DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : BIOLOGY
DPP No. : 8

Topic :- Photosynthesis in Higher Plants

1 **(a)**

Kranz anatomy, *i.e.*, chloroplast containing mesophyll cells and bundle sheath cells. The phosphoenol pyruvate in mesophyll cells combine with CO_2 in presence of PEP carboxylase and forms oxaloacetic acid and large bundle sheath are the characters of C_4 plants

2 **(c)**

In the leaves of C_4-plants, the bundle sheath consists of thick walled cylindrical cells. These cells have a granal chloroplast so density is low

3 **(b)**

Scheme of transfer of electrons, starting from the PS-II, uphill to the acceptor, down the electron transport chain to PS-I, excitation of electrons, transfer to another acceptor and finally down hill to $NADP^+$ causing it to be reduced to $NADPH + H^+$ is called the Z scheme, due to its characteristic shape. This shape is formed when all the carriers are placed in a sequence on a redox potential scale

4 **(b)**

Photophosphorylation in chloroplast is similar to the mitochondrial oxidative phosphorylation. In both of them, the proton gradient plays a significant role in chloroplast the proton gradient develops in the lumen and in mitochondria the proton gradient develops in the intermitochondrial space. Rest of the mechanism of phosphorylation remains the same in both the organelle

6 **(b)**

As a result of light reaction, oxygen, NADPH and ATP are formed. Oxygen is released into the atmosphere, while NADPH and ATP are utilised for reduction of carbon dioxide to carbohydrate in dark reaction.

7 **(a)**

At the low CO_2 and high O_2 concentration RuBisCo oxygenese activity increases. Binding with oxygen leads to the formation of 2-phosphoglycolate and 3 phosphoglycerate

8 **(b)**

In C_4-plants the initial fixation of carbon dioxide occurs in mesophyll cell. The primary acceptor of CO_2 is phosphoenol pyruvate or PEP. It combines with carbon dioxide in presence of PEP carboxylase or PEPcase to form oxaloacetic acid or oxaloacetate

$$PEP + CO_2 + H_2O \xrightarrow{\text{PEP carboxylase}} \text{Oxaloacetic acid} + H_3PO_4$$

9 **(a)**

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

10 **(b)**

Dark phase of photosynthesis or Calvin cycle takes place in stroma of chloroplast. First step of dark phase is Carboxylation. In Carboxylation, carbon dioxide is combined with RuBP to form first stable compound.

$6RuBP + 6CO_2 \xrightarrow{\text{RuBP carboxylase}} 12$ phosphoglyceric acid

$NADP^+$acts as hydrogen acceptor.

11 **(b)**

The Calvin cycle occurs in the stroma of chloroplast of C_3 plants and consists of three main parts, i.e., carboxylation, reduct5ion and regeneration. Carboxylation involves addition of carbon dioxide to ribulose 1,5-bisphosphate in presence of **RUBISCO** enzyme to form 3-PGA (3-phosphoglyceric acid), *i.e.*, single carboxylation occurs in Calvin cycle.

12 **(a)**

Plants adapted to low light intensity have larger photosynthetic unit size than the sun plants.

13 **(a)**

Oxygen evolves by the oxidation of water molecule in the process called photosynthesis. Thus, it water is O^{18} labelled then oxygen liberated by process called photosynthesis must also be labelled

14 **(a)**

Algae (*Clodophora*).

Julius von Sachs provided evidence for the production of glucose when plants grow. Glucose is usually stored as starch. His later studies showed that the green substance in plants (chlorophyll as we know it now) is located in special bodies (later called chloroplast) within plant cells.

He found that the green parts in plants are where glucose is made, and that the glucose is usually stored as starch

15 **(d)**

Three molecules of carbon dioxide must be converted to glyceraldehydes 3-phosphate (three carbon molecules), three ATP and two NADPH are required for each carbon dioxide to be converted to glyceraldehydes-3-phosphate.

$3CO_2 + 6NADPH + 9ATP \rightarrow$Glyceraldehyde

3-photophate $+ 6NADPH^+ + 9ADP + P_i$

16 **(d)**

Product of light reactions are ATP, NADPH and O_2. Of these O_2 diffuse out of the chloroplast, while ATP and NADPH are used to drive the process leading to synthesis of food, sugars. $NADPH + H^+$, O_2, etc.

17 **(b)**

There is a point in the light intensity, where there is no gaseous exchange in photosynthesis. It is called light compensation point

18 **(b)**

During the dark reaction the acceptor of CO_2 is RuBP (Ribulose 1-5 diphosphate). After accepting, it forms the intermediately six carbon compound, which breaks down into two three carbon stable compound. It is called 3 PGA

19 **(b)**

The first reaction of photorespiration occurs in **stroma** of chloroplast. In this reaction, the RuBP (Ribulose 1, 5-biphophate) consumes one oxygen molecules in presence of enzyme RUBISCO. In **peroxisome**, the glycolate transferred from chloroplast, takes up oxygen and formed the glyoxylate whereas the H_2O_2 release as byproduct.

20 **(d)**

Phosphorylation refers to the process, in which ATP is made, when energy is used to bond another phosphate to ADP. In photosynthesis, they energy is supplied by light and the process is, therefore, called photophosphorylation.

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