Photosynthesis in Higher Plants

Assertion Reason Questions

Given below are two statements labelled as Assertion (A) and Reason (R). Select the most appropriate answer from the options given below:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

Assertion (A): Photosystem II is also known as P680 Reason (R): Maximum absorption in PS II takes place at wavelength 680 nm.

Ans. (a) Both A and R are true and R is the correct explanation of A.Explanation: Photosystem II is known as P680 because maximum absorption here occurs at wavelength 680 nm.

2. Assertion (A): As electrons move through the photosystems, protons are transported across the membrane.

Reason (R): The primary acceptor of an electron which is located towards the outer side of the membrane transfers its electron not to an electron carrier but to an H* carrier.

Ans. (a) Both A and R are true and R is the correct explanation of A.

Explanation: As electrons move through photosystems, protons are exchanged across the membrane. Because the principal electron acceptor on the membrane's outer side sends its electron to a hydrogen carrier rather than an electron carrier, this happens. As a result, this molecule carries an electron from the stroma while withdrawing a proton.

3. Assertion (A): The splitting of water is associated with the PS II. **Reason (R):** The electrons needed to replace those removed from photosystem II are provided by photosystem I.

Ans. (c) A is true but R is false.

Explanation: The PS II is linked to the splitting of water. Photosystem II provides the electrons required to replace those destroyed from photosystem I.



4. Assertion (A): In terms of the redox potential scale, movement of electrons is downhill.

Reason (R): Electrons in the reaction centre of PS I excite when they receive blue light of wavelength.

Ans. (c) A is true but R is false.

Explanation: When electrons in PS I's reaction centre are exposed to wavelength red light, they are also excited.

5. Assertion (A): For the formation of one molecule of glucose, 6 molecules of CO₂ and 12 molecules of NADPH+ + H+ and 18 ATP are used. NADPH₂ are formed.
Reason (R): In light reaction, ATP and

Ans. (b) Both A and R are true and R is not the correct explanation of A. **Explanation:** In light reactions, organic energy molecules like ATP and NADPH are formed, which are required for dark reactions.

6. Assertion (A): Photorespiration is not present in C₄ plants. **Reason (R):** Presence of high concentration of carbon dioxide in mesophyll cells.

Ans. (a) Both A and R are true and R is the correct explanation of A. **Explanation:** In C4 plants, there is Kranz's anatomy. The malic acid is broken down to release carbon dioxide in the bundle sheath cells due to which the concentration of carbon dioxide increases in the cells where the enzyme RuBisCO functions as carboxylase instead of oxygenase.

7. Assertion (A): C₄ plants are adapted to tropical dry climates.
Reason (R): C₄ plants have a large number of chloroplast and thick walls which are impervious exchange. to gaseous

Ans. (a) Both A and R are true and R is the correct explanation of A. **Explanation:** C₄ plants have special anatomy of leaf i.e. Kranz anatomy in which there are large numbers of chloroplast, thick walls which are impervious to gaseous exchange and no extracellular spaces. Due to this specialized mechanism of photosynthesis, productivity increases. It helps them to survive in dry tropical and desert regions.

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8. Assertion (A): Six molecules of CO_2 , 12 molecules of NADPH and 18 ATP are required to form one molecule of glucose.

Reason (R): Dark reaction produces ATP and NADPH.

Ans. (c) A is true but R is false.

Explanation: In the Calvin cycle, the product glucose is formed by six molecules of carbon dioxide, 12 molecules of NADPH and 18 ATP. The net reaction of C_3 dark fixation of carbon dioxide is:

 $6CO_2+ 18 \text{ ATP} + 12 \text{ NADPH} \rightarrow C_6H_{12}O_6 + 18$ ADP + 12 NADP

The dark reaction is not responsible for formation of ATP and NADPH. In dark reactions, there is the production of carbohydrates with the help of these assimilatory power.

9. Assertion (A): RuBisCO oxygenase.

Reason (R): Under high oxygen concentration and at high temperatures, the enzyme oxidises RuBP into 3-carbon phosphoglyceric acid and also acts as an 2-carbon phosphoglycolate.

Ans. (a) Both A and R are true and R is the correct explanation of A.

Explanation: RuBisCO acts as both carboxylase and oxygenase. When there is a high concentration of oxygen, this enzyme catalyzes the reaction and forms one molecule of phosphoglycolic acid and one molecule of phosphoglyceric acid but this does not happen in plants.

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