Short Answer Type Questions – I

Q. 1. Describe action spectrum. What does it show?

Ans. Action Spectrum: The curve depicting the relative rates of photosynthesis at different wavelengths of light is called action spectrum. It shows that maximum photosynthesis occurs in blue-violet part of the light.

Q. 2. What is absorption spectrum ? How it is studied?

Ans. The curve showing the amount of differet wavelengths of light absorbed by a substance is called absorption spectrum. It is studied help of spectrophotometer.

Q. 3. Describe the types of carotenoids found in plastids

Ans. There are two types of carotenoids:

(i) **Carotenes :** They are hydrocarbons with a general formula of $C_{40}H_{56}$. The most common carotence is β -carotene which is converted to vitamin A by animals and human beings.

(ii) Xanthophylls : They are oxygen containing derivative of carotenes e.g., $C_{40}H_{56}$.O (cryptoxanthin), $C_{40}H_{56}O_{2}$ (lutein, zeaxanthin).

Q. 4. Two potted plants were kept in an oxygen free environment in transparent containers Plant A was exposed to green light and plant B to sunlight. Which one of the two, is likely tosurvive longer and why?

Ans. Plant A will show more photosynthesis. Chlorophyll absorbs maximum light in the blue region of the spectrum, *i. e.*, 400-450 nm and hence photosynthetic rate will also be high. Plant B will show negligible amount of photo synthesis or no photosynthesis as chlorophyll does not absorb any light in the green region, *i. e.*, 500-550 nm but reflects light.

Q. 5. What is the advantage of having more than one pigment molecule in a photocentre ? [V.Imp.]

Ans. (i) Light reaction depends upon the amount of solar energy trapped by the pigment molecule.

(ii) Energy trapped by a single pigment molecule is not enough to start the initial reactions which may occur in light.

(iii) A number of pigment molecules capture light over a large surface area, and later on pass it on to photocentre.

(iv) The presence of a number of pigment molecules would provide protection to the chlorophyll molecule against photo-oxidation.

Q. 6. "There exists a clear division of labour with in the chloroplast". Comment.

Ans. There is a clear division of labour within the chloroplast. The membrane system is responsible for the light reaction (trapping light energy and synthesis of ATP and NADPH) while dark reaction *i.e.*, enzymatic reactions for the reduction of carbon dioxide into sugarsusing ATP and NADPH takes place in the stroma.

Q. 7. Expand the term RaBisCO. How does it act as carboxylase and oxygenase respectively ? [DDE 2017]

Ans. RuBlisCO-Ribulose bisphosphate carboxylase oxygenase RuBisCo brings about carboxylation during Calvin cycle in photosynthesis. Under high concentration of oxygen and increase in temperature, RuBisCo act as oxygenase and carry out photorespiration.

Q. 8. What are the two main steps of photosynthesis ?

Ans. Photosynthesis consists of two steps:

(i) In photochemical phase or light reaction solar energy is trapped by chlorophyll and stored in the form of chemical energy of ATP and as reducing power in NADPH₂. Oxygen is involved in the light reaction by splitting of water (photolysis of water).

(ii) Biosynthetic phase or dark reaction in which the reducing capacity of NADPH and the energy of ATP are utilized in the conversion of carbon dioxide to carbohydrates.

Q. 9. What are cardinal points ? How does they affect the physiological process ?

Ans. A factor influencing a physiological process has three principle values called cardinal points, minimum, optimum and maximum.

(i) The minimum of a factor is that valuee below which the physiological process cannot continue.

(ii) Optimum value is that point where the physiological process can continue indefinitely at its highest velocity.

(iii) Maximum value is that beyond which the process comes to stop.

Q. 10. What do you understand by Emerson effect ? How it was observed ?

Ans. "The fall in photosynthetic yield beyond red region of the spectrum is called Emerson's first effect or red drop." Emerson et, al: (1957) exposed unicellular alga *Chlorella* to monochromatic light and measured the photosynthetic yield in terms of quantum yield. They observed that the quantum yield of photosynthesis decreased very sharply towards fat red region of the spectrum.

Q. 11. Name the enzyme that catalyses carboxylation as well as oxygenation reaction. In which cell organelle is this enzyme found and in what way is that organelle different in the mesophyll and bundle sheath cells ?

Ans. RubisCO enzyme catalyses carboxylation and oxygenation reactions. It is found in the chloroplast (cell organelle). Chloroplasts in mesophyll oells are granal but chloruplast of bundle sheath cells are agranal. Granal chloroplasts have thylakoids stacked to form grana

(as in C_3 plants). Agranal chloroplasts are without grana but thylakoids are found as stroma lamellae.