1. Discovery of Emerson effect has already shown the existence of :–
(a) Two distinct photosystems
(b) Light and dark reactions of photosynthesis
(c) Photophosphorylation
(d) Photorespiration

2. Wavelength of light responsible for Emerson's enhancement effect :–
(a) only 680 nm
(b) only 680 nm¯
(c)infra red wavelength
(d) Both 680 nm and 680 nm¯ PHOTOSYNTHETIC APPARATUS, PIGMENTS & PIGMENT SYSTEMS

3. The site for dark reaction of photosynthesis is :-
(a) Stroma
(b) Grana
(c)Intergrana
(d) Mitochondria

4. The number of pigment molecules in quantasome is:
(a) 250 - 400
(b) 300 - 900
(c) 500 - 600
(d) 50 -100

5. What is the by product of bacterial photosynthesis?
(a) O2
(b) CO2
(c) S
(d) H2 S

6. Which of the following protein is most abundant on the earth?
(a) Catalase
(b) Rubisco
(c) Amylase
(d) None of these

7. Which of the following is the site of photolysis of water ?
(a) Stroma of chloroplast
(b) Cristae of chloroplast
(c) Ribosome of chloroplast
(d) Lumen surface of thylakoid membrane

8. Why Calvin cycle is called C_3 -cycle?
(a) Primary CO_2 acceptor is C_3 compound
(b) Many intermediate compounds are C_3 compound
(c) 1st stable product is 3 PGA which is a C_3 compound
(d) None of the above

9. Carboxylation (C_3 cycle) is catalysed by
(a) carboxylase
(b) RuBP carboxylase
(c) RuBP oxygenase
(d) Both (b) and (c)

10. How many turns of Calvin cycle produces one molecule of glucose?
(a) Eight (b) Six
(c) Three (d) One

11. In Calvin cycle, if one molecule of RuBP is carboxylated than how many PGA molecule will be formed?
(a) 2 (b) 3
(c) 4 (d) 5

12. With reference to three Calvin cycles, which of the given options is correct for the following questions?
I. HowmanygrossPGALmolecules are produced ?
II. Total, how manyATPmolecules are required for synthesis ofPGALmolecules ?
III. Total how many$NADPH_2$ molecules are required for the synthesis of obtainedPGALmolecules ?

(a) I–3PGAL, II–3ATP, III–3NADPH 2
(b) I–6PGAL, II–6ATP, III–6 $NADPH_2$
(c) I–18PGAL, II–18ATP, III–18$NADPH_2$
(d) I–9 PGAL, II–9ATP, III–9$NADPH_2$

13. Kranz anatomy is found in ***JIPMER 2019***
(a) C3-plants (b) Only in monocots
(c) Both C4 and C3-plants (d) C4-plants

14. PEP + CO + H O ⟶ 2 2 X Oxaloacetic acid + 3 4 H PO . Identify *X*.
(a) Ligase (b) Oxidoreductase
(c) PEP carboxylase (d) Lyase

15. Which of these is incorrect for C_4 plants? ***JIPMER 2018***
(a) Kranz anatomy (b) CO_2 acceptor is PEP
(c) PEPCase in mesophyll (d) RuBisCO in mesophyll

16. Fixation of one molecule of CO_2 requires how much (in C_4 plants) ATP and NADPH, respectively?
(a) 5/2 (b) 2/5
(c) 2/3 (d) 3/2

17. Which plant performs photosynthesis even after the closing of stomata?
(a) C_2 (b) C_3
(c) C_4 (d) C_5

18. PEPCase has an advantage over RuBisCO. The advantage is
(a) RuBisCO combines with O_2, but PEPCase does not
(b) RuBisCO combines with NO_2, but PEPCase does not
(c) RuBisCO conserves energy, but PEPCase does not
(d) PEPCase is present in both mesophyll cells and bundle sheath cells, but RuBisCO is not

19. Chloroplasts without grana are known to occur in
(a) bundle sheath cells of C_3 plant
(b) bundle sheath cells of C_4 plant
(c) mesophyll cells of C_4 plant
(d) mesophyll cells of C_3 plant

20. What is the site of C 3 cycle in C 3 and C 4 plants? ***AIIMS 2019***
(a) In C_3 plants–Mesophyll cell and in C_4 plants–Bundle sheath cell
(b) In C_3 plants–Bundle sheath cell and in C_4 plants–Mesophyll cell
(c) In C_4 plants–Bundle sheath cell and in C_3 plants–Bundle sheath cell
(d) In C_3 plants–Mesophyll cell and in C_4 plants–Mesophyll cell

21. C_4 -pathway is advantageous over C_3-pathway in plants, because it ***AIIMS 2019***
(a) occurs in relatively low CO_2 concentration
(b) uses more amount of water
(c) occurs in relatively low O_2 concentration
(d) is less efficient in energy utilisation

22. Osmophilic granules are present in
(a) Plasma membrane (b) Cytoplasm
(c) Chloroplast (d) Ribosomes

23. Chlorophyll 'e' is generally present in
(a) Thallophytes (b) Rhodophytes
(c) Mycophytes (d) Xanthophytes

24. The light phase of photosynthesis is called
(a) Hill reaction (b) Photo action
(c) Pigment action (d) Chlorophyllous process

25. Ferrodoxin contain
(a) Mg (b) CO (c) Iron (d) Nitrites

26. In light reaction of photosynthesis, chlorophyll is subjected to
(a) Destruction (b) Permanent reduction
(c) Oxidation and reduction (d) Neutralization

27. Photosynthetic pigments in chloroplast are embedded in membrane of
(a) Thylakoids (b) Photoglobin
(c) Matrix (d) Envelope of chloroplast

28. Which of the following pigment is yellow in colour
(a) Chlorophyll 'a' (b) Chlorophyll 'b'
(c) Carotene (d) Xanthophyll

29. Which of the following product of photosynthesis is produced first
(a) Glucose (b) Oxygen
(c) Both (a) and (b) together (d) None of the above

30. In normal chloroplast, the percentage of chlorophyll is
(a) 50% (b) 75% (c) 5–10% (d) 95%

1. (a)
2. (d)
3. (a)
4. (a)
5. (c)
6. (b)
7. (d)
8. (*c*) In Calvin cycle, the first product identified was 3-phosphoglyceric acid or PGA. Thus, this cycle is known as C3 cycle. Melvin Calvin used radioactive 14C in algal photosynthesis, which led to the discovery that the first CO2-fixation product as 3 carbon organic acid. He also contributed to working out the complete biosynthetic pathway; hence it was called Calvin cycle after him.

9. (d)
10. (b)
11. (a)
12. (*a*) In Calvin cycle, ribulose 1-5 bisphosphate ultimately produces 3 molecules of PGAL, i.e. total 6 molecules by three Calvin cycles. In the same process, one ATP and one NADPH2 are required for each 3 PGAL molecules to be phosphorylated. Thus, for three Calvin cycles, 3 molecules each of ATP and NADPH2 will be required.

13. (*d*) Kranz anatomy is found in C 4-plants. These are plants that are adapted to dry tropical conditions Kranz anatomy refers to the presence of two types of chloroplasts agranal in bundle sheath cells and granal in mesophyll cells ,e.g. sugarcane, maize, etc. In these plants, the first stable product after the fixation of CO 2 is 4C dicarboxylic acid called Oxaloacetic Acid (OAA). But they still use the C3 pathway or the Calvin cycle as the main biosynthetic pathway.

14. (c)
15. (*d*) Among the given options, option (d) is incorrect about C4-plants. The mesophyll cells of C4-plants do not possess RuBisCO enzyme. C4-plants show Kranz anatomy. In these plants, the initial fixation of CO2 occurs in mesophyll cells. The primary acceptor of CO2 is Phosphoenol Pyruvate or PEP. It combines with CO2 in the presence of PEP carboxylase or PEPCase to form oxaloacetic acid or oxaloacetate.

16. (*a*) Fixing of one molecule of CO2 or carbon needs 5 ATP and 2 NADPH in C4-plants. C4-plants take 2 more ATP than C3-plants. But the photorespiration is absent in C4-plants, thus C4-plants are more economical than C3-plants.

17. (*c*) Even after the closing of the stomata, C4-plants perform photosynthesis because they can produce their own CO2 by decarboxylation of malic acid. This CO2 is used in Calvin cycle like in C3-plants.

18. (*a*) PEPCase has an advantage over the RuBisCO because PEPCase does not bind to the oxygen. But RuBisCO binds with oxygen and does the photorespiration, which is a harmful and wastage process and leads to decrease in photosynthetic yield.

19. (c)
20. (*a*) In C3-plants, all the reactions of C 3 or Calvin cycle occur in mesophyll cells of leaves, while C4-plants show a distinct type of anatomy called as Kranz anatomy, where two different regions mesophyll cells and bundle sheath, are involved in this process.

21. (a)
22. (c)

23. (d)

24. (a)

25. (c)

26. (c)

27. (a)

28. (d)

29. (b)

30. (c)