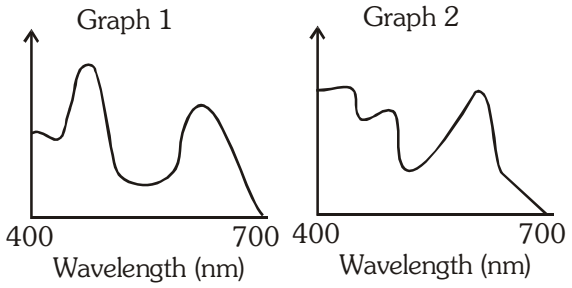
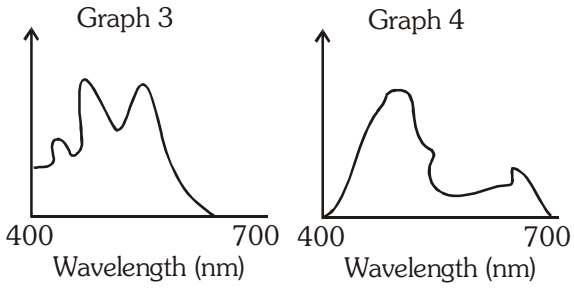
PHOTOSYNTHESIS IN HIGHER PLANTS

1. Three of the graphs below show the absorption spectra of photosynthetic pigments and one graph shows the action spectrum of photosynthesis for a plant. All the x-axis show wavelengths. Three of the y-axis show light absorption and one y-axis shows the rate of photosynthesis.





Choose correct match for graph 1 to 4 :-

	Absorption spectrum Chlorophyll a	Absorption spectrum Chlorophyll b	Absorption spectrum Carotenoids	Action Spectum
(1)	1	4	3	2
(2)	2	1	3	4
(3)	2	4	3	1
(4)	3	2	4	1

2. Select the correct path of electrons during photosynthesis.

(1) $CO_2 \rightarrow$ RuBP $\rightarrow$ G3P $\rightarrow$ Glucose

(2) $H_2O \rightarrow$ PSI $\rightarrow$ PSII $\rightarrow$ NADPH + $H^+ \rightarrow$ G3P

(3) PSII $\rightarrow H_2O \rightarrow$ PSI $\rightarrow$ NADPH + $H^+ \rightarrow$ Glucose

(4) $H_2O \rightarrow$ PSII $\rightarrow$ PSI $\rightarrow$ NADPH + $H^+ \rightarrow$ G3P

3. Thomas Engelmann illuminated a filament of algae with light that passesd through a prism, thus exposing different segments of the algal filament to different wavelengths of light. He added aerobic bacteria and found that these bacteria congregated in the areas illuminated by red and blue light. If you ran the same experiment without passing light through a prism, what would you predict?

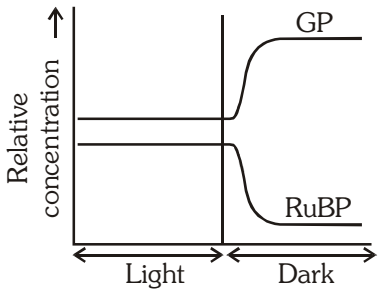
(1) There would be no difference in result

(2) The number of bacteria would decrease along the entire length of the filament

(3) The bacteria would be relatively evenly distributed along the length of the filament

(4) The number of bacteria would increase along the entire length of the filament

4. The graph below refers to an experiment involving a species of alga. The relative concentrations of GP (Glyceraldehyde 3P) and RuBP present in the cells were monitored when the plants were in light and then in darkness.



Which of the following conclusions cannot be drawn from these results?

(1) In darkness, the relative concentration of GP increases

(2) During the experiment, RuBP may be converted into GP

(3) The relative concentration of RuBP decreases on removal of CO_2

(4) In light, a steady state exists between RuBP and GP

5. Two groups of isolated thylakoids are placed in an acidic bathing solution so that H^+ diffuses into the thylakoids. They are then transferred to a basic bathing solution, and one group is placed in the light, while the other group is kept in the dark. Select below the choice that describes what you expect each group of thylakoids to produce?

	In light	**In Dark**
(1)	ATP only	Nothing
(2)	ATP, O_2	ATP only
(3)	ATP, O_2, glucose	ATP, O_2
(4)	ATP, O_2	O_2

6. A student sets up an experiment on photosynthesis and it is as follows.
He takes soda water in a glass tumbler and adds chlorophyll extract and keeps the tumbler exposed to sunlight, hoping that he has provided the necessary ingredients. What will happen after, say, a few hours of exposure to light? Choose the correct answer :-

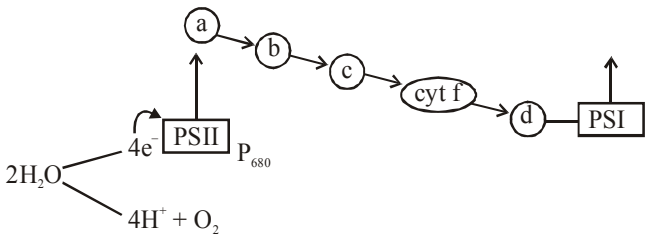
(1) Photosynthesis will takes place and glucose would be produced turning the mixture sweet

(2) Photosynthesis will take place and starch would be produced which will turn the mixture turbid

(3) Photosynthesis will not take place and CO_2 dissolved in soda water will escapes into the atmosphere

(4) Photosynthesis will not take place because intact chloroplasts are needed for the process

7. In the below schematic diagram, which is plastocyanin ?



(1) a (2) b (3) c (4) d

8. Fill in the blanks :-

1. Light saturation occurs at __a__ per cent of full sunlight.
2. There is a __b__ relationship between incident light and CO_2 fixation rates at low light intensities.
3. C_3 plants show CO_2 saturation at about __c__ $\mu 1L^{-1}$ while C_4 plants corresponds to CO_2 saturation at about __d__ $\mu 1L^{-1}$.

(1) a–2-5%, b–sigmoid, c–350, d–460

(2) a–50%, b–linear, c–460, d–350

(3) a–10%, b–sigmoid, c–360, d–450

(4) a–10%, b–linear, c–450, d–360

9. Assuming a thylakoid is somehow punctured so that the interior of the thylakoid is no longer separated from the stroma. This damage will have the most direct effect on which of the following processes?

(1) Splitting of water

(2) Absorption of light energy by chlorophyll

(3) Flow of electrons from photosystem II to photosystem I

(4) Synthesis of ATP

10. The following (P through U) are the main steps of chemosynthetic ATP synthesis in the light reaction. Which option places them in **correct order**?

(P) H^+ concentration gradient established

(Q) H^+ diffuses through ATP synthetase

(R) Carriers use energy from electrons to move H^+ across the membrane

(S) Electrons from PS II pass along electron transport chain

(T) Light excites electrons in PS II

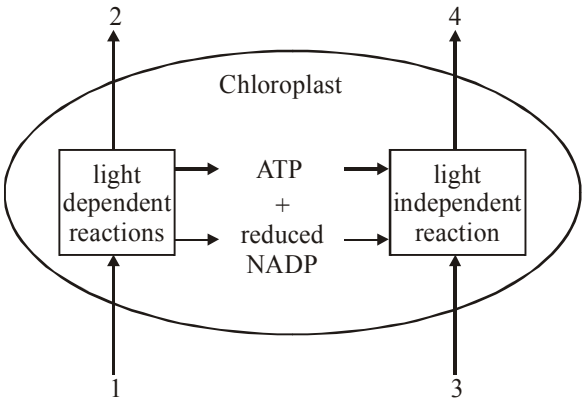
U. Energy of H^+ flow is used by ATP synthetase to make ATP

Options :-

(1) PQTSRU (2) STPQRU

(3) TSRPQU (4) TSRUQP

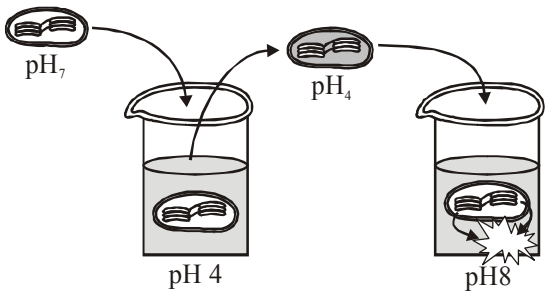
11. The diagram shows the movement of substances in and out of chloroplast -



What do labels 1 to 4 represent?

	1	2	3	4
(1)	CO_2	ATP	H_2O	Starch
(2)	CO_2	H_2O	Sugar	O_2
(3)	H_2O	O_2	CO_2	Sugar
(4)	Sugar	H_2O	ATP	O_2

12. The diagram below represents an experiment with isolated chloroplasts. The chloroplasts were first made acidic by soaking them in a solution at pH 4. After the thylakoid space reached pH 4, the chloroplasts were transferred to a basic solution at pH 8. The chloroplasts are then placed in the dark. Which of these compounds would you expect to be produced?



(1) ATP (2) NAD

(3) G3P (4) $C_6H_{12}O_6$

ANSWER KEY													
Que.	1	2	3	4	5	6	7	8	9	10	11	12	
Ans.	**1**	**4**	**3**	**3**	**2**	**4**	**4**	**4**	**4**	**3**	**3**	**1**	