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CHAPTER- 5

FUNDAMENTAL UNIT OF LIFE

• Cells are the smallest unit of life that can exist independently and are the basic functional unit of all living things. Each living cell has the capacity to perform certain basic functions that are

characteristic of all living forms

- The study of cells is known as cytology and is possible with the help of a microscope.
- Microscopes mainly perform two functions-
- i- Magnification
- ii- Resolution

The given table illustrates the contribution of various scientists-

Anton Von Leeuwenhoek	First saw and described a live cell.
Robert Hook (1665)	Discovered cell in cork slice with the help of a primitive microscope.
Robert Brown (1831)	Discover nucleus.
Schleiden and Schwan	Proposed cell theory
Purkinje (1839)	Coined the term protoplasm
Rudolf Virchow (1855)	Omnis cellula-e cellula

TYPES OF CELLS



- * Unicellular Single-celled organisms like Amoeba
- * Multicellular Have many cells like Human
- * Plant cell- Have cell walls Like Mango plant
- * Animal cell- Do not have cell wall like Human
- * Prokaryotic cell- Do not have nuclear membranes like Bacteria
- * Eukaryotic cell Have nuclear membranes like Human

DIFFERENCE BETWEEN PLANT CELL AND ANIMAL CELL

Plant Cell Animal cell Have cell wall Do not have a cell wall Usually posses Chloroplast No chloroplast Autotrophic Heterotrophic No lysosome Lysosome present Centriole present only in few lower plants Centriole present Vacuole – one large Vacuole- many and small Rough endopla Plasma Centriole oth Nuclear Mitochondrion Rough endoplasmic reticulum

DIFFERENCE BETWEEN PROKARYOTIC CELL AND EUKARYOTIC CELL



CELL ORGANELLES

PLASMA MEMBRANE

- ▶ It is the outermost covering of the cell.
- > It plants another covering (cell wall) that is present which is absent in animal cells.
- > It is a selectively permeable membrane (it only allows specific molecules to pass)
- > The plasma membrane is made up of lipids and proteins.
- > The plasma membrane acts as a mechanical barrier to protect protoplasmic structures.
- Across the plasma membrane the transport of the molecules occurs in the following manner
 - a- Diffusion
 - b- Osmosis
- a- Diffusion- The movement of solutes or ions from a higher concentration to a lower concentration is called as diffusion.
- b- Osmosis- The movement of solvent/ water from their higher concentration region to a region with lower concentration through a semipermeable membrane is called osmosis

Osmosis is a biological process and is slower than diffusion.

c- Plasmolysis: When a living plant cell loses water through osmosis there is shrinkage or contraction of the contents of the cell away from the cell wall. This phenomenon is known as plasmolysis.



CELL WALL

- > It is the outermost rigid layer in plant cells, fungi and bacteria.
- Plant, bacterial and fungal cell wall is composed of cellulose, peptidoglycan and chitin respectively.
- > Cell walls provide rigidity, protect from pathogens, and help in transport.

NUCLEUS

- > The nucleus is a small and round structure.
- It may be covered by a nuclear membrane (in eukaryotes) or without a nuclear membrane (in prokaryotic cells). The prokaryotic nucleus is known as a nucleoid.
- In eukaryotic cells, the nucleoplasm of the nucleus contains nucleolus and nucleic acid (genetic material) in it.



- The nucleus contains chromosomes. Nondividing chromosomes are known as chromatins. The chromosomes contain genetic information in the form of DNA (Deoxyribose Nucleic Acid) molecules.
- > Chromosomes are composed of DNA and protein.
- The functional segments of DNA are called genes. Function-
 - Nucleus is the control centre of the cell
 - It is responsible for the transmission of hereditary traits.
 - In cell division
 - It controls all the metabolic activities of the cell.

CYTOPLASM

- > The cytoplasm is the fluid content inside the plasma membrane
- > It jelly-like substance in which cell organelles are situated.
- It contains various cell organelles like the Endoplasmic reticulum, Mitochondria, Golgi complex, Ribosome, Vacuoles, Lysosome, Plastids etc.

ENDOPLASMIC RETICULUM (ER)

- ER are absent in prokaryotic cells and RBCs of mammals.
- It is the network of membranes present in the cytoplasm.
- > It continues with the outer nuclear membrane.
- > It has three main components- Cisternae, Vesicles and tubules.
- Some of these proteins and lipids synthesized with the help of ER are helpful in building the cell membrane. This process is known as membrane biogenesis
- ER is to serve as a channel for the transport of materials (especially proteins) between various regions of the cytoplasm or between the cytoplasm and the nucleus.
- ER also functions as a cytoplasmic framework providing a surface for some of the biochemical activities of the cell.
- > In the liver cells of vertebrates, SER helps in the detoxification of poisons and drugs.

GOLGI APPARATUS

- ➢ It is first observed by Camillo Golgi (1898).
- > The Golgi apparatus consists of many flat, disc-shaped sacs or cisternae.
- These structures are situated parallel to each other. The cisternae have interconnected
 cis (convex or farming face) and trans (maturing face) faces.
- > The Golgi apparatus remains in close association with the endoplasmic reticulum.
- The Golgi body is involved in packaging materials, modification of proteins, and formation of glycoproteins and glycolipids.
- The material synthesized near the ER is packaged and dispatched to various targets inside and outside the cell through the Golgi apparatus. Its functions include the storage, modification, and packaging of products in vesicles.
- It is also involved in the formation of lysosomes

LYSOSOMES



➤ When a cell gets damaged, then the lysosomes burst and release digestive enzymes. These enzymes digest their own cell leading to the death of that cell. Therefore, lysosomes are also known as suicide bags of the cell.

MITOCHONDRIA





PLASTIDES

- > These are present only in plant cells.
- Chloroplasts are the main chromoplast and are the main pigment for photosynthesis in plants.
- Chloroplast is a double membrane containing organelles.
- It has a stroma in which numerous membrane layers are embedded.
- Plastids also have their own DNA and ribosomes.



VACUOLES

- ➤ Vacuoles are storage sacs for solid or liquid contents.
- > Vacuoles are small-sized in animal cells while plant cells have very large vacuoles.
- > Vacuoles are storage sacs for solid or liquid contents.
- Remove and store nutrients as well as waste produced

CELL DIVISION







IMPORTANT QUESTIONS

MCQs and Very Short Answer Questions

- 1- Which plastid has no colour –
 a- Chromoplast b- Chloroplast c- Leucoplast d- Chlorophyll
- 2- In the formation of male gamete sperm which type of cell division occur-
a- Mitosisb- Meiosisc- Amitosisd- Both a and b
- 3- Which of the following movement is a biological process
 - a- Brownian movement
 - b- Diffusion
 - c- Osmosis
 - d- None of these

4- ATP synthesis takes place in-

- a- Mitochondria
- b- Chloroplast
- c- Ribosome
- d- SER
- 5- The function of expelling excess water and some wastes from the cell is takes place by
 - a- RER
 - b- Vacuole
 - c- Lysosome
 - d- All of these
- 6- What are the components of the plasma membrane?
- 7- Write one role of the Smooth Endoplasmic Reticulum.
- 8- What is the component of the cell wall of plants and fungi?
- 9- Who coined the term protoplasm?
- 10- Give two examples of unicellular organisms except bacteria.

Short Answer Questions

- 1- Mention the name of different types of cell division. Also, write one difference in these.
- 2- Which cell organelles are termed suicidal bags and why?

- 3- What are the two basic properties of microscopes?
- 4- Write the full form of DNA and ATP.
- 5- What is the function of chromosome?

Long Answer Questions

- 1- Write five differences between prokaryotic and eukaryotic cell.
- 2- Daw well labelled diagram of plant cell and describe roles of mitochondria, rough endoplasmic reticulum.
- 3- a- Write two differences between diffusion and osmosis.b- How plasma membrane differs from cell wall?

4- Describe the structure of Golgi body. Also mention two roles of the Golgi body.

5- Draw a neat labelled diagram of an animal cell and compare it with animal cell and prokaryotic cell.