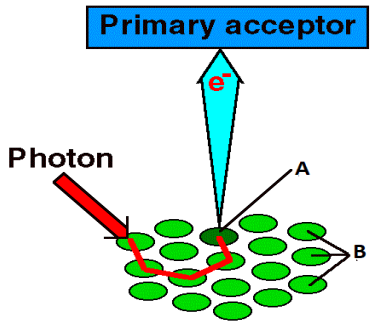
CBTA FOCUS AREA - REVISION QUESTIONS AND ANSWERS - PHOTOSYNTHESIS

Each question from 1 to 10 carries 1 score.

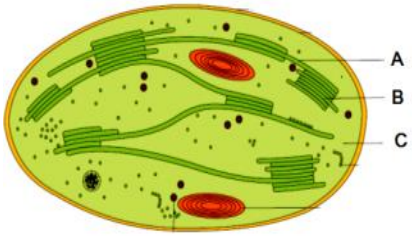
1) The colour of the chlorophyll b in the chromatogram is _____.
2) The reaction centre of PS I & PS II is ___ & ____ respectively.
3) Mention the technique used for separation of leaf pigments.
4) Expand LHC.
5) What is the range of wave length of visible spectrum of light, VIBGYOR?
6) The reaction centre of PS I is called as P700 .Why?
7) Name the primary CO_2 accepter molecule in C3 cycle.
8) Name the first stable 3 carbon compound formed during C3 cycle.
9) How many molecules of ATP and NADPH are used up to synthesise one glucose molecule?
10) Name the enzyme involved in carboxylation in C3 cycle?

Each question from 11 to 20 carries 2 scores.

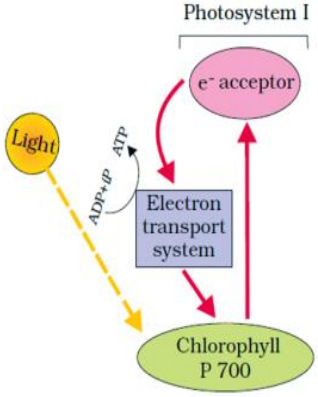
11) Define photophosphorylation. Name the two types.
12) Non-cyclic photo-phosphorylation takes place in grana not in stroma lamellae . Why?
13) Expand RuBisCO .Explain why this enzyme is named so?
14) Observe the given diagram and answer the following questions.
a) Identify the figure. b) Name A and B.



15) Where is NADP reductase enzyme located in the chloroplast? What is its role in Non cyclic photophosphorylation?
16) Observe the diagram given below and answer the following questions.
a) Identify the organelle. b) Name A , B & C



17) Mention the two components of ATP synthase enzyme. Where is it located in the chloroplast?
18) Observe the diagram given below. a) Name the process b) Why is it called so?



19) What are accessory pigments? What is their role in photosynthesis?
20) What are the requirements for ATP synthesis according to Chemiosmotic Hypothesis?

Each question from 21 to 30 carries 3 scores.

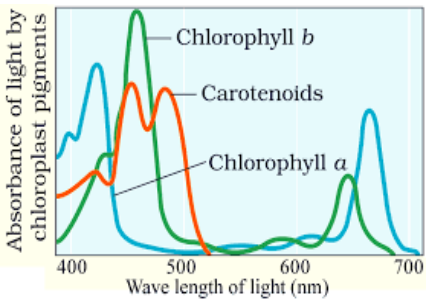
21) $2H_2O \longrightarrow 4H^+ + O_2 + 4e^-$

The above equation represents an important reaction that takes place during Non-cyclic photophosphorylation

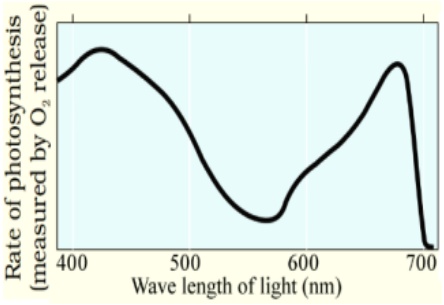
a) Name the process. b) Where does this reaction take place in plants?

c) What is the significance of this reaction?

22) Observe the graphs given below. What does these graphs indicate?

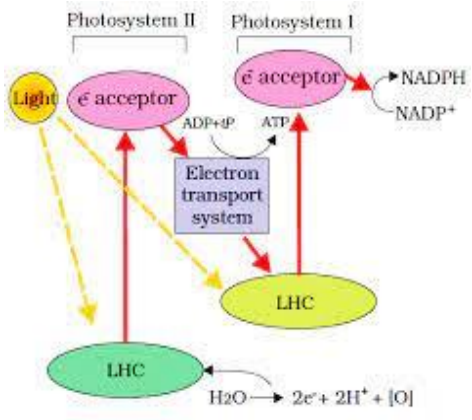


Graph A



Graph B

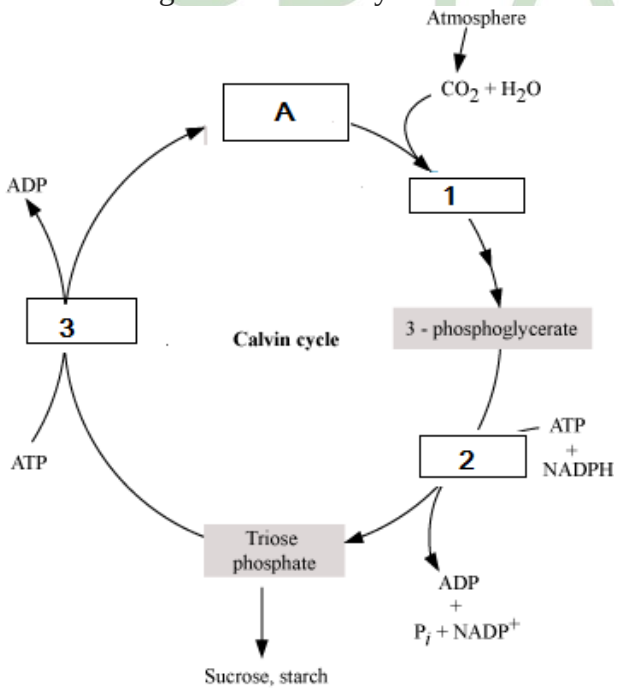
23) Given below diagram represents the process of Non cyclic photophosphorylation.



a) Why is it called as Non cyclic photophosphorylation?

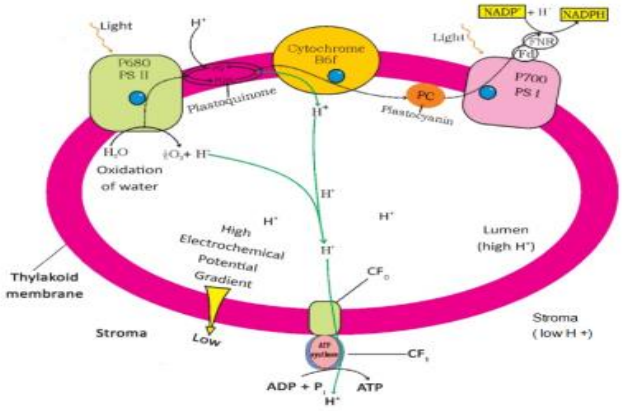
b) Why it is called as Z scheme.

24) Given below is the schematic diagram of Calvin cycle. Observe it and answer the following questions.



1) Where does this cycle takes place? 2) Mention the three stages of Calvin cycle.
3) Name the compound which is regenerated in this cycle.

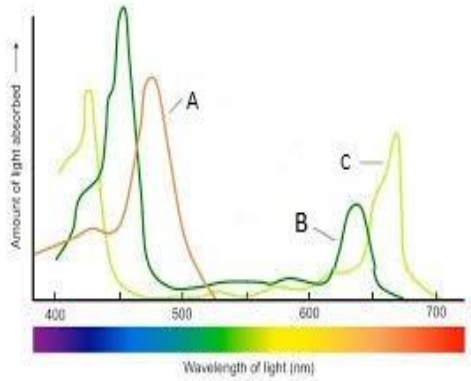
25) Observe the diagram given below.



a) Which process is explained by this diagram?
b) Name the three electron carrier molecules present on the thylakoid membrane.
c) Name the enzyme required for ATP synthesis and its components.

26) ATP synthesis is linked to development of proton gradient across a membrane.
Explain three ways for developing the proton gradient across the thylakoid membrane.

27) Observe the graph given below and answer the questions.
a) Label the pigments A ,B,& C b) Which is the chief pigment in photosynthesis? Why?



28) You are provided with some characters of photophosphorylation, arrange them in appropriate column
[Occurs at stroma lamella, Electron flow is cyclic, Production of ATP and NADPH,
Both PS I & PS II are functional, Presence of NADP reductase, Occurs at grana, Only PS I is functional,
Absence of NADP reductase, Synthesis of ATP only, Electron flow is not cyclic.]

Cyclic Photophosphorylation	Noncyclic photophosphorylation

29) Explain the process of ATP synthesis according to Chemiosmotic hypothesis.

30) Photolysis – splitting of water is a very important reaction that takes place during Non-cyclic photo-phosphorylation.
a) Which pigment system is associated with this process?
b) Mention the site of the water splitting complex.
c) Which gas is released during this process?

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ANSWERS

1) Yellow green.
2) P700 & P680.
3) Paper chromatography.
4) Light Harvesting Complex.
5) 400 nm - 700 nm.
6) Because the reaction centre of PSI is a Chl-a molecule which is having an absorption peak at 700 nm.
7) RUBP - Ribulose bisphosphate .
8) 3PGA - 3 Phosphoglycerate.
9) 18 ATP & 12 NADP.
10) RuBisCo.
11) Photophosphorylation is the synthesis of ATP from ADP and inorganic phosphate in the presence of light.
Cyclic photophosphorylation & Non cyclic photophosphorylation.
12) Stroma lamellae membranes lack PS II as well as NADP reductase enzyme,
Whereas the grana have both PS I and PS II as well as NADP reductase enzyme.
13) RuBP carboxylase-oxygenase.
This enzyme is called so because it has both carboxylation and oxygenation activity.
14) a) Light harvesting complex b) A) Reaction centre B) Pigment molecules.
15) Stroma side of the thylakoid membrane. To convert $NADP^+$ to NADPH.
16) a) Chloroplast b) A – Stroma lamellae B- Grana C- Stroma.
17) The ATP synthase enzyme consists of two parts: F0 & F1 .
F0 is embedded in the thylakoid membrane and F1 protrudes on to the outer surface of the thylakoid membrane into the stroma.
18) a) Cyclic photophosphorylation
b)The electrons that escape from PSI are cycled back to the same pigment system.
19) All the pigments other than chlorophyll a, like chlorophyll b, xanthophylls and carotenoids, which are present in a pigment system are called accessory pigments.

- They absorb sunlight and transfer the solar energy to chlorophyll a.
- They also protect chlorophyll a from photo-oxidation.

20) The four requirements for ATP synthesis are
1) A membrane. 2) A proton pump. 3) A proton gradient across the membrane. 4) ATP synthase enzyme.
21) a) Photolysis.
b) In the lumen of thylakoid.
c) i) Help to increase H+ gradient in lumen for ATP synthesis.
ii) Help to replace electrons in PS II.
22) -Graph A represents the Absorption spectrum of the pigments chlorophyll a, b and the carotenoids
-It shows that the rate of absorption of light by the pigments are more in the blue and red regions of the visible spectrum.
-Graph B represents the Action spectrum of photosynthesis.
-It shows that the rate of photosynthesis is maximum in the blue and red regions of the spectrum
23) a) The electrons escaped from PSII are not cycled back to same PS, instead they move towards PS I
b) This whole 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 downhill to $NADP^+$ reducing it 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
24) a - Stroma. b- 1- Carboxylation. 2- Reduction. 3- Regeneration. c - Ribulose-1,5- bisphosphate.
25) a) Chemiosmotic hypothesis which explains the mechanism of ATP synthesis.
b) Plastoquinine, Cytochrome B6-f, Plastocyanine.
c) ATP synthase - F0 & F1 complex.

26)

- The protons or hydrogen ions are produced by the splitting of water and they accumulate within the lumen of the thylakoids.
- When electrons moves through the electron accepter molecules, the protons are released into the lumen of the thylakoids. As a result the concentration of protons are high within the lumen of the thylakoids.
- The protons present in the stroma are used up for the reduction of $NADP^+$ to NADPH+ H^+. So the concentration of protons are reduced within the stroma.

Thus a proton gradient is created across the thylakoid membrane.

27) a) A. Carotenoides B. Chlorophyll b. C. Chlorophyll a.

b) Chlorophyll a.

Because in Absorption spectrum and Action spectrum Chl-a shows maximum rate of absorption in blue and red region and also shows higher rate of photosynthesis.

28)

Cyclic photophosphorylation	**Non cyclic photophosphorylation**
Occur at stroma lamella	Occur at grana
Only PS I is functional	Both PS I and PS II functional
Absence of NADP reductase	Presence of NADP reductase
Synthesis of ATP only	Production of ATP and $NADPH_2$
Electron flow is cyclic	Electron flow is not cyclic

29)

- A proton gradient is created across the thylakoid membrane.
- The breakdown of this proton gradient provides enough energy which leads to the synthesis of ATP.
- The gradient is broken down due to the movement of protons across the membrane to the stroma.
- ATP synthase enzyme present on the membrane has a channel F0 that allows diffusion of protons from the lumen into the stroma across the membrane.
- This releases enough energy to cause a conformational change in the F1 particle of the ATP synthase thus catalyses the formation of ATP.

30) a) PS II.

b) Inner side of thylakoid membrane.

c) Oxygen.

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