Photosynthesis in Higher Plants

CHAPTER 13

TRY YOURSELF

ANSWERS

1. Photosynthesis is an anabolic physio-chemical process by which green plants use light energy and synthesise their own organic food, *i.e.*, carbohydrates.

2. The variegated leaf experiment proves that chlorophyll is necessary for photosynthesis.

3. To perform half-leaf experiment the steps are as follows :

(i) A potted plant is kept in the dark for 48-72 hours for destarching.

(ii) A part of a destarched plant's leaf is enclosed in a test tube containing some KOH (which absorbs CO_2), while the other half of the same leaf is exposed to air.

(iii) The set up is then kept in sunlight for some time.

(iv) When the leaf is tested for starch, the exposed part of the leaf tested positive while the part enclosed in the test tube is tested negative. This shows that carbon dioxide is necessary for the photosynthesis.

4. The photosynthetic pigments are located in the lipid part of thylakoid membrane.

5. Paper chromatography

6. Light reaction occurs in thylakoids and dark reaction occurs in the stroma of chloroplasts.

7. Chlorophyll is the principal pigment involved in photosynthesis.

8. The four events associated with photochemical phase of light reaction are :

(i) Light absorption (ii) Splitting of water

(iii) Release of oxygen (iv) Formation of ATP and NADPH.

9. Photosystem II

10. Photolysis is the process in which water is split into H^+, oxygen and electrons in the presence of light by PS II.

11. The four requirements for chemiosmosis to occur are :

(i) A membrane (ii) A proton pump

(iii) A proton gradient (iv) ATP synthase.

12. The process by which carbon dioxide is reduced to carbohydrates is called carbon fixation. It makes use of the ATP and NADPH produced in the light phase. It occurs in the stroma of chloroplasts, by a series of enzyme-catalysed reactions.

13. (i) In C_3 plants, photosynthesis occurs in mesophyll cells while in C_4 plants it occurs in mesophyll and bundle sheath cells.

(ii) Kranz anatomy is absent in C_3 plants while it is present in C_4 plants.

14. Dark reaction in photosynthesis is called so because it does not directly depend on light energy. Instead assimilatory power, *i.e.*, ATP and NADPH, produced during photochemical phase is used in fixation and reduction of carbon dioxide. All the enzymes required for the process are present in the matrix or stroma of the chloroplast.

15. Photorespiration is also called C_2 cycle because of the formation of 2-carbon intermediates, *i.e.*, glycolic acid.

16. Two factors that affect photorespiration are :

(i) CO_2 compensation point

(ii) High temperature

17. Two significances of photosynthesis are :

(i) The process of photosynthesis consumes atmospheric carbon dioxide and yields carbohydrates and molecular oxygen.

(ii) In addition to organic food plants yield fodder, firewood, timber, fibres, rubber, resins, oils and many other products of photosynthesis. Fossil fuels are also products of photosynthetic organisms which used in the remote past some millions of years ago.

18. The internal factors that affect the rate of photosynthesis are :

(i) Internal CO_2 concentration

(ii) Amount of chlorophyll

(iii) Number, size, age and orientation of leaves

(iv) Number and size of mesophyll cells

(v) Number and size of chloroplasts

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