

**13.1 What do we know?**

- Chlorophyll is the-  
(Pg. 206, E)
  - Red pigment of leaf of all plants
  - Blue pigment of leaf of all plants
  - Green pigment of root of all plants
  - None of these
- In an experiment where a part of leaf is enclosed in test tube containing KOH Soaked Cotton & exposed to light will-  
(Pg. 207, E)
  - Test positive for starch
  - Test negative for starch due to inability to absorb light inside test tube
  - Test negative for starch due to inability to absorb  $\text{CO}_2$
  - Test negative for starch due to absence of water

**13.2 Early Experiments**

- Match the experiment objective with the scientist who performed it-  
(Pg. 207, H)

i	Priestly	I	Production of glucose in photosynthesis
ii	Julius von Sachs	II	Role of sunlight in photosynthesis
iii	Jan Ingenhousz	III	Role of air in photosynthesis

	(i)	(ii)	(iii)
(A)	I	III	II
(B)	II	I	III
(C)	II	III	I
(D)	III	I	II

- Who performed a series of experiments that revealed the essential role of air on the growth of green plants and when?

(Pg. 207, E)

- Cornelius van Niel (1787)
- Joseph Priestly (1770)
- T. Engelmann (1756)
- Both A and B

- Who discovered oxygen and when?  
(Pg. 207, E)
  - Joseph Priestly (1770)
  - T. Engelmann (1770)
  - Jan Ingenhousz (1787)
  - Joseph Priestly (1774)
- Who showed that sunlight is essential to the plant?  
(Pg. 207, E)
  - T. Engelmann
  - Joseph Priestly
  - Jan Ingenhousz
  - Cornelius van trial
- part of the plants that could release oxygen.  
(Pg. 207, E)
  - Jan Ingenhousz
  - T. Engelmann
  - Joseph priestly
  - None of these
- Match the following  
(Pg. 207, H)

(A)	First action spectrum	(1)	Cornelius van nel
(B)	Chlorophyll	(2)	T.W Engelmann
(C)	$\text{O}_2$ evolve from $\text{H}_2\text{O}$	(3)	Algae
(D)	<i>Cladophora</i>	(4)	Julius von sachs
		(5)	Bacteria

- A-1, B-4, C-1, D-3,5
  - A-3, B-2, C-4, D-1
  - A-1, B-3, C-2, D-5
  - A-2, B-4, C-1, D-3
- \_\_\_\_\_ were used to detect the sites of  $\text{O}_2$  evolution.

(Pg. 207, E)

- Bacteria
  - Daze
  - Fungi
  - Virus
- Cornelius van Neil studied on \_\_\_\_ to demonstrate that photosynthesis is essentially a light dependent reaction.

(Pg. 208, E)

- Cladophora*
- Purple and green bacteria

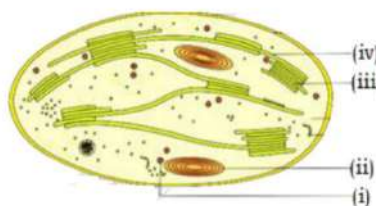
- C) Red algae  
(D) Both A and B
11. \_\_\_\_\_ from a suitable oxidisable compound reduces CO<sub>2</sub> to Carbohydrates.  
(Pg. 208, E)
- A) Oxygen                      B) Hydrogen  
C) Carbon                      D) Both A and B
12. *Cladophora* is-  
(Pg. 208, E)
- A) Purple and green bacteria  
B) Green bacteria  
C) Red algae  
D) Green algae
13. (A) – O<sub>2</sub> evolved by the green plant comes from H<sub>2</sub>O, not from carbon dioxide.  
(B) – This was proved by using Radio isotopic techniques.  
(Pg. 208, E)
- A) Statement A is wrong and Statement B is right  
B) Both Statement A and B are wrong  
C) Statement B is wrong and Statement B is correct  
D) Both Statement A and B are correct

### **13.3 Where does photosynthesis take place?**

14. Where does photosynthesis take place?  
(Pg. 209, E)
- A) Green part of leaves  
B) Green part of stem  
C) Brown part of stem  
D) Both A and B
15. Assertion – Chloroplasts usually align themselves along the walls of mesophyll cells.  
Reason – They get optimum quantity of incident light by aligning along wall. Choose the correct option.  
(Pg. 209, M)
- (A) Assertion and Reason are correct and Reason is correct explanation for Assertion  
(B) Assertion and Reason are correct but is not the explanation of Assertion  
(C) Assertion and Reason are both incorrect

(D) Assertion is correct but Reason is incorrect

16. Chloroplast is- (Pg. 209, E)
- A) Single membrane organelle  
B) Double membrane organelle  
C) Triple membrane organelle  
D) Not an organelle
17. Choose the incorrect statement from the following? (Pg. 209, E)
- (A) There is no clear division of labour within chloroplast  
(B) Chloroplast has membranous system which includes stroma as well  
(C) Membrane system is responsible for trapping the light energy  
(D) More than one of the above
18. Dark reaction- (Pg. 209, E)
- A) is not light-dependent  
B) occurs in darkness  
C) is photochemical reaction  
D) is indirectly light-dependent
- 19.



Identify correct labelling. (Pg. 209, E)

	(i)	(ii)	(iii)	(iv)
A	Starch granule	Lipid droplet	Stroma lamella	Grana
B	Starch granule	Lipid droplet	Grana	Stroma lamella
C	Lipid droplet	Starch granule	Grana	Stroma lamellae
D	Lipid droplet	Starch granule	Stroma lamella	Grana

20. Sugar is synthesized- (Pg. 209, E)
- A) Non-enzymatically in grana  
B) Non-enzymatically in stroma  
C) Enzymatically in grana  
D) Enzymatically in stroma
21. Which of the following is correct?

(Pg. 209, E)

- A) Light reaction depends on dark reaction  
B) Dark reaction depends on light reaction  
C) Both of the above  
D) None of the above
22. If a plant is kept in dark for a long time-

(Pg. 209, E)

- A) Starch will be synthesized in chloroplast  
B) ATP will be synthesized in chloroplast but no starch  
C) NADPH will be synthesized in chloroplast but no starch  
D) None of these
23. Choose the incorrect option- During daytime-
- (Pg. 209, E)
- A) ATP will be synthesized in chloroplast by light reaction  
B) NADPH will be synthesized in chloroplast by light reaction  
C) Starch will not be synthesized by dark reaction  
D) None of these

### **13.4 How many types of pigments are involved in photosynthesis**

24. The colour of leaf is due to- (Pg. 210, E)
- A) Chlorophyll only  
B) Chlorophyll, carotenoids only  
C) Chlorophyll, carotenoids, xanthophyll  
D) None of these
25. Leaf pigments are separated by-
- (Pg. 210, E)
- A) Crystallization  
B) Gel electrophoresis  
C) Blotting  
D) Paper chromatography
26. Match the pigment with its colour -

(Pg. 210, E)

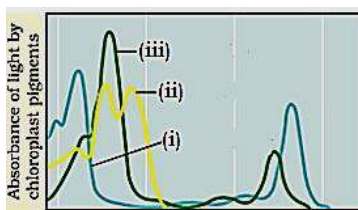
	I		II
(i)	Chlorophyll a	(A)	Blue green
(ii)	Chlorophyll b	(B)	Yellow
(iii)	Carotenoids	(C)	Yellow-green
(iv)	Xanthophyll	(D)	Yellow-orange

	(i)	(ii)	(iii)	(iv)
A)	A	C	B	D
B)	A	C	D	B
C)	A	D	B	C
D)	A	D	C	B

27. Which is the most abundant plant pigment in the world? (Pg. 210, E)

A) Chlorophyll a      B) Chlorophyll b  
C) Carotenoids      D) xanthophylls

28.



Identity correct

(Pg. 210, E)

i	ii	iii
A Chl a	Chl b	Carotenoids
B Carotenoids	Chl a	Chl b
C Chl b	Chl a	Carotenoids
D Chl b	Carotenoids	Chl a

29. Maximum absorption by chlorophyll a occurs in- (Pg. 210, E)

A) blue & green region  
B) red & green region  
C) blue & red region  
D) yellow & red region

30. Assertion - Chlorophyll 'a' is the chief pigment associated with photosynthesis  
Reason - Chlorophyll maximum absorption coincides with maximum photosynthesis.

Choose correct option - (Pg. 210, M)

- A) Assertion & Reason are correct & Reason is correct explanation of Assertion  
B) Assertion & Reason are correct but Reason is not correct explanation of Assertion  
C) Assertion is correct & Reason is incorrect.

- D) Assertion & Reason are incorrect.
31. Accessory pigments include **(Pg. 210, E)**  
 A) Chlorophyll a      B) Chlorophyll b  
 C) both of these      D) None of these
32. Accessory pigments **(Pg. 210, E)**  
 A) Pass on the energy to chl 'a'  
 B) pass on the energy to primary acceptor  
 C) Use energy for photolysis of water  
 D) more than one option
33. Advantages of accessory pigments include – **(Pg. 210, E)**  
 A) they help by photolyzing the water  
 B) they protect chl 'a' from photo-oxidation  
 C) they enable narrower range of wavelength of incoming light to be used for photosynthesis  
 D) both a & b

### **13.5 What is light Reaction?**

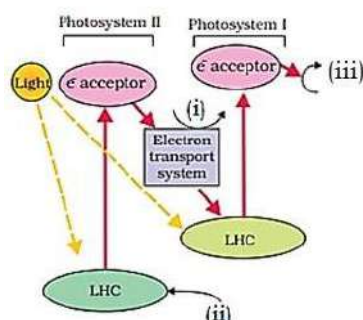
34. Light Reaction is also Known as- **(Pg. 211, E)**  
 A) photochemical phase  
 B) biosynthetic phase  
 C) both of these  
 D) None of these
35. Choose correct order of events in light reaction- **(Pg. 211, E)**  
 i) ATP & NADPH formation  
 ii) Water Splitting  
 iii) Oxygen release  
 iv) Light absorption  
 A)      III      IV      II      I  
 B)      IV      III      I      III  
 C)      IV      II      III      I  
 D)      II      III      IV      I
36. LHC stands for- **(Pg. 211, E)**  
 A) Late Harvesting Complex  
 B) Light Harvesting Complex  
 C) Light Hanging Complex  
 D) Late Hanging Complex
37. The naming of PS I & PS II was based on- **(Pg. 211, E)**  
 A) their discovery order  
 B) their functioning sequence  
 C) the scientist who named it  
 D) the components of the photosystem.

38. Which of the following is correct? **(Pg. 211, E)**  
 A) PS I is called P800  
 B) PS II is called P680  
 C) Both a & b  
 D) None of these
39. Reaction Centre is formed by- **(Pg. 211, E)**  
 A) Only one chlorophyll 'a' molecule  
 B) A few chlorophyll 'a' molecule  
 C) One chlorophyll 'a' and a few accessory  
 D) A few chlorophyll 'a' and a few accessory pigments.
40. Choose the incorrect statements- **(Pg. 211, E)**  
 A) Antennae is a light harvesting system  
 B) Contains accessory pigments  
 C) Does not include reaction centre  
 D) None of these

### **13.6 The Electron Transport**

41. When the light energy is absorbed by PS-II, it is- **(Pg. 211, E)**  
 A) Converted to mechanical energy  
 B) Used to excite electrons  
 C) Used to change configuration of RUBisCO  
 D) Both a & c
42. The movement of excited electrons in Noncyclic Photophosphorylation: **(Pg. 211, E)**  
 A) uphill in terms of reduction potential scale  
 B) downhill in terms of reduction potential scale  
 C) uphill and downhill in terms of oxidation-reduction potential scale  
 D) both A and C
43. The electrons excited form PS II- **(Pg. 211, E)**  
 A) get used up by the first electron acceptor.  
 B) get used up in the middle of its ETS pathway to PS I  
 C) get passed on to pigments of PS I  
 D) get partially used up in ETS and the rest is passed to PS I.
44. The electrons passed on by PS I to electron acceptor are- **(Pg. 212, E)**

- A) the ones that were transferred to PS I from PS II  
 B) electrons from the water splitted.  
 C) electrons excited when PS I absorbs light.  
 D) All of these
45. Electrons from PS-I move downhill to a molecule of energy-rich- **(Pg. 212, E)**  
 A)  $\text{NADP}^+$  B)  $\text{NAD}^+$   
 C)  $\text{FAD}^+$  D) GTP
46. The Z scheme is named so because- **(Pg. 212, E)**  
 A) it was discovered by a scientist with 'Z' as initial letter of name  
 B) the carriers of ETS present in thylakoid membrane are in 'Z' shape.  
 C) it forms 'Z' shape when the carriers of ETS are arranged in sequence on redox potential scale.  
 D) both A & C
- 47.



Identify the correct site for **(Pg. 212, E)**  
 I- water splitting, II- $\text{NADP}^+$  reduction, III- ATP synthesis

- |    | <b>I</b> | <b>II</b> | <b>III</b> |
|----|----------|-----------|------------|
| A) | I        | II        | III        |
| B) | II       | I         | III        |
| C) | III      | II        | I          |
| D) | III      | I         | II         |

### **13.6.1 Splitting of Water**

48. Splitting of water is important- **(Pg. 212, E)**  
 A) for the  $\text{O}_2$  formation  
 B) for the electrons released  
 C) for the hydroxide ions released  
 D) for the  $\text{H}_2$  released
49. Water splitting is associated with-

**(Pg. 212, E)**

- A) PS I located on inner side of thylakoid membrane  
 B) PS II located on inner side of thylakoid membrane  
 C) PS I located on Outer stroma lamellae  
 D) PS II located on outer stroma lamellae membrane

50. The  $\text{O}_2$  is released in- **(Pg. 212, E)**

- A) Lumen of thylakoid  
 B) Outer side of thylakoid  
 C) Stroma  
 D) Cytoplasm

51. Protons are released- **(Pg. 212, E)**

- A) Lumen of thylakoid  
 B) Outer side of thylakoid  
 C) Stroma  
 D) Cytoplasm

### **13.6.2 Cyclic & Non-Cycle Photophosphorylation**

52. The process of ATP synthesis in cells is/are- **(Pg. 212, E)**

- A) Photo-phosphorylation  
 B) Oxidative phosphorylation  
 C) Phosphosynthesis  
 D) Both A & B

53. The order of working of the two photosystems is- **(Pg. 213, E)**

- A) PS I  $\rightarrow$  PS II  
 B) PS II  $\rightarrow$  PSI  
 C) Any of these depending upon location  
 D) None of these

54. Non-cyclic photo-phosphorylation involves- **(Pg. 213, E)**

- A) PS I  
 B) PS II  
 C) Both PS I & PS II  
 D) None of the these, only enzymes in stroma

55. End product of Z-scheme is- **(Pg. 213, E)**

- A) ATP B) Glucose  
 C)  $\text{NADH} + \text{H}^+$  D) Both A & C

56. Cyclic photophosphorylation involves-

**(Pg. 213, E)**

- A) PS I only  
 B) PS II only  
 C) Both PS I & PS II

- D) None of these
57. Cyclic phosphorylation ends in formation of- **(Pg. 213, E)**  
 A) ATP only  
 B) Glucose only  
 C) NADPH + H<sup>+</sup> only  
 D) Both A & C
58. A possible location of cyclic photophosphorylation under full light is condition. **(Pg. 213, E)**  
 A) Stroma  
 B) Stroma lamellae  
 C) Cristate  
 D) Outer membrane of chloroplast.
59. Assertion – Cyclic photophosphorylation occurs in stroma  
 Reason – Stroma membrane lacks PS II and NADP reductase.  
 Choose correct answer- **(Pg. 213, M)**  
 A) Both Assertion & Reason are correct and Reason is correct explanation for A  
 B) Both Assertion & Reason are correct but Reason is not correct explanation for Assertion  
 C) Assertion is correct but Reason is wrong  
 D) Both Assertion & Reason are wrong

### **13.6.3 Chemiosmotic Hypothesis**

60. ATP Synthesis is linked to i graduate across a membrane in ii **(Pg. 213, E)**

	(i)	(ii)
A)	Electron	Photosynthesis & respiration
B)	Electron	Photosynthesis only
C)	Proton	Photosynthesis and respiration
D)	Proton	Photosynthesis but not respiration

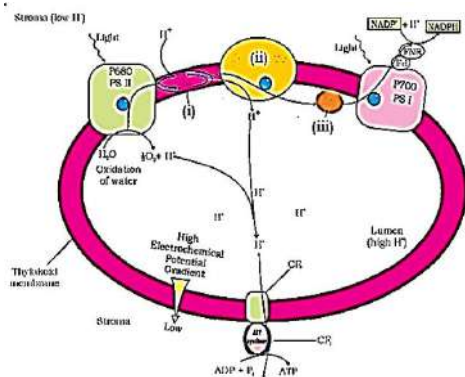
61. Which of the following statements is true? **(Pg. 213, E)**  
 A) the protons accumulate towards outer side of membrane in photosynthesis  
 B) the protons accumulate towards inner side (lumen) of thylakoid in respiration.

- C) The protons accumulate towards outer side of membrane of respiration thylakoid  
 D) None of these
62. The proton gradient may be formed in photosynthesis due to- **(Pg. 213, E)**  
 A) Splitting of water  
 B) Reduction of NAD<sup>+</sup>  
 C) Both A and B  
 D) None of these
63. Assertion – Protons move through photosystems, protons are transported across membrane.  
 Reason – Primary acceptor of electrons is an H carrier **(Pg. 213, M)**  
 A) Both Assertion & Reason are correct and Reason is explanation of Assertion  
 B) Both Assertion & Reason are correct and Reason is not the explanation for Assertion  
 C) Assertion is correct but Reason is not correct  
 D) Assertion & Reason both are incorrect
64. Which of these is an H carrier? **(Pg. 213, E)**  
 A) PS II  
 B) Ferredoxin  
 C) Plastocyanin  
 D) Plastoquinone
65. NADP reductase enzyme is located on \_\_\_\_\_ of thylakoid membrane. **(Pg. 214, E)**  
 A) Stroma side (outer side)  
 B) Lumen side (I.e. outer side)  
 C) Stroma Side (i.e. inner side)  
 D) Lumen side (i.e. inner side)
66. The proton gradient is also formed due to- **(Pg. 214, E)**  
 A) reduction of NAD<sup>+</sup>  
 B) reduction of NADP<sup>+</sup>  
 C) reduction of both NAD<sup>+</sup> & NADP<sup>+</sup>  
 D) reduction of FAD<sup>+</sup>
67. Which of the following is true? **(Pg. 214, M)**  
 A) ATP & NADPH + H<sup>+</sup> both are formed towards stroma.  
 B) ATP & NADPH + H<sup>+</sup> both are formed in lumen of thylakoid  
 C) ATP is formed in lumen while NADPH + H<sup>+</sup> is formed towards stroma.



D) NADPH + H<sup>+</sup> formed in lumen while ATP is formed in stroma.

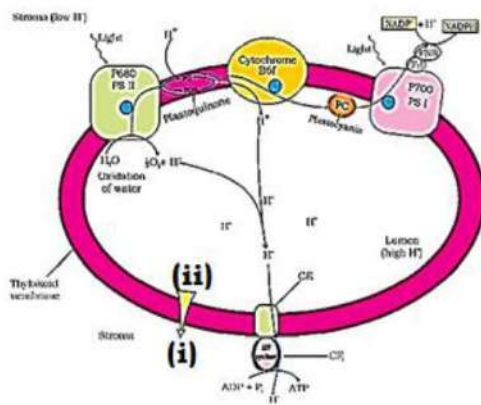
68.



Identify correct labels- (Pg. 214, E)

	(i)	(ii)	(iii)
A)	PQ	PC	Cyt B <sub>6</sub> f
B)	Cyt B <sub>6</sub> f	PQ	PC
C)	PC	Cyt B <sub>6</sub> f	PC
D)	PQ	Cyt B <sub>6</sub> f	PC

69.



Identify correct - (Pg. 214, E)

	I	II
A)	High electrochemical gradient	Low gradient
B)	Low electrochemical gradient	High gradient
C)	High electrochemical gradient	High gradient
D)	Low electrochemical gradient	Low gradient

70. Statement A - The accumulation of protons in stroma cause decrease in pH of stroma.

Statement B - The accumulation of proton in lumen cause formation of potential gradient across thylakoid membrane.

Select the correct option- (Pg. 214, M)

- A) A is correct and B is incorrect
- B) B is correct and A is incorrect
- C) A & B are correct
- D) A & B are incorrect

71. ATP formation occurs upon- (Pg. 214, E)

- A) build up of potential gradient
- B) break down of potential gradient
- C) Both of these
- D) None of these

72. The transmembrane channel in ATP synthase enzyme is formed by-

(Pg. 214, E)

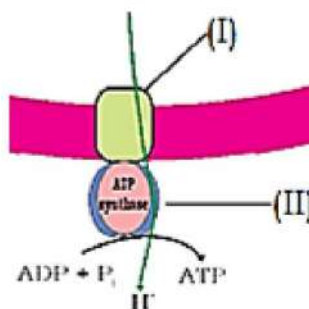
- A) CF<sub>0</sub>
- B) CF<sub>1</sub>
- C) CF<sub>2</sub>
- D) Both A & B

73. The transmembrane channel allows - across membrane for ATP synthesis

(Pg. 214, E)

- A) Osmosis of protons
- B) Simple diffusion of proton
- C) Facilitated diffusion of electron
- D) Facilitated diffusion of proton

74.



The ATP synthase has two parts I & II

I II

- (A) CF<sub>0</sub> CF<sub>1</sub>
- (B) CF<sub>1</sub> CF<sub>0</sub>
- (C) CF CF<sub>0</sub>
- (D) None

75. CF<sub>0</sub> is - (Pg. 214, E)

- A) embedded in chloroplast membrane

- B) protruding on outer surface of chloroplast  
 C) protruding on inner surface of chloroplast membrane  
 D) None of these
76.  $CF_1$  is- **(Pg. 215, E)**  
 A) embedded in chloroplast membrane  
 B) protruding on outer surface of chloroplast membrane  
 C) protruding on inner surface of chloroplast  
 D) None of these
77. Conformational change in \_\_\_\_ makes ATP. **(Pg. 215, E)**  
 A)  $CF_0$  B)  $CF_1$   
 C) Both D) None
78. For creating proton gradient across thylakoid membrane \_\_\_\_\_. **(Pg. 215, E)**  
 A) Energy is used  
 B) No energy is used  
 C) Energy is released  
 D) None of these
79. The end products of light reaction are- **(Pg. 215, E)**  
 A) Stored till dark reaction takes place at right  
 B) immediately used up in next round of light reaction  
 C) transferred to the stroma from lumen to be used in biosynthetic reaction occurring in stroma  
 D) None of these

### **13.7 Where are the ATP and NADPH used?**

80. The products of light reaction are- **(Pg. 215, E)**  
 A) ATP only B) ATP & NADPH  
 C) ATP, NADPH,  $O_2$  D) NADPH Only
81.  $O_2$  is- **(Pg. 215, E)**  
 A) used up in dark reaction in stroma  
 B) used up in dark reaction in lumen thylakoid  
 C) diffused out of chloroplast  
 D) more than one option is correct
82. Statement A – Biosynthetic reaction is independent of direct presence of light

Statement B – Biosynthetic process continues for some time after the light becomes unavailable and then stops.

**(Pg. 215, E)**

- A) Both A & B are correct  
 B) A is correct and B is incorrect  
 C) A is incorrect and B is correct  
 D) A & B are in correct
83. Calvin discovered that first  $CO_2$  fixation product is- **(Pg. 215, E)**  
 A) 3-carbon organic acid  
 B) 4-carbon organic acid  
 C) 5-carbon organic acid  
 D) 6-carbon organic acid
84. To discover the first  $CO_2$  fixation product, Calvin worked on-using- **(Pg. 215, E)**  
 A) algae, radioactive  $C_{12}$   
 B) fungi, radioactive  $C_{12}$   
 C) algae, radioactive  $C_{14}$   
 D) fungi, radioactive  $C_{14}$
85. The first product of  $CO_2$  fixation was identified to be in the Calvin cycle. **(Pg. 215, E)**  
 A) PGA B) RUBP  
 C) Citric acid D) OAA
86. In  $C_4$  pathway, first  $CO_2$  fixation product is same options as **(Pg. 215, E)**  
 A) PGA B) RUBP  
 C) Citric acid D) OAA
87. OAA and PGA stands for- **(Pg. 216, E)**  
 A) 3-phosphoglyceric acid and oxalic acid respectively  
 B) 3-peptide glutaric acid and oxalic acid respectively  
 C) 3-phosphoglutamic acid and oxalic acid respectively  
 D) None of these

### **13.7.1 The primary Acceptor of $CO_2$**

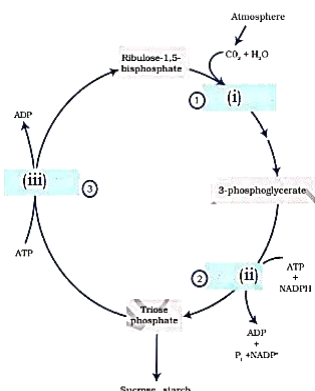
88. For a 3 carbon compound to be formed after  $CO_2$  fixation, the acceptor molecule is of- **(Pg. 216, E)**  
 A) 2-carbon B) 3-carbon  
 C) 4-carbon D) 5-carbon
89. RUBP stands for- **(Pg. 216, E)**  
 A) Ribulose Bisphosphate Carboxylase-oxygenase



- B) Ribose Bisphosphate Carboxylase-oxygenase  
 C) Ribulose Bisphosphate  
 D) Ribose Bisphosphate Carboxylase-oxygenase

### 13.7.2 The Calvin Cycle

90. The Calvin cycle starts with \_\_\_\_\_ ends with \_\_\_\_\_ (Pg. 216, E)  
 A) RUBisCo, regeneration of RUBisCo  
 B) RUBP, regeneration of RUBisCo  
 C) RUBP, regeneration of RUBP  
 D) PGA, regeneration of PGA
91. Calvin cycle- (Pg. 216, E)  
 A) occurs in  $C_3$  plants only  
 B) occurs in  $C_4$  plants only  
 C) occurs in both  $C_3$  &  $C_4$   
 D) None of these
- 92.



The three steps in Calvin cycle are- (Pg. 216, E)

	i	ii	iii
A)	Carboxylation	Oxidation	Regeneration
B)	Reduction	Carboxylation	Regeneration
C)	Carboxylation	Reduction	Regeneration
D)	Carbonation	Reduction	Regeneration

93. The most crucial step of Calvin cycle is- (Pg. 216, E)  
 A) Carbonation B) Carboxylation  
 C) Reduction D) Regeneration
94. Carboxylation is catalyzed by the enzyme-

(Pg. 216, E)

- A) RUBP B) PEP  
 C) NADPH D) None of these
95. RUBisCo has the activity of- (Pg. 217, E)  
 A) Carbonation B) Oxygenation  
 C) Oxidation D) None of these
96. Reduction involves Use of \_\_\_\_\_ molecules of ATP for fixed  $CO_2$  reduction (Pg. 217, E)  
 A) 1 B) 2  
 C) 3 D) 4
97. Reduction involves use of \_\_\_\_\_ molecules of NADPH to reduce fixed  $CO_2$ . (Pg. 217, E)  
 A) 1 B) 2  
 C) 3 D) 4
98. For formation of 1 glucose molecule, how many turns of Calvin cycle is needed? (Pg. 217, E)  
 A) 3 B) 1  
 C) 2 D) 6
99. Regeneration of (i) takes place at expense of (ii) ATP & (iii) NADPH. (Pg. 217, E)

	(i)	(ii)	(iii)
A)	RUBP	0	1
B)	RUBP	1	0
C)	RUBisCo	0	1
D)	RUBisCo	1	0

100. Statement A – In  $CO_2$  fixation cycle, the molecules of ATP used is more than NADPH used.

Statement B – to meet the difference in number of ATP & NADPH used in dark reaction, cyclic phosphorylation take place.

Choose the correct option- (Pg. 217, M)

- A) A is correct but B is wrong  
 B) B is correct but A is wrong  
 C) A & B are correct and A explains B  
 D) A & B are incorrect.
101. For formation of 1 glucose, how many molecules of ATP are required by  $C_3$  cycle? (Pg. 217, E)  
 A) 12 B) 16

- C) 18                                      D) 10  
102. For one glucose formation, how many NAD molecules are needed by  $C_3$  pathway?

(Pg. 217, E)

- A) 10                                      B) 12  
C) 16                                      D) 18

### 13.8 The $C_4$ Pathway

103.  $C_4$  plants are adaptation of plants to-  
(Pg. 218, E)

- A) wet regions (heavy rainfall)  
B) polar regions  
C) dry tropics  
D) moist rainforest

104. (i) –  $C_4$  plants lack Calvin cycle  
(ii) –  $C_4$  plants lack photorespiration  
(iii) –  $C_4$  plants have more productivity than  $C_3$  plants  
(iv) –  $C_4$  plants cannot tolerate higher temperature

How many of the above statements are incorrect? (Pg. 218, M)

- A) 0                                      B) 1  
C) 2                                      D) 3

105. First  $CO_2$  fixation product in  $C_4$  cycle is-  
(Pg. 218, E)

- A) RBP                                      B) PEP  
C) OAA                                      D) Malate

106. Bundle sheath cells are present in \_\_\_\_ around \_\_\_\_.  
(Pg. 218, E)

- A)  $C_4$  plants, vascular bundles  
B)  $C_3$  plants, vascular bundles  
C) Both of these  
D) None of these

107. Leaves with bundle sheath cells are said to show-  
(Pg. 218, E)

- A) Krant anatomy                      B) Kranz anatomy  
C) Kent anatomy                      D) Krez anatomy

108. Bundle sheath cells- (Pg. 218, E)

- A) Allow gaseous exchange  
B) Have intercellular spaces  
C) Have large number of chloroplasts  
D) All of these

109. Example of  $C_4$  plants is- (Pg. 218, E)

- A) Rice                                      B) Maize  
C) Soyabean                              D) Both A and C

110. Primary  $CO_2$  acceptor in  $C_4$  plants is-  
(Pg. 218, E)

- A) 3-carbon molecule RUBP  
B) 3-carbon molecule PEP  
C) 4-carbon molecule PEP  
D) 4-carbon molecule OAA

111. Enzyme responsible for primary  $CO_2$  fixation in  $C_4$  plants is- (Pg. 218, E)

- A) RUBisCO                              B) PEPCase  
C) Oxaloacetase                      D) Phenolase

112. Which of the following is true? (Pg. 218, E)

- A)  $C_4$  plants lack RUBisCO  
B) Mesophyll cells of  $C_4$  plants lack RUBisCO  
C) Bundle sheath cells of  $C_4$  plants lack RUBisCO  
D)  $C_3$  plants lack RUBisCO

113. Primary  $CO_2$  fixation occurs in  $C_4$  plants in  
(Pg. 218, E)

- A) Bundle sheath cells  
B) Mesophyll cells  
C) Any of the above  
D) None of these

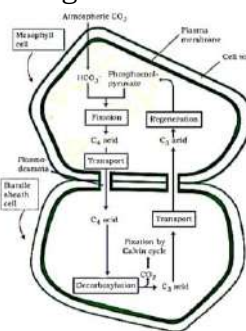
114.  $CO_2$  fixation in  $C_4$  plants occurs in-  
(Pg. 218, E)

- A) Bundle sheath cells  
B) Mesophyll cells  
C) Both A and B  
D) None of the above

115. OAA forms other four carbon acids which are transported. They are- (Pg. 218, E)

- A) Malic acid and oxalic acid  
B) Malic acid and aspartic acid  
C) Succinic acid and aspartic acid  
D) Succinic acid and glutamic acid

116. The figure shows (Pg. 219, E)



- A) Krebs cycle  
B) Calvin cycle  
C) Hatch and Slack pathway  
D) EMP pathway

117. In  $C_4$  pathway, RUBisCO is- **(Pg. 219, E)**

- A) absent
- B) present in mesophyll cells
- C) present in bundle sheath cell
- D) none of these

118. PEPcase enzyme is- **(Pg. 219, E)**

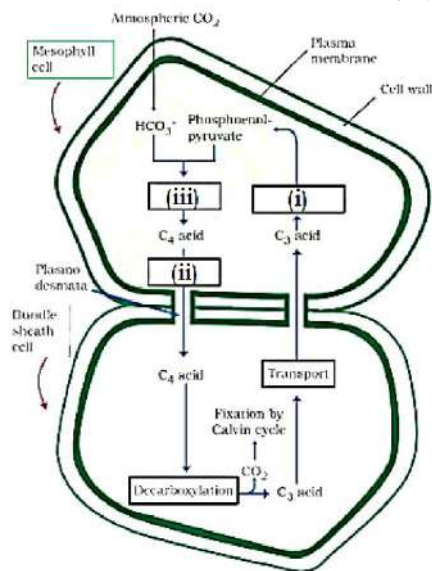
- A) absent in mesophyll cells
- B) present in bundle sheath cells
- C) both A and B
- D) None of these

119. Calvin cycle takes place in \_\_ (i) \_\_ in all  $C_3$  plants in \_\_ (ii) \_\_ in all  $C_4$  plants

**(Pg. 219, E)**

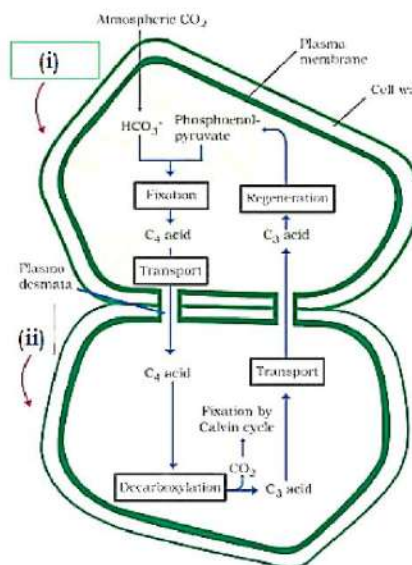
	(i)	(ii)
(A)	mesophyll cells	mesophyll cells
(B)	bundle sheath cells	mesophyll cells
(C)	mesophyll cells	bundle sheath cells
(D)	bundle sheath cells	bundle sheath cells

120. Identify correct labels- **(Pg. 219, E)**



	(i)	(ii)	(iii)
A	Fixation	Decarboxylation	Regeneration
B	Transport	Fixation	Regeneration
C	Regeneration	Transport	Fixation
D	Regeneration	Decarboxylation	Fixation

121. Identify the A and B **(Pg. 219, E)**



	(i)	(ii)
A	mesophyll cells	mesophyll cells
B	bundle sheath cells	mesophyll cells
C	mesophyll cells	bundle sheath cells
D	bundle sheath cells	bundle sheath cells

## 13.9 Photorespiration

122. Read the following statements-

Statement A – Ribulose Biphosphate is the most abundant enzyme in the world.  
Statement B – Photorespiration doesn't occur in  $C_4$  plants.

Choose the correct option- **(Pg. 220, E)**

- A) A is correct and B is incorrect
- B) B is correct and A is incorrect
- C) A and B are correct
- D) A and B are incorrect

123. RUBisCO has \_\_\_\_\_ when  $CO_2$  &  $O_2$  is equal. **(Pg. 220, E)**

- A) greater affinity for  $CO_2$  than  $O_2$
- B) greater affinity for  $O_2$  than  $CO_2$
- C) equal affinity for  $CO_2$  &  $O_2$
- D) no affinity for  $O_2$

124. In  $C_3$  plants- **(Pg. 220, E)**

- ### 13.10 Factors Affecting Photosynthesis

- NEET MBBS DOCTORS

- ### 13.10.1 Light

- ### **13.10.2 Carbon dioxide concentration**

136. Which of the following is true? **(Pg. 223, E)**

- A)  $\text{CO}_2$  is a major limiting factor for photosynthesis in nature
- B) Light is rarely a limiting factor for photosynthesis in nature
- C) Both of these
- D) None of these

137. The concentration of  $\text{CO}_2$  beyond which the  $\text{CO}_2$  becomes damaging over longer periods is- **(Pg. 223, E)**

- A) 0.03%                      B) 0.04%
- C) 0.05%                      D) 0.08%

138. The  $\text{CO}_2$  fixation rates increases upto the  $\text{CO}_2$  concentration of- **(Pg. 223, E)**

- A) 300 ppm                      B) 400 ppm
- C) 500 ppm                      D) 800 ppm

139. At low light conditions, which of the groups respond positively to increase in  $\text{CO}_2$ - **(Pg. 223, E)**

- A)  $\text{C}_3$                               B)  $\text{C}_4$
- C) Both                              D) None

140. At high light conditions, which of the groups respond positively to increase in  $\text{CO}_2$ . **(Pg. 223, E)**

- A)  $\text{CO}_2$                               B)  $\text{C}_4$
- C) Both                              D) None

141.  $\text{C}_4$  plants show saturation at  $\text{CO}_2$  concentration of- **(Pg. 223, E)**

- A)  $240 \mu\text{L}^{-1}$                       B)  $360 \mu\text{L}^{-1}$
- C)  $450 \mu\text{L}^{-1}$                       D)  $540 \mu\text{L}^{-1}$

142.  $\text{C}_3$  plants show saturation for  $\text{CO}_2$  concentration at- **(Pg. 223, E)**

- A)  $450 \mu\text{TL}^{-1}$                       B)  $360 \mu\text{L}^{-1}$
- C)  $540 \mu\text{L}^{-1}$                       D)  $240 \mu\text{L}^{-1}$

143. Assertion – Greenhouse crops like tomatoes and bell pepper are grown in  $\text{CO}_2$  enriched atmosphere for higher yields.  
Reason –  $\text{C}_4$  plants respond to higher  $\text{CO}_2$  concentration by showing increased rate of photosynthesis.

Choose the correct option. **(Pg. 223, E)**

- A) Both Assertion and Reason are correct and Reason is correct explanation for Assertion
- B) Both Assertion and Reason are correct but Reason is not the explanation for Assertion

C) Assertion is correct but Reason is wrong

D) Assertion and Reason are wrong

### 13.10.3 Temperature

144. Which of the reaction is more sensitive to temperature? **(Pg. 223, E)**

- A) Light Reaction
- B) Dark Reaction
- C) Both of them are equal
- D) None of the above

145. Which group of plants has a higher temperature optimum? **(Pg. 223, E)**

- A)  $\text{C}_4$                               B)  $\text{C}_3$
- C) Both                              D) None

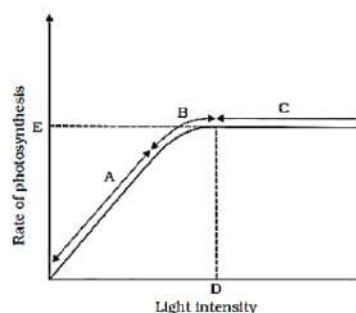
146. Which of the following is true? **(Pg. 223, E)**

- A) Tropical plants have higher temperature optimum than temperate plants
- B) Temperate plants have higher temperature optimum than tropical plants
- C) Temperate and Tropical have equal temperature optimum
- D) Polar regions plants have highest temperature optimum

147. Water stress causes **(Pg. 223, E)**

- A) reduced  $\text{CO}_2$  availability
- B) leaf wilting
- C) reduced surface area of leaf
- D) All of these

148.



In the given graph, in which region will plant not respond to increase in  $\text{CO}_2$  concentration? **(Pg. 223, E)**

- A) A                                      B) B
- C) C                                      D) None



## Answer Key

### PHOTOSYNTHESIS IN HIGHER PLANTS.

<b>Q</b>	<b>01</b>	<b>02</b>	<b>03</b>	<b>04</b>	<b>05</b>	<b>06</b>	<b>07</b>	<b>08</b>	<b>09</b>	<b>10</b>
Ans	D	C	D	B	D	C	A	D	A	B
<b>Q</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
Ans	B	D	D	D	A	B	A	D	C	D
<b>Q</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
Ans	B	D	C	C	D	B	A	D	C	A
<b>Q</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>
Ans	B	A	B	A	C	B	A	B	A	D
<b>Q</b>	<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>
Ans	B	C	C	C	A	C	D	B	B	A
<b>Q</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>
Ans	C	D	B	C	D	A	A	B	B	C
<b>Q</b>	<b>61</b>	<b>62</b>	<b>63</b>	<b>64</b>	<b>65</b>	<b>66</b>	<b>67</b>	<b>68</b>	<b>69</b>	<b>70</b>
Ans	D	A	C	D	A	B	A	D	B	B
<b>Q</b>	<b>71</b>	<b>72</b>	<b>73</b>	<b>74</b>	<b>75</b>	<b>76</b>	<b>77</b>	<b>78</b>	<b>79</b>	<b>80</b>
Ans	B	A	D	A	D	D	B	A	D	C
<b>Q</b>	<b>81</b>	<b>82</b>	<b>83</b>	<b>84</b>	<b>85</b>	<b>86</b>	<b>87</b>	<b>88</b>	<b>89</b>	<b>90</b>
Ans	C	A	A	C	A	D	D	D	C	C
<b>Q</b>	<b>91</b>	<b>92</b>	<b>93</b>	<b>94</b>	<b>95</b>	<b>96</b>	<b>97</b>	<b>98</b>	<b>99</b>	<b>100</b>
Ans	C	C	B	D	B	B	B	D	B	C
<b>Q</b>	<b>101</b>	<b>102</b>	<b>103</b>	<b>104</b>	<b>105</b>	<b>106</b>	<b>107</b>	<b>108</b>	<b>109</b>	<b>110</b>
Ans	C	B	C	C	C	A	B	C	B	B
<b>Q</b>	<b>111</b>	<b>112</b>	<b>113</b>	<b>114</b>	<b>115</b>	<b>116</b>	<b>117</b>	<b>118</b>	<b>119</b>	<b>120</b>
Ans	B	B	B	C	B	C	C	D	C	C
<b>Q</b>	<b>121</b>	<b>122</b>	<b>123</b>	<b>124</b>	<b>125</b>	<b>126</b>	<b>127</b>	<b>128</b>	<b>129</b>	<b>130</b>
Ans	C	C	A	C	D	D	A	C	D	D
<b>Q</b>	<b>131</b>	<b>132</b>	<b>133</b>	<b>134</b>	<b>135</b>	<b>136</b>	<b>137</b>	<b>138</b>	<b>139</b>	<b>140</b>
Ans	B	A	B	B	B	C	C	C	D	C
<b>Q</b>	<b>141</b>	<b>142</b>	<b>143</b>	<b>144</b>	<b>145</b>	<b>146</b>	<b>147</b>	<b>148</b>		
Ans	B	A	C	B	A	A	D	A		