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## CLASS IX : SCIENCE

### Chapter 5 : The Fundamental Unit Of Life

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**Q1.** Who discovered cell and how ?

**Ans.** Robert Hooke (1665). The scientist found that cork possesses a number of small box-like structure which he named cell (cellula which later abbreviated to cell). His work was published in the form of a book called “Micrographia”.

**Q2.** Why is the cell called structural and functional unit of life?

**Ans.** A living organism is made up of one or more cells. Therefore, cell is structural and functional unit of life. All life functions of an organism reside in its cells. As the different parts of human body perform different functions. Similarly division of labour is also seen within a single cell. In fact each such cell has got certain specific components within it known as cell organelles. Each kind of cell organelle perform a specific function, such as making new material in the cell, clearing up the waste material from the cell and so on. Cells may also become specialised to perform specific functions like contraction in muscle cell or impulse transmission in nerve cell. Therefore, cell is functional unit of life.

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**Q1.** How do substances like CO<sub>2</sub> and water move in and out of the cell ?

**Ans.** CO<sub>2</sub> moves into and out of the cell by diffusion while water does it through osmosis.

**Q2.** Why is plasma membrane called selectively permeable membrane?

**Ans.** Cell membrane is semipermeable membrane for water. It permits the entry of gases through diffusion. Ions, sugar, amino acids, etc. pass through the plasma membrane by an active process. Plasma membrane is impermeable to certain other materials. Therefore, it is selectively permeable.

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**Q1.** 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 $\mu\text{m}$ ) $1 \mu\text{m} = 10^{-6}\text{m}$ .	1. Size: generally large ( 5-100 $\mu\text{m}$ ).
2. Nuclear region: -----	2. Nuclear region: well defined and surrounded by a nuclear membrane.
3. Chromosome: single.	3. More than one chromosome.
4. Membrane-bound cell organelles absent	4. -----

**Ans.**

Prokaryotic Cell	Eukaryotic Cell
1. Size : generally small ( 1-10 $\mu\text{m}$ ) $1 \mu\text{m} = 10^{-6}\text{m}$ .	1. Size: generally large ( 5-100 $\mu\text{m}$ ).
2. Nuclear region: undefined and not surrounded by a nuclear membrane and known as nucleoid.	2. Nuclear region: well defined and surrounded by a nuclear membrane.
3. Chromosome: single	3. More than one chromosome
4. Membrane-bound cell organelles absent.	4. Membrane-bound cell organelles present.

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**Q1.** Can you name the two organelles we have studied that contain their own genetic material?

**Ans.** Mitochondria, chloroplast - are two organelles that contain their own genetic material.

**Q2.** If the organisation of a cell is destroyed due to some physical or chemical influence, what will happen?

**Ans.** Lysosomes will burst to release digestive enzymes. Digestive enzymes cause break down of various cellular components causing destruction of the cell.

**Q3.** Why are lysosomes known as suicidal bags ?

**Ans.** At the time of cellular damage, the lysosomes burst to release its enzymes and they digest its own cell. Therefore, lysosomes are also known as suicidal bags of a cell.

**Q4.** Where are proteins synthesized inside the cell ?

**Ans.** Ribosome in the Cytoplasm, Rough endoplasmic reticulum.

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## EXERCISES

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**Q1.** Make a comparison and write down ways in which plant cells are different from animal cells.

Ans.	Animal Cell	Plant Cell
	1. Animal cells are generally small in size.	1. Plant cells are larger than animal cells.
	2. Cell wall is absent.	2. The plasma membrane of plant cells is surrounded by a rigid cell wall of cellulose.
	3. Animal cell don't possess plastids.	3. Plastids are present.
	4. Vacuoles in animal cells are many, small and temporary.	4. Most mature plant cells have a permanent and large central sap vacuole.
	5. Animal cells have a single highly complex and prominent Golgi apparatus.	5. Plant cells have many simpler units of Golgi apparatus, called dictyosomes.
	6. Animal cells have centrosome and centrioles.	6. Plant cells lack centrosome and centrioles.

**Q2.** How is a prokaryotic cell different from a eukaryotic cell?

**Ans.**

**Prokaryotic Cells**

**Eukaryotic Cells**

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| <p>1. The prokaryotic cells are represented by bacteria, blue-green algae, Mycoplasma or PPLO (Pleuro Pneumonia Like Organisms).</p> <p>2. Single-celled organism. Lack a membrane bound nucleus (nucleoid).</p> <p>3. Genetic material is naked or no histone proteins are found, single, circular (usually) chromosome.</p> <p>4. Extrachromosomal DNA (plasmid) is found. Ribosomes are present in cytoplasm (70 S).</p> <p>5. Cell surrounded by cell membrane and cell wall (made of carbohydrates and amino acids).</p> <p>6. Prokaryotes lack membrane enclosed organelles in their cytoplasm.</p> <p>7. The chlorophyll in photosynthetic prokaryotic bacteria is associated with membranous vesicles.</p> | <p>1. The eukaryotes include all the protists, plants, animals and fungi.</p> <p>2. Single-celled organism. Possess an organised nucleus with nuclear envelope.</p> <p>3. Their genetic material is organised into chromosomes (linear molecules) having histone protein. More than one chromosome.</p> <p>4. Extrachromosomal DNA (plasmid) is not found. Ribosomes are present in cytoplasm (80 S).</p> <p>5. Cell surrounded by cell membrane and cell wall (made of cellulose or chitin).</p> <p>6. Have other membrane bound distinct structures called organelles.</p> <p>7. The chlorophyll is associated with Plastids.</p> |
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**Q3.** What would happen if the plasma membrane ruptures or breaks down ?

**Ans.** There will be spilling of cytoplasm and cell organelles, bursting of lysosomes and digestion of cellular contents.

**Q4.** 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, no complexing of molecules, no excretion and no formation of new plasma membrane.

**5.** What organelle is known as power house of the cell ? Why ?

**Ans.** Mitochondria is known as power house of the cell because it produces most of the molecules of ATP (adenosine triphosphate) which are required for providing energy for synthesis of new chemicals, mechanical and other cellular functions.

**Q6.** Where do the lipids and proteins constituting the cell membrane get synthesised ?

**Ans.** Proteins are synthesised over ribosomes of RER while lipid are synthesised over SER.

**Q7.** How does Amoeba obtain food ?

**Ans.** Plasma membrane of Amoeba is flexible. With its help, Amoeba engulfs food particle. The engulfed food particle passes into the body of Amoeba 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.

**Q8.** 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.

**Q9.** Carry out the following osmosis experiment. Take four peeled potato halves and hollow each one out to make potato cups. One of these potato cups should be made from the boiled potato. Put each potato cup in the trough containing water. Now (a) Keep cup A empty. (b) Put one tea spoon sugar in cup B. (c) Put one tea spoon of salt in cup C. (d) Put one tea spoon sugar in boiled cup D. Keep this set up for two 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.

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

- Ans.** (i) Sugar and salt increase osmotic concentration which results in passage of water osmotically from the trough through the cells of potato into its cavity.  
(ii) Potato A functions as control experiment which indicates that the cavity of potato does not induce movement of water.  
(iii) Water does not gather in the hollowed out portion of A because it does not have a higher osmotic concentration than the cells of potato tuber. Potato tuber D does not have living cells. Osmosis does not occur in dead cells. Therefore, despite presence of sugar in the cavity of D, no water passes from through dead potato cells into cavity of the tuber.

**Q10.** Cell division plays a crucial role in both growth and repair of the body, as well as the formation of gametes (reproductive cells). The two main types of cell division are mitosis and meiosis, and they serve different purposes:

**Ans. 1. Mitosis:**

- Mitosis is the type of cell division responsible for growth and repair of the body.
- During mitosis, a single cell divides into two identical daughter cells, each with the same number of chromosomes as the parent cell.
- The primary function of mitosis is to maintain the integrity of the organism's body by replacing damaged or dying cells with new, identical ones.
- It occurs in somatic cells (body cells) throughout an organism's life.

**2. Meiosis:**

- Meiosis is the type of cell division involved in the formation of gametes (sperm and egg cells) for sexual reproduction.
- Meiosis reduces the chromosome number by half, resulting in cells with half the number of chromosomes as the parent cell.
- This reduction in chromosome number is essential for maintaining the diploid (two sets of chromosomes) to haploid (one set of chromosomes) ratio during sexual reproduction.
- Meiosis generates genetic diversity among offspring because it shuffles and recombines genetic material from the two parents.

In summary, mitosis is responsible for growth and repair of the body, as it produces identical somatic cells, while meiosis is involved in the formation of gametes, which are necessary for sexual reproduction and contribute to genetic diversity.