

2

Cell – The Building Block of Life

1. Differentiate between the following pairs of terms based on the clues given in parentheses:

(i) Cell membrane and cell wall (permeability)

Feature	Cell Membrane	Cell Wall
Nature	Flexible and thin	Rigid and thick
Permeability	Selectively permeable	Fully permeable
Presence	All cells	Only plant cells
Function	Controls entry & exit	Provides support & protection

(ii) RER and SER (structure)

Feature	Cell Membrane	Cell Wall
Nature	Flexible and thin	Rigid and thick
Permeability	Selectively permeable	Fully permeable
Presence	All cells	Only plant cells
Function	Controls entry & exit	Provides support & protection

(iii) Chloroplasts and chromoplasts (pigments)

Feature	Chloroplasts	Chromoplasts
Pigment	Chlorophyll (green)	Carotenoids (red, yellow, orange)
Function	Photosynthesis	Provide colour to fruits & flowers
Presence	Green parts of plants	Fruits, flowers

2. Two similar animal cells are placed in two different solutions:

- Cell X is placed in pure water.
- Cell Y is placed in a concentrated salt solution.

Cells are observed after some time. Cell X swells, and Cell Y shrinks.

Which statement provides the correct explanation for the above observations?

- Salt molecules moved into Cell Y, causing it to shrink.
- Water moved into Cell X and more water moved out of Cell Y than the salt solution entered in it.
- Water moved into Cell X and moved out of Cell Y through the cell membrane.
- Solute movement caused osmosis in both cells.

Ans:

(ii) Water moved into Cell X and more water moved out of Cell Y than the salt solution entered in it.

Water movement explanation:

- Cell X → Gains water → Swells (Hypotonic solution)
- Cell Y → Loses water → Shrinks (Hypertonic solution)

3. Look at the diagram of a cell in Fig. 2.20. Identify the parts labelled from (a) to (g) and correctly match them with their functions given below:

- (i) Controlling all the activities of a cell.
- (ii) Site of cellular respiration.
- (iii) Storage organelle that also provides rigidity to the cell.
- (iv) Separates the cell contents from surroundings.
- (v) Provides structural rigidity to the cell.
- (vi) Packs and stores materials received from ER.
- (vii) Helps in manufacturing food.

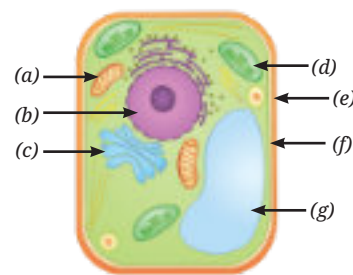


Fig. 2.20

Ans:

Function	Correct Organelle
(i) Controlling all activities	Nucleus
(ii) Site of cellular respiration	Mitochondria
(iii) Storage organelle	Vacuole
(iv) Provides rigidity	Cell wall
(v) Separates contents from surroundings	Cell membrane
(vi) Packs and stores materials	Golgi apparatus
(vii) Helps in manufacturing food	Chloroplast

4. Which of the following option(s) of the pairs of cell organelles are correctly placed under the given categories?

Option	Present in the plant cells	Absent in the animal cells
(i)	Leucoplast ✓	Cell wall ✓
(ii)	Mitochondria ✓	Ribosome ✗
(iii)	Cell wall ✓	Golgi apparatus ✗
(iv)	Lysosome ✗	Endoplasmic reticulum ✗

5. Two students, Renu and Rohit, were having a discussion on the plastids. Renu emphasised that all parts of the plants, even roots, contain plastids. However, Rohit did not agree with the statement and told her that plastids are absent in plant roots since the roots are underground and do not need to perform photosynthesis. Who is correct? Justify your answer.

Ans: Renu is correct

Explanation:

- Plastids are present in roots but not chloroplasts
- Roots do not perform photosynthesis
- They contain leucoplasts for storage

6. Mitochondria and chloroplasts are two important organelles in a plant cell. Discuss how these two organelles are structurally and functionally similar to each other, and different from each other.

Ans:

Feature	Mitochondria	Chloroplast
Function	Energy production (ATP)	Photosynthesis
Presence	All eukaryotic cells	Only plant cells
Pigment	Absent	Chlorophyll present
Structure	Double membrane	Double membrane + thylakoids

7. Which of the following pairs of cell organelles contains DNA?

- (i) Chloroplasts, Ribosomes
- (ii) Mitochondria, Nucleus
- (iii) Golgi bodies, Ribosomes
- (iv) Nucleus, Lysosomes

Ans: (ii) Mitochondria, Nucleus

Explanation:

Both mitochondria and nucleus contain their own DNA.

8. A researcher carried out an experiment in which she took two carrots of similar size. She placed one carrot in plain water and the other carrot in concentrated salt solution (Fig. 2.21). After 24 hours she recorded her observations.

- (i) What hypothesis does she want to test through this experiment?
- (ii) What would you suggest for the improvement of this experiment?
- (iii) Why does the carrot in plain water stay stiff and crunchy, but the carrot in concentrated salt solution become rubbery and limp?

Ans:

(i) Hypothesis:

- Salt solution will cause water to move out of carrot due to osmosis.

(ii) Improvement:

- Use equal size carrot pieces
- Maintain controlled conditions
- Measure weight precisely

(iii) Conclusion:

- Water moves from dilute to concentrated solution
- Demonstrates osmosis

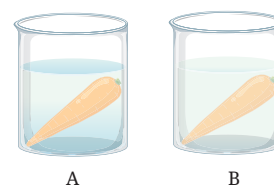


Fig. 2.21: Experimental set-up having carrot (a) in plain water, and (b) in salt solution

9. Indicate the presence or absence of following structures in bacterial and animal cells:

Structures in a cell	Bacterial cell	Animal cell
Chromosome	✓	✓
Nucleus	✗	✓
Mitochondria	✗	✓
Golgi complex	✗	✓
Chromoplasts	✗	✗

10. Carry out the following 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.

One of these potato cups should be made from a boiled potato.

Place each of the potato cups in a beaker containing water (Fig. 2.22).

Now, set up the experiment as follows:

- (a) Keep Cup A empty.
- (b) Add one teaspoon sugar in Cup B.
- (c) Add one teaspoon salt in Cup C.
- (d) Add one teaspoon sugar in the boiled potato in Cup D.

Observe the four potato cups at least two hours and answer the following questions:

- (i) Explain why water gathers in the hollowed portion of Cup B and Cup C.
- (ii) Why is Cup A necessary for this experiment?
- (iii) Explain why water does not gather in the hollowed portions of Cups A and D.

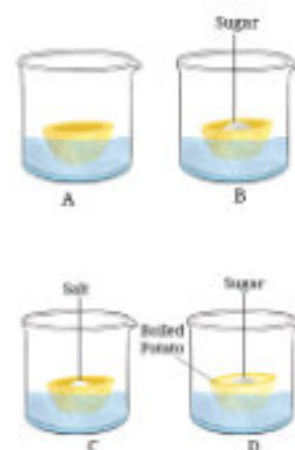


Fig. 2.22: Experimental set-up

Ans:

(i) Why water gathers in hollowed portion?

Ans: Because of osmosis, water moves into region with higher solute concentration.

(ii) Why Cup A is necessary?

Ans: Acts as a control experiment for comparison.

(iii) Why water does not gather in some cups?

Ans: No concentration difference → no osmosis.

11. Identify the pair that incorrectly matches the cell organelle with its function.

(i) Ribosome — Protein synthesis

(ii) SER — Lipid and cellulose synthesis

(iii) Lysosome — Digestion of foreign agents

Ans:

SER — Lipid and cellulose synthesis (Incorrect)

Smooth Endoplasmic Reticulum (SER) helps in lipid synthesis, but cellulose is synthesized in the cell wall, not by SER.

12. What outcome do you expect, if all the mitochondria are removed from a eukaryotic cell?

Ans: If mitochondria are removed Cell will die because:

- No ATP production
- No energy for life processes

13. Which phenomenon inhibits the formation of tumors in the human body? Can plants also develop tumors? Explain.

Ans:

The phenomenon that inhibits the formation of tumors is controlled cell division, especially through mechanisms like cell cycle regulation and programmed cell death (apoptosis). In normal cells, division is strictly regulated, and damaged or abnormal cells are destroyed through apoptosis. This prevents uncontrolled growth of cells, which could otherwise lead to tumor formation.

Yes, plants can also develop tumors, but they are different from animal tumors. In plants, tumors are usually caused by infections such as bacteria (e.g., *Agrobacterium tumefaciens*) or by uncontrolled cell growth due to abnormal conditions.

14. The cell membrane of a cell is made up of proteins and lipids. Which cell organelles help in the synthesis of cell membrane? Write the path of these compounds from their site of synthesis to the cell membrane and show this through a labelled diagram.

Ans: The cell membrane is made up of proteins and lipids, and their synthesis involves the following organelles:

- Ribosomes → synthesize proteins
- Rough Endoplasmic Reticulum (RER) → helps in protein transport
- Smooth Endoplasmic Reticulum (SER) → synthesizes lipids
- Golgi Apparatus → modifies, packages, and transports proteins and lipids

Path of Proteins and Lipids to Cell Membrane

- Proteins are synthesized by ribosomes attached to the RER.
- These proteins are transported through the RER.
- Lipids are synthesized in the SER.
- Both proteins and lipids are sent to the Golgi apparatus.
- The Golgi apparatus modifies and packages them into vesicles.
- These vesicles move to the cell membrane and fuse with it, adding proteins and lipids to the membrane.

15. What would happen if gametes are formed by mitotic divisions?**Ans:**

If gametes were formed by mitotic division, they would have the same (diploid) number of chromosomes as body cells instead of half. As a result, during fertilization, the chromosome number would double in each generation (for example, $2n + 2n = 4n$), leading to genetic imbalance. This would disturb the stability of chromosome number in a species and could cause abnormalities or failure of proper development. Therefore, meiosis is necessary to maintain the constant chromosome number across generations.

16. A farmer, Deepa, was very happy with the harvest of amla (Indian Gooseberry) and lemons on her farm. However, she could sell only one fourth of the produce in the local market. Recognising that a significant amount of produce may be lost post-harvest, she employed a traditional yet scientifically sound method to extend the shelf life of amla and lemons. She turned perishable produce into profitable products, such as pickles and sharbat. She used the excess produce to prepare pickles, murabbas, and sharbat by adding appropriate amounts of salt, sugar, or jaggery to small pieces of fruit and their juices. These were then stored in small glass bottles for sale, helping her prevent the wastage of post-harvest produce. This shift from farming to agro-processing would strengthen food security and boost the local economy, creating a sustainable model that cuts waste while increasing her income. Based on the above passage answer the following questions:

- (i) Which scientific concept has the farmer applied in the preservation of the farm produce?
- (ii) How does the addition of high concentrations of salt and sugar create an environment that prevents the growth of spoilage-causing bacteria and fungi?
- (iii) Suggest a healthy recipe of this kind for food preservation.
- (iv) What are the scientific values addressed in this case?

Ans:

- (i) The farmer has applied the concept of food preservation using osmosis. By adding high concentrations of salt, sugar, or jaggery, she creates conditions that prevent the growth of microorganisms and increase the shelf life of the produce.
- (ii) High concentrations of salt or sugar create a hypertonic environment around microorganisms. Due to osmosis, water moves out of the microbial cells, causing them to shrink (plasmolysis). This loss of water inhibits their growth and reproduction, thereby preventing spoilage of food.
- (iii) A healthy recipe is Amla Murabba. Fresh amla fruits are washed, pricked, and boiled slightly to soften them. They are then soaked in a concentrated sugar syrup and left for a few days until the syrup is absorbed. The murabba is stored in clean glass jars, which helps preserve the fruit for a long time while retaining its nutritional value, especially vitamin C.
- (iv) The scientific values demonstrated in this case include:
 - Application of scientific knowledge in real-life situations
 - Prevention of food wastage
 - Sustainable use of resources
 - Innovation and entrepreneurship
 - Contribution to food security and economic growth