

The Fundamental Unit of Life

Case Study Based Questions

Case Study 1

Diffusion is the process of movement of molecules under a concentration gradient. It is an important process occurring in all living beings. Diffusion helps in the movement of substances in and out of the cells. The molecules move from a region of higher concentration to a region of lower concentration until the concentration becomes equal throughout.

Read the given passage carefully and give the answer of the following questions:

Q1. Name the process which is useful for the movement of substances like CO₂ and O₂ across the plasma membrane.

- a. Osmosis
- b. Diffusion
- c. Endocytosis
- d. Plasmolysis

Q2. Osmosis is the diffusion of:

- a. Water
- b. Free energy
- c. Solute and solvent
- d. None of these

Q3. Diffusion finally stops when:

- a. concentration of particles of one region becomes higher than the other.
- b. concentration of particles of one region becomes lower than the other.
- c. concentration of particles of two regions becomes the same.
- d. None of the above

Q4. Which of the following statement defines hypertonic solutions?

- a. A solution that has a lesser concentration of solutes on the outside of a cell when compared with the inside of a cell.
- b. A solution that has a greater concentration of solutes on the outside of a cell when compared with the inside of a cell.
- c. A solution that has same concentration of solutes on the outside of a cell when compared with the inside of a cell.
- d. None of the above

Q5. If the two solutions have same concentrations, they are said to be:

- a. Isotonic
- b. Hypertonic
- c. Hypotonic
- d. Dilute

Solutions

1. (b) Diffusion
2. (a) Water
3. (c) concentration of particles of two regions becomes the same
4. (b) A solution that has a greater concentration of solutes on the outside of a cell when compared with the inside of a cell.
5. (a) Isotonic

Case Study 2

The nucleus is a membrane-bound organelle found in eukaryotic cells. It is found in the middle of the cells, and it contains DNA arranged in chromosomes. It is surrounded by the nuclear envelope, a double nuclear membrane, which separates the nucleus from the cytoplasm. The outer membrane is continuous with the rough endoplasmic reticulum. The nuclear envelope contains pores which control the movement of substances in and out of the nucleus.

Read the given passage carefully and give the answer of the following questions:

Q1. Nucleus was discovered by:

- a. Leeuwenhoek
- b. Purkinje
- c. Robert Brown
- d. Robert Hooke

Q2. Which part of the cell helps the transfer of material from the nucleus to the cytoplasm?

- a. Nuclear pores
- b. DNA
- c. Chromatin material
- d. None of these

Q3. What is the function of nucleus of a cell?

- a. It controls all the metabolic activities of the cell.
- b. It bring about growth of the cell by directing the chemical activities of the cell.
- c. controls the heredity characteristics of an organism.
- d. All of the above

Q4. Which of the following statement is true about chromosomes?

- a. It is present within the nucleus.
- b. It carries genes and helps in inheritance.
- c. They are visible as rod-shapes structures only when the cell is about to divide.
- d. All of the above

Q5. The main difference between eukaryotes and prokaryotes is:

- a. eukaryotes have nucleoid and prokaryotes have nucleus.
- b. eukaryotes have nucleus and prokaryotes have nucleoid.
- c. eukaryotes do not have membrane-bound cell organelles while prokaryotes have membrane bound cell organelles.
- d. eukaryotes are unicellular and prokaryotes are multicellular.

Solutions

1. (c) Robert Brown
2. (a) Nuclear pores

3. (d) All of the above
4. (d) All of the above
5. (b) eukaryotes have nucleus and prokaryotes have nucleoid.

Case Study 3

A cell is the basic structural and functional unit of a living organism, which makes anything alive and is self-sufficient to carry out all the fundamental functions of an organism. A small organ-like structure present inside the cell is called a cell organelle. It has a particular structural makeup and performs a specific function. They coordinate and function efficiently for the normal functioning of the cell. A few of them function by providing shape and support, whereas some are involved in the locomotion and reproduction of a cell.

Read the given passage carefully and give the answer of the following questions:

Q1. Organelles that are surrounded by two membranes are:

- a. nucleus and mitochondria
- b. nucleus and Golgi bodies
- c. endoplasmic reticulum and lysosomes
- d. endoplasmic reticulum and mitochondria

Q2. The organelles that are present in eukaryotes but not in prokaryotes is/are:

- a. Golgi apparatus
- b. vacuoles
- c. ribosome
- d. Both a. and b.

Q3. From the following, an organelle with ribosomes attached to its surface is:

- a. chloroplast
- b. rough endoplasmic reticulum
- c. smooth endoplasmic reticulum
- d. mitochondria

Q4. Select the incorrect statement regarding cell organelles.

- a. Lysosomes are a kind of waste disposal system of the cell.
- b. Mitochondria and chloroplast are similar in external structure.
- c. Vacuoles are small-sized in animal cells, while plant cells have very large vacuoles.
- d. SER is involved in storage, modification and packaging of products in vesicles.

Q5. Match the columns and select the correct option.

Column I	Column II
A. Lysosomes	(i) Powerhouses of the cell
B. Chloroplasts	(ii) Storage of amino acids, sugars, etc.
C. Vacuoles	(iii) Suicide bags of cell
D. Mitochondria	(iv) Kitchen of the cell

- a. A-(iv), B-(iii), C-(ii), D-(i)
- b. A-(iii), B-(i), C-(ii), D-(iv)
- c. A-(iii), B-(iv), C-(ii), D-(i)
- d. A-(iv), B-(ii), C-(i), D-(iii)

Solutions

- 1. (a) nucleus and mitochondria
- 2. (d) Both a. and b.
- 3. (b) rough endoplasmic reticulum
- 4. (d) SER is involved in storage, modification and packaging of products in vesicles.
- 5. (c) A-(iii), B-(iv), C-(ii), D-(i)

Case Study 4

Rohan carried out the following osmosis experiment:

He took 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.

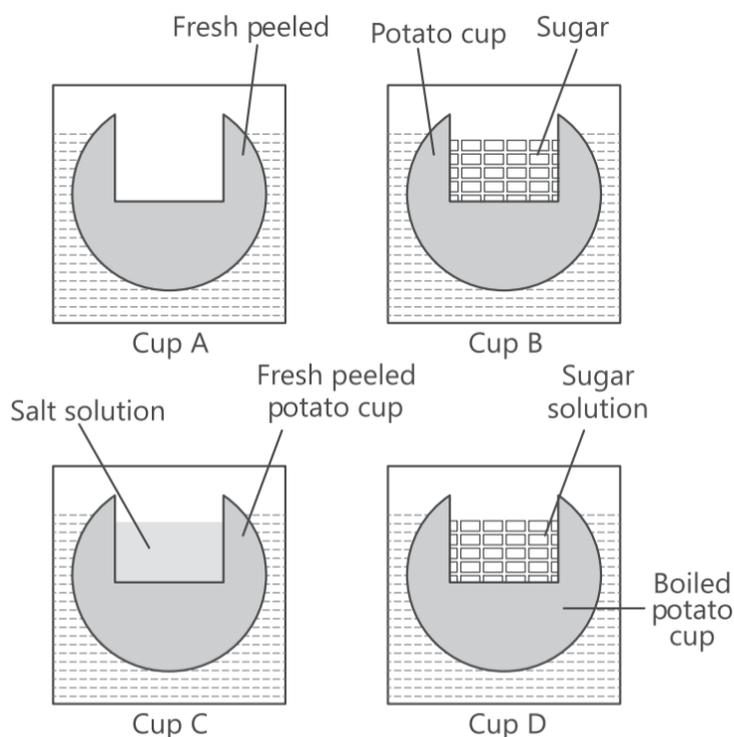
Put each potato cup in a trough containing water.

Now,

- (i) keep cup an empty.
- (ii) put one teaspoon sugar in cup B.

(iii) put one teaspoon salt in cup C.

(iv) put one teaspoon sugar in the boiled potato cup D.



Keep these for two hours and then observe the four potato cups.

Read the given passage carefully and give the answer of the following questions:

Q1. Explain why water gathers in the hollowed portion of B and C.

Q2. Why is potato A necessary for this experiment?

Q3. Explain why water does not gather in the hollowed-out portions of A and D.

Q4. Write down two differences between diffusion and osmosis?

Q5. State two conditions required for osmosis.

Solutions

1. Since, sugar and salt were present in B and C respectively, water from the trough gathered in the hollowed portions of potato in B and C by the process of osmosis through the semipermeable membrane of potato.

2. Potato A is necessary for carrying out this experiment because it helps us to check what changes occurred during the course of the experiment and helps us to compare the results.

3. Water does not gather in the hollowed portion of potato A as it was empty. Water also does not gather in the cup D because the potato used was boiled and has lost its semipermeable membrane.

4. Differences between Diffusion and Osmosis:

Diffusion	Osmosis
It can occur in any medium.	It occurs only in liquid medium.
The diffusing molecules may be solids, liquids or gases.	It involves the movement of solvent molecules only.
Semipermeable membrane is not required.	Semipermeable membrane is required.

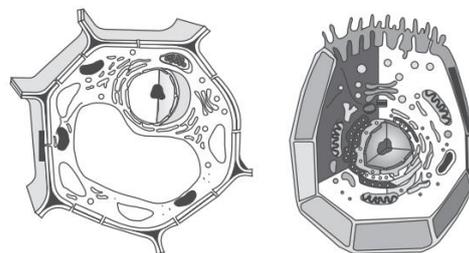
5. Conditions for osmosis are:

(i) There should be two solutions of different concentrations.

(ii) The membrane separating these two solutions should be semipermeable.

Case Study 5

Plants and animals are made up of millions of cells and these cells have several similarities and differences. Structurally, plant and animal cells are very similar because they are both eukaryotic cells. They both contain membrane-bound organelles such as the nucleus, mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, and vacuoles.



Read the given passage carefully and give the answer of the following questions:

Q1. Create a Venn diagram to compare the structure of plant and animal cells.

Q2. What will happen, if we put a plant and animal cell in an isotonic solution?

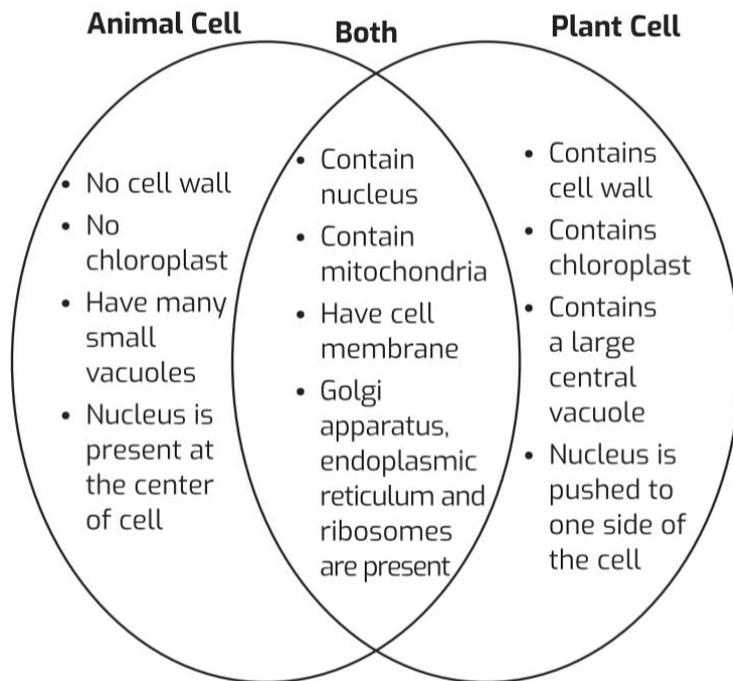
Q3. Write the functions of cell wall in plant cell.

Q4. Name the largest animal cell.

Q5. Name two organisms (other than plants) with cell wall.

Solutions

1.



2. If plant and animal cells are kept in isotonic solutions then cells will not swell or shrink. Hence, there will not be any change in cells.

3. Cell wall permits the cells of plants to withstand very dilute (hypotonic) external media without bursting. Also, plant cells can withstand much greater changes in the surrounding medium because of cell wall.

4. Largest animal cell is ostrich egg.

5. Fungi and bacteria.