Solutions

S1. Ans.(c)
For fixation of 1 molecule of CO_2 in Calvin cycle 3 ATP molecules and 2 NADPH molecules are required.

S2. Ans.(b)
For dark reaction of photosynthesis there are the requirement of
CO_2
ATP
NADPH

S3. Ans.(b)
In C_3 plant, some O_2 bind to RuBisCO, and hence CO_2 fixation is decreased. Statement II is incorrect, photorespiration does not occur in C_4 plants as they lack RuBisCO in mesophyll. Hence statement I is the only correct option.

S4. Ans.(a)
Refer to Class XIth NCERT Pg. 218

S5. Ans.(d)
Refer to Class XIth NCERT Pg. 211

S6. Ans.(d)
Refer to Class XIth NCERT Pg. 215

S7. Ans.(a)
The primary CO_2 acceptor is a 3-carbon molecule, phosphoenol pyruvate (PEP) and is present in the mesophyll cells. Mesophyll cells of C_4 plants lack RuBisCO enzyme.

S8. Ans.(c)
Chemiosmosis requires a membrane, a proton pump, a proton gradient and ATP synthase. Energy is used to pump protons across a membrane to create a gradient or a high concentration of protons within the thylakoid lumen. The NADP reductase enzyme is located on the stroma side of the membrane. Along with the electrons that come from the acceptor of electrons of PS 1, protons are necessary for reduction of $NADP^+$ to NADPH + H^+. The process does not involve breaking of electron gradient.

S9. Ans.(b)
The large cells around the vascular bundles of C_4 plants form bundle sheath. These cells have large number of chloroplasts to perform Calvin cycle.

S10. Ans.(a)
The first stable product of CO_2 fixation in Sorghum (C_4 plant) is Oxaloacetic acid.

S11. Ans.(c)
In cyclic photophosphorylation, electrons are passed from P_{700} of PS-I via electron transfer chain to back to P_{700} with the formation of ATP. It does not include PS II.

S12. Ans.(a)
In photorespiration, the oxygenation activity of RuBisCo enzyme produces one molecule of 3-phosphoglycerate (PGA) and one molecule of 2-phosphoglycolate (2PG or PG). A 3C chemical is 3-phosphoglycerate, while a 2C compound is 2-phosphoglycolate.

S13. Ans.(d)
The following is the electron transport pathway in the light reaction
$PSII \rightarrow Ph \rightarrow PQ \rightarrow Cytb_6f \rightarrow PC \rightarrow PSI$

S14. Ans.(a)
The electrons lost from photosystem II must be replenished during non-cyclic photophosphorylation. This is accomplished by using electrons that are available as a result of water splitting. Photosystem II breaks down H_2O molecules into 1/2 O, $2H^+$, and two electrons. Electrons lost by Photosystem II antenna complexes are constantly replaced by these electrons.

S15. Ans.(a)
The RuBisCO enzyme is absent in C_4 plants' mesophyll cells. RuBisCO is abundant in bundle sheath cells.

S16. Ans.(d)
Hatch and slack pathway is a cyclic pathway for CO_2 fixation. The primary CO_2 acceptor is a 3-carbon compound phosphoenol pyruvate (PEP) which is present in mesophyll cells. PEP is converted to oxaloacetic acid (OAA) which is then further converted into a 4-carbon compund such a malic acid or aspartic, which is then transported to the bundle sheath cells, it is again broken down into a 3-carbon compound with the release of CO_2. The CO_2 released enters the Calvin cycle in the bundle shealth cells, while the 3 carbon compound I transported back to the mesophyll cells. In the mesophyll cells, the 3 carbon compound is converted back to PEP, thus completing the cycle.

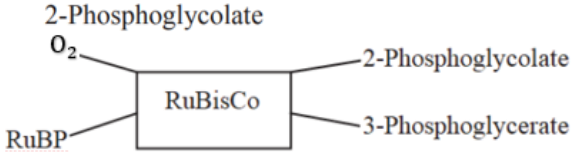
S17. Ans.(b)
During the light reaction, sunlight energy is transformed into a little amount of ATP and an energy carrier, NADPH. Additionally, water is divided and oxygen is released.

S18. Ans.(c)
C_4 plants can withstand a wide temperature range.

S19. Ans.(b)
PEP is a 3C molecule that acts as a main CO_2 acceptor in the cytoplasm of mesophyll cells in C_4 plants such as maize, sugarcane, and sorghum.

S20. Ans.(d)
The presence of a purple pigment called anthocyanin alters the colour of leaves in some plants. Because anthocyanins are water soluble, they are found in solution in the cells' water

S21. Ans.(a)
RuBP interacts to O_2 and forms one phosphoglycolate and one phosphoglycerate molecule.



S22. Ans.(a)
Photorespiration is the process that distinguishes C_3 plants from C_4 plants. C_4 plants have a unique leaf morphology that allows them to withstand higher temperatures, respond to higher light intensities, lack the process of photorespiration, and produce more biomass.

S23. Ans.(b)
Phytochrome is a kind of chromoprotein

S24. Ans.(b)
The lumen of the thylakoid contains the most protons in a chloroplast. Protons in the stroma of the chloroplast decrease in number, whereas protons accumulate in the lumen of the thylakoid. A proton gradient is created across the thylakoid membrane, as well as a detectable drop in pH in the lumen.

S25. Ans.(b)
C_4 plants are unique in that they have a unique leaf anatomy, can withstand higher temperatures, and respond to high light intensities, yet they lack photorespiration

S26. Ans.(d)
Anthocyanins are water-soluble pigments present in plant cell vacuoles

S27. Ans.(b)
The finding of two photosystems working simultaneously was aided by Emerson's amplification effect (1957) and Red drop. Chlorella was the subject of Emerson's experiment.

S28. Ans.(c)

Enzymatic reactions in the stroma incorporate CO_2 into the plant, resulting in sugar production. These reactions are dependent on the products of light reactions and are not directly light-driven (ATP and NADPH).

S29. Ans.(b)

Rhodospirillum uses H_2S instead of H_2O as a source of hydrogen. As a result, O_2 is not produced during photosynthesis.