L1

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CLASS IX - SCIENCE

(PK)

THE FUNDAMENTAL UNIT OF LIFE

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TOPICS TO BE COVERED

- Cell Theory
- Cell Types
- Plasma Membrane
- Cell Wall
- Diffusion & Osmosis
- Nucleus
- Prokaryotic & Eukaryotic

CELL

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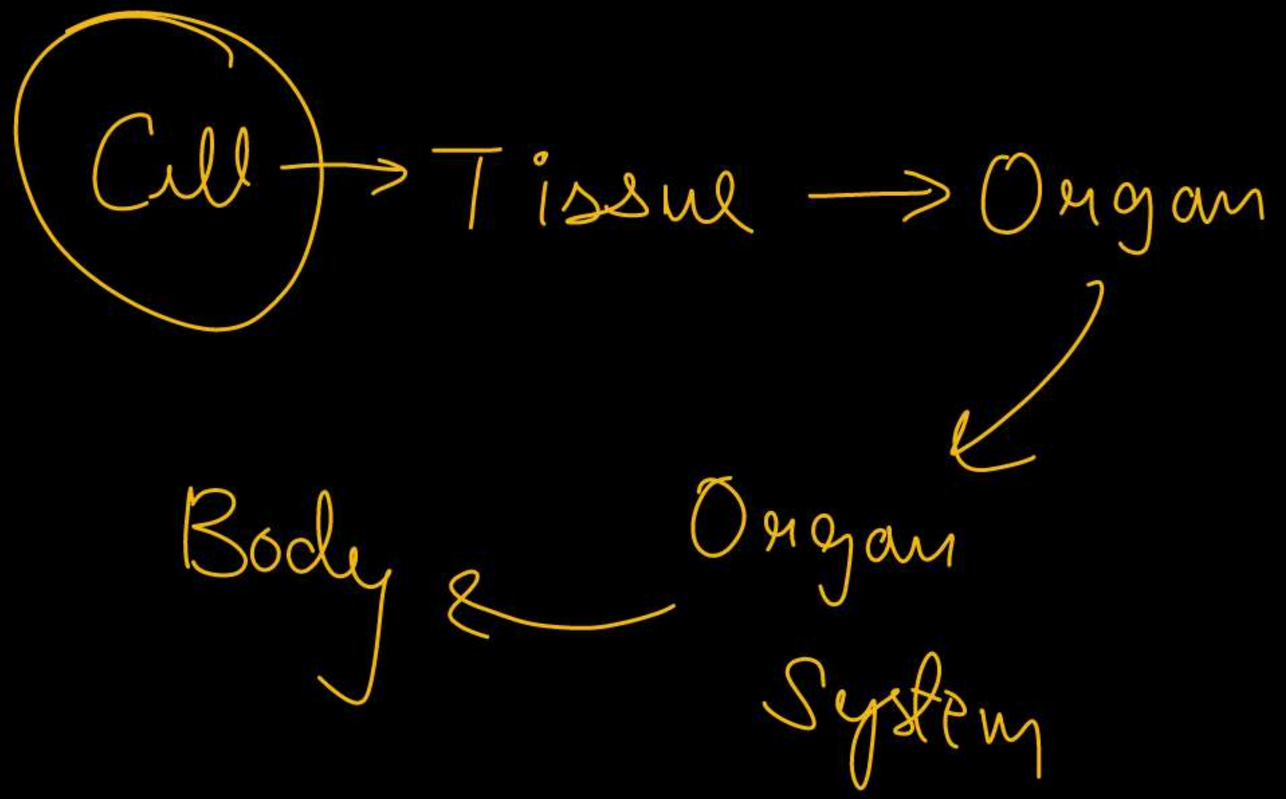
A cell is the basic structural and functional unit of life.

All living organisms, whether plants, animals, or microorganisms, are made up of cells.

- The basic unit from which all functions of living organisms originate is the cell, making it the **fundamental unit of life**.
- Cells can reproduce independently, which is why they are considered the **building blocks of life.**


Cell
Tissue
Organ
Organ System
Body

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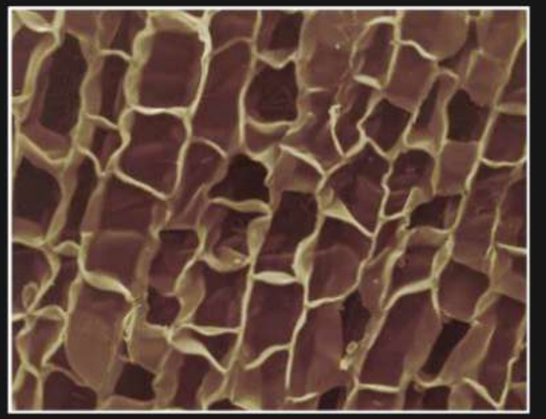
CELL DISCOVERY

Non-Living

- Robert Hooke was the first person to observe cells.
- He used a simple microscope to look at thin slices of cork (bark from a tree).
- Hooke observed small, box-like structures and named them "cells" He was the first to coin the term cell.

Robert hooke



Cork Cells

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IMPORTANT SCIENTISTS

- **Robert Hooke (1665):** Discovered and named the "cell."
- **Antonie van Leeuwenhoek (1674):** First to observe living cells (protozoa and bacteria).
- **Robert Brown (1831):** Discovered the nucleus in cells.
- **Jan Evangelista Purkinje (1839):** Coined the term "protoplasm."
- **Schleiden (1838):** Proposed that plants are made up of cells.
- **Schwann (1839):** Extended the idea to animals and co-proposed the Cell Theory.

Living Part

THE CELL THEORY

- All living organisms are made up of cells, whether single-celled or multicellular.
- The cell is the basic structural and functional unit of life.
- All cells arise from pre-existing cells, as stated by Rudolf Virchow in 1855.

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CELLS

- SIZE
- SHAPE
- NUMBER

Cells can be of various types depending upon shape, size and number.

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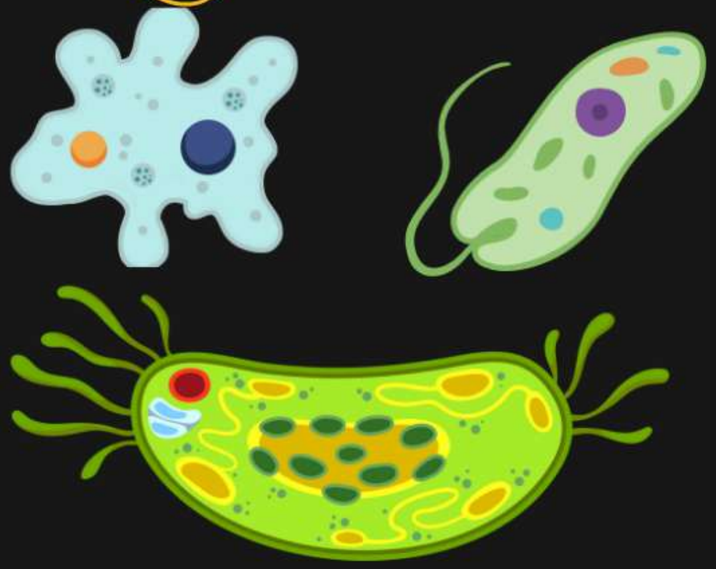
1. ORGANISMS BASED ON THE NUMBER OF CELLS

Single

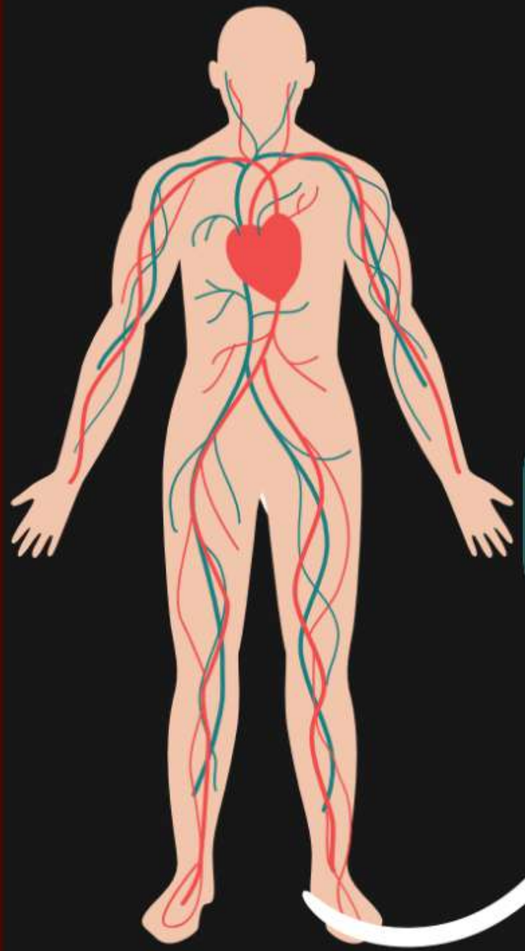
Unicellular Organisms

Amoeba
Yeast



Multicellular Organisms

PK Bhaiya



- These organisms consist of multiple cells.
- Different cells are specialized to perform specific functions.

Multicellular organisms

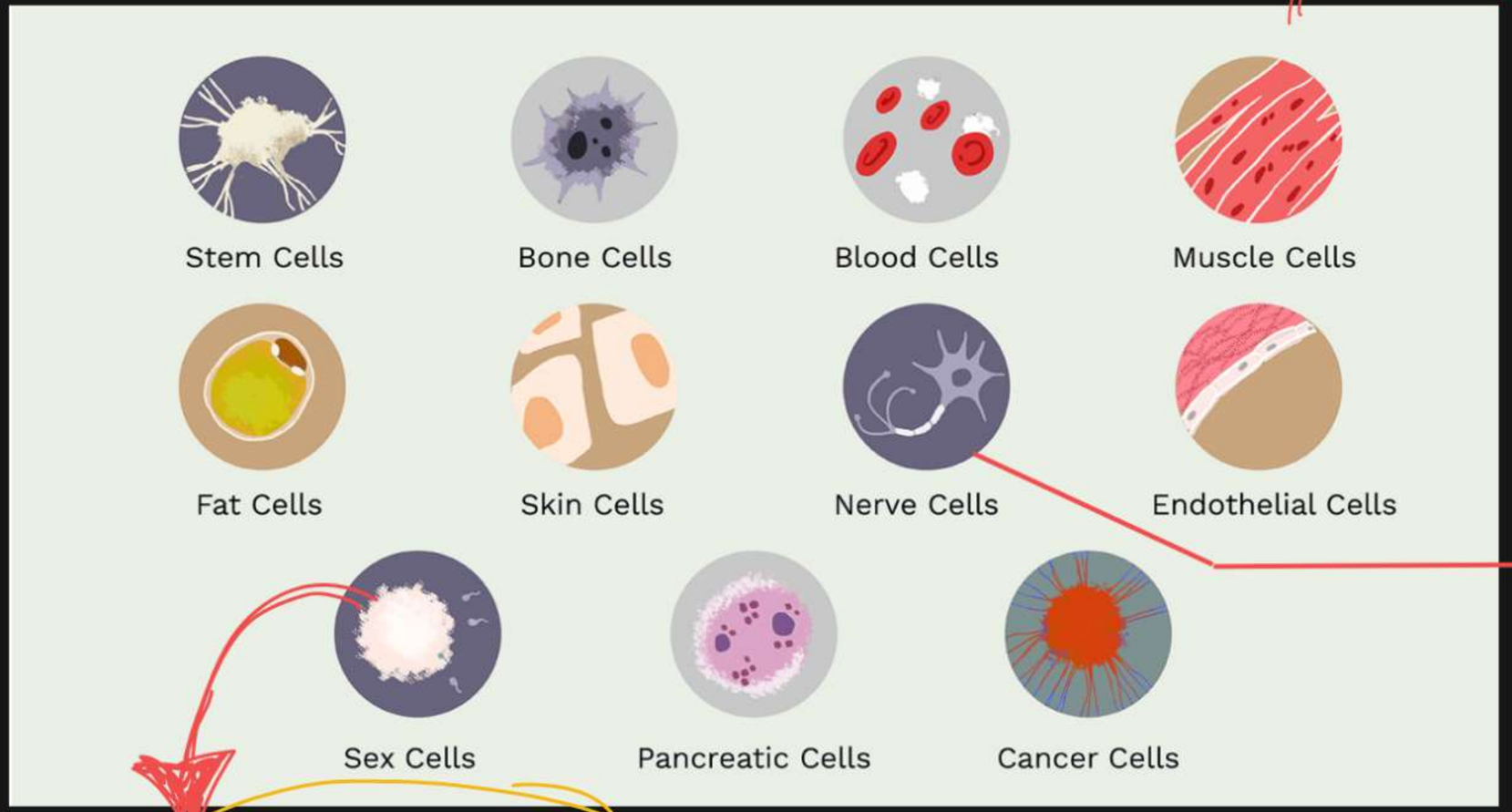
Plants, animals etc.

- These are organisms made up of a single cell.
- a single cell carries out all life processes like respiration, digestion, excretion, and reproduction.

Unicellular organisms

Ameoba, yeast etc.

2. DIFFERENT CELL SHAPES



Spindle shape

Branched & Elongated

Ovum - Spherical

3. DIFFERENT CELL SIZES

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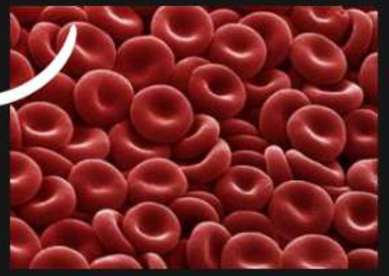
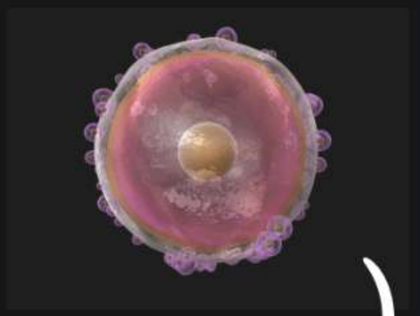
Largest Cell on the Planet (Ostrich Egg)

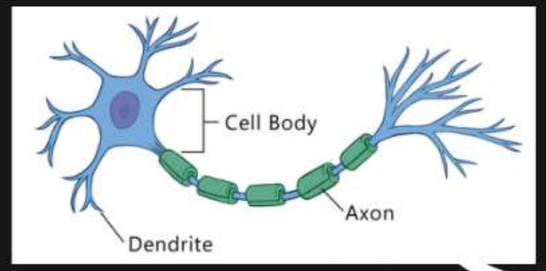
The smallest type of cell in the world (Mycoplasma Bacterium)

The Smallest cell in Human Body (RBCs)





Longest Cell in Human Body (Nerve Cell)



The largest cell in Human Body (Ovum)

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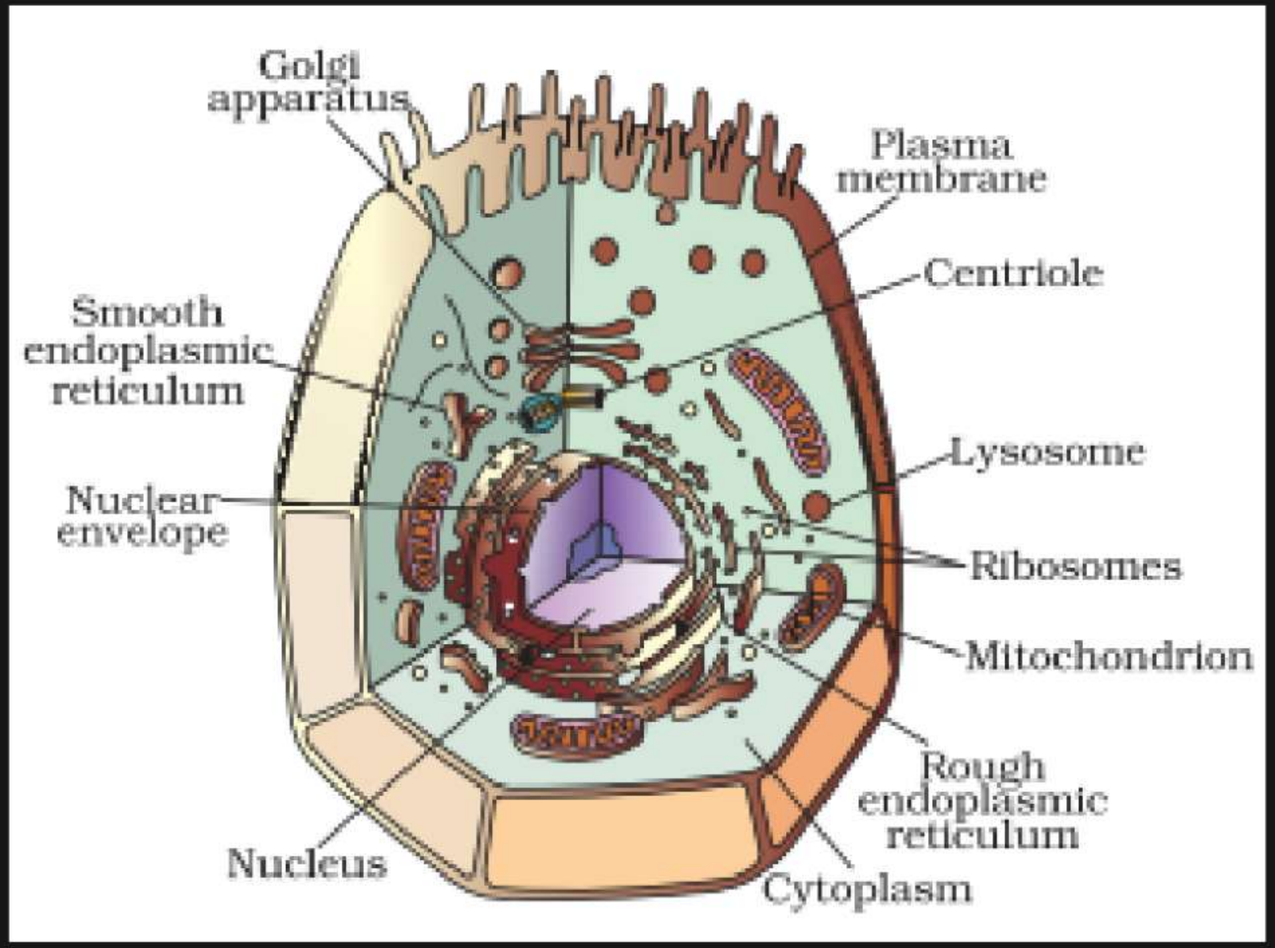
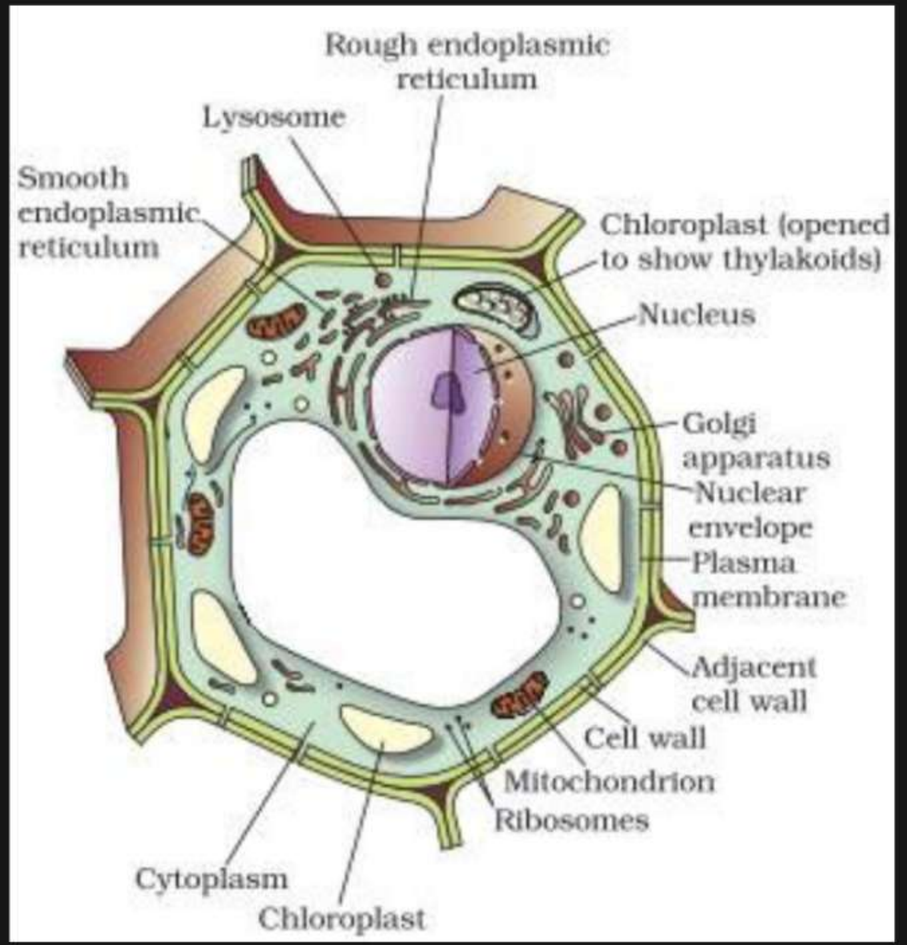
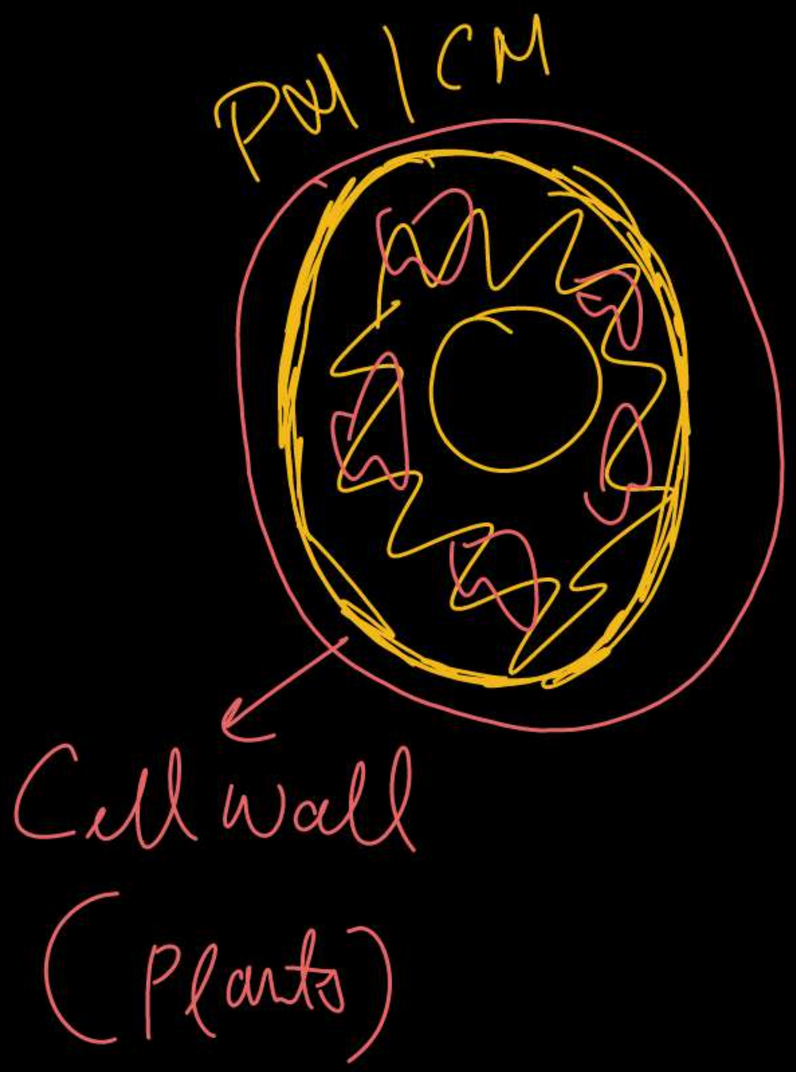
BASIC STRUCTURE OF CELL



Animal Cell



Plant Cell


PM / CM
Cell wall
(Plants)

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CELL MEMBRANE

The cell membrane (or plasma membrane) is the outermost boundary of the cell that separates the interior of the cell from its external environment.

- The cell membrane acts as a protective barrier, maintaining the integrity of the cell by controlling what enters and exits.
- The cell membrane is selectively permeable, meaning it allows some substances to pass through while restricting others.
- The cell membrane is composed of proteins and lipid.

ENDOCYTOSIS AND EXOCYTOSIS

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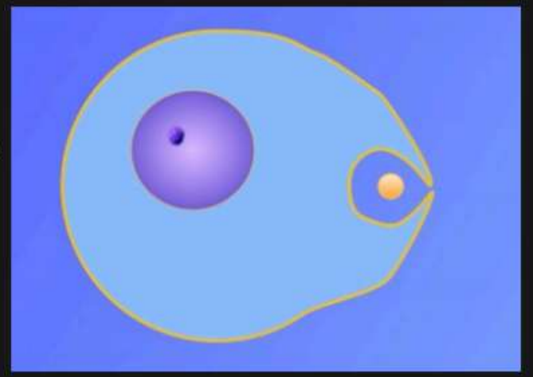
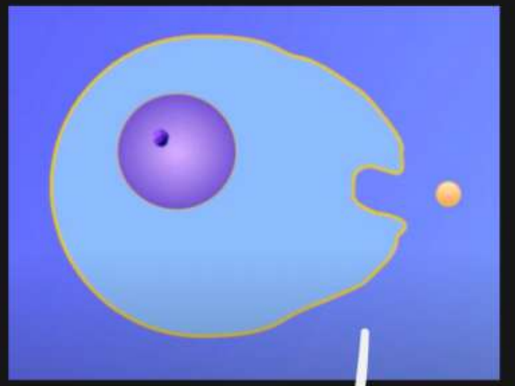
Endocytosis is the process by which cells engulf substances from their external environment and bring them into the cell.

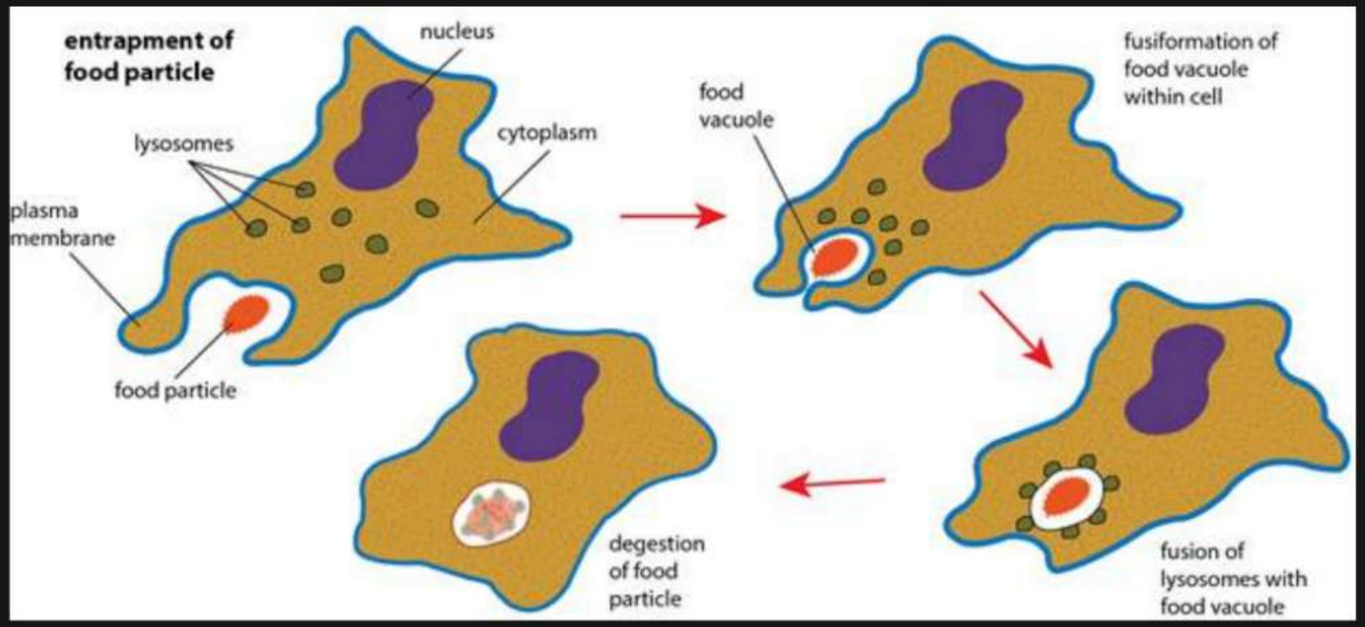




Exocytosis is the process by which cells expel materials to the outside of the cell.

Amoeba acquires food through Endocytosis and expels the waste through Exocytosis.

The process of Endocytosis and Exocytosis is possible because of the flexible Cell Membrane.



TRANSPORTATION ACROSS THE CELL MEMBRANE

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Feature	Passive Transport	Active Transport
Direction of Movement	Substances move from higher to lower concentration.	Substances move from lower to higher concentration.
Energy Requirement	No energy is required.	Requires energy in the form of ATP molecules.
Speed of Movement	Slow movement.	Rapid movement.
Type of Molecules	Transports small molecules or water molecules.	Transports large molecules.

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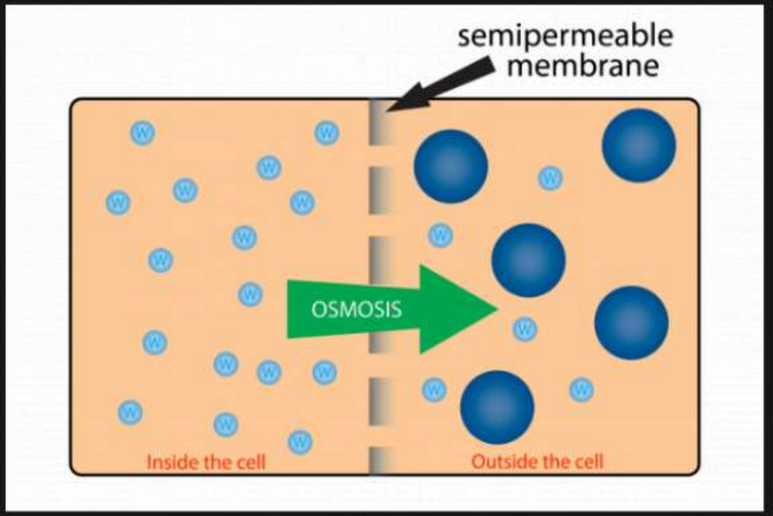
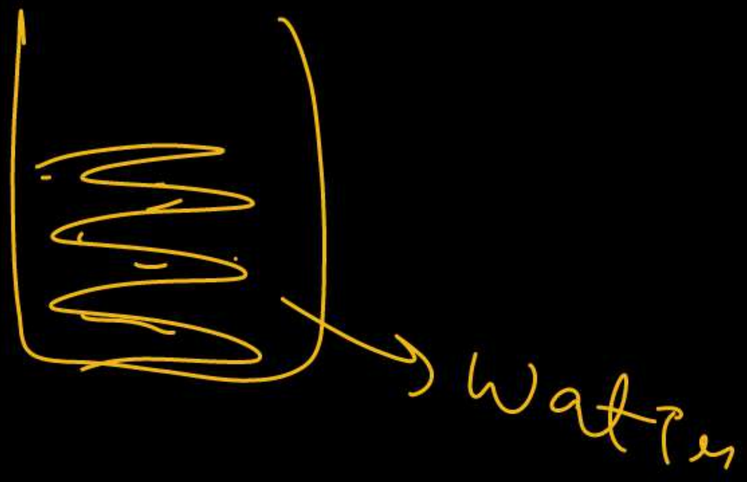
OSMOSIS

Osmosis is the process by which water molecules move through a selectively permeable membrane from an area of lower solute concentration (more water) to an area of higher solute concentration (less water) until equilibrium is reached.



- **Endosmosis :** The process in which the water molecules / solvent enter into the cell. (Cell Swell)
- **Exosmosis :** The process in which the water molecules / solvent move out of the cell. (Cell Shrink)

Solute + Solvent



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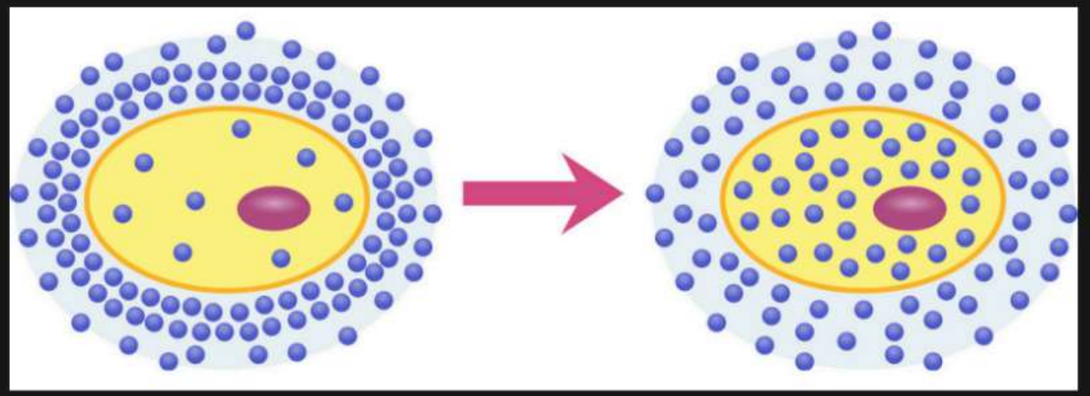
DIFFUSION (Solid, L, G)

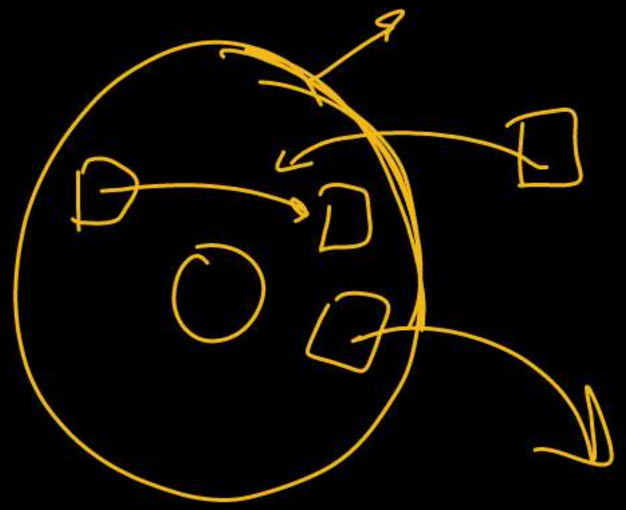
Diffusion is the process where molecules move from a place where they are crowded (high concentration) to a place where they are less crowded (low concentration) until they are evenly spread out. This happens naturally and doesn't need any energy.

In the process of diffusion the molecules of the one substance mix with the molecule of the other substance.

Osmosis orr diffusion me confuse matt hona!



Liquids



Feature	Diffusion	Osmosis
Definition	Movement of particles from a region of higher concentration to lower concentration.	Movement of solvent particles (like water) across a semipermeable membrane from low solute to high solute concentration.
Occurs in	Happens in liquids and gases.	Happens only in liquids.
Membrane Requirement	No membrane is needed.	Requires a semipermeable membrane.
Role of Water	Water is not essential.	Water is the main solvent involved.
Direction of Flow	Flow occurs in all directions.	Flow occurs in one direction (towards higher solute concentration).
Control	A natural process that cannot be stopped.	Can be stopped or reversed using external forces.
Substances Moved	All types of substances in a solution can move from higher to lower concentration.	Only water or solvent moves from a region of higher solvent concentration to lower.
Example	Ink spreading evenly in water.	Red blood cells swelling in pure water.

TYPES OF SOLUTIONS:

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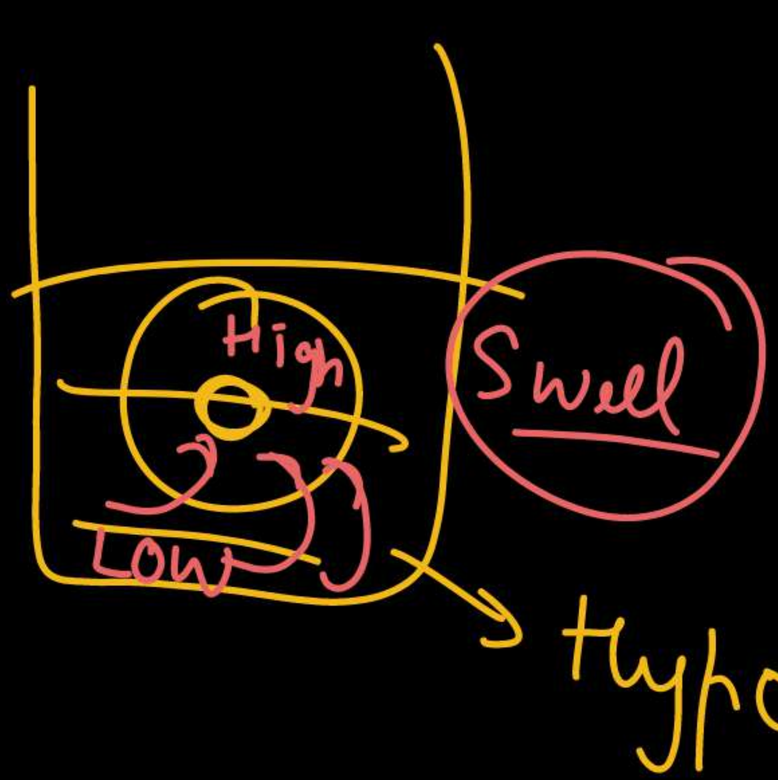
- **Hypertonic Solution:** The concentration of solute is higher outside the cell than inside. Water moves out of the cell, causing it to shrink .

- **Hypotonic Solution:** The concentration of solute is lower outside the cell than inside. Water moves into the cell, causing it to swell and potentially burst.

- **Isotonic Solution:** The concentration of solute is the same inside and outside the cell. Water moves in and out at equal rates, so the cell maintains its shape.

Hypo



Shrink

Hyper

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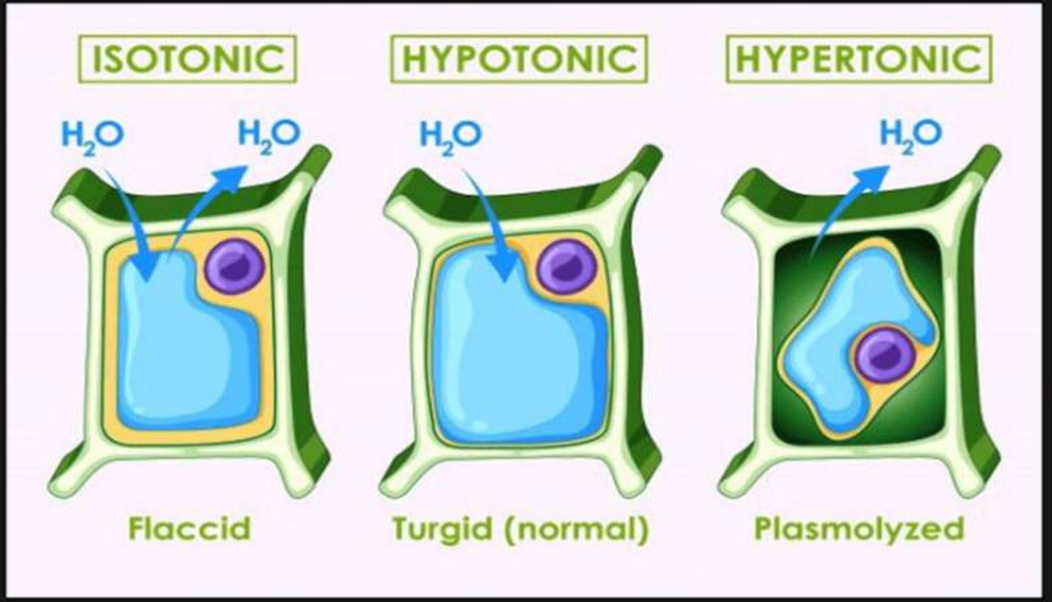
CELL WALL

- The cell wall is a non living rigid outer layer that surrounds the plasma membrane of the cell, providing structural support, protection, and shape. In Plants, the cell wall is primarily made up of cellulose.
- **Plasmolysis:** Occurs in living plant cells when they lose water through osmosis which results in shrinkage of cell contents away from the cell wall.



Functions of Cell Walls:

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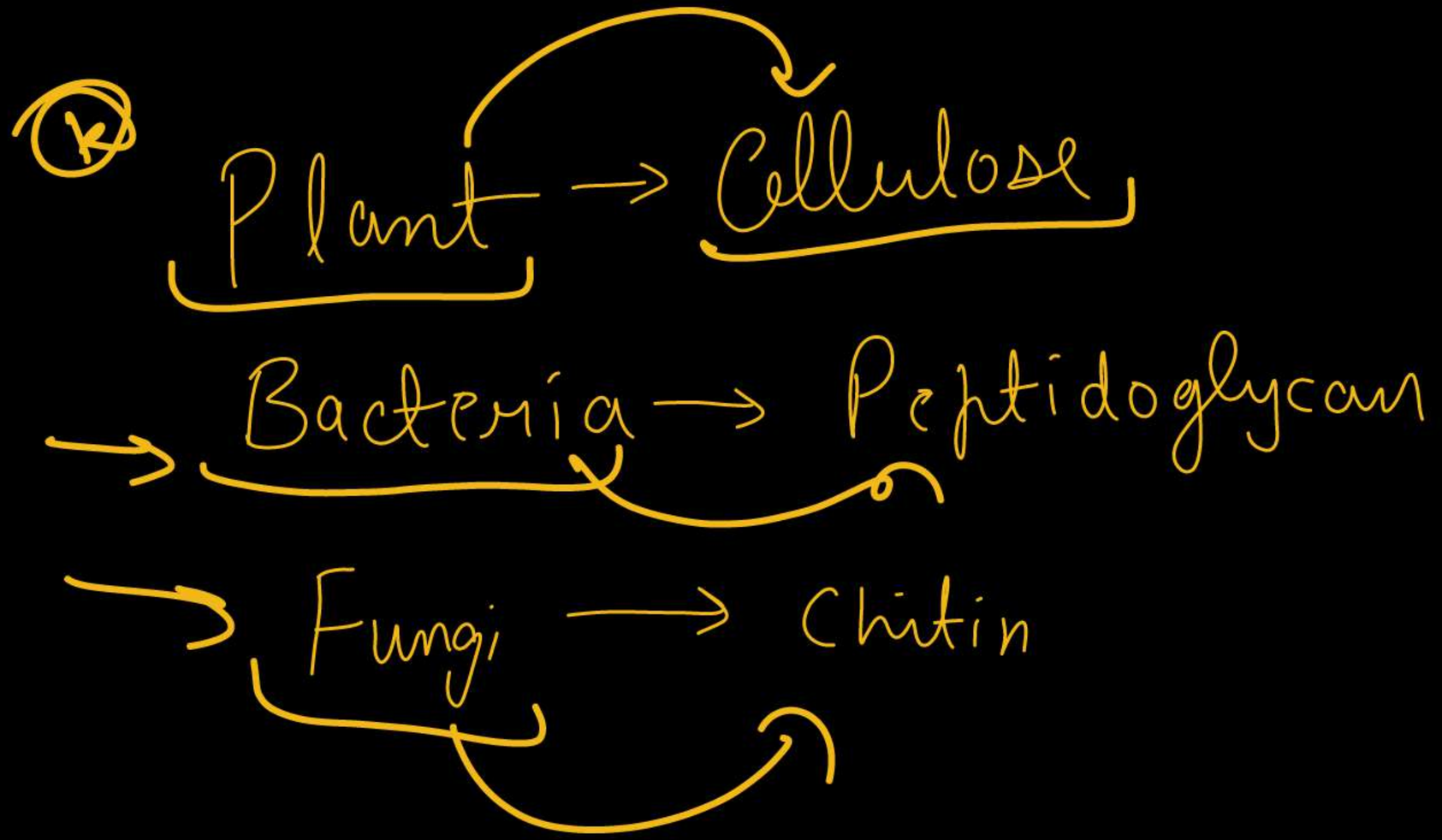
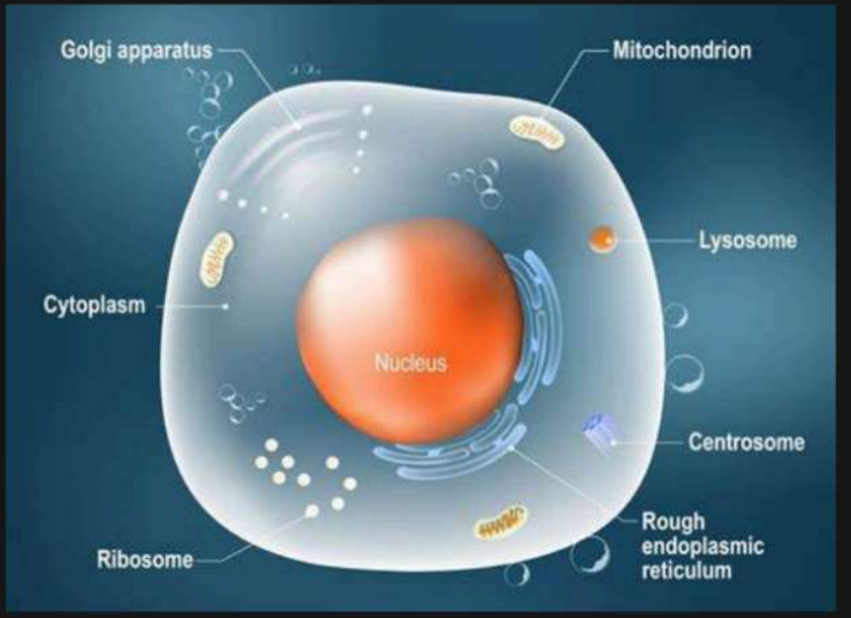
- Provides rigidity and maintains the shape of the cell, preventing it from collapsing under pressure.
- Protects the cell from external factors such as mechanical stress, pathogens, and environmental changes.
- Allows plant, fungi, and bacterial cells to endure greater changes in their surrounding medium compared to animal cells.
- Protects plant, fungi, and bacterial cells from bursting in a hypotonic environment by exerting pressure against swollen cells.
- Helps cells withstand osmotic changes by balancing the pressure from water absorption during osmosis.


Plant → Cellulose
Bacteria → Peptidoglycan
Fungi → Chitin

NUCLEUS

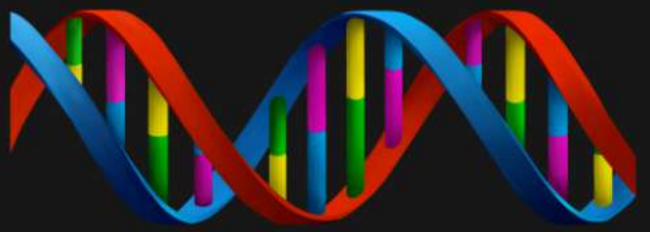
Cell Nucleus was discovered by Robert Brown in 1831.

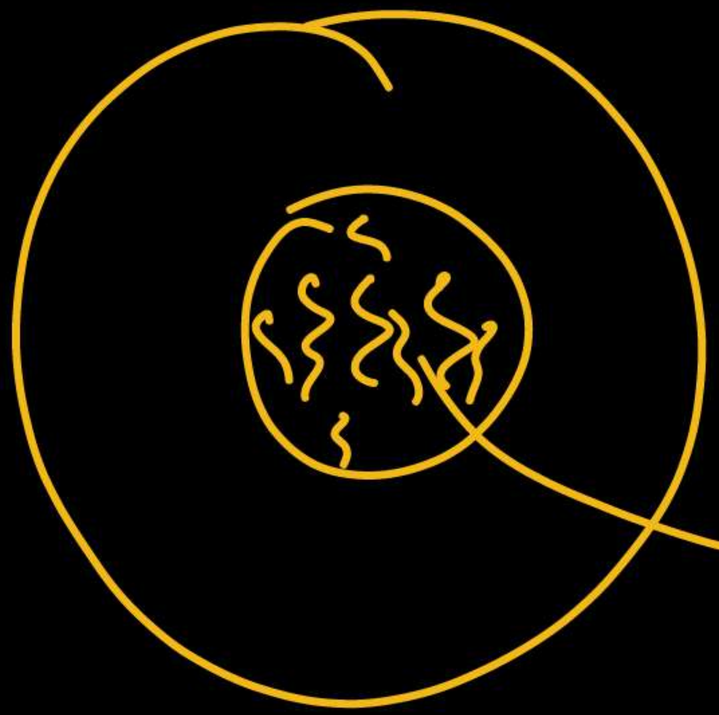
The nucleus contains DNA, which carries the genetic instructions for the development, functioning, and reproduction of the cell.

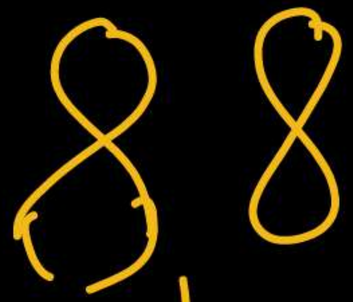


Structure of the Nucleus:

- The nucleus is surrounded by a double membrane called the nuclear membrane or nuclear envelope.
- The nucleolus is a dense, round structure inside the nucleus.
- The nucleus contains Chromatin, which is a thread-like material made of DNA and proteins.
- During cell division, chromatin condenses to form chromosomes. Chromosomes carry genes, which determine inherited traits.







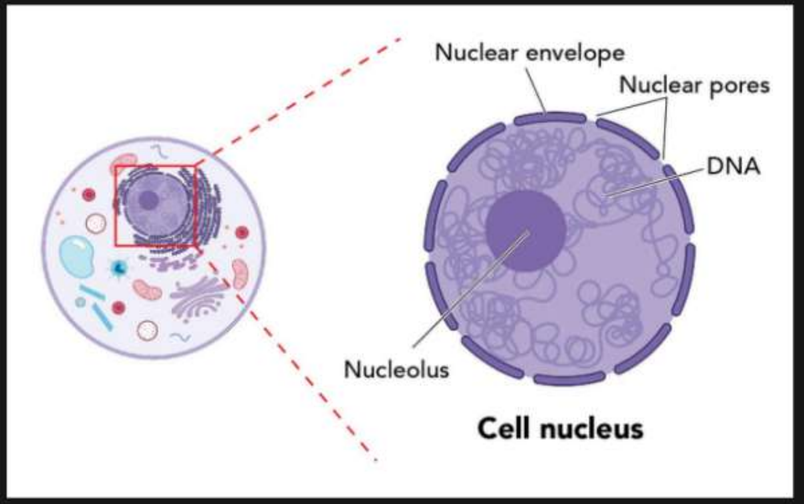
→ Chromosome

→ DNA + Protein

→ Chromatin

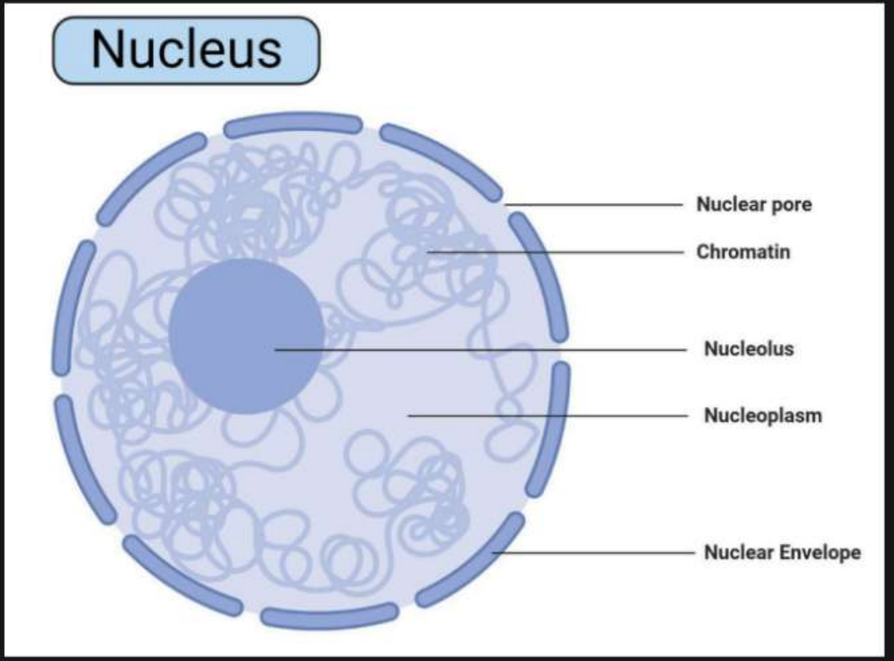
Functions of the Nucleus:

- The nucleus contains DNA, which carries the genetic instructions for the development, functioning, and reproduction of the cell.
- The nucleolus within the nucleus is responsible for producing ribosomes, which are necessary for protein synthesis.
- The nucleus is vital because it acts as the "brain" of the cell, directing its functions and ensuring the organism's traits are passed on during reproduction.



Nucleoid:

- The nucleoid is a well-defined region within the cell, though it lacks a surrounding membrane.
- It contains the cell's DNA, usually organized as a single circular molecule, which is highly coiled and compacted to fit within the limited cell space.



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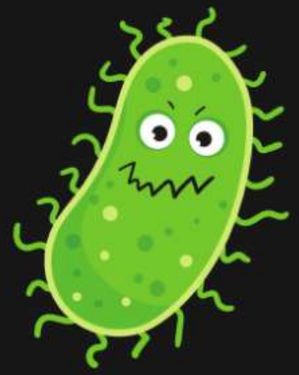
TYPES OF CELLS BASED ON NUCLEUS



- Prokaryotes
- Eukaryotes

Q. State the Differences Between the Prokaryotic and Eukaryotic Cells.

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Prokaryotic Cell	Eukaryotic Cell
Typically small in size, ranging from 1–10 µm, where 1 µm = 10^{-6} m.	Generally larger in size, ranging from 5–10 µm.
The nuclear region is not clearly defined and is referred to as the nucleoid.	The nucleus is clearly defined and enclosed by a nuclear membrane.
Contains a single chromosome.	Contains multiple chromosomes.
Lacks membrane-bound organelles.	Contains well-defined, membrane-bound organelles.

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1. What happens to a plant cell when placed in a hypertonic solution?

(a) It becomes turgid.
(b) It shrinks (plasmolysis).
(c) It bursts.
(d) No change.

Hypo →

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2. Who proposed that all cells arise from pre-existing cells?

(a) Schleiden
(b) Schwann
(c) Virchow
(d) Leeuwenhoek

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3. What is the plasma membrane made of?

(a) Proteins and carbohydrates
(b) Lipids and proteins
(c) DNA and RNA
(d) Cellulose

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4. Which of the following is a characteristic feature of prokaryotic cells?

(a) Presence of a well-defined nucleus
(b) Lack of membrane-bound organelles
(c) Presence of chloroplasts
(d) Presence of a cell wall made of cellulose

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5. Why cell walls are only present in plants and not animals?

Cell wall is present in plants while animals have cell membrane. Cell wall mainly helps the plant to remain rigid and fixed. this helps the plants because they are immobile. the cell wall mainly contains cellulose and other substances, which are the main reasons why the trunks and branches of the trees are strong.

HW

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8. To observe osmosis, a student first deshelled two eggs by keeping them in dil. HCl. He then placed one egg in water and the other in conc. salt solution.
(a) State the changes which he will observe in the two eggs.
(b) Explain the reason for the changes observed.

(a) The first egg, kept in water will swell up and the second egg will shrink.
(b) In the first case, water is hypotonic so water enters the cell due to endosmosis. The second egg is kept in salt solution which is a hypertonic solution, so exosmosis takes place.

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Ab kal kya padhenege bhaiya iss chapter me?

Kal padhenge mitochondria is the powerhouse of cell 😂