

## Photosynthesis and Biosynthesis

### 1. Define:

**Photophosphorylation** – Photophosphorylation is the process of making ATP using light as an energy source. It is essentially a biochemical process that allows cells to transfer light energy into chemical energy (ATP). Photophosphorylation processes are sometimes referred to as the light reactions of photosynthesis.

**Ferredoxin** – The ferredoxins are small, soluble, iron-sulfur proteins that serve as electron acceptors in photosystem I of photophosphorylation. Ferredoxins accept electrons from electron acceptors associated with the reaction centers of P700 chlorophyll molecules or bacteriochlorophylls. They can then pass electrons to NADP or to cytochromes.

**Bacteriochlorophyll** – Bacteriochlorophylls are the primary light trapping pigments associated with anoxygenic phototrophic bacteria (e.g., the green and purple bacteria), and occur as five types, a, b, c, d, and e. These pigments capture light energy during photophosphorylation reactions.

**Anoxygenic** – Anoxygenic means without oxygen production. Photophosphorylation reactions that do not yield oxygen as an end product are anoxygenic. The photophosphorylation reactions of green and purple bacteria are anoxygenic.

**Calvin-Benson cycle** – The Calvin-Benson cycle is an anabolic pathway involving a series of chemical reactions allowing autotrophs to "fix" inorganic carbon (carbon dioxide) into organic compounds (carbohydrates). Enzymes associated with the Calvin-Benson cycle occur within the stroma of chloroplasts and within carboxysomes.

2. Photophosphorylation/ bacteriochlorophylls/ bacteriorhodopsin
3. Bacteriochlorophylls/ anoxygenic
4. Proton motive force/ ATP synthase
5. Bacteriorhodopsin/ ATP synthase
6. Bacteriorhodopsin
7. Chlorophylls/ plastoquinones/ ferredoxins
8. Thylakoids/ cell membranes
9. Plastoquinone/ molecular oxygen
10. Ferredoxin/ NADP (Nicotinamide Adenine Dinucleotide Phosphate)
11. Water
12. Thylakoids/ carboxysomes

13. Calvin-Benson cycle
14. ATP and NADPH + H<sup>+</sup>
15. Calvin-Benson cycle/ ATP/ NADPH + H<sup>+</sup>
16. Ribulose 1,5-bisphosphate carboxylase-oxygenase (RuBisCO)/ six (6)
17. Fix inorganic carbon (carbon dioxide) into organic compounds/ carboxysomes
18. Calvin-Benson cycle/ stroma of chloroplasts
19. Fix inorganic carbon (CO<sub>2</sub>) into organic compounds, because they do not make the enzymes needed to run the Calvin-Benson cycle./ trap light energy and use it to make ATP, because they do not contain light trapping pigments nor the enzymes needed to carry out photophosphorylation.
20. Bacteriorhodopsin **Note** - Organisms in the genus *Halobacterium* are now categorized as Archaea and not Bacteria.
21. Matching letter sequence is - D, A, F, E, I, H, C, B, J, and G