

3. PLANT LIFE

A. Choose the correct answer.

- Which of the following statements on photosynthesis is correct?
 - It is a catabolic process
 - starch is produced during the process
 - Nitrogen is also produced as a by product
 - Sunlight, water, carbon dioxide are the raw materials required for the process
- Which of the following respire anaerobically?
 - Yeast
 - earthworm
 - fish
 - frog
- Chemoautotrophic nutrition is shown by
 - plants
 - Bacteria
 - leech
 - lichens
- Destarching of leaves of plants take _____ hours.
 - 24-48
 - 36-72
 - 12 – 4
 - 06-12
- Deficiency symptom of magnesium is
 - neurosis
 - stunted growth
 - Chlorosis
 - sterile flowers
- The substance that is broken down during respiration is
 - starch
 - protein
 - fats
 - Glucose
- Anabolic process means _____ process.
 - breaking down
 - Building up
 - catabolic
 - endothermic
- Dicot leaves have _____ venation.
 - Reticulate
 - parallel
 - anti-parallel
 - convergent
- Glycolysis occurs in _____ of cell.
 - ribosomes
 - nucleus
 - Cytoplasm
 - lysosomes
- Kidney-shaped cells surrounding stomata are _____ cells.
 - tubular
 - mesophyll
 - epidermal
 - guard

B. Give one word answer

- Opening found on the under surface of leaves - **Stomata**
- Chemical needed to test for the presence of starch - **Iodine**
- The tissue containing chlorophyll - **Mesophyll**
- Plants with leaves that have green and non-green portions - **Variegated leaf or coleus**
- The stages of respiration that occurs in mitochondria - **Kreb's cycle**
- Opening on the surface of stem - **Lenticels**
- Product formed from anaerobic respiration in animals - **Lactic acid**
- The energy currency of the cell - **Mitochondria**
- The plant mostly used in the experiment to show the evolution of oxygen during photosynthesis - **Hydrilla**
- An insectivorous plant - **Venus flytrap**

C. Fill in the blanks

- Food helps in building Living matter of cells.
- Green plants are photoautotrophic.
- Lichens are Symbiotic in nature.
- The element Nitrogen is especially present in meristems.
- Sunlight is trapped by Chlorophyll of leaves.
- Methylated spirit helps to Decolorize the leaves.
- Parts of leaves that turn Blue-black shows presence of starch.
- 38 molecules of ATP are produced during aerobic respiration.
- Full form of ATP is Adenosine triphosphate
- Anaerobic respiration occurs in Some bacteria and Yeast.

D. Matching (Direct answers)

Column A	Column B
1. Lichens	i).Symbiosis
2. Manganese	h). Micronutrient
3. Magnesium	j).Macronutrient
4. Lenticels	g).Stem
5. Stomata	f).Leaves
6. Ethyl alcohol	c).Anaerobic respiration
7. Coleus	d).Variegated leaf
8. Phloem	e).Transports food
9. Saprophytic	a).Moulds
10. Parasitic	b).Cuscuta

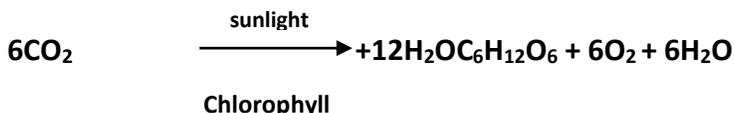
E. State true or false

1. Glucose is converted into starch by polymerization. - **True**
2. Necrosis means less chlorophyll in leaves. - **False**
3. Less amount of manganese produces sterile flowers. - **True**
4. Glycolysis in an aerobic process. - **False**
5. Glucose is formed by photosynthesis. - **True**
6. Carbon dioxide gas is produced during photosynthesis. - **False**
7. Pea has dorsiventral leaves. - **True**
8. Non-green portions of leaf turn blue-black in starch test. - **False**
9. Rate of photosynthesis increases upto a temperature of 40°C. - **True**
10. Pyruvic acid is formed by glycolysis. - **True**

F. Answer the following questions

1. Define photosynthesis. Write the equation for the process.

Ans. Photosynthesis is an anabolic process by which the chlorophyll containing green plants manufacture food (i.e. glucose) using carbon dioxide and water, in the presence of sunlight. Oxygen is given out as a by-product.



2. How is a leaf adapted to carry out photosynthesis?

Ans. Special features of leaf for photosynthesis

- a) Thin and flat leaves, have a greater surface area for trapping light for photosynthesis.
 - b) Greater number of stomata on the lower surface of leaves help in the exchange of gases.
 - c) The number of chloroplasts present on the upper region of the mesophyll cells, i.e. palisade parenchyma is more to trap more sunlight
 - d) The veins in the leaves have xylem and phloem which not only help in the upward movement of sap but also translocation of food to different parts
3. What are the major factors affecting photosynthesis? Explain them.

Ans.The major factors affecting photosynthesis are as follows:

- a) Carbon dioxide: The rate of photosynthesis increases with the increase in the concentration of carbon dioxide but only up to a certain limit, above which the rate becomes stable.

- b) Light: The rate of photosynthesis increases with the increase in light intensity. Light of very high intensity destroys chlorophyll and reduces photosynthesis. Light of very low intensity slows down the rate of photosynthesis.
- c) Chlorophyll: It traps sunlight and becomes activated. This energy splits up water molecules to liberate oxygen. Thus in the absence of chlorophyll, photosynthesis cannot occur.
- d) Temperature: With the increase in temperature, the rate of photosynthesis increases but only up to a temperature of 40°C.
- e) Water: Water absorbed by the roots is transported to the leaves for preparation of food.

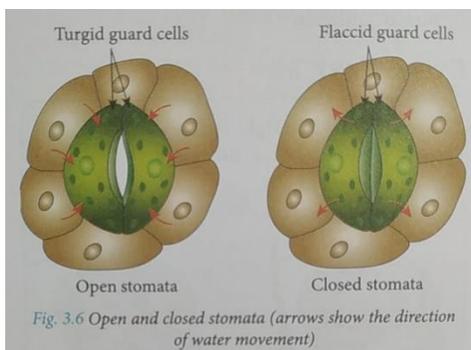
4. Describe the starch test in a stepwise manner.

Ans. The major steps of the starch test are:

- a) Boil the leaf in water to kill the cells.
- b) Next boil the leaf in methylated spirit over a water bath. This decolorizes the leaf, so that the colour change due to iodine can be easily noted.
- c) Then dip the leaf in boiling water to soften it.
- d) Finally add a few drops of dilute iodine solution to it.
- e) Parts that turn blue-black show the presence of starch and parts that turn brown show the absence of starch.

5. With a neat labeled diagram explain the phenomenon of opening and closing of the stomata.

Ans. [Diagram 3.6]



The opening and closing of stomata is controlled by guard cells. During the day, glucose gets stored in guard cells. Due to increase in the solute concentration, water enters the guard cells from the adjoining epidermal cells. Thus guard cells become turgid and swollen, causing their outer thin walls to bulge outwards. This results into the opening of stomata.

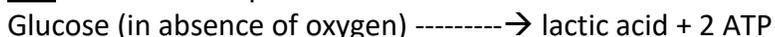
During the night, the glucose is trans-located to other parts of the plant, so solute concentration in the guard cell decreases. Thus the water moves out from the guard cells. Cells become flaccid and their inner walls become straight causing the stomata to close.

6. When does anaerobic respiration occur in humans?

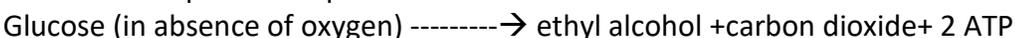
Ans. During strenuous physical exercise, some of the muscle cells of the human body may respire anaerobically for a short period of time. But that is only temporary.

7. Write down the equation for anaerobic respiration.

Ans. Anaerobic respiration in animals:



Anaerobic respiration in plants:



8. Describe an experiment to show that light is necessary for photosynthesis.

Ans.

Aim: To show that sunlight is essential for photosynthesis.

Procedure: Take a healthy potted plant and keep it in a dark room for 24 – 28 hours to destarch its leaves. Select any one leaf and fix a strip of black paper on the middle of both sides with the help of clips. Expose the plant to sunlight for 6 – 8 hours. Now pluck the selected leaf, remove the strips of black paper and perform starch test.

Observation: It will be found that only the covered parts of the leaf give a negative result, i.e., turn brown with iodine, while the other portions of the leaf turn blue – black. Any other leaf of the plant will also turn blue – black with iodine. This shows that photosynthesis occurs only in those parts of the leaf that receive light.

9. What are the two phases of respiration? Where do they occur?

Ans. The two phases of respiration are :

- Glycolysis:** In this step, glucose is broken down into pyruvic acid in the absence of oxygen. This phase occurs in the cytoplasm of the cell
- kreb's cycle:** In this step, pyruvic acid is broken down into carbon dioxide, water and energy in the presence of oxygen. This phase occurs in the mitochondria of the cell.

10. What is the significance of photosynthesis?

Ans. a) Oxygen produced by the process of photosynthesis is taken in by all living organisms of the world for the process of respiration. Carbon dioxide released by the organisms during respiration is again taken in by the plants for the process of photosynthesis. Thus the balance of oxygen and carbon dioxide is maintained.

b) Photosynthesis is the process by which green plants make food. All animals are directly or indirectly dependent on this food for their survival. Thus it is only by photosynthesis that all living organisms of the world get food.

G. Define the following terms

- Destarching:** The process of removal of starch from the leaves by keeping the plant in a dark room for a certain period of time is called destarching.
- Micronutrients:** The nutrients which are needed by plants the plants in small amounts are called micronutrients. E.g., Iron, zinc, manganese, etc.
- Polymerisation:** The process of conversion of glucose into insoluble starch and stored in the leaf is called polymerisation.
- Respiration:** The process of breakdown of glucose, releasing energy that is needed for all life processes is called respiration
- Nutrition:** The sum total of all the processes by which the nutrients from food are utilized by living organisms to provide energy and maintain life processes is called nutrition.

H. Differentiate between

1. Dicot and monocot leaves

Dicot leaves	Monocot leaves
1. The upper surface of the leaves is greener than the lower surface.	1. Both the sides of the leaves are equally green.
2. They have reticulate venation	2. They have parallel venation
e.g. pea, bean, etc.	E.g. Rice, maize etc.

2. Aerobic and anaerobic respiration

Aerobic respiration	Anaerobic respiration
1. It proceeds in the presence of oxygen	1. It proceeds in the absence of oxygen

2. Complete breakdown of glucose occurs	2. Incomplete breakdown of glucose occurs
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3. Lenticels and stomata

Lenticels	Stomata
1. They are openings found on the surface of the woody stems, which allows gases to diffuse in and out of the plant body.	1. They are small openings, that are found mostly on the lower surface of dicot leaves and both the surfaces in the monocot leaves
2. They remain open all the time	2. They open only during daytime and closes at night

4. Anaerobic respiration in plants and animals

Anaerobic respiration in plants	Anaerobic respiration in animals
1. Glucose is broken down in the absence of oxygen to produce ethyl alcohol and carbon dioxide	1. Glucose is broken down in the absence of oxygen to produce lactic acid
2. Occurs in certain bacteria and fungi like yeast	2. Occurs in animals only during strenuous physical exercise temporarily

5. Photosynthesis and respiration

Photosynthesis	Respiration
1. Photosynthesis is an anabolic process by which the chlorophyll containing green plants manufacture food (i.e. glucose) using carbon dioxide and water, in the presence of sunlight.	1. The process of breakdown of glucose, releasing energy that is needed for all life processes is called respiration
2. Oxygen is given out as a byproduct.	2. Carbon dioxide is produced as by product releasing 38 ATP molecules.

I. Experiments

- Oxygen is produced during photosynthesis (figure 3.7)
 - **Aim:** To show the evolution of oxygen during photosynthesis
 - **Procedure:** Take a beaker and fill half of it with tap water. Place some Hydrilla plants inside the beaker and cover the plants with a short stemmed funnel. The Hydrilla plant should be placed in such a way that the cut end of the stem of Hydrilla comes out of the stem of the funnel. A test tube full of water is then inverted over the stem of the funnel. Precaution should be taken to see that no air bubbles are inside the test tube. This set up should be kept in the sunlight for a few hours.
 - **Observation:** Bubbles of a gas will collect in the test tube. When the test tube is filled with the gas, it is tested with a glowing splinter. The glowing splinter will be rekindled showing that the gas collected is oxygen.
 - **Conclusion:** Oxygen is produced during photosynthesis.
- To demonstrate anaerobic respiration in germinating seeds (fig 3.14)
 - **Aim:** To demonstrate anaerobic respiration in germinating seeds
 - **Procedure:** Take some germinating bean seeds and remove their seed coats. Take a test tube and completely fill it with mercury. Introduce the soaked seeds into the mouth of the test tube. Invert the test tube on a trough containing mercury.

- **Observation:** The seeds will reach the top of the test tube. Keep the setup undisturbed for 1-2 days. It will be seen that the level of mercury in the test tube comes down. Introduce a pellet of potassium hydroxide into the test tube. The level of mercury again rises in the test tube.
- **Conclusion:** This shows that the gas which collects above the mercury level is Carbon dioxide.

J. Diagram based questions.



- 1) Which experiment is carried out using the above leaf?
Ans. To show the necessity of chlorophyll for the process of photosynthesis.
- 2) Name two plants that can be used for this experiment.
Ans. Croton and Coleus.
- 3) How are the leaves made starch free?
Ans. By keeping the plant in a dark room.
- 4) What will be the result of the starch test?
Ans. It shows that photosynthesis occurs only in the chlorophyll containing part of the leaf.
- 5) What type of leaves are used in this experiment?
Ans. Variegated.

EXTRA NOTES

Choose the odd one out:

1. Nitrogen, phosphorous, calcium, **copper**
2. Iron, zinc, **magnesium**, copper
3. Cuscuta, lichens, **green plants**, moulds
4. **Ammonia**, carbon dioxide, light, temperature
5. Growth, **locomotion**, energy, repair

Draw neat and labeled diagram :

1. Cells of leaves containing chloroplast (3.1)
2. Open and closed stomata (fig 3.6)