SECTION A : PLANT LIFE

1 UNIT

MITOSIS

EXPERIMENT-1

Aim of the Experiment

To identify different stages of mitosis in plant cells from permanent slides. Also, to draw labelled diagrams.

Materials Required

Compound microscope, note-book, pencil, permanent slides of mitosis, etc.

Theory

A cell is the structural and functional unit of body. The formation of daughter cells from a single cell is called **cell division.** Cell division is essential for growth and repair of damaged parts. It is of three types—Mitosis, Meiosis and Endomitosis.

Mitosis or equational division is a type of cell division where a parent cell produces two identical daughter cells having the same number of chromosomes that of the parent cell. If the parent cell is diploid ($2n$), the daughter cells will be also diploid (n). Hence, mitosis is also known as equational division. Mitosis occurs usually in somatic or vegetative or asexual cells. So, mitosis is also known as somatic or vegetative or asexual cell division.

Mitosis mainly involves two processes—karyokinesis (nuclear division) and cytokinesis (division of cytoplasm) to form two daughter cells.

Root tips of plants contain meristematic cells and are the most suitable material to study mitosis. The chromosomes of monocotyledons plants (like onion) are large sized with better visibility. So, onion root tips are used to study mitosis. Anthers of onion or *Tradescantia* are used to study different stages of meiosis.

Procedure

- Take compound microscope to observe a permanent slide.
- Adjust the given slide under low power of the compound microscope. Locate same cells on the screen.
- Adjust the objective lense into high power from low power.
- Try to identify the stages of mitosis.
- Draw labelled diagrams after your observation.

Observations

Rectangular cells with scattered pink nucleus are seen under low power of microscope.

Interphase

- A cell membrane and a cell wall are present as protective covering.
- A clear nuclear membrane is present.

- Chromatin material is present in the nucleus.
- Nucleolus is also distinct.

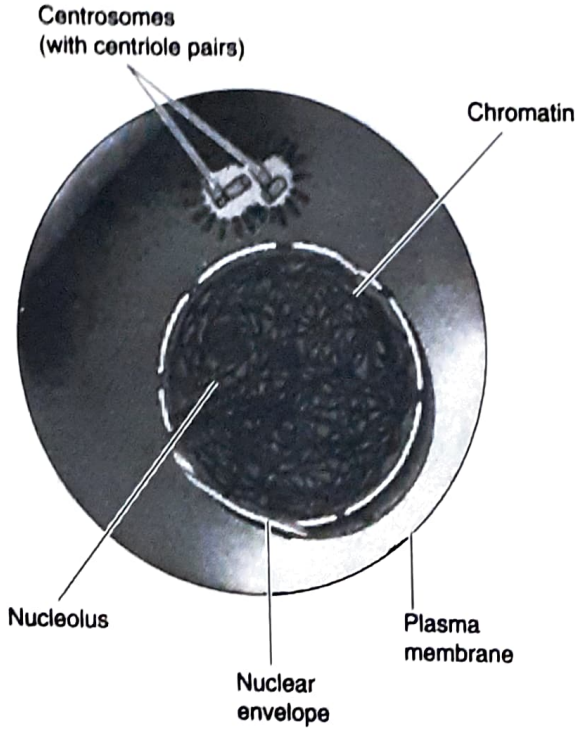


Fig. 1.1 Interphase

Prophase

- Nucleolus disappears and nuclear membrane starts to disappearing.
- Chromatin material forms chromosome.
- Chromosomes can be seen. One chromosome consists of one chromatid.

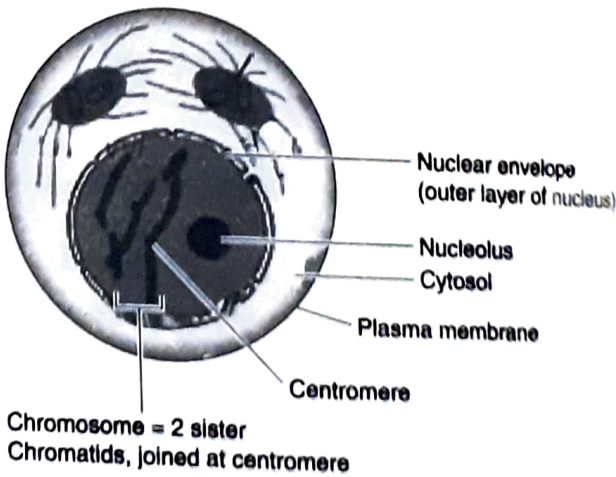


Fig. 1.2 Prophase

Metaphase

- Chromosomes become shortened and thickened.
- Nuclear membrane is absent.
- Chromosomes line up at centre of spindle making an equatorial plate or metaphasic plate.
- Centromere of a pair of chromatids attach to the equator of the spindle.

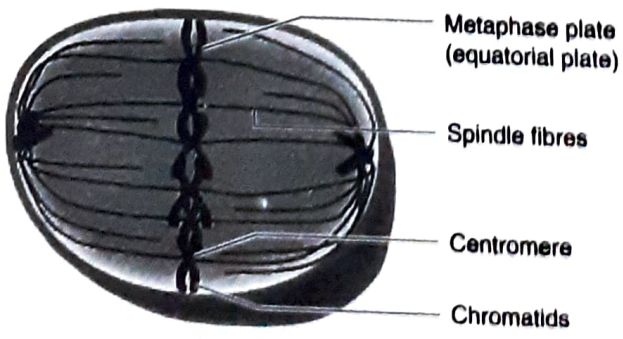


Fig. 1.3 Metaphase

Anaphase

- Centromere of each chromatids pair split into two daughter centromeres.
- Each chroma 'd possesses its own centromere.
- Daughter chromosomes appears as V, J, L and I-shaped based on the position of centromere.
- Daughter chromosomes move towards the opposite poles.

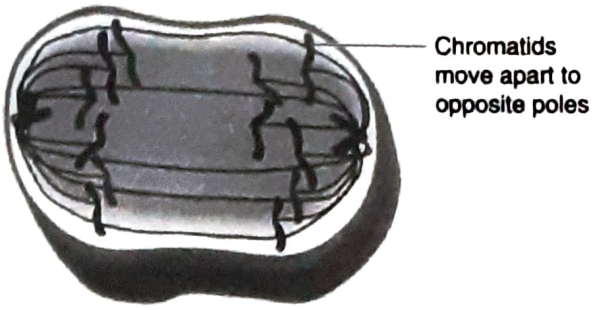


Fig. 1.4 Anaphase

Telophase

- Daughter chromosomes form a close set at each pole.
- Spindle disappears but nucleoli reappears.
- Nuclear membrane starts to form.
- Two daughter nuclei are formed.
- A cell plate is formed in the middle of two daughter nuclei. Thus, cell plate divides the cytoplasm into two new cells. This process is called **cytokinesis.**

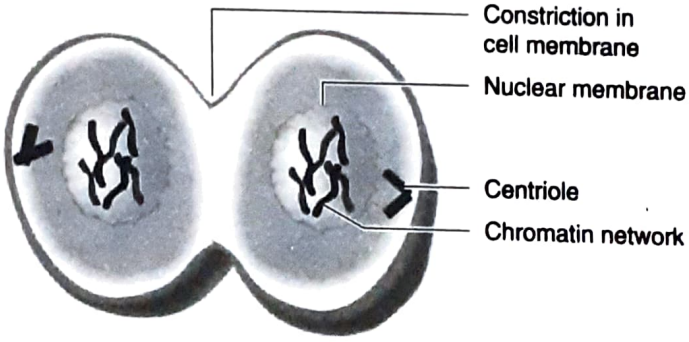


Fig. 1.5 Telophase

Result

All the stages of mitosis in plant cells have been observed.

Precautions

- Adjust the slide only under low power. It is avoided under high power.
- Fine adjustment screw is only used under high power.
- Don't move the slide fastly under high power.

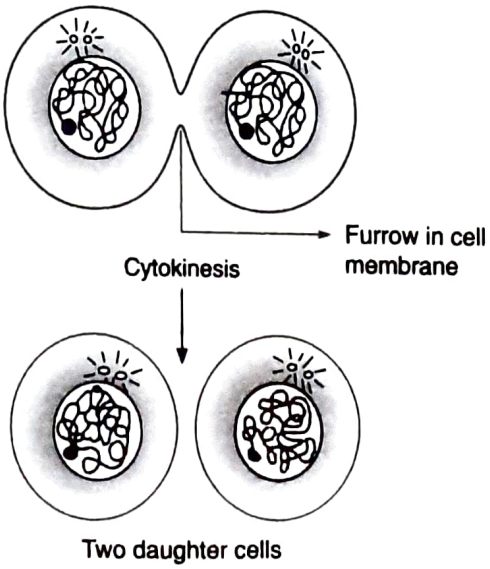


Fig. 1.6 Cytokinesis

2 UNIT

DIFFUSION, OSMOSIS AND ABSORPTION

EXPERIMENT-1

Aim of the Experiment

To demonstrate the phenomenon of diffusion.

Apparatus/Materials Required

Glass beaker, water, potassium permanganate crystals, etc.

Theory

The movement of molecules of a substance, *i.e.*, solid, liquid or gas from the region of their higher concentration to the region of their lower concentration until the equilibrium state, is called as **diffusion.** The movement of the particles occur due to their random kinetic force. In plants, diffusion is the only means for gaseous movement within the plant body. The fragrance of flowers like rose, micheli, etc., is due to diffusion. Factors affecting diffusion are—Gradient of concentration, temperature, pressure and permeability of membrane.

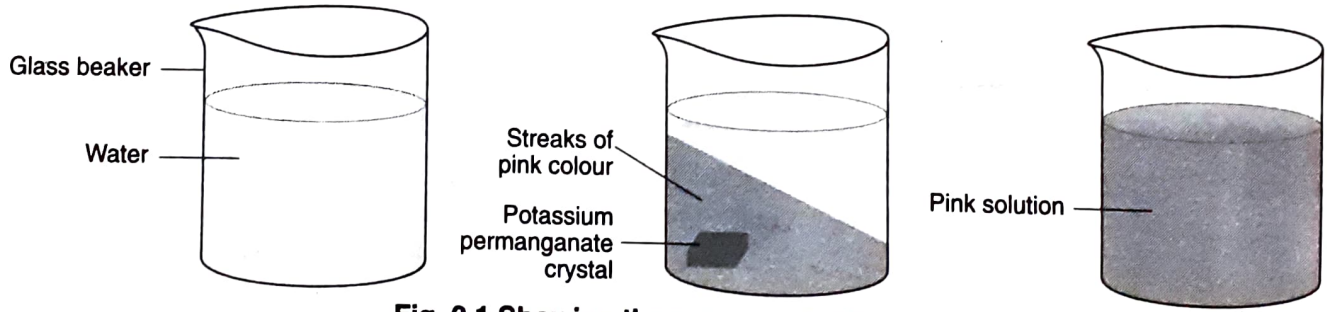


Fig. 2.1 Showing the process of diffusion

Procedure

- Take a clean beaker.
- Fill the beaker up to 2/3 level with water.
- Drop some crystals of potassium permanganate in it.
- Keep the beaker undisturbed and observe.

Observations

- The crystals of potassium permanganate ($KMnO_4$) sinks at the bottom of the beaker and dissolves in water slowly.
- The pink colour of potassium permanganate starts to spread from its higher concentration to lower concentration.
- Initially the colour of solution is red near the $KMnO_4$ and slowly it becomes lighter and lighter.
- Finally the molecules of the crystals are diffused uniformly and the solution becomes homogeneously pink.

Result

- Potassium permanganate crystals shows its diffusion in water slowly and finally spreads uniformly.

Precautions

- Take pure and clean water in the beaker.
- Put the crystals of potassium permanganate gently at one corner of the beaker.
- Leave the experimental set-up undisturbed at room temperature.

INTERACTION SESSION : VIVA VOCE

Q. 1. Define the term 'Diffusion'.

Ans. Diffusion is defined as, "the movement of substances from the region of their higher concentration to the region of their lower concentration up to the equilibrium state".

Q. 2. Name the factors that influence diffusion.

Ans. The main factors that influence diffusion are—concentration gradients, temperature, pressure and diffusion pressure gradient.

Q. 3. The rate of diffusion of NaCl is faster than sugar. Why?

Ans. NaCl is electrolyte and sugar is non-electrolyte. The rate of diffusion in electrolytes is about twice than the non-electrolytes.

EXPERIMENT-2

Aim of the Experiment

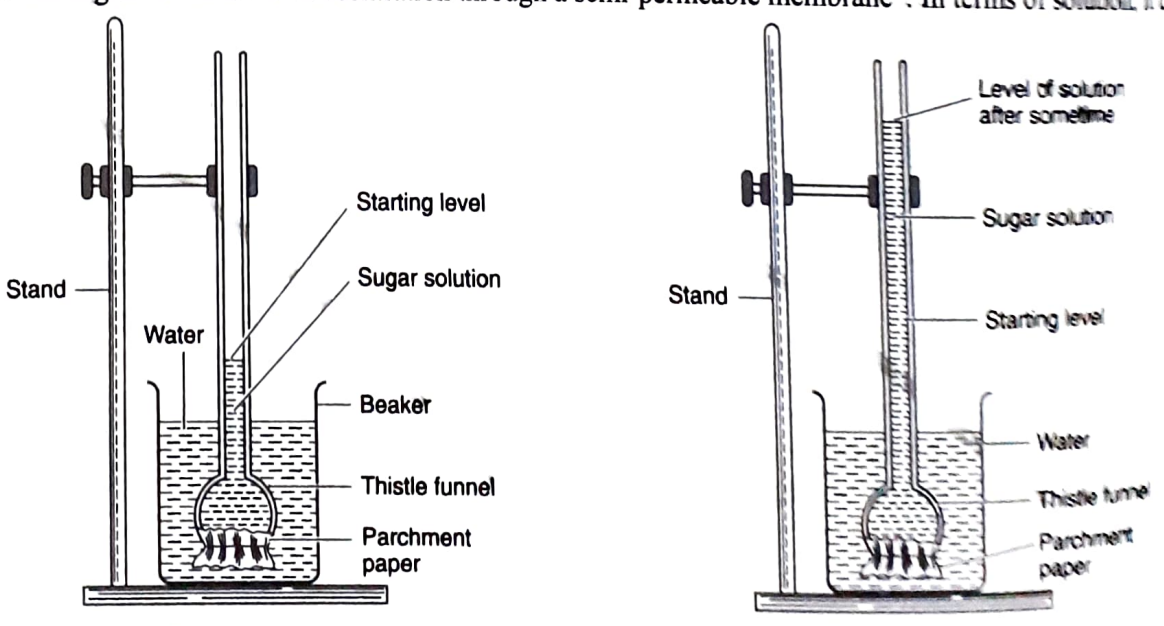
To demonstrate the phenomenon of osmosis by 'thistle funnel method'.

Apparatus/Materials Required

Glass beaker, thistle funnel, parchment paper or pig's bladder, sugar (20%), iron stand, thread, water, glass marker, etc.

Theory

Osmosis is a special type of diffusion. It is defined as, "the movement of water or solvent from a region of its higher concentration to the region of its lower concentration through a semi-permeable membrane". In terms of solution, it can be



(a) Before osmosis (b) After osmosis

Fig. 2.2 Thistle funnel experiment to show osmosis

also defined as, "the movement of solvent from the region of its low concentrated solution to the region of its higher concentrated solution through a semi-permeable membrane". Based on the tonicity of solution, osmosis can be inward or outward. The inward movement of water through a semi-permeable membrane when the cell is placed in a hypotonic solution, is called as **endosmosis.** The outward movement of water through a semi-permeable membrane when the cell is placed in a hypertonic solution, is called **exosmosis.**

Procedure

- Prepare 20% sugar solution.
- Take a thistle funnel and close the wide mouth of the funnel with a parchment paper or animals bladder by means of a thread.
- Take a beaker at the base of an iron stand. Put water in the beaker and mark the level of water in the beaker.
- Pour 20% sugar solution in the thistle funnel till it stands at about 1/3rd of the height of the stem.
- Dip the thistle funnel in beaker.
- Fix the thistle funnel with the help of the iron stand.
- Mark the initial level of sugar solution as A by a glass marker pencil.
- Leave the experiment set-up undisturbed for an hour and observe the level of water in thistle funnel and in the beaker.

Observations

- After an hour, the level of the sugar solution rises in the stem of thistle funnel to a point B. At the same time, the level of water falls down in the beaker.

Result

- The rise of sugar solution in thistle funnel occurs due to the entry of water through the parchment paper or the animals bladder. It is called **endosmosis.**
- Taste the water from the beaker. It is not sweet, it states that the parchment paper or animal bladder is a semi-permeable membrane. It only allows water to pass through it.
- The thistle funnel experiment shows the phenomenon of osmosis.

Precautions

- Parchment paper or animal bladder must not be damaged or torn.
- The edges of the paper or membrane must be properly and tied.
- Thistle funnel should be held upright using iron stand.
- Initial marking on the thistle funnel should be done after dipping it in water.

EXPERIMENT-3

Aim of the Experiment

To demonstrate the phenomenon of osmosis by 'potato osmoscope method'.

Apparatus/Materials Required

Petridish, pins, a knife or scalpel, water, a large sized potato, glass beakers, 20% sugar solution, etc.

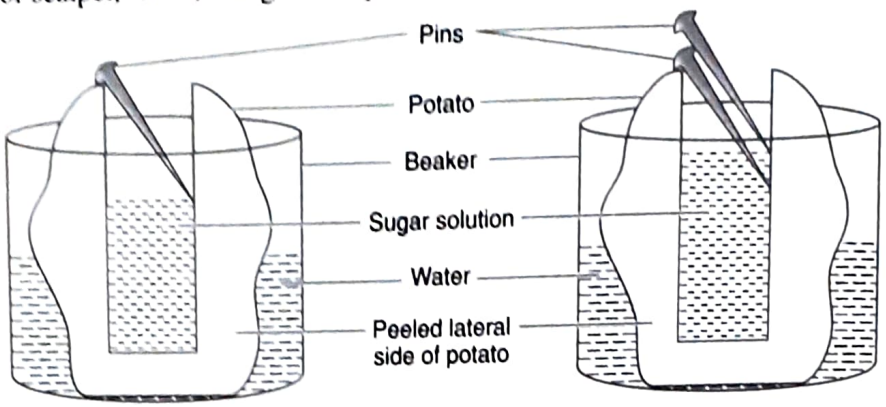


Fig. 2.3 Potato osmoscope

Theory

An osmometer is a device for measuring the osmotic strength of a solution, colloid or compound. To determine the concentration of dissolved salts or sugars in blood or urine sample or in any solution, an osmometer is used.

Potato osmometer is used to examine the semi-permeable membrane nature of potato tuber tissue as well as the process of osmosis.

Procedure

- Take a large sized potato tuber.
- Peel off its skin using a small knife/scalpel, as the skin of tuber is impermeable.
- Cut one side of the potato flat.
- Bore a cavity from the other side so that a very thin base is left infact on the flat side.
- Prepare 20% sugar solution and pour it in the potato cavity upto half its volume (potato osmometer).
- Mark the level of sugar solution with a pin pierced in a slanting manner.
- Place the tuber on its flat cut end, *i.e.*, potato osmoscope in a petridish, half full of water.
- Leave the experiment set-up undisturbed for an hour and observe.

Observations

The level of sugar solution in the cavity of potato osmoscope rises mark the new level with another pin. It indicates that the sugar solution has absorbed water from the petridish. The sugar solution and water has been separated by semi-permeable membrane, *i.e.*, cell membrane.

Result

The peeled potato tuber membrane acts as semi-permeable membrane. The rise in the level of sugar solution indicates osmosis (endosmosis.)

Precautions

- Sugar solution should be more concentrated than cell sap of the tuber cell.
- The slide of potato tuber should not be damaged during the cavity formation in the potato tuber.
- Cavity must be deep so that a very thin layer of potato is left at the base.

EXPERIMENT-4

Aim of the Experiment

To demonstrate the phenomena of endosmosis and exosmosis.

Apparatus/Materials Required

Petridishes, 10% sugar solution, water, grapes with stalks, raisins with stalks, etc.

Theory

Endosmosis and exosmosis are two types of osmosis. Movement of water molecules from hypotonic solution to a cell through a semi-permeable membrane is called as **endosmosis.** Exosmosis is the movement of water molecules from a cell to a hypertonic solution through a semi-permeable membrane.

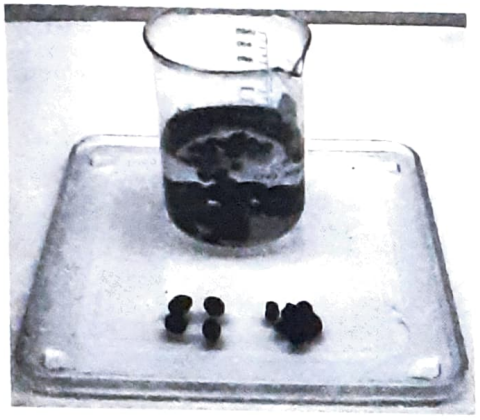


Fig. 2.4 (a) Experiment showing endosmosis

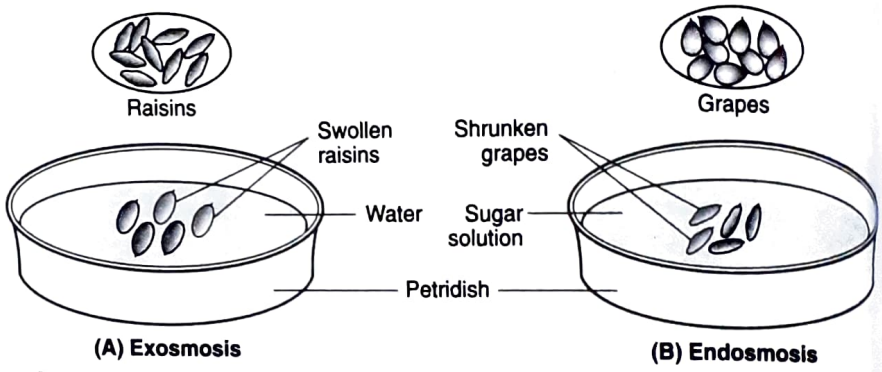


Fig. 2.4 (b)

A solution having less concentration than the surrounding solution or outer solution is called **hypotonic solution,** while a solution having higher concentration than the surrounding solution is called **hypertonic solution.**

Procedure

- Take two petridishes and mark them as A and B.
- Pour water in a petridish A and 10% sugar solution in petridish B.
- Put 5-8 raisins in petridish A and 5-8 fresh grapes petridish B.
- Keep the petridishes A and B undisturbed for 3-4 hours and observe.

Observations

Raisins present in petridish A have swollen, while grapes or petridish B have shrunk down.

Result

The swelling of raisins denotes endosmosis while the shrinkage of grapes denotes exosmosis. Raisins have low wate concentration than the water present in petridish A. So, water moves from hypotonic to hypertonic solution and it is calle **endosmosis**. Grapes have higher water concentration that the solution present in petridish B. So, water moves from grapes t the hypertonic solution and it is called **exosmosis.**

Precautions

- Grapes and raisins with stalks should be taken.
- Few (5-8) grapes or raisins should be taken in the petridishes.
- Grapes or raisins should be properly dipped in the solution or water. So, sufficient amount of solution or water should be taken.

EXPERIMENT-5

Aim of the Experiment

To demonstrate the phenomenon of absorption of water in plants.

Apparatus/Materials Required

Test tube, glass marker, test tube stands, few drops of oil, young leafy balsam plants with its intact roots, water, etc.

Theory

Water is the most important constituent of plant body. It is regulated throughout the plant body. It maintains turgidity, shape of a cell, cohesion and adhesion for transports in plants, etc. Plants absorb water mainly by roots. The area of young roots where most absorption takes place is the root hair zone. As the root hairs are extremely thin and large in number, they provide enormous surface area for absorption.

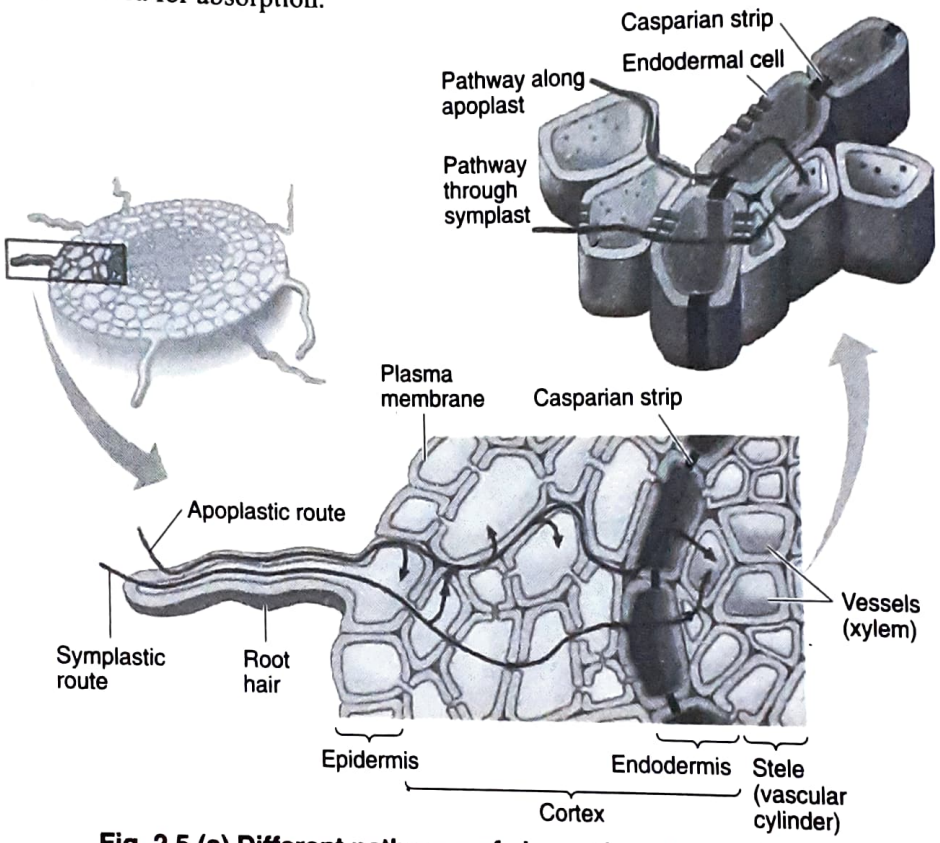


Fig. 2.5 (a) Different pathways of absorption of water by roots

The absorption of water may be active (with the metabolic energy, *i.e.*, ATP utilisation) or passive (without ATP utilisation). Root pressure is directly involved during active absorption of water. The pressure develops in the xylem of some vascular plants when the soil moisture is high and transpiration is low during the day is called **root pressure.**

Procedure

- Take two test tubes and mark them as A and B.
- Both test tubes A and B are filled with water upto 2/3rd level.
- Fix them in a separate test tube stand.
- Mark the level of water in test tube A and B with a glass marker.
- Up root a young leafy balsam plant from soil with its infact roots. Insert the roots into the test tube A.
- Provide support to the plant with wooden sticks or any other object to keep upright.
- Add a few drops of oil in both test tubes to prevent water loss through evaporation.
- Leave the experimental set-up undisturbed for few hours and observe.

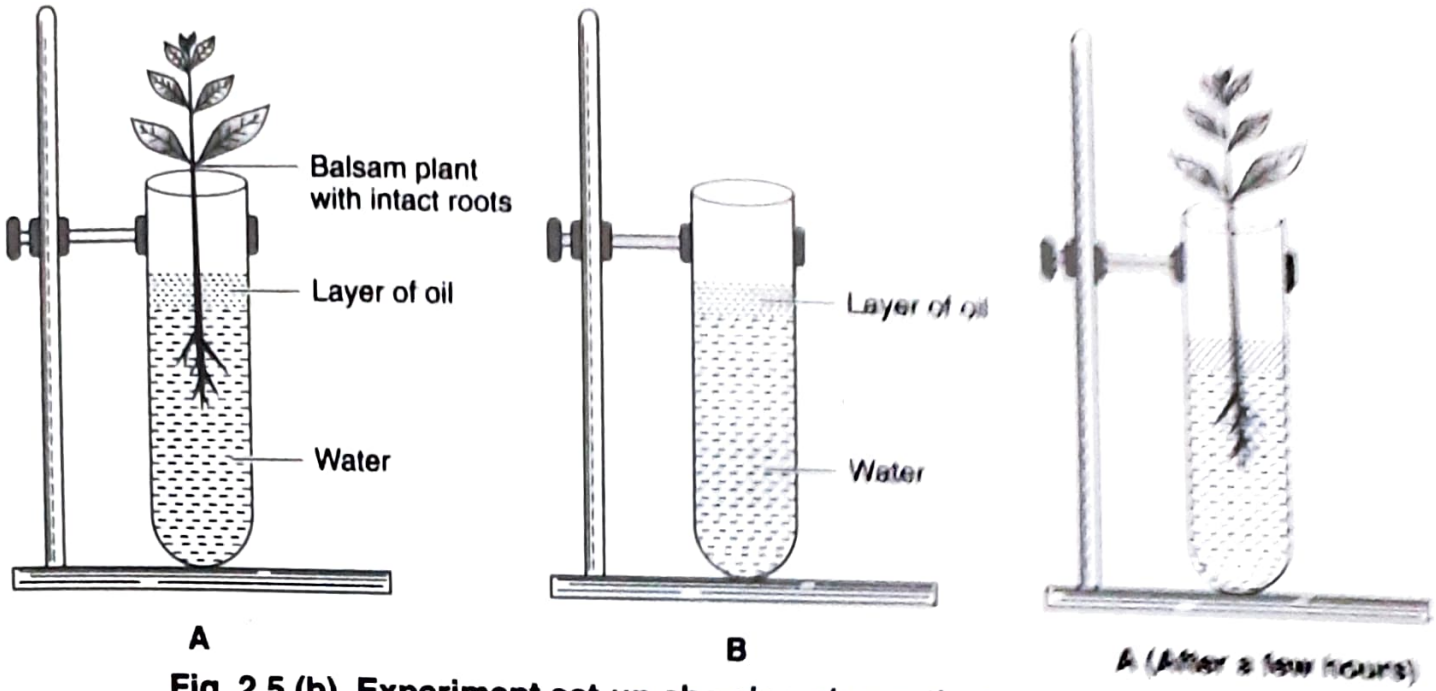


Fig. 2.5 (b) Experiment set-up showing absorption of water by roots

Observations

The water level in test tube A falls but the level of water in test tube B remains same.

Result

The fall in water level proves that water has been absorbed by roots in test tube A. It demonstrates the process of water absorption by roots in plants.

Precautions

- Balsam plant should be small and along with its intact roots.
- Marking of the level of water should be carefully.
- Balsam plant should be kept upright.

3 UNIT

TRANSPIRATION

EXPERIMENT-1

Aim of the Experiment

To demonstrate the phenomenon of transpiration.

Apparatus/Materials Required

Two bell jars, polythene sheet, polythene bags, water, vaseline, thread, a small potted plant, glass plates, a pot with soil, etc.

Theory

The phenomenon of loss of water from the aerial parts of a plant in the form of water vapour is called as **transpiration.** Transpiration is an evil but necessary process. It is an unavoidable process. It maintains concentration of cell sap to execute osmosis. It helps in cooling of plants. It also regulates ascent of sap (water rise) and absorption of water (water uptake). There are three main modes of transpiration—Stomatal (about 80-90% of total transpiration occurs through it), cuticular and lenticular.

Procedure

- Take a potted plant and water it.
- Keep the potted plant on glass plate.
- Cover the pot and soil with polythene bag.
- Cover the potted plant by inverted bell jar.
- Apply vaseline at the edge of a bell jar.
- Keep the first experimental set-up undisturbed for sometime.
- Prepare the another experimental set-up in the same way but removing the plant.
- Soiled pot must be covered with polythene bag and observe the experiment set-up A and B comparatively.

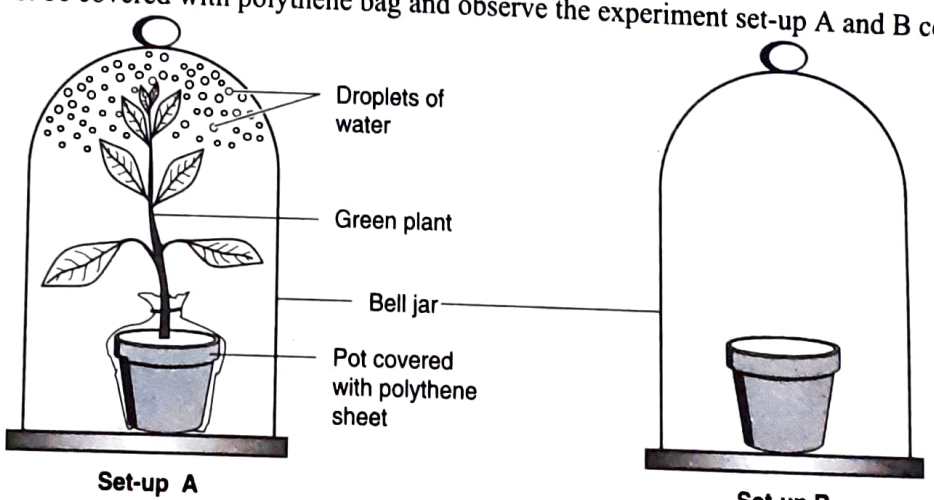


Fig. 3.1 Experiment set-up A and B showing the phenomenon of transpiration

Observations

After sometimes, the bell jar becomes misty (having droplets of water) in the experiment set-up A. The drops of water appear on the inner surface of the bell jar in experiment set-up A. In the second control experiment (experiment set-up B), no water droplets appear on the inner surface of bell jar.

Result

Leafy plant present in experiment set-up A only shows droplets of water on the inner surface of jar bar. It demonstrates the loss of water in the form of water drops from aerial parts (leaves) of plant. It proves the phenomenon of transpiration. No transpiration occurs in experiment set-up B because of lack of water source, *i.e.*, leafy plants.

Precautions

- Keep the experiment set-up in adequate warm place.
- Use a glass slab at the base of apparatus.
- Stop the entry of air by seeing the edges of the bell jar.
- Cover the soil and exterior of pot with polythene bag.
- Don't disturb the experiment set-up.

EXPERIMENT-2

Aim of the Experiment

To compare the rate of transpiration from the upper and the lower surface of a dorsiventral leaf.

Apparatus/Materials Required

A potted dicot leafy plant, glass slides, rubber bands, filter paper strips, cobalt chloride ($CoCl_2$) solution, desiccator, vaseline, etc.

Theory

The number and distribution of stomata present on the surface of leaves determines the rate of transpiration. Based on the distribution of stomata, the leaves of plants are of two types :

Dorsiventral leaf, where stomata are present on both upper and lower surfaces of leaf but the lower surface has more stomata than to the upper surface. It is most common in dicot plants, *e.g.*, Mango, peepal, etc.

Isobilateral leaf, where stomata are equally distributed on upper and lower surface of leaf. It is most common in monocot plants, *e.g.*, banana, maize, etc.

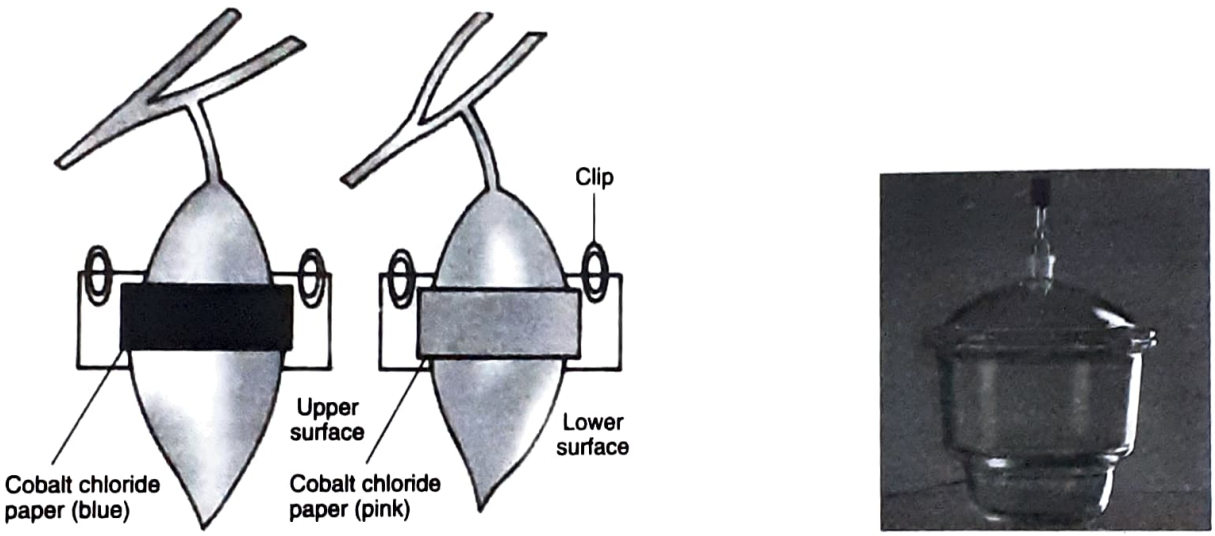


Fig. 3.2 (a) Experiment to compare the rate of transpiration from both surface of a leaf, (b) Desiccator

The device that is used to measure rate of transpiration is called **potometer.** Cobalt chloride ($CoCl_2$) potometer is a special type of potometer that determines both rate of transpiration and relative distribution of stomata on the upper and lower surfaces of leaves.

Desiccator is a box or chamber that contains calcium chloride which is hygroscopic in nature. It absorbs water from the cobalt chloride strips and dries them. $CoCl_2$ is a desiccant that ensures that absorption of water vapour before it reacts the reactants. The desiccator is used to protect chemicals which are hygroscopic or which react with water from humidity.

Procedure

- Prepare 5% cobalt chloride solution.
- Dip small pieces of filter paper in the solution.
- Place these paper strips in a desiccator and allow them to dry completely.
- $CoCl_2$ paper is blue in dry condition but turns pink in moist condition.

- Take a potted leafy plant and soak moisture from the surfaces of a thick leaf using filter paper.
- Clean the upper and lower surfaces of the leaf using dry cotton.
- Place dry cobalt chloride paper strips on both upper and lower surfaces of the leaf.
- Cover it with glass slides and hold the glass slides in position with rubber bands.
- Smear the edges of glass slides with vaseline and observe the colour of $CoCl_2$ strips.

Observations

The lower (ventral) surface of leaf turns pink within a few minutes. The upper (dorsal) surface of leaf takes longer time to turn pink. The colour variation of $CoCl_2$ strips demonstrate that the papers have absorbed water moisture from upper and lower surfaces of a leaf.

Result

The colour of $CoCl_2$ strip changes quickly on the lower surface of a leaf. It proves that the higher rate of transpiration than the upper surface of the leaf. It occurs due to maximum number of stomata on the lower surface of stomata per unit area than the upper surface.

Precautions

- Keep leaf surfaces, glass slides, $CoCl_2$ paper strips.
- Use dry forceps or hand to handle, $CoCl_2$ paper strips.
- Seal the edges of the slide with vaseline completely.

EXPERIMENT-3

Aim of the Experiment

To measure the rate of transpiration using Ganong's potometer.

Apparatus/Materials Required

Ganong's potometer, knife, glass beaker, water, eosin (dye), a small leafy shoot, vaseline, etc.

Theory

Potometer (Gk., *Potos* = drink; *meter* = measure) is a device that measures the water taken by a plant. Ganong's potometer is made up of a horizontal glass tube. It has a wide upward opening part on one end and bent downwards on the other end having a small hole on the lateral side. The glass tube is graduated towards the side of the downward bend. It is attached with a water reservoir or with a stopper towards the side with the upward opening wider tube. The complete apparatus is fixed on a solid stand.

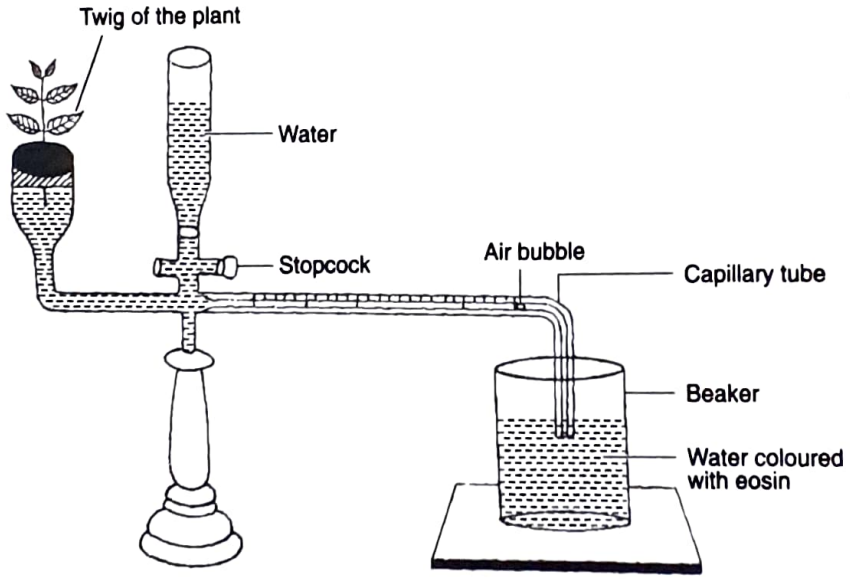


Fig. 3.3 Ganong's potometer

Procedure

- Take Ganong's potometer and fill it with water, completely.
- Take a freshly cut leafy shoot cut under water so that air should be prevented from entering the vessels of stem.
- Fix the plant air-tight to the upper wider end of the apparatus through a split cork.
- Apply vaseline on the sides of the cork and the stem of shoot.
- Dip the distal end of the potometer into water contained in a beaker.
- Pour few drops of eosin dye to colour the water (it shows the movement of water through the graduated tube clearly).
- When coloured water starts rising in the horizontal arm of the apparatus, remove the beaker with coloured water, so that an air bubble enters into the apparatus.
- Keep the beaker under the narrow lower end of the apparatus again.
- Now observe the movements of air bubble and coloured water in the horizontal, narrow and graduated tube of the apparatus by keeping the complete experiment set-up in bright sunlight.

Observations

Air bubble travels from right to left with loss of water by transpiration. Write the time taken by the air bubble to reach the end of graduated tube. Calculate the amount of water lost in a given time as follows :

$$\text{Rate of transpiration} = \frac{\text{Distance travelled}}{\text{Time taken}}$$

Take the reading thrice. To repeat the experiment, open the valve of the reservoir slowly and the air bubble will move towards right, *i.e.*, towards the starting point. The apparatus can be kept in different environmental conditions to compare the rates of transpiration. Write the different reading at different conditions. It has been observed that air bubble in Ganong's potometer moves fastest under direct sunlight than a warm room infront of a fan.

Result

Ganong's potometer gives different reading at different environmental conditions. Thus, the rate of transpiration can be calculated by recording the timing of the air bubble movement over fixed distance on the scale. Increasing temperature and wind velocity, the rate of transpiration also increases.

Precautions

- Cut the leafy shoot under water to prevent the air entering the conducting vessels of the stem.
- The entire joints of apparatus should be made air tight with vaseline.

4

UNIT

PHOTOSYNTHESIS

EXPERIMENT-1

Aim of the Experiment

To show that the leaves prepare starch during the process of photosynthesis.

Apparatus/Materials Required

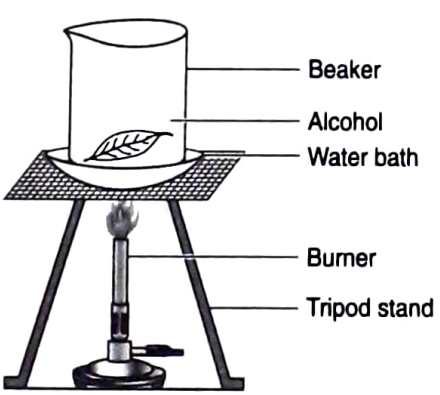
A healthy potted plant, water bath, alcohol, white glazed tile, iodine solution, tripod stand, burner, beaker (250 mL), petridish, etc.

Theory

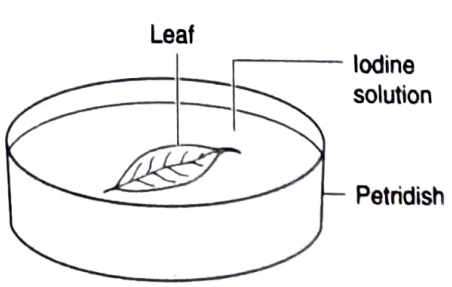
Photosynthesis is defined as, "Conversion of radiant energy (sunlight) into chemical energy (glucose) in the green plants with the help of water and carbon dioxide". Glucose is stored as such starch in green plants.

Procedure

- Keep the destarched plant in sunlight for a few hours (24-48 hours).
- Place this plant in sunlight for 4-6 hours.
- Pluck a leaf from the plant and dip in boiling water for sometime to kill the protoplasm. It makes the cell more permeable to iodine solution.
- Put the leaf in a beaker containing alcohol over a water bath.
- Heat the leaves completely upto their decolourisation.
- During this process, chlorophyll is removed from the leaf cells and the leaves turn colourless.
- Wash the colourless leaf with water to make it soft and wash off the alcohol.
- Place the leaf in a petridish containing dilute iodine solution and leave it for sometime.
- Remove the leaf from iodine solution and wash it with water.
- Now observe the colour of leaf.



Leaf being heated in alcohol over a water bath



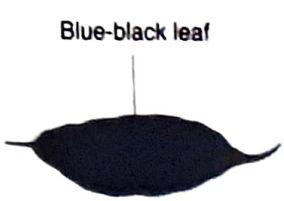


Fig. 4.1 Leaves of green plants prepare starch during photosynthesis

Observations

The colour of leave turns blue or blue-black.

Result

Blue-black colour of leaf indicates the presence of starch. Actually the iodine solution does not change the colour in those leaf parts which do not contain starch. During photosynthesis, all the gradients are present that forms glucose. Finally glucose is polymerised into starch. Thus, leaves prepare starch during photosynthesis.

Precautions

- Thin broad leaves of a healthy plant should be taken.
- Leaf should be placed in boiling water for 1 minute to make the leaf permeable.
- Water bath is used for heating of leaf in alcohol as alcohol is highly inflammable.
- Make the leaf soft through dehydration in alcohol and dipping in water.

EXPERIMENT-2

Aim of the Experiment

To show that sunlight is necessary for photosynthesis.

Apparatus/Materials Required

A destarched potted plant having thin and broad leaves, two pieces of black papers, two clips, beaker, burner, water bath, wire gauge, tripod stand, forceps, a petridish, alcohol, iodine solution, etc.

Theory

The ultimate source of energy is sunlight. PAR (Photosynthetic Active Radiation, 400-700 nm wavelength of light) executes different rate of photosynthesis. During day, light reaction of photosynthesis occurs. Assimilatory power (ATP + $NADPH_2$) formed in light reaction is utilised in dark reaction of photosynthesis to form glucose.

Procedure

- Select a healthy leaf of a destarched plant.
- Cover a part of this leaf with a black paper strip on each side of the leaf fixing its position by paper clips.
- Place the set-up in bright sunlight for 4-6 hours.
- Remove the black paper and test for the presence of starch with iodine solution like the process of starch test (experiment no. 1).
- After 5-7 minutes, remove the leaf from iodine solution and wash it with water.
- Observe the colour of the covered part and the exposed part of the leaf.

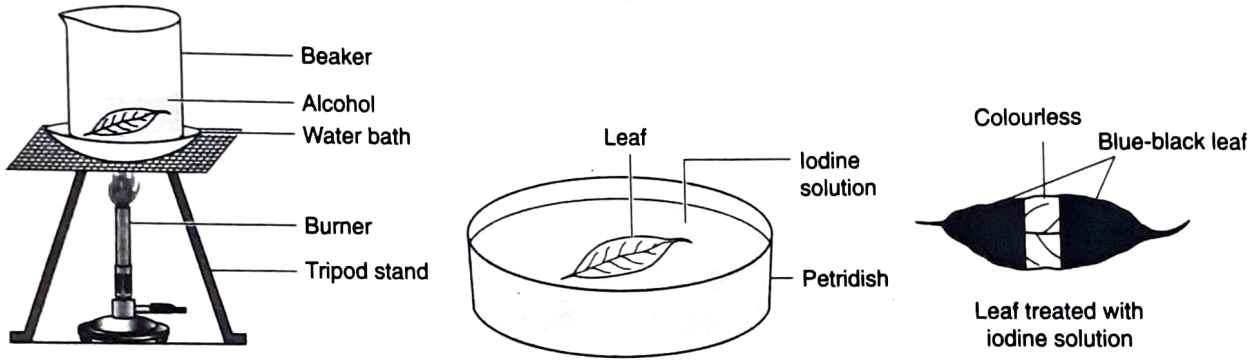


Fig. 4.2 Demonstrating that sunlight is essential for photosynthesis

Observations

The exposed part of leaf turns blue-black, *i.e.*, positive test for starch. The covered part of leaf turns colourless, *i.e.*, negative test for starch.

Result

The exposed part of leaf performs photosynthesis and forms glucose that is stored as starch. It demonstrates that sunlight is necessary for photosynthesis.

Precautions

- Leaf must be thin and broad.
- Cover the both parts of leaf properly.
- Use water bath to avoid inflammation.
- Wash the leaf for softening before iodine test.

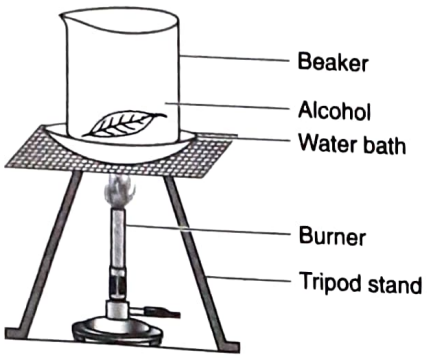
EXPERIMENT-3

Aim of the Experiment

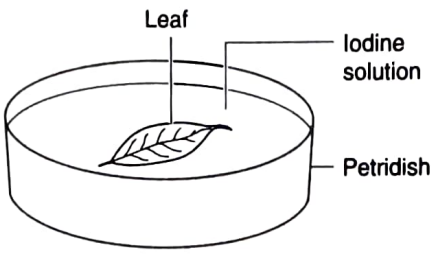
To show that chlorophyll is necessary for photosynthesis.

Apparatus/Materials Required

A potted plant with variegated leaves (*Coleus* or *Croton*), beaker, burner, water bath, wire gauge, tripod stand, forceps, petridish, alcohol, tracing paper, iodine solution, etc.



Leaf being heated in alcohol over a water bath



Leaf dipped in iodine solution

Fig. 4.3 Starch test

Theory

Jan Ingen-Hausz recognised the participation of chlorophyll and light in the photosynthesis process. **Sachs** first discovered that green chloroplasts are the organs where CO_2 is used up and O_2 is released. Chlorophyll traps solar radiation to perform light reaction of photosynthesis where assimilatory power (ATP + $NADPH_2$) is formed which is utilised to perform dark reaction of photosynthesis.

Procedure

- Take the destarched plant with variegated leaves and expose it to sunlight for 4-6 hours.
- Detach a leaf and trace its outline.
- Mark its green and non-green parts of leaf with a pencil on trace paper.
- Test this leaf for the presence of starch and observe.

Observations

Green parts of variegated leaf shows positive starch test through blue-black colour, the non-green parts of variegated leaf show negative starch test through its pale yellow patches.

Result

Green parts of variegated leaf contained chlorophyll and show starch synthesis. Thus, chlorophyll is necessary for photosynthesis.

Precautions

- Mark properly to the green and non-green parts of a variegated leaf on rice paper or tracing paper.
- Expose the leaf to sunlight for 6 hours before starch test.
- Perform the correct sequences for starch test.

EXPERIMENT-4

Aim of the Experiment

To show that carbon dioxide is necessary for photosynthesis.

Apparatus/Materials Required

A wide mouthed bottle, a split cork, caustic potash (KOH), a green destarched plant, materials for starch test, etc.

Theory

Priestley (1772) discovered that CO_2 containing impure air (phlogiston) would get purified (dephlogiston) if kept in contact with green mint plants for some months. **Jean Senebier** (1782) first recognised that fixed air (CO_2) was essential in photosynthesis.

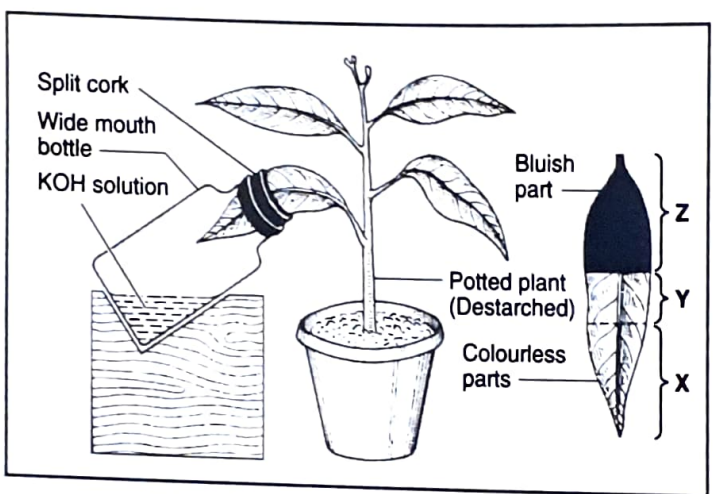


Fig. 4.4 Moll's half leaf experiment

Procedure

- Take a destarched potted plant.
- Insert one half of a leaf of the destarched plant into a wide mouthed bottle containing KOH solution with a split cork.
- Make the bottle air-tight by applying petroleum jelly or vaseline.
- Place the apparatus in sunlight for few hours (3-5 hours).
- Pluck the experimental leaf from the plant, undergo for starch test and observe.

Observations

- Three parts of the experimental leaf can be marked as :

  X-part present inside the bottle.

  Y-part present in the split cork.

  Z-part present outside the bottle.
- After few hours, it is noticed that the outer part of leaf (Z) shows positive starch test by turning its colour blue (= Blue-black). X and Y parts of leaf do not turn blue-black, *i.e.*, both X and Y show negative starch test.

Result

CO_2 present inside the bottle is absorbed by potassium hydroxide (KOH) solution of the bottle. In the absence of CO_2, no photosynthesis takes place and further no starch is produced. Thus, carbon dioxide is necessary for photosynthesis.

Precautions

- Make the experimental set-up air-tight.
- The solution of KOH should not touch the leaf.
- Plant should be destarched completely.
- Place the experimental set-up in sunlight for 3-5 hours.

EXPERIMENT-5

Aim of the Experiment

To show that oxygen is released out during photosynthesis.

Apparatus/Materials Required

Large beaker (1000 mL), funnel with short stem, sodium hydrogen carbonate or sodium bicarbonate ($NaHCO_3$), test tube, aquatic plant (*Hydrilla* or *Elodea* or *Vallisneria*), match box, etc.

Theory

Sachs was the first to discover that green chloroplasts are the organs where carbon dioxide is used up and oxygen is released. **S. M. Reuben** and co-worker found that oxygen released in photosynthesis came from water molecule and not from CO_2. Thus, the source of oxygen is water.

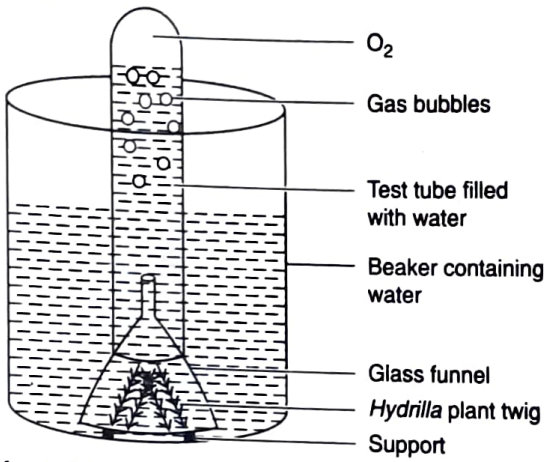


Fig. 4.5 Experiment to prove that oxygen is evolved during photosynthesis

Procedure

- Place *Hydrilla* plants at the bottom of a large beaker containing water.
- Cut the end of stems and place them pointing towards the upper side inside the beaker.
- Cover the plants by inverting over a short stemmed funnel.
- Take water and pour it into the beaker till covering of the funnel stem, completely.
- Dissolve a pinch of sodium hydrogen carbonate ($NaHCO_3$) to the water to increase concentration of CO_2.
- Invert a test tube filled with water over the stem of the funnel.
- Keep the experimental set-up in sunlight for few hours and observe.

Observations

Gas bubbles are seen rising upward through the cut ends of funnel stem. The gas collects in the test tube displacing the water. Remove the test tube after complete displacement of water from the test tube. Now introduce a lightened match stick. The match stick burns brightly.

Result

Since the gas collected in the test tube supports combustion, it is nothing but oxygen gas only. Thus, it proves that oxygen gas is released out during the process of photosynthesis.

Precautions

- The stem of funnel should be submerged.
- Point the cut end of stem towards the stem of the funnel.
- A bit of sodium bicarbonate ($NaHCO_3$) is introduced to enhance CO_2 concentration.
- Do not disturb the experimental set-up.

INTERACTION SESSION : VIVA VOCE

Q. 1. Name the source of oxygen released in photosynthesis.

Ans. Water (H_2O).

Q. 2. Name the gaseous product released during photosynthesis.

Ans. Oxygen.

Q. 3. Name the chemical used to increase the concentration of CO_2 in the beaker.

Ans. $NaHCO_3$ (Sodium bicarbonate).

Q. 4. Why is a submerge plant like *Hydrilla* taken in experiment?

Ans. *Hydrilla* is a submerge plant and remains health inside the water. Such plant uses up the CO_2 dissolved in water and gives out oxygen during photosynthesis.

Q. 5. Name the scientist that experimentally showed the release of O_2 during photosynthesis.

Ans. S.M. Reuben and co-worker.

❑❑❑

Section B : ANIMAL LIFE

5 UNIT

HUMAN BODY ORGANS

EXPERIMENT-1

Aim of the Experiment

To identify the structure of the human urinary system through a study of its models and charts.

Apparatus/Materials Required

Specimen of human kidney or charts/models showing the structure of human urinary system.

Theory

The vital process in which waste products are removed from the body is called **excretion.** Mainly nitrogenous wastes like ammonia, urea, uric acid, etc., are formed from proteins and other complex nitrogenous compounds. These are toxic or harmful if retained in our body. So, these are eliminated through the urinary system. The urinary system consists of a pair of kidney, a pair of ureters, a urinary bladder and a urethra. It excretes and removes metabolic wastes like water, urea, uric acid, some salts, etc., in the form of urine from our body.

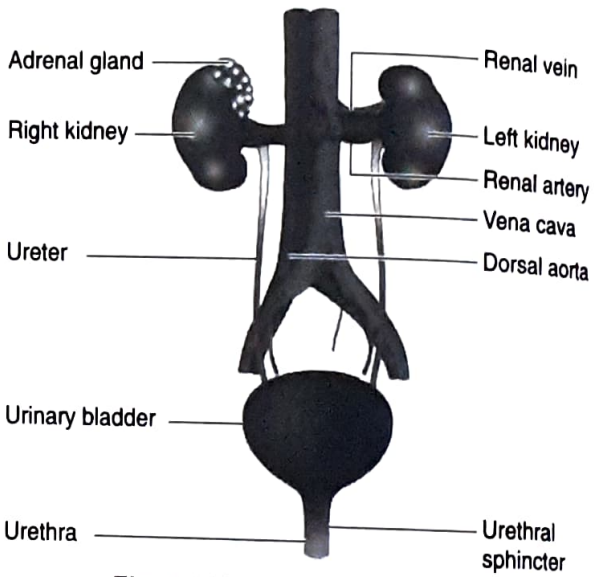


Fig. 5.1 Human urinary system

Procedure

- Study the parts of the urinary system and draw labelled diagrams.
- Note down your observations.

Observations

Human urinary system consists of a pair of kidneys, a pair of ureters, a urinary bladder and a urethra.

A. Kidneys

The kidneys are located on either side of the backbone. These are protected by the last two ribs.

External Features

- The kidneys are dark red, slightly flattened, bean-shaped organs. Each one measures about 10-12 cm in length, 5-7 cm in breath and 2-3 cm in thickness.
- An adult human kidney is about 150 gm in weight.
- The outer surface of kidney is convex while the inner surface of kidney is convex.

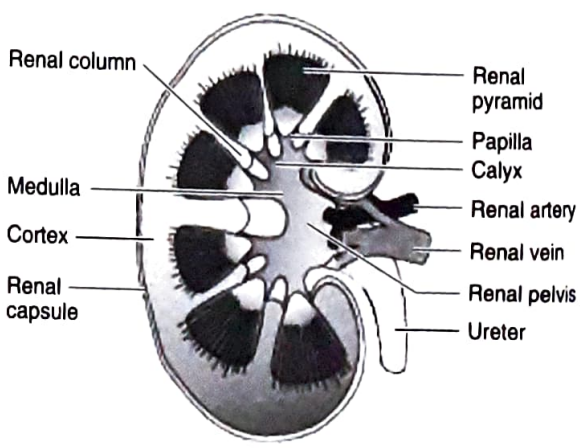


Fig. 5.2 Longitudinal structure of kidney

- A depression is present on the convex side, called **hilum.** The ureter originates from the hilum and joins the urinary bladder backwardly.
- At the hilum, the renal artery and the renal vein pass in and out.
- A thin layer of fibrous tissue present outside of the kidney is called **renal capsule.**

Internal Structure

- Kidney has two main zones—outer dark red zone is called **cortex** and the inner lighter zone is called **medulla.**
- The medulla is filled with cone-shaped projections called **renal pyramids.** The narrow apex of each pyramid is called **papilla.**
- The apex of each pyramid point into a sac-like cavity called **renal pelvis.**
- Nephrons are the structural and functional unit of the kidney.

B. Ureters

- The pelvis leads into a long narrow and white tube called **ureter.** It is about 25 to 30 cm in length.
- Ureter runs backwards along the abdominal wall to open into the urinary bladder.
- Urine passes from ureter to the urinary bladder.

C. Urinary Bladder

- A pair of ureters enter the urinary bladder.
- It is a triangular and muscular sac-like structure.
- It is situated in the middle of the pelvic cavity of the abdomen.
- It serves as a reservoir of urine.

D. Urethra

- The urinary bladder opens into urethra. It is guarded by sphincter muscle.
- The sphincter muscle remains closed except when the urine is to passed out, *i.e.*, urination.

EXPERIMENT-2

Aim of the Experiment

To identify the structure of the human heart (internal structure) through a study of its models and charts.

Apparatus/Materials Required

Specimen of goats's or human heart/models or charts showing the internal structure of human heart.

Procedure

- Observe the models/charts of human heart, carefully.
- Identify the structure of heart and its various parts.
- Draw the diagrams and label its various parts.
- Described the diagrams under observation.

Observations

- Human heart is the main part of circulatory system. It is located between the lungs in the thoracic cavity.
- It appears as a clenched fist and is conical in shape that weighs about 300 gm. It is 12 cm long, 6 cm wide at its broadest point and 6 cm thick.
- Heart is enclosed by a membranous structure called **pericardium.** It is made of outer parietal pericardium and inner visceral pericardium. The pericardium protects the heart from shocks and mechanical injuries. It allows free movement of the heart.

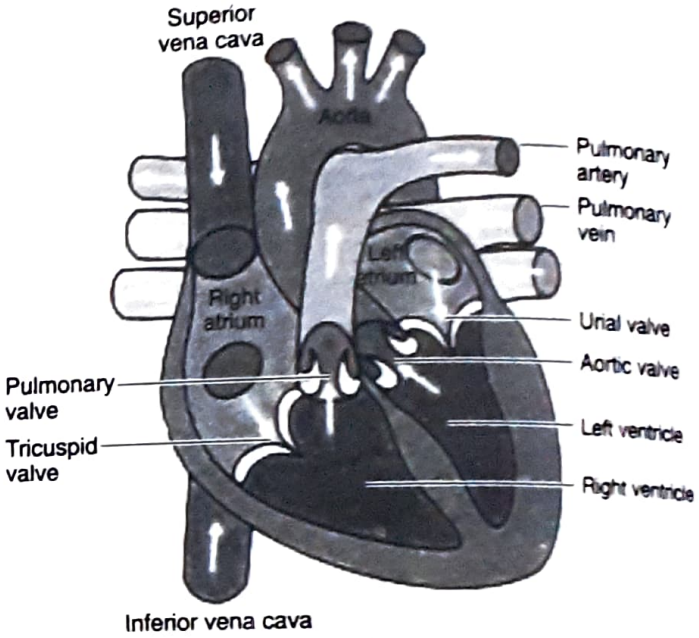


Fig. 5.3 Heart

- Human heart is a four chambered structure. The upper part is made of two thin walled structure is called **atria.** The lower two thick muscular walled structure is called **ventricles.**
- Atria is divided by an interartrial septum. Atria are separated externally from the ventricles by an irregular groove, **coronary sulcus.**
- An oblique groove called interventricular sulcus demarcates two ventricles externally.
- The right ventricle has thinner muscular walls than the left ventricle.
- The opening between the right atrium and the right ventricle is guarded by a valve formed of three cusps or muscular flaps called **tricuspid valve.**
- A bicuspid valve guards the opening between the left atrium and the left ventricle.
- The pulmonary aorta and the dorsal aorta have semilunar valves, respectively called **pulmonary semilunar valves** and **aortic semilunar valves.**
- The right atria has the Semi Auricular Node (SAN) or pacemaker. It is made of specialised muscle cells.
- The valves in the heart allow the flow of blood only in one direction. It prevents any backward flow of blood.
- The heart receives deoxygenated blood in the right atria and then pumps it through right ventricle to the lungs for oxygenation through the pulmonary artery.
- The oxygenated blood is brought back into the left atria through pulmonary vein and then from there it is pumped into left ventricle. Further, it pumped to all parts of the body by the dorsal aorta and its branches.

Result

Models or charts of human heart have been observed to identify its internal structure.

EXPERIMENT-3

Aim of the Experiment

To identify the structure of the human brain through a study of its models and charts.

Apparatus/Materials Required

Specimen of goat's brain or human brain/models charts showing the structure of human brain.

Procedure

- Study the parts of the brain carefully.
- Identify the structure of brain and its various parts.
- Describe your observation and draw labelled diagrams.

Observations

- Human brain is an important part of central nervous system. It is located in the cranial cavity of the skull. It weighs about 1450 gm in an adult human. It is made of about 100 billion neurons.
- Human brain is mainly consist of three parts—forebrain (prosencephalon), midbrain (mesencephalon) and hindbrain (rhombencephalon).

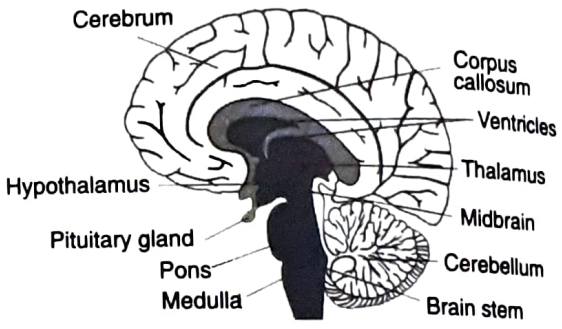


Fig. 5.4 Structure of human brain

- **Forebrain :** It is made up of cerebrum, thalamus and hypothalamus. Cerebrum is the largest part of the brain. It is divided by a deep cleft in the middle into two distinct parts known as right hemisphere and left hemisphere. The hemispheres are connected by a tract of nerve fibres called **corpus callosum.**
- Cerebral cortex covers the cerebral hemisphere. The cerebral cortex has grey matter (outer part of cerebrum that is darker in colour with greyish appearance) and white matter (inner and lighter part of cerebrum with an opaque white appearance).
- **Thalamus :** It is the main coordinating centre for sensory and motor cells. It is wrapped around by cerebrum.
- **Hypothalamus :** It lies at the base of the thalamus. It controls body temperature, hunger, thirst, heart and blood vessels and reaction. It is attached to pituitary gland by a stalk.
- **Midbrain :** It is the area of brain that is located between thalamus of the forebrain and pons of the hindbrain. The dorsal portion of the midbrain consists of four rounded lobes called **corpora quadrigemina.**
- **Hindbrain :** It is made of pons, cerebellum and medulla oblongata. **Pons** links the cerebellum and medulla oblongata with cerebrum through the midbrain. **Cerebellum** is concerned with posture and postural activities. It controls muscular coordination and maintain the body balance. Medulla oblongata is connected to the spinal cord. It contains centres that control respiration, cardiovascular reflexes and gastric secretions.

Result

Models/charts of human brain have been observed to identify the structure of brain.

EXPERIMENT-4

Aim of the Experiment

To identify the structure of the human eye through a study of its models and charts.

Apparatus/Materials Required

Specimen of goat's eye or human eye/models or charts showing the structure of human eye.

Procedure

Observe the external view carefully through specimen or the models or charts of human eye. Identify the structure of eye, draw a diagram and label its various parts.

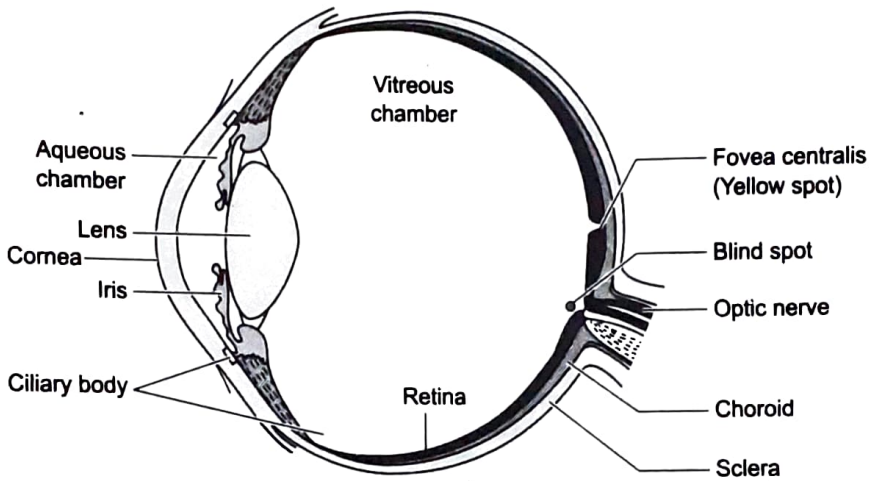


Fig. 5.5 (a) Section of a human eye

Observations

- Human eye is the organ of photoreceptive organs. They are located in the sockets of the skull, called orbits.
- Human eye is a spherical structure having about 2.5 cm diameter.
- The wall of the eyeball is made up of three layers : **Sclera, choroid** and **retina.**
- **Sclera** is the external layered of eye ball. It is white opaque part. It covers and maintains the shape of the eyeball. The anterior portion of sclera is known as **cornea.** It allows light to enter the eye through a curved transparent part. It has no blood supply.
- **Choroid :** It is middle layer of the eye. It contains capillaries for blood supply to the eyes. It is pigmented to absorb extra light. It appears bluish in colour. The anterior and thick part of choroid layer forms **ciliary body.** The ciliary body continues forward to form a pigmented and opaque structure called **iris.** It encloses the aqueous humour in the anterior chamber of eye. It has a opening in the centre called **pupil.** It regulates the size of the pupil and controls the amount of light entering the eye. Eye lense is biconvex transparent and elastic structure. It is attached to suspensory ligaments of ciliary body and focuses light onto the light sensitive layer. The space between the lens and the retina is called **vitreous chamber.** It is filled with a transparent gel called **vitreous humour.**
- **Retina :** It is the inner layer of eyeball. It consists of light sensitive cells of two types—rods and cones. Rods are responsible for day light vision and colour vision. Cones are responsible for twilight vision.
- Optic nerve conducts the nerve impulses from the eyeball to the brain.
- A point on optic nerve where no image is formed is called **blind spot.** It has no light sensitive cells. There is a depressed area of retina lateral to the blind spot, called as **fovea centralis** or **yellow spot.** It contains only cones. It is the place of most distinct vision.

Accessory Structures of Human Eye

Human eye has the following accessory structures :

(a) **Eyebrows :** Two arched eminences of skin present on the supra-orbital margins of the frontal bone, are called **eyebrows.** They protect from sweat, dust particles and other foreign bodies entering the eyes.

(b) **Eyelids :** It is two in number upper eyelid and lower eyelid. The upper eyelid is movable and protective that cleans the surface of eyes. The lower eyelid is immovable but protective.

Fig. 5.5 (b) Accessory structures of the eye

(c) **Eyelashes :** The outgrowth of hairs present on the face edges of eyelids are called **eyelashes.** They protect the eyeball by preventing dust particles.

(d) **Conjunctiva :** An outermost and transparent continuation of the skin of the eyelids is called **conjunctiva.** It protects the eyeball and maintain the moisture of eyeball.

(e) **Lacrimal gland :** It is located in the orbit on the superior and lateral surface of eyeball. It secretes tears. Lysozymes are present in tears and have an antiseptic property that kill germs.

Result

Models/charts of human eye have been observed to identify its structure.

EXPERIMENT-5

Aim of the Experiment

To identify the structure of human ear through a study of its models and charts.

Apparatus/Materials Required

A model or chart of the ear.

Procedure

- Observe the models/charts of human ear, carefully.
- Identify the structure of ear, draw its labelled diagram.

Observations

- Human ears are phonoreceptor organs. They are located on each of the lateral side of the head. Human ear helps the body in maintaining its balance through equilibrium.
- Human ear is consist of three parts—outer (external) ear, middle ear and inner (internal) ear.

Outer Ear : It is made up of ear pinna, external auditory meatus and eardrum. The **pinna** is a projecting and elastic cartilage that collects the vibrations which produce sound. A tubular passage of external ear is called **external auditory meatus** (canal). It is lined by hair and wax glands which secrete ear wax. Eardrum or tympanic membrane is a thin, semi-transparent and oval membrane that collects the sound waves and sends it to middle ear.

Middle Ear

It is air filled cavity and present between external ear and internal ear. It contains three ossicles or small bones called **malleus, incus** and **stapes.** These bones are attached to each other in a series. The malleus is attached to the tympanic membrane. The stapes is attached to the oval window of the cochlea. The ear ossicles help to increase the efficiency of phonoreception. These transmit sound waves to the inner ear. Eustachian tube connects the middle eye to pharynx. It helps to equalise the pressure in middle ear to that of atmosphere.

Fenestra ovalis (oval window) and fenestra rotunda (round window) are two small openings in the middle ear.

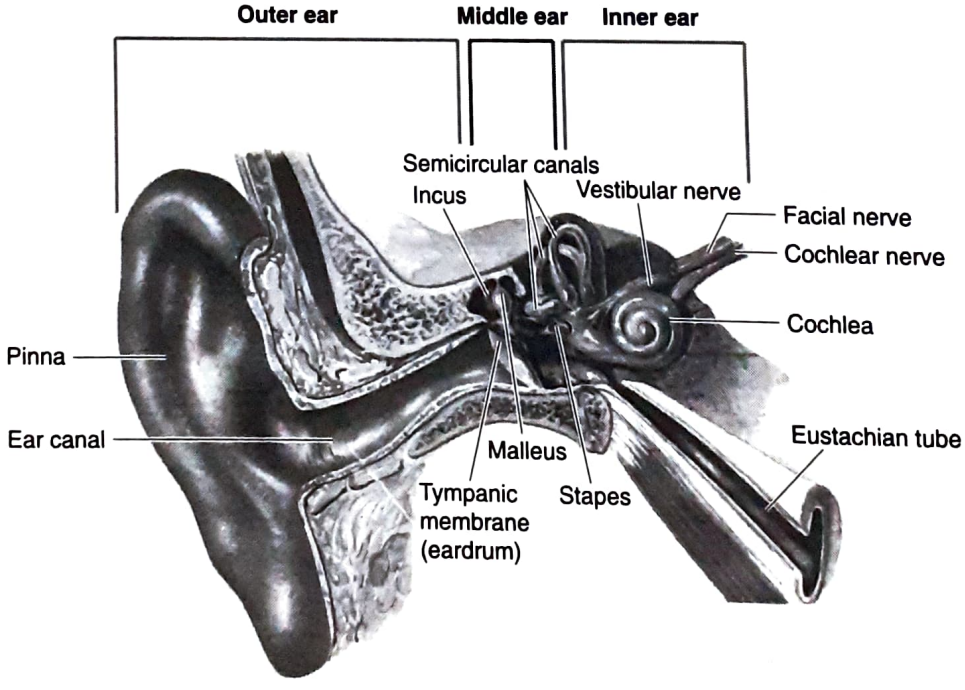


Fig. 5.6 Section through human head showing parts of the ear

Inner Ear

- It consists of perilymph, membranous labyrinth, endolymph and auditory nerve.
- Perilymph is fluid, present between the hard periotic bone and membranous labyrinth. It acts as ashock absorber.
- The membranous labyrinth consists of vestibular apparatus (semicircular canals and utriculus and sacculus) and cochlea. Cochlea is the coiled portion of the labyrinth (inner ear). It has special collection of cells called **organs of Corti.** These help in hearing.
- **Endolymph :** It is the fluid in the membranous labyrinth. It activates the cells of the organs of Corti for hearing.
- Auditory nerve motors the impulses or vibration from internal ear to the brain.

Result

Models/charts of human ear have been observed to identify its structure.

6 UNIT

BLOOD CELLS

EXPERIMENT-1

Aim of the Experiment

To identify different types of blood cells under a microscope.

Apparatus/Materials Required

Compound microscope, permanent slides of blood cells.

Theory

Blood is a fluid and mobile connective tissue. It consists of plasma and formed elements of cells, *i.e.*, blood cells and platelets. Blood always circulates from the heart to the arteries and back through the veins. The colour of blood is bright red and dark red when taken from an artery and a vein respectively.

Plasma is a straw coloured extracellular fluid in the blood. It is about 50% of total blood. It contains about 92% water and 8% solutes. The solutes include protein, glucose, minerals, hormones, antibodies, gases and a number of waste products. The formed elements of cells are of three types :

Erythrocytes (Red Blood Cells)

Red blood cells are characterised by its red colour due to presence of haemoglobin (an iron containing complex protein). Mature RBCs are enucleated (nucleus absent), biconcave and circular in shape. The total count of RBC is 4.5 million/mL and 5 million/mL of blood in adult woman and man respectively. A healthy individual has 12-16 gm of haemoglobin in every 100 mL of blood. Blood plays vital role in transport of respiratory gases. In sufficient Hbg results in anaemia and breathing problem. An average lifespan of RBCs is 120 days.

Leucocytes (White Blood Cells)

White blood cells (WBCs) are colourless, amoeboid and nucleated cells. The total count of WBC in a normal human is 5000/mL of blood. WBCs play vital role in defence system of the body. WBCs are of the following types :

- **(a) Agranulocytes** (Non-granular cytoplasm)
  - **1.** Lymphocytes—having spherical nucleus
  - **2.** Monocytes—having bean-shaped nucleus
- **(b) Granulocytes** (Granular cytoplasm)
  - **3.** Neutrophils—having multilobed nucleus
  - **4.** Eosinophils—having multilobed nucleus
  - **5.** Basophils—having bilobed nucleus

Platelets (Thrombocytes)

Platelets are enucleated, disc-shaped bodies formed from megakaryocyte cells in bone marrow. Blood normally contains 1,50,000 to 3,50,000 platelets mm^{-3}. Thrombocytes help in coagulation of blood. Deficiency or reduction in the number of thrombocytes may cause excessive loss of blood from the body or clotting disorders.

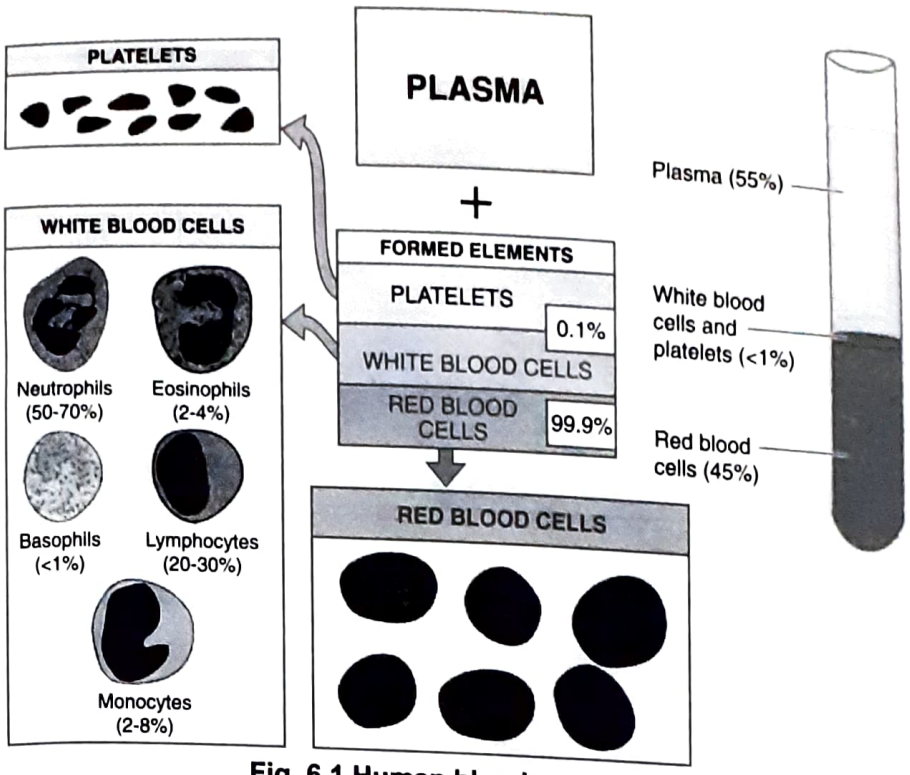


Fig. 6.1 Human blood corpuscles

Procedure

- Observe the permanent slide of blood cells under low power of the microscope.
- Shift the objective lens from low power to high power.
- Identify the different types of blood cells.
- Draw labelled diagrams of various types of blood cells on the basis of your observation.

Observations

Following types of cells are observed in human blood :

Red Blood Cells

- Disc-like enucleated cells
- Biconcave in shape
- Larger in number
- Red in colour (but appears yellowish in single cell)
- No cytoplasmic organelles but contain haemoglobin.

White Blood Cells

- Larger in size,
- Amoeboidal,
- Colourless,
- Nucleated cells.

Granulocytes

Characteristics	Neutrophils	Eosinophils	Basophils
1. Nucleus	Many lobed	Bilobed	Trilobed usually
2. Granules	Fine	Coarse	Coarse but less in number
3. Number	400-500 mL	60-300 mL	35-100 mL

Agranulocytes

Characteristics	Lymphocytes	Monocytes
1. Nucleus	Rounded	Kidney/Bean-shaped
2. Size	Smaller	Bigger

Platelets

- Enucleated bodies
- Small ovoid or disc-shaped
- Appear as violet granules

7 UNIT

ENDOCRINE GLANDS

EXPERIMENT-1

Aim of the Experiment

To identify and locate the following endocrine glands, with the help of models/charts : (i) Adrenal, (ii) Pancreas, (iii) Thyroid, (iv) Pituitary.

Apparatus/Materials Required

Models and charts showing the endocrine glands of human like adrenal gland, pancreas gland, thyroid gland and pituitary gland.

Theory

Endocrine glands secrete hormones and are transported by blood circulation to target cells or organs. Endocrine glands have no ducts, so these are also known as **ductless gland.** Hormones are non-nutrient chemicals used up irregulatory action. Hormones are also known as chemical massengers and produced in trace amount to control and coordinate human morphology and physiology.

The endocrine glands may be of two types :

1. **Holocrine glands :** These secrete only hormones. *e.g.*, pituitary, thyroid, adrenal gland, etc.

2. **Heterocrine glands :** These secrete both hormones and some other chemicals like enzymes, etc. *e.g.*, pancreas, testes, ovaries, etc.

Thomas Addison is called as the Father of Endocrinology. **Claude Bernard** reported that nervous system controls the function of endocrine glands. **W.M. Baylis** and **E.H. Starling** first discovered hormones while the term 'Hormone' introduced by **Starling.**

Procedure

- Identify and locate the various endocrine glands in human body from the models/charts.
- Draw the labelled diagrams write your observation.

Observations

1. Adrenal Gland

Adrenal glands are also called as **glands of emergency.** These are two adrenal glands in human body.

Identification

Adrenal glands are made of adrenal medulla (centrally located tissues) and adrenal cortex (outside tissues enclosing medulla). Since adrenal glands are present over the kidney, these are also known as **suprarenal gland.**

Location

Adrenal glands are located on the tip of each kidney.

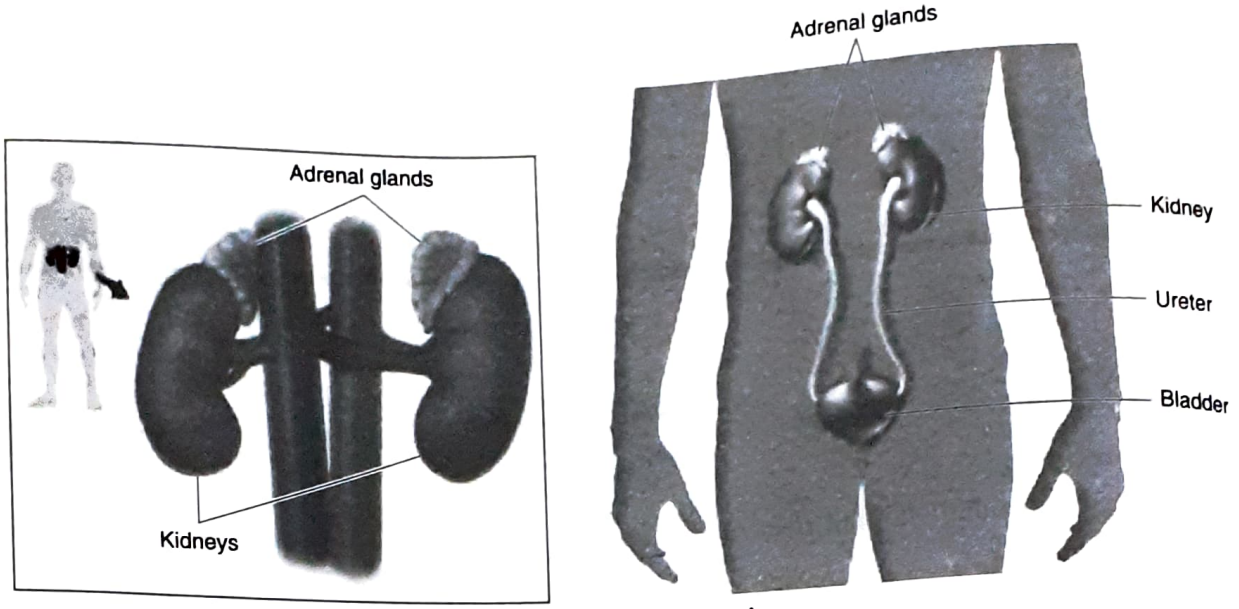


Fig. 7.1 Adrenal gland

Hormones Secreted by Adrenal Glands

Cortex secretes glucocorticoids (cortisol), mineralocorticoids (aldosterone) and sex corticoids (steroids). Medulla secretes adrenaline (amine) and noradrenaline (amine).

2. Pancreas

It is a heterocrine gland having characters of both endocrine and exocrine. The digestive enzymes are poured into duodenum. Pancreas also consists of a group of hormone secreting cells called islets of Langerhans. These produce endocrine secretions. Four kinds of cells have been identified in the islets as follows :

(a) Alpha cells (α-cells)—Produce glucagon.

(b) Beta cells (β-cells)—Produce insulin.

(c) Delta cells (δ-cells)—Produce somatostatin.

(d) Pancreatic Polypeptide Cells (PP/F-cells)—Produce pancreatic polypeptide.

Identification

It is a flattened endocrine gland. It is made up of a head, neck, body and tail. It is attached into the curve of duodenum by head, the body extends to the left and tail touches the spleen.

Location

It is located below the stomach in the bend of duodenum.

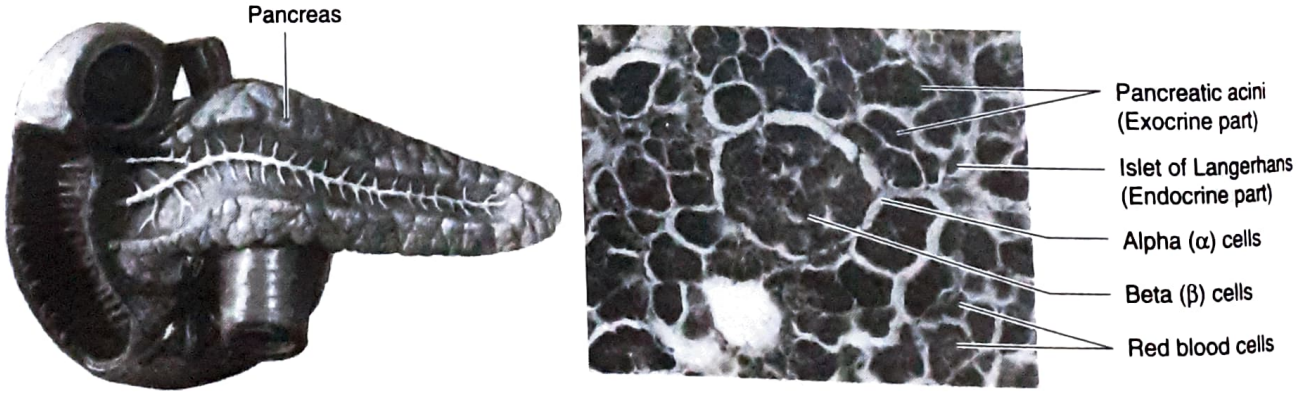


Fig. 7.2 (a) Location of pancreas (The biliary tract), (b) Section of pancreas

Hormones Secreted by Pancreas

Islets of Langerhans secrete insulin (protein), glucogan (protein) and somatostatin (protein).

3. Thyroid Gland

Thyroid gland is the largest endocrine gland. It is well supplied with blood vessels. It is bilobed structure. The two lobes are connected by a narrow structure called **isthmus.** Thyroid gland is the only gland that stores large quantity of hormones. It is about 25 gm in weight.

Identification

The thyroid gland appears like a butterfly. It is brownish red in colour.

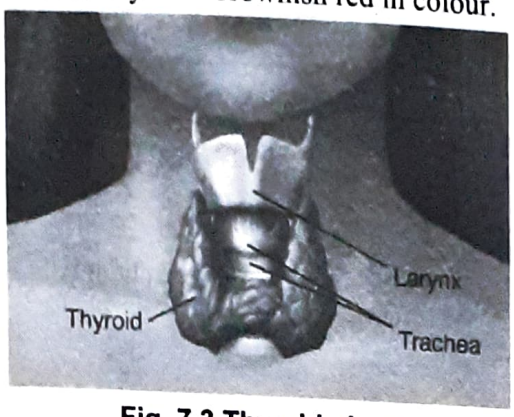


Fig. 7.3 Thyroid gland

Location

Thyroid gland lies in the neck on the sides of trachea just below the larynx.

Hormones Secreted by Thyroid Gland

Thyroid gland secretes thyroxine (iodinated amino acid) and calcitonin (peptide). Thyroxine contains iodine and controls the metabolism of carbohydrates, fats and proteins. 21st October is observed as Iodine Deficiency Disorder Day (IDD-Day).

4. Pituitary Gland

It is also known as master endocrine gland because its secretion control the hormonal secretion from other glands. It is the smallest endocrine gland. It is about 2 gm in weight. It hangs from the base of the brain.

Identification

It is reddish grey in colour.

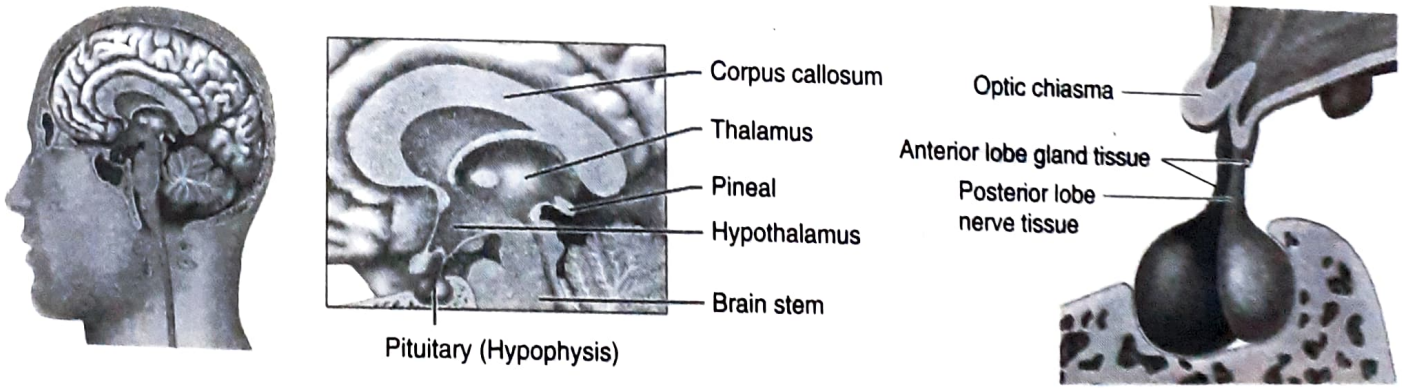


Fig. 7.4 Pituitary gland

Location

Pituitary gland is attached to the ventral side of the brain. It is present in a bony cavity called **sella turcica** and associated to hypothalamus by infundibulum.

Hormones Secreted by Pituitary Gland

Pituitary gland secretes Follicle Stimulating Hormone (FSH), Luteinising hormone (LH), Somatotrophin (GH), Prolactin, Adrenocorticotrophin (ACTH), Thyrotrophin (TSH), Melanocyte Stimulating Hormone (MSH), Oxytocin and Vasopressin.

8 UNIT

FIRST AID

EXPERIMENT-1

Aim of the Experiment

To compile the necessary materials for preparing a first aid box.

Theory

First aid box is the box which contains almost all the materials required for the basic and immediate care to prevent the injuiry or situation from becoming worse, is called **first aid box.**

Emergency health problems like an electric shock, drowning accident, bitten by poisonous animal, etc., may occur suddenly. First aid meets the immediate care before the arrival of an ambulance, doctor or a qualified medical expert. Thus, first aid is the help given at the first instant to give some relief to a victim during a sudden emergency health problem. A red plus (+) symbol can be observed at tip cover of the first aid box. The first aid box should be placed at an easily accessable place. Its size may be 6" × 10" × 5". It is kept in vehicles, laboratories, workshops, factories, shops or even homes.

Compiling the Materials for a First Aid Box

First aid box includes :

(a) Antiseptic liquid : It includes dettol or savlon to clean wounds.

(b) Absorbent cotton : It is used to clean blood and dirt.

Fig. 8.1 First aid box

(c) **Antiseptic cream :** It includes burnol plus, betadin, T-bact, etc., and apply in any type of cuts, wounds or burns, etc.

(d) **Elastic bandage :** It is used to stop bleeding from injuired site.

(e) **Baking soda :** It is used in case of sting by a bee and a wasp.

(f) **Painkiller tablets :** It includes disprin, saridon, voverin, etc., to get relief from severe pain.

(g) **Oral rehydration solution :** It is used to control water loss and dehydration caused by diarrhoea or vomiting.