

Topic :- Photosynthesis in Higher Plants

- 1 (d)
Light reaction starts when solar radiation or light falls on the PS-II. Light reaction is also called photochemical phase, which includes light absorption, water splitting, oxygen release and formation of high energy chemical intermediates like ATP and NADPH
- 2 (d)
- | In | Out |
|---------------------|-------------|
| Six CO ₂ | One glucose |
| 18 ATP | 18 ADP |
| 12 NADPH | 12 NADP |
- 3 (c)
Minimum photosynthesis occur in the green wavelength. Plants grow under the canopy like herbs and shrubs receive very little red and blue-violet light because of its absorption by leaves of the canopy. They receive more of green light that is transmitted through leaves. As a result, the photosynthesis in herbs and shrubs is comparatively low
- 4 (a)
PEPcase has an advantage over the RuBisCo because PEPcase does not bind to the oxygen. But RuBisCo binds with oxygen and does the photorespiration, which is a harmful and wastage process and leads to decrease in photosynthetic yields
- 5 (a)
RuBisCo (Ribulose, 1-5 biphosphatase carboxylase and oxygenase) is the main critical enzymes in photosynthetic carbon fixation. Mg²⁺ is an activator of RuBisCo
- 6 (a)
The phenomenon of photolysis of water during photosynthesis is associated with photosystem-II and catalysed by presence of Mn²⁺ and Cl⁻ ions. When PS-II is active, the water molecules split into OH⁻ and H⁺ ions.
- 7 (b)
RuBisCo.
RuBisCo is the most abundant enzyme in the world. It is characterised by the fact that active sites can bind to both CO₂ and O₂. This binding is competitive. It is the relative concentration of O₂ and CO₂ that determines, which of two (CO₂ and O₂) will bind to enzyme
- 8 (a)
Dicker and Tio (1959) discovered photorespiration in tobacco plant. It is a light dependent process of oxygenation of ribulosebiphosphate (RuBP). During this process, carbon

dioxide is liberated and oxygen is consumed. C₄-plants avoid photorespiration by following Hatch-Slack pathway.

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(d)

Flow of electrons in the non-cyclic photophosphorylation is always unidirectionally, from PS-II to the PS-I

10

(b)

Joseph Priestley (1733-1804) in 1770 performed a series of experiment that revealed the essential role of air in growth of green plant. He also discovered oxygen in 1774

11

(d)

Pigment system-II (PS-II) has absorption maxima at 680 nm and is called P₆₈₀.

12

(c)

Mesophyll cells and bundle sheath cells which are connected through plasmodesmata, through which organic acid like malic acid, pyruvic acid can translocate. Malic acid translocate from the mesophyll cells to bundle sheath cell and pyruvic acid translocate from the bundle sheath cells to mesophyll cells

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(c)

The light intensity at which a plant can achieve maximum amount of photosynthesis is called saturation point

14

(b)

Sunken stomata are usually found in crassulacean acid metabolic plants. Such stomata remain situated below the epidermis and open at night.

15

(b)

In C₄-plants the Calvin cycle takes place in bundle sheath cells

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(b)

The C₃-plant shows optimum photosynthesis at high CO₂ concentration

17

(b)

During C₄-cycle, the first C₄ acid formed is oxaloacetic acid in chlorophyll of mesophyll cells. Then this oxaloacetic acid changes into another C₄ acids like malic and aspartic acid in mesophyll and bundle sheath cells respectively

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(a)

Reduction of NADP⁺ to NADPH occurs during non-cyclic Photophosphorylation of light reaction, while oxidation of NADPH takes place during Calvin cycle.

Tetrapyrrole ring of chlorophyll a flat, square, structure of alternating single and double bonds containing four smaller pyrrole rings with a magnesium atom at the centre.

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(c)

C₄-plants have Kranz anatomy in their leaves. In this leaf, the vascular bundle is surrounded by bundle sheath and mesophyll cells. Chloroplasts in the bundle sheath cells lack grana, while mesophyll chloroplasts are normal, e.g. *sugarcane*, *maize*, *Euphorbia*, *Amaranthus*, *Sorghum*, *Portulaca* and *Chenopodium*.

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(b)

Oscillatoria is a photosynthetic cyanobacterium. In this, photosynthesis water is electron donor and oxygen is a byproduct, i.e., oxygenic photosynthesis occurs. *Rhodospirillum* and *Chlorobium* are non-oxygenic photosynthetic, purple non-sulphur and green-sulphur

bacteria.

Chromatium is purple sulphur bacterium and also non-oxygenic photosynthetic.

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	D	C	A	A	A	B	A	D	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	C	C	B	B	B	B	A	C	B

PE