CHAPTER 7

Cells—The Building Blocks of Life

You have learnt earlier that all living things are made up of cells. These are the building blocks of life. Just as bricks are the basic units from which a building is made, cells are the basic structural units of all living things. In organisms whose body is made of one cell, all life functions are performed by the same cell.

Exercise 1

Can you name some organisms whose body is made up of one cell? What are such organisms called?

In multicellular organisms, the work is divided. There are different cells to carry out different functions. Yet the basic structure of the cell is the same in all organisms. The cell can be defined as **a fundamental structural and functional unit of living things**. Cells are too tiny to be seen with the naked eye. You need a microscope to see them.

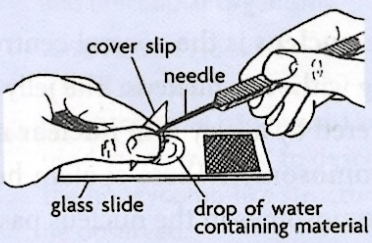
Activity 1 How to Make a Slide: Observing Cells from Onion Peel and Cheek Cells

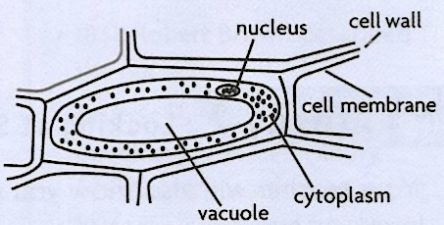
You will need: glass slides, cover slips made of very thin glass, a thin needle with a handle, water, blotting paper

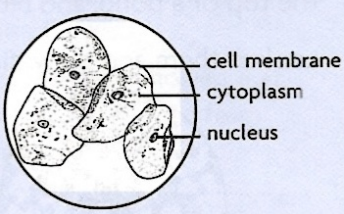
Use a toothpick and gently scrape the inside of your cheek. Also take a very thin piece of onion peel. Place these materials on two separate, clean glass slides. Place a drop of water on each slide. Use your needle as shown in the picture and gently lower the cover clip onto the drop of water. Ease the needle out only when the cover slip is almost touching the glass slide. This will prevent air bubbles from getting under the cover slip. Use the blotting paper to gently remove any extra water outside the cover slip.

▲ cells from onion peel

▲ cheek cells







(Practise these drawings.)

Place the slide under the microscope and with your teacher's guidance, focus it on your slide. If required, your teacher will help you put a drop of a coloured dye on your slide, before you lower the cover slip. This will help you see the structures of the cell more clearly.

The pictures show you what you are likely to see through the microscope. Observe your own slide carefully and draw what you see. Ask your teacher for help in identifying the different parts of the cells you are observing. Draw a simple diagram of what you have seen in your slides.

Parts of A Cell

Cells are found in many shapes and sizes. Nevertheless, all of them have certain things in common.

All cells are filled with a jelly-like material called **cytoplasm**. They also contain a small, dense body called the **nucleus**. The cytoplasm produces all the carbohydrates and proteins that are needed by the cell, by breaking down food materials taken in by the cell. It also recycles unwanted proteins and other chemicals into useful materials for the cell.

Cells are surrounded by a very thin elastic covering called the **cell membrane** or **plasma membrane**. This is living material which protects the contents of the cell. It only allows substances needed by the cell to permeate, or enter, into it. Substances not needed by the cell are allowed to go out. For this reason, the cell membrane is called a **selectively permeable membrane**.

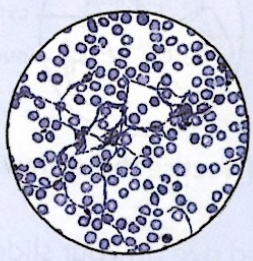
Plant cells have a rigid cell wall in addition to the cell membrane. Cell wall is made up of non-living material called **cellulose**. It allows substances to pass freely in and out of the cell.

The **nucleus** is the control centre of the cell. It controls all the functions of the cell. A cell cannot live long without a nucleus. The jelly-like material inside the nucleus is called **nucleoplasm**. The nucleus is covered by a very thin **nuclear membrane**. Inside the nucleus, there are thread-like structures called **chromosomes**. These contain hereditary information about an organism. When the cell divides, the chromosomes in the nucleus pass on characters from one generation to another.

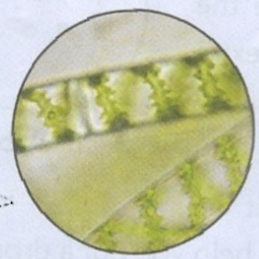
Activity 2 Looking at Slides of Yeast, *Spirogyra* and Blood

Your teacher will also show you some slides of yeast, *Spirogyra*, the green alga you find floating on the top of a pond, and blood.

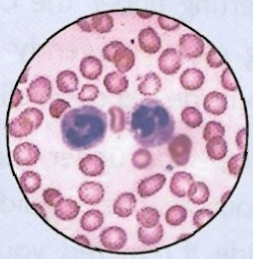
Look at them and draw diagrams of what you can observe.



▲ yeast



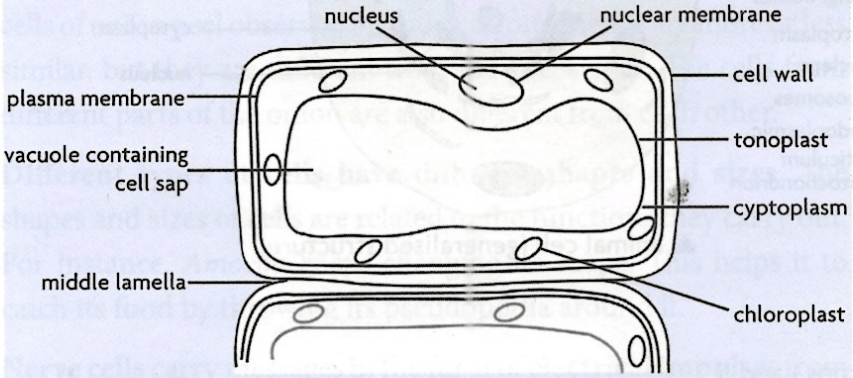
▲ *Spirogyra*



▲ blood cells

When you looked at the slide of *Spirogyra*, did you notice the spiral-shaped green bodies? These are **chloroplasts**. Chloroplasts can only be seen in plant cells. They are usually round or oval in shape. Their green colour is due to the presence of **chlorophyll**. Chlorophyll absorbs solar energy during photosynthesis.

Look at the drawing of the onion peel cell in Activity 1. Notice the large central portion which seems to be empty. Did you notice this when you observed the cell under the microscope? This is the **vacuole** which is filled with a fluid called **cell sap**. There are many substances produced in the cell as a result of its activities. These chemicals are stored in vacuoles. The vacuole is surrounded by a membrane called the **tonoplast**. Plant cells have large vacuoles. In animal cells, vacuoles are usually absent; if present, they are small and temporary. The cell wall of two adjoining cells are cemented together by **middle lamella**.



▲ a typical plant cell (Practise this drawing.)

Some Cell Organelles and Their Functions

There are some cell structures which can only be seen under a high-powered microscope. Still others can only be seen with the help of an electron microscope. Each of these structures perform a specific function. The structures present within a cell having a specific function are called **organelles**.

Did you know?

Some Important Landmarks in the History of Cells.

- 1650–1700: Anton van Leeuwenhoek observed nuclei and unicellular organisms.
- 1665: Robert Hook observed a slice of cork under the microscope he had made. He used the term 'cells' to describe the honeycomb-like structures he observed.
- 1831: Robert Brown described the nucleus.
- 1838: Schleiden and Schwann developed the 'cell theory' which describes the cell as the basic structural and functional unit of life.
- 1855: Virchow showed that all cells are formed from pre-existing cells.
- 1930s: With the development of the electron microscope, the detailed structure of cells became known.

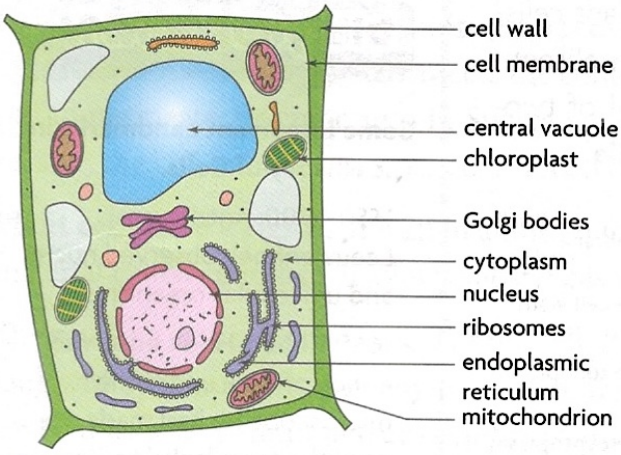
The **endoplasmic reticulum (ER)** (*endo*=inside, *plasm*=cytoplasm, *reticulum*=network) forms a network of double-layered membranes throughout the cytoplasm. These membranes offer a large surface area for the enzymes to function. They also serve as transport channels for materials to pass through.

Ribosomes present on some endoplasmic reticulum are the 'protein factories' of the cell.

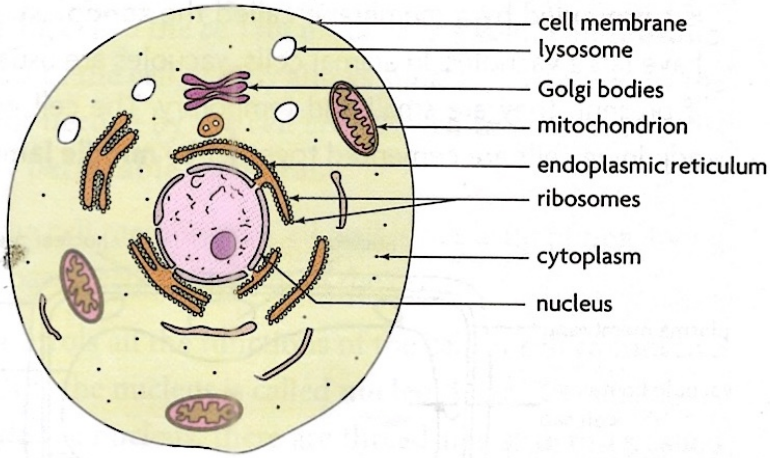
Mitochondria are called the 'power houses' of the cell. Cell respiration takes place here and energy is released for life activities.

Golgi bodies are also called **Golgi apparatus**. These are stacks of membrane-covered bags. They take the materials made in the ER, package them and send them to the other parts of the cell.

Lysosomes, sometimes called 'suicide bags', contain enzymes which destroy the damaged or dead cells. They help in recycling the cell material.



▲ plant cell (generalised structure)



▲ animal cell (generalised structure)

Exercise 2

Match the words and phrases in columns I and II.

Column I	Column II
i. mitochondria	**a.** protection
ii. lysosomes	**b.** power house
iii. ribosome	**c.** selectively permeable
iv. chloroplast	**d.** storage
v. Golgi bodies	**e.** protein factory
vi. vacuole	**f.** food factory
vii. cell wall	**g.** packaging unit
viii. cell membrane	**h.** suicide bag

Differences Between Plant and Animal Cells

Plant Cell	Animal Cell
1. They are large, with a cell wall made up of cellulose.	**1.** The cell wall is absent.
2. Usually has a large vacuole, sometimes there may be more than one vacuole.	**2.** Vacuoles are absent. If present, they are small and temporary, they may appear for a short time and then disappear.
3. Chloroplasts are present.	**3.** Chloroplasts are absent.

Different Shapes and Sizes of Cells

You have observed slides of blood, onion peel and yeast. You also know about the unicellular *Amoeba*. Do they all look the same? No, they are different in structure. You would have also seen that all the cells of onion peel observed by you and your friends are more or less similar, but they are different from the cheek cells. The cells from different parts of the onion are also different from each other.

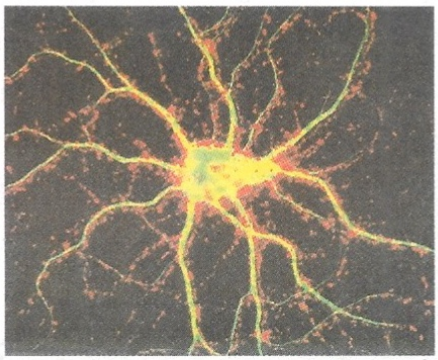
Different types of cells have different shapes and sizes. The shapes and sizes of cells are related to the functions they carry out. For instance, *Amoeba* keeps changing its shape. This helps it to catch its food by throwing its pseudopodia around it.

Nerve cells carry messages in the form of **electrical impulses** from different parts of the body to the brain or the spinal cord and back. For this reason, each nerve cell has a long arm to carry messages. It consists of a **cell body,** the **nerve fibre** and the **nerve ending.** It is also the longest cell in the body.

Ciliated cells that form the lining of the nose have hair-like projections called **cilia**. The sticky **mucus** and the lashing movement of cilia keep dust and germs away.

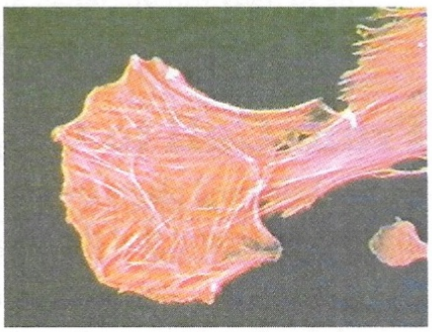
The human body has more than one kind of muscle. Muscles help in movement. Hence, muscle cells are capable of contraction and relaxation.

Human blood has different kinds of cells floating in a fluid called **plasma**. **Red blood cells (RBCs)** and **white blood cells (WBCs)**



▲ nerve cell

▲ ciliated cells



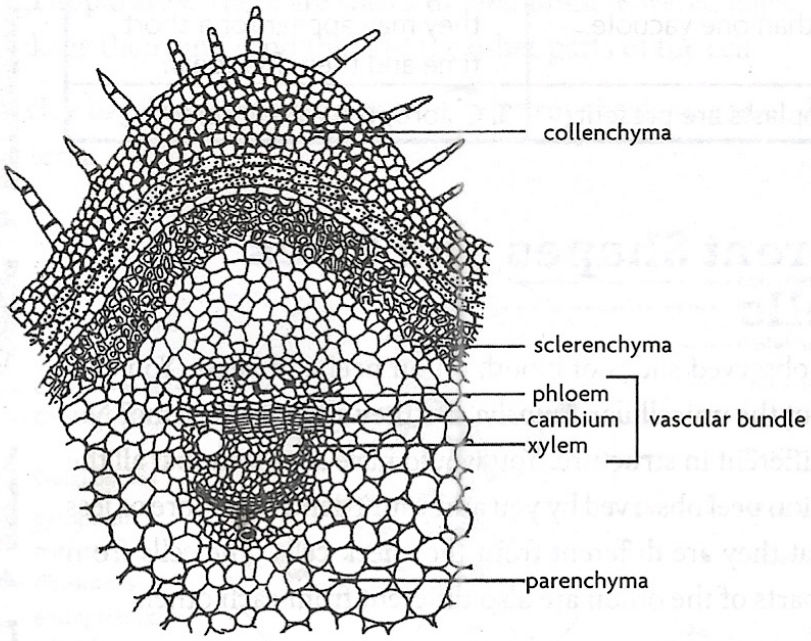
▲ muscle cells

Did you know?

- A bacterium is one of the smallest cells.
- The yolk of an egg is a complete cell that is visible to the naked eye!
- The yolk of an ostrich egg is the largest cell

are quite different from each other. The red blood cells are red due to the presence of **haemoglobin**, a compound of iron which carries oxygen from lungs to different parts of the body. RBCs do not have nuclei hence they cannot reproduce and live only for a short time. White blood cells, on the other hand, are irregular in shape and destroy germs.

Plant cells also show great diversity in shapes and sizes. The **xylem** cells that conduct water and minerals are thick walled and tube-like. Similarly the cells that store food in plants are thin-walled.



▲ cross-section of pumpkin stem

From Cell to Organism

Human being and plants are multicellular organisms with millions and millions of cells in their bodies. You have just learnt that the cells take different shapes to carry out different functions.

Groups of similar cells working together for a specific functions form **tissues**. For example, muscle tissue, bone and skin are all tissues of animals, while xylem is a tissue in plants. Various tissues together make up **organs**. The heart is an organ that performs the function of pumping blood. It is made of muscles, nerves, blood. Similarly the root, stem and leaves are some of the organs of plants.

A group of organs work together to form **organ systems**. You have learnt about ten systems in the human body in previous classes. Plants are simpler as they have only a root system and a shoot system. All these systems work together to form an **organism**.

Division of labour is a characteristic of all living organisms. When work is divided, the organism can function more efficiently. Division of labour is found at all levels of organisation in the body. Within the cell, there are cell organelles each responsible for a specific function. Each tissue is responsible for a particular function. Similarly, each organ or each organ system performs a specific set of functions. All these functions, ocurring in a coordinated manner at all levels, help to form and maintain an organism.