

Photosynthesis in Higher Plants — CBSE Pattern Test 2

Class 11 Biology · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 2 — CBSE Pattern (90 minutes, 40 marks)

Class 11 Biology · Photosynthesis in Higher Plants · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.
(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.
(3) For MCQ questions choose the single correct option; for VSA answers write a single line.
(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

- The site of photosynthesis in the cell is the
 - chloroplast
 - mitochondrion
 - ribosome
 - nucleus
- In the light reaction, water is split in a process called
 - photolysis
 - hydrolysis
 - glycolysis
 - photorespiration
- The products of the light reaction are
 - ATP, NADPH and O_2
 - glucose and O_2
 - CO_2 and water
 - ATP only
- The Calvin cycle is also called the
 - C_3 pathway
 - C_4 pathway
 - CAM pathway
 - glycolytic pathway
- The C_4 pathway is also called the
 - Hatch-Slack pathway
 - Calvin pathway
 - CAM pathway
 - Z-scheme
- Kranz anatomy is seen in
 - C_4 plants
 - C_3 plants
 - all plants
 - CAM plants
- Photorespiration is favoured by
 - high O_2 and low CO_2

- (B) high CO₂ and low O₂
 - (C) low light
 - (D) high humidity
8. The most important external factor affecting photosynthesis is
- (A) light
 - (B) CO₂
 - (C) temperature
 - (D) water
9. What is photorespiration?
10. What is Kranz anatomy?

Section B — Short Answer I (4 × 2 = 8 marks)

11. What does P680 stand for?
12. Why is the Calvin cycle called the C₃ pathway?
13. Distinguish between C₃ and C₄ plants.
14. State the law of limiting factors.

Section C — Short Answer II (4 × 3 = 12 marks)

15. Why is photosynthesis called a physicochemical process?
16. Explain the Z-scheme with reference to the two photosystems.
17. Explain why C₄ plants are more efficient than C₃ plants.
18. How do C₄ plants avoid photorespiration?

Section D — Long Answers (2 × 5 = 10 marks)

19. (a) Explain the role of RuBisCO in carbon fixation. (b) Explain photorespiration and its drawbacks.
20. (a) Describe the law of limiting factors with an example. (b) Distinguish between the light reaction and the dark reaction.

Answer Key (Marking Scheme)

- Q1 — (A) chloroplast. Q2 — (A) photolysis. Q3 — (A) ATP, NADPH and O₂. Q4 — (A) C₃ pathway. Q5 — (A) Hatch-Slack pathway. Q6 — (A) C₄ plants. Q7 — (A) high O₂ and low CO₂. Q8 — (A) light.
- Q9 — Photorespiration is the wasteful process in which RuBisCO binds O₂ instead of CO₂, consuming ATP without producing sugar.
- Q10 — Kranz anatomy is the arrangement of large bundle-sheath cells around vascular bundles in C₄ plants.
- Q11 — P680 is the reaction centre of photosystem II that absorbs light maximally at 680 nm.
- Q12 — Because the first stable product is a 3-carbon compound (3-PGA).
- Q13 — C₃: 3-PGA first product, no Kranz anatomy; C₄: OAA first product, Kranz anatomy.
- Q14 — The rate of a process is limited by the factor in shortest supply.
- Q15 — It involves physical light absorption and chemical conversion of CO₂ and water to carbohydrate.
- Q16 — PSII (P680) and PSI (P700); electrons flow from water through PSII and PSI to NADP⁺, drawn as a Z.

Q17 — C4 plants concentrate CO₂ in bundle-sheath cells, avoiding photorespiration and thus fixing carbon more efficiently.

Q18 — By fixing CO₂ first into OAA in mesophyll cells, so a high CO₂ concentration reaches RuBisCO in bundle-sheath cells.

Q19 — (a) RuBisCO fixes CO₂ onto RuBP to give two molecules of 3-PGA. (b) O₂ competes with CO₂ at RuBisCO, consuming ATP and producing no sugar.

Q20 — (a) Rate is set by the factor in shortest supply, e.g. low CO₂ limits at high light. (b) Light reaction: thylakoids, needs light, gives ATP/NADPH/O₂; dark reaction: stroma, light-independent, fixes CO₂ into sugar.