

NCERT Solutions for Class 9 Science Chapter 5 The Fundamental Unit of Life

Topic 5.1 - What are Living Organisms made up of

1. Who discovered cells, and how?

Solution:

Cells were discovered in 1665 by Robert Hooke. He was examining a thin slice of cork using a primitive microscope he had designed himself. He saw that the structure of the cork at a microscopic level is similar to that of a honeycomb. It had several small chambers like those in a honeycomb. These small chambers were termed cells.

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

Solution:

The cell is called the structural and functional unit of life as it is the smallest living unit which can carry out all the living processes essential for living.

Topic 5.2 - What is a cell made up of? What is the structural organization of the cell?

Q. 1. How do substances like CO_2 and water move in and out of the cell? Discuss.

Solution:

CO_2 and water move in and out of the cell through the cell membrane by the processes of diffusion and osmosis, respectively.

2. Why is the plasma membrane called a selectively permeable membrane?

Solution:

The plasma membrane is called a selectively permeable membrane because it relatively allows the movement of substances from the inside of the cell to the outside and vice-versa.

This selectivity depends on the requirements of the cell and the substances present in the surroundings of the cell.

Topic 5.2.2 Cell Wall

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

Prokaryotic Cell	Eukaryotic Cell

Size: Generally small (1-10 μ m) 1 μ m=10 ⁻⁶ m	Size: Generally large (5-100 μ m)
Nuclear region:and known as.....	Nuclear region: well defined and surrounded by a nuclear membrane
Chromosome: single	More than one chromosome
Membrane-bound cell organelles absent

Solution:

Prokaryotic Cell	Eukaryotic Cell
1. The size is generally small.	1. The size is generally large.
2. Nuclear Region: Poorly defined because of the absence of the cell membrane, and is called the nucleoid.	2. Nuclear Region: Well-defined and surrounded by a nuclear membrane.
3. Chromosome: single.	3. More than one chromosome.
4. Membrane-bound cells organelles are present	4. Membrane-bound cell organelles are absent.

Topic 5.2 What is a cell made up of? What is the structural organization of the cell?

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

Solutions:

Two organelles which contain their own genetic material are

1. Mitochondria
2. Plastids

2. If the organisation of a cell is destroyed due to some physical or chemical influence, what will happen?

Solution:

If the organisation of a cell is destroyed due to some physical or chemical influence, it will not be able to perform the life processes essential for living and will therefore be digested by lysozymes.

3. Why are lysosomes known as suicide bags?

Solution:

When the cells are damaged to such an extent that they are incapable of performing certain functions that are essential for survival, the organism tries to get rid of these cells.

For this function, the lysosomes, which are membrane-bound organelles, burst and release digestive enzymes called lysozymes, which destruct the cell. Lysosomes are therefore called suicide bags.

4. Where are proteins synthesized inside the cell?

Solutions:

Inside the cells, the proteins are synthesized at sites called ribosomes. These are very small structures made up of ribonucleic acids and proteins.

Solved Exercise Questions

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

Solution:

Plant Cells	Animal Cells
1. Plant cells are generally bigger than animal cells.	1. Animal cells are relatively small.
2. Plant cells have a cell wall.	2. Animal cells do not have a cell wall.

3. The nucleus is not present in the centre of the cell.	3. The nucleus is there at the centre of the cell.
4. The size of the vacuole is large.	4. The size of the vacuole is small.
5. A chloroplast is present.	5. A chloroplast is absent.

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

Solution:

Prokaryotic Cell	Eukaryotic Cell
1. A prokaryotic cell is quite small in size. (1 - 10 μm)	1. A eukaryotic cell is relatively larger. (5-100 μm)
2. The nuclear region is poorly defined as the nuclear membrane is absent.	2. The nuclear membrane is present and the nuclear region is well defined.
3. Organelles are not membrane-bound.	3. Organelles are membrane-bound.
4. Only one chromosome is present.	4. More than one chromosome is present.

3. What would happen if the plasma membrane ruptured or broke down?

Solution:

If the plasma membrane ruptures, the cell will eventually die because the movement of substances won't be regulated.

This will cause important substances to move out of the cell and harmful substances from the environment to enter the cell.

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

Solution:

The Golgi apparatus stores and transports materials through vesicles. In the absence of the Golgi apparatus, these functions would stop, which would cause the death of the cell.

5. Which organelle is known as the powerhouse of the cell? Why?**Solution:**

Mitochondria are known as the powerhouse of the cell, as mitochondria release energy in the form of ATP, which is essential for performing all the functions of the cell.

6. Where do the lipids and proteins constituting the cell membrane get synthesized?**Solution:**

Lipids and proteins are synthesized in the endoplasmic reticulum.

In the rough endoplasmic reticulum, proteins are manufactured, whereas the manufacturing of lipids takes place in the smooth endoplasmic reticulum.

7. How does an amoeba obtain its food?**Solution:**

An amoeba obtains its food by virtue of the flexibility of its shape. The amoeba entraps the food particle around its membrane and then engulfs it within the cytoplasm. This process is called endocytosis.

8. What is osmosis?**Solution:**

Osmosis is the movement of water from a region of low concentration of solute (high water concentration) to a region of high concentration of solute (low water concentration) through a semi-permeable membrane.

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 in a trough containing water. Now,

- (a) Keep cup A empty
- (b) Put one teaspoon of 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 two hours. Then observe the four potato cups and answer the following:

9. (i) Explain why water gathers in the hollowed portion of B and C.

Solution:

Due to the presence of a solute (sugar in case of B and salt in case of C), there is a concentration difference of water in the potato cup and the trough due to which osmosis takes place where the cells of the potato act as the semi-permeable membrane.

9. (ii) Why is potato A necessary for this experiment?

Solution:

Potato A is absolutely necessary because it acts as the control for the experiment. Without A we will have no reference to compare the other cases with. We can see that since there is no solute in the hollow part of this potato no osmosis has taken place.

9. (iii) Explain why water does not gather in the hollowed-out portions of A and D.

Solution:

Since there is no solute in the hollow part of potato A, no osmosis has taken place, and water does not gather in the hollowed part of A.

In the case of D, even in the presence of solutes, osmosis does not take place. Boiling this potato has destroyed the cells, and thus no semi-permeable membrane is there for osmosis to take place.

10. Which type of cell division is required for the growth and repair of the body, and which type is involved in the formation of gametes?

Solution:

Mitosis is required for the growth and repair of the body, and meiosis is involved in the formation of gametes.