

## Topic :- Photosynthesis in Higher Plants

- 1 (d)  
In  $C_4$ -plants, carbon dioxide is picked up by phosphoenol pyruvate (PEP) and the reaction being catalysed by **PEP carboxylase**.
- 2 (c)  
Conversion of carbon dioxide to simple (reduced) organic compounds is called carbon dioxide assimilation or carbon dioxide fixation or carbon fixation. This fixation pathway was elucidated in the early 1950s by **Melvin Calvin** and coworkers and is often called as Calvin cycle.  
Since, one molecule of carbon is fixed in one turn of the Calvin cycle. So, **six** turns of the cycle are required to fix the glucose molecule containing six carbon atoms.
- 3 (d)  
The light reaction of photosynthesis ends up in the formation of  $NADPH_2$  from  $NADP^+$
- 4 (b)  
In  $C_4$ -plants, the Hatch and Slack pathway involves two carboxylation reactions, one taking place in chloroplast of mesophyll cells and other in chloroplast of bundle sheath cells.
- 5 (d)  
Synthesis of sugars or carbohydrates is called the biosynthetic phase of photosynthesis. This process does not directly depend on the presence of light but is dependent on the products of the light reaction, *i.e.*, ATP and NADPH, besides  $CO_2$  and  $H_2O$ . This could be verified immediately after light becomes unavailable. The biosynthetic process continues for sometime and then stops. If then, light is made available, the synthesis starts again.
- 6 (b)  
Light reaction begins with the PS-II. In photosystem-II the reaction centre chlorophyll-*a* absorbs 680 nm. wavelength of red light causing electrons to become excited and jump into orbit further from the nucleus. These electrons are picked up by an electron acceptor, which passes them to an electron system consisting of cytochromes.
- 7 (b)  
 $CO_2$  assimilation during photosynthesis generally takes place in two ways in plants  
(i)  **$C_3$  pathway** Those plants in which the first product of  $CO_2$  fixation is a  $C_3$  acid (PGA), *i.e.*, the  $C_3$  pathway  
(ii)  **$C_4$  pathway** Those plants in which the first product is a  $C_4$  acid (OAA), *i.e.*, the  $C_4$  pathway
- 8 (b)  
**Blackman** (1905) extended the law of minimum to formulate the law of limiting factors,

which in his own words is 'when a process is conditioned as to its rapidity by a number of separate factors, the rate of the process is limited by the pace of slowest factor.'

9 **(d)**

Only PS-I is involved in cyclic photophosphorylation the formation of ATP when the electrons move down hill in term of redox potential

10 **(b)**

**Julius Robert Mayer** gave name chlorophyll to green pigment present in autotrophs.

11 **(a)**

Within the chloroplast, there is the membranous system (grana, stroma lamellae) and fluid it is called stroma

12 **(c)**

Joseph Priestley observed that a candle burning in a closed, a bell jar, soon gets extinguished. Similarly, a mouse would soon suffocate in a closed space. He conclude that a burning candle or an animal that breathe the air, both somehow, damage the air.

But when he placed a mint plant in the same bell jar, he found that the mouse stayed alive and the candle continued to burn. Priestly hypothesised that plants restore to the air whatever breathing animals and burning candles remove

13 **(d)**

In photorespiration, the three subcellular compartments namely, the chloroplast, peroxisomes and mitochondria are involved

14 **(c)**

The first step in dark reaction of photosynthesis is Carboxylation, in which six molecules of carbon dioxide Carboxylation, in which six molecules of carbon dioxide combine with six molecules of ribulose 1, 5-biphosphate (RuBP) to form six molecules of unstable six carbon compound. Carboxylation of RuBP is catalysed by the enzyme RuBP carboxylase or **RUBISCO**.

15 **(d)**

The other names for Calvin cycle are Calvin Benson Cycle, C<sub>3</sub>-cycle, and reductive pentose phosphate pathway

16 **(b)**

CO<sub>2</sub> assimilation during photosynthesis generally takes place in two ways in plants

(i) **C<sub>3</sub> pathway** Those plants in which the first product of CO<sub>2</sub> fixation is a C<sub>3</sub> acid (PGA), *i.e.*, the C<sub>3</sub> pathway

(ii) **C<sub>4</sub> pathway** Those plants in which the first product C<sub>4</sub> acid (OAA), *i.e.*, the C<sub>4</sub> pathway

17 **(c)**

Ultimately, all living forms on the earth depends on sunlight for energy. The use of energy from sunlight by the plants for doing photosynthesis is the basis of life on earth.

Photosynthesis is important due to two reasons. It is the primary source of food on earth and it is responsible for the release of oxygen into the atmosphere by green plants

18 **(d)**

Photolysis of water involves the splitting of water molecules into OH<sup>-</sup> and H<sup>+</sup> ions in the presence of light. This phenomenon is associated with pigment system-II and is catalysed by the presence of Mn<sup>2+</sup> and Cl<sup>-</sup> ions.

19 **(a)**  
Calvin cycle or dark reaction is the reductive carboxylation leading to the formation of sugar. That's way, it is also called the reductive pentose pathway

20 **(c)**  
Triose phosphate isomerase enzyme converts glyceraldehydes-3 phosphate molecule into dihydroxy acetone phosphate. Then an enzyme **transketolase** comes, which acts on sedoheptulose-7-phosphate molecule and changes it into ribulose-5-phosphate and xylulose-5-phosphate. Then ribulose-5-phosphate isomerase enzyme comes and acts on ribulose-5-phosphate. This reaction has a molecule of ribulose-5-phosphate, while xylulose-5-phosphate molecule is also converted into ribulose-5-phosphate by another enzyme, ribulose-5-phosphate epimerase.

P

E

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