DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : BIOLOGY
DPP No. : 7

Topic :- Photosynthesis in Higher Plants

1 **(b)**

Photosynthesis (*photos-light*; *synthesis*-putting together) is an anabolic process of manufacturing organic compounds inside the chlorophyll containing cells from carbon dioxide and water with the help of sunlight as the source of energy

2 **(c)**

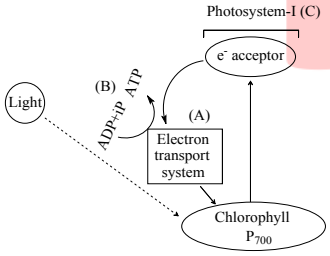
Beyond the saturation point (seldom seen in C_4-plants), the rate of photosynthesis begin to decline. This process is called solarisation. It is due to the reduction in hydration and closure of stoma (photo-inhibition) or oxidation of photosynthetic pigment (photoxidation)

3 **(b)**

A chemical substance, when irradiated with UV rays, absorbs radiation and emits visible light is called **fluorochrome**.

4 **(b)**

In cyclic photophosphorylation, only PS-I is functional and the formation of ATP takes place (not NADPH). The possible location of cyclic photophosphorylation is stroma lamella



5 **(a)**

Chlorophylls are magnesium porphyrin compounds. Chlorophyll-*a* ($C_{55}H_{72}O_6N_4Mg$) and chlorophyll-b ($C_{55}H_{70}O_6N_4Mg$), both consist of magnesium porphyrin head, which is hydrophilic and a phytol tail, which is lipophilic but chlorophyll-*b* differs from chlorophyll-*a* only in one of the functional groups bonded to porphyrin. Actually in chlorophyll-*b*, there is –CHO(aldehyde) group instead of $–CH_3$(methyl) group at the third C-atom in second pyrrole ring.

6 **(b)**

PAR (Photosynthetically active radiation) designates the spectral range of solar radiation from 400 to 700 nm that photosynthetic organisms are able to use in the process of photosynthesis. Of the total incident solar radiation the proportion of PAR is less than 50%

7 **(c)**

Using a similar set up as used by Priestley but by placing it once in a dark and once in a sunlight, Jan Ingen Housz (1730-1799) showed that sunlight is essential to plant process that purifies air

8 **(c)**

Glucose is a hexose sugar. It's one molecule contains six carbon atoms. As Calvin cycle takes in only one carbon (as CO_2) at a time, six turns of this cycle will be required to produce one molecule of glucose (6C).

Hence, for producing 5 molecules of glucose (30 molecules of carbon), 30 turns of Calvin cycle are required.

9 **(b)**

During the light reaction

(i) Formation of ATP from ADP takes place or phosphorylation of ADP to ATP takes place

(ii) Reduction of $NADP^+$ to $NADPH + H^+$ takes place by PS-I through electron transport system

10 **(d)**

ATP made when energy is used to bond another phosphate to ADP, a process called **phosphorylation**. In photosynthesis, the energy is supplied by light and the process is, therefore, called **photophosphorylation**.

11 **(b)**

TW Engelmann (1843-1909) performed an interesting experiment using a prism. He split light into its spectral components and then illuminated a green alga, *Cladophora*, placed in a suspension of aerobic bacteria.

The bacteria were used to detect the sites of O_2 evolution. He observed that the bacteria accumulated mainly in the region of blue and red light of the split spectrum. A first action spectrum of photosynthesis was thus described

12 **(a)**

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

13 **(d)**

Calvin cycle (C_3-cycle) was discovered by **Calvin, Benson** and their associates, which fed *Chlorella* and *Scenedesmus* with radioactive carbon (C^{14}) in carbon dioxide.

14 **(b)**

The movement of electrons in ETS of photosynthesis is down hill in terms of oxidation reduction or redox potential scale. The electrons are not used up as they pass through the electron transport chain, but they passed on the pigments of photosystem I.

Simultaneously, electrons in the reaction centre of PS-I are also excited, when they receive red light of wavelength 700 nm and are transferred to another acceptor molecule that has greater redox potential. These electrons than are moved down hill again this time to a molecule of energy rich $NADP^+$. The addition of these electrons reduces the $NADP^+$ to

$NADPH + H^+$

15 **(b)**

When $P_r$absorbs red light (660-665 nm) it is converted into P_{fr} from and when P_{fr} absorbs far red light (730-735 nm)it is converted into P_r from.

16 **(d)**

Kranz anatomy is a characteristic feature of the leaves of C_4-plants like sugarcane, maize, etc. in this type of anatomy, mesophyll cells are not differentiated into spongy and palisade cells and have chloroplasts with large grana. These are involved in the initial fixation of carbon dioxide. Bundle sheath chloroplasts are large and agranal and are highly efficient in carbon dioxide fixation, therefore, abundant starch grains are produced in these cells.

17 **(a)**

In the matrix or stroma, there are embedded a number of flattened membranous sacs called thylakoids or lamellae. Membranes of thylakoids are called fret membranes. They are made up of both proteins and unsaturated lipids, roughly in the ratio of 50:50

18 **(b)**

C_4-plants are more efficient in photosynthesis than C_3-plants but use more energy. They possess the larger number of chloroplasts in the leaf cells. In the leaves of C_4- plants, the vascular bundles are surrounded by bundle sheath of larger parenchymatous cells, which in turn are surrounded by mesophyll cells. Chloroplasts in bundle sheath cells are larger and always contain grana, whereas chloroplasts in mesophyll cells are smaller.

19 **(a)**

RuBPcarboxylase (RUBISCO) is the most abundant protein in chloroplasts and probably on earth. It catalyses the carboxylation of ribulose 1-5 bisphosphate to form two molecules of 3-phosphoglyceric acid in C_3-cycle of photosynthesis.

20 **(c)**

During the photolysis of water, the release of electrons, protons and oxygen takes place. Reaction during the photolysis of water is follows

$2H_2O \rightarrow 4H^+ + O_2 + 4e^-$

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