



LATEST EDITION

SMART ATOMS

SMART



ATOMS

9TH SCIENCE

BOARD/OLYMPIAD/NATIONAL EXAMS



Flashcards

Mnemonics

Special points

Presented By

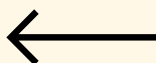
SMART ATOMS

Features



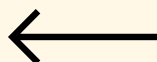
→ Concept building notes

Memory Tips



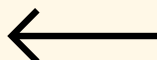
→ Flashcards

Previous Year Questions



→ Flowcharts

HD Graphics and Images





Introduction

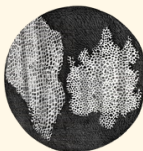
- While examining a thin slice of cork, Robert Hooke saw that the cork resembled the structure of a honeycomb consisting of many little compartments.
- Cork is a substance which comes from the bark of a tree.
- In the year 1665 when Hooke made this chance observation through a self-designed microscope.
- Robert Hooke called these boxes cells. Cell is a Latin word for 'a little room'.



Robert Hooke



Cork can be used as bottle cover



Cork cells under the microscope



Microscope used by Robert Hooke

-
- *Amoeba*, *Chlamydomonas*, *Paramoecium* and bacteria composed of single cell and are called unicellular organisms (uni = single).
 - On the other hand, many cells group together in a single body and assume different functions in it to form various body parts in multicellular organisms (multi = many) such as some fungi, plants and animals.



Amoeba



Bacteria



Paramoecium

Unicellular organisms



Fungi



Plants

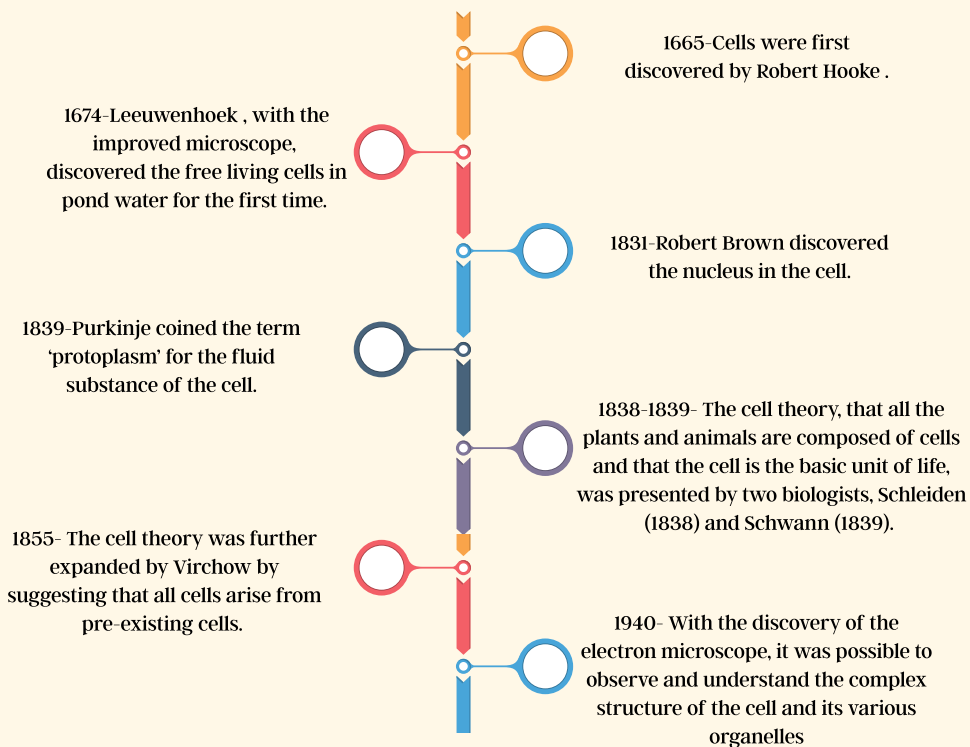


Animals

Multicellular organisms



Timeline of History of cell



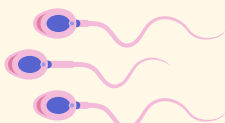
Gyan Box

The longest nerve cell in the human body is the neuron (also known as a nerve cell). These cells can be up to 1 meter (3 feet) long

Types of Human cells



Smooth Muscle Cell



Sperm cell



Blood cells



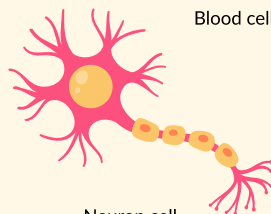
Ovum



Bone cells



Fat cell



Neuron cell



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NEET Corner
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Scientist	Contribution
Robert Hooke (1665)	Observed cork cells using a microscope and coined the term "cell".
Leeuwenhoek	First to observe free-living cells in pond water.
Schleiden (plants) and Schwann (animals)	Gave the cell theory, proposed that all plants and animals are composed of cells.
Rudolf Virchow	"Omnis cellula e cellula" – All cells arise from pre-existing cells.

NCERT Funda



- Each living cell has the capacity to perform certain basic functions that are characteristic of all living forms.
- There is a division of labour in multicellular organisms such as human beings.
- This means that different parts of the human body perform different functions.
- The human body has a heart to pump blood, a stomach to digest food and so on.
- Similarly, division of labour is also seen within a single cell. Each such cell has got certain specific components within it known as cell organelles.
- Each kind of cell organelle performs a special function, such as making new material in the cell, clearing up the waste material from the cell and so on.
- A cell is able to live and perform all its functions because of these organelles.
- These organelles together constitute the basic unit called the cell.
- It is interesting that all cells are found to have the same organelles, no matter what their function



Heart pumps the blood to organs of body



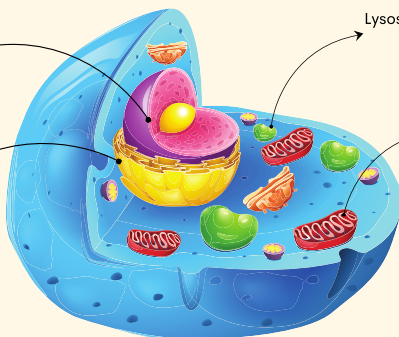
Stomach digest the food



Kidney remove the toxic material from blood



Liver is helps in digestion and detoxify the body



Nucleus - is command center of cell

Lysosomes-are called suicidal bags of cells

Mitochondria- is called powerhouse of cell

Endoplasmic reticulum- synthesize the material like proteins

5.1 Structural Organisation of a Cell

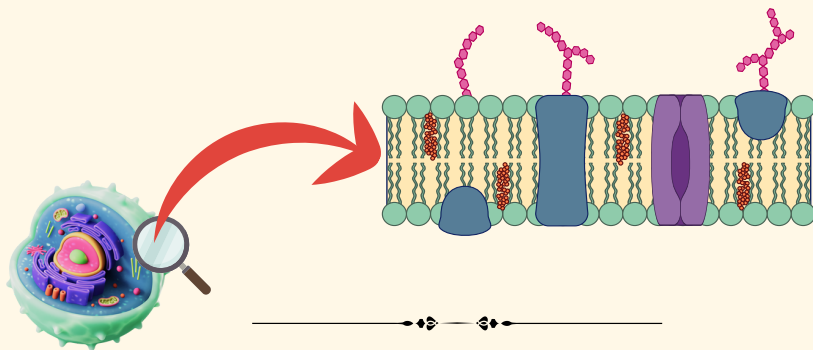
Cell is made up of-

1. Plasma Membrane
2. Cell Wall
3. Nucleus
4. Cytoplasm
5. Cell Organelles



5.1.1 Plasma Membrane

- This is the outermost covering of the cell that separates the contents of the cell from its external environment.
- The plasma membrane allows or permits the entry and exit of some materials in and out of the cell.
- It also prevents movement of some other materials.
- The cell membrane, therefore, is called a selectively permeable membrane



Gyan Box

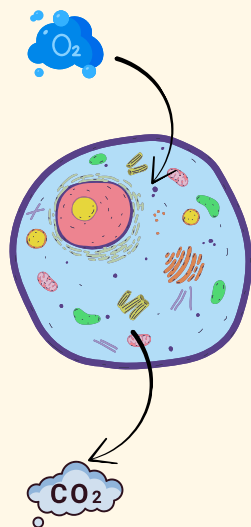
Plasma membrane is composed of phospholipids and proteins and hence called phospholipid bilayer

Function of Plasma Membrane

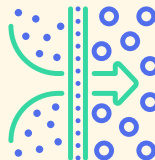
- **Selective Permeability:** It controls what enters and exits the cell, allowing only specific substances to pass through (like water, oxygen, and nutrients).
- **Protection:** Acts as a protective barrier, separating the internal environment of the cell from the outside.
- **Communication:** Contains receptor proteins that help the cell receive signals (like hormones) and respond to the environment.
- **Transport of Materials:** Facilitates transport via diffusion, osmosis, and active transport (with energy for larger or charged molecules).
- **Cell Recognition and Adhesion:** Helps in identifying self and non-self cells, important for immunity, and allows cells to stick together in tissues.

Some substances like carbon dioxide or oxygen can move across the cell membrane by a process called **diffusion**. In this there is a spontaneous movement of a substance from a region of high concentration to a region where its concentration is low.

Some substance like CO₂ (which is cellular waste and requires to be excreted out by the cell) accumulates in high concentrations inside the cell. In the cell's external environment, the concentration of CO₂ is low as compared to that inside the cell. As soon as there is a difference of concentration of CO₂ inside and outside a cell, CO₂ moves out of the cell, from a region of high concentration, to a region of low concentration outside the cell by the process of diffusion. Similarly, O₂ enters the cell by the process of diffusion when the level or concentration of O₂ inside the cell decreases. Thus, diffusion plays an important role in gaseous exchange between the cells as well as the cell and its external environment



Water also obeys the law of diffusion. The movement of water molecules through such a selectively permeable membrane is called osmosis.



Different cells in different types of solution

A. Hypotonic Solution

-Definition: Solution has lower solute concentration than cell cytoplasm.

-Water Movement: Water enters the cell.

Result:

Animal cell: May burst (lysis).

Plant cell: Becomes turgid (swollen but protected by cell wall).

🧠 Memory Hook: "Hypo makes it Hippo" – cell swells up!

B. Hypertonic Solution

-Definition: Solution has higher solute concentration than cell cytoplasm.

-Water Movement: Water leaves the cell.

Result:

Animal cell: Shrinks (crenation).

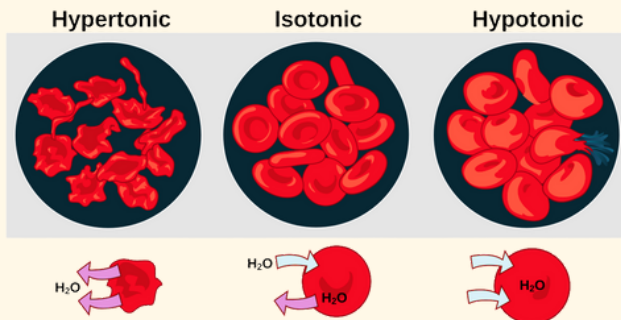
Plant cell: Plasmolysis (cell membrane pulls away from the wall).

C. Isotonic Solution

-Definition: Solute concentration is equal inside and outside the cell.

-Water Movement: No net water movement (but molecules still move randomly).

Result: Cell stays normal and balanced.



💡 Real-Life Applications of Osmosis

- Medical: IV fluids are isotonic to avoid damaging cells.
- Food Preservation: Pickling in salt creates hypertonic environments, killing microbes.
- Gardening: Overwatering may cause hypotonic stress in plant roots.

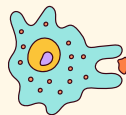


🧠 Olympiad Alert: In an isotonic medium, cell volume remains unchanged – crucial for medical drips.

NCERT Funda

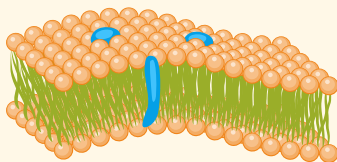


- Absorption of water by plant roots is also an example of osmosis.
- Diffusion is important in exchange of gases and water in the life of a cell.
- Cell also obtains nutrition from its environment.
- Different molecules move in and out of the cell through a type of transport requiring use of energy.
- The plasma membrane is flexible and is made up of organic molecules called lipids and proteins.
- We can observe the structure of the plasma membrane only through an electron microscope.
- The flexibility of the cell membrane also enables the cell to engulf in food and other material from its external environment. Such processes are known as endocytosis.
- *Amoeba* acquires its food through such processes



Amoeba in action taking food via endocytosis

Types of transport Across the Plasma Membrane



The plasma membrane allows movement of substances by two main types of transport:

◆ 1. Passive Transport (No energy required)

- Movement: From high to low concentration (along the concentration gradient).
- Types:
 - Diffusion: Movement of gases like O_2 , CO_2 .
 - Osmosis: Movement of water through a semi-permeable membrane.
 - Facilitated Diffusion: Uses channel or carrier proteins, but no energy (e.g., glucose transport in some cells).

🧠 Olympiad Tip: Even though facilitated diffusion uses proteins, it is still passive if no ATP is used.

◆ 2. Active Transport (Requires energy/ATP)

- Movement: From low to high concentration (against the gradient).
- Energy Source: ATP (Adenosine Triphosphate)
- Example:
 - Uptake of minerals by root cells from the soil.
 - Sodium-potassium pump in nerve cells.



“ NEET Corner ”



1. Which of the following occurs during osmosis?

- A. Movement of solute from low to high concentration
- B. Movement of solvent from low to high concentration
- C. Movement of solute through semi-permeable membrane
- D. Active transport of water molecules

✓ Answer: B

2. In a hypertonic solution, a plant cell will:

- A. Become turgid
- B. Remain unchanged
- C. Undergo plasmolysis
- D. Burst due to water intake

✓ Answer: C

3. Which of the following is a passive transport mechanism?

- A. Sodium-potassium pump
- B. Endocytosis
- C. Facilitated diffusion
- D. Phagocytosis

✓ Answer: C

4. Which structure in the cell membrane allows facilitated diffusion?

- A. Phospholipid bilayer
- B. Carbohydrates
- C. Protein channels
- D. Nucleoproteins

✓ Answer: C

5. Which solution will cause an animal cell to burst?

- A. Hypertonic solution
- B. Isotonic solution
- C. Hypotonic solution
- D. No solution affects animal cells

✓ Answer: C

6. A red blood cell placed in a 0.9% NaCl solution will:

- A. Shrink
- B. Swell and burst
- C. Remain unchanged
- D. Undergo plasmolysis

✓ Answer: C (0.9% NaCl is isotonic to RBCs)

7. Which of the following processes requires cellular energy (ATP)?

- A. Osmosis
- B. Facilitated diffusion
- C. Active transport
- D. Simple diffusion

✓ Answer: C

8. Osmosis involves movement of:

- A. Solute only
- B. Solvent only
- C. Solute and solvent
- D. Only gases

✓ Answer: B

9. Which condition is essential for osmosis to occur?

- A. Presence of proteins
- B. Presence of ions
- C. Semi-permeable membrane
- D. Equilibrium state

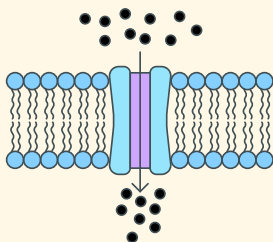
✓ Answer: C

10. When a plant cell is placed in an isotonic solution, it will:

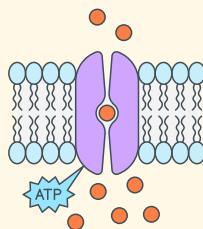
- A. Gain water and become turgid
- B. Lose water and undergo plasmolysis
- C. Not change in volume
- D. Collapse completely

✓ Answer: C

Passive Transport



Active Transport



Feature	Passive Transport	Active Transport
Energy Required	✗ No	✓ Yes (ATP)
Direction	High → Low	Low → High
Uses Proteins	Only in facilitated diffusion	Often uses carrier proteins
Examples	O ₂ , CO ₂ , water, glucose	Na ⁺ /K ⁺ pump, mineral absorption

5.1.2 Cell Wall



Definition

The cell wall is the rigid, outermost layer found in plant cells, fungi, and some prokaryotes, providing structure and protection.

It is absent in animal cells.