UNIT II

The World of Living

Experiment 18

Aim

To prepare a stained, temporary mount of onion peel and to study its cells.

Theory

All living organisms are composed of cells. New cells arise by the division of pre-existing cells. Cell is the structural and functional unit of life. In plants, cells have an outermost rigid cell wall beneath which is a cell membrane. The cell membrane encloses cytoplasm, cell organelles, and a nucleus.

Materials Required

An onion bulb, slides, cover slips, two watch glasses, needle, brush, forceps, razor blade, compound microscope, blotting paper, methylene blue (or safranin) solution, glycerine, and water.

Procedure

1. Take one fleshy scale leaf of an onion. Break it into two and using a forcep pull out a thin membranous peel adhering to the inner surface of the leaf. This is the epidermal peel.
2. Place the peel in a watch glass containing water and cut it into small rectangular pieces.

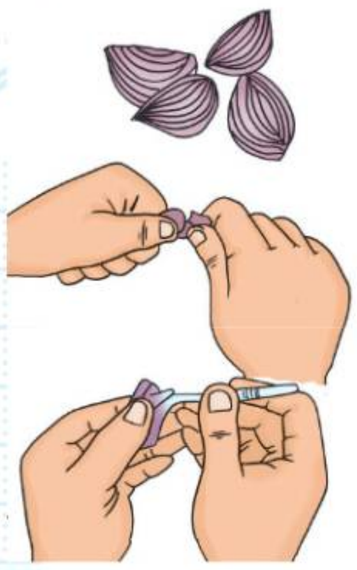


Fig. 18.1 : *(a) Method of removing an epidermal peel from onion leaf*

3. Mix 1 or 2 drops of methylene blue or safrarin in a small quantity of water taken in another watch glass and transfer the peels into it. Leave the peels for about 3 minutes. Dip the peel in water to remove excess stain.
4. Take a clean slide with a drop of glycerine in the middle and using a brush transfer the washed and stained peel on to it.
5. Place a cover slip over it by slowly lowering it with a needle. Avoid entry of air bubbles.
6. Remove excess glycerine from the edges of cover slip with the help of a piece of blotting paper.
7. Observe the slide under the microscope, first in low power and then in high power.
8. Draw a labelled diagram of the cells as seen under microscope.
9. Note the features listed in the observation table.

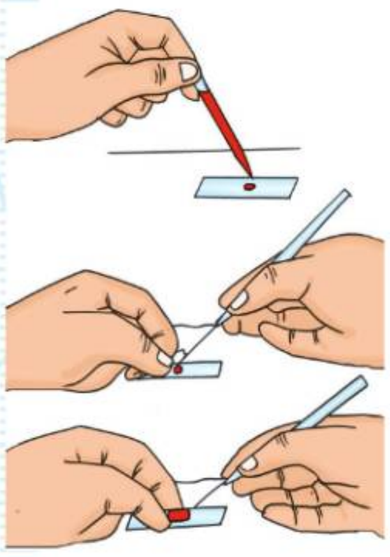


Fig. 18.1 : *(b) Staining and mounting the onion peel*

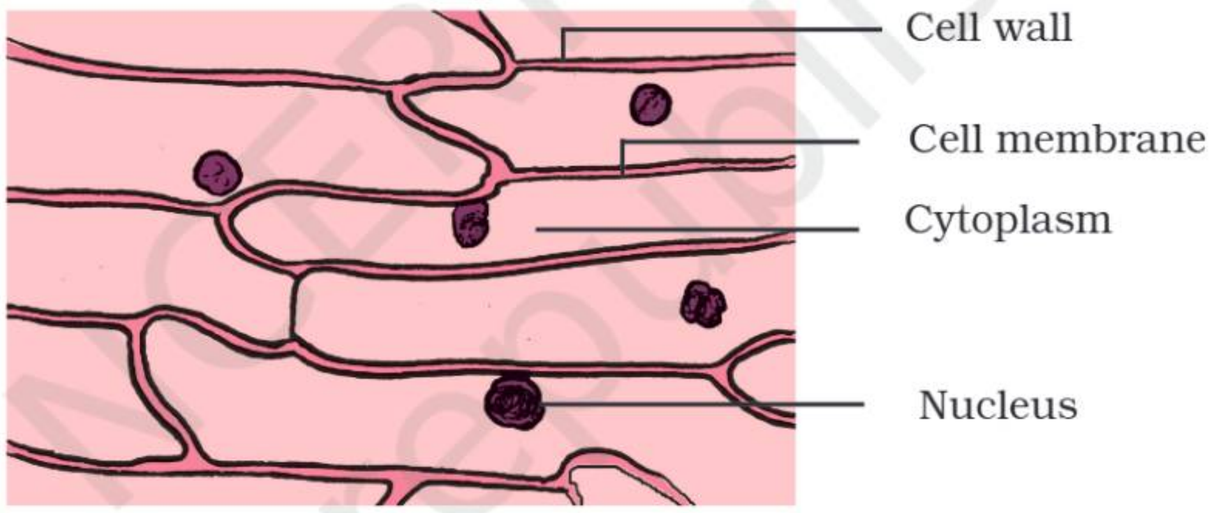


Fig. 18.2 : *Epidermal cells of an onion peel*

OBSERVATION TABLE

Sl.No.	Feature	Observation
1.	Shape of cells	spherical/oval/rectangular/square
2.	Arrangement of cells	compact/loose
3.	Inter-cellular spaces	present/absent
4.	Nucleus	present/absent
5.	Cell wall	present/absent
6.	Stained portions of cell	cell wall/cytoplasm/nucleus
7.	Unstained portions of cell	cell wall/cytoplasm/vacuole

Results and Discussion

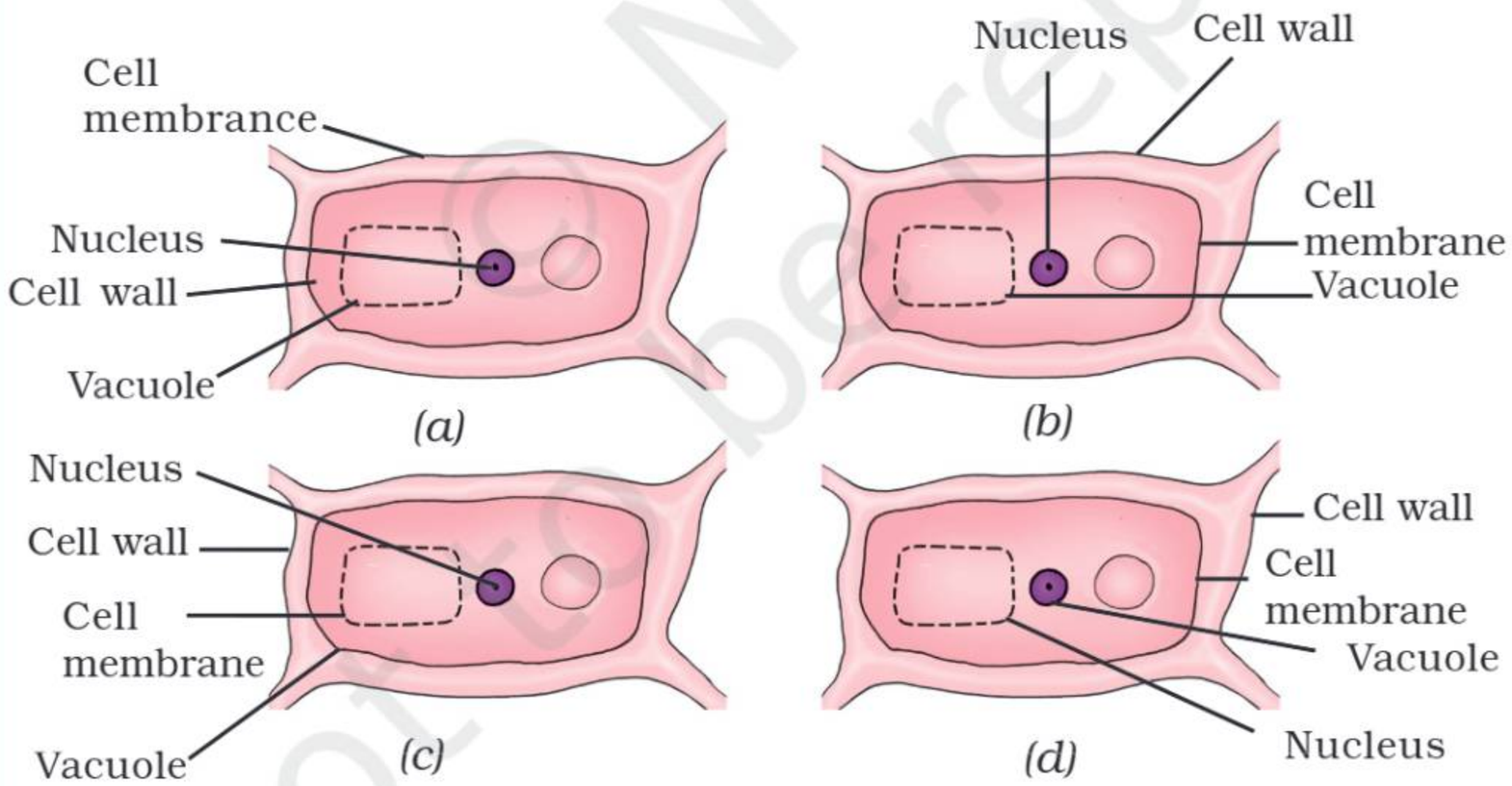
The cells that form the peel are rectangular in shape, compactly arranged and without any intercellular spaces. Each cell has a distinct cell wall, a prominent nucleus and a vacuole. The cells form the outer layer of the leaf known as epidermis.

Precautions

- Staining of the peel must be appropriate. Excess stain can be removed by rinsing the peel with water taken in a watch glass.
- Use a brush to transfer the peel on to the slide.
- While placing the cover slip care should be taken to avoid air bubbles.

Questions

- What is the size of nucleus in relation to size of cell?
- Name the stained parts of the cell.
- Pick the odd one out. (a) plastids, (b) large vacuoles, (c) cell wall, (d) centrioles.
- Which of the following is a correctly labeled cell of an onion peel?



Experiment 19

Aim

To prepare a temporary mount of human cheek epithelial cells, and to study its characteristics.

Theory

Like plants, the body of all animals including humans is composed of cells. Unlike plant cells, animal cells do not have cell wall. The outermost covering of an animal cell is a cell membrane. The cytoplasm, nucleus and other cell organelles are enclosed in it. Epithelial tissue is the outermost covering of most organs and cavities of an animal body.

Materials Required

Methylene blue stain, glycerine, a compound microscope, slide, cover slip, a clean spatula or a toothpick, a brush, a needle, and a piece of blotting paper.

Procedure

1. Rinse your mouth with fresh water.
2. With the help of a clean spatula or a toothpick, gently scrap the inner side of your cheek.
3. Transfer the scrapped material into a drop of water taken on a clean slide.

4. With the help of a needle spread the material uniformly.
5. Add a drop of methylene blue stain. After about 3 minutes put a drop of glycerine over it.
6. Place a clean cover slip over the glycerine. Remove the excess glycerine from the edges of cover slip with the help of a piece of blotting paper.
7. Examine the slide under microscope, first under low power and then under high power.
8. Draw diagrams of cells as seen under the microscope. Observe and record the features.

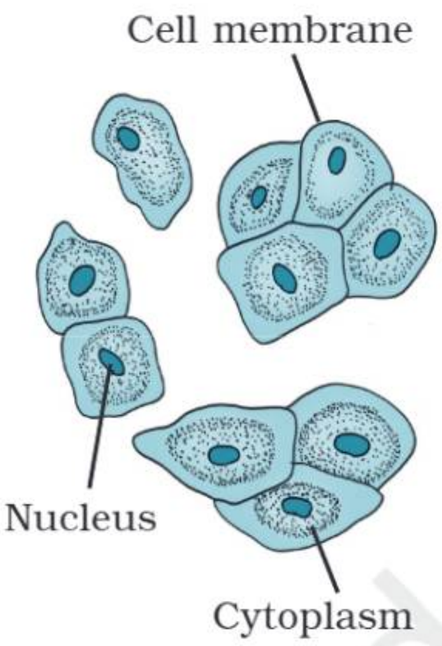


Fig. 19.1 : *A few Cheek cells*

OBSERVATIONS

Sl.No.	Feature	Observation
1.	Shape of cells	
2.	Arrangement	
3.	Intercellular space	
4.	Cell wall	present/absent
5.	Cell membrane	present/absent
6.	Cell contents	
7.	Vacuoles	

RESULTS AND DISCUSSION

Epithelial cells are small, polygonal in shape and compactly arranged to form a continuous layer. The cells are without cell wall. Cell membrane encloses a distinct nucleus and a vacuole. Epithelial tissue forms the outermost covering of almost all the organs and various cavities of animals and human.

PRECAUTIONS

- Cheeks should be scrapped gently to prevent injury.
- Spread the material on the slide so that it forms a thin uniform layer.
- Avoid over staining (or understaining) of the material.
- While mounting the cover slip, avoid entry of air bubbles.

NOTE FOR THE TEACHER

In such temporary preparations, cytoplasmic organelles are not visible because they are too small and are not stained by methylene blue.

QUESTIONS

- Arrange the following steps in correct sequence–
  (i) Putting a drop of glycerine on the cheek cells on a slide,
  (ii) Scrapping the inner side of cheek,
  (iii) Adding methylene blue stain, and
  (iv) Placing the cover slip over the material.
  (a) i, ii, iii, iv; (b) ii, i, iv, iii; (c) iv, ii, iii, i; (d) ii, iii, i, iv.
- Which one of the following is absent in animal cells–
  (a) Cell membrane, (b) Nucleolus, (c) Cell wall, (d) Cytoplasm
- Cheek epithelial cells are an example of
  (a) squamous epithelial cells, (b) cuboidal epithelial cells,
  (b) columnar epithelial cells, (d) all of these.
- Why are cheek epithelial cells always moist?
- Name two structures which you would see in cheek cells if you were using a very high magnifying power of microscope?

Experiment 20

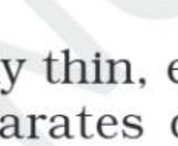
Aim

To study the phenomenon of osmosis.

Theory

Every living cell has an extremely thin, elastic cell membrane, also called plasma membrane, which separates cell contents from the external environment. It is the outermost covering of animal cells. In plant cells, the membrane is present below the cell wall. It is selectively permeable as it allows solvent molecules and only selected solute molecules to pass through it. It differs from a permeable membrane which allows all types of molecules to pass through it. Movement of molecules of water or solvent from a region of its higher concentration to the region of its lower concentration across a selectively permeable membrane is called *osmosis*. It is of two types – endosmosis and exosmosis. Endosmosis is the entry of water into the cell while exosmosis is the movement of water out of the cell into the external solution. Endosmosis takes place, when the cell is placed in a hypotonic solution. Exosmosis takes place when the cell is placed in a hypertonic solution.

Materials Required



Two raw eggs, dil. hydrochloric acid, a salt (or sugar) solution of about 25% concentration in water (dissolve about 25 g salt in 100 mL water), beakers and petri dishes.

PROCEDURE

1. Dissolve the shells of two eggs by placing them in two separate beakers containing dil. HCl. Hydrochloric acid dissolves the calcium chloride of the egg shells. The eggs will become de-shelled.
2. Carefully drain off the acid from the beakers and wash the eggs thoroughly with water while they are still in the beakers. Repeat this process several times till all traces of acid are completely removed.
3. Observe the de-shelled eggs.
4. Fill one beaker containing one de-shelled egg with water and the other beaker with another de-shelled egg with the concentrated salt (or sugar) solution.
5. Leave the set up for about four hours and observe the two de-shelled eggs.

OBSERVATIONS

Observe the de-shelled eggs before and after placing them in water and concentrated salt (or sugar) solution respectively. And answer the following–

(i) What has happened to the de-shelled egg placed in water?

(ii) What has happened to the de-shelled egg placed in salt (or sugar) solution?

RESULTS AND DISCUSSION

The de-shelled egg when placed in water swells because the concentration of water molecules outside the egg is much higher than the concentration of water molecules inside the egg, as a result of which endosmosis takes place and water from the beaker enters into the egg. Exosmosis takes place when the de-shelled egg is placed in a sugar (or salt) solution. The water comes out from the de-shelled egg into the (or salt) sugar solution. The loss of water results in the shrinkage of the egg.

PRECAUTIONS

- While washing the de-shelled eggs, care should be taken to prevent the damage of egg membrane.
- Use dil. hydrochloric acid only lest the egg membrane gets damaged.

QUESTIONS

- What is the difference between endosmosis and exosmosis?
- What will happen if a de-shelled egg is placed in a solution with the same osmotic concentration as in the egg?
- Why did the egg swell when placed in water?
- Movement of water during osmosis takes place across–
  (a) cell wall, (b) cell membrane, (c) cytoplasm, (d) protoplasm.
- The plasma membrane which selectively allows solvent molecules and solute molecules to pass through it is–
  (a) a permeable membrane, (b) a selectively permeable membrane, (c) an impermeable membrane, (d) a semi-permeable membrane.