



INDIAN SCHOOL AL WADI AL KABIR



Class: IX	DEPARTMENT OF SCIENCE -2025-26 SUBJECT: BIOLOGY	DATE: 22/04/2025
WORKSHEET NO:1 WITH ANSWERS	TOPIC: THE FUNDAMENTAL UNIT OF LIFE -PART 1	A4 FILE FORMAT
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

I. OBJECTIVE TYPE QUESTIONS (1 MARK):

1. Plasmolysis in a plant cell is defined as:

- a) breakdown (lysis) of the plasma membrane in a hypotonic medium.
- b) shrinkage of protoplasm in a hypertonic medium.
- c) shrinkage of nucleoplasm.
- d) detachment of the plasma membrane from the cell wall in a hypotonic medium.

2. Cell theory states that all organisms are made up of one or more similar units of organization called cells. Which of the following organisms do not strictly adhere to this theory?

- a) Protozoa
- b) Bacteria
- c) Viruses
- d) Algae

3. The undefined nuclear region of prokaryotes are also known as

- a) nucleus
- b) nucleolus
- c) nucleic acid
- d) nucleoid

4. The primary component of a plant cell wall is:

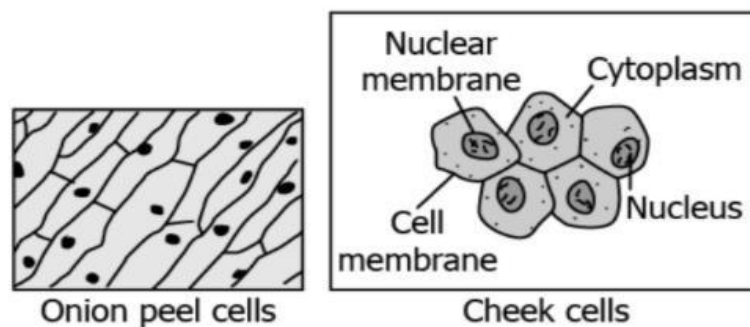
- a) Sugars
- b) Cellulose
- c) Proteins

d) Lipids

5. A cell will swell up if:

- a) The concentration of water molecules in the cell is higher than the concentration of water molecules in surrounding medium.
- b) The concentration of water molecules in surrounding medium is higher than water molecules concentration in the cell.
- c) The concentration of water molecules is same in the cell and in the surrounding medium
- d) The Concentration of water molecules does not matter.

6. The image shows cells in the onion peel and the human cheek. What can be understood by observing them?



- a) All living things are made up of cells that look similar.
- b) All living things are made up of cells that are structurally different but functionally the same.
- c) All living things are made up of cells that have different shapes and structures based on their functions
- d) All living things are made up of cells with same structure and functions.

7. Which characteristic differentiates a prokaryotic cell from a eukaryotic cell?

- a) Presence or absence of cytoplasm
- b) Presence or absence of cell membrane
- c) Presence or absence of genetic material
- d) Presence or absence of nuclear membrane

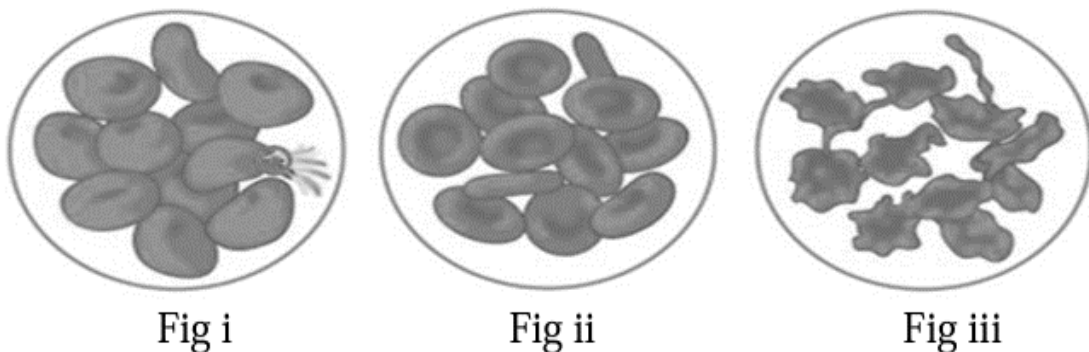
8. The main function of a plasma membrane is to:

- a) Prevent water from entering or leaving.
- b) Control what goes into and out of the cell.
- c) Act as a sieve, allowing only lipids to pass.
- d) Move the cell from place to place.

9. Which of the following is not a part of the Cell Theory?

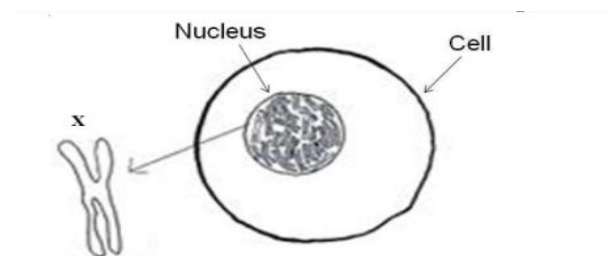
- a) All living organisms are composed of cells
- b) The cell is the basic structural and functional unit of life
- c) All cells arise from pre-existing cells
- d) Cells can be created from non-living materials spontaneously

10. Observe the figure given below and choose the correct sequence:



- a) Fig i. Hypotonic solution, Fig ii. Hypertonic solution, Fig iii. Isotonic solution
- b) Fig i. Hypertonic solution, Fig ii. Isotonic solution, Fig iii. Hypotonic solution
- c) Fig i. Hypertonic solution, Fig ii. Hypotonic solution, Fig iii. Isotonic solution
- d) Fig i. Hypotonic solution, Fig ii. Isotonic solution, Fig iii. Hypertonic solution

11. The diagram below shows a magnified view of a nucleus of human cell. Name the part labelled X.



- a) Ribosome
- b) Chromosome
- c) Nucleoplasm

d) Mitochondrion

12. What is the primary difference between the nucleus observed in cheek cells and onion peel cells?

a) Cheek cells have no nucleus, while onion peel cells do

b) The nucleus in cheek cells is centrally located, while in onion peel cells, it is near the periphery

c) The nucleus in onion peel cells is larger than in cheek cells

d) Onion peel cells have multiple nuclei, while cheek cells have only one

For the questions 13 to 16, two statements are given—one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the options (i), (ii), (iii) and (iv) as given below:

(i) Both A and R are true and R is the correct explanation of the assertion.

(ii) Both A and R are true but R is not the correct explanation of the assertion.

(iii) A is true but R is false.

(iv) A is false but R is true.

13. **Assertion (A):** The shape of a cell varies and can be circular, elongated, tubular, oval, or cylindrical.

Reason (R): The shape of a cell is determined by its specific function.

14. **Assertion (A):** The cell wall is present in plant cells.

Reason (R): Animal cells lack a cell wall and are enclosed only by a cell membrane.

15. **Assertion (A):** The cell wall is a non-living component of the cell.

Reason (R): It does not provide protection, shape, or support to the cell.

16. **Assertion (A):** Multicellular organisms, such as humans, exhibit a division of labour.

Reason (R): Different organs and tissues in the human body perform specialised functions.

II. VERY SHORT QUESTIONS (2 MARKS):

17. Who proposed the cell theory? What are its main postulates?

18. How do prokaryotic and eukaryotic cells differ? Mention any two key differences.

19. How is the nucleoid of a prokaryotic cell different from the nucleus of a eukaryotic cell?

20. Why is the plasma membrane called a selectively permeable membrane? Mention one of its functions.

21. How does endocytosis benefit organisms like Amoeba?

22. Why can fungi and bacteria tolerate greater changes in their surrounding medium compared to animal cells?

23. What happens when a plasmolysed cell is placed in water?

24. Two beakers, A and B, contain plain water and a concentrated sugar solution, respectively. An equal number of dried raisins and fresh grapes are placed in both beakers for a few hours and then removed. Explain the difference in their physical appearance.

III. SHORT ANSWER QUESTIONS (3 MARKS):

25. Define and differentiate between hypotonic, isotonic, and hypertonic solutions.

26. Perform the following osmosis experiment and answer the related questions:

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

Place them in a trough filled with water.

Follow these steps:

Cup A: Leave empty.

Cup B: Add 1 tsp sugar.

Cup C: Add 1 tsp salt.

Cup D: Add 1 tsp sugar to a boiled potato.

a) Why does water collect in the hollowed portions of cups B and C?

b) Why is potato A included in the experiment?

c) Why does water not collect in the hollowed-out portions of A and D?

27. Briefly explain what happens in the following situations:

a) Dry apricots are placed in pure water for some time and then transferred to a sugar solution.

b) The plasma membrane of a cell ruptures.

c) Rheo leaves are first boiled in water and then a drop of sugar syrup is added to them.

28. Describe how oxygen (O₂) and carbon dioxide (CO₂) diffuse through the cell membrane.

IV. LONG ANSWER TYPE QUESTIONS (5 MARKS):

29.a) Explain the structure of the nucleus in detail.

- b) Draw a neat, labelled diagram of a prokaryotic cell.
30. What is plasmolysis? Explain the process with the help of an experiment

V. SOURCE BASED/CASE BASED QUESTION (4 MARKS):

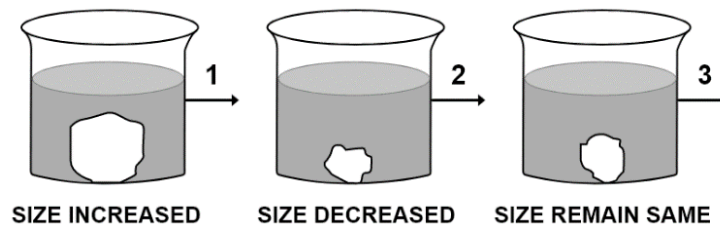
31. A candidate conducted an experiment to study osmosis by placing three potato cubes in three separate beakers containing different solutions. After 24 hours, the observations were as follows:

In Beaker 1, the potato cube increased in size.

In Beaker 2, the potato cube decreased in size.

In Beaker 3, the size of the potato cube remained unchanged.

The diagram provided represents the results of this experiment.



- a) Identify the technical terms for the types of solutions in Beakers 1, 2, and 3. Why does the potato cube in Beaker 3 remain unchanged in size?
- b) What are the specific features of the cell sap in root hairs that help in water absorption?
- c) Define osmosis and explain its significance in plant cells.
- d) How does the permeability of the cell membrane differ from that of the cell wall?

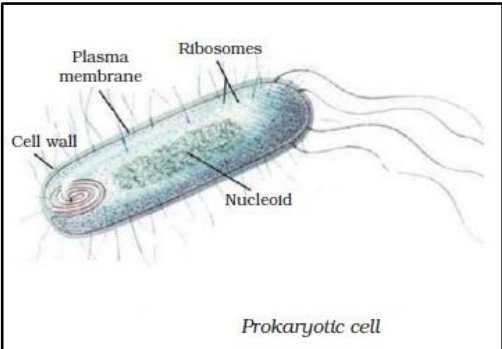
ANSWERS

I.	OBJECTIVE TYPE QUESTIONS (1 MARK):
1.	b) shrinkage of protoplasm in a hypertonic medium.
2.	c) Viruses
3.	d) nucleoid
4.	b) Cellulose
5.	b) The concentration of water molecules in surrounding medium is higher than water

	molecules concentration in the cell.										
6.	a) All living things are made up of cells that have different shapes and structures based on their functions.										
7.	d) Presence or absence of nuclear membrane										
8.	b) Control what goes into and out of the cell.										
9.	d) Cells can be created from non-living materials spontaneously										
10.	d) Fig i. Hypotonic solution, Fig ii. Isotonic solution, Fig iii. Hypertonic solution										
11.	b) Chromosome										
12.	b) The nucleus in cheek cells is centrally located, while in onion peel cells, it is near the periphery										
II.	ASSERTION AND REASONING:										
13.	(i)Both A and R are true and R is the correct explanation of the assertion.										
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15.	(iii)A is true but R is false.										
16.	(i)Both A and R are true and R is the correct explanation of the assertion.										
III.	VERY SHORT QUESTIONS (2 MARKS)										
17.	Matthias Schleiden, Theodor Schwann and Rudolf Virchow. Postulates of Cell theory are: 1. All living organisms are made up of cells or the products of the cells. 2.Cells are the fundamental building blocks of tissues, organs, and entire functioning organisms. 3.New cells are formed through division in the pre-existing cells.										
18.	<table border="1"> <thead> <tr> <th>Prokaryotic Cell</th><th>Eukaryotic</th></tr> </thead> <tbody> <tr> <td>1. Size: Generally small (1–10 μm) ($1\mu\text{m} = 10^{-6} \text{ m}$)</td><td>1. Size: Generally large (5–100 μm)</td></tr> <tr> <td>2. Nuclear region is poorly defined due to absence of a nuclear membrane and known as nucleoid.</td><td>2. Nuclear region well defined and surrounded by a nuclear membrane.</td></tr> <tr> <td>3. There is a single chromosome.</td><td>3. There are more than one chromosomes.</td></tr> <tr> <td>4. Membrane-bound cell organelles absent.</td><td>4. Membrane-bound cell organelles present.</td></tr> </tbody> </table>	Prokaryotic Cell	Eukaryotic	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 is poorly defined due to absence of a nuclear membrane and known as nucleoid.	2. Nuclear region well defined and surrounded by a nuclear membrane.	3. There is a single chromosome.	3. There are more than one chromosomes.	4. Membrane-bound cell organelles absent.	4. Membrane-bound cell organelles present.
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19.	The nucleus found inside eukaryotic cells is protected by the nuclear membrane. It separates the nucleus from other cellular components inside the cell. The nucleoid possesses no such protective membrane and is not separated from the other components of the prokaryotic cell.										
20.	The cell membrane or plasma membrane is a biological membrane that separates the interior of the cell from the outside environment. The plasma membrane is called as selectively permeable membrane because it regulates the movement of substances in and out of the cell. It means that										

	the plasma membrane allows some material to pass through it while at the same time it blocks other material from entering through it.		
21.	Endocytosis is the process by which amoeba takes up the food particle. During the process of endocytosis, the outermost membrane of the amoeba folds inwardly and extends outwards to catch the food. By the process of endocytosis, the amoeba takes up its nutrition.		
22.	Fungi and bacteria can tolerate greater changes in their surrounding medium because they have a strong cell wall. • The cell wall is a rigid, protective layer outside the cell membrane. • It prevents the cell from bursting or shrinking too much when the surrounding environment changes (like changes in water content, salt concentration, etc.). • In contrast, animal cells do not have a cell wall — only a soft, flexible cell membrane — so they are much more sensitive to changes in their surroundings.		
23.	When a plasmolysed cell is placed in water (especially pure water): ➡ Water will enter the cell by osmosis. ➡ The cell will start to swell. ➡ The plasma membrane will move back toward the cell wall. ➡ If enough water enters, the cell can become fully turgid again (normal condition).		
24	In beaker A (plain water): Dried raisins will swell up because water moves into the raisins by endosmosis (water enters from a region of higher concentration outside to lower concentration inside). Fresh grapes may swell slightly, but not much change because they are already full of water. In beaker B (concentrated sugar solution): Dried raisins and fresh grapes will shrink or shrink further because water moves out of them into the sugar solution by exosmosis (water moves from inside the cell to outside where the concentration of solutes is higher).		
IV	SHORT ANSWER QUESTIONS (3 MARKS);		
25.	Hypotonic solution If the medium surrounding the cell has a higher water concentration than the cell, meaning that the outside	Isotonic solution If the medium has exactly the same water concentration as the cell, there will be no net movement of water across the	Hypertonic solution If the medium has a lower concentration of water than the cell, meaning that it is a very concentrated solution,

	solution is very dilute, the cell will gain water by osmosis. Such a solution is known as a hypotonic solution.	cell membrane. Such a solution is known as an isotonic solution.	the cell will lose water by osmosis. Such a solution is known as a hypertonic solution.	
26.	(i) Water gathers in the hollowed portions of set-up B and C because water enters the potato as a result of osmosis. Since the medium surrounding the cell has a higher water concentration than the cell, the water moves inside by osmosis. Hence, water gathers in the hollowed portions of the potato cup. (ii) Potato A in the experiment acts as a control set-up. No water gathers in the hollowed portions of potato A. (iii) Water does not gather in the hollowed portions of potato A because potato cup A is empty. It is a control set-up in the experiment. Water is not able to enter potato D because the potato used here is boiled. Boiling denatures the proteins present in the cell membrane and thus, disrupts the cell membrane. For osmosis, a semi-permeable membrane is required, which is disrupted in this case. Therefore, osmosis will not occur. Hence, water does not enter the boiled potato cup.			
27.	a) Dry apricots in pure water and then in sugar solution: In pure water, dry apricots swell because water enters them by endosmosis (movement of water into the cells). When transferred to a sugar solution, apricots shrink because water moves out of them by exosmosis (movement of water out of the cells). b) Plasma membrane of a cell ruptures: If the plasma membrane ruptures, the cell loses its protective barrier. As a result, the contents of the cell leak out, and the cell dies. c) Rheo leaves boiled in water and then sugar syrup is added: Boiling kills the Rheo leaf cells and denatures their plasma membranes. When sugar syrup is added, no plasmolysis (shrinking of cytoplasm) occurs because the cells are already dead and cannot respond to the hypertonic solution.			
28.	a) CO₂ is a cellular waste which accumulates in high concentrations inside the cell and needs to be excreted out. In the cell's external environment, the concentration of CO₂ is low as compared to inside of the cell. CO₂ tends to move out by the process of diffusion. Similarly, O₂ enters the cell by the process of diffusion when the level or concentration of O₂ inside the cell decreases with respect to the outside. Thus, diffusion plays an important role in gaseous exchange between the cells as well as the cell and its external environment.			

V.	LONG ANSWER TYPE QUESTIONS (5 MARKS):
29.	a) Structure of nucleus : 1. It is large and well organized in structure which controls all the cell activities and called as brain of the cell. 2. The nucleus contains a covering layer called a nuclear envelope which covers all the contents of the nucleus. 3. A nuclear membrane is a selectively permeable membrane. 4. The nucleus contains a dense network of fine fibrous called chromatin. 5. Chromatin is made up of DNA and nuclear proteins. 6. The nucleus contains nucleic acids such as DNA and RNA. Functions of the nucleus : 1. The chromatin part of the nucleus possesses all genetic information that is required for the growth and development of an organism, reproduction, metabolism, and behavior. 2. It plays a central role in cellular reproduction. b) 
30.	Plasmolysis is the process of shrinkage or contraction of the protoplasm of a plant cell as a result of loss of water from the cell. Plasmolysis can be demonstrated by placing Rheo leaves in a concentrated sugar solution. Due to exosmosis, the protoplasm shrinks away from the cell wall, and the cell becomes plasmolysed. On observation under a microscope, the gap between the cell wall and plasma membrane can be clearly seen.
VI	SOURCE BASED/CASE BASED QUESTION (4 MARKS):
31.	a) Beaker 1: Hypotonic solution (the solution has a lower solute concentration than the potato cells → water enters → cube swells) Beaker 2: Hypertonic solution (the solution has a higher solute concentration than the potato cells → water leaves → cube shrinks) Beaker 3: Isotonic solution (the solution has the same solute concentration as the potato cells → no net movement of water → cube remains the same size) Reason:

	In Beaker 3, since the solution is isotonic, there is no net gain or loss of water, so the potato cube remains unchanged. b) The cell sap of root hair has a higher concentration of salts as compared to the outside soil water. c) Osmosis: Movement of water molecules from a region of higher water concentration to a region of lower water concentration through a semi-permeable membrane. Significance in plants: Maintains turgor pressure which keeps the plant upright. Helps in water absorption from the soil. Facilitates transport of nutrients dissolved in water.
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Prepared by:

Ms Shruti Mukundan

Checked by:

HoD Science