

CLASS XI BIO CH-11

MCQ Set 3: Photosynthesis in Higher Plants

1. Who hypothesized that plants restore to the air whatever breathing animals and burning candles remove?
 - a) Jan Ingenhousz
 - b) Joseph Priestley
 - c) Julius von Sachs
 - d) Melvin Calvin
2. Ingenhousz showed that sunlight is essential for the process in plants that:
 - a) Releases carbon dioxide
 - b) Purifies the air
 - c) Produces glucose
 - d) Forms starch
3. Julius von Sachs found that the green substance in plants is located in special bodies called:
 - a) Mitochondria
 - b) Chloroplasts
 - c) Ribosomes
 - d) Vacuoles
4. The first action spectrum of photosynthesis was described by Engelmann using:
 - a) A prism and green alga
 - b) A candle and bell jar
 - c) KOH and cotton
 - d) Radioactive carbon
5. The equation $2\text{H}_2\text{A} + \text{CO}_2 \xrightarrow{\text{Light}} 2\text{A} + \text{CH}_2\text{O} + \text{H}_2\text{O}$ was given by:
 - a) Melvin Calvin
 - b) Cornelius van Niel
 - c) Joseph Priestley
 - d) Jan Ingenhousz
6. The O_2 released during photosynthesis comes from:
 - a) Carbon dioxide
 - b) Water
 - c) Glucose
 - d) Minerals
7. The number of water molecules used as substrate in the correct photosynthesis equation is:
 - a) 6
 - b) 12
 - c) 18
 - d) 24
8. Photosynthesis in plants occurs in:
 - a) Roots
 - b) All green parts

- c) Leaves only
- d) Stem only

9. Within the chloroplast, the stroma is the site of:

- a) Light reactions
- b) Sugar synthesis
- c) ATP synthesis
- d) Electron transport

10. The light-harvesting complexes are made up of:

- a) Proteins and pigments
- b) Lipids and carbohydrates
- c) Nucleic acids and proteins
- d) Minerals and water

11. Which pigment is yellow in the chromatogram?

- a) Chlorophyll a
- b) Chlorophyll b
- c) Xanthophylls
- d) Carotenoids

12. The absorption spectrum of chlorophyll a shows peaks in the:

- a) Green and yellow regions
- b) Blue and red regions
- c) Violet and orange regions
- d) Yellow and red regions

13. The action spectrum of photosynthesis closely resembles the absorption spectrum of:

- a) Chlorophyll a
- b) Chlorophyll b
- c) Carotenoids
- d) Xanthophylls

14. Accessory pigments help in:

- a) Absorbing different wavelengths of light
- b) Splitting water
- c) Fixing carbon dioxide
- d) Releasing oxygen

15. The light-harvesting system in photosystems is also called:

- a) Reaction centre
- b) Antennae
- c) Electron transport chain
- d) Cytochrome complex

16. The reaction centre chlorophyll a in PS I absorbs light at:

- a) 680 nm
- b) 700 nm
- c) 650 nm
- d) 750 nm

17. The reaction centre chlorophyll a in PS II absorbs light at:

- a) 680 nm
- b) 700 nm
- c) 650 nm
- d) 750 nm

18. The electron acceptor in PS II passes electrons to the:

- a) Electron transport system
- b) PS I directly
- c) Calvin cycle
- d) Water splitting complex

19. The Z scheme is characterized by its shape on a:

- a) pH scale
- b) Redox potential scale
- c) Temperature scale
- d) Light intensity scale

20. The splitting of water is associated with which photosystem?

- a) PS I
- b) PS II
- c) Both PS I and PS II
- d) Neither

21. The products of the light reaction that are used in the biosynthetic phase are:

- a) ATP and NADPH
- b) ATP and O₂
- c) NADPH and O₂
- d) CO₂ and H₂O

22. The synthesis of ATP in the presence of light is known as:

- a) Photophosphorylation
- b) Photolysis
- c) Photorespiration
- d) Phosphorylation

23. Non-cyclic photophosphorylation produces:

- a) ATP only
- b) NADPH only
- c) Both ATP and NADPH
- d) Sugars

24. Cyclic photophosphorylation occurs when:

- a) Only PS I is functional
- b) Only PS II is functional
- c) Both PS I and PS II are functional
- d) Neither PS I nor PS II is functional

25. The chemiosmotic hypothesis involves the movement of protons across the:

- a) Thylakoid membrane
- b) Mitochondrial membrane

- c) Both a and b
- d) Nuclear membrane

26. The ATP synthase enzyme has two parts: F_0 and F_1 . F_0 is:

- a) Embedded in the membrane
- b) Protruding on the outer surface
- c) Located in the stroma
- d) Part of the electron transport chain

27. The biosynthetic phase is also called the dark reaction because it:

- a) Occurs only in the dark
- b) Does not directly require light
- c) Is inhibited by light
- d) Occurs at night

28. The first product of CO_2 fixation in the Calvin cycle is:

- a) 3-phosphoglyceric acid
- b) Oxaloacetic acid
- c) Ribulose biphosphate
- d) Phosphoenol pyruvate

29. The primary CO_2 acceptor in the Calvin cycle is:

- a) PEP
- b) RuBP
- c) PGA
- d) OAA

30. The enzyme RuBisCO catalyzes the carboxylation of:

- a) PEP
- b) RuBP
- c) PGA
- d) OAA

31. For each CO_2 molecule fixed in the Calvin cycle, the number of ATP and NADPH required is:

- a) 2 ATP and 2 NADPH
- b) 3 ATP and 2 NADPH
- c) 2 ATP and 3 NADPH
- d) 3 ATP and 3 NADPH

32. How many turns of the Calvin cycle are needed to make one glucose molecule?

- a) 2
- b) 6
- c) 8
- d) 12

33. C_4 plants have a special leaf anatomy called:

- a) Mesophyll anatomy
- b) Kranz anatomy
- c) Vascular anatomy
- d) Bundle anatomy

34. The primary CO₂ acceptor in C₄ plants is:

- a) RuBP
- b) PEP
- c) PGA
- d) OAA

35. The enzyme that fixes CO₂ in the mesophyll cells of C₄ plants is:

- a) RuBisCO
- b) PEPcase
- c) ATP synthase
- d) Cytochrome

36. In C₄ plants, the Calvin cycle occurs in the:

- a) Mesophyll cells
- b) Bundle sheath cells
- c) Epidermal cells
- d) Guard cells

37. Photorespiration is a process that:

- a) Produces ATP and NADPH
- b) Releases CO₂ and consumes ATP
- c) Fixes carbon dioxide
- d) Releases oxygen

38. RuBisCO has a higher affinity for CO₂ when:

- a) O₂ concentration is high
- b) CO₂ concentration is high
- c) Light intensity is low
- d) Temperature is low

39. Blackman's Law of Limiting Factors applies when:

- a) Only one factor affects the process
- b) Multiple factors affect the process
- c) Light is the only factor
- d) Temperature is the only factor

40. The factor that is most often limiting for photosynthesis is:

- a) Light
- b) Temperature
- c) CO₂ concentration
- d) Water

41. Light saturation occurs at what percentage of full sunlight?

- a) 5%
- b) 10%
- c) 50%
- d) 100%

42. C₄ plants show saturation at a CO₂ concentration of about:

- a) 180 μL⁻¹
- b) 360 μL⁻¹

- c) $450 \mu\text{L}^{-1}$
- d) $500 \mu\text{L}^{-1}$

43. C₄ plants have a higher temperature optimum than C₃ plants because:

- a) They have Kranz anatomy
- b) They lack photorespiration
- c) They use PEPcase
- d) All of the above

44. Water stress affects photosynthesis by:

- a) Directly inhibiting the light reactions
- b) Causing stomatal closure
- c) Denaturing enzymes
- d) Breaking down chlorophyll

45. The first product of CO₂ fixation in C₄ plants is:

- a) PGA
- b) OAA
- c) RuBP
- d) PEP

46. The number of carbon atoms in the primary CO₂ acceptor in C₃ plants is:

- a) 3
- b) 4
- c) 5
- d) 6

47. The number of carbon atoms in the primary CO₂ fixation product in C₄ plants is:

- a) 3
- b) 4
- c) 5
- d) 6

48. Photorespiration results in the:

- a) Synthesis of sugars
- b) Release of CO₂
- c) Release of O₂
- d) Synthesis of ATP

49. The most abundant enzyme in the world is:

- a) PEPcase
- b) ATP synthase
- c) RuBisCO
- d) Cytochrome

50. The Hatch and Slack Pathway is another name for the:

- a) C₃ pathway
- b) C₄ pathway
- c) Calvin cycle
- d) Photorespiratory pathway

Answer Key for Set 3

1. b) Joseph Priestley
2. b) Purifies the air
3. b) Chloroplasts
4. a) A prism and green alga
5. b) Cornelius van Niel
6. b) Water
7. b) 12
8. b) All green parts
9. b) Sugar synthesis
10. a) Proteins and pigments
11. c) Xanthophylls
12. b) Blue and red regions
13. a) Chlorophyll a
14. a) Absorbing different wavelengths of light
15. b) Antennae
16. b) 700 nm
17. a) 680 nm
18. a) Electron transport system
19. b) Redox potential scale
20. b) PS II
21. a) ATP and NADPH
22. a) Photophosphorylation
23. c) Both ATP and NADPH
24. a) Only PS I is functional
25. a) Thylakoid membrane
26. a) Embedded in the membrane
27. b) Does not directly require light
28. a) 3-phosphoglyceric acid
29. b) RuBP
30. b) RuBP
31. b) 3 ATP and 2 NADPH
32. b) 6
33. b) Kranz anatomy
34. b) PEP
35. b) PEPcase
36. b) Bundle sheath cells
37. b) Releases CO₂ and consumes ATP
38. b) CO₂ concentration is high
39. b) Multiple factors affect the process
40. c) CO₂ concentration
41. b) 10%
42. b) 360 μL^{-1}
43. d) All of the above
44. b) Causing stomatal closure
45. b) OAA
46. c) 5
47. b) 4

- 48. b) Release of CO₂
- 49. c) RuBisCO
- 50. b) C₄ pathway

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