



Attempt questions first; check the separate key afterward. Use labelled diagrams where asked. Give scientific reasons; answer key covers closed questions.

A. Very short answers - 1 mark each

1. Name the primary photosynthetic pigment.
2. What is the source of oxygen released in photosynthesis?
3. Where does the Calvin cycle occur in chloroplasts?
4. Name the primary CO_2 acceptor in C_3 plants.
5. Name the first stable C_3 -cycle product.
6. Name the primary CO_2 acceptor in C_4 mesophyll cells.
7. Name the first stable C_4 product.
8. Which photosystem participates alone in cyclic photophosphorylation?

B. Short answers / practice - 2 marks each

9. Explain the roles of accessory pigments.
10. Compare absorption spectrum and action spectrum.
11. Describe light-harvesting complexes and reaction centres.
12. Explain why PS II is called P680 and PS I P700.
13. Trace electron flow in non-cyclic photophosphorylation.
14. Explain photolysis of water and its location.
15. Compare cyclic and non-cyclic photophosphorylation.
16. Describe the proton gradient across the thylakoid membrane.
17. Explain ATP synthase in the chemiosmotic mechanism.
18. State the three main phases of the Calvin cycle.
19. Explain carboxylation by RuBisCO.
20. Describe reduction and RuBP regeneration.

C. Application / reasoning - 3 marks each

21. How many CO_2 molecules are needed for one glucose through the Calvin cycle?
22. State ATP and NADPH demand per glucose in the Calvin cycle.
23. Calculate ATP needed in the Calvin cycle to fix three CO_2 .
24. Describe Kranz anatomy.
25. Explain spatial separation of initial fixation and Calvin cycle in C_4 plants.
26. Why is photorespiration strongly suppressed in typical C_4 plants?
27. Compare oxygenase and carboxylase activities of RuBisCO.
28. Does photorespiration produce ATP as a net benefit?
29. Explain the effects of light, CO_2 and temperature on photosynthetic rate.
30. State the principle of limiting factors with an example.
31. Why can additional light fail to increase photosynthesis?

D. Extended practice - 5 marks each

32. Draw the Z-scheme and explain ATP, NADPH and oxygen formation.
33. Explain the Calvin cycle with carbon counts and energy requirements.
34. Compare C_3 and C_4 photosynthesis in anatomy, enzymes, products and photorespiration.
35. Explain chemiosmotic ATP formation and design a controlled test of one limiting factor.

ANSWER KEY - Numerical / closed questions

- 1) Chlorophyll a. 2) Water. 3) Stroma. 4) RuBP.
5) 3-phosphoglycerate. 6) PEP. 7) Oxaloacetate.
8) Photosystem I. 21) Six. 22) 18 ATP; 12 NADPH.
23) Nine ATP. 28) No.