# Chapter – 5 Transpiration

## Progress Check 1

### Question 1

Transpiration is best defined as (tick-mark the correct option).

(a) loss of water from the plant.

(b) loss of water as vapour from the plants.

(c) evaporation of water from the surface of leaves.

***Answer***

loss of water as vapour from the plants.

### Question 2

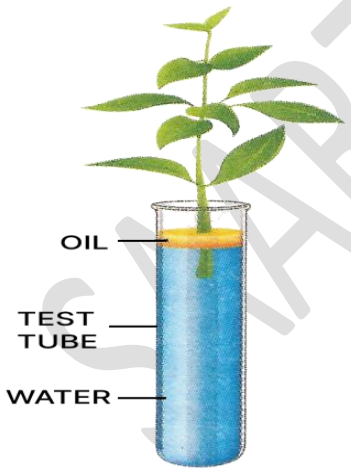
In one of the experiments to demonstrate transpiration, we used cobalt chloride paper. What are the characteristics of this paper that suit the experiment?

***Answer***

Cobalt chloride paper is an indicator of moisture. It is blue when dry but turns pink when exposed to moisture.

### Question 3

Look at the experiment shown in figure below. Suppose you took a single flower with a long stalk dipping in water, instead of a leafy twig. Will it serve the purpose? Yes/No. Give reason.




***Answer***

No, it will not serve the purpose because the number of stomata is much lesser on petals as compared to leaves. Moreover, there are no roots also to actively absorb water and increase the rate of transpiration. Hence, the water loss through transpiration will be negligible in this case.

### Question 4

Mention any two limitations in the use of potometers.

***Answer***

Two limitations in the use of potometer are:

1. Introducing the air bubble is not very easy.
2. Any change in the outside air temperature may affect the position of the air bubble in the capillary tube.

**Progress Check 2**

**Question 1**

From the following list, pick out the parts through which the water vapour of transpiration leaves the leaf and rearrange them in proper sequence.

Xylem vessels, mesophyll cells, stoma, intercellular space and substomatal space.

***Answer***

Xylem vessels → mesophyll cells → intercellular space → substomatal space → stoma

**Question 2**

Does diffusion play a role in the passage of water vapour from the leaf during transpiration? If so, how?

***Answer***

Yes, diffusion plays a role in the passage of water vapour from the leaf during transpiration. The entire movement of water vapour from a cell into the outside atmosphere is a result of diffusion. The molecules of water vapour, like those of any gas, move from the region of their higher concentration to the region of their lower concentration.

**Question 3**

In any experiment to demonstrate transpiration, the leaf must remain attached to its parent plant. Why is this so?

***Answer***

In any experiment to demonstrate transpiration, the leaf must remain attached to its parent plant because on detachment the leaf may die and stomata gets closed.

**Question 4**

Out of the three kinds of transpiration, which one is maximum and which one is minimum?

1. Maximum .....
2. Minimum .....

***Answer***

1. Stomatal transpiration
2. Cuticular transpiration

**Progress Check 3**

**Question 1**

How will the following conditions affect transpiration ?

(i) Still air

(ii) Midday high temperature

(iii) Dry air

(iv) Dim sunlight

(v) Insufficient absorption of water by the roots

***Answer***

(i) Still air — decreases transpiration

(ii) Midday high temperature — increases transpiration

(iii) Dry air — increases transpiration

(iv) Dim sunlight — decreases transpiration

(v) Insufficient absorption of water by the roots — decreases transpiration

**Question 2**

List any three adaptations in plants to reduce transpiration.

***Answer***

1. Sunken stomata covered by hairs.
2. Fewer Stomata
3. Narrow leaves (reduce the surface area)

**Progress Check 4**

**Question 1**

List any four advantages of transpiration to the plant.

***Answer***

Four advantages of transpiration to the plants are:

1. It has a cooling effect on leaf surface. This cooling effect helps the plant withstand the heat. Intense heat can destroy the enzymes.
2. It maintains the suction force due to transpirational pull and thus maintains ascent of sap.
3. Regular ascent of sap results in proper absorption and distribution of water and minerals.
4. Transpiration also maintains the turgidity of plant cells.

**Question 2**

How would you justify the statement that transpiration contributes in bringing rain?

***Answer***

Plant release a large quantity of water vapour into atmosphere. For instance, an apple tree may lose 30 litres of water per day and a maize plant can lose 2 litres of water per day. Therefore, the large stretch of field and dense forests contribute a huge quantity of moisture through transpiration. This moisture further bring the rains.

**Question 3**

**Differentiate between guttation and transpiration.**

***Answer***

| S. No. | Guttation | Transpiration |
|---|---|---|
| 1. | It occurs from the edges of leaves by hydathodes. | It occurs from whole plant surface through stomata, lenticel and cuticle. |
| 2. | It occurs in early morning or night. | It occurs in the presence of sunlight. |
| 3. | Loss of water is in liquid form. | loss of water is in vapour form. |
| 4. | It has no effect on turgidity. | It may lead to loss of turgidity and cause wilting. |
| 5. | Opening of hydathodes are not regulated. | Stomatal transpiration is regulated by guard cells. |
| 6. | It has no cooling effect. | It has cooling effect. |
| 7. | It occurs in humid condition. | It occurs in dry condition. |

**Question 4**

Plants have no blood, yet we sometimes say that a plant is "bleeding". How do you justify this ?

***Answer***

Plants when injured, ooze out cell sap from the ruptured surface due to root pressure. This is very similar to bleeding in animals. Therefore, the term bleeding is used for it.

**Multiple Choice Type**

**Question 1**

The process of evaporative loss of water from the aerial parts of plant is:

1. Ascent of sap
2. Translocation
3. Transpiration
4. Exudation

***Answer***

Transpiration

**Reason** — Loss of water in form of vapour from aerial parts of plant through stomata, lenticel and cuticle is called Transpiration.

**Question 2**

The process of oozing out of the fluids from a plant part is :

1. Transpiration
2. Excretion
3. Transportation
4. Exudation

***Answer***

Exudation

**Reason** — Exudation refers to oozing out of fluids from plant either from hydathodes or from injured part.

**Question 3**

Transpiration occurs:

1. More from adaxial surface of a monocot leaf
2. More from adaxial surface of a dicot leaf

3. Equal from both the surfaces of a dicot leaf
4. More from abaxial surface of a dicot leaf

***Answer***

More from abaxial surface of a dicot leaf

**Reason** — The lower or the abaxial side of leaf has more stomata which results in more transpiration.

**Question 4**

Guttation takes place through:

1. Stomata
2. Lenticels
3. Hydathodes
4. Cuticle

***Answer***

Hydathodes

**Reason** — Hydathodes are small pores found in angiospermic plants (leaves) through which fluid oozes out in form of tiny droplets.

**Question 5**

The apparatus used to measure the rate of transpiration is:

1. Barometer
2. Clinostat
3. Manometer
4. Potometer

***Answer***

Potometer

**Reason** — Potometers are the devices to measure rate of transpiration.

**Question 6**

Which of the following is an external factor affecting the rate of transpiration ?

1. Number of stomata
2. Exposed surface
3. Humidity

4. Sunken stomata

***Answer***

Humidity

**Reason** — Humidity of the atmosphere decides the rate of transpiration. If the humidity is more then the diffusion of water vapour from sub stomatal space is slow.

**Question 7**

The upper layer of mesophyll in a leaf consists of elongated ground tissue called:

1. Spongy parenchyma.
2. Palisade cells
3. Xylem cells
4. Phloem cells

***Answer***

Palisade cells

**Reason** — The upper layer of mesophyll in a leaf consists of elongated ground tissue called palisade mesophyll.

**Question 8**

Transpiration is significant for all except:

1. Cooling effect
2. Suction pull
3. Ascent of sap
4. Translocation of food

***Answer***

Translocation of food

**Reason** — Translocation of food is carried out by phloem tissue and is not dependent on transpiration.

**Question 9**

Hydathodes are located on:

1. At the petiole
2. Upper surface of leaves
3. Lower surface of leaves

4. Margins of leaves

***Answer***

Margins of leaves

**Reason** — Hydathodes are the tiny pores located on leaf margins. They are responsible for guttation.

**Question 10**

When guard cells are flaccid, the stoma must be:

1. Open
2. Neither open nor closed
3. Closed
4. None of these

***Answer***

Closed

**Reason** — When guard cells are flaccid, their inner wall is relaxed closing the stomata. Similarly, when the guard cells become turgid the inner wall is pulled outwards opening the stomata.

**Assertion Reason Type**

**Question 11**

**Assertion.** Lenticels allow diffusion of gases for respiration.

**Reason.** Lenticels are located on the surface of older woody stems. They close during night time and open during the day for the process of transpiration.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

***Answer***

A is True and R is False

**Explanation**
Lenticels are located on the surface of older woody stems. They remain open as they have no opening and closing mechanism like stomata.

**Question 12**

**Assertion.** Transpiration decreases the amount of moisture in the atmosphere.

**Reason.** Forests contribute in bringing rain because of transpiration.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

***Answer***

A is False and R is True.

**Explanation**
Transpiration increases the amount of moisture in the atmosphere. Increased moisture in atmosphere helps in rain.

**Question 13**

**Assertion.** Nerium leaves have sunken stomata covered by trichomes.

**Reason.** Nerium is a hydrophytic plant which gets rid of excessive water through the process of transpiration.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

***Answer***

A is True and R is False.

**Explanation**
Nerium is adapted to dry environments and has sunken stomata and trichomes to reduce water loss. Nerium is not a hydrophytic plant (which lives in water-rich environments); it is actually a xerophytic plant adapted to arid conditions. The adaptations such as sunken stomata and trichomes help in minimizing water loss, not getting rid of excess water.

**Question 14**

**Assertion.** Transpiration helps in the descent of sap by producing a suction force acting from the top of a plant.

**Reason.** Transpiration is the evaporative loss of water through the aerial parts (leaves, stems) of a plant. However, this loss holds much significance for the plant.

1. Both A and R are True.
2. Both A and R are False.

3. A is True and R is False.

4. A is False and R is True.

***Answer***

A is False and R is True.

**Explanation**
Transpiration helps in the ascent of sap by producing a suction force acting from the top of a plant.

**Very Short Answer Type**

**Question 1**

Name the following:

(a) Openings on the stem through which transpiration occurs.

(b) The process by which the intact plant loses water in the form of droplets.

(c) An instrument used to find the rate of transpiration.

(d) A plant in which the stomata are sunken.

(e) The apparatus to record the rate of transpiration in a cut shoot.

(f) Any two parts of a leaf which allow transpiration.

(g) The structure in a leaf that allows guttation.

(h) Loss of water as droplets from the margins of certain leaves.

***Answer***

(a) Lenticels.

(b) Guttation.

(c) Potometer.

(d) Nerium.

(e) Ganong's potometer.

(f) Stomata and Cuticle.

(g) Hydathodes.

(h) Guttation.

**Question 2**

**Fill In The Blanks:**

(a) Transpiration is the loss of water as water ..... from the ..... parts of the plant.

(b) Closing of ..... and shedding of leaves reduce ..... .

(c) Transpiration helps in creating ..... force and in removing excess ..... .

***Answer***

(a) Transpiration is the loss of water as water ***vapour*** from the ***aerial*** parts of the plant.

(b) Closing of ***stomata*** and shedding of leaves reduce ***transpiration***.

(c) Transpiration helps in creating ***suction*** force and in eliminating excess ***water (heat)***.

**Short Answer Type**

**Question 1**

Given below is an example of a certain structure and its special functional activity:

**chloroplasts and photosynthesis**

In a similar way, **write the functional activity** against each of the following:

(a) Hydathodes and .....

(b) Leaf spines and .....

(c) Lenticels and .....

(d) Xylem and .....

***Answer***

(a) Hydathodes and ***guttation***.

(b) Leaf spines and ***protection and reduced transpiration***.

(c) Lenticels and ***transpiration***.

(d) Xylem and ***conduction of water and mineral salts***.

**Question 2**

State whether the following statements are **True** (T) or **False** (F)? **Rewrite** the false statements in the correct form.

(i) Most transpiration occurs at midnight.

(ii) Transpiration creates a pull for the upward movement of the sap.

(iii) Wind velocity has an effect on transpiration.

(iv) Atmospheric humidity promotes transpiration from a green plant.

(v) Transpiration helps to cool the body of the plant.

***Answer***

(i) False
**Corrected statement** — Most transpiration occurs at **mid-day**.

(ii) True

(iii) True

(iv) False
**Corrected statement** — Atmospheric humidity reduces transpiration from a green plant.

(v) True

**Question 3**

**Match the terms given in column A with column B:**

| **Column A** | **Column B** |
|---|---|
| (a) Hydathodes | (i) Photosynthesis |
| (b) Stomata | (ii) Respiration |
| (c) Cuticle | (iii) Regulates opening and closing of stomata |
| (d) Lenticels | (iv) Reduces loss of water |
| (e) Guard cells | (v) Guttation |

***Answer***

| **Column A** | **Column B** |
|---|---|
| (a) Hydathodes | (v) Guttation |
| (b) Stomata | (i) Photosynthesis |
| (c) Cuticle | (iv) Reduces loss of water |
| (d) Lenticels | (ii) Respiration |
| (e) Guard cells | (iii) Regulates opening and closing of stomata |

**Question 4**

**Name These:**

(a) Three kinds of transpiration.

(b) Three external factors which increase the rate of transpiration.

(c) Three intrinsic features which reduce the rate of transpiration.

(d) Three extrinsic factors which decrease the rate of transpiration.

(e) Four kinds of potometers on the basis of the name of scientists who discovered them.

***Answer***

(a) Three kinds of transpiration:

1. Stomatal transpiration.
2. Lenticular transpiration.
3. Cuticular transpiration.

(b) Three external factors which increase the rate of transpiration:

1. Increase in intensity of Sunlight.
2. Low humidity.
3. Increase in velocity of wind.

(c) Three intrinsic features which reduce the rate of transpiration:

1. Sunken stomata.
2. Narrow leaves.
3. Thick cuticles.

(d) Three extrinsic factors which decrease the rate of transpiration:

1. Increase in humidity.
2. Increase in carbon dioxide level in atmosphere.
3. Increase in temperature.

(e) Four potometers named after their discoverers :

1. Farmers's potometer
2. Ganong's potometer
3. Darwin's potometer

4. Garreau's potometer

**Descriptive Type**

**Question 1**

Define the following terms:

(a) Transpiration

(b) Exudation

(c) Potometer

(d) Wilting

(e) Hydathodes

(f) Cuticle

***Answer***

(a) **Transpiration** — Transpiration is the loss of water in the form of water vapour from the aerial parts (leaves and stem) of the plant.

(b) **Exudation** — The process by which plants lose water or other fluids along with dissolved substances directly in liquid form and not as water vapour is called exudation.

(c) **Potometer** — Potometer is a device that measures the rate of water intake by a plant and this water intake is almost equal to the water lost through transpiration.

(d) **Wilting** — The drying out, drooping and withering of the leaves of a plant due to inadequate water supply, excessive transpiration, or vascular disease.

(e) **Hydathodes** — Special pore-bearing structures present on the margins of the leaf to allow exudation are called hydathodes.

(f) **Cuticle** — Cuticle is a waxy layer secreted by the epidermis on the two surfaces of the leaf which prevents evaporation of water from the leaf surfaces.

**Question 2**

**Distinguish between the following pairs:**

(a) Stomata and Lenticels

(b) Guttation and Bleeding

(c) Transpiration and Evaporation

***Answer***

(a) Difference between stomata and lenticels

| Stomata | Lenticels |
|---|---|
| They are minute openings in the epidermal layer of leaves. | They are minute openings on the surface of old woody stems. |
| Maximum transpiration occurs through stomata. | Lesser transpiration occurs through lenticels. |



| Guttation | Bleeding |
|---|---|
| It occurs from the edges of leaves by hydathodes in uninjured plants. | It occurs from any cut or injured part of a plant. |

| Guttation | Bleeding |
|---|---|
| The exudate is mainly water with some dissolved mineral salts. | The exudate is mainly plant sap and sugars. |
| It occurs during early mornings or late nights. | It occurs at the time of injury. |
| It happens in certain plants like Banana, Nasturtium, Strawberry. | It occurs in all plants that have been cut or injured. |

(b) Difference between Guttation and Bleeding

(c) Difference between Transpiration and Evaporation

| Transpiration | Evaporation |
|---|---|
| It is the loss of water in the form of vapour from the aerial parts of the plant. | It is the loss of water from the surface of water bodies in the form of vapour. |
| It is a slow process. | It is comparatively a faster process. |

**Question 3**

Give reason/suitable explanation for each :

(a) Nerium loses less amount of water during transpiration.

(b) More transpiration occurs from the under surface of a dicot leaf.

(c) Transpiration increases with the velocity of wind.

(d) Leaves of some plants wilt during midday and recover in the evening.

(e) Guttation normally occurs during early mornings or late nights.

(f) Forests tend to bring more rains.

***Answer***

(a) Nerium loses less amount of water during transpiration because they have sunken stomata that are covered with hair like structures called trichome.

(b) More transpiration occurs from the under surface of a dicot leaf because the number of stomata is more on abaxial (lower) side of leaf.

(c) Transpiration increases with the velocity of wind because when wind blows faster, the water vapour released during transpiration is removed faster and the area outside the leaf does not get saturated with water vapour.

(d) Leaves of some plants wilt during midday due to high rate of transpiration. They usually recover by evening as the loss of water is compensated by absorption.

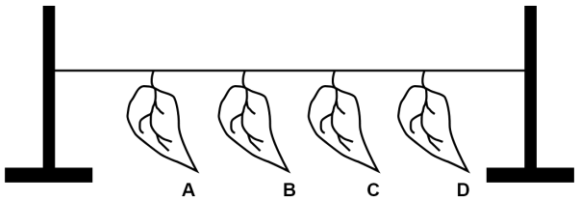
(e) Guttation normally occurs during early mornings or late nights when there is least transpiration. The hydrostatic pressure built, forces out the excess water directly from the tips of veins in the leaf.

(f) Due to transpiration, huge quantities of water are released into the atmosphere by vast stretches of forests. Thus, transpiration increases the moisture in the atmosphere and brings more rain.

**Structured / Application / Skill Type**

**Question 1**

The given figure represents an experiment:




(a) Leaf A was coated with grease on both the surfaces.

(b) Leaf B was coated with grease on the lower surface.

(c) Leaf C was coated with grease on the upper surface.

(d) Leaf D was left without any application of grease.

All the four leaves A, B, C and D were left in a room for about 24 hours.

(i) Which leaf dries first? Give reason.

(ii) Which leaf dries last? Give reason.

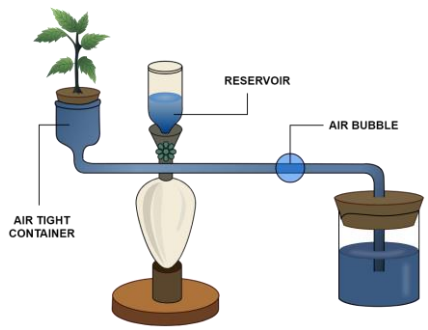
***Answer***

(i) **Leaf D** — The leaf with no greasing on either surfaces would dry first because it would lose water from both surfaces i.e. it would lose maximum quantity of water.

(ii) **Leaf A** — It was coated with grease on both the surfaces. Hence, it would dry last because greasing prevents evaporation of water and transpiration occurs through stomata which are present more on the lower surface of the leaf.

**Question 2**

Given below is the diagram of an apparatus used to study a particular phenomenon in plants:



(a) Name the apparatus.

(b) What is it used for?

(c) What is the role played by the air-bubble in this experiment?

(d) What is the use of the reservoir?

(e) What happens to the movement of the air-bubble if the apparatus is kept:

1. In the dark
2. In sunlight
3. In front of a fan

Give a reason in each case.

***Answer***

(a) Name of the apparatus is **Ganong's potometer**.

(b) Ganong's potometer is used to measure the rate of water intake by a plant.

(c) The air bubble which was introduced into the horizontal graduated capillary tube moves along as transpiration proceeds. As the water is lost from the twig, a suction force is set up which pulls the water from the beaker and the bubble in the capillary tube moves along.

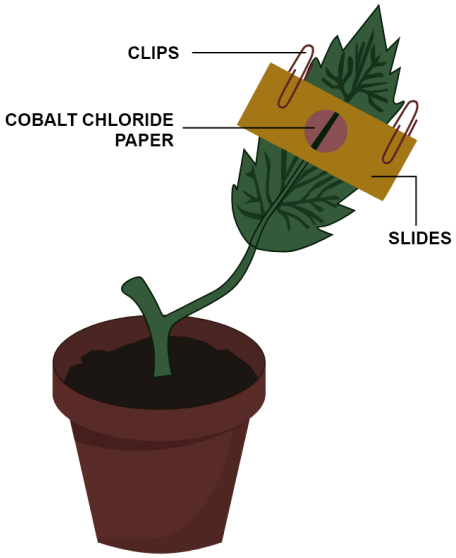
(d) Reservoir is used to release the water into the capillary tube by opening the stop cock.

(e) The movement of air bubble is affected as follows:

1. If the apparatus is kept in the dark, there will be no transpiration as the stomata would be closed. As a result, there would be no movement of the air bubble and it would remain stable.
2. During the day, the stomata are open to facilitate the inward diffusion of $CO_2$ for photosynthesis. At night they are closed. Therefore, more transpiration occurs during the day. As a result, the movement of the air bubble would be larger since there would be more loss of water due to transpiration.
3. If the apparatus is kept in front of a fan, the rate of transpiration will be more. As a result, the movement of the air bubble would be larger since there would be more loss of water due to transpiration as the velocity of wind/air increases.

**Question 3**

Given ahead is the diagram of an experimental set up to study the process of transpiration in plants. Study the same and then answer the questions that follow:




(a) Name the colour of dry cobalt chloride paper.

(b) Is the experimental leaf a monocot or a dicot? Give a reason to support your answer.

(c) Why are glass slides placed over the dry cobalt chloride papers?

(d) After about half an hour what change, if any, would you expect to find in the cobalt chloride paper placed on the dorsal and ventral sides of the leaf? Give a reason to support your answer.

***Answer***

(a) Blue.

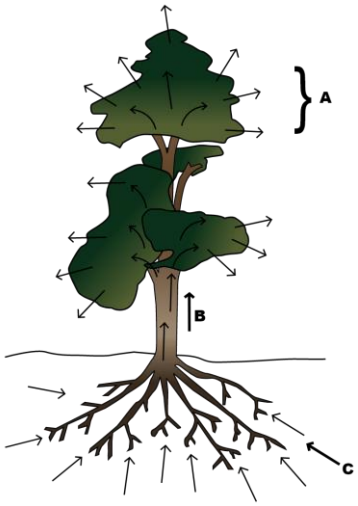
(b) The experimental leaf is a dicot leaf as it shows reticulate venation and there are more number of stomatal openings on the undersurface of a dicot leaf. Hence, transpiration is more and can be easily observed.

(c) Glass slides are placed over the dry cobalt chloride papers so as to retain the strips in their position.

(d) The cobalt chloride paper on the dorsal side will turn less pink or turns pink in a much longer time while the one on the ventral side will turn more pink. This occurs because the ventral surface has more number of stomata as compared to the dorsal surface. As a result, the rate of transpiration is more on the ventral side than on the dorsal side of a dicot leaf.

**Question 4**

An outline sketch of a tree is shown in a diagram below. Study the same and answer the questions that follow:




(a) Name and define the phenomenon labelled A in the diagram.

(b) Write the significance of the process mentioned in A for the plants.

(c) What do the direction of arrows in B and C indicate? Name the phenomenon.

(d) Draw a neat and labelled diagram of an opened stomata.

***Answer***

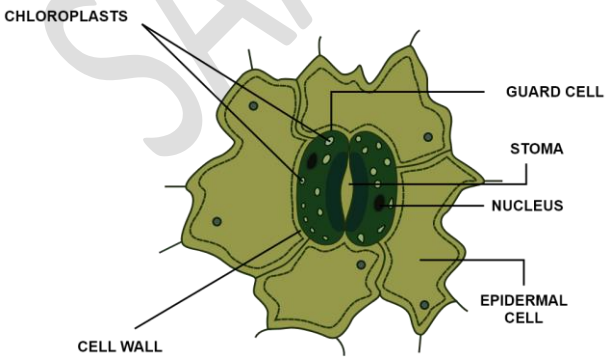
(a) A is transpiration. Transpiration is the evaporative loss of water from the aerial parts (leaves and stem) of the plants.

(b) Significance of transpiration for the plants:

1. Cooling effect.
2. Creating suction force.
3. Distribution of water and minerals.

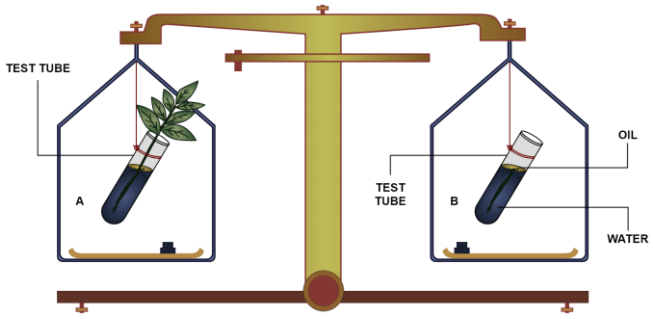
(c) Arrow B indicates water passing up the trunk and the phenomenon is ascent of sap. Arrow C indicates water absorbed by roots from the soil and the phenomenon is called Endosmosis.

(d) Below diagram shows an opened stomata:



**Question 5**

The figure given below represents an experimental set up with a weighing machine to demonstrate a particular process in plants. The experimental set up was placed in bright sunlight. Study the diagram and answer the following questions.




(a) Name the process intended for study.

(b) Define the above mentioned process.

(c) When the weight of the test tubes A and B is taken before and after the experiment, what change is observed? Justify.

(d) What is the purpose of keeping the test tube B in the experimental setup?

(e) What is the purpose of putting oil in the test tube?

***Answer***

(a) Transpiration

(b) Transpiration is a process by which water is lost in the form of water vapour from aerial parts of the plant.

(c) Weight of test tube A before the experiment was more than its weight after the experiment. This is because water from test tube A has evaporated due to transpiration.

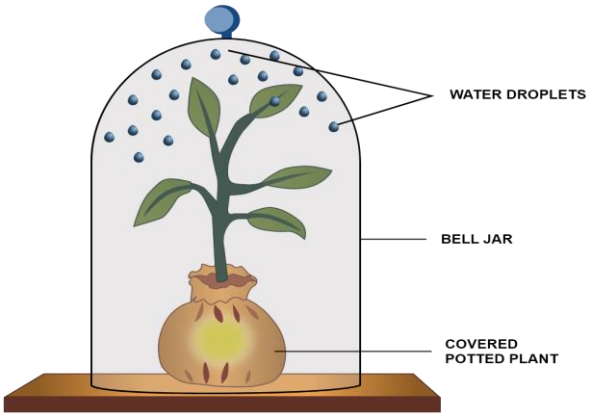
Weight of test tube B remains the same before and after the experiment, because no loss of water occurs in test tube B.

(d) Test tube B is used here as a control. This makes the observation of the change in test tube A easy.

(e) The purpose of putting oil in the test tube is to prevent loss of water from the test tube by evaporation.

**Question 6**

An apparatus as shown below was set up to investigate a physiological process in plants. The setup was kept in sunlight for two hours. Droplets of water were then seen inside the bell jar. Answer the questions that follow:




(a) Name the process being studied.

(b) Explain the process named above in (a).

(c) Why was the pot covered with a plastic sheet?

(d) Suggest a suitable control for this experiment.

(e) Mention two ways in which this process is beneficial to plants.

(f) List three adaptations in plants to reduce the above mentioned process.

***Answer***

(a) Transpiration

(b) Transpiration is a process during which water is lost in the form of water vapour through aerial parts of the plant.

(c) The pot is covered with a plastic sheet to prevent evaporation of water from the soil.

(d) A control for this experiment will be an empty polythene bag with its mouth tied.

(e) Transpiration is beneficial to plants in the following ways:

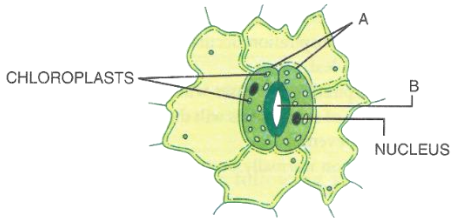
1. It creates a suction force in the stem which enables the roots to absorb water and minerals.
2. It helps in cooling the plant in hot weather.

(f) Some plants have developed adaptations to reduce transpiration to cut down loss of water such as:

1. Sunken stomata
2. Narrow leaves
3. Reduced exposed surface by rolling or folding of leaves.

**Question 7**

Given below is the figure of a stoma. Study the same and answer the following questions:




(a) Label the guidelines A and B.

(b) Write the exact location of the above mentioned structures.

(c) Mention one important role of structure A.

(d) Write three important roles of structure B.

(e) Redraw the same figure when structures A are in flaccid condition. When does flaccid condition occur ?

***Answer***

(a) The guidelines A and B are:

- A → Guard cells
- B → Stoma

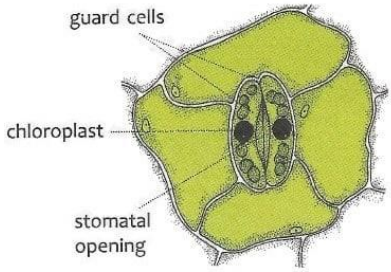
(b) Most of them are found under the leaf i.e. abaxial side of leaf.

(c) It regulates the opening and closing of the stomata.

(d) Three important roles of structure B are:

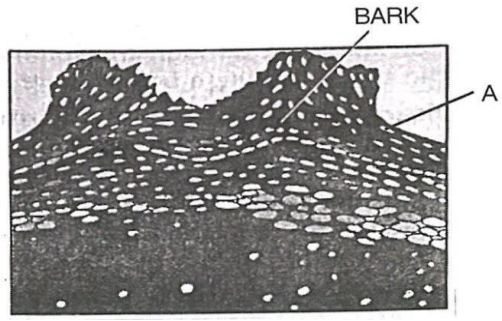
1. Transpiration.
2. Intake of carbon dioxide for photosynthesis.
3. Respiration.

(e) The flaccid condition occurs when there is less absorption of water. In such condition the cells lose their turgidity and the stomata closes.



**Question 8**

The figure given below is a transverse section of an old woody stem. It shows very minute openings labelled - A on its surface.




(a) What are these tiny openings called?

(b) Mention two significant functions of these openings.

(c) Name two other tiny openings which can be found on the surface or margins of leaves.

***Answer***

(a) These tiny openings are called lenticels.

(b) Two functions of lenticels -

1. They facilitate transpiration.
2. They allow exchange of gases.
   s (c) Stomata and hydathodes.