

GRADE 10

LIFE SCIENCES

CELL: THE BASIC UNIT OF LIFE

 1. Discovery of the Cell

Discoverer	Contribution
Robert Hooke (1665)	First used the term <i>cell</i> when observing cork cells under a light microscope.
Antonie van Leeuwenhoek	First person to observe living cells (e.g. bacteria, protozoa) under a microscope.

- Discovery enabled by development of **microscopes**.
- Led to development of **cell theory**.

 2. Tools for Studying Cells

 Types of Microscopes

Microscope	Features	Use
Light Microscope	Uses light rays and lenses; up to 1000× magnification	General cell structure
Transmission Electron Microscope (TEM)	Electrons pass through specimen; up to 50 million×	Internal organelles
Scanning Electron Microscope (SEM)	Scans surface; 3D images	Cell surface structure

 Key Terms:

- **Micrograph:** Image captured using a microscope.
- **Staining:** Enhances contrast in cells for visibility.

 3. Cell Theory

 Classic Cell Theory (Schleiden & Schwann, 1838–39):

1. All living organisms are made of cells.
2. Cells are the basic units of life.
3. All cells come from pre-existing cells.

 Modern Extensions:

4. All biochemical activities of life occur within cells.
5. Hereditary information (DNA) is in cells.
6. All cells share similar chemical composition.

4. Basic Cell Structure

Feature	Prokaryotic	Eukaryotic
Nucleus	✗ (no true nucleus)	✓ (membrane-bound)
Organelles	✗ (no membrane-bound)	✓
Size	Small (1–10 µm)	Larger (10–100 µm)
Examples	Bacteria	Plants, animals, fungi

6. Plant vs Animal Cells

Feature	Plant Cell	Animal Cell
Cell wall	✓ (cellulose)	✗
Plastids (chloroplasts)	✓	✗
Vacuole	Large, central	Small or absent
Centrioles	✗	✓
Shape	Regular (boxy)	Irregular/rounded

7. Detailed Structure of Organelles

Cell Wall

- Found in: **plants, fungi, bacteria**
- Made of: **cellulose** (plants), **chitin** (fungi)
- **Function:**
 - Support, protection, shape
 - Allows water & minerals through (fully permeable)
 - Plasmodesmata: channels for transport between cells

Cell Membrane (Plasma Membrane)

- Present in: all cells
- Made of: **phospholipid bilayer** with proteins (fluid mosaic model)
- **Functions:**
 - Controls what enters/leaves cell
 - Selectively permeable
 - Involved in: osmosis, diffusion, active transport

Cytoplasm

- Jelly-like substance inside cell

- Site of metabolic reactions
- Suspends organelles

Nucleus

- Control center
- Contains DNA (chromatin)
- Surrounded by nuclear envelope with pores
- Contains **nucleolus** – makes ribosomes

Mitochondria

- Powerhouse of the cell
- Site of **aerobic respiration**
- Releases **ATP (energy)**
- Has its own DNA

Ribosomes

- Site of **protein synthesis**
- Found in cytoplasm or on rough ER

Endoplasmic Reticulum (ER)

Type	Function
Rough ER	Has ribosomes; makes & transports proteins
Smooth ER	No ribosomes; makes lipids & detoxifies

Golgi Apparatus (Body)

- Packages, modifies, and secretes substances
- Forms vesicles

Vacuole

Plant Cell	Animal Cell
Large central vacuole	Small, scattered vacuoles
• Stores water, minerals, pigments, waste	

Lysosomes

- Contains enzymes
- Break down waste or damaged organelles
- Only in **animal cells**

Centrioles

- Involved in **cell division**
- Found only in **animal cells**

Plastids (Plant Cells Only)

Type	Function
Chloroplasts	Photosynthesis (contain chlorophyll)
Chromoplasts	Pigments for colour (fruit/flowers)
Leucoplasts	Storage (e.g. starch)

8. Functions All Cells Perform

- Metabolism
- Respiration
- Growth
- Reproduction (cell division)
- Excretion
- Sensitivity (response)
- Movement (internal or external)