

THE FUNDAMENTAL UNIT OF LIFE

NCERT Textbook Questions

Q.1. Who discovered cells and how?

Ans. **Robert Hooke** in 1665 discovered the cells. He examined a thin slice of cork under a self-designed crude microscope and observed that the cork resembled the structure of a honey comb. The latter consisted of many tiny compartments. Hooke called them **cellulae** (singular cellula), now termed cells. Cellula is a Latin name which means 'a little room'. Such rooms were also present in monasteries.

Q.2. Why is the cell called the structural and functional unit of life?

Ans. All living organisms are made up of cells. Thus, cell is the structural unit of life. Each living cell has the capacity to perform certain basic functions that are characteristics of all living forms. Each cell acquired distinct structure and function due to the organization of its membrane and cytoplasmic organelles in specific way. Each kind of cell organelle performs a special function, such as making new materials in the cell (*e.g.*, chloroplast, ribosomes), clearing up the waste materials from the cells (*e.g.*, lysosomes), utilisation of oxygen in oxidation of food and energy production (*e.g.*, mitochondria), movement (microtubules containing spindle, cilia, flagella), etc. A cell is able to live and perform all its functions because of these organelles. These organelles together constitute the basic unit of structure and function called the cell.

Q.3. How do substances like CO₂ and water move in and out of the cell?

Ans. Carbon dioxide (CO₂) moves in and out of the cells by the process of diffusion. Diffusion involves movement of molecules from higher concentration to lower concentration across the plasma membrane.

Water moves in and out of the cells by **osmosis**. Osmosis is the movement of water or solvent through a semipermeable membrane from a solution of lower concentration of solutes to a solution of higher concentration of solutes to which the membrane is relatively impermeable.

Both diffusion and osmosis are physical or mechanical processes and do not require spending of energy for their performance by the cells.

Q.4. Why is plasma membrane called a selectively permeable membrane?

Ans. Plasma membrane is called selectively permeable membrane because it allows the movement of only selected molecules across it and not all of them.

Q.5. Fill in the gaps in the following table illustrating differences between prokaryotic and eukaryotic cells.

Prokaryotic cell	Eukaryotic cell
1. Size: generally small (1 – 10 μm); $1\mu\text{m} = 10^{-6} \text{ m}$	1. Size: generally large (5 – 100 μm)
2. Nuclear region: and known as	2. Nuclear region: well defined and surrounded by a nuclear membrane
3. Chromosome: single	3. Chromosome: more than one
4. Membrane – bound organelles: absent	4.

- Ans.** 2. It lies in the cytoplasm and not covered with a nuclear membrane, nucleoid.
4. Membrane-bound cell organelles such as mitochondria, plastids, Golgi apparatus, lysosomes, etc., are present in the cytoplasm.

Q.6. Can you name the two organelles we have studied that contain their own genetic material?

- Ans.** (a) Mitochondria; (b) Chloroplasts (plastids).

Q.7. If the organization of a cell is destroyed due to some physical and chemical influence, what will happen?

- Ans.** A well organized cell maintains **homeostasis**, *i.e.*, constant internal chemical composition. It is, therefore, able to perform basic functions such as respiration, obtaining nutrition, clearing of waste, forming new proteins, etc. If the organization of a cell is destroyed, it will not be able to maintain homeostasis and thus will not be able to perform above said basic functions and such a cell will ultimately die.

Q.8. Why are lysosomes are known as suicide bags?

- Ans.** Lysosomes contain digestive enzymes for almost all types of organic materials. If their covering membrane breaks as it happens during injury to cell, the digestive enzymes will spill over the cell contents and digest the same. As lysosomes are organelles which on bursting can kill cells possessing them, they are called **suicide bags**.

Q.9. Where are proteins synthesized inside the cell?

- Ans.** Proteins are synthesized in the ribosomes.

NCERT Exercises

Q.1 Make a comparison and write down ways in which plant cells are different from animal cells.

Ans. Differences between plants and animal cells are as follows:

Plant cell	Animal Cell
1. Plant cell has cell wall.	Animal cells lack cell wall.
2. It has plastids and specialized plastids called chloroplast that help them to synthesise their own food.	Animal cells lack plastids and cannot synthesise food.
3. Plant cells have large central vacuole.	Animal cells have small vacuoles
4. Food is stored as starch.	Food is stored as glycogen.
5. Centriole is absent in plant cells.	Animal cells have centriole.

Q.2. How is a prokaryotic cell different from a eukaryotic cell?

Ans. Differences between prokaryotic and eukaryotic cells:

Prokaryotic Cells	Eukaryotic cells
1. The genetic material is naked. It is not the true nucleus and it is called nucleoid.	True nucleus with nuclear membrane present.
2. DNA is circular.	DNA is linear.
3. Membrane bound organelles are absent.	Most organelles are membrane bound.
4. Eg: Bacteria	Eg: plant cells, animal cells

Q.3. What would happen if the plasma membrane ruptures or break down?

Ans. Plasma membrane is a selectively permeable membrane of the cell that maintains its homeostasis, *i.e.*, constant internal composition of the cell. If it ruptures or breakdown the constant internal chemical composition of the cell will be lost and it will not be able to perform its basic functions. Such a cell with ruptured plasma membrane is killed.

Q.4. What would happen to the life of a cell if there was no Golgi apparatus?

Ans. There would not be any lysosome for intracellular digestion and cleansing, not complexing of molecules, no exocytosis and no formation of new plasma membrane.

Q.5. Which organelle is known as the powerhouse of the cell? Why?

Ans. Mitochondrion is known as the powerhouse of the cell because it contains enzymes that are needed for stepwise oxidation of food stuffs (carbohydrate, fats or lipids and proteins) present in the cells to CO_2 and water. Oxidation of food releases energy which is used to form high-energy ATP (adenosine triphosphate) molecules. ATP is known as **energy currency** of the cell and it is used as cellular fuel. Energy stored in ATP is used to bring about energy requiring activities of cell such as photosynthesis, protein synthesis and muscle contraction.

Q.6. Where do the lipids and proteins constituting the cell membrane get synthesized?

Ans. Proteins are synthesized in ribosomes of rough ER while lipids are synthesized over smooth ER.

Q.7. How does an *Amoeba* obtain its food?

Ans. *Amoeba* is unicellular animal. It acquires its food by the process of endocytosis. Plasma membrane of *Amoeba* is flexible with its help *Amoeba* engulfs food particles. The engulfed food particle passes into the body of organism as a phagosome. Phagosome combines with lysosome to produce **digestive** or **food vacuole**. Digestion occurs in food vacuole. The digested food passes into surrounding cytoplasm. The undigested matter is thrown out of the cell.

Q.8. What is osmosis?

Ans. Osmosis is diffusion of water from the region of its higher concentration (pure water or dilute solution) to the region of its lower concentration (strong solution) through a semipermeable membrane.

Q.9. Carry out the following osmosis experiment:

Take four peeled potato halves and scoop each one out to make potato cups. One of these potato cups should be made from a boiled potato. Put each potato cup into a trough containing water.

Now

- (a) keep cup A empty;
- (b) put one teaspoon sugar in cup B;
- (c) put one teaspoon salt in cup C;
- (d) put one teaspoon sugar in the boiled potato cup D;

Keep these for 2 hours. Then observe the four potato cups and answer the following:

- (i) Explain why water gathers in the hollowed portion of B and C.
- (ii) Why is potato A necessary for this experiment?
- (viii) Explain why water does not gather in the hollow out portion of A and D?

Ans. (i) When unboiled potato cups B and C were put into a trough containing water, the cells of potatoes gained water by **endosmosis**. When a teaspoon of sugar and salt were added

later in the hollowed portion of B and C cups respectively, water movement occurred through the plasma membranes of the cells from within the cells of potato into the hollowed portion of both B and C cups because of **exosmosis** (*i.e.*, exit of water molecules through permeable plasma membranes from within the cells of unboiled potatoes into the hollowed portions having hypertonic sugar and salt, respectively).

- (ii) Potato cup A is necessary in the experiment as a 'control' for providing comparison with situations created in potato cups B, C and D. It indicates that the potato cavity alone does not induce movement of water.
- (iii) Water does not gather in the hollowed portion of potato cup A because it does not possess higher osmotic concentration than the cells of potato.

Potato cup D is boiled potato cup. On boiling, potato cells die and the membranes of the potato cells lost their permeability. As a result, when teaspoon of sugar is added into the hollowed portion of boiled potato cup D, water does not come out from within the potato cells into the hollowed portion.