CLASS XI BIO CH-11

MCQ Set 1: Photosynthesis in Higher Plants

1. The process by which green plants use light energy to drive the synthesis of organic compounds is called:
a) Respiration
b) Photosynthesis
c) Transpiration
d) Photorespiration

2. Who discovered oxygen in 1774?
a) Jan Ingenhousz
b) Joseph Priestley
c) Julius von Sachs
d) Melvin Calvin

3. Ingenhousz showed that sunlight is essential for the plant process that purifies the air fouled by:
a) Burning candles only
b) Breathing animals only
c) Both burning candles and breathing animals
d) Decomposing plants

4. The empirical equation for photosynthesis in oxygen-evolving organisms is:
a) $CO_2+H_2O\rightarrow[CH_2O]+O_2$
b) $C_6H_{12}O_6+6O_2\rightarrow6CO_2+6H_2O$
c) $6CO_2+6H_2O\rightarrow C_6H_{12}O_6+6O_2$
d) $CO_2+H_2O\rightarrow$Carbohydrates

5. Cornelius van Niel demonstrated that in green plants, the hydrogen donor is:
a) H_2S
b) H_2O
c) CH_4
d) NH_3

6. The correct overall equation for photosynthesis is:
a) $6CO_2+6H_2O\rightarrow C_6H_{12}O_6+6O_2$
b) $6CO_2+12H_2O\rightarrow C_6H_{12}O_6+6H_2O+6O_2$
c) $CO_2+H_2O\rightarrow[CH_2O]+O_2$
d) $2H_2A+CO_2\rightarrow2A+CH_2O+H_2O$

7. The primary site of photosynthesis in plants is:
a) Roots
b) Stem
c) Green leaves
d) Flowers

8. Within the chloroplast, the membrane system is responsible for:
a) Sugar synthesis
b) Trapping light energy and synthesis of ATP and NADPH
c) Starch storage
d) Protein synthesis

9. The part of the chloroplast where enzymatic reactions synthesize sugar is the:
a) Grana
b) Stroma
c) Thylakoid
d) Lamellae

10. The pigments responsible for trapping light energy are organized into:
a) Mitochondria
b) Photosystems
c) Ribosomes
d) Golgi bodies

11. How many types of pigments are involved in photosynthesis?
a) One
b) Two
c) Three
d) Four

12. Which pigment is bright or blue green in the chromatogram?
a) Chlorophyll b
b) Xanthophylls
c) Chlorophyll a
d) Carotenoids

13. The chief pigment associated with photosynthesis is:
a) Chlorophyll b
b) Carotenoids
c) Xanthophylls
d) Chlorophyll a

14. Accessory pigments protect chlorophyll a from:
a) Hydrolysis
b) Photo-oxidation
c) Reduction
d) Phosphorylation

15. Light reactions include all EXCEPT:
a) Light absorption
b) Water splitting
c) Oxygen release
d) Glucose synthesis

16. The reaction centre chlorophyll a in PS I is called:
a) P680
b) P700
c) P650
d) P750

17. The reaction centre chlorophyll a in PS II is called:
a) P680
b) P700
c) P650
d) P750

18. The movement of electrons from PS II to PS I is downhill in terms of:
a) pH gradient
b) Redox potential scale
c) ATP concentration
d) NADPH concentration

19. The scheme of electron transfer in light reaction is called:
a) A scheme
b) Z scheme
c) Y scheme
d) X scheme

20. The splitting of water is associated with:
a) PS I
b) PS II
c) Cyclic photophosphorylation
d) Calvin cycle

21. The products of the light reaction are:
a) ATP, NADPH, O_2
b) ATP, NADPH, CO_2
c) ATP, NADP, O_2
d) ADP, NADPH, O_2

22. Photophosphorylation is the synthesis of ATP from ADP and inorganic phosphate in the presence of:
a) CO_2
b) Light
c) O_2
d) Water

23. When both PS I and PS II work in series, it is called:
a) Cyclic photophosphorylation
b) Non-cyclic photophosphorylation
c) Oxidative phosphorylation
d) Substrate-level phosphorylation

24. Cyclic photophosphorylation results in the synthesis of:
a) ATP and NADPH
b) ATP only
c) NADPH only
d) Sugars

25. The chemiosmotic hypothesis explains the mechanism of:
a) CO_2 fixation
b) ATP synthesis

c) Water splitting
d) Photorespiration

26. The proton gradient across the thylakoid membrane is broken down by the movement of protons through the channel of:
a) ATP synthase
b) RuBisCO
c) PEPcase
d) Cytochrome

27. The biosynthetic phase of photosynthesis is also known as:
a) Light reaction
b) Dark reaction
c) Photophosphorylation
d) Electron transport

28. The first CO_2 fixation product in the Calvin cycle is:
a) Oxaloacetic acid
b) Phosphoglycerate
c) 3-phosphoglyceric acid
d) Ribulose bisphosphate

29. The primary CO_2 acceptor in the Calvin cycle is:
a) PEP
b) RuBP
c) PGA
d) OAA

30. The enzyme that catalyzes the carboxylation of RuBP is:
a) PEPcase
b) RuBisCO
c) ATP synthase
d) Cytochrome

31. For every CO_2 molecule entering the Calvin cycle, the number of ATP and NADPH required are:
a) 2 ATP and 3 NADPH
b) 3 ATP and 2 NADPH
c) 1 ATP and 2 NADPH
d) 2 ATP and 2 NADPH

32. To make one molecule of glucose, how many turns of the Calvin cycle are required?
a) 2
b) 6
c) 8
d) 12

33. Plants adapted to dry tropical regions have the:
a) C_3 pathway
b) C_4 pathway
c) C_2 pathway
d) C_5 pathway

34. The special leaf anatomy in C_4 plants is called:
a) Mesophyll anatomy
b) Kranz anatomy
c) Vascular anatomy
d) Bundle anatomy

35. The primary CO_2 acceptor in C_4 plants is:
a) RuBP
b) PEP
c) PGA
d) OAA

36. The enzyme responsible for CO_2 fixation in mesophyll cells of C_4 plants is:
a) RuBisCO
b) PEPcase
c) ATP synthase
d) Cytochrome

37. Photorespiration occurs in:
a) C_3 plants
b) C_4 plants
c) Both C_3 and C_4 plants
d) Neither

38. RuBisCO has affinity for both:
a) CO_2 and N_2
b) CO_2 and O_2
c) O_2 and H_2O
d) CO_2 and H_2O

39. The law of limiting factors was proposed by:
a) Calvin
b) Blackman
c) Priestley
d) Ingenhousz

40. The major limiting factor for photosynthesis is:
a) Light
b) Temperature
c) CO_2 concentration
d) Water

41. Light saturation occurs at what percentage of full sunlight?
a) 5%
b) 10%
c) 50%
d) 100%

42. C_4 plants show saturation at about what CO_2 concentration?
a) 180 $\mu l L^{-1}$
b) 360 $\mu l L^{-1}$

c) 450 µlL⁻¹
d) 500 µlL⁻¹

43. The temperature optimum for C_4 plants is:
a) Lower than C_3 plants
b) Higher than C_3 plants
c) The same as C_3 plants
d) Not defined

44. Water stress affects photosynthesis primarily by:
a) Directly inhibiting light reactions
b) Causing stomatal closure
c) Denaturing enzymes
d) Breaking down chlorophyll

45. The first product of CO_2 fixation in C_4 plants is:
a) PGA
b) OAA
c) RuBP
d) PEP

46. In C_4 plants, the Calvin cycle occurs in:
a) Mesophyll cells
b) Bundle sheath cells
c) Epidermal cells
d) Guard cells

47. The number of carbon atoms in the primary CO_2 acceptor in C_3 plants is:
a) 3
b) 4
c) 5
d) 6

48. The number of carbon atoms in the primary CO_2 fixation product in C_4 plants is:
a) 3
b) 4
c) 5
d) 6

49. Photorespiration results in the release of:
a) O_2
b) CO_2
c) N_2
d) H_2O

50. The most abundant enzyme in the world is:
a) PEPcase
b) ATP synthase
c) RuBisCO
d) Cytochrome

Answer Key for Set 1

1. b) Photosynthesis
2. b) Joseph Priestley
3. c) Both burning candles and breathing animals
4. a) $CO_2+H_2O\rightarrow[CH_2O]+O_2$
5. b) H_2O
6. b) $6CO_2+12H_2O\rightarrow C_6H_{12}O_6+6H_2O+6O_2$
7. c) Green leaves
8. b) Trapping light energy and synthesis of ATP and NADPH
9. b) Stroma
10. b) Photosystems
11. d) Four
12. c) Chlorophyll a
13. d) Chlorophyll a
14. b) Photo-oxidation
15. d) Glucose synthesis
16. b) P700
17. a) P680
18. b) Redox potential scale
19. b) Z scheme
20. b) PS II
21. a) ATP, NADPH, O_2
22. b) Light
23. b) Non-cyclic photophosphorylation
24. b) ATP only
25. b) ATP synthesis
26. a) ATP synthase
27. b) Dark reaction
28. c) 3-phosphoglyceric acid
29. b) RuBP
30. b) RuBisCO
31. b) 3 ATP and 2 NADPH
32. b) 6
33. b) C_4 pathway
34. b) Kranz anatomy
35. b) PEP
36. b) PEPcase
37. a) C_3, plants
38. b) CO_2 and O_2
39. b) Blackman
40. c) CO_2 concentration
41. b) 10%
42. b) 360 $\mu l L^{-1}$
43. b) Higher than C_3 plants
44. b) Causing stomatal closure
45. b) OAA
46. b) Bundle sheath cells
47. c) 5
48. b) 4
49. b) CO_2
50. c) RuBisCO