

QB365

## Important Questions - Photosynthesis in Higher Plants

11th Standard CBSE

**Biology**

Reg.No. :

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Time : 01:00:00 Hrs

Total Marks : 50

### Section-A

- 1) Which mechanism of photosynthesis is responsible for trapping of light energy, splitting of water, oxygen release and formation of ATP and NADPH? **1**
- 2) Mention any condition under which PS-1 functions. **1**
- 3) What is the basis for designating  $C_3$  and  $C_4$  pathways of photosynthesis? **1**
- 4) The enzyme, which is not found in  $C_3$ -plants. **1**
- 5) Enumerate the type of chlorophyll known as universal photosynthetic pigment. **1**
- 6) Which range of wavelength(in nm) is called Photosynthetically Active Radiation (PAR)? **1**
- 7) Tomatoes, carrots and chillies are red in colour due to presence of one pigment. Name the pigment. It is a photosynthetic pigment? **1**
- 8) What would happen to the rate of photosynthesis in  $C_3$ -plants if  $CO_2$  concentration level almost doubles from its present level in the atmosphere? **1**
- 9) Why is photorespiration called as the  $C_2$  cycle? **1**
- 10) Mention the four basic requirements for chemiosmosis to occur. **1**

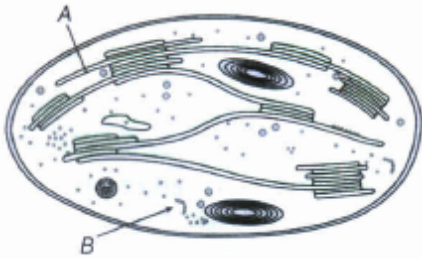
### Section-B

- 11) ATPase enzyme consists of two parts. What are those parts? How are they arranged in the thylakoid membrane.  
The conformational changes occur in which part of the enzyme? **2**
- 12) Mention any two reasons, which prove that photosynthesis is essential for sustaining life on the earth. **2**
- 13) Why is the colour of a leaf kept in the dark frequently becomes yellow or pale green? Which pigment do you think is more stable? **2**
- 14) Expand RuBP and also mention the role of RuBP in photosynthesis. **2**
- 15) Why is the lumen of thylakoids acidic while, the stroma is alkaline in nature? **2**
- 16) Dark reactions are dependent on light yet are called dark reactions. Justify. **2**
- 17) Differences between stroma and grana of chloroplasts. **2**
- 18) Suppose there were plants that had a high concentration of chlorophyll-b, but lacked chlorophyll-a, would it carry out photosynthesis? Also mention why do plants have chlorophyll-b and other accessory pigments? **2**
- 19) Name the end products of light reaction of photosynthesis. Mention the fate of each of them. **2**
- 20) Explain how during light reaction of photosynthesis, ATP synthesis as a chemiosmotic phenomenon takes place? **2**

**Section-C**

21) Examine the figure

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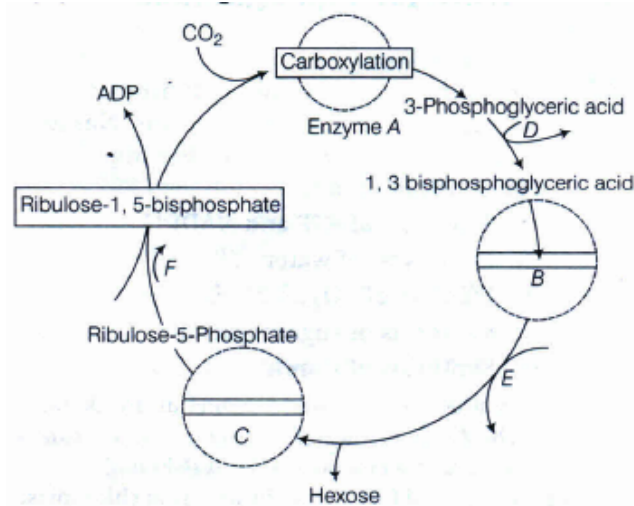
- (i) This structure is present in animal cell or plant cell?
- (ii) Can these be passed on to the progeny? How?
- (iii) Name the metabolic processes taking place in the places marked (A) and (B).

22) The diagram given below shows stages in the light-independent reactions of photosynthesis.

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Answer the following

- (i) At which stage NADPH is oxidised?
- (ii) What are A, B and C?
- (iii) At what stages ATP is converted into ADP?

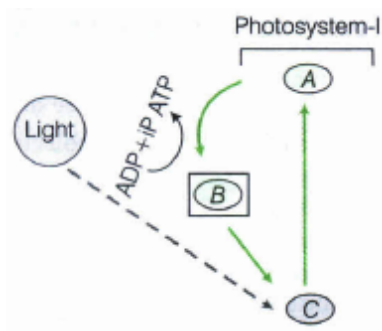


23) Is it correct to say that photosynthesis occurs only in leaves of a plant? Besides leaves, what are the other parts be capable of carrying out photosynthesis? Justify.

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24) In the diagram shown below label A, B and C. What type of phosphorylation is possible in this?

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**Section-A**

- 1) Light reaction is responsible for all the above mentioned conditions. 1
- 2) 1  
 Conditions necessary under which PS-1 functions are (i) When the wavelength of light is higher than 680 nm. (ii) When NADPH accumulates and CO<sub>2</sub> fixation is retarded.
- 3) The number of carbon atoms present in the first stable product of photosynthesis 1
- 4) PEP carboxylase enzyme is not found in C<sub>3</sub>-plants. 1
- 5) 1  
 Chlorophyll-a is known as the universal photosynthetic pigment present in almost all photosynthetic organisms.
- 6) The light range between 400-700 nm of wavelength is called PAR. 1
- 7) Lycopene pigment, which is a chromoplast. It is a non-photosynthetic pigment. 1
- 8) 1  
 If the CO<sub>2</sub> concentration in C<sub>3</sub>-plants almost get doubles from its present level in the atmosphere, plants will grow much faster and lead to the higher productivity due to higher rate of photosynthesis.
- 9) 1  
 Photorespiration is also called as the C<sub>2</sub> cycle because of the formation 2-carbon intermediate compound named glycolic acid.
- 10) Four basic requirements are as follows 1  
 (i) A unit membrane  
 (ii) A proton pump  
 (iii) A proton gradient  
 (iv) ATP synthase enzyme

### Section-B

- 11) 2  
 ATPase enzyme consists of two parts, i.e., a stalk (F<sub>0</sub>) and a headpiece (F<sub>1</sub>) These two parts are located completely across the membrane of thylakoid membrane. The conformational changes occur in the headpiece (F<sub>1</sub>) of this enzyme.
- 12) 2  
 Two reasons are as follows  
 (i) It is the process by which food is manufactured for all living organisms.  
 (ii) It is the only natural process by which oxygen is liberated into the atmosphere. This O<sub>2</sub> is used by all living organisms respiring aerobically.
- 13) 2  
 This is due to disintegration of chlorophyll pigment in continuous absence of light. The carotene pigment is more stable, so leaves become pale.
- 14) 2  
 RuBP is known as Ribulose 1,5-Bisphosphate. It is the primary acceptor of carbon dioxide in Calvin cycle of C<sub>3</sub>-plants. It forms the first stable compound of photosynthesis known as PGA.

15) 2

The acidic nature of lumen of thylakoids is due to the accumulation of protons by the photolysis of water. The same reaction does not occur in stroma so, it is basic in nature.

16) 2

Dark reactions are dependent on the products of light reaction that are ATP and NADPH to carry out reduction of CO<sub>2</sub> to form glucose. This does not need so, they are called dark reactions.

17) Differences between stroma and grana of chloroplasts are 2

<b>Stroma</b>	<b>Grana</b>
It is the jelly-like matrix of the chloroplast.	These are formed of stacks of thylakoids.
Dark reaction takes place here.	Light reaction takes place here.

18) 2

Though chlorophyll-a is the major pigment responsible for trapping light, other photosynthesis pigments like chlorophyll-b, xanthophylls and carotenoids, which are called accessory pigments, also absorb light of different energy wavelengths and transfer their energy to chlorophyll-a. In deed, they not enable a wider range of wavelength of incoming light to be utilised for photosynthesis, but carotene protects chlorophyll-a from photooxidation.

19) 2

ATP, NADPH are oxygen are the products of light reaction. ATP and NADPH are used in the reduction step of biosynthetic phase of photosynthesis. Oxygen is liberated into the atmosphere.

20) 2

Chemiosmosis requires a membrane, a proton pump, a proton gradient and ATP synthase enzyme. Energy is used to pump protons across a membrane, to create a gradient or a high concentration of protons within the thylakoid lumen. ATP synthase enzyme catalyses the formation of ATP, along with the NADPH produced by the movement of electrons. The energy carried by ATP molecules will be used immediately in the biosynthetic reaction taking place in the stroma for fixing CO<sub>2</sub> and synthesis of sugars.

### Section-C

21) (i) Plant cell 5

- (ii) Yes, these can be passed on to the progeny through female gametes.
- (iii) In part (A) photophosphorylation and in part (B) Calvin cycle.

22) (i) NADPH is oxidised at stage E 5

- (ii) A-RuBP carboxylase oxygenase (RuBisCO),  
B-Reduction, C-Regeneration
- (iii) ATP is converted to ADP at stages D and E.

23)

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Although all cells in the green part of a plant have chloroplasts, most of the energy is captured in the leaves. The cells in the interior tissues of a leaf, called the mesophyll, can contain between 450000 and 800000 chloroplasts for every square millimetre of leaf (nearly 60-70 chloroplasts/cell).

The surface of the leaf is uniformly coated with a water-resistant waxy cuticle that protects the leaf from excessive evaporation of water and decreases the absorption of ultraviolet or blue light to reduce heating. The transparent epidermal layer allows light to pass through to the palisade mesophyll cells, where most of the photosynthesis takes place. The green stems are also capable of performing photosynthesis.

24)

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The diagram is showing cyclic photophosphorylation. Here, A is electron acceptor, B is electron transport system and C is Photo system- $PS_{400}$

In cyclic photophosphorylation, only PS-I is functional. The electron is circulated within the photosystem and the phosphorylation occurs due to cyclic flow of electrons.