

CELL: FUNDAMENTAL UNIT OF LIFE

CELL

- All living forms are composed of microscopic units called as "Cells".
- A cell is the basic structural and functional unit of all life forms.
- Study of structure and composition of cell is called as "Cytology".
- Cell was first observed by "Robert Hooke" in a dead cork slice in the year 1665. He described about this in his book "Micrographic".
- The word cell was derived from a Greek word "Cellulae" which means small room.
- First living cell was discovered by A.V. Leeuwenhoek.
- The term protoplasm was coined by Purkinje in 1839.
- Protoplasm was discovered by "Felix Dujardin" and named as sarcode.
- Its consistency differs under different conditions. It exists in sol-gel states.
- Protoplasm is an aggregate of various chemicals such as water, ions, salts and other organic molecules like proteins, carbohydrates, fats, nucleic acids, vitamins etc.

CELL THEORY

Two biologists, "Schleiden and Schwann" gave the "Cell theory" which was later on expanded by "Rudolf Virchow". Cell theory states that

- (i) All plants and animals are composed of cells.
 - (ii) Cell is the basic unit of life.
 - (iii) All cells arise from pre-existing cells.
- Viruses are the exceptions of cell theory.

TYPES OF CELL & ORGANISM

(a) On the Basis of Number of Cells Organisms can be categorized as:

- (i) Unicellular organisms: These are organisms which are made up of single cell only. This single cell performs all the vital body functions of an organism. **e.g. Amoeba**
- (ii) Multicellular organisms: These are the organisms which are made up of numerous cells. These cells then combine to form an organ and a group of organs performing different functions forms an organ system which further forms an organism. **e.g. plants and animals**

(b) On the basis of type of organization, cells are two types :

- (i) Prokaryotic cells: these are primitive and incomplete cells. They have less developed nucleus without nuclear membrane & nucleolus. **e.g. Bacteria.**
- (ii) Eukaryotic cells: these are well developed cells. They have advanced nucleus with nuclear membrane and nucleolus. **e.g. Plants & animals.**

CELL SHAPE

Cells are of variable shapes and sizes. Their shape is according to the function. Generally cells are spherical but they may be elongated (nerve cell), branched (pigmented), discoidal (RBC), spindle shaped (muscle cell) etc.

CELL SIZE

Size of cell is variable depending upon the type of organism. Some are microscopic while some are visible with naked eyes.

Their size may vary from 0.2 μm to 18 cm.

- Size of a typical cell in a Multicellular organism ranges from 20-30 μm .
- The largest cell is ostrich egg (15 cm. in dia with shell & 8 cm. in dia without shell)

SPECIAL ADVANCED STUDY MATERIAL / QUESTION BANK

- The longest cell is nerve cell.(upto 1m. or more)
- Smallest cells so far known are PPLOs e.g. mycoplasma (0.1 μm in dia.)
- Human egg is 0.1 mm. in dia.

COMPONENTS OF CELL

There is an occurrence of division of labour within a cell as they all got certain specific components called "Cell organelles" each of them perform a specific function.

- The three basic components of all the cells are
(i) IM (Plasma Membrane) (ii) Nucleus (iii) Cytoplasm

EXERCISE-1

1. The first person to observe a cell under microscope was
(A) M. Schleiden (B) T. Schwann (C) Robert Hook (D) A.V.Leeuwenhoek
2. Cell theory was propounded by
(A) Morgan (B) Halden
(C) Schleiden and Schwann (D) Robert Hooke
3. The word cell was coined by
(A) Robert hooke (B) Weismann (C) Cuvier (D) Darwin
4. Nucleus discovered by
(A) Robert Hooke (B) Robert Brown (C) Dujardin (D) Purkinje
5. Smallest cells so far known are
(A) Bacteria (B) blue green algae (C) PPLOs (D) human egg
6. Which of the following is the longest cell of animal kingdom?
(A) Bacteria (B) Nerve cell (C) Virus (D) Muscle cell
7. Which one of the following is an example of prokaryotic cell?
(A) Typical plant cell (B) Typical animal cell (C) Bacteria (D) None of these
8. What is cytology?
(A) Study of cytoplasm (B) Study of structure and composition of cell
(C) Study of animal cell only (D) Study of cell only
9. Who coined term protoplasm?
(A) Leeuwenhoek (B) Purkinje (C) Robert hooke (D) Robert Brown
10. Cell is
(A) Functional unit of life (B) Structural unit of life
(C) Hereditary unit of life (D) all of the above

VERY SHORT ANSWER TYPE QUESTIONS

1. Name the largest cell of living world.
2. Amoeba is a organism.
3. Who wrote the book "Micrographia"?

SHORT ANSWER TYPE QUESTIONS

4. What is the composition of protoplasm?
5. Define cell.

LONG ANSWER TYPE QUESTION

6. Who gave the cell theory? What does it state? Which organism is an exception of cell theory?

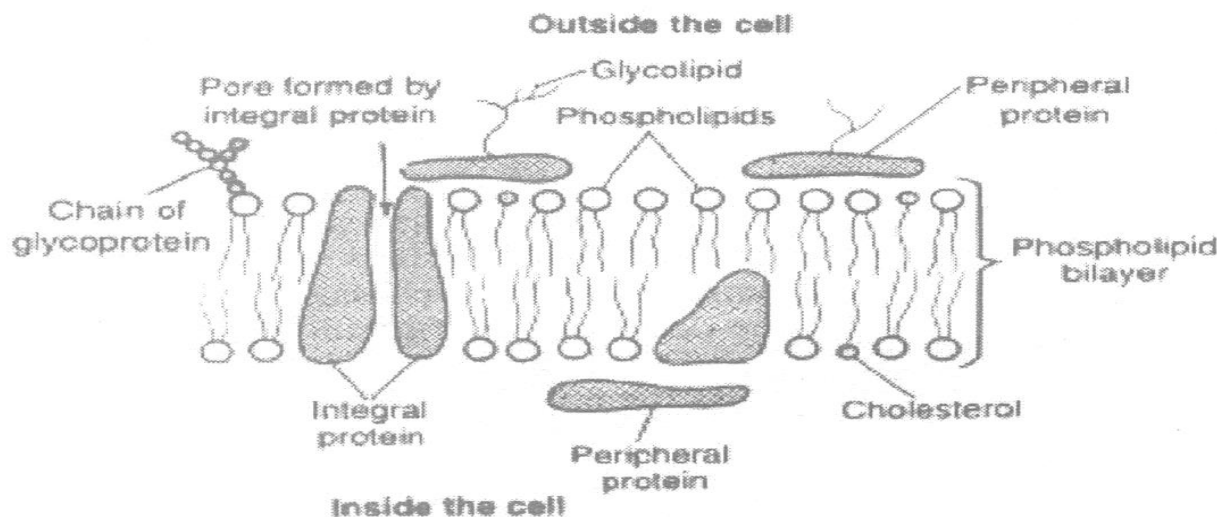
CELL MEMBRANE

(a) Cell Membrane:

- Cell membrane is also called as plasma Membrane or Plasma lemma.

SPECIAL ADVANCED STUDY MATERIAL / QUESTION BANK

- It is the limiting boundary of each cell which separates the cytoplasm from its surroundings.
- It is found in both plant as well as animal cells.
- It is the outer most covering of a cell in case of animals and lies below the cell wall in case of plants.
- It is made up of proteins and lipids where proteins are sandwiched between bilayer of lipids.
- Plasma membrane name was given by Nageli.
- Plasma membrane is selectively permeable in nature. It allows or permits the entry and exit of some materials in and out of the cell.
- **Singer and Nicholson** gave the fluid mosaic model of plasma membrane according to him it consists of a protein layer sandwiched between two layers of lipids. It is in quasifluid state. It is 75Å thick.
- It is flexible and can be folded, broken and reunited.



(i) Function of plasma membrane:

- (A) It regulates the movement of molecules inside and outside the cell.
- (B) It helps in maintaining the distinct composition of the cell.

(ii) Transportation of molecules across the plasma membrane: This can be done by following ways:

- (A) **Diffusion:** Movement of solutes or ions from higher concentration to lower concentration is called as diffusion. It does not require energy therefore it is called as passive transport.
- (B) **Osmosis:** The movement of solvent or water from higher concentration (solvent) to lower concentration (solvent) through a semipermeable membrane is called as osmosis. Or The movement of solvent or water from lower concentration to higher concentration of solution through a semipermeable membrane is called as osmosis. Osmosis can also be called as diffusion of solvents”.

- **Endosmosis:** Movement of solvent into the cell is called as Endosmosis.
- **Exosmosis:** Movement of solvent outside the cell is called as Endosmosis.

(iii) Types of solution on the basis of concentration:

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

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

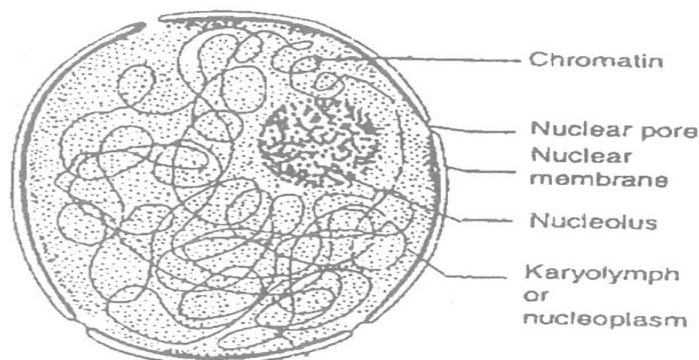
(C) **Hypotonic solution:** When the concentration of the solution outside the cell is lesser than that of cytoplasm of cell. Due to this cell swells up and bursts.

(b) Cell Wall:

- It is the outermost covering of the plant cells.

- It is absent in animal cells.
- Cell wall is rigid, strong, thick, porous and non living structure. It is made up of cellulose and hemicelluloses. Cell walls of two adjacent cells are joined by a layer called middle lamellae. It is made up of calcium and magnesium pectate.
- Functions of cell wall:
- It provides definite shape to the cell.
- It provides strength to the cell.
- It is permeable and allows entry of molecules of different sizes.
- It is antigen specific.
- It has the characteristics of repair and regeneration.

(c) Nucleus:



- Nucleus is the most important cell organelle which directs and controls all its cellular activities.
 - It is called as "Headquarter of the cell".
 - It was discovered by "Robert Brown in 1831".
 - In eukaryotes a well defined nucleus is present while in prokaryotes a well defined nucleus is absent.
 - Prokaryotes contain a primitive nucleus.
 - It has double layered covering called as nuclear membrane. Nuclear membrane has pores which regulate the movement of materials of materials in & out of the cell.
 - Besides nuclear membrane nucleus also contains nucleolus and chromatin material and the substance filled inside the nucleus is nucleolus or karyolymph.
 - Chromosomes or chromatin material consists of DNA which stores and transmits hereditary information for the cell to function, grow and reproduce.
- (i) Function of the nucleus:
- (A) It controls all the metabolic activities of the cell and regulates the cell cycle.
- (B) It helps in transmission of hereditary characters from parents to off springs

EXERCISE-2

1. Plasma membrane is made up of
 - (A) Proteins and carbohydrates
 - (B) Proteins and lipids
 - (C) Proteins and nucleic acids
 - (D) Proteins, some nucleic acids and lipids
2. Plant cell wall is mainly composed of
 - (A) Sugars
 - (B) Cellulose
 - (C) Proteins
 - (D) lipids
3. Nucleus was discovered of
 - (A) Robert Brown
 - (B) Robert Hooke
 - (C) A.V. Leeuwenhoek
 - (D) Schwann
4. A solution is said to be hypotonic when
 - (A) Concentration of medium is higher than that of the cell
 - (B) Concentration of medium is equal to that of the cell

- (C) Concentration of medium is lower than that of the cell
 (D) None of the above are correct.
5. Cell wall shows
 (A) Complete permeability (B) semipermeability
 (C) Differential permeability (D) impermeability
6. Plasma membrane is –
 (A) Impermeable (B) formed of cellulose
 (C) selectively permeable (D) nonselective
7. Ribosome was named by –
 (A) Palade (B) Porter (C) de Duve (D) Koliker
8. Ribosome consist of –
 (A) DNA and protein (B) RNA and protein
 (C) RNA and amino acids (D) RNA and DNA
9. The solution having concentration equal to the concentration of solution of inside the cell is called as
 (A) Isotonic solution (B) hypotonic solution
 (C) Hypertonic solution (D) all of the above
10. .If a cell will be placed in hypotonic solution what will happen to it ?
 (A) The cell will swell and burst (B) The cell will become flaccid
 (C) It will remain unchanged (D) None of the above

VERY SHORT ANSWER TYPE QUESTIONS

- Who gave the fluid mosaic model of plasma membrane ?
- Movement of solvent into the cell is called as.....
- Which cell organelle is called as the head quarter of cell?

SHORT ANSWER TYPE QUESTIONS

- What is the difference between diffusion and osmosis?
- Why plasma membrane is called as selectively permeable membrane ?

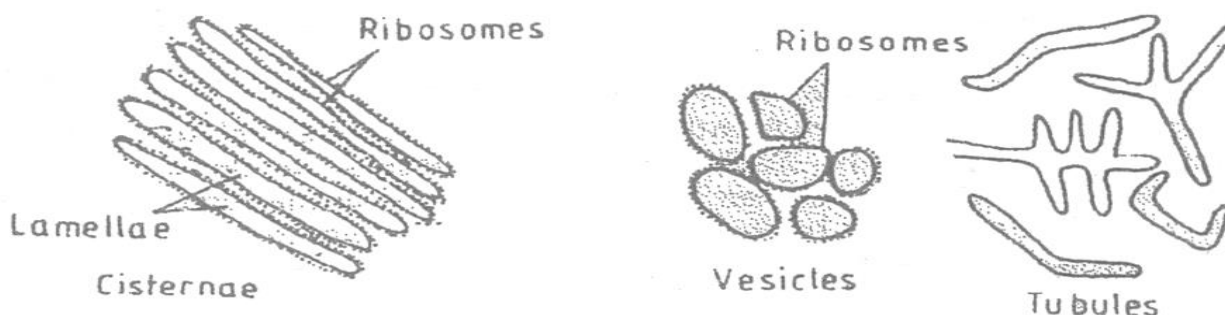
LONG ANSWER TYPE THE QUESTION

- Draw a neat and labeled diagram of nucleus. State its main function.

CYTOPLASM

- Cytoplasm was discovered by Kolliker in 1862.
- It is the site of both biosynthetic and catabolic pathways.
- It can be divided into two parts:
 (i) Cytosol: Aqueous soluble part contains various fibrous proteins forming cytoskeleton.
 (ii) Cell organelles: Living part of the cells having definite shape, structure and function bounded By Plasma membrane.

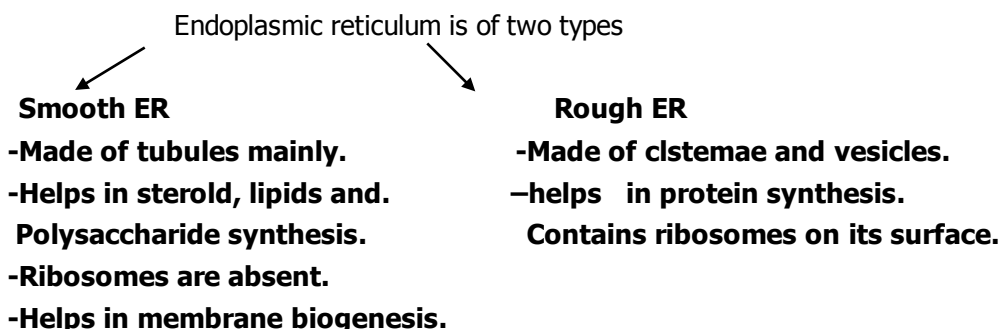
ENDOPLASMIC RETICULUM



- It is the network of membranes present in the cytoplasm.
- It was discovered by Porter, Claude and Fullam.
- These are present in all cells except prokaryotes and mammalian erythrocytes.

- They are made up of three components:
 - Cisternae:** These are long, flattened, parallelly arranged, unbranched tubules. These form successive layers of nucleus. These are found in cells which are active in protein synthesis and are 40-50 μm in diameter.
 - Vesicles:** These are round or spherical they are found in synthetically active cells.

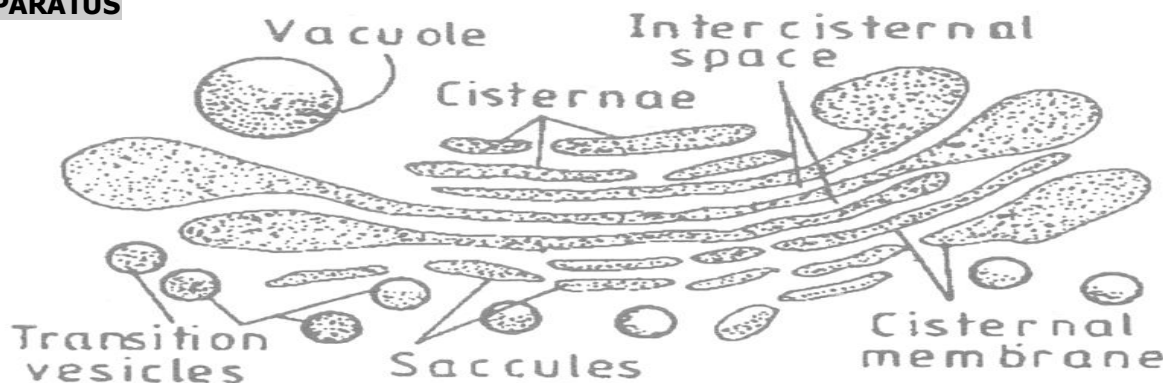
(a) Types :



(b) Function of ER:

- It is the only organelle which can move within a cell so it serves as a channel for the transport of materials between various regions of cytoplasm and between cytoplasm and nucleus.
- It also function as a cytoplasmic framework to provide space for some of the biochemical activities. It forms endoskeleton of cell.
- It helps in synthesis of fats, steroids, cholesterol etc.
- It contains secretory proteins.
- SER plays a crucial role in detoxification of drugs and poisonous by-products.

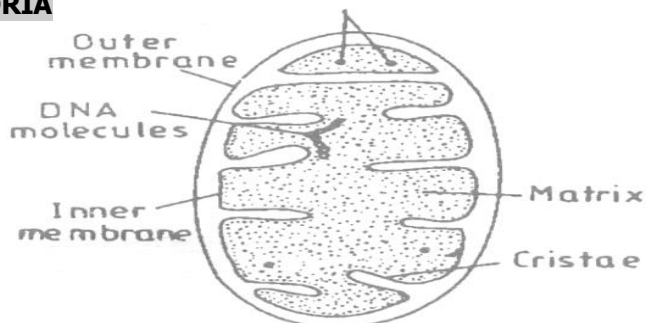
GOLGI APPARATUS



- Golgi apparatus consists of a system of membrane bounded vesicles arranged parallel to each other in stacks called Cisternae along with some large and spherical vacuoles.
- It was discovered by Camilo Golgi.
- In plants Golgi membrane bounded.
- It is single membrane bounded.
- It is absent in prokaryotes, mammalian RBC's & sieve cells.

(a) Functions:

- It helps in formation of lipids
- It helps in formation of middle lamellae
- It is secretory in nature.
- It helps in melanin synthesis
- Lipids and proteins synthesized in endoplasmic reticulum are packed at Golgi complex. They provide the site for assembly of new membrane material.

MITOCHONDRIA

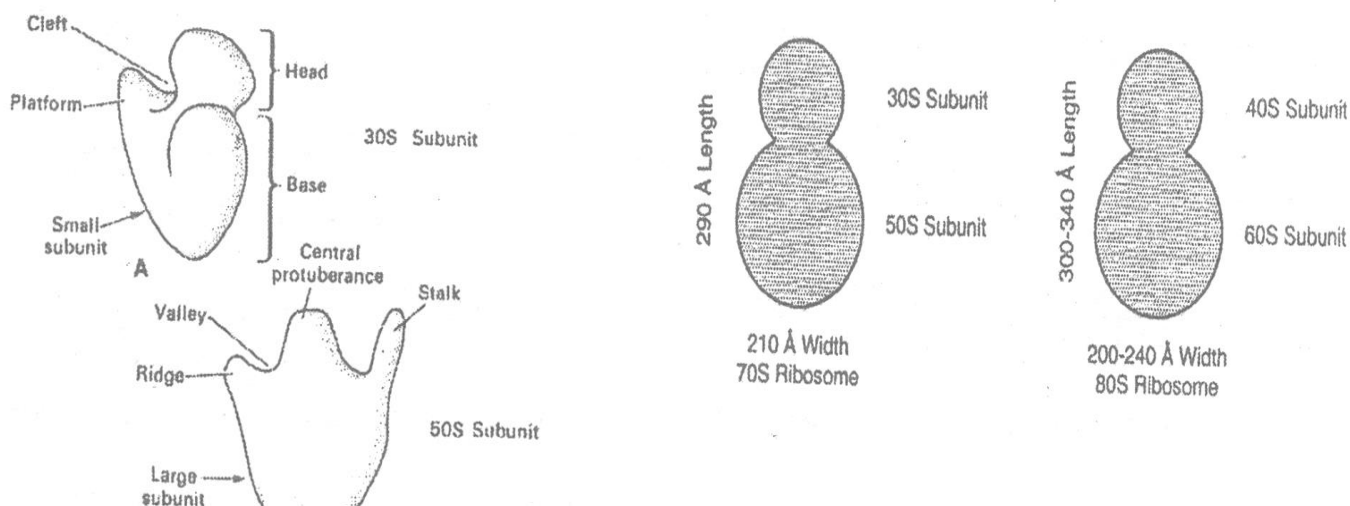
- It is a rod shaped structure found in cytoplasm of all eukaryotic cells except mammalian RBC's.
- These are also absent in prokaryotes.
- It was first seen by Kolliker in insect cells.
- Maximum mitochondria are found in metabolically active cells.
- It is also called as "Power House of the Cell" or the "Storage Battery".
- It is double membranous structure where outer membrane has specific proteins while inner membrane is folded inside to form chambers called Cristae. "Cristae" are the infoldings of inner mitochondrial membrane that possess enzymes for respiratory cycles like Krebs Cycle. ATP synthesizing units are called Oxysomes or F_1 particles.
- Space between inner and outer mitochondrial membranes is called as Perimitochondrial space. The fluid present in mitochondrial is called as matrix.

(a) Functions:

- Its main function is to produce and store the energy in the form of ATP.
- It is the site of Krebs cycle of respiration.
- Oxysome contains enzymes for ATP production.
- Matrix contains enzymes for Krebs cycle.

RIBOSOMES**Ribosomes are the sites of protein synthesis.**

All structural and functional proteins (enzymes) coded by the nuclear DNA, are synthesized upon cytoplasmic ribosomes. The DNA codes are transcribed into messenger RNA (mRNA) molecules in the chromosomes of the nucleus. mRNA molecules diffuse out into the cytoplasm and each becomes attached to several ribosomes which thus form a group called polyribosome or polyribosomes. In this way each mRNA molecule brings about polymerization of specific protein molecules, with the help of ribosomes from amino acid molecules found in the Cytosol.

**EXERCISE-3**

SPECIAL ADVANCED STUDY MATERIAL / QUESTION BANK

1. What is more abundant in smooth endoplasmic reticulum?
(A) Cisternae and vesicles (B) Tubules
(B) Tubules and vesicles (C) Cisternae
2. Mitochondria are concerned with
(A) Krebs cycle (B) C₃ cycle (C) glycolysis (D) none of the above
3. Which of the following organelle is the site of Krebs cycle?
(A) Ribosomes (B) Lysosomes (C) eukaryotic cells (D) Nucleus
4. Mitochondria are absent in
(A) Prokaryotic cells (B) RBC of mammals (C) eukaryotic cells (D) (A) and (B) Both
5. Mitochondria stores energy in form of
(A) Heat energy (B) ATP (C) light energy (D) none of the above
6. The ATP synthesizing units of Mitochondria are
(A) Oxysomes (B) peroxysomes (C) glyoxysomes (D) lysosomes
7. Lipid synthesis is performed by
(A) Rough ER (B) smooth ER (C) both of above (D) none of the above
8. Who observed Mitochondria at first?
(A) Porter (B) Palade (C) Koliker (D) Camilo Golgi
9. Detoxification of body is done by?
(A) Mitochondria (B) lysosomes
(C) Smooth endoplasmic reticulum (D) rough endoplasmic reticulum
10. Golgi apparatus is made of
(A) Cisternae (B) vesicles (C) golgian vacuoles (D) all of the above

VERY SHORT ANSWER TYPE QUESTIONS

1. Which cell organelle is called as 'power house of cell'?
2. Which cell organelle contains enzymes for ATP production?
3. In mitochondria which portion contains specific proteins?

SHORT ANSWER TYPE QUESTIONS

4. Define Cristae.
5. State any two function of Golgi body.

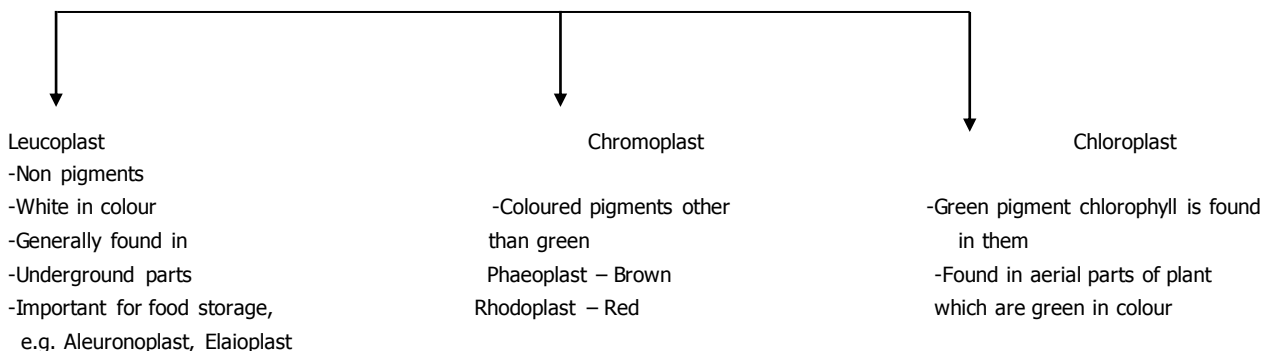
LONG ANSWER TYPE QUESTION

6. Describe the types of endoplasmic reticulum and draw necessary figure. Give it's main functions also.
 7. Draw a neat and labeled diagram of mitochondria.
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PLASTID

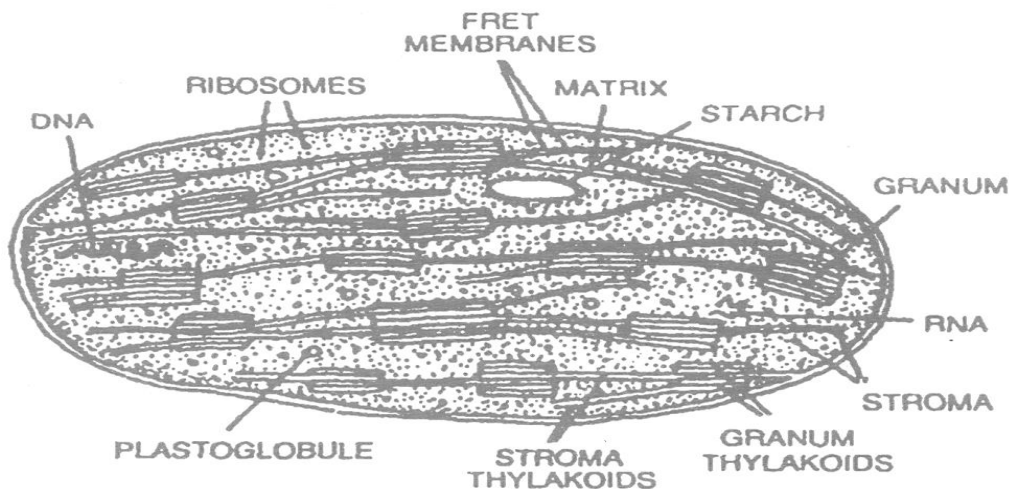
- It is double membranous discoidal structure, found only in plant cells.
- Term plastid was given by Haeckel.
- Chloroplast was discovered by A.V. Leeuwenhoek and named by Schimper.
- Besides being discoidal or rhombic in plant cells they occur in variable shapes like in algae they can be 'U' shaped, spiral, coiled, ribbon shaped etc.

Depending upon the type of pigment present in them they are of following three types.



(a) Chloroplast have Following Two Parts :

- (i) **Grana:** It constitutes the lamellar system. These are found layered on top of each other, these stacks are called as Grana. Each granum of the chloroplast is formed by superimposed closed compartments called Thylakoids.
- **Function:** They are the sites of light reaction of photosynthesis as they contain photosynthetic pigment chlorophyll. In each thylakoid Quantasomes are present which are called as Photosynthetic units. Each quantasome possesses 230 chlorophyll molecules.
- (ii) **Stroma:** It is a granular transparent substance also called as matrix. Grana are embedded in it. Besides Grana they also contain lipid droplets, starch grains, ribosomes etc.



- **Function:** This is the site of dark reaction of photosynthesis. Also helps in protein synthesis due to presence of ribosomes.

VACUOLES

- These are membrane bounded regions in the cytoplasm containing water and other substances.
- They are bounded by a single membrane called Tonoplast.
- In animal cells vacuoles are smaller in size and numerous while in plant cells a single large vacuole is found which occupies about 90% of the volume of cell.

(a) Functions:

- It helps in maintaining osmotic pressure in a cell.
- It stores toxic metabolic products of plant cell.
- It contains various Coloured pigments like anthocyanins.

LYSOSMES

(Discovery: Christian de Duve) (Lyso = digestive, some = body)

- These are tiny sac like granules containing enzymes of intracellular digestion.
- They are bounded by a single membrane.
- They occur in animal cells and a few plant cells.
- They do not have a definite shape or size.
- They contain hydrolyzing enzymes called **acid hydrolyses**.

(a) FUNCTION :

- Their main function is phagy = digestion
- They are kind of waste disposal system.
- They help in digesting foreign materials and worn out cells.
- 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"**.

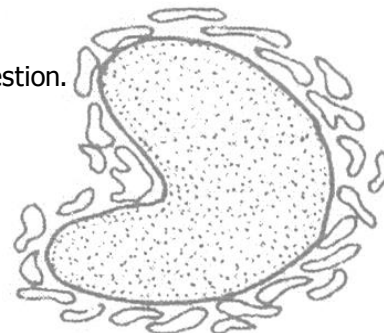


Fig: Lysosomes

PEROXISOMES

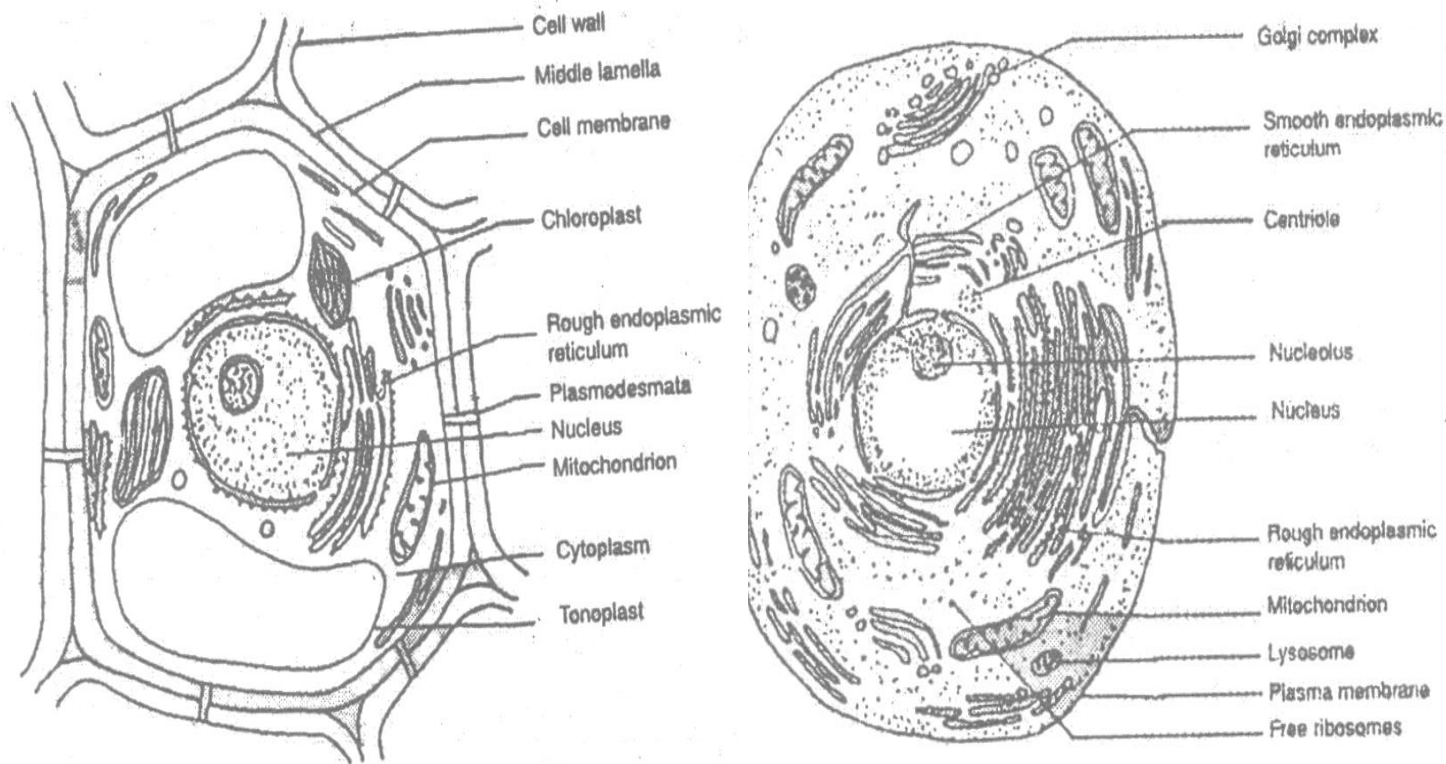
- These structures were first described from liver and kidney cells by Rodhin(1954)
- In plant cells, they were first observed in germinating seeds by Tolbert(1969)
- The term 'peroxysomes' was first used by de Duve and also called as uricosomes.
- Peroxysomes are ovoid or granular structures, limited by a single unit membrane & have a diameter of 0.5 to μm .
- In green leaves of C_3 plants, peroxysomes carry out photorespiration.
- In animal cells they carry out lipid metabolism.
- They contain important enzymes as oxidases (peroxide producing enzyme), peroxidases and catalases (which break down toxic peroxides to water and oxygen).

GLYOXSOMES

- A beaver (1961) was the first person to discover these organelles and were described later by **R.W. Briedenbach (1967)**.
- They are about 0.5 to **1 μm in size** and are surrounded by a single unit membrane.
- They are found in plant cells, particularly, in germinating fatty seeds e.g. Ricinus (castor) and groundnut where fat is being converted into carbohydrates by a process called glyoxylate cycle.
- Glyoxysomes contain important enzymes, isocitrate, lyase, maltase and Synthelast along with several others.
- Structure of glyoxysomes is similar to peroxisome.

DIFFERENCES BETWEEN A PLANT CELL AND AN ANIMAL CELL

CHARACTERS	Plant Cell	Animal Cell
Cell wall	present	absent
Plastids	present	absent
Number of Vacuole	One	Numerous
Size of Vacuole	large	small
Centriole	absent	present
Position of nucleus	Side	Centre
Nutrition	autotroph	Heterotroph
Aster in division	present	Absent
Cytoplasm division	By Cell plate	By cleavage



ON THE BASIS OF TYPE ORGANIZATION CELLS CAN BE DIFFERENTIATED AS

Characters	Prokaryotic Cells	Eukaryotic Cells
1. Nuclear body	Incipient nucleus, No nuclear membrane Nucleolus absent No mitosis Single closed loop, (histones absent)	True nucleus, Nucleolus membrane present Nucleolus present Mitosis found Multiple chromosomes, (histones in chromosome)
2. Mitosis	No mitosis	Mitosis found
3. DNA arrangement	Single closed loop, (histones absent)	Multiple chromosomes, (histones present in chromosome)
4. Respirator system	In plasma a membrane, (mitochondria)	In mitochondria
5. Photosynthetic apparatus	In intemal membranes, (chloroplasts absent)	In chloroplasts
6. Golgi bodies chloroplast ER Mitochondria, Lysosomes	Absent	Present
7. Ribosomes	70 S type	80 S type
8. Cell wall	Generally present, complex chemical composition	Present in some types, simple Chemical composition
9. Flagella	Submicroscopic, no 9+2 fibrillar structure	Microscopic size 9+2 Fibrillar structure
10. Cytoplasmic movements	Cytoplasmic streaming rare or absent	Cytoplasmic streaming often occurs
11. Vacuoles	Absent	Present
12. Lysosome	Absent	Present
13. Capsule	May be present	Always absent
14. Hereditary material	DNA circular	DNA (linear)

SOME IMPORTANT POINTS

- Centrosome :It is found in animal cell. It consists of two centrioles. It is non membranous. It is made up of microtubules. It helps in cell division and spindle formation.
 - (ii) Cilia and flagella: These are thread like appendages used for locomotion and emerge from basal body.
 - (iii) Chromosomes: These are thread like structures containing hereditary information in form of genes.
 - (iv) *There are four different types of membranes on the basis of permeability:*
 - (A) *Permeable: They allow diffusion of both solvent and solute molecules or ion through them. e.g. Cell wall of plant cell.*
 - (B) *Impermeable: They prohibit the diffusion of both solvent and solute particles through them. e.g. Cutinized cell wall, Lignified cell wall.*
 - (C) *Semipermeable: Allows diffusion of solvent molecules but do not allow the passage of solute molecules. e.g. Parchment paper, Kidney membrane.*
 - (D) *Differentially Permeable: It allow some solutes to pass through them along with the solvent molecules. E.g. Plasmalemma, Tonoplast.*
- Cell organelles can be separated by the method of differential centrifugation.
- First cell that developed in laboratory by Sydney Fox and A.I. Oparin was called as Coacervate.
 - Smallest cell is Mycoplasma (PPLO)(0.1 μ dia)
 - Largest cell is Ostrich egg (15 cm.dia.)
 - Longest Animal Cell is Nerve fibre (1m.)
 - Lysosomes exhibit polymorphism i.e. they occur in different forms.
 - Mitochondria, plastid and centrioles have their own DNA molecules so they are called as "Semiautonomous Cell Organelles".
 - Connection through which cells communicate chemically with each other through their thick walls are called as "Plasmodesmata".
 - Cell wall of fungi is made up of chitin instead of cellulose.
 - Protoplasm was called as "Physical Basis of Life" by Huxley
 - DNA is called as "**Chemical Basis of life**".
 - Euglena is the connecting link between plants and animals as it lacks cell wall but has plastids.
 - Mesosomes in bacteria are analogous to mitochondria as they both help in cellular respiration.
 - Centre for cellular and molecular biology is situated at Hyderabad.
 - In animal cell the 'Cell Coat' is present instead of cell wall which provides them protection. It is made up to glycocalyx.
 - ATP (Adenosine Triphosphate) is the energy currency of the cell i.e. energy in cell is stored in form of ATP molecules.

EXERCISE-4

1. Which of the following is called as 'Suicidal bags' ?
 (A) Centrosome (B) Lysosome (C) Microsome (D) Mesosomes
2. Eukaryotic ribosomes are
 (A) 30s (B) 50s (C) 80s (D) 70s
3. Plastids that are white in colour (Pigment free)
 (A) chloroplast (B) lysosome (C) leucoplast (D) Chromoplast
4. Striking difference between a plant cell and an animal cell is due to the presence
 (A) mitochondria (B) plasma membrane (C) cell wall (D) ribosome
5. Tonoplast is the membrane surrounding the

SPECIAL ADVANCED STUDY MATERIAL / QUESTION BANK

- (A) cytoplasm (B) vacuole (C) nucleus (D) mitochondria
6. Lysosomes are responsible for
 (A) protein synthesis (B) digestion of organic molecules
 (C) fat synthesis (D) fat emulsification
7. In prokaryotic cell
 (A) nucleus is developed
 (B) membrane bounded organelles are present
 (C) double membrane bounded organelles are absent
 (D) none of these
8. A typical plant cell contains
 (A) cell wall (B) plastids (C) large vacuole (D) all of the above
9. The waste disposal system of cell is formed by
 (A) lysosomes (B) peroxysomes (C) mitochondria (D) glyoxysomes
10. In which cell Centriole is absent ?
 (A) plant cell (B) Animal cell (C) Both of above (D) None of above

VERY SHORT ANSWER TYPE QUESTIONS

- Which cell organelle is called as "digestive bag" ?
- Which organelle controls osmotic pressure in a cell ?
- Plastids having Coloured pigments are called as

SHORT ANSWER TYPE QUESTIONS

- Name various type of plastids present in a plant cell.
- State the main function of lysosomes ?

LONG ANSWER TYPE QUESTION

- Differentiate between plant and animal cell with suitable figures.

ANSWER KEY

(1)

Q	1	2	3	4	5	6	7	8	9	10
A.	C	C	A	B	C	B	C	B	B	D

2

Q	1	2	3	4	5	6	7	8	9	10
A.	B	B	A	C	A	C	A	B	A	A

3

Q	1	2	3	4	5	6	7	8	9	10
A.	B	A	C	D	B	A	B	C	C	D

4

Q	1	2	3	4	5	6	7	8	9	10
A.	B	C	C	C	B	B	C	D	A	A