

The Fundamental Unit of Life [Class - 9th] Short-Notes

- A cell is the basic structural and fundamental unit of life, capable of performing essential life processes. Hence, it is the fundamental unit of life.

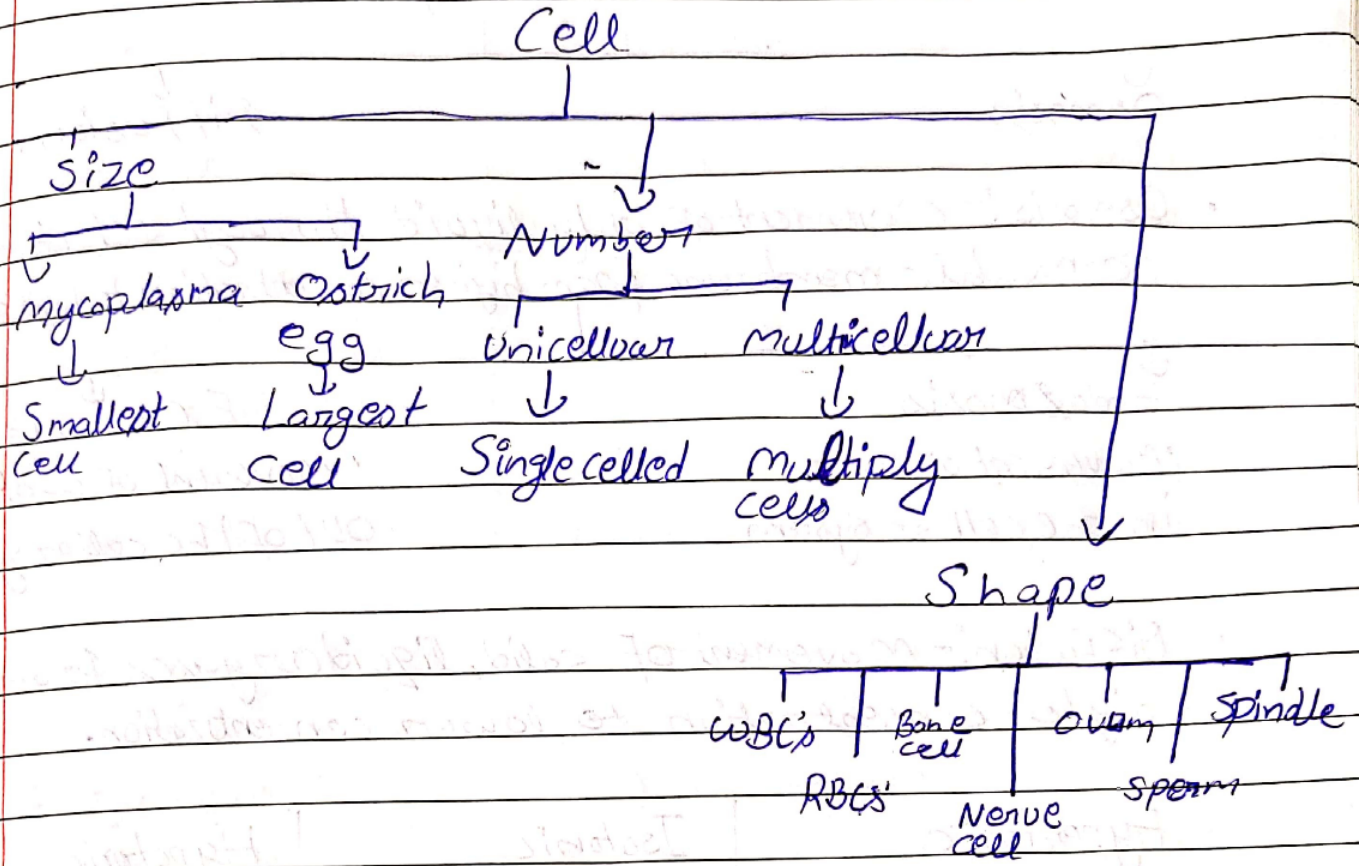
Discovery of cell and other important parts.

- Cell (Dead cell) - Robert Hooke (1665)
- Discovered protozoa and bacteria (living cell) - Antonie van Leeuwenhoek (1674)
- Cell nucleus - Robert Brown (1831)
- Protoplasm - Purkinje (1839)
- Protoplasm - Living part of cell, consisting of nucleus and cytoplasm.

Cell is the building block of life

Cell → Tissue → Organ → Organ System → Organism

Cell Theory → Schleiden & Schwann (1838, 39) { All living things are made of cells
Cells are the basic unit of life
→ All cells come from pre-existing cells (Rudolph Virchow (1855))



Humans {
 Smallest cell - Sperm cell
 Largest cell - Ovum
 Longest cell - Neuron

Plasma Membrane (Cell membrane)

- Outermost covering of the cell and it separates cell contents from external environment.
- It is made up of lipids and proteins. It is also known as selectively permeable membrane.

Active Transport

- From Lower concentration to Higher concentration.
- Energy (ATP) is required.

Passive Transport

- From Higher concentration to lower concentration.
- No Energy (ATP) is required.

Passive Transport

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Osmosis

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Diffusion

- Osmosis:- Movement of only liquid through selectively permeable membrane from higher concentration to lower.

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Endosmosis

- Movement of water in the cell or system

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Exosmosis

- Movement of water out of the cell or system.

- Diffusion:- Movement of solid, liquid or gases from higher concentration to lower concentration.

Hypertonic	Isotonic	Hypotonic
• Higher solute outside.	• Equal solute.	• Higher solute inside.
• Higher water inside.	• Equal water.	• Higher water outside.
• Water moves out	• No net movement.	• Water moves in.
• Cell shrinks	• Normal.	• Cell swells.

Cell wall:- Non-living, outer covering of plant cells, made of cellulose, providing structural strength and lies outside Plasma membrane

⇒ Plasmolysis:- Water loss by osmosis causes cell contents to shrink away from the cell wall.

Functions:-

- Prevents bursting of cell in hypotonic environments.
- Protecting plant cells from environmental challenges.

Cell Nucleus (Brain of the cell):

- Central center of the cell and its surrounded by double-layered nuclear membrane with pores.
- Chromatin: Thread-like structure made of DNA and proteins, found in nucleus of non-dividing cell

↓ Condensation (during cell division)
- Chromosomes: (rod-shaped structure) → carry genetic information.

Prokaryotic cell	Eukaryotic cell
• Small size (1-10 μm).	• Large size (5-10 μm).
• Nuclear region not well defined (called nucleoid).	• Well-defined nucleus
• Single chromosome.	• More than one chromosome.
• No-membrane bounded cell organelles except ribosome .	• Membrane-bound organelles are present.

- Nucleoplasm fills the nucleus.
- Controls all cell activities, reproduction and inheritance.

- ⇒ Cytoplasm: - All the semi-fluid substance in cell.
- ⇒ Cell organelles: - Membrane-bounded structure (e.g. nucleus, ER, Golgi body, lysosomes) that perform specialized functions.
- ⇒ Ribosomes: - Involved in synthesis of protein. [present in both prokaryotic and Eukaryotic cell].
- ⇒ Endoplasmic Reticulum: - network of membranes within a cell that is involved in protein and lipid synthesis.

Rough Endoplasmic Reticulum (RER)	Smooth Endoplasmic Reticulum (SER)
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|---|--|
| <ul style="list-style-type: none"> • Rough due to ribosome; site of protein synthesis. | <ul style="list-style-type: none"> • Smooth appearance; facilitates lipid and hormone production. |
| <ul style="list-style-type: none"> • Ribosomes synthesis protein. | <ul style="list-style-type: none"> • No protein synthesis; Functions in lipid synthesis. |
| <ul style="list-style-type: none"> • Not involved in detoxification. | <ul style="list-style-type: none"> • Crucial in detoxification. |

=> Golgi apparatus:- Discovered by Camillo Golgi

- Membrane-bounded vesicles arranged in stacks (cisterns).
- Package, stores and transports proteins and helps in lysosome formation.

=> Lysosomes:-

- Small-sacs filled with digestive enzymes.
- Breakdown worn-out waste and cell parts.
- Called "suicidal bags" because they can burst and digest the cell itself.

=> Vacuoles:-

- In plant cells, occupying 50-90% cell's volume.
- Surrounded by membrane called tonoplast.
- Provide turgidity and rigidity to plant cells.

In unicellular organisms, vacuoles:-

- Store consumed food.
- Smaller in unicellular organisms.

⇒ Mitochondria (Powerhouse of cell):-

- Double membrane bounded.
- Produce ATP, the energy currency of cell.
- Have their own DNA & ribosome.

⇒ Plastids are found only in plant cells

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Chloroplasts

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Chromoplasts

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Leucoplasts

- Green Plastids (contain chlorophyll)
- Do Photosynthesis
- Found in green part of plant.
- Colored Plastids (red, yellow, orange pigments)
- Give color to fruits and flowers.
- Colorless
- Store starch, oils, proteins.

⇒ Cell Division: Process of forming new cells in organisms. Needed for growth, cell replacement and reproduction.

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Mitosis

- Two daughter cells formed
- Chromosome number remains same
- Helps in growth and repair

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Meiosis

- Four daughter cells formed.
- Chromosome no. gets halved.
- Helps in gamete formation.

≠ Important

Double-membrane bounded:- Nucleus, Mitochondria, Plastids.

Single-membrane bounded:- Vacuoles, lysosomes, Golgi body, endoplasmic reticulum (ER).

Membrane-less:- Ribosome, centrosome (centriole).