Board – ICSE	Class – 10	Topic – Photosynthesis

1. Name the following:

The source of oxygen during photosynthesis.

The final products of light reaction.

In which form are the carbohydrates translocated in plants?

The plant tissue which takes part in translocation of food material within the plant body.

The universal hydrogen acceptor in plants.

Ans. (a) Water

(b) ATP and $NADPH^+$

(c) Sucrose

(d) Phloem

(e) NADP

2. Mention if the following statements are true or false. If false, rewrite the wrong ones by changing only the words printed in bold face.

(i) Light reaction is called thermo-chemical reaction.

(ii) Oxygen evolved during light reaction is from carbon dioxide.

(iii) A plant can be destarched by keeping it in dark for 48 hours.

(iv) Stroma is the site of light reaction.

(v) Potassium hydroxide absorbs oxygen.

Ans. (i) False (Photochemical)

(ii) False (Water)

(iii) True

(iv) False (Thylakoid)

(v) False (Carbon dioxide).

3. What will be the effect of excess oxygen on the process of photosynthesis?

Ans. Photosynthesis will be inhibited.

4. (a) What is photolysis of water?

(b) What is the function of chlorophyll pigment?

Ans. (a) Light induced splitting of water molecule into its two component ions, H^+ and OH^-, is called photolysis of water.

(b) During light reaction of photosynthesis solar energy is trapped by chlorophyll which is used for the photolysis of water and ATP formation.

5. (a) All life would come to an end if there were no green plants. Comment.

(b) How is the light reaction linked to the dark reaction?

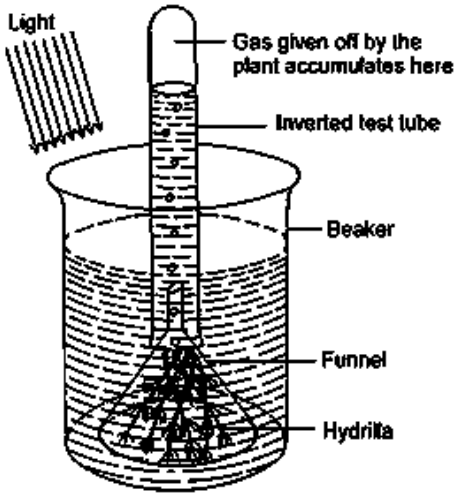
Ans. (a) Green plants are the primary producers on the earth. That is, they fix up atmospheric CO_2, utilizing light, chlorophyll and water, and synthesize food material. This food is utilized by different heterotrophs in the ecosystem. In addition, the plants release oxygen during the photosynthetic process and thus maintain the balance of oxygen in the atmosphere. Oxygen is used by all organisms for their respiratory activity.

(b) During light reaction, ATP and NADPH are generated. These two compounds are used in the dark reactions during the reduction of 3 PGA to phosphoglyceraldehyde.

6. (a) How would you demonstrate that green plants release oxygen when exposed to light?

(b) In most of the experiments on photosynthesis one uses destarched leaf or plant. What is the purpose of destarching in these experiments?

Ans. (a) Place Hydrilla, water plant, in a beaker containing pond water and cover it with a short-stemmed funnel. Invert a test tube full of water over the stem of the funnel. Place the apparatus in the sun for a few hours. Bubbles of a gas will collect in the test tube. Test the gas in the test tube. A glowing splinter when introduced on the top of the tube, it bursts into flame which confirms the presence of oxygen.



(b) During the destarching period, all the stored starch from the leaves is used up and only that starch is detected which is formed under the experimental conditions.

7. State any five differences between photosynthesis and respiration.

Ans.

Respiration	**Photosynthesis**
1. It is a catabolic process in which food substances are broken down.	It is an anabolic process in which food substances are synthesised.
2. It uses oxygen to oxidise the food substances and releases carbon dioxide and energy.	It uses carbon dioxide to synthesise food and release oxygen.
3. It occurs at all times of day and night.	It occurs only in the presence of light.
4. It occurs in all living cells.	It occurs only in cells containing chlorophyll.
5. It results in the loss of dry weight of the plant due to the break down of food materials and the formation of carbon dioxide and water which escape into the atmosphere.	It results in a gain in the dry weight of the plant due to the formation of carbohydrates which accumulate in the plant body.

8. (i) Water and oxygen are waste products of photosynthesis. But are they really wastes?

(ii) How is the leaf adapted for photosynthesis?

Ans. (i) There are three end-products of photosynthesis.

(a) Sugar, which is immediately utilized by the cells or is stored in the form of insoluble starch.

(b) Water, which may be reutilized in the further continuance of photosynthesis.

(c) Oxygen, some of it is used in respiration in the leaf cells but the major portion of it is not required and diffuses out into the atmosphere through the leaf surfaces. Though considered a waste product for the plant, all organisms require it for respiration.

(ii) The adaptations of leaf for photosynthesis are as follows:

(a) Large surface area for maximum light absorption.

(b) Leaf arrangement at right angles to the light source to obtain maximum light.

(c) Rapid transport to and from mesophyll cells by extensive vein system.

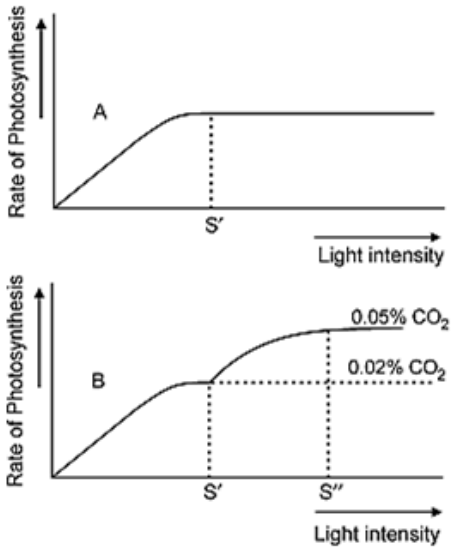
(d) Numerous stomata allow rapid exchange of gases (O_2 and CO_2).

(e) Thinness of leaf reduces distance between cells facilitating rapid transport.

(f) Chloroplasts are concentrated in upper layers of the leaf to obtain light energy quickly.

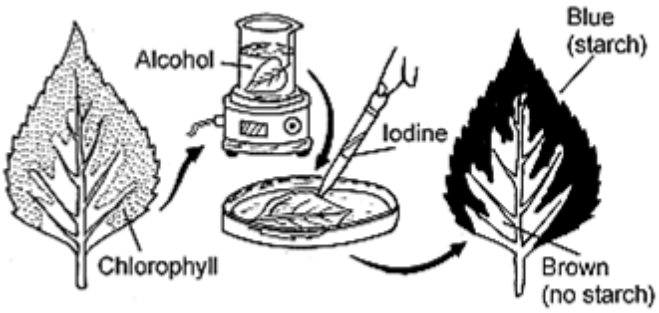
9. What do you understand by the law of limiting factors? Explain its significance in photosynthesis.

Ans. When a process like photosynthesis depends on more than one variable external factor, the rate of the process will depend on the factor which is in the shortest supply.



To understand it, suppose that there is a lot of CO_2 in the air and the temperature is just below the optimum temperature but the light intensity is very low, the rate of photosynthesis will be low. Similarly, if light intensity is high but carbon dioxide concentration is low, again the photosynthesis rate will be low.

10. (i) A healthy potted geranium plant with variegated leaves was watered and left in the sunlight for several hours. A leaf was then plucked and tested for starch. It was found that a part of the leaf had starch, but the other had no starch.

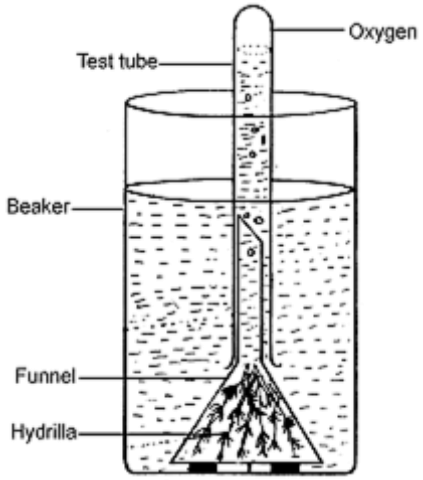


(a) What is the experiment designed to show?

(b) How would your account for the presence of starch in some parts of the plant, but absence in other parts?

(c) What experimental details have been omitted while performing the experiment?

(ii) Given below is an experimental set-up. Study it and answer the questions given below.



(a) What does the set-up show?

(b) Where should the set-up be kept?

(c) Name the gas that is bubbling out.

(d) How do you prove which gas is evolved?

Ans. (i) (a) This experiment shows that chlorophyll is necessary for photosynthesis.

(b) The part having chlorophyll showed the presence of starch. Whereas, the part without chlorophyll could not synthesize starch.

(c) The plant was not destarched before starting the experiment.

(ii) (a) It proves that oxygen is released during photosynthesis.

(b) The experiment should be set-up in light, preferably sunlight.

(c) Oxygen.

(d) Introduce a burning splinter inside the accumulated gas after removing the water. It bursts into flames. This proves that the released gas is oxygen.

11. Mention one point of difference between the following on the basis of what is given in the brackets.

(a) Respiration and photosynthesis (gas released)

(b) Light reaction and dark reaction (products formed)

(c) Producers and consumers (mode of nutrition)

Ans. (a) Respiration — Gas released is carbon dioxide.

Photosynthesis — Gas released is oxygen.

(b) Light reaction — Product formed is NADPH.

Dark reaction — Product formed is glucose.

(c) Producers — Make their own food e.g. green plants

Consumers — Obtain food directly or indirectly from autotrophs.

Can't make their own food e.g. tiger.

12. Given below are sets of five terms. Rewrite the terms in the correct order so as to be in logical sequence with regard to photosynthesis: water molecules, oxygen, grana, hydrogen and hydroxyl ions, photons**.**

Ans. Grana, photons, water molecules, hydrogen and hydroxyl ions, oxygen. The reaction is known as photolysis, which means splitting of water by light (photon).

13. Why is it not possible to demonstrate respiration in a green plant kept in sunlight?

Ans. In every period of twenty-four hours, plants are subjected to a regular cycle of changes in light intensity, and the rate of photosynthesis increases from dawn to mid-day and declines as dusk approaches. Plants, like other organisms, respire taking in oxygen and giving out carbon dioxide. In light, the effects of this respiratory activity are marked by those of photosynthesis and there is a net output of oxygen. Thus, in this time, demonstration of respiration is not possible.

14. "Oxygen is a waste product of photosynthesis." Comment.

Ans. The life supporting gas, oxygen present in the atmosphere in a free state, is released by photosynthesis only. Scientists strongly believe that about 2 billion years ago, when there was no life on the earth in any form, there was no free oxygen in the atmosphere. This oxygen is released as the waste product of photosynthesis in this way –

$$6CO_2 + 12H_2O \xrightarrow[\text{chlorophyll}]{\text{light energy}} C_6H_{12}O_6 + 6H_2O + 6O_2$$

15. Why is it necessary to place a plant in the dark before starting an experiment on photosynthesis?

Ans. A plant used for experiments in photosynthesis should initially be placed in the dark for 24 to 48 hours to destarch the leaves. During this period, all the starch will be removed from the leaves and they will not show the presence of starch.