6. Give comparison between the following:
(a) C_3 andC_4 pathways
(b) Cyclic and non-cydic photophosphorylation
(c) Anatomy of leaf in C_3 and C_4 plants.
Solution: (a) The differences between C_3 and C_4

	C_3 pathway	C_4 pathway
(i)	Ribulose biphosphate is the first acceptor of CO_2.	Phosphoenol pyruvate is the first acceptor of CO_2, while ribulose biphosphate is the second acceptor.
(ii)	Phosphoglyceric acid is the first product.	Oxaloacetic acid is the first product.
(iii)	The plants operate only Calvin cycle.	Plants operate a dicarboxylic acid cycle in addition to Calvin cycle.
(iv)	CO_2 compensation point is 25 – 100 ppm.	CO_2 compensation point is 0 – 10 ppm.
(v)	Mesophyll cells perform complete photosynthesis.	Mesophyll cells perform only initial fixation.

(vi)	The rate of carbon assimilation is slow.	The rate of carbon assimilation is quite rapid.
(vii)	The plants are unable to perform photosynthesis at very low CO_2 concentration (say 10 – 50 ppm).	Photosynthesis continues even at very low CO_2 concentration of 10 – 50 ppm.
(viii)	The cycle operates in all plants.	The cycle is found only in some plants like maize, sugarcane etc.
(ix)	Fixation of one molecule of CO_2 uses 3 ATP and 2NADPH.	Fixation of one molecule of CO_2 requires 5 ATP and 2NADPH.

(b) The differences between cyclic and non- cyclic photophosphorylation are as follows :

	Cyclic photophos-phoryaltion	Non-cyclic photo-phosphorylation
(i)	It is performed by photosystem I independently.	It is performed by collaboration of both photosys-tems I and II.
(ii)	It is not connected with photolysis of water. There-fore, no oxygen is evolved.	It is connected with photolysis of water and libera-tion of oxygen.
(iii)	It synthesises only ATP.	Non-cyclic pho-tophosphoryla-tion is not only connected with ATP synthesis but also production of NADPH.
(iv)	It operates under low light intensity, anaerobic condi-tions or when CO_2 availability is poor.	Non-cyclic photo-phosphorylation takes place under optimum light, aerobic conditions and in the pres-ence of carbon dioxide.
(v)	It occurs mostly in stromal or inter-granal thylakoids.	It occurs in the granal thylakoids.

(c) Differences between the leaf anatomy of C_3 and C_4plants are as follows :

	C_3 plants	C_4 plants
(i)	The leaves do not possess kranz anatomy.	The leaves have kranz anatomy.
(ii)	Chloroplasts do not have peripheral reticulum.	Chloroplasts have peripheral reticulum.
(iii)	Chloroplasts are of one type (monomorphic).	There are two types of chloroplasts (dimorphic).
(iv)	Bundle sheath cells usually do not contain chloroplasts.	Bundle sheath cells possess prominent chloroplasts.
(v)	In higher plants, operating C_3 cycle, all the chloroplasts are granal.	There are two types of chloroplasts, granal in mesophyll cells and agranal in bundle sheath cells.
(vi)	Mesophyll cells perform complete photosynthesis.	Mesophyll cells perform only initial fixation.
(vii)	Perform photosynthesis only when stomata are open.	Perform photosynthesis even when stomata are closed (from CO_2 produced in respiration).

(vi)	ATP synthesis is not affected by DCMU.	DCMU inhibits non-cyclic photophosphorylation.

7. Look at leaves of the same plant on the shady side and compare it with the leaves on the sunny side. Or ompare the potted plants kept in the sunlight with those in the shade. Which of them has leaves that are darker green? Why?
Solution: The leaves of the shaded side are darker green than those kept in sunlight due to two reasons:
(i) The chloroplasts occur mostly in the mesophyll cells along their walls for receiving optimum quantity of incident light.
(ii) The chloroplasts align themselves in vertical position along the

lateral walls of high light intensity and along tangential wails in moderate light.

8. The given figure shows the effect of light on the rate of photosynthesis. Based on the graph, answer the following questions.

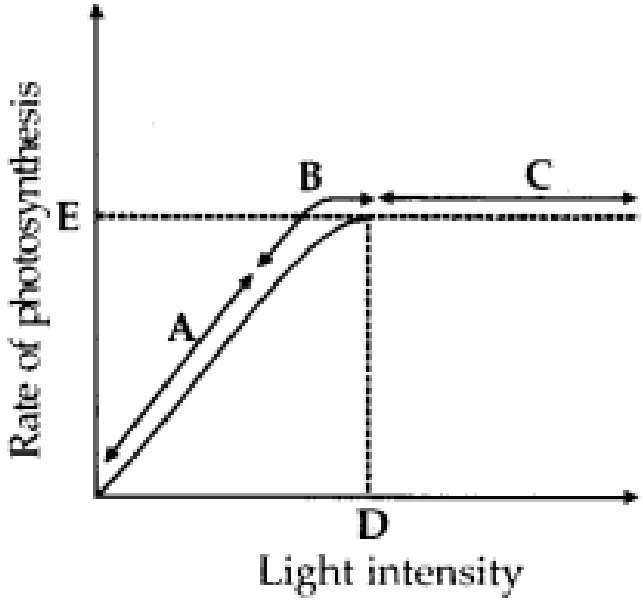

Fig.: Graph showing effect of light intensity on the rate of photosynthesis

(a) At which point/s (A, B or C) in the curve is light limiting factor?
(b) What could be the limiting factor/s in region A?
(c) What do C and D represent on the curve?
Solution:
(a) At regions A and B light is the limiting factor.
(b) In the region A', light can be a limiting factor.
(c) C is the region where the rate of photosynthesis is not increased when light intensity is increased. D is the point where some other factors become limiting.

9. 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?
Solution: Carotenoid pigments are found in all photosynthetic cells. They are accessory pigments also found in roots, petals etc. These pigments do not breakdown easily thus temporarily reveal their colour due to unmasking, following breakdown of chlorophylls. Thus the colour of leaf kept in dark is yellow or pale green.

********** END **********