CLASS XI BIO CH 11

MCQ Set 4: Photosynthesis in Higher Plants

1. Who discovered that a mint plant restores the air in a bell jar?
a) Jan Ingenhousz
b) Joseph Priestley
c) Julius von Sachs
d) Melvin Calvin

2. Ingenhousz showed that the bubbles formed around green parts of aquatic plants in sunlight are:
a) Carbon dioxide
b) Oxygen
c) Nitrogen
d) Hydrogen

3. Julius von Sachs found that glucose is usually stored as:
a) Sucrose
b) Starch
c) Cellulose
d) Glycogen

4. Engelmann used aerobic bacteria to detect the sites of:
a) CO_2 fixation
b) O_2 evolution
c) Glucose synthesis
d) Starch storage

5. The equation $CO_2+H_2O \rightarrow Light[CH_2O]+O_2$ represents:
a) The correct overall process
b) The empirical equation
c) The $C4$ pathway
d) Photorespiration

6. Van Niel's equation for photosynthesis is $2H_2A+CO_2 \rightarrow Light \quad 2A+CH_2O+H,O,$ In green plants, H_2A is:
a) H_2S
b) H_2O
c) CH_4
d) NH_3

7. The O_2 released during photosynthesis comes from H_2O . This was proved using:
a) Prism experiments
b) Radioisotopic techniques
c) KOH experiments
d) Bacterial studies

8. Photosynthesis occurs in all green parts of the plant, but mainly in the:
a) Roots

b) Leaves
c) Stem
d) Flowers

9. Within the chloroplast, the light reactions occur in the:
a) Stroma
b) Membrane system
c) Starch granule
d) Lipid droplet

10. The light-harvesting complexes are found in:
a) PS I only
b) PS II only
c) Both PS I and PS II
d) Neither PS I nor PS II

11. Which pigment is yellow to yellow-orange in the chromatogram?
a) Chlorophyll a
b) Chlorophyll b
c) Xanthophylls
d) Carotenoids

12. The absorption spectrum of chlorophyll a shows maximum absorption in the:
a) Green region
b) Blue and red regions
c) Yellow region
d) Orange region

13. The action spectrum of photosynthesis is determined by the rate of photosynthesis at different:
a) Temperatures
b) Light intensities
c) Wavelengths
d) CO_2 concentrations

14. Accessory pigments transfer the absorbed energy to:
a) Chlorophyll a
b) Chlorophyll b
c) Carotenoids
d) Xanthophylls

15. The reaction centre in a photosystem consists of:
a) Hundreds of pigment molecules
b) A single chlorophyll a molecule
c) Proteins only
d) Lipids only

16. The reaction centre in PS I is called P700 because it absorbs light at:
a) 680 nm
b) 700 nm
c) 650 nm
d) 750 nm

17. The reaction centre in PS II is called P680 because it absorbs light at:
a) 680 nm
b) 700 nm
c) 650 nm
d) 750 nm

18. The electron transport chain between PS II and PS I consists of:
a) Cytochromes
b) RuBisCO
c) ATP synthase
d) PEPcase

19. The Z scheme describes the flow of:
a) Protons
b) Electrons
c) Water
d) Carbon dioxide

20. The splitting of water produces protons, oxygen, and:
a) Electrons
b) Carbon dioxide
c) Glucose
d) ATP

21. The products of the light reaction that are used in the Calvin cycle are:
a) ATP and NADPH
b) ATP and O_2
c) NADPH and O2
d)CO_2 and H_2O

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

23. Non-cyclic photophosphorylation involves both photosystems and produces:
a) ATP only
b) NADPH only
c) Both ATP and NADPH
d) Sugars

24. Cyclic photophosphorylation occurs when only PS I is active and produces:
a) ATP only
b) NADPH only
c) Both ATP and NADPH
d) Sugars

25. The chemiosmotic hypothesis explains the synthesis of:
a) ATP
b) NADPH

c) Glucose
d) O_2

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

27. The dark reaction is so called 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 bisphosphate
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 that catalyzes the carboxylation of RuBP is:
a) PEPcase
b) RuBisCO
c) ATP synthase
d) Cytochrome

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. To make one molecule of glucose, the Calvin cycle must turn:
a) 2 times
b) 6 times
c) 8 times
d) 12 times

33. $C4$ plants are special because they:
a) Have Kranz anatomy
b) Tolerate higher temperatures
c) Lack photorespiration
d) All of the above

34. The primaryCO_2 acceptor in $C4$ plants is:
a) RuBP
b) PEP
c) PGA
d) OAA

35. The enzyme that fixes CO_2 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 occurs in:
a) $C3$ plants
b) $C4$ plants
c) Both $C3$ and $C4$ plants
d) Neither

38. RuBisCO can act as both a carboxylase and an oxygenase because it can bind to:
a) $CO2$ and O_2
b) $CO2$ and N_2
c) $O2$ and H_2O
d) $CO2$ and H_2O

39. Blackman's Law of Limiting Factors states that the rate of a process is determined by the factor that is:
a) At its maximum value
b) Nearest to its minimal value
c) Always light
d) Always temperature

40. The most common limiting factor for photosynthesis is:
a) Light
b) Temperature
c) $CO2$ concentration
d) Water

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

42. $C4$plants show saturation at a CO_2 concentration of about:
a) 180 μlL^{-1}
b) 360 μlL^{-1}

c) 450 µlL⁻¹
d) 500 µlL⁻¹

43. $C4$ plants have a higher temperature optimum than $C3$ plants because they:
a) Have Kranz anatomy
b) Lack photorespiration
c) Use PEPcase
d) All of the above

44. Water stress affects photosynthesis by:
a) Causing stomatal closure
b) Directly inhibiting the light reactions
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 CO_2
c) Release of O_2
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 associated with:
a) $C3$ plants
b) $C4$ plants
c) Photorespiration
d) Cyclic photophosphorylation

Answer Key for Set 4

1. b) Joseph Priestley
2. b) Oxygen
3. b) Starch
4. b) O_2 evolution
5. b) The empirical equation
6. b) H_2O
7. b) Radioisotopic techniques
8. b) Leaves
9. b) Membrane system
10. c) Both PS I and PS II
11. d) Carotenoids
12. b) Blue and red regions
13. c) Wavelengths
14. a) Chlorophyll a
15. b) A single chlorophyll a molecule
16. b) 700 nm
17. a) 680 nm
18. a) Cytochromes
19. b) Electrons
20. a) Electrons
21. a) ATP and NADPH
22. a) Light
23. c) Both ATP and NADPH
24. a) ATP only
25. a) ATP
26. a) ATP synthase
27. b) Does not directly require light
28. a) 3-phosphoglyceric acid
29. b) RuBP
30. b) RuBisCO
31. b) 3 ATP and 2 NADPH
32. b) 6
33. d) All of the above
34. b) PEP
35. b) PEPcase
36. b) Bundle sheath cells
37. a) $C3$ plants
38. a) CO_2 and $O2$
39. b) Nearest to its minimal value
40. c) $CO2$ concentration
41. b) 10%
42. b) 360 $\mu l L^{-1}$
43. d) All of the above
44. a) Causing stomatal closure
45. b) OAA
46. c) 5
47. b) 4
48. b) Release of $CO2$
49. c) RuBisCO
50. b) $C4$ plants