DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : BIOLOGY
DPP No. : 6

Topic :- Photosynthesis in Higher Plants

1 **(c)**

C_4-**plants are special** They have a special type of leaf anatomy, they tolerate higher temperature, they show a response to high light intensities, they lack a process called photorespiration and have greater productivity of biomass

2 **(c)**

Most of the photosynthesis takes place in blue and red region

3 **(b)**

The addition of $NaHCO_3$ to water in the given experimental set-up causes the availability of more carbon dioxide for photosynthesis. Thus, amount of oxygen evolved increases.

4 **(a)**

Cornelius van Niel (1897-1985) who based on his studies on purple and green bacteria, demonstrated that photosynthesis is essentially a light dependent reaction in which hydrogen from a suitable oxidisable compound reduces carbon dioxide to carbohydrate.

This can be expressed by

$$2H_2A + CO_2 \xrightarrow{\text{Light}} 2A + CH_2O + H_2O$$

In green plants, H_2O is the hydrogen donor and is oxidised to O_2 photosynthesis. Some organism do not release O_2 during photosynthesis. When H_2S instead is the hydrogen donor for purple and sulphur bacteria, the oxidation product is sulphur or sulphate depending on the organism and not O_2. Hence, he inferred that O_2 evolved by green plant comes from H_2O, not from carbon dioxide

5 **(d)**

Ruben and Kamen (1941) and Ruben *et al* (1941) suspended *Chlorella* in water having non-radioactive heavy isotope of oxygen ^{18}O, instead of natural oxygen (^{16}O). The suspension was illuminated. Oxygen evolved was tested by means of mass spectrometer. It was found to be having isotope, O^{18}. This is possible only if, oxygen evolved during photosynthesis comes from splitting of water

$$6CO_2 + 12H_2O^{18} \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6\,O_2^{18}$$

6 **(d)**

Photosystem-I is located on both the non-appressed part of grana thylakoids as well as stroma thylakoids, while photo system-II is located in the appressed part of the grana thylakoids.

7 **(a)**

A possible location for the cyclic phosphorylation is the stroma lamellae because stroma lamellae lacks PS-II as well as the NADP reductase enzyme

8 **(d)**

Plastocyanin is a small (10.5 KDa), water soluble, copper containing protein that transfer electrons between the cytochrome-$b_6 - f$ complex and P_{700}.

9 **(d)**

During phosphorylation, the chloroplast stroma is less acidic than the interior of thylakoid membrane because accumulation of protons during electron transport chain occurs in the lumen of thylakoid

10 **(c)**

Ribulose bisophosphate carboxylase oxygenase and phosphoenol pyruvate carboxylase are critical enzymes in photosynthetic carbon fixation. Mg^{2+}Is an activator for both the enzymes?

11 **(b)**

In 1939, **Robin Hill** demonstrated photolysis of water by isolated chloroplast in the presence of suitable electron acceptor.

12 **(c)**

Ottowarburg made an observation that O_2 inhibits photosynthesis in C_3-plants. This phenomenon is originally known as the Warburg effect. It was latter recognised as the light dependent release of CO_2 due to oxygenase activity of RuBisCo called photorespiration

13 **(b)**

After the fixing of CO_2 to Oxaloacetic Acid (OAA) in C_4 cycle, the oxaloacetic acid changes into the malic aspartic acid

$$\text{OAA} + \text{NADPH} \xrightarrow{\text{Malic acid dehydrogenase}} \text{Malic acid} + \text{NADP}^+$$

$$\text{OAA} + \text{NH}_3 + \text{NADPH} \xrightarrow{\text{Transaminase}} \text{Aspartic acid} + \text{NADP}^+ + \text{H}_2\text{O}$$

Both of these reactions occur in mesophyll cell

14 **(b)**

The portion of spectrum between 400-700 nm is referred to as Photosynthetically Active Radiation.

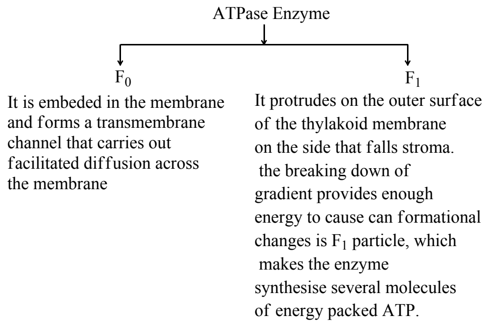
Manganese and chloride ions play prominent role in photolysis of water.

15 **(b)**

ATP is synthesised by cells (in mitochondria and chloroplasts) and the process is named as phosphorylation. Photophosphorylation is the synthesis of ATP from ADP and inorganic phosphate in the presence of light. When the two photosystems work in a series, first PS-II and then the PS-I, a process called non-cyclic photophosphorylation occurs. The two photosystem are connected through an electron transport chain, as seen earlier- in the Z scheme. Both ATP and NADPH + H^+ are synthesised by this kind of electron flow. When only PS-I is functional, the electron is circulated within the photosystem and the phosphorylation occurs due to the cyclic flow of electrons

16 **(b)**

I and II.



17 **(d)**

Chemiosmosis requires a membrane, a proton pump, a proton gradient for making ATP through ATPase enzyme

18 **(a)**

Biosynthetic phase of photosynthesis depend on the NADPH and ATP. Both are used directly in the synthesis of glucose.

The energy required to hydrolyse the water comes from oxidising chlorophyll. Oxidation of chlorophyll occurs due to the release a high energy electrons from the chlorophyll

19 **(d)**

Kranz anatomy is the characteristics of C_4-plants.

The vertical section of leaves of C_3 and C_4 show differences. The C_4 leaves have particularly large cells around the vascular bundles of C_4 pathway plants called bundle sheath cells and the leaves which have such kind of anatomy are said to have 'Kranz-anatomy'. 'Kranz' means wreath and is reflection of arrangement of cells

20 **(a)**

The process of photorespiration have the involvement of chloroplasts, peroxisomes and mitochondria. Biochemical mechanism for photorespiration is also called **glycolate cycle.**

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