TOPIC

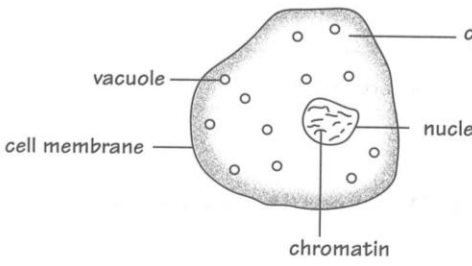
6 CELL: THE BASIC UNIT OF LIFE

STUDY NOTES

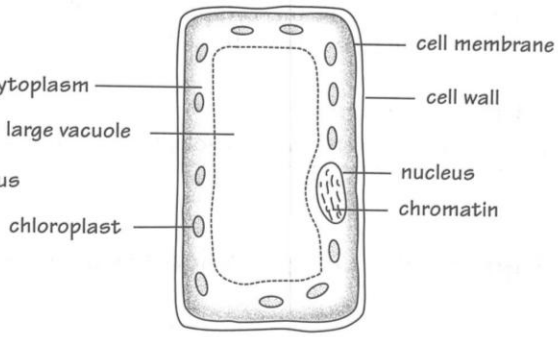
LEARNING OUTCOME

(a) Show an understanding of the functions of the different parts of a typical cell, including the nucleus.

- **Cells** are the **basic building unit of all living organisms**. All organisms are made up of living cells.
- Simple organisms such as amoeba are made up of only one cell. They are described as **unicellular organisms**.
- The majority of plants and animals are made up of thousands of cells. They are described as **multicellular organisms**. The human body is made up of billions of cells.
- A typical cell contains five main parts: **nucleus, chromosomes, cytoplasm, cell membrane and vacuoles**. In addition, **plant cells** contain a **cell wall** and **chloroplasts**.



Typical animal cell



Typical plant cell

Part of cell	Features	Function
Nucleus	• It contains chromosomes.	• It controls all the chemical reactions in the cell. • It is responsible for cell reproduction.
Chromosomes (made up of chromatin)	• These are thread–like hereditary materials. • They are passed down from parents to their offspring.	• They determine what a living thing looks like and how it functions.

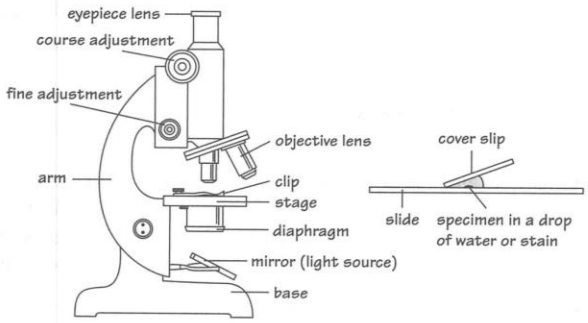
Part of cell	Features	Function
Cytoplasm	• This is a jelly–like substance which surrounds the nucleus.	• It acts as a chemical factory where many chemical reactions take place.
Cell membrane	• This is a thin layer around the cell. • It is partially permeable as it lets some substances pass through but stops others.	• It controls movement of substances in and out of the cell.
Vacuoles	• Animal cells usually have many small vacuoles but plant cells have only one large vacuole.	• These are spaces containing and temporarily storing air, liquid and food particles.
Cell wall (plant cells only)	• This is a thick rigid layer around the cell membrane. • It is made of a tough substance called **cellulose**.	• It makes plant cells firm. • It supports and gives the cell its shape.
Chloroplasts (plant cells only)	• These are tiny discs containing a green substance called **chlorophyll**.	• Chlorophyll traps the sunlight that the plant needs to make its food.

- **Protoplasm** is the transparent jelly–like living matter found inside all cells. It consists of two parts: the cytoplasm and the nucleus.
- **Cytoplasm** is the protoplasm which is found outside the nucleus. It is contained by the cell membrane. It is in the cytoplasm that the chemical reactions which produce energy and maintain life takes place. These take place in tiny bodies in the cytoplasm called **organelles**.

Link

Lower Secondary Science Matters Volume A (2nd Edition) — Section 6.1, 6.2

Experiment Using a Microscope to See Different Parts of a Cell



Simple microscope

1. Scrape the inside of your cheek with a clean toothpick and place the scrapings on a clean microscope slide.

2 Spread the cells out and stain with methylene blue or iodine solution. Cover the cells with a cover-slip.
3 Remember when focussing a microscope, always start with the objective lens close to the stage and focus by moving it away.
4 Examine the cheek cells under the microscope with eyepiece lens (5x or 10x) and objective lens (10x). Remember the magnification is the product of the eyepiece and objective lens magnifications.
5 Examine the cheek cells again with a higher powered objective lens (40x).

LEARNING OUTCOME

(b) Infer whether an organism is an animal or plant from its cellular composition.

- There are important **differences between a plant and animal cell**. These are shown in the table.

Animal cell	Plant cell
• Usually has many small vacuoles containing air, water or food particles	• Has one large vacuole in the centre of the cell. This contains cell sap, which is water and dissolved substances such as sugar and salt.
• Does not contain chloroplasts	• Contains tiny disc–like structures called chloroplasts. These contain the green pigment chlorophyll which traps the sunlight and allows the plants to photosynthesise (make food).
• Does not have a cell wall	• Has a rigid cellulose cell wall. This supports the plant cell and gives it its shape.
• Most of the cell is filled with cytoplasm	• Has a thin lining of cytoplasm

Exam Tip

You can infer if a cell is a plant or an animal by its cellular composition. Unlike animal cells plant cells, are rigid as they have a cellulose wall. Plant cells also have a large vacuole and green chloroplasts whereas animal cells do not.

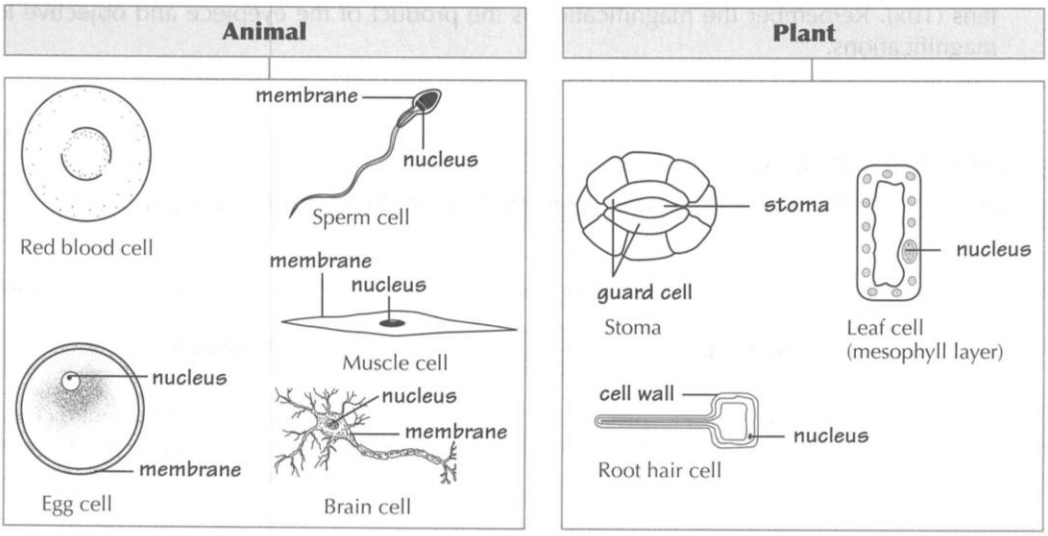
Common Error

✗ Animal cells have a cell membrane but plants cells have a cell wall instead.	✓ Animal cells have a cell membrane but plants cells have both a cell wall and a cell membrane.

LEARNING OUTCOME

(c) Recognise that in multicellular organisms (both plants and animals), cells become specialised, explain the significance of division of labour.

- **Division of labour** is the breakdown of the workload into smaller and more specific tasks to increase efficiency. This happens on a cellular level with living organisms.
- **Cells** come in many **different shapes** and **sizes**. Each type of cell has a special job to do.

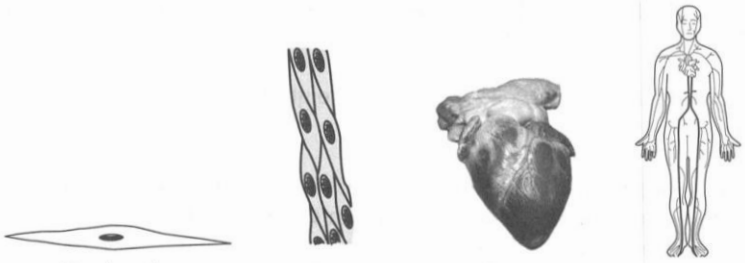


Cells have different shapes

- In a multicellular organism, cells performing specific tasks are grouped together into **tissues**, **organs** and **systems**, as shown in the table.

Structure	Characteristics	Examples
Tissue	A large number of similar cells performing a particular function.	• Plants: Epidermal tissue, photosynthetic tissue, supporting tissue • Animals: Epithelial tissue, muscle tissue, nerve tissue
Organ	Two or more tissues grouped together, carrying out the same function.	• Stomach (epithelial, muscle tissues grouped and connective tissues) • Heart (muscle, blood and connective tissues) • Brain (nerve and connective tissues)
System	Two or more organs working together in the same function.	• Digestive, circulatory, nervous, respiratory, excretory, reproductive and musculo–skeletal system

- Just like a computer system that has various components each with a specific function, so does a 'system' in a living organism. For example, the heart and blood vessels are **organs** that make up the **circulatory system** which pumps blood around the body. The heart has muscle **tissue** to pump the blood around. The blood itself has different **cells** each with a special job to do. Red cells carry oxygen gas in the blood whereas the white blood cells are important in defence against disease.



Muscle cell | Muscle tissue | Heart | Circulatory system

- This **division of labour** between cells, tissues, organs and systems ensures that the multicellular organism functions smoothly and efficiently.

Exam Tip

Cells become specialised in carrying out certain tasks, for example nerve cell, muscle cell etc. This division of labour on a cellular level increases efficiency as it breaks down the workload into smaller and more specific tasks.