

Column I	**Column II**
(i) Smooth ER	(A) Amoeba
(ii) Lysosome	(B) Nucleus
(iii) Food vacuoles	(C) Bacteria
(iv) Chromatin material & Nucleolus	(D) Detoxification
(v) Nucleoid	(E) Suicidal bag

(A) i–D, ii–E, iii–A, iv–B, v–C
(B) i–B, ii–E, iii–A, iv–D, v–C
(C) i–B, ii–D, iii–A, iv–E, v–C
(D) i–D, ii–E, iii–A, iv–C, v–B

EXERCISE – II

VERY SHORT ANSWER TYPE

1. What are chromosomes ?
2. Name the protein factory of cell ?
3. What are leucoplasts ?
4. Which cell organelle is commonly called cellular housekeeper ?
5. Name any cell organelle which is non-membranous.
6. Name the organelles having double membrane envelope.
7. Give two examples of unicellular organisms.
8. Define osmosis.
9. Define diffusion.
10. Name two types of Endoplasmic reticulum present in the cell.

SHORT ANSWER TYPE

1. Who discovered cell & how ?
2. Why is plasma membrane called selectively permeable membrane ?
3. Which organelle is known as the power house of cell & why ?
4. What is osmosis ?
5. Why are lysosomes known as suicide bags ?

LONG ANSWER TYPE

1. Draw a well labelled sketch of a ultra structure of animal cell ?
2. Explain the following -
   (a) Membrane biogenesis
   (b) Diffusion
   (c) Endocytosis
   (d) Cell organelles
3. (a) Draw a diagram of an animal cell & label its seven parts.
   (b) Mention two cell organelles which are bounded by double membrane. Give structural detail also.

TRUE / FALSE TYPE

1. Plant cell has cell wall.
2. Mitrochondria is power house of cell.
3. Lysosome is a protein factory.
4. Chloroplast is single membranous structrures.
5. Head quarter of cell is nucleus.

FILL IN THE BLANKS

1. Transporting channels of cell is .....
2. Powerhouse of cell is.....
3. Digestive bag of cell is.....
4. Kitchen of cell is .....
5. Storage sacs of the cell is .....

Answer Key

EXERCISE–I														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	A	D	B	A	C	D	B	A	A	B	C	C	A	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	B	C	C	B	D	C	B	B	A	B	C	B	D	C
31														
A														

EXERCISE – II

TRUE/FALSE TYPE

1. T **2.** T **3.** F **4.** F **5.** T

FILL IN THE BLANKS

1. ER **2.** Mitochondira **3.** Lysosome

4. Chloroplast **5.** Food vacuole

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : FUNDAMENTAL UNIT OF LIFE CELL)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

TISSUE 2

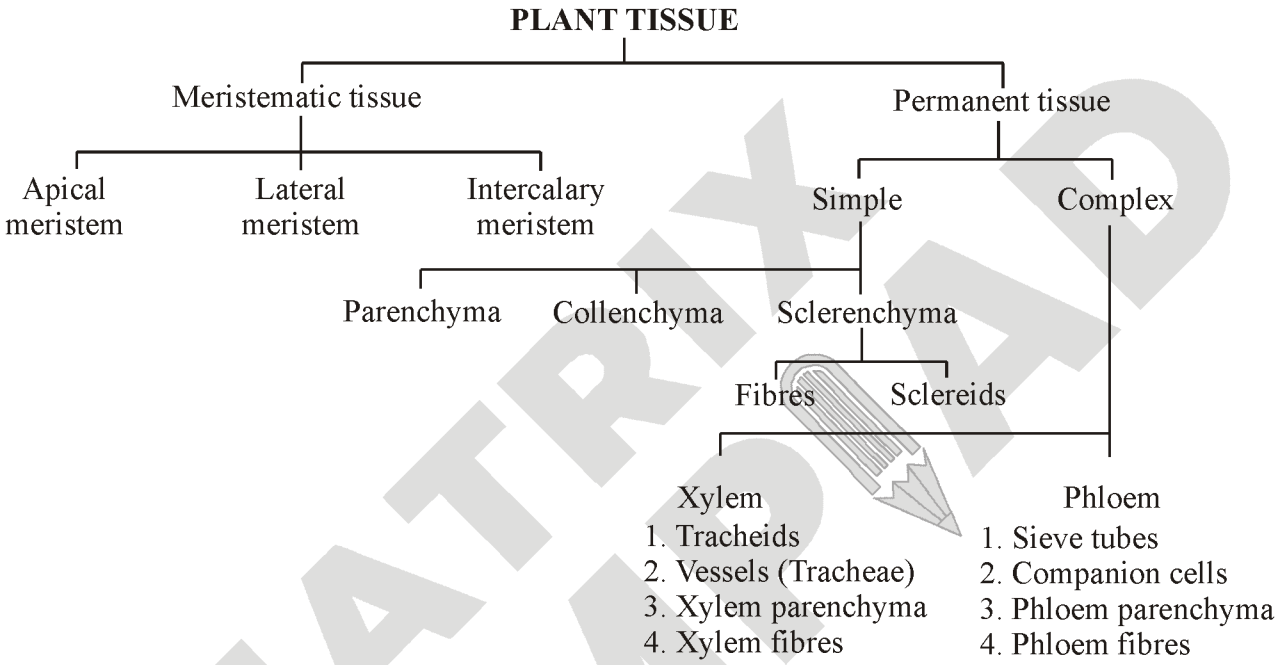
Concepts

INTRODUCTION

"A tissues may be defined as a group or collection of similar or dissimilar cells that perform a common function & have a common origin."

1. PLANT TISSUE

Classification of Plant Tissues :



1.1 MERISTEMATIC TISSUE

Meristematic tissues may be defined as a group or collection of living cells which are located specific locations and divide continuously to add new cells to the plant body.

(a) Apical meristem :

This meristem is located at the growing apices of main and lateral shoots and roots. These cells are responsible for linear growth of an organ. Example root apical meristem and shoot apical meristem.

(b) Lateral meristem :

This meristem consists of initials which divide mainly in one plane and cause the organ to increase in diameter and girth. The lateral meristem usually occurs on the sides both in stem and root. Lateral meristem is of two types, i.e., in the form of cork cambium and in vascular bundles of dicots in the form of vascular cambium. The activity of this cambium results in the formation of secondary growth.

(c) Intercalary meristem :

This meristem is located in between the regions of permanent tissues. The intercalary meristem are usually persent at the base of node, base of internode or at the base of the leaf. They are responsible for growth of leaves and internodes.

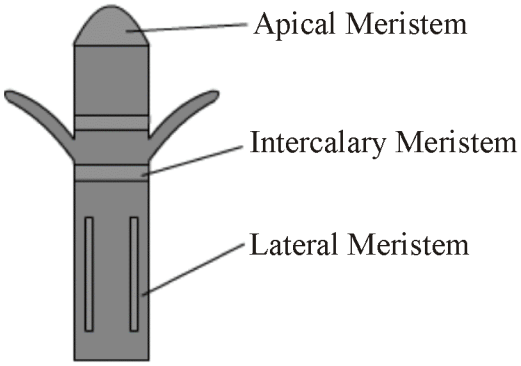


Figure : Meristematic tissues

→ **CHARACTERISTICS OF MERISTEMATIC TISSUES :**

- The cells of meristematic tissues are similar in structure and have thin and elastic primary cell walls made up of cellulose.
- These meristematic cells may be rounded, oval, polygonal or rectangular in shape.
- They are compactly arranged without intercellular spaces between them.
- Each cell contains dense or abundant cytoplasm and a large prominent nucleus.
- The dense protoplasm of meristematic cell contains few small vacuoles or no vacuoles at all.

1.2 PERMANENT TISSUES

These tissues are derived from the meristematic tissues but their cells have lost the ability of division and have attained their different forms. They are of two types-Simple and Complex.

(a) SIMPLE PERMANENT TISSUES :

These tissues are made up of cells which are structurally and functionally similar. These are of three types -

(i) Parenchyma

(ii) Collenchyma

(iii) Sclerenchyma

(i) Parenchyma :

- The parenchyma tissue is composed of living cells which are variable in thin morphology and physiology but generally having thin wall and a polyhedral shape and concern with vegetative activities of the plant.
- They have inter cellular spaces between them.
- They act as storage for food and water.

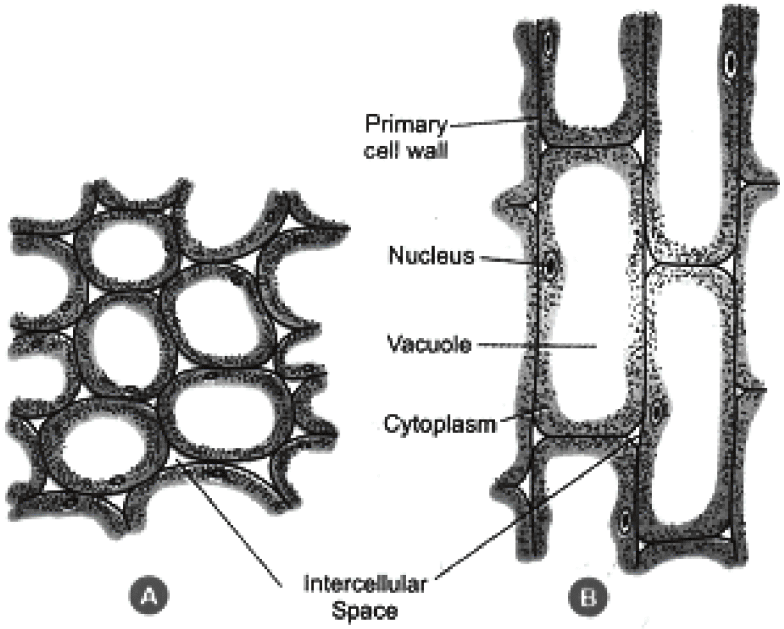


Figure : PARENCHYMA ; A-TRANSVERSE SECTION
B-LONGITUDINAL SECTION

Focus Point

Types of Parenchyma :

Aerenchyma :

- In hydrophytes, the intercellular space between cells become wide & filled with air.
- Such a parenchymatous tissue having large air spaces is called Aerenchyma.
- These help in gaseous exchange and provide buoyancy to plant.

Chlorenchyma :

- When parenchyma is richly supplied with chloroplasts, it is called chlorenchyma.
- They are found in leaf mesophyll, sepals, phylloclades, phyllodes, cladodes etc. It is photosynthetic in function and posses chlorophyll.

(ii) Collenchyma :

- It was discovered and coined by schleiden (1839).
- The cells are living with intercellular space in between the cells or junctional places filled with cellulose and pectin.

- Generally they are longer than parenchyma
- Usually they are known as living mechanical tissue owing to their supportive functions.
- It provides flexibility and strength to young plant organ.

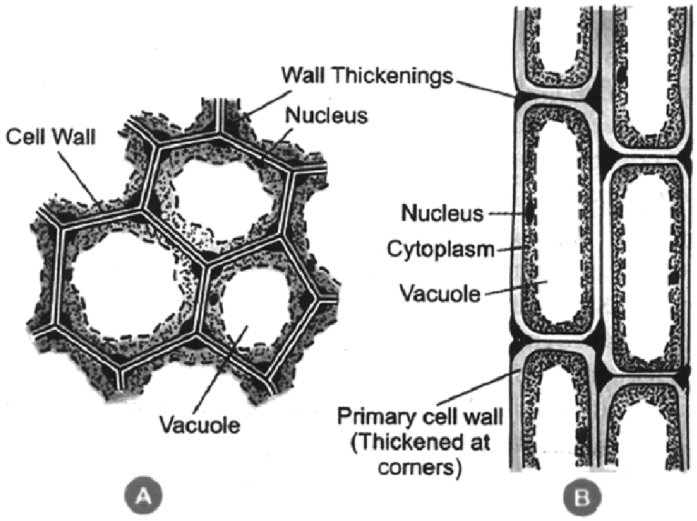


Figure : Collenchyma ; A-Transverse Section ; B - Longitudinal Section

(iii) Sclerenchyma

- They were discovered and coined by Mettenius (1805).
- The cells are long, narrow, pointed at ends, thick walled and lignified. They are the dead cells.
- It impart hardness to plant parts and give mechanical strength.

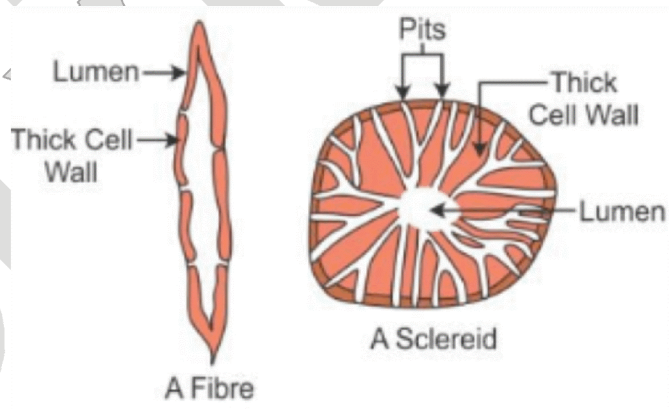


Figure : Sclerenchyma

Focus Point

Protective Tissue :

- It includes epidermis and cork.

Epidermis :

- It is usually present in the outermost layer of the plant body such as leaves, flowers, stem and roots.
- Epidermis is one cell thick and is covered with cuticle.
- This layer also have guard cells which have pore known as stomata.
- Cuticle is a water proof layer of a waxy substance called cutin which is secreted by epidermal cells.
- The main function of epidermis is to protect the plant from desication and infection.

Cork :

- As roots and stem grow older with time (increase in girth), tissues at the periphery become cork cell.
- Cork cells are dead cells and they do not have any intercellular spaces.
- The walls of cork cells are heavily thickened by the deposition of an organic substance (a fatty substance),called suberin.
- Cork is protective in function. cork cells prevent desication (loss of water from plant body), infection and mechanical injury.
- Cork is produced by cork cambium commercially it is obtained from oak (Quercus suber).
- Cork is used for making insulation boards, sports goods, bottle corks etc.

(b) COMPLEX PERMANENT TISSUES :

- A complex tissues can be defined as a collection of different types of cells that help in the performance of a common function.
- The important complex tissues in vascular plants are xylem and phloem. Both these together called as vascular tissues.
- Both these tissues are an assemblage of living and dead cells and may be primary or secondary, depending upon their mode of origin.
- Complex tissue transport water, mineral salts (nutrients) and food material to various parts of plant body.

COMPLEX TISSUES ARE OF FOLLOWING TWO TYPES :

(i) XYLEM :

- Its main function is conduction of water and mineral salts from root to the top of plant.

- Primary xylem elements originate from procambuim of apical meristem.
- Secondary xylem elements originate from the vascular cambium of lateral meristem.
- The xylem elements are of 4 types : (a) xylem tracheids (b) vessels (c) fibers (d) parenchyma.

→ **Xylem Tracheids :**

- These are lignified and dead cells with bordered pits.
- They help in conduction of water in pteridophytes and gymnosperms and provide mechanical support plants.

→ **Xylem Vessels :**

- The cells are long and tubular with lignified cell wall.
- The cross wall (end wall) at both the ends dissolves and form a pipe like channel.
- They help in ascent of sap in angiosperms.

→ **Xylem Fibers :**

- Long and narrow sclerenchymatous fibers with tapering end. The wall is heavily lignified leaving a very narrow Lumen.
- It provides tensile strength and mechanical strength.

→ **Xylem Parenchyma :**

- They are thin walled living cells present in both primary and secondary xylem.
- They store food materials.

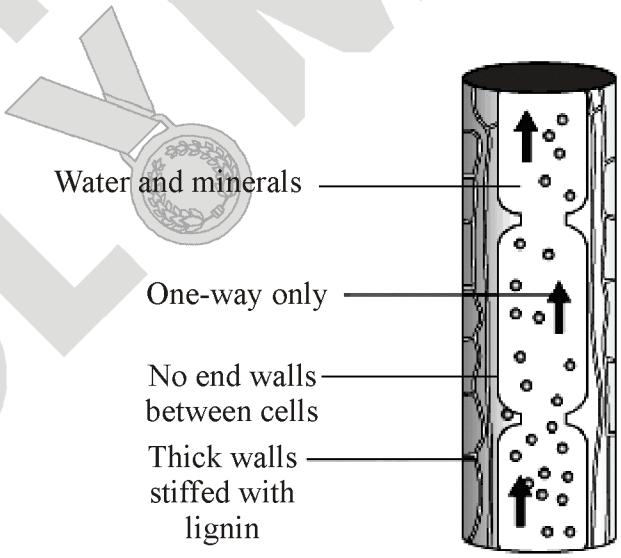


Figure : Xylem

(ii) PHLOEM :

- The dead matter in them is known as bast.
- Its main function is conduction of food material from leaves to other plant parts.
- The phloem elements are of four type : (a) Sieve tubes (b) Companion cells (c) Fibres (d) paranchyma.

→ **Sieve Tubes :**

- These are living but lack nucleus at maturity.
- Cell wall is thin and made up of cellulose.
- The transverse walls of sieve tube form sieve plate.
- They help in conduction of food material.

→ **Companion Cells :**

- The cells are living, thin walled, narrow and found attached to the lateral side of sieve element.
- They are absent in pteridophytes and gymnosperms.
- They support the sieve tube in transport of food.
- These are living and thin walled cells.
- They are absent all monocots and some dicots.

→ **Phloem Fibers (bast fibers) :**

- These are sclerenchymatous fibers having thick wall and narrow Lumen.
- They provide mechanical support to the plant.

→ **Phloem Parenchyma -**

- The chief function of parenchyma is to store food material and other substances like mucilage, tanins and resins.

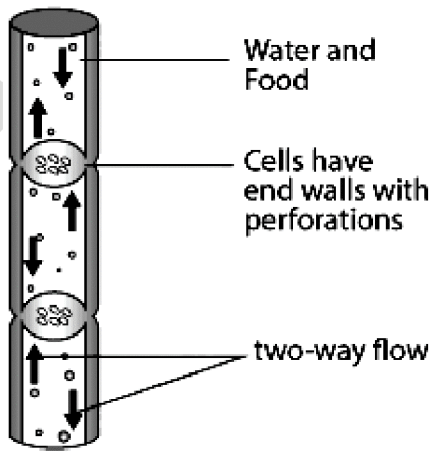
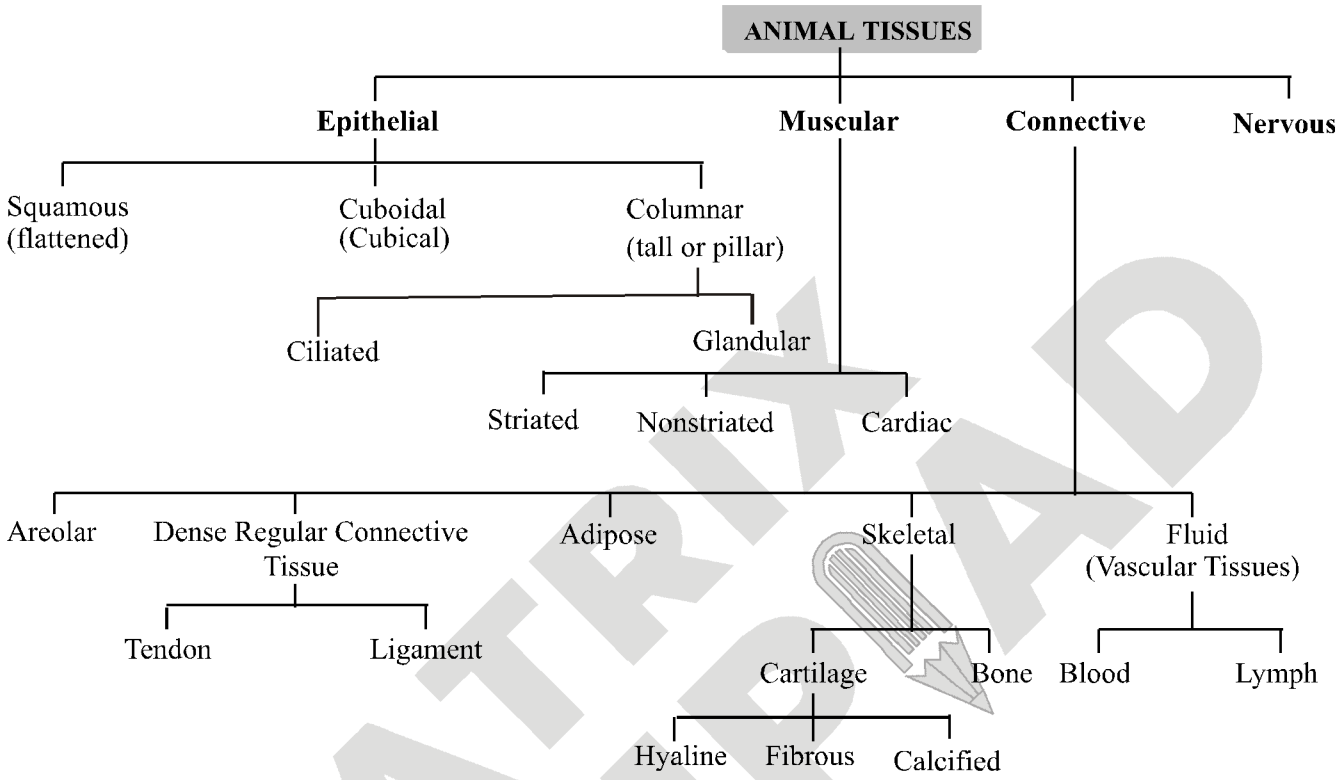


Figure : Phloem

2. ANIMAL TISSUES



2.1 EPITHELIAL TISSUE

- Epithelial tissue is a simplest as a protective covering.

→ **FUNCTION OF EPITHELIAL TISSUE:**

- Epithelial cover the body surface as an outer layer of skin and provide protection to the underlying tissues from mechanical injury, drying up, entry of germs (viral or bacterial pathogens), and harmful chemicals.
- Epithelia forms inner lining of mouth, alimentary canal and other internal organs inside the body and protect these organs.
- Epithelial lining of the intestine absorbs water and digested food.
- Epithelial tissues help in the elimination of nitrogenous and other waste products.
- Epithelial lining of the cavities give rise to glands that provide valuable secretions such as mucus, gastric juice, etc.

TYPE OF EPITHELIAL TISSUE :

(a) SQUAMOUS EPITHELIUM :

- **Structure:** Simple squamous epithelial cells are extremely thin and flat and form a delicate lining. It consists of tiles shaped cells. (Pavement epithelium)

- **Occurrence:** The skin, which protects the body, is also made of squamous epithelium. The oesophagus and the lining of the mouth are also covered with squamous epithelium.
- **Function:** Diffusion

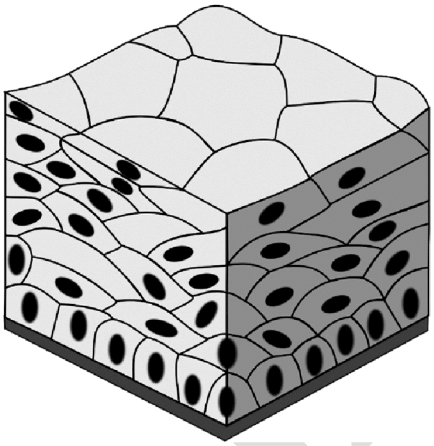


Figure. Squamous epithelum

(b) CUBOIDAL EPITHELIUM :

- **Structure:** This epithelium consists of cube-like cells which are about as tall as wide. The outline of cells is polygonal in surface view and square in section.
- **Occurrence:** The cuboidal epithelium lines the small salivary ducts, pancreatic ducts, sweat glands, salivary glands and thyrid glands. It also covers the ovaries and lines the sperm-producing tubules. Cuboidal epithelium (with cube-shaped cells) forms the lining of kidney tubules and ducts of salivary glands, where it provides mechanical support.
- **Function:** It helps in protection , secretion, absorption, excretion and gamete formation.

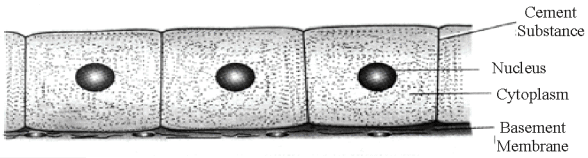


Figure : CUBOIDAL EPITHELIUM

(c) COLUMNAR EPITHELIUM

- **Structure.** This epithelium consists of tall or pillar-like cells that are much taller than wide. The nuclei are generally elongated along the long axis of cells.
- **Occurrence.** The columnar epithelium lines the stomach, intestine and gall bladder. It also lines mammary gland ducts and parts of urethra.
- **Function.** Secretion, absorption

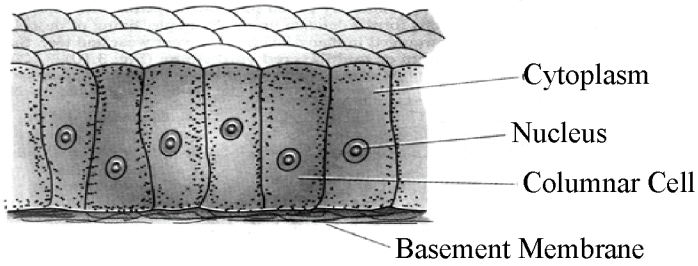


Figure : Columnar Epithelium

→ **GLANDULAR EPITHELIUM :**

- **Structure.** Tall, slender cells, some cells from the free surface inveginate inside to form secretory cells – goblet cells.
- **Occurence.** Lining of intestine & glands, trachea, bronchi.
- **Function.** Protection, movement of substances in a particular direction for e.g. of mucus in nasal passages.

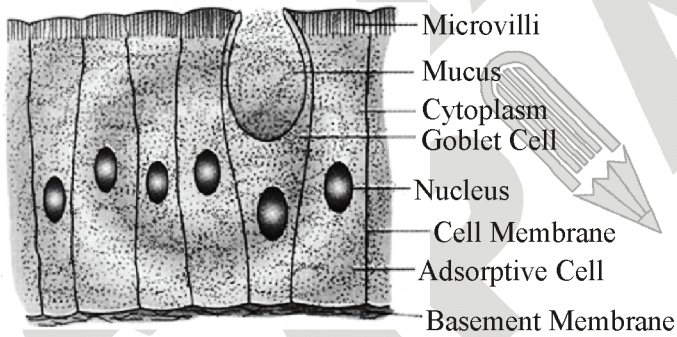


Figure : Glandular epithelium

→ **CILIATED COLUMNAR EPITHELIUM**

- **Structure.** Tall, slender cells which possess cilia.
- **Occurence.** Lines the nasal passages, oviducts. terminal bronchioles.
- **Function.** Secretion of mucus and other secretions.

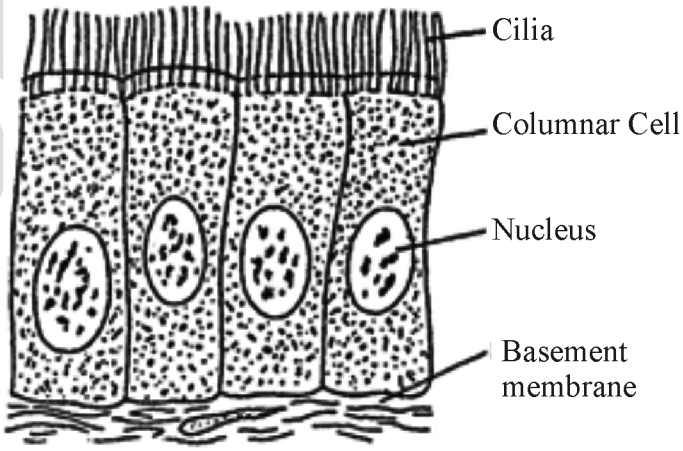


Figure : Ciliated columnar epithelium

2.2 MUSCULAR TISSUE

- Locomotion and movements are due to muscular tissues which contain highly contractile muscle cells.
- It is made up of muscle fibres.
- On the basis of their structures and functions, they can be divided as striated, unstriated and cardiac muscles.
- Muscle is a contractile tissue which brings about movements, regarded as motors of the body.
- Muscle cells are elongated slender like cells and called muscle fibres.
- The muscles are of three types as compared below :

Characteristics	Striped	Unstriped	Cardiac
Location	Occur in the body wall, limbs, tongue, pharynx and beginning of oesophagus	Occur in the wall of hollow viscera, iris of the eye and dermis of the skin.	Occur in the walls of heart, pulmonary veins and superior venacava.
Other names	Also called striated, skeletal and voluntary muscle fibres	Also called non-striated, smooth, visceral and involuntary muscle fibres.	Also called heart muscle fibres.
Shape	Cylindrical	Spindle	Cylindrial
Action	Voluntary	Involuntary	Involuntary
Light & Dark bands	Present	Absent	Absent
Branching	Absent	Absent	Present

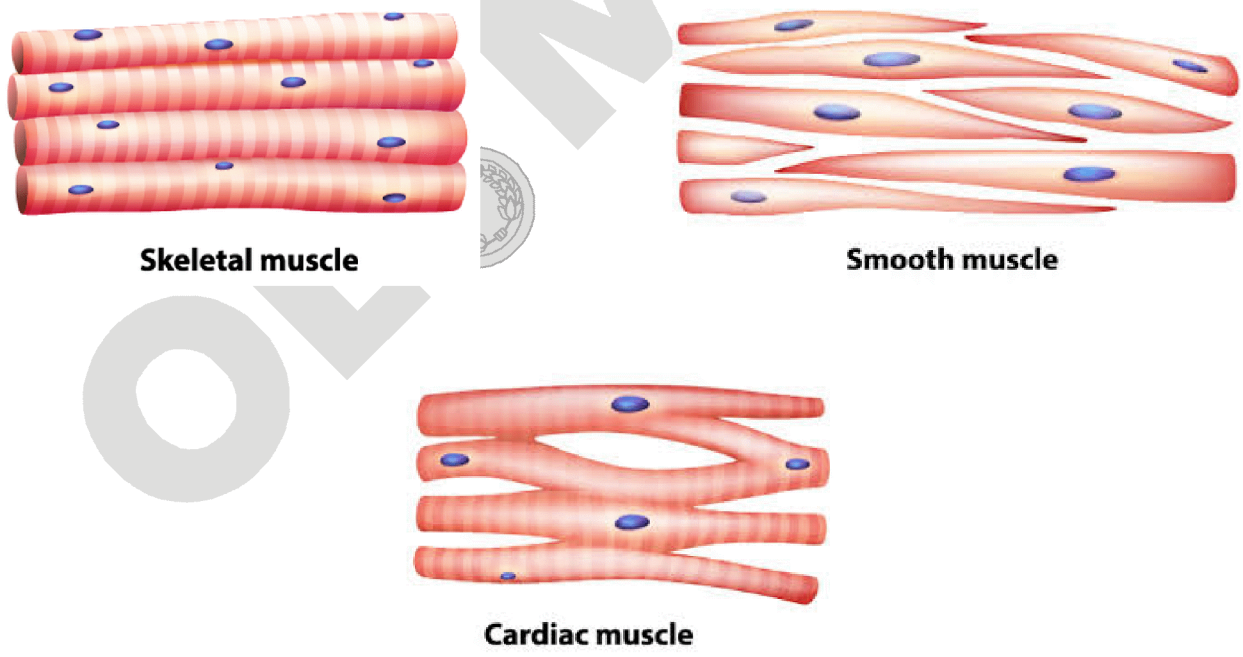


Figure : Muscular tissue

2.3 CONNECVE TISSUE

Connective tissues of animals serve the functions of binding and joining one tissue to another (i.e. connecting bones to each other, muscles to bones etc.) forming protective sheath and packing material around the various organs separating them so that they do not interfere with each other acitivities carrying materials from one part to another in the body, forming a supporting framework of cartilage and bones for the body etc.

→ **TYPES OF CONNECTIVE TISSUE :**

(a) AREOLAR TISSUE :

- The areolar tissue is also known as loose connective tissue. It is most widely distributed connective tissue in the animal body. It consists of a transparent, jelly-like sticky matrix containing numerous fibres and cells and abundant mucin. The fibres are mostly of two types : (a) White collagen fibres. They are made up of a protein called collagen, which on boiling with water changes to gelatin and (b) yellow elastic fibres. They are formed of a protein called elastin. Collagen fibres provide flexibility and strength whereas elastin fibres provide elasticity.
- The areolar tissue is connective in function. It fixes the skin with the muscles, fills the spaces inside the organs, Attaches the blood vessels and nerves with the surrounding tissues, fastens the peritoneum to the body wall and viscera. It is commonly called **"Packaging tissue"** of the body. Examples bone periosteum, muscle perimysium, nerve perineurium, etc.

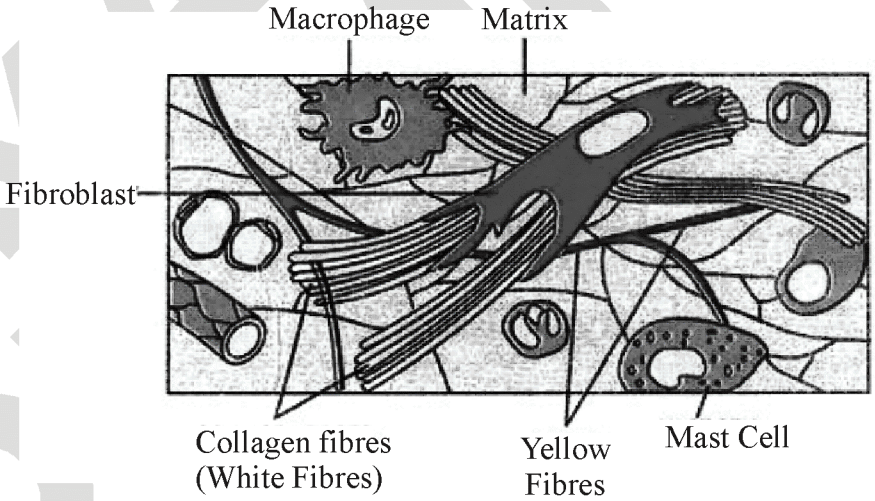


Figure : Areolar tissue

(b) DENSE REGULAR CONNECTIVE TISSUE :

- Dense regular connective tissue consists of orderd and densely packed fibres and cells. The fibres are loose and very elastic in nature. They are secreted by the surrounding connective tissue cells. This tissue is the principal component of tendons and ligaments.

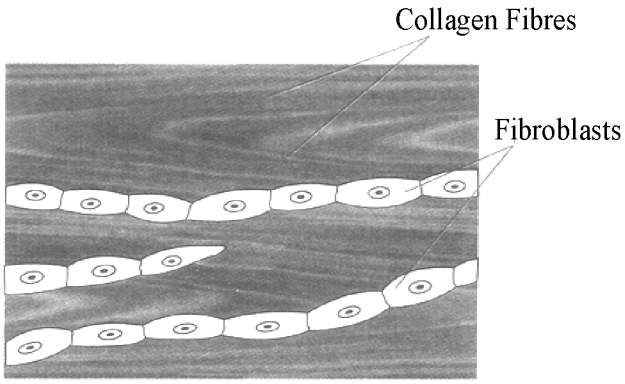


Figure : *DENSE REGULAR CONNECTIVE TISSUE*

(i) Tendon : Tendons are cord-like, very tough, inelastic bundles of white collagen fibres bound together by areolar tissue. The cells present in the tendons are elongated fibroblasts which lie in almost continuous rows here and there. The tendons connect the skeletal muscles with the bones.

(ii) Ligaments : Ligaments are cords formed by yellow elastic tissue in which many collagen fibres are bound together by areolar tissue. The fibroblasts are irregularly scattered. This tissue combines strength with great flexibility. The ligaments serve to bind the bones together.

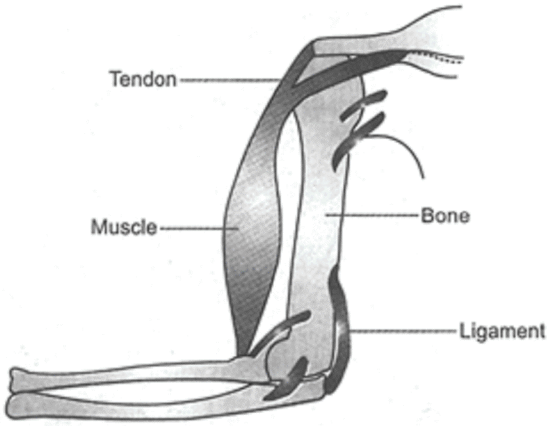


Figure : ATTACHMENT OF TENDOMS AND LIGAMENTS

Build The Concept

Difference between Tendons and Ligaments

	Tendons		Ligaments
1.	Tendons are very tough and inelastic	1.	Ligaments are elastic
2.	They connect the skeletal muscles with the bones	2.	Ligaments connect bones to other bones at joints.
3.	Tendons are made up of white fibrous tissue. Yellow elastic fibres are however absent	3.	Ligaments are made up to yellow elastic fibres. The white occur but they are very fine.
4.	Fibroblasts occur in rows.	4.	Fibroblast lies scatred.

(c) ADIPOSE TISSUE :

- Adipose is primarily a fat storing tissue in which the matrix is packed with large, spherical or oval fat cells (or adipocytes). Each fat cell contains a large fat globule. The matrix also contains fibroblasts, macrophages, collagen fibres and elastic fibres. The adipose tissue is arranged in lobules encased in areolar tissue.
- The adipose tissue is found beneath the skin, in the covering of the heart, around the blood vessels and kidney and in yellow bone marrow. This tissue stores fat and insulates the body against heat loss. It forms a shock absorbing cushion around the kidneys and the eyeballs. Blubber in whales is, in fact, an insulating fat body. Similarly, hump in camel is also rich in adipose tissue.

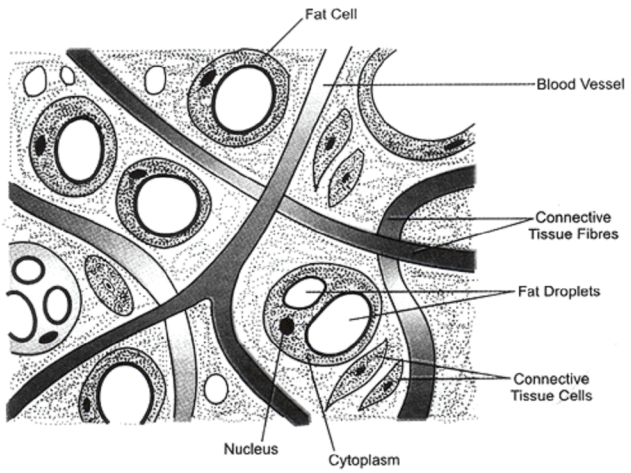


Figure : ADIPOSE TISSUE

(d) SKELETAL TISSUE :

- Skeletal tissue forms the rigid skeleton which supports the vertebrate body, helps in locomotion and provides protection to many vital organs. There are two types of skeletal tissues.

(i) **Cartilage**

- **Characteristics.** Cartilage is a hard but flexible skeletal tissue consisting of living cells embedded in a matrix. The cells (chondroblasts) become chondrocytes when get surrounded within special fluid-filled chambers, called lacunae (sing. lacuna). The lacunae (containing chondrocytes)are separated by the amorphous matrix (chondrin) that contains glycoproteins, collagen and elastic fibres. The surface of cartilage is surrounded by irregular connective tissue forming the perichondrium. Growth of cartilage occurs continuously due to multipli cation of chondrocytes by mitosis, deposition of matrix within existing cartilage and from activity of the deeper cells of the perichondrium. Blood vessels and nerves are absent in the matrix.

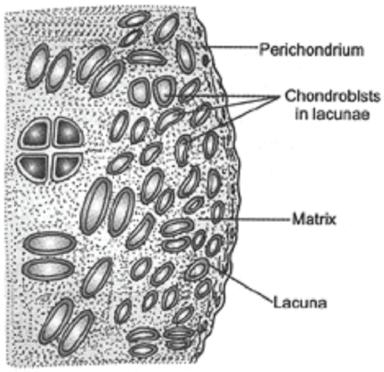


Figure : CARTILAGE

- **Occurrence :** This tissue occurs in very few parts of the body. In humans, the cartilage occurs at the ends of long bones, the pinnae of ears, the ends of nose, in the walls of respiratory ducts, within intervertebral discs, etc. In sharks and rays, the entire skeleton is cartilage.
- **Functions:** Cartilage is more compressible than bone. It absorbs stresses and provides flexibility to the body parts.

(ii) Bone

- **Characterisitics:** Bone is a very strong and non-flexible vertebrate connective tissue. A compact bone consists of living bone cells. Called osteoblasts, embedded in a firm, calcified matrix. The osteoblasts are contained in lacunae (spaces) which are arranged in concentric circles present throughout the matrix. The lacunae are also surrounded by nerves and blood vessels. The blood vessels passing through them provide nutrients to osteo blasts and help exchange of materials. The matrix is composed of about 30% organic materials (chiefly collagen fibres and glycoproteins) and 70% inorganic bone salts (mainly phosphates and charbonates of calcium and magnesium, hydroxyapatite etc.). These inorganic salts are responsible for hardness of the bone.

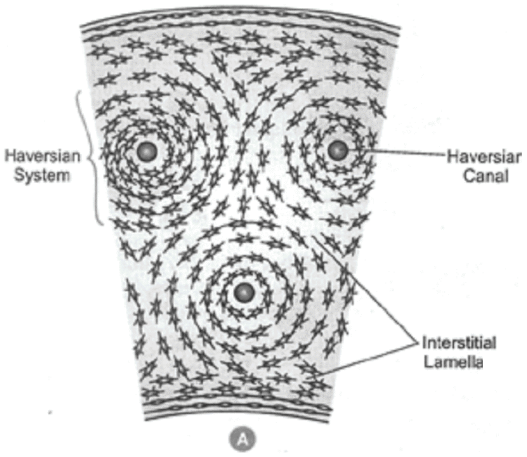


Figure : T.S. Of LONG BONE

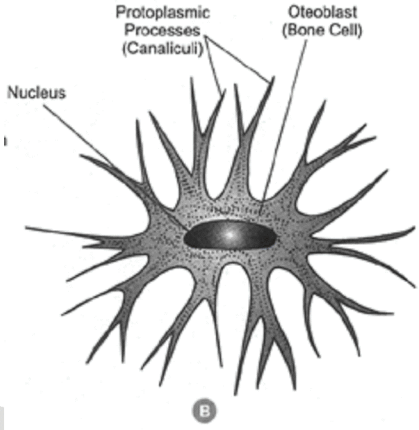


Figure : OSTEOBLAST

Build The Concept

Difference between Cartilage and Bones

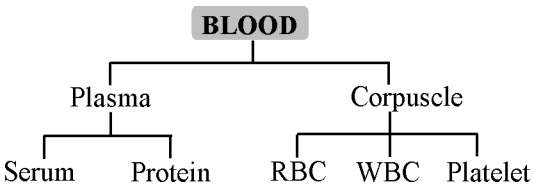
	Cartilage		Bone
1.	Cartilage is soft, elastic and flexible	1.	Bone is hard, tough and inelastic.
2.	Matrix of cartilage consists of entirely organic matter.	2.	Ligaments connect bones to other bones.
3.	Cartilage do not have blood supply (except in (perichondrium).	3.	Bones have rich blood supply.
4.	elastic fibres are absent	4.	elastic fibres are present
5.	Growth of cartilage is unidirectional	5.	Growth of bone is bidrectional

(e) Fluid Connective Tissue : (Vascular Tissue)

- Fluid connective tissue links the different parts of body and maintains a continuity in the body. It includes blood and lymph.

(i) Blood :

- It is a fluid connective tissue.



→ **Functions of blood :**

- Blood transports nutrients, hormones and vitamins to the tissues and transports excretory products from the tissues to the liver and kidney.
- The red blood corpuscles (RBC's) carry oxygen to the tissues for the oxidation of food stuff.
- The white blood cells (WBC's) fight disease either by engulfing and destroying foreign bodies or by producing antitoxins and antibodies.
- Granulocytes include neutorphils, eosinophils and basophils.
- Agranulocytes include lymphocytes and monocytes.
- Blood platelets disintegrate at the site of injury and help in the clotting of blood.

(ii) Lymph:

→ **Nature :**

- Lymph is a colourless fluid that has filtered out of the blood capillaries. Red blood corpuscles and some blood proteins are absent in it. In the lymph, white blood cells are found in abundance.

→ **Functions :**

- Lymph transports the nutrients (oxygen, glucose) that may have filtered out of the blood capillaries back into the heart to be recirculated in the body.
- It brings CO_2 and nitrogenous wastes from tissue fluid to blood.

2.4 NERVOUS TISSUE

- The nervous tissue, which contains densely packed nerve cells, called neurons (Gk. neuro = nerve), is present in the brain, spinal cord and sense organs. The neurons are specialized for conduction of nerve impulses. They receive stimuli from within or outside the body and conduct impulses (signals) which travel from one neuron to another neuron. Each neuron is composed of the following three parts.

(a) Cyton or cell body. The cell body contains the major concentration of the cytoplasm and the central nucleus of the neuron. The cell body also contains **Nissl's granules**, which are groups of ribosomes and rough endo plasmic reticulum.

(b) Dendrons. These are short much-branched and tapering projections arising from the cell body. The dendrons are further branched into dendrites. They provide a large surface area for synaptic connections with other neurons. They conduct nerve impulses towards the cell body.

(c) Axon (Nerve fibre). The axon is a long cylindrical process of uniform diameter that arises from the axon hillock of the cyton. It shows fine branching at the terminal end. Each branch ends in a swollen structure, called synaptic knob. The axons carry impulses aways from the cell body to other neurons. The synaptic knobs of terminal branches of neuron are connected with dendrite branches of an adjacent neuron. Each such junction, in fact, has minute gap called synapse. It is meant for the transmission of nerve impulse from one neuron to the other.

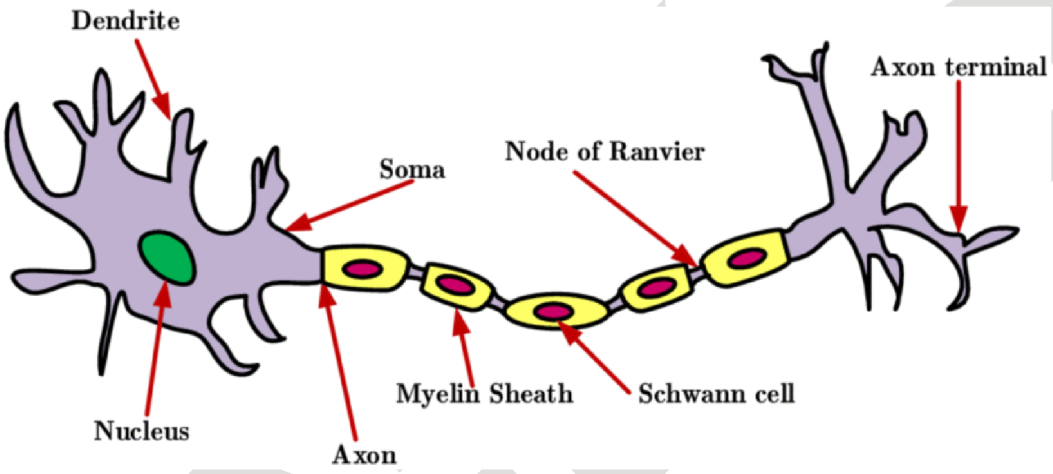


Figure : Neuron

EXERCISE – I

ONLY ONE CORRECT TYPE

1. Permanent tissues are derived from
   (A) Simple tissue (B) Meristematic tissue
   (C) Complex tissue (D) Collenchyma
2. Protective tissue is -
   (A) Xylem (B) Chlorenchyma
   (C) Respiration (D) Cork
3. Which of the following is an example of photosynthetic type of tissue
   (A) Chlorenchyma (B) Sclerenchyma
   (C) Collecnchyma (D) Aerenchyma
4. Which of the following statement is false about meristematic tissue -
   (A) They contain dense cytoplasm
   (B) The endoplasmic reticulum & mitochondria are fully developled
   (C) These are the most metabolically active cells
   (D) Meristematics cells are similar in structure.
5. One of the following is modification of parenchyma
   (A) Fibres found in phloem (B) Vessel
   (C) Tracheids (D) Chlorenchyma
6. Mucilage, tannins & resins are stored materials of -
   (A) Xylem (B) Apical tissue
   (C) Phloem (D) Collenchyma
7. Aerenchyma is found in -
   (A) Sciophytes (B) Xerophyte
   (C) Lithophytes (D) Hydrophytes
8. Which is not a component of xylem?
   (A) Tracheid (B) Companion cell
   (C) Xylem Parenchyma (D) Vessels
9. Aerenchyma provides -
   (A) Flexibility of plants
   (B) Buoyancy to plants
   (C) Mechanical strength to plants
   (D) Help floating
10. Xylem & phloem occur in -
    (A) Connective tissue (B) Cortex
    (C) Periderm (D) Vascular bundle
11. Periderm is produced by -
    (A) Cork cambium (B) Secondary cortex
    (C) Procambium (D) Vascular cambium
12. Some parts of the plants are flexible due to the presence of -
    (A) Parenchyma (B) Collenchyma
    (C) Meristematic (D) Sclerenchyma
13. Which of the following tissue has dead cells?
    (A) Parenchyma (B) Sclerenchyma
    (C) Collenchyma (D) Epidermins
14. Collenchyma provides -
    (A) Flexibility of plant
    (B) Mechenical strength to plant
    (C) Buoyancy to plant
    (D) Help in floating
15. Which is not a component of phloem?
    (A) Phloem paremchyma
    (B) Companion cell
    (C) Sieve tube
    (D) Vessels
16. Large intercellular space are present in -
    (A) Epithelial tissue (B) Connective tissue
    (C) Muscular tissue (D) Nervous tissue

17 Intestine absorbs the digested food materials. What type of epithelial cell are responsible for that?
(A) Startified squamous epithelium
(B) Brush Bordered Columnar epithelium
(C) Spindle fibres
(D) Cuboidal epithelium

18. White fibres of connective tissue are made up of -
(A) Elastin (B) Reticular fibre
(C) Collagen (D) Myosin

19. Spinal cord & brain are made of -
(A) Muscular tissue (B) Vascular tissue
(C) Nervous tissue (D) Skeletal tissue

20. The cell body of nerve cell contains a nucleus & cytoplasm and is called the -
(A) Cyton (B) Dendron
(C) Axon (D) None

21. Voluntary muscles are found in -
(A) Alimentary canal (B) Limbs
(C) Iris of eye (D) Bronchi of lungs

22. Striated muscles are -
(A) Multinucleater & unbranced
(B) Uninucleate & spindle - Shaped
(C) Uninucleate & branched
(D) Multinucleate & branched

23. Dendrites are found in -
(A) Striated muscle (B) Cardiac
(C) Neuron (D) Nonstriated muscle

24. Adipose tissue is a type of -
(A) Nervous tissue (B) Muscular tissue
(C) Epidermal tissue (D) Connective tissue

25. Mast cells are part of -
(A) Adipose tissue (B) Areolar tissue
(C) areolar tissue (D) Cartillage

26. Cartilage is not found in -
(A) Nose (B) Ear
(C) Kidney (D) Larynx

27. Fats are stored in human body as -
(A) Cuboidal epithelium
(B) Adipose tissue
(C) Bones
(D) Cartilage

28. Bone matrix is rich in -
(A) Fluoride & calcium
(B) Calcium & phosphorus
(C) Calcium & Potassium
(D) Phosphorus & potassium

29. Lymph can be defined as -
(A) Blood minus plasma
(B) Blood minus RBCs
(C) Blood minus WBCs
(D) Blood with RBCs

30.

Column I	**Column II**
(i) Photosynthetic	(A) Transport
(ii) epithelia tissue	(B) Protection
(iii) connective tissue	(C) messages
(iv) blood tissue	(D) feeding
(v) nervous tissue	(E) strength

(A) i –D, ii–B, iii–E, iv– A, v–C
(B) i –A, ii–B, iii–C, iv– D, v–E
(C) i –C, ii–B, iii–E, iv– A, v–D
(D) i –D, ii–C, iii–E, iv– A, v–B

EXERCISE – II

VERY SHORT ANSWER TYPE

1. What is neuron ? Define it.
2. How many types of muscles occur in animals ?
3. Give 3 features of cardiac muscles.
4. Name the tissue responsible for the movement in our body.
5. What is the main function of nervous tissue?
6. Give one example of Apical meristem and Lateral meristem.
7. What is the main function of parenchyma?
8. Which chemical is deposited at the corner of cells in collenchyma ?
9. Which chemical is deposited in the cell wall of sclerenchyma ?
10. Give one main function of collenchyma.

SHORT ANSWER TYPE

1. Give the chemical nature of white fibres.
2. What is the average life span of RBCs of man ?
3. Name the protein found in yellow fibres.
4. What is the function of blood platelets in human body ?
5. Which tissue is commonly known as 'packaging' tissue ?
6. Distinguish between xylem and phloem?
7. Explain the different types of elements present in phloem.
8. What are tracheary elements ? Describe their functions.
9. What are the function of xylem ?
10. What are different types of tissues in plant ?

LONG ANSWER TYPE

1. Name the following:
   (i) Tissue that forms the inner lining of our mouth.
   (ii) Tissue that connects muscle to bone in humans.
   (iii) Tissue present in the brain.
   (iv) Tissue that stores fat in our body.
   (v) Connective tissue with a fluid matrix.
2. Draw a flow chart showing the various types of connective tissues.
3. What are Nissl's granules ? Give their functions.
4. Give the functions of plasma of blood.
5. What are tissues ? Why are plant and animal tissues different ? Give importance of tissues.
6. What are meristematic tissues ? Explain with the help of suitable diagram. Give their classification on the basis of their position in the plant body.
7. Define simple tissue. Classify and explain its different types with suitable diagrams.
8. Define complex tissue. Classify and explain its different types with suitable diagrams.
9. Name and describe two protective tissues of plants. Give their other functions as well.
10. Differentiate between blood and lymph.

TRUE / FALSE TYPE

1. Cambium has the apical meristem.
2. Parenchyma contains isodimetric cells.
3. Sclereids form gritty part of ripe fruits.
4. Cuboidal epithelium is located in salivary glands.
5. Collagen occurs in white fibres.

FILL IN THE BLANKS

1. In higher plants food is conducted by _____
2. Blood is a _____ Tissue.
3. Bone consists of _____ cells.
4. Fibres are absent in _____ a type of fluid connective tissue.
5. A nerve impulse passes from one neuron to another across a _____.

Space for Notes :

Answer Key

EXERCISE–I														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	D	A	B	D	A	D	B	B	D	A	B	B	A	D
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
B	B	C	C	A	B	A	C	D	B	C	B	B	B	A

EXERCISE – II

TRUE/FALSE TYPE

1. F **2.** T **3.** T **4.** T **5.** T

FILL IN THE BLANKS

1. Phloem **2.** Connective **3.** Osteocyte

4. Blood **5.** Synapse

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : TISSUE)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

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