REVIEW QUESTIONS

MULTIPLE CHOICE TYPE

(Select the most appropriate option in each case)

1. Transpiration pull will be maximum under which set of the following conditions?

(a) Open stomata, dry atmosphere and moist soil

(b) Open stomata, high humid atmosphere and well irrigated soil

(c) Open stomata, high humid atmosphere and dry soil

(d) Closed stomata, dry atmosphere and dry soil

Solution:-

(a) Open stomata, dry atmosphere and moist soil

2. With decrease in atmospheric pressure, the rate of transpiration will

(a) increase **(b) decrease rapidly**

(c) decrease slowly **(d) remain the same**

Solution:-

(a) increase

3. The rate of transpiration is more when

(a) atmosphere is dry **(b) temperature is high**

(c) humidity is high **(d) atmosphere is dry and temperature is high**

Solution:-

(b) temperature is high

4. One of the internal factors which affect the rate of transpiration, is

(a) big size of the leaf **(b) Colour of the leaf**

(c) sunken stomata **(d) sunny day**

Solution:-

(c) sunken stomata

5. Guttation takes place through

(a) stomata **(b) lenticels**

(c) lower epidermis of leaves **(d) hydathodes**

Solution:-

(d) hydathodes

6. The loss of water as water vapour from the aerial parts of a plant is known as

(a)evaporation **(b) perspiration**

(c) guttation **(d) transpiration**
Solution:-
(d) transpiration

7. Transpiration will be fastest when the day is
(a) cool, humid and windy **(b) hot, humid and still**
(c) hot, humid and windy **(d) hot, dry and windy**
Solution:-
(d) hot, dry and windy

8. Most of the transpiration in tall trees occurs through
(a) Stomata **(b) Lenticels**
(c) Cuticle **(d) Bark**
Solution:-
(b) Lenticels

9. Transpiration is best defined as
(a) loss of water by the plant
(b) evaporation of water from the aerial surfaces of a plant
(c) loss of water, as water vapour, by a plant
(d) release of water by a plant into the atmosphere
Solution:-
(b) evaporation of water from the aerial surfaces of a plant

B. VERY SHORT ANSWER TYPE
1. Name the following:
(a) Openings on the stem through which transpiration occurs.
Solution:-
Lenticels

(b) The process by which the intact plant loses water in the form of droplets.
Solution:-
The intact plant loses water in the form of droplets is called Guttation.

(c) An instrument used to find the rate of transpiration.
Solution:-
Potometer is an instrument used to find the rate of transpiration.

(d) A plant in which the stomata are sunken.
Solution:-
Nerium is the plant in which the stomata are sunken.

(e) The apparatus to record the rate of transpiration in a cut shoot.
Solution:-
Ganong's photometer is the apparatus to record the rate of transpiration in a cut shoot.

(f) Any two parts of a leaf which allow transpiration.
Solution:-
The two parts of a leaf which allow transpiration is stomata and cuticle.

(g) The structure in a leaf that allows guttation.
Solution:-
Hydathodes is the structure in a leaf that allows guttation.

(h) Loss of water as droplets from the margins of certain leaves.
Solution:-
Loss of water as droplets from the margins of certain leaves is called guttation.

2. Fill in the blanks:
(a) Transpiration is the loss of water as water ..... from the .....parts of the plant.
Solution:-
Transpiration is the loss of water as water vapour from the aerial parts of the plant.

(b) Closing of ..... and shedding of leaves reduce .....
Solution:-
Closing of stomata and shedding of leaves reduce transpiration

(c) Transpiration helps in creating ..... force and in eliminating excess.....
Solution:-
Transpiration helps in creating suction force and in eliminating excess water

C. SHORT ANSWER TYPE
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 .....
Solution:-
Hydathodes and guttation

(b) Leaf spines and.....
Solution:-
Leaf spines and protection and reduced transpiration

(c) Lenticels and.....
Solution:-
Lenticels and transpiration

(d) Xylem and.....
Solution:-
Xylem and conduction of water and mineral salts.

2. (a) State whether the following statements are True (T) or False (F)?
(b) Rewrite the false statements in (a) above, in the correct form by changing either the first or the last word only.
(i) Most transpiration occurs at midnight.
Solution:-
(a) False
(b) Most transpiration occurs at mid-day.

(ii) Transpiration creates a pull for the upward movement of the sap.
Solution:-
(a) True

(iii) Wind velocity has an effect on transpiration.
Solution:-
(a) True

(iv) Voltmeter is an instrument used for measuring the rate of transpiration in green plants.
Solution:-
(a) False.

(b) Potometer is an instrument used for measuring the rate of transpiration in green plants.

2. Give suitable explanation for the following:
(a) A higher rate of transpiration is recorded on a windy day rather than on a calm day.
Solution:-
Transpiration increases with the velocity of wind. If the 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.

(b) Excessive transpiration results in the wilting of the leaves.
Solution:-
Leaves of some plants wilt during midday and recover in the evening. In some plants, e.g. balsam, the leaves of the plants wilt during the midday in spite of the fact that there is plenty of water in the soil. In such cases, the rate of transpiration during midday exceeds the rate of absorption of water by the roots. The cells, therefore, lose turgidity. So, excessive transpiration results in wilting of the leaves.

(c) Water transpired is the water absorbed.
Solution:-
All plants continuously absorb water through their roots. This water is conducted upwards through the stem and is distributed to all the aerial parts including the leaves. Only a small quantity of this water (about 2%) is used by the plant in photosynthesis and other activities. The rest of it is almost lost to the atmosphere as water vapour as a result of transpiration.

(d) More transpiration occurs from the lower surface of a dorsiventral leaf.
Solution:-
More transpiration occurs from the lower surface of a dorsiventral leaf. There are more stomatal openings on the lower surface of a dorsiventral leaf and therefore, more transpiration occurs from the lower surface.

(e) Cork and bark of trees help in preventing loss of water.
Solution:-
Cork and bark of trees help in preventing loss of water. As Cork and Bark of trees are tissues of old woody stems. Bark is thick with outermost layer made of dead cells and

the cork is hydrophobic in nature. These properties make them water-proof and hence they prevent transpiration.

(f) Perspiration and transpiration help to cool the body temperature of the organism.
Solution:-
Perspiration and transpiration help to cool the body temperature of the organism. In both perspiration and transpiration, water is lost by evaporation from the body of the organism as water vapour. This evaporation reduces the temperature of the body surface and brings about cooling in the body of the organism.

(g) On a bright sunny day, the leaves of certain plants roll up.
Solution:-
Many plants and specially those which grow in a dry climate have evolved a variety of permanent adaption to cortical transpiration. On a bright sunny day, the rate of transpiration is much higher than any other days. The leaves of certain plants roll up on a bright day, in some cases, leaves may get wavy, rolled or folded to reduce exposed surface.

4. Which of the following statements are true and which ones are false? Give reason in support of your answer.
(a) Potometer is an instrument used for demonstration of transpiration occurring from the lower surface of a leaf.
Solution:-
False.
Photometer is a device that measure the rate of water intake by a plant and this water intake is almost equal to the water lost through transpiration.

(b) Hydathodes are similar to stomata in plant physiology.
Solution:-
False.
Hydathodes are special pore-bearing structure present on the margins of the leaf to allow this exudation.

(c) Atmospheric humidity promotes transpiration from a green plant.
Solution:-
False.
Transpiration is reduced if the air outside is humid. High humidity in the air reduces the

rate of outward diffusion of the internal water vapour across stomata, thereby reducing the rate of transpiration.

(d) Some desert plants have sunken stomata on their leaves.
Solution:-
True.
Many plants and specially those which grow in a dry climate have evolved a variety of permanent adaptions to curtail transpiration. The stomata may be sunken or covered by hairs.

(e) Most transpiration occurs during mid-day.
Solution:-
True.
Transpiration occurs as long as the stomata are open, but it stops when they are closed. As the stomata open during the daytime, the diffusion of gases in and out starts fulfilling the need for photosynthesis as well as allowing transpiration.

5. Differentiate between guttation and bleeding in plants.
Solution:-

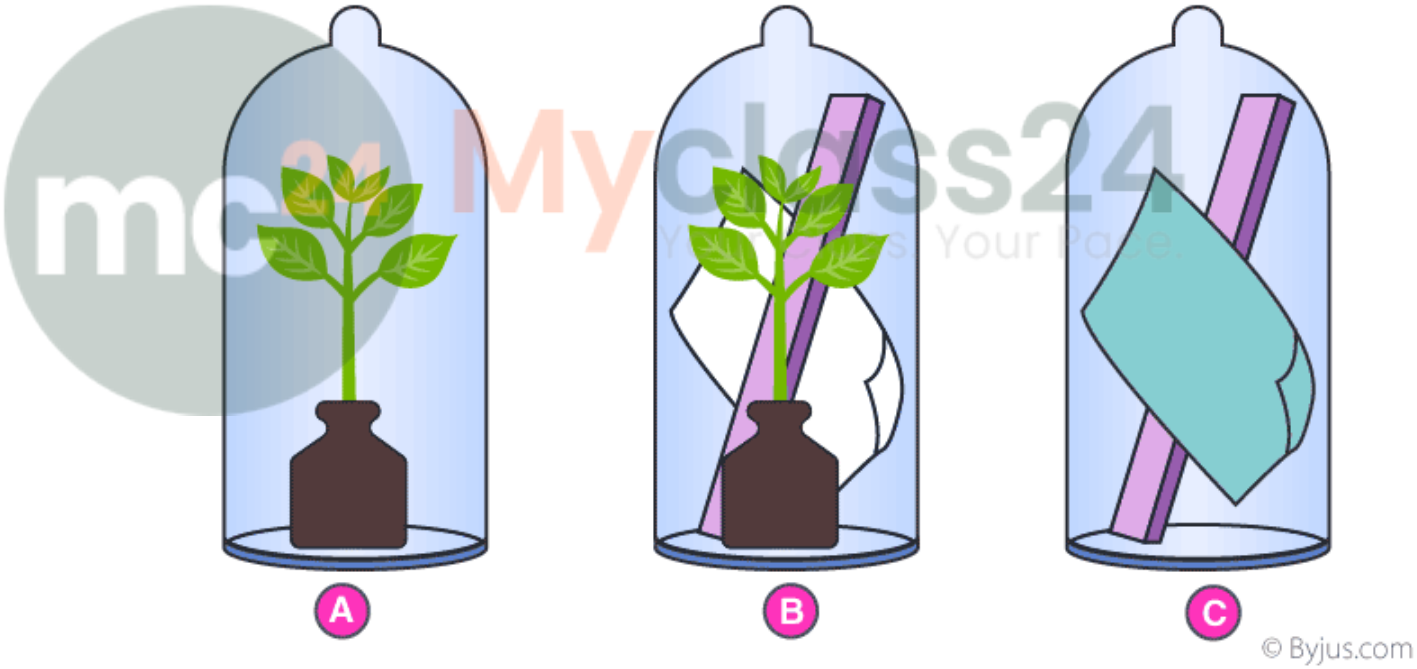
Guttation	Bleeding
The leaves of certain plants exhibits droplets of water along their margins in the morning. This particular happens in plants growing in warm humid conditions. Water escapes from specialized structures called hydathodes.	This happens only due to injury. The plant sap escapes from the ruptured or cut surfaces of a plant. The root pressure generated by a plant assists in bleeding.

D. LONG ANSWER TYPE
1. What is wilting? Some plants show wilting of their leaves at noon even when the soil is well watered. Why is it so?
Solution:-
Leaves of some plants wilt during midday and recover in the evening. In some plants, e.g. balsam, the leaves of the plants wilt during the midday in spite of the fact that there is plenty of water in the soil. In such cases, the rate of transpiration during midday exceeds the rate of absorption of water by the roots. The cells, therefore, lose turgidity. In the evening or during the night, the stomata are constricted and the temperature is not high, therefore, there is no loss of water through transpiration and the turgidity of

the leaves is re-acquired and they stand out erect.

2. Why are the stomata in most plants more numerous on the lower surface of a leaf instead of being on the upper surface?
Solution:-
Stomata are minute openings in the epidermal layer of leaves. A stomata is surround by two bean-shaped guard cells. More transpiration occurs from the under surface of a dicot leaf. There are more stomatal openings on the undersurface of a dicot leaf and therefore, more transpiration occurs from the undersurface.

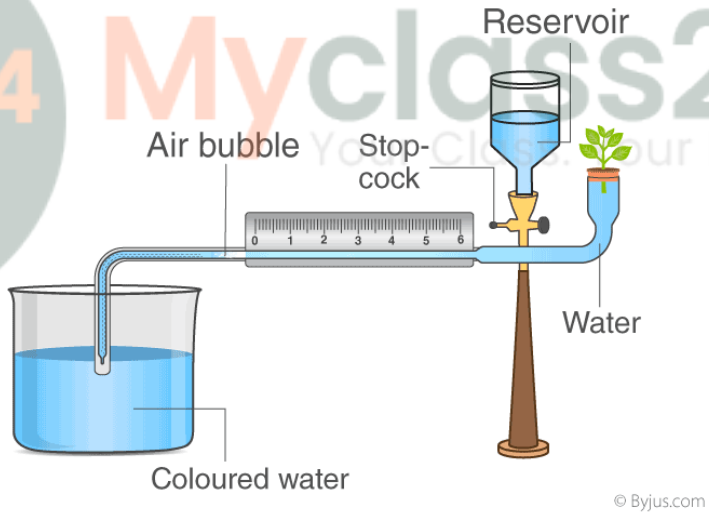
3. Suppose you have a small rose plant growing in a pot. How would you demonstrate transpiration in it?
Solution:-



Set-up A. Take a small well-watered potted plant, preferably one with broad leaves. Enclose the pot completely within a polythene bag and tie the mouth of the bag firmly around the base of the stem. This would prevent the escape of water vapour from the pot. Now cover the entire plant under a bell jar as in (A).
Set-up B. Arrange another similar plant and cover it with a bell jar exactly in the same manner as the first one, except that here you also keep a piece of dry cobalt chloride paper by the side of the plant inside the bell jar (B). The paper may be pinned to a wooden stick or to a strip of cork sheet.

Set-up C. Take a third bell jar without the plant, but still containing a similar piece of cobalt chloride paper (C). Now, keep all the three bell jars together in the sun.
After about half an hour we observe that,
1. The first bell jar (A) would show water vapour condensing on its inner walls.
2. The second bell jar (B) would also show a similar condensation and at the same time, the initially blue cobalt chloride paper in it would turn pink.
3. The blue colour of the cobalt chloride paper in the third bell jar (C) does not change at all and there are no water drops on the jar's inner walls either.
The third bell jar in this experiment is a control which proves that there was no moisture in the air due to transpiration as there was no plant in it.

4. What is a photometer?
Solution:-
Potometer is a device that measures the rate of water intake by a plant (L. poton: drink, meter: measure), and this water intake is almost equal to the water lost through transpiration.



A twig of some suitable plant cut with a sharp knife is fixed in an apparatus as shown in fig. The entire apparatus is filled with water so that no air spaces are present. An air bubble is introduced into the horizontal graduated capillary tube which dipping into the beaker containing water.[This is done by lifting the bent capillary tube the coloured water so that air may be sucked in due to suction pull and is again dipped into the water.] As transpiration proceeds, i.e., 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. The readings on the capillary tube moves along. The readings on the capillary tube would give the volume of water lost in a given time. The air bubble can be

brought back to its original position by releasing some more water from the reservoir the capillary tube by opening the stop cock.

5. What is lenticular transpiration? Mention one major difference between lenticular transpiration and stomatal transpiration.

Solution:-

Lenticels are special opening that develop on the barks of older stem in place of stomata. These allow diffusion of gases for respiration as well as for photosynthesis. Lenticels never close. They remain open all the time.

Lenticular	Stomatal
Lenticels are special opening that develop on the barks of older stem in place of stomata.	The amount of transpiration from lenticels certainly more than the cuticular transpiration, but very much less than the stomatal transpiration.

6. List any three major factors that accelerate the rate of transpiration.

Solution:-

The factors that accelerate the rate of transpiration are,

1. Intensity of sunlight
2. Temperature
3. Velocity of wind
4. Humidity

7. There is a general belief that forests tend to bring more frequent rains. Can you explain this scientifically?

Solution:-

As we know forests have large number of plants and trees. So plants loses water in the form of water everyday into the atmosphere through transpiration. A tree loses more than 30 liters of water per day. Hence huge amount of water is escaped into the atmosphere by forests. This increases the moisture in the atmosphere and brings more frequent rains.

8. Droplets of water may sometimes be seen along the margins of the leaves of a banana plant, growing in wet soil in the mornings. Are these dew drops? Comment upon your answer.

Solution:-

The leaves of certain plants exhibits droplets of water along their margins in the

morning. This particular happens in plants growing in warm humid conditions. A humid environment hampers transpiration while the roots continue to absorb water from the soil. This builds up a big hydrostatic pressure within the plant and "forces out" the excess water directly from the tips of veins in the leaf. Special pore-bearing structures called hydathodes are present on the margins of the leaf to allow this exudation.

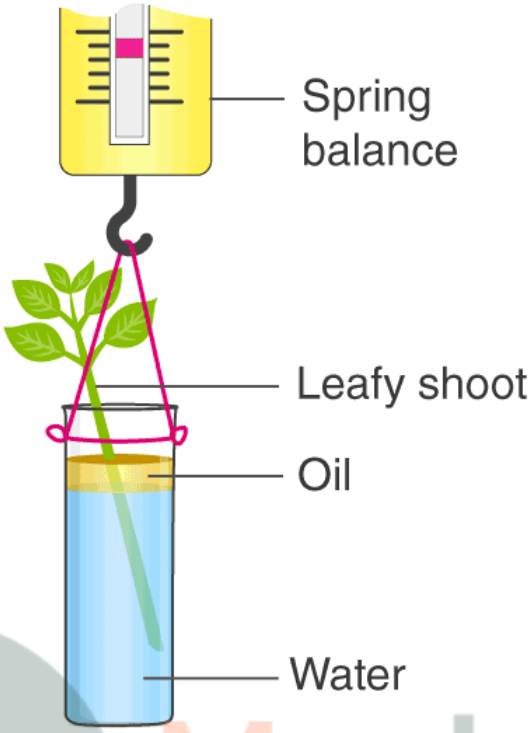
9. Briefly explain how the rate of transpiration is affected by:
(a) Intensity of light
(b) Humidity of the atmosphere
Solution:-
(a) Intensity of light:- During the day, the stomata are open to facilitate the inward diffusion of CO_2 for photosynthesis. At night they are closed. Therefore, more transpiration occurs during the day. When it is cloudy during the day, the stomata are partially closed and transpiration is reduced.
(b) Humidity of the atmosphere:- Transpiration is reduced if the air outside is humid. High humidity in the air reduces the rate of outward diffusion of the internal water vapour across stomata, thereby reducing the rate of transpiration.

E. STRUCTURED/APPLICATION/SKILL TYPE
1. In an experiment, four freshly plucked leaves (A-D) of a plant, such as those of China Rose, was treated as follows:
(A) coated with Vaseline on its upper surface
(B) coated on the lower surface
(C) coated on both surfaces
(D) left uncoated.
All the four leaves A, B, C and D were left in a room for about 24 hours.
(i) Which leaf would become most limp? Why?
Solution:-
The leaf D become most limp. Because, this is the only leaf which is left uncoated and water would be lost through transpiration from upper and lower surface.

(ii) Which leaf would show least limping? Why?
Solution:-
The leaf C shows the least limping. Because both surface of the leaf is coated with Vaseline. Hence, no water is lost from the leaf through the transpiration.

2. Given alongside is the diagram of an experimental set-up to demonstrate a certain

phenomenon in plants.



(a) Name the phenomenon being demonstrated.
Solution:-
The phenomenon being demonstrated is Transpiration.

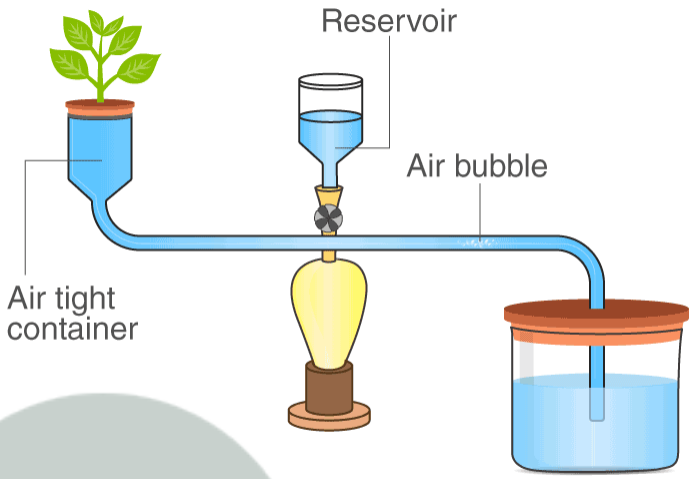
(b) What is the purpose of putting oil in the test tube?
Solution:-
The purpose of putting oil in the test tube is to prevent the loss of water by evaporation.

(c) What is the purpose of the spring balance in the set-up?
Solution:-
The purpose of the spring balance in the set-up is to measure the change in weight of the set-up. A small light weight potted plant can be weighed before and after the end of a certain period of time. The soil surface and the pot should be fully covered to prevent evaporation from the surfaces other than the plant. The loss in weight by the plant during that time is due to loss of water by transpiration.

(d) Would it make a difference if the experimental set-up is kept in bright sunshine?
Solution:-
Yes it definitely make a difference if the experimental set-up is kept in bright sunshine.

The transpiration rate will increase.

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



(a) Name the apparatus.
Solution:-
Name of the apparatus is Ganong's potometer.

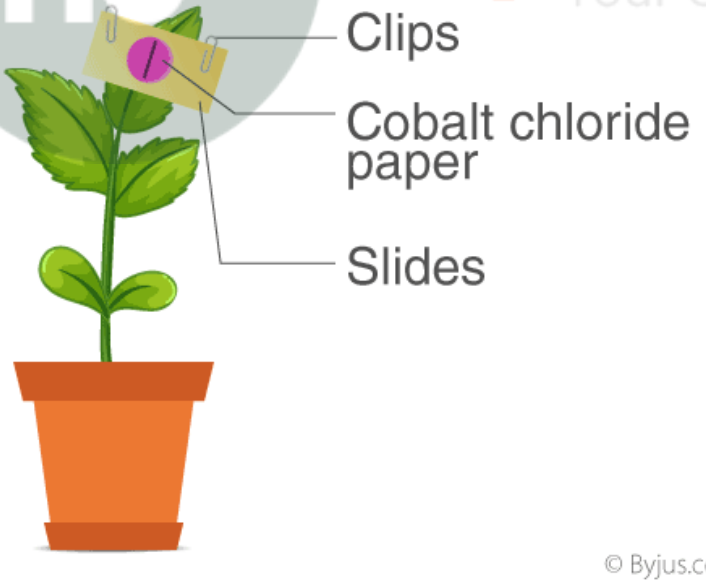
(b) What is it used for?
Solution:-
Ganong's potometer is used to measure the rate of water intake by a plant.

(c) What is the role played by the air-bubble in this experiment?
Solution:-
As transpiration proceeds, i.e., 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. The readings on the capillary tube would give the volume of water lost in a given time.

(d) What is the use of the reservoir?
Solution:-
To release the water into the capillary tube by opening the stop cock.

(e) What happens to the movement of the air-bubble if the apparatus is kept:
(i) In the dark
(ii) In sunlight
(iii) In front of a fan
Give a reason in each case.
Solution:-
(i) 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.
(ii) 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. When it is cloudy during the day, the stomata are partially closed and transpiration is reduced. As a result, the movement of the air bubble would be larger since there would be more loss of water due to transpiration.
(iii) 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.

4. 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.
Solution:-
The colour of dry cobalt chloride paper is blue.

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

Solution:-

Stomata are minute openings in the epidermal layer of leaves. A stomata is surround by two bean-shaped guard cells. More transpiration occurs from the under surface of a dicot leaf. There are more stomatal openings on the undersurface of a dicot leaf and therefore, more transpiration occurs from the undersurface.

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

Solution:-

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

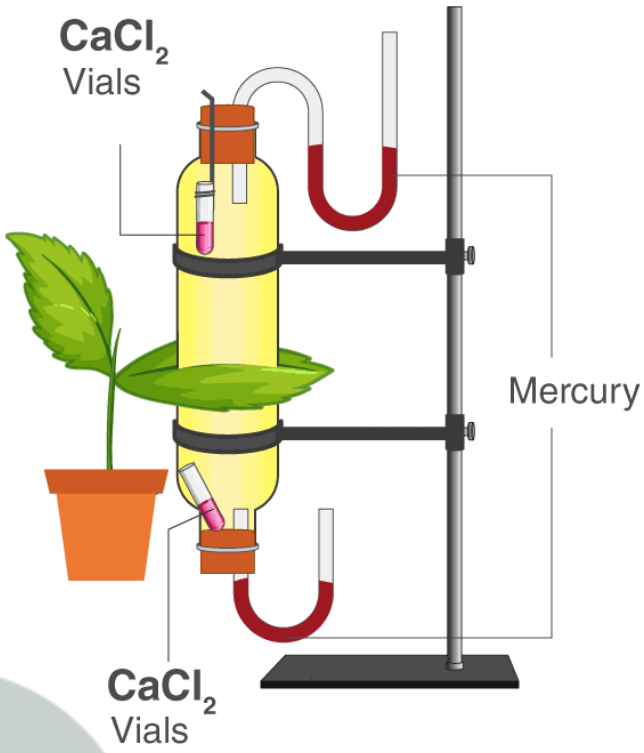
(d) After about half an hour what change, if any, would you expect to find in the cobalt chloride paper placed on the dorsal and ventral sides of the leaf? Give a reason to support your answer.

Solution:-

After about half an hour we observe that,

1. The water vapour condensing on its inner walls.
2. The second bell jar (B) would also show a similar condensation and at the same time, the initially blue cobalt chloride paper in it would turn pink.

5. The apparatus shown in the following diagram is Garreau's potometer designed to demonstrate unequal transpiration from the two surfaces of a dorsiventral leaf. Before keeping the leaf in between the cups, anhydrous calcium chloride ($CaCl_2$) contained in two small vials were weighed and placed in both the cups. The ends of the cups were closed with corks through which two mercury manometers were connected. After few hours, $CaCl_2$ vials were taken out and weighed again.



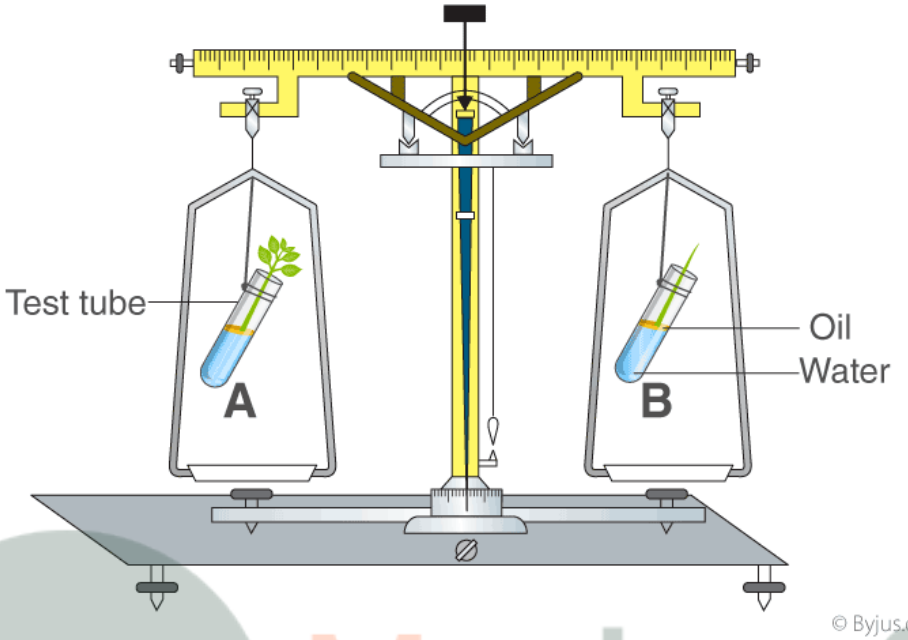
(a) What is the purpose of keeping $CaCl_2$ vials inside the cup?
Solution:-
The purpose of keeping $CaCl_2$ vials inside the cup to absorb water.

(b) After few hours $CaCl_2$ vials were taken out and weighed again. Will you expect any difference in weight? If so, give reason.
Solution:-
Yes, there is a difference in weight. After few hours the weight of the $CaCl_2$ vials will increase because they will absorb water lost by the leaf of the plant due to transpiration.

(c) What is the purpose of using a manometer?
Solution:-
The purpose of using the monometer in order to measure the pressure exerted by the fluid.

(d) What do you mean by transpiration?
Solution:-
Transpiration is the loss of water in the form of water vapour from the leaves and other aerial parts of the plant.

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



(a) Name the process intended for study.
Solution:-
Transpiration is the process intended for study.

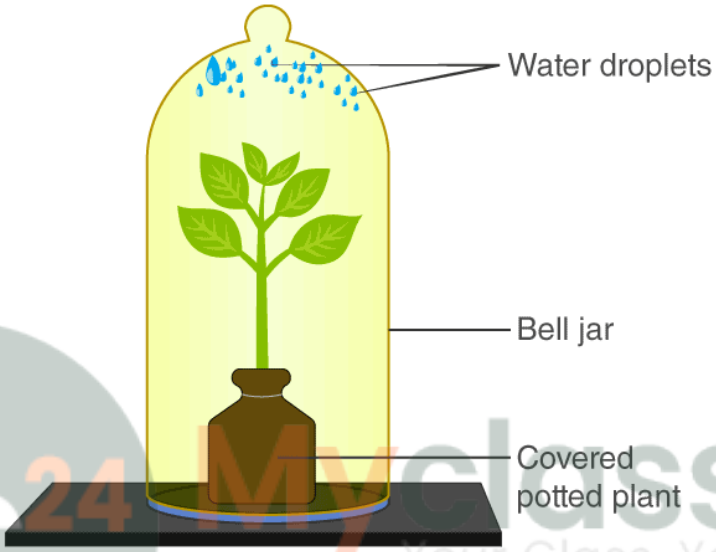
(b) Define the above mentioned process.
Solution:-
Transpiration is the loss of water in the form of water vapour from the leaves and other aerial parts of the plant.

(c) When the weight of the test tubes A and B is taken before and after the experiment, what change is observed? Justify.
Solution:-
Weight of test tube A is taken before the experiment was more when compare to its weight after the experiment. Because water from test tube A has evaporated due to transpiration.
Weight of test tube B is taken before and after the experiment is remains the same, because no loss of water occurs in test tube B. This is because oil is putting on the test tube.

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

Solution:-
The purpose of keeping the test tube B in the experimental setup this makes the observation of the change in test tube A easy.

7. 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.
Solution:-
Transpiration is the process being studied.

(b) Explain the process named above in (a).
Solution:-
Transpiration is the loss of water in the form of water vapour from the leaves and other aerial parts of the plant.
(c) Why was the pot covered with a plastic sheet?
Solution:-
The pot is covered with a plastic sheet to prevent evaporation of water from the soil.

(d) Suggest a suitable control for this experiment.
Solution:-
A suitable control for this experiment is an empty polythene bag.

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

Solution:-

Transpiration is the process is beneficial to plants.

1. Water is lost in the form of vapour
2. It occurs in the presence of sunlight
3. It cools the plant body
4. It occurs during dry conditions.

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

Solution:-

The three adaptations in plants to reduce the transpiration are,

1. Sunken stomata: - The stomata may be sunken or covered by hairs
2. Fewer stomata:- The number of stomata may be reduced.
3. Narrow leaves:- The leaves may become narrower to reduce surface area.