

# NEET- 2020- 45 Days Crash Course



Date : 10 th August 2020



Chapter Name : Photosynthesis in PLANTS



QUIZ – PHOTOSYNTHESIS

In  $C_4$  plants, the first carbon dioxide acceptor is

1997]

- (A) Pyruvate
- (B) Phosphoenol pyruvate
- (C) Ribulose biphosphate
- (D) Ribulose 5, phosphate

PEP

**Ans [B]**

In C<sub>4</sub> plants, the first CO<sub>2</sub> acceptor is 3C compound, phosphoenol pyruvate.

In photosynthesis, splitting of water and release of oxygen occurs during

[1998]

(A) Photolysis

(B) Red drop

(C) Pasteur effect

(D) Calvin cycle



**Ans [A]**

In photosynthesis, release of oxygen occurs during photolysis of water in light reaction.

Blackman's law of limiting factor is applied to

[2001]

- (A) Respiration
- (B) Transpiration
- (C) Photorespiration
- (D) Photosynthesis

**Ans [D]**

Blackman's law is applicable to photosynthesis. It states that when a process is conditioned as to its rapidity by number of factors, its rate is limited to the pace of slowest factor. Taking temperature into consideration, rate of photosynthesis is maximum at optimum temperature.

Hill reaction occurs in

[2003]

(A) High altitude plants

(B) Total darkness

(C) Absence of water

(D) Presence of ferricyanide



**Ans [A]**

Hill reaction or light reaction depends upon light. It involves photolysis of water and production of assimilatory power in the form of NADPH and ATP.

Which one of the following categories of organisms do not evolve oxygen during photosynthesis?

[2004]

(A) Red algae

~~(B)~~ Photosynthetic bacteria

(C)  $C_4$  plants with Kranz anatomy

(D) Blue green algae



evolve

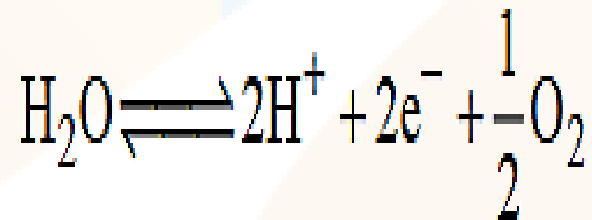
Sulphur

eg purple S<sub>2</sub>

green S bacteria

**Ans [B]**

Photosynthetic bacteria do not use H<sub>2</sub>O as electron donor but some other compound like H<sub>2</sub>S . In photosynthesis, splitting of water and liberation of O<sub>2</sub> by chlorophyll in presence of light and hydrogen acceptor is called photolysis of water.



[Photolysis of water]

What is PAR range? →

*Photosynthetically Active*

[2007]

*Light Radiation*

(A) 200 nm - 800 nm

(B) 400 nm - 700 nm

(C) 350 nm - 550 nm

(D) 600 nm - 100 nm

**Ans [B]**

PAR (Photosynthetically active radiations) ranges between the wavelength 400-700nm.

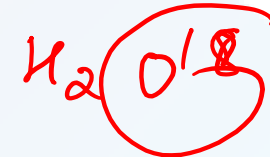
Through the use of oxygen-18 (heavy oxygen), scientists have found that the oxygen released during photosynthesis comes from molecules of **[2009]**

(A) Carbon dioxide

~~(B) Water~~

(C) Glucose

(D) Chlorophyll



↓

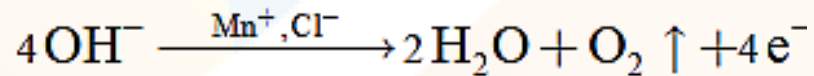
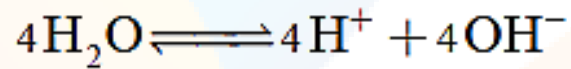
Labelled

By Ruben &

Kamen

**Ans [B]**

Oxygen which is liberated during photosynthesis comes from water. In photosynthesis, the light energy is captured by chlorophyll in the chloroplasts in plant leaves. This energy is used to split water apart in a process called photolysis.



Select the incorrect statement

[2011]

- (A)  $C_4$  pathway for  $CO_2$  fixation were discovered by Hatch and Slack ✓
- (B)  $CO_2$  is essential for photosynthesis ✓
- ✓ (C) Addition of sodium carbonate in water retards photosynthetic rate in vallisneria
- (D) Phloem is the principal pathway for translocation of solutes ✓



**Ans [C]**

C<sub>4</sub> pathway for CO<sub>2</sub> fixation were discovered by Hatch and Slack. This pathway has more effective method of CO<sub>2</sub> fixation and is seen in plants like sugarcane. CO<sub>2</sub> is essential for photosynthesis. It is the source of carbon.

The phloem or leptome is the pathway for movement of solutes.

The family in which many plants are  $C_4$  type

[2007]

(A) Malvaceae

(B) Solanaceae

(C) Crucifereae

~~(D) Graminae~~

*Typical plants*

**Ans [D]**

The Gramineae family has been renamed as Poaceae family - family of true grasses. They are a large and nearly ubiquitous family of monocotyledonous flowering plants. With more than 10,000 domesticated and wild species, the Poaceae represent the fifth-largest plant family. The C4 grasses have a photosynthetic pathway linked to specialized Kranz leaf anatomy that particularly adapts them to hot climates and atmospheres low in carbon dioxide.

In the electron transport chain during terminal oxidation, the cytochrome, which donates electrons to  $O_2$  is [2012]

(A) Cytochrome-b

(B) Cyto-C

(C) Cyto-a<sub>3</sub>

(D) Cyto-f

*Cyt → a<sub>3</sub>*

*Complex IV of ETS*

**Ans [C]**

In ETS or respiratory chain, there are five cytochromes cyto-b, cyto-c<sub>1</sub>, cyto-c, cyto-a, cyto-a<sub>3</sub>. Cytochrome a is last cytochrome of ETS which denotes electrons to O<sub>2</sub> due to this metabolic water is formed.

Which one does not differ between a  $C_3$  and a  $C_4$  plant?

[2013]

I. Initial  $CO_2$  acceptor.

II. Extent of photorespiration.

III. Enzyme catalyzing reaction that fixes  $CO_2$ .

~~IV. Presence of Calvin cycle.~~

*- Takes place in  $C_3$  &  $C_4$  both*

V. Leaf anatomy.

(A) I and V

~~(B) IV~~

(C) II and III

(D) II

**Ans [B]**

The initial  $\text{CO}_2$  receptor is RuBP for  $\text{C}_3$  plants whereas phosphoenolpyruvate for  $\text{C}_4$  plants. Photorespiration losses are high in  $\text{C}_3$  whereas low in  $\text{C}_4$ . Calvin cycle is a dark reaction which occurs in both  $\text{C}_3$  and  $\text{C}_4$  plants.  $\text{C}_4$  plants have specialized Kranz anatomy of leaves.

The total requirement of ATP & NADPH for each molecule of  $\text{CO}_2$  fixed & reduced in photosynthesis in the Calvin cycle is **[2014]**

(A) 2 ATP & 2 NADPH

(B) 2 ATP & 3 NADPH

(C) 3 ATP & 2 NADPH

(D) 4 ATP & 3 NADPH

1 molecule of  $\text{C}_6\text{H}_{12}\text{O}_6$  -

6 turns of Calvin cycle

$18 \text{ ATP} + 12 \text{ NADPH}_2$   
~~~~~  
3                      2.



**Ans [C]**

For every CO<sub>2</sub> molecule entering the Calvin cycle, 3 molecules of ATP and 2 molecules of NADPH are required.

Consider the following statements regarding photosynthesis.

[2015]

(A) ATP formation during photosynthesis is termed as photophosphorylation. T

(B) Kranz anatomy pertains to leaf. T

(C) Reduction of  $\text{NADP}^+$  to NADPH occurs during Calvin cycle. F

(D) In a chlorophyll molecule, magnesium is present in phytol tail. Of the above statements F

(A) A and B are correct

(B) C and D are correct

(C) A and C are correct

(D) A and D are correct

**Ans [A]**

A) In photosynthesis, the phosphorylation of ADP to form ATP using the energy of sunlight is called photophosphorylation. Sp 'a' is correct. Kranz anatomy is the special structure of leaves in C<sub>4</sub> plants like maize where the tissue equivalent to the spongy mesophyll cells is clustered in a ring around the leaf veins, outside the bundle-sheath cells. So, 'b' is correct.

B) NADPH is required in Calvin's cycle. It is not reduced from NADP to NADPH in Calvin's cycle. So, 'c' is wrong. Magnesium occurs in the porphyrin head of chlorophyll. So, 'd' is wrong.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses. **[1998]**

**Assertion :**  $C_4$  pathway of  $CO_2$  fixation is found in some tropical plants. -T

**Reason :** In this pathway,  $CO_2$  is fixed by 3C compound. T not explanation

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

**Ans [B]**

C4 is an adaptation of tropical plants to reduce/avoid the photorespiratory loss. In C4 pathway, first acceptor of CO<sub>2</sub> is a 3 carbon compound – phosphoenol pyruvate.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses. **[1999]**

**Assertion :** Mitochondria helps in photosynthesis

F

**Reason :** Mitochondria have enzymes for dark reaction

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

**Ans [D]**

Mitochondria helps in cellular respiration by transferring energy from organic compounds to ATP. Chloroplast helps in photosynthesis. Dark reaction takes part in the stroma of the chloroplast.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses. **[2002]**

**Assertion :** Bacterial photosynthesis occurs by utilizing wavelength longer than 700 nm. *↑*

**Reason :** Here reaction centre is B-890. *↑*

*not correct explanation*

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.



**Ans [B]**

In bacteria, photosynthesis utilizes light wavelength more than 700 nm and their reaction centre is B-890.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses. **[2003]**

**Assertion :** Rhoeo leaves contain anthocyanin pigments in epidermal cells. T

**Reason :** Anthocyanins are accessory photosynthetic pigments. F

*↳ Not photosynthetic*

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

**Ans [C]**

Anthocyanin pigments only give colouration since the epidermal cells mainly have potential colouring pigments. It is responsible of blue, red, pink and purple colours, observed in different parts of plants such as petals, stamens and fruits etc. Anthocyanin are also important for attracting insects for pollination and seed dispersal. Hence, Anthocyanin pigments are not accessory photosynthetic pigments.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

**Assertion :** Cyclic pathway of photosynthesis first appeared in some eubacterial species.

[2004]

**Reason :** Oxygen started accumulating in the atmosphere after the non-cyclic pathway of photosynthesis evolved.

*NA correct explanation*

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

**Ans [B]**

Photosynthetic bacteria have a substance called bacteriochlorophyll. The bacteriochlorophyll pigment absorbs light in the extreme UV and infra-red parts of the spectrum which is outside the range used by normal chlorophyll, seen in plants.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

[2004]

**Assertion :**  $C_4$  photosynthetic pathway is more efficient than the  $C_3$  pathway

**Reason :** Photorespiration is suppressed in  $C_4$  plants.

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

**Ans [A]**

C4 Pathway/Hatch and Slack pathway ensures the Calvin cycle to be operated only in bundle sheath cell. It is an adaptation to photorespiratory loss. Therefore, C4 plants are adapted to photorespiratory loss.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

[2005]

**Assertion :** The atmospheric concentration of  $\text{CO}_2$  at which photosynthesis just compensates for respiration is referred to as  $\text{CO}_2$  compensation point.

**Reason :** The  $\text{CO}_2$  compensation point is reached when the amount of  $\text{CO}_2$  uptake is less than that generated through respiration because the level of  $\text{CO}_2$  in the atmosphere is more than that required for achieving  $\text{CO}_2$  compensation point.

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.



**Ans [C]**

Compensation point is that value or point in the light intensity and atmospheric  $\text{CO}_2$  concentration when the rate of photosynthesis is just equivalent to the rate of respiration in the photosynthetic organ. So that there is not net gaseous exchange.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

[2006]

**Assertion :** Under conditions of high light intensity and limited  $\text{CO}_2$  supply, photorespiration has a useful role in protecting the plants from photo-oxidative damage.

**Reason :** If enough  $\text{CO}_2$  is not available to utilize light energy for carboxylation to proceed, the excess energy may not cause damage to plants. compensation point.

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

**Ans [C]**

Photorespiration is the uptake of  $O_2$  and release of  $CO_2$  in light and results from the biosynthesis of glycolate in chloroplasts and subsequent metabolism of glycolate acid in the same leaf cell. During photorespiration loss of carbon takes place in the form of  $C_2$ .

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

[2006]

**Assertion :** Photosynthetically  $C_4$  plants are less efficient than  $C_3$  plants.

**Reason :** The operation of  $C_4$  pathway requires the involvement of only bundle-sheath cells.

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

**Ans [D]**

C4 plants are more efficient in picking up  $\text{CO}_2$  even when it is found in low concentration because of its high affinity for PEP. They show Kranz anatomy i.e. vascular bundle is surrounded by bundle sheath and mesophyll cells.

**Direction :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

[2007]

**Assertion :** Dark reaction is purely enzymatic reaction.

**Reason :** It occurs only in absence of light.

- (A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (C) If the Assertion is correct but Reason is incorrect.
- (D) If the Assertion is incorrect but the Reason is correct.

**Ans [D]**

During photosynthesis, assimilatory power ATP and NADPH<sub>2</sub> are produced which require light. This reaction is called light reactions or Hill's reaction. Assimilatory powers are required for the reduction of CO<sub>2</sub>. This reaction is enzymatic and independent of light. It is called dark reaction which takes place in stroma of chloroplast. So, dark reaction is independent of presence or absence of light

**Direction :** Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements. [2009]

**Assertion :** Dark reaction occurs only at night in the stroma of chloroplast.

**Reason :** CO<sub>2</sub> fixation occurs only during C<sub>3</sub> cycle.

- Fake*
- Fake*
- (A) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (B) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- (C) If Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.
- ✓*



## Ans [D]

Dark reaction is also known as light independent phase. Unlike, light reaction, it does not require light as an essential factor. Thus, can take place both in the presence or absence of light. The term dark reaction does not mean that it takes place only in dark period or at night. CO<sub>2</sub> fixation occurs in both C<sub>3</sub> and C<sub>4</sub> cycle. In C<sub>3</sub> cycle, CO<sub>2</sub> is added by the enzyme, RuBisco to a 5 carbon compound RuBP that is converted to 2 molecules of 3-carbon PGA. In C<sub>4</sub> cycle, the first product of CO<sub>2</sub> fixation (takes place in mesophyll) is a 4-carbon compound, oxaloacetic acid. It is seen in some tropical plants.

**Direction :** Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements. **[2010]**

**Assertion :** Amaranthus and sugarcane are called as Hatch & Slack plants.

**Reason :** One glucose is formed by fixation of  $6\text{CO}_2$  in the plants.

- (A) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (B) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- (C) If Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

**Ans [B]**

Amaranthus sp and sugarcane are known as Hatch and Slack plants. In Hatch and Slack pathway, one glucose molecule is formed by fixation of  $6\text{CO}_2$  in the plants.