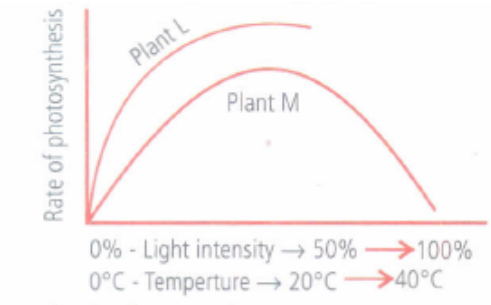
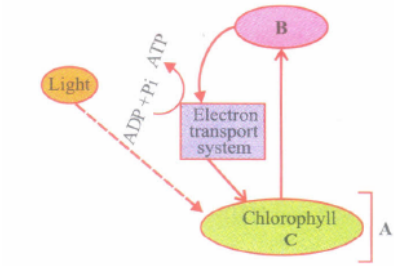
**Time : 1 Mins** **PHOTOSYNTHESIS IN HIGHER PLANTS 1** **Marks : 990**

1. Select the correct match.
   a) Stroma - Light reactions b) Membrane system - Trapping of light energy
   c) Thylakoids - $CO_2$ fixation d) Stromal lamellae - Synthesis of ATP
2. During fixation of one molecule of $CO_2$ by $C_3$ plants, number of ATP and $NADPH_2$ required are
   a) 3 ATP and 2 $NADPH_2$ b) 5 ATP and 2 $NADPH_2$ c) 12 ATP and 12 $NADPH_2$
   d) 2 ATP and 3 $NADPH_2$
3. When two plants L and M were exposed to different light intensities and temperatures, they showed changes in their rates of photosynthesis, which have been represented in the following graph.




   The graph indicates that
   a) plant L is a $C_3$ plant for which the light saturation point is 100% of full sunlight
   b) plant M is a $C_4$ plant for which the optimum temperature is around 20°C
   c)
   plant M is a $C_3$ plant which is more affected at higher temperature and higher light intensity as compared to plant L
   d) plant L is a $C_4$ plant and cannot function at light intensities above the saturation point.
4. The factor which is not limiting in normal conditions for photosynthesis is
   a) water b) chlorophyll c) light d) carbon dioxide
5. Photosynthetic pigments such as chl a, chl b, xanthophyll and carotene can be separated by which of the following techniques?
   a) Paper chromatography b) Gel Electrophoresis c) X-ray diffusion d) ELISA test
6. Pigment-containing membranous extensions in some cyanobactena are___
   a) Basal bodies b) pneumatophores c) Chromatophores d) Heterocysts
7. Oxygenic photosynthesis occurs in____
   a) Oscillatoria b) Rhodospirillum c) Chlorobium d) Chromatium
8. Bundle sheath chloroplast of $C_4$ plant are
   a) Large & agranal b) Large & granal c) small & agranal d) small & granal

9. The substrate for photorespiration is_____
   a) ribulose bis-phosphate  b) glycolate  c) serine  d) glycine
10. A very efficient converter of solar energy with net productivity of 2- 4 kg/$m^2$ or more is the crop of _____ .
    a) Wheat  b) Sugarcane  c) Rice  d) Bajra
11. Dark reactions of photosynthesis occur in____
    a) granal thylakoid-membranes  b) stromal lamella membranes
    c) stroma outside photosynthetio lamellae  d) periplastidial space
12. Study the given flow chart of cyclic photophosphorylation and select the correct answer for A, B and C.




a)

| A | B | C |
|---|---|---|
| PS II | Cytochrome | P 680 |

b)

| A | B | C |
|---|---|---|
| PS I | e- acceptor | P 680 |

c)

| A | B | C |
|---|---|---|
| PS I | e- acceptor | P 700 |

d)

| A | B | C |
|---|---|---|
| PS II | Cytochrome | P 700 |

13. **Assertion:** The $C_4$ plants have a special type of leaf anatomy called kranz anatomy.
    **Reason:** Chloroplasts of bundle sheath cells have well-developed grana and starch grains.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false.  d) If both assertion and reason are false.
14. Element which helps in electron transport in the process of photosynthesis is
    a) Zinc  b) Molybdenum  c) Boron  d) Mangnese
15. How many ATP and $NADPH_2$ are respectively produced in the process of photorespiration?
    a) 2 and 4  b) 1 and 2  c) 4 and 6  d) 0 and 0
16. **Assertion:** The colour of the leaf is due to the presence of four pigments-chlorophyll a, chlorophyll b, xanthophylls and carotenoids.
    **Reason:** Chlorophyll b is the chief pigment associated with photosynthesis.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false.  d) If both assertion and reason are false
17. Photosystem-II occurs in____
    a) stroma  b) cytochrome  c) grana  d) mitochondrial surface

18. Photosynthesis is
    a) Oxidative, exergonic, catabolic  b) Redox-reaction, endergonic, anabolic
    c) Reductive, endergonic, catabolic
19. The size of chlorophyll molecule is _____ .
    a) head 15 x 15 $A^o$, tail 25 $A^o$  b) head 20 x 20 $A^o$, tail 25 $A^o$  c) head 15 x 15 $A^o$, tail 20 $A^o$
    d) head 10 x 12 $A^o$, tail 25 $A^o$
20. In photosynthesis the light-independent reactions take place at___
    a) Photosystem-I  b) photosystem-II  c) Stromal matrix  d) Thylakoid lumen
21. Nine-tenth of all photosynthesis of world (85-90%) is carried out by_____ .
    a) large trees with rnillions of branches and leaves  b) algae of the ocean
    c) chlorophyll containing ferns of the forest  d) scientists in the laboratories
22. Energy required for AlP synthesis in PSII comes from
    a) proton gradient  b) electron gradient  c) reduction of glucose  d) oxidation of glucose
23. Ingenhousz in an experiment showed that in bright sunlight, small bubbles were formed around the green parts of the plant, while in the dark, they did not. He identified these bubbles to be of
    a) $CO_2$  b) $H_2O$  c) $O_2$  d) $H_2$
24. Product of light reaction of photosynthesis is
    a) Carbohydrate  b) ATP  c) NADP and $O_2$  d) $NADPH_2$ ATP & $O_2$
25. With reference to factors affecting the rate of photosynthesis. Which of the following statements is not correct?
    a) Light saturation for CO2 fixation occurs at 10% of full sunlight
    b) Increasing atmospheric CO2 concentration upto 0.05% can enhance CO2 fixation rate
    c)
    C3 plants responds to higher temperatures with enchanced photosynthesis while C4 plants have much lower temperature optimum
    d)
    Tomato is a greenhouse crop which can be grown in CO2 enriched atmosphere for higher yield
26. Which of the following is not an external factor influencing photosynthesis?
    a) $CO_2$ concentration  b) $O_2$ concentration  c) Availability of water
    d) Chlorophyll concentration
27. In photosystem-I the first electron acceptor is_____
    a) Cytochrome  b) Plaslocyanin  c) An iron-sulphur Protein  d) Ferredoxin
28. PEP is primary $CO_2$ acceptor in:
    a) $C_4$ plants  b) $C_3$ plants  c) $C_2$ plants  d) both $C_3$ and $C_4$ plants
29. CAM helps the plants in_____
    a) conserving water  b) secondary growth  c) disease resistance  d) reproduction
30. Which of the following absorb light energy for photosynthesis?
    a) Chlorophyll  b) Water molecule  c) $O_2$  d) RUBP

31. Photorespiration is favoured by_____
    a) high $O_2$ and low $CO_2$  b) low light and high $O_2$  c) low temperature and high $O_2$
    d) low $O_2$ and high $CO_2$
32. During photocatalytic splitting of water, liberation of $O_2$ requires
    a) $Mn^{2+}$  b) $Cl^-$  c) $Ca^{2+}$  d) All of these.
33. Cytochrome is_____
    a) Metallo - Flavo protein  b) Fe-containing porphyrin pigment  c) Glycoprotein  d) Lipid
34. Study the following statements regarding chl a molecule.
    (i) Molecular formula of chi a is $C_{55}H_{72}O_5N_4Mg$.
    (ii) It is the primary photosynthetic pigment.
    (iii) In pure state, it is red in colour and thus it absorbs more blue wavelength of light than the red wavelength.
    (iv) It is soluble in water as well as petroleum ether.
    Which of the above statements is/are not correct?
    a) (i) and (iii)  b) (iii) and (iv)  c) (ii) only  d) (iv) only
35. Formation of ATP in photosytthesis and respiration is an oxidation process which utilises the energy from____
    a) cytochromes  b) ferredoxin  c) electrons  d) carbon dioxide
36. During Hatch and Slack pathway, PEP combines with $CO_2$ in the presence of enzyme PEP Case, to form OAA. This process of initial fixation of $CO_2$ occurs in
    a) mesophyll cells  b) bundle sheath cells  c) both (a) and (b)  d) none of these.
37. Photosynthesis in $C_4$ plants is relatively less limited by atmospheric $CO_2$ level because of_____
    a) Effective pumping of $CO_2$ into bundle sheath cells.
    b) Rubisco in $C_4$ plants has higher affinity for $CO_2$
    c) Four carbon acids are the primary initial $CO_2$ fixation products.
    d) The primary fixation of $CO_2$ is mediated via PEP carboxylase
38. Glucose synthesis occurs during which stage of $C_3$ cycle?
    a) Carboxylation  b) Oxygenation  c) Reduction  d) Regeneration
39. Who, after conducting experiments on purple and green sulphur bacteria, inferred that 02 evolved during photosynthesis comes from $H_2O$ not from $CO_2$?
    a) Sachs  b) Engelmann  c) van Niel  d) Blackmann
40. $CO_2$ concentrating steps are found in
    a) $C_3$ plants  b) $C_4$ plants  c) CAM plants  d) Temperate plants only
41. Chlorophyll in chloroplasts is located in_____
    a) grana  b) Pyrenoid  c) stroma  d) both grana and stroma
42. Read the following four statements, A, B, C and D and select the right option having both correct statements
    Statements:
    (A) Z scheme of light reaction takes place in present of PSI only

(B) Only PSI is functional in cyclic photophosphorylation
(C) Cyclic photophosphorylation results into synthesis of ATP and $NADPH_2$
(D) Stroma lamellae lack PSII aswell as NADP
a) A and B  b) B and C  c) C and D  d) B and D

43. Splitting of water is associated with
a) photosystem I  b) lumen of thylakoid  c) both photosystem I and II
d) inner surface of thylakoid membrane.

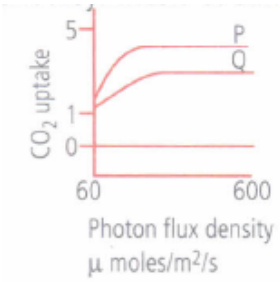
44. Which of the following is not a product of light reaction of photosynthesis?
a) NADPH  b) NADH  c) ATP  d) Oxygen

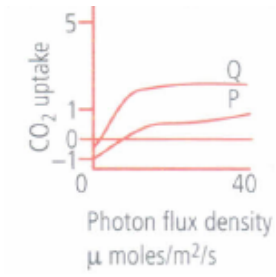
45. **Assertion:** Tropical plants have a higher optimum temperature for photosynthesis than temperate plants.
**Reason:** The temperature optimum for photosynthesis of different plants depends on their habitat.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.  d) If both assertion and reason are false.

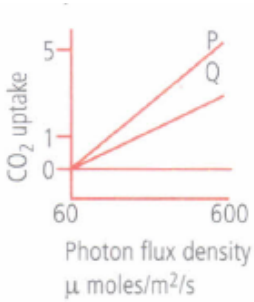
46. Secondary xylem and phloem in dicot stem are produced by____
a) phellogen  b) vascular cambium  c) apical meristems  d) axillary meristems

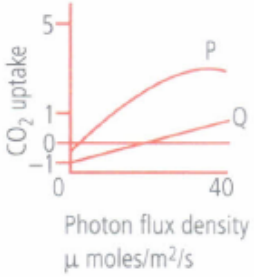
47. The main difference between chlorophyll 'a' and 'b' is :
a) Chlorophyll 'a' is all a linear chain compound and 'b' is branched chain
b) Chlorophyll 'a' has no $Mg^+$ ion in center of molecule
c) In chlorophyll 'a' there is $-CH_3$ group whereas in 'b' it i -CHO group  d) All of the above

48. Which of the following graphs correctly depicts the rate of photosynthesis of sun plant (P) and shade plant (Q)?

(A)
a) 


(B)
b) 


(C)
c) 

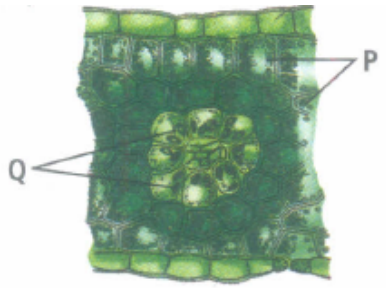

(D)
d) 


49. Which of the following scientists concluded by his experiments that green plant parts play a role in purifying the noxious air only in the presence of sunlight?

a) Priestley b) Ingenhousz c) Sachs d) Engelmann

50. How many ATP and NADPH molecules are respectively required to make one molecule of glucose through Calvin cycle?
    a) 3 and 2 b) 9 and 6 c) 18 and 12 d) 12 and 18
51. In PSI, the reaction centre Chi a has absorption maxima at_____ ; whereas in PS II, the reaction centre Chi a has absorption maxima at _____.
    a) 700 nm, 680 nm b) 680 nm, 700 nm c) 400 nm, 500 nm d) 700 nm, 800 nm
52. The principle of limiting factors was proposed by_____
    a) Blackmann b) Hill c) Arnon d) Liebig
53. Which of the following is produced during the light phase of photosynthesis?
    a) ATP b) $NADPH_2$ c) Both ATP and $NADPH_2$ d) Carbohydrates
54. When $CO_2$ is added to PEP, the first stable product synthesised is:
    a) pyruvate b) glyceraldehyde- 3-phosphate c) phosphoglycerate d) oxaloacetate.
55. Read the given statements and select the correct option.
    **Statement 1:** Carboxylation is the most crucial step of Calvin cycle where $CO_2$ is utilised for the carboxylation of RuBP.
    **Statement 2:** Carboxylation is catalysed by the enzyme RuBisCO which results in the formation of two molecules of 3PGA.
    a) Both statements 1 and 2 are correct.
    b) Statement 1 is correct but statement 2 is incorrect.
    c) Statement 1 is incorrect but statement 2 is correct.
    d) Both statements 1 and 2 are incorrect
56. Which element is located at the centre of the porphyin ring in chlorophyll?
    a) Manganese b) Calcium c) Magnesium d) Potassium
57. **Assertion:** The splitting of water is associated with PS II
    **Reason:** Water is split into $H^+$, $O_2$ and electrons.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false. d) If both assertion and reason are false.
58. A CAM help the plants in
    a) Reproduction b) Secondary growth c) Conserving water d) Disease resistance
59. Mints adapted to low light intensity have___
    a) larger photosynthetic unit size tharuthe sun plants
    b) higher rare of $CO_2$ fixation than the sun plants c) more extended root system.
    d) leaves modified to spines
60. Stomata of CAM plants_____
    a) never open b) are always open c) open during the day and close at night
    d) open during the night and close during the day

61. Refer to the given cross section of a $C_4$ leaf and select the incorrect option.




a) P are the chloroplasts in which thylakoids are stacked together to form grana.

b)

P are the chloroplasts which can perform light reaction, evolve molecular $O_2$ and produce assimilatory power.

c) Q are the chloroplasts in which thylakoids occur as stroma lamellae.

d)

Q are the chloroplasts in which $CO_2$ is fixed by phosphoenol pyruvic acid to form oxaloacetic acid.

62. Chlorophyll a appears _____ in colour and chlorophyll b appears _____ in colour in the chromatogram

a) bluish green, yellowish green b) yellowish green, bluish green c) blue, blue

d) green, green

63. Which of the following is the sie of photolysis of water?

a) Stroma of chloroplast b) Cristae of chloroplast c) Ribosome of chloroplast

d) Lumen of thylakoid sacs

64. RuBisCO is _____ .

a) RuBP carboxylase b) RuBP oxygenase c) RuBP carboxylase-oxygenase

d) RuBP carboxydismutase.

65. PSI occurs in -

a) Appressed part of granal thylakoids

b) Appressed and non-appressed part of grans thylakoids c) stroma

d) stroma thylakoids and non-appressed part of grans thylakoids

66. **Assertion:** In C4 plants, the bundle sheath cells are rich in an enzyme phosphoenol pyruvate carboxylase (PEPCase).

**Reason:** In C4 plants, the mesophyll cells are rich in an enzyme Ribulose bisphosphate carboxylase-oxygenase (RuBisCO).

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

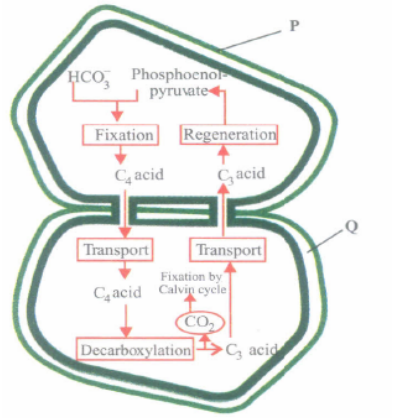
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

67. Who provided the evidence that glucose is formed during photosynthesis and is then stored in the form of starch?

a) Sachs b) Engelmann c) van Niel d) Blackmann

68. Which kind of cells are represented by letters P and Q in the given figure showing $C_4$ pathway?




a)

| P | Q |
|---|---|
| Palisade parenchyma | Spongy parenchyma |

b)

| P | Q |
|---|---|
| Spongy parenchyma | Palisade parenchyma |

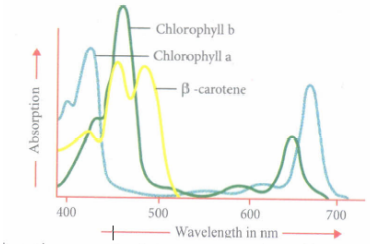
c)

| P | Q |
|---|---|
| Mesophyll cell | Bundle sheath cell |

d)

| P | Q |
|---|---|
| Bundle sheath cell | Mesophyll cell |

69. Given graph represents the absorption spectra of three photosynthetic pigments, chi a, chi b and ~-carotene.




Select the correct statement regarding this.

a)

The curve showing the amount of absorption of different wavelengths of light by a photosynthetic pigment is called as absorption spectrum.

b) Chi a and chi b absorb maximum light in blue and red wavelengths of light.

c) Rate of photosynthesis is maximum in blue and red wavelengths of light. d) All of these

70. Read the given statements and select the correct option.

Statement 1: Photorespiration interferes with the successful functioning of Calvin cycle.

Statement 2: Photorespiration oxidises ribulose-1, S biphosphate which is an acceptor of CO2 in Calvin cycle.

a) Both statements 1 and 2 are correct.

b) Statement 1 is correct but statement 2 is incorrect.

c) Statement 1 is incorrect but statement 2 is correct.

d) Both statements 1 and 2 are incorrect

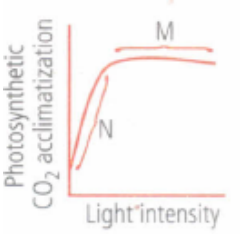
71. Stomata in grass leaf are_____

a) rectangular b) kidney-shaped c) dumb-bell-shaped d) barrel-shaped

72. The first carbon dioxide acceptor in $C_4$- plants is _____ .

a) phosphoenol-pyruvate b) ribulose 1, 5-diphosphate c) oxalo acetic acid
d) phosphoglyceric acid

73. A typical light response curve of photosynthesis is shown. The limiting factor/s for photosynthesis at M and N is/are




a) temperature and $CO_2$ respectively b) $CO_2$ and light respectively c) only $CO_2$
d) light and $CO_2$ respectively.

74. Incorrect statement in relation to chemiosmotic hypothesis is
a) Primary electron acceptor is located towards outer side of membrane
b) NADP reductase is located on lumen side of thylakoid membrane
c) Splitting of water releases protons in the lumen of thylakoid membrane
d) Decrease in pH of thylakoid lumen due to proton accumulation

75. Maximum solar energy is trapped.by_____
a) planting trees b) cultivating crops c) growing algae in tanks d) growing grasses

76. Select the incorrect pair
a) 2-carbon compound - Aspartic acid b) 3-carbon compound - PGA
c) 4-carbon compound - Malic acid d) 5-carbon compound - RuBP

77. c-4 plats are found among
a) Only gramineae b) Only monocot c) Only dicot d) Monocots and dicots

78. Which one of the following correctly depicts the biochemical reaction for photosynthesis?
a) $C_6H_{12}O_6 + 6O_2 \xrightarrow{Enzymes} 6CO_2 + 6H_2O$ + energy
b) $C_6H_{12}O_6 + 6O_2 + 6H_2O \rightarrow 6CO_2 + 12H_2O$ + energy
c) $6CO_2 + 6H_2O \xrightarrow[Chlorophyll]{sunlight} C_6H_{12}O6 + 6O_2$
d) $6CO_2 + 12H_2O \xrightarrow[Chlorophyll]{sunlight} C_6H_{12}O_6 + 6O_2 + 6H_2O$

79. Oxygen is not produced during photosynthesis by_____
a) Cycas b) Nostoc c) Green sulphur bacteria d) Chara

80. Assume a thylakoid which is somehow punctured so that the interior of the thylakoid is no longer separated from the stroma. This damage will have the most direct effect on which of the following processes?
a) Splitting of water b) Absorption of light energy by chlorophyll
c) Flow of electrons from photosystem II to photosystem I d) Synthesis of ATP

81. Which of the following statements about dark reactions is correct?
a) They occur in darkness. b) They are not light dependent.
c) They are dependent upon the products synthesised during light reactions. d) All of these

82. Match column I with column II and select the correct option from the given codes.

| | Column I | | Column II |
|---|---|---|---|
| A. | $C_4$ plants | (i) | Succulents |
| B. | Chlorophyll b | (ii) | Accessory photosynthetic pigment |
| C. | PSII | (iii) | Photooxidation of $H_2O$ |
| D. | CAM | (iv) | Kranz anatomy |

a) A-(iv), B-(ii), C-(iii), D-(i) b) A-(iii), B-(ii), C-(iv), D-(i) c) A-(i), B-(iii), C-(iii), D-(iv)
d) A-(i), B-(ii), C-(iii), D-(iv)

83. PGA as the first $CO_2$ fixation product was discovered in photosynthesis of_____
a) Bryophyte b) Glmnosperm c) Angiosperm d) Alga

84. PGA as the first carbon dioxide fixation product was discovered in photosynthesis of
a) Gymnosperm b) Angiosperm c) Alga d) Bryophyte

85. In photosynthesis energy from light reaction to dark reaction is transferred in the form of____
a) ADP b) ATP c) RUDP d) Chlorophyll

86. Optimum temperature conditions for photosynthesis in $C_3$ and $C_4$ plants are respectively
a) 10°C-25°C and 30°C-45°C b) 30°C-45°C and 10°C-25°C c) 0°C-10°C and 10°C-30°C
d) 25°C-30°C and 40°C -50°C.

87. Kranz anatomy is typical of_____
a) $C_4$ - Plants b) $C_3$ - Plants c) $C_2$ - Plants d) $C_{AM}$ - Plants

88. Number of carboxylations reactions during fixation of one $CO_2$ molecule in sorghum and maize is
a) 1 b) 2 c) 3 d) 4

89. Carbon dioxide joins the photosynthetic pathway in_____
a) PS - I b) PS - II c) light reaction d) dark reaction

90. Identify the correct sequence of stages of Calvin cycle.
a) Reduction ⟶ Carboxylation ⟶Regeneration
b) Carboxylation ⟶ Regeneration ⟶ Reduction
c) Carboxylation ⟶ Reduction ⟶ Regeneration
d) Reduction ⟶ Regeneration ⟶ Carboxylation

91. In $C_4$-plants, Calvin cycle operates in _____ .
a) stroma of bundle sheath chloroplasts b) grana of bundle sheath chloroplasts
c) grana of mesophyll chloroplasts d) stroma of mesophyll chloroplasts

92. Glycolate induces opening of stomata in_____
a) presence of oxygen b) low $CO_2$ con. c) high $CO_2$ con d) absence of $CO_2$

93. **Assertion:** The external factors that affect photosynthesis are number, size, age and orientation of leaves, mesophyll cells and chloroplasts and the amount of chlorophyll.
**Reason:** The internal factors that affect photosynthesis are availability of sunlight, temperature, $CO_2$ concentration and water.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

94. In $C_4$ plants, first product of $CO_2$ fixation is
a) 3-PGA b) OAA c) Malic acid d) Glutamic acid

95. Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | $C_3$ plants | (i) | Kalanchoe, Opuntia |
| B. | $C_4$ plants | (ii) | Maize, sugarcane |
| C. | CAM plants | (iii) | Helianthus |

a)

| A | B | C |
|---|---|---|
| (ii) | (iii) | (i) |

b)

| A | B | C |
|---|---|---|
| (i) | (ii) | (iii) |

c)

| A | B | C |
|---|---|---|
| (iii) | (ii) | (i) |

d)

| A | B | C |
|---|---|---|
| (i) | (iii) | (ii) |

96. Which pigment acts directly to convert light energy to chemical energy?
a) Chlorophyll a b) Chlorophyll b c) Xanthophyll d) Carotenoid

97. The carbon dioxide acceptor in Calvin cyble/$C_3$ - plants is _____ .
a) Phosphoenoi Pyruvare (PEP) b) Ribulose 1, 5-Diphosphate (RuDP)
c) Phosphoglyceric Acid (PGA) d) Ribulose Monophosphate (RMP)

98. In chloroplast, the highest number of protons are found in
a) Antenna complex b) Stroma c) Lumen of thylakoids d) Intermembrane space

99. In the leaves of $C_4$ plants, malic acid formation during $CO_2$ fixation occurs in the cells of
a) Epidermis b) Mesophyll c) Bundle Sheath d) Phloem

100. $C_4$ plants are more efficient in photosynthesis than $C_3$ plants due to_____
a) Higher leaf area b) Presence of larger number of chloroplasts in the leaf cells
c) Presence of thin cuticle d) Lower rate of photorespiration

101. In $C_4$ plants, Calvin cycle enzymes are present in
a) chloroplasts of mesophyll cells b) chloroplasts of bundle sheath cells
c) cytoplasm of guard cells d) cytoplasm of epidermal cells

102. Which one of the following equations suggests that $O_2$ released during photosynthesis comes from water?
a) $6CO_2^{18} + 12H_2O \rightarrow 6O_2^{18} + C_6H_{12}O_6 + 6H_2O^{18}$
b) $6CO_2 + 12H_2O^{18} \rightarrow 6O_2 + C_6H_{12}O_6 + 6H_2O^{18}$
c) $6CO_2^{18} + 12H_2O \rightarrow 6O_2^{18} + C_6H_{12}O_6 + 6H_2O$
d) $6CO_2 + 12H_2O^{18} \rightarrow 6O_2^{18} + C_6H_{12}O_6 + 6H_2O$

103. Read the following statements and select the correct ones.
(i) PS I is involved in non-cyclic photophosphorylation only.
(ii) PS II is involved in both cyclic and non-cyclic photophosphorylation.
(iii) Stroma lamellae membranes possess PS I only, whereas grana lamellae membranes possess both PS I and PS II.
a) (i) only b) (ii) only c) (iii) only d) (i), (ii) and (iii)

104. Which of these is a type of phycobilin pigments?
a) Phycocyanin b) Allophycocyanin c) Phycoerythrin d) All of these

105. Which pigment system is inactivated in red drop?

a) PS-I and PS-n b) PS - I c) PS - II d) None of these

106. Cytochromes are found in _____ .
a) Outer wall of mitochondria b) Cristae of mitochondria c) Lysosomes
d) Matrix of mitochondria

107. Protochlorophyll differs from chlorophyll in lacking___
a) 2 hydrogen atoms in one of its pyrrole rings
b) 2 hydrogen atoms in two of its pyrrole rings
c) 4 hydrogen atoms in one of its pyrrole rings
d) 4 hydrogen atoms in two of its pyrrole rings

108. The enzyme that catalyses initial carbon dioxide fixation in $C_4$ - plants is _____ .
a) RuBP carboxylase b) PEP carboxylase c) carbonic anhydrase d) carboxydismutase

109. The wavelength of light absorbed by Pr form of phytochrome is____
a) 680nm b) 720nm c) 620nm d) 640nm

110. Wavelength of PAR (Photosynthetically active radiation) varies from
a) 40 - 70 nm b) 400 - 700 nm c) 400 - 700 A˚ d) 40 - 70 A˚

111. Electron from excited chlorophyll molecule of photosystem II are accepted first by
a) Quinone b) Ferredoxin c) Cytochrome - b d) Cytochrome -f

112. Chlorophyll-a occurs in____
a) all photosynthetic autotrophs b) in all higher plants c) all oxygen liberating autotrophs
d) all plants except fungi

113. The essential element required for water splitting in photosynthesis leading to oxygen evolution is
a) Mo b) Mn c) Mg d) K

114. Quality of light refers to
a) intensity of light b) frequency of light c) wavelength of light d) duration of light.

115. Water soluble pigments found in plant cell vacuoles are____
a) Xanthophylls b) Chlorophylls c) Carotenoids d) Anthocyanins

116. $CO_2$ combines with RuBP in the presence of enzyme RuBisCO to form 3-PGA. This process of Calvin cycle is included under
a) carboxylation b) oxygenation c) reduction d) regeneration

117. Translocation of carbohydrate nutrients usually occurs in the form of_____
a) glucose b) maltose c) starch d) sucrose

118. Absorption spectrum of chl a shows maximum absorption in_____ and_____ regions of light.
a) blue and green b) blue and red c) red and green d) red and far red

119. Stroma in the chloroplasts of higher plants contain
a) Chlorophyll b) Light dependent reaction enzymes
c) Light independent reaction enzymes d) Ribosomes

120. A point at which illuminated plant parts stop absorbing $CO_2$ from their environment, is known as

a) $CO_2$ compensation point b) $CO_2$ saturation point c) $CO_2$ optimum point
d) $CO_2$ limiting point

121. The process which makes major difference between C3 and C4 plants is
a) Respiration b) Glycolysis c) Calvin cycle d) Photorespiration

122. Which enzyme is most abundantly found on earth?
a) Catalase b) RuBisCO c) Nitrogenase d) Invertase

123. $C_4$ - cycle was discovered by___
a) Hatch and Slack b) Calvin c) Hill d) Arnon

124. How many number of $CO_2$ molecules are required to synthesise one molecule of glucose during $C_3$ cycle?
a) One b) Three c) Six d) Five

125. During non-cyclic photophosphorylation, electrons are continuously lost from the reaction centre of PS II. Which source is used to replace these electrons?
a) Sunlight b) $O_2$ c) $H_2O$ d) $CO_2$

126. PS II is located on
a) inner side of thylakoid membrane b) outer side of thylakoid membrane
c) lumen of thylakoid membrane d) stroma lamellae.

127. The reaction that is responsible for the primary fixation of $CO_2$ is catalysed by:
a) RuBP carboxylase b) PEP carboxylase c) RuBP carboxylase and PEP carboxylase
d) PGA synthase.

128. Emerson's enhancement effect and Red drop have been instrumental in the discovery of :
a) Oxidative phosphorylation b) Photophosphorylation and non-cyclic electron transport
c) Two photo systems operating simultaneously
d) Photophosphorylation and cyclic electron transport

129. The 'law of limiting factors' was given by_____ in the year_____.
a) Blackman, 1905 b) Blackman, 1804 c) Engelmann, 1909 d) Warburg, 1920

130. Which light range is least effective in photosynthesis?
a) Blue b) Green c) Red d) Violet

131. Which range of wavelength (in nm) is called photosynthetically active radiation (PAR)?
a) 100-390 b) 390-430 c) 400-700 d) 760-10,000

132. In cyclic photophosphorylation, the electron released by reaction centre ($P_{700}$) is ultimately accepted by
a) ferredoxin b) $NADP^+$ c) reaction centre ($P_{700}$) d) plastocyanin

133. Visible part of electromagnetic spectrum consists of radiations having a wavelength in the range of
a) 400-800 nm b) 300-2600 nm c) 390-760 nm d) 650-760 nm

134. For $NADPH^+ H^+$ formation:
a) only PS I is required b) only PS II is required c) both PS I and PS II are required
d) only stroma is required

135. The 'Red - drop' phenomenon is due to the distribution of the photo chemical activity of
a) PS-I b) PS-I & PS-II both c) PS-II d) Carotenoids

136. Process that makes important difference, between $C_3$ and $C_4$ plants is _____ .
a) Transpiration b) Glycolysis c) Photosynthesis d) photorespiration

137. Dark reaction in photosynthesis is called so because
a) it can occur in dark also b) it does not directly depend on light energy
c) it cannot occur during day light d) it occurs more rapidly at night.

138. In light reaction, plastoquinone facilitates the transfer of electrons from_____
a) PS-I to NADP+ b) PS-I to ATP synthase c) PS-II to Cytb6f complex
d) Cytb-6complex to PS-I

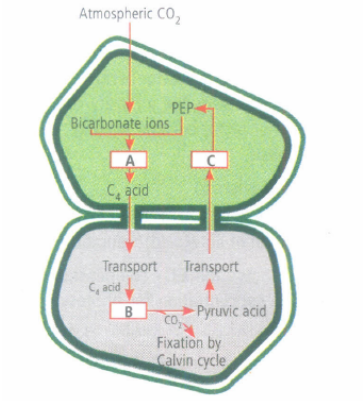
139. The enzyme RuBisCO has
a) more affinity for $CO_2$, than for $O_2$ b) more affinity for $O_2$, than for $CO_2$
c) equal affinity for both d) more affinity for sugars, than for $CO_2$.

140. Which one of the following ions is essential for photolysis of water?
a) Manganese b) Zinc c) Copper d) Boron

141. The $C_4$ plants are photosynthetically more efficient than $C_3$ plants because_____
a) the $CO_2$ compensation point is more
b) $CO_2$ generated during photorespiration is trapped and recycled through PEP carboxylase
c) the $CO_2$ efflux is not Prevented d) they have more chloroplasts

142. Indigo and red regions of VIBGYOR, respectively fall in the range of wavelength
a) 430-470 nm and 660-760 nm b) 300-390 nm and 600-650 nm
c) 390-760 nm and 430-470 nm d) 660-760 nm and 430-470 nm.

143. Given figure represents C4 pathway. Select the suitable options for A, B and C.




a)

| A | B | C |
|---|---|---|
| Decarboxylation | Reduction | Regeneration |

b)

| A | B | C |
|---|---|---|
| Fixation | Transamination | Regeneration |

c)

| A | B | C |
|---|---|---|
| Carboxylation | Decarboxylation | Reduction |

d)

| A | B | C |
|---|---|---|
| Fixation | Decarboxylation | Regeneration |

144. In the leaves of $C_4$ plants, malic acid formation during $CO_2$ fixation occurs in the cells of_____
a) bundle sheath b) Phloem c) epidermis d) mesophyll

145. How many quanta are required to reduce one molecule of $CO_2$ and produce one molecule of $O_2$ in green plant photosynthesis?
a) 1 b) 8 c) 16 d) 32

146. The process of photo-phosphorylation take place in
a) Cell-wall b) Chloroplast c) Ribosomes d) Mitochondria

147. Wnicn of the following is not a product of light reaction of photosynthesis?
a) NADPH b) NADH c) ATP d) Oxygen

148. Which of the following equations holds true for acidification reactions of CAM pathway?
a) $PEP + CO_2 + H_2O \xrightarrow{PEP\ case} OAA + H_3PO_4$
b) $OAA + NADH \xrightarrow{Dehydrogenase} Malic\ acid + NAD^+$
c) $Malic\ acid + NADP^+ \xrightarrow[enzyme]{Malic} Pyruvic\ acid + CO + NADPH$ d) Both (a) and (b)

149. Cyclic photophosphorylation results in the formation of
a) ATP and NADPH b) NADPH and O2 c) NADPH d) ATP

150. Phospho enol Pyrurate (PEP) is the primary CO2 acceptor in:
a) C3 plants b) C4 plants c) C2 plants d) C3 and C4 plants

151. Consider the following statements regarding starch and sucrose synthesis during day time and select the correct ones.
(i) Triose phosphate is confined to chloroplast and is utilised for the synthesis of starch only.
(ii) Triose phosphate is translocated to cytosol from chloroplast.
(iii) Triose phosphate is utilised for the synthesis of both starch and sucrose.
(iv) Triose phosphate is translocated from cytosol to chloroplas
a) (i) and (iii) b) (ii) and (iii) c) (ii) and (iv) d) (iii) and (iv)

152. Which pigment system donates $e^-$ for the reduction of NADP
a) PS II b) PS I c) $CO_2$ d) Plastoquinone

153. $NADP^+$ is reduced to NADPH in____
a) PS - I b) PS - II c) Calvin cycle d) Non-cyclic photophosphorylation

154. The correct sequence of flow of electrons in the light reaction is
a) PSII, plastoquinone, cytochromes, PSI, ferredoxin
b) PSI, plastoquinone, cytochromes, PSII, ferredoxin c) PSI, ferredoxin, PSII
d) PSI, plastoquinone, cytochromes, PSII, ferredoxin.

155. To reduce 1 $CO_2$ in $C_3$ cycle, assimilatory power neede is
a) 3ATP, $2NADPH_2$ b) 2 ATP, 3 $NADPH_2$ c) 5 ATP, $2NADPH_2$ d) 6 ATP, $2NADPH_2$

156. During monsoon, the rice crop of Eastern states of India shows lesser yield due to limiting factor of_____
a) $CO_2$ b) light c) temperature d) water

157. During high light intensity, the chloroplasts align themselves
a) in vertical position along lateral walls b) along tangential walls
c) in centre and get scattered d) perpendicular to light.

158. Reaction centre of PSI is_____and reaction centre of PS II is _____.
a) P680, $P_{700}$ b) $P_{700}$, $P_{680}$ c) $P_{800}$, $P_{600}$ d) $P_{700}$, $P_{900}$

159. Which of the following statements is incorrect regarding the Calvin cycle of $C_3$ plants?
a) First stable product of Calvin cycle in $C_3$ plants is 3-Phosphoglyceric acid.
b) Sunflower is an example of $C_3$ plants.
c) Calvin cycleoccurs in bundle sheath cells of $C_3$ plants.
d) Enzyme PEPcase is absent in $C_3$ plants.

160. Red colour of tomatoes, carrots and chilies is due to the presence of a type of carotene pigment called as
a) lutein b) lycopene c) fucoxanthin d) phycoerythrin

161. Select the incorrect statement as far as kranz anatomy is concerned.
a) Undifferentiated mesophyll occurs in concentric layers around vascular bundles.
b) Centrifugal chloroplasts are present in bundle sheath cells.
c)
Large sized bundle sheath cells are arranged in a wreath-like manner in one to several layers
d) Chloroplasts of bundle sheath cells possess well developed grana lamellae

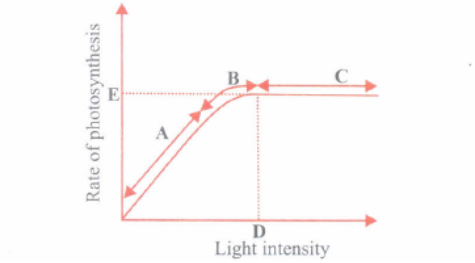
162. Photosynthetically active radiation is represented by the range of wavelength_____
a) 340 - 450nm b) 400 -700nm c) 500-600nm d) 400-950nm

163. Name the scientist, who first pointed out that plants purify foul air by bell jar experiment
a) Willstatter b) Robert Hooke c) Priestly d) lean Snebier

164. When temperature is increased from minimum to optimum, rate of photosynthesis doubles for every _____rise in temperature.
a) 1°C b) 10°C c) 20°C d) 30°C

165. Which one is involved in Z-scheme of photosynthesis?
a) PS I (b) b) PS II c) e carriers d) All of these

166. Study the given graph showing the effect of light intensity on the rate of photosynthesis. Which of the following statements regarding this is correct?




a) Light is a limiting factor in the region A.
b)
Region C represents that rate of photosynthesis is not increased further by increasing light intensity because some other factor became limiting.
c) Point D represents the intensity of light at which some other factor became limiting.
d) All of these

167. **Assertion:** Dark reactions are called biosynthetic phase of photosynthesis.
**Reason:** Dark reactions do not directly depend on the presence of light but are dependent on the products of the light reaction, i.e., ATP and NADPH.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false

168. **Assertion**: Photorespiration is a wasteful process.
**Reason:** In photorespiratory pathway, there is no synthesis of sugars or ATP.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

169. **Assertion:** In $C_4$ plants, photorespiration does not occur.
**Reason:** $C_4$ plants have a mechanism that increases the concentration of $CO_2$ at the enzyme site.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false d) If both assertion and reason are false.

170. The biochemical objective of PS I is to
a) oxidise NADPH b) hydrolyse ATP c) phosphorylate ADP d) reduce $NADP^+$.

171. The significance of light & chlorophyll in photosynthesis discovered by
a) Priestly b) Inegenhousz c) Englemann d) Blackman

172. Synthesis of complex organic substances from simple inorganic raw materials in the presence of sunlight and chlorophyll is called as _____, which is a _____ process.
a) photosynthesis, anabolic b) photosynthesis, catabolic c) respiration, anabolic
d) respiration, catabolic

173. NADPH is generated through____
a) photosystem-I b) photosystem-II c) anaerobic respiration d) glycolysis

174. A photosynthesising plant is releasing $^{18}O$ more than the normal. The plant must have been supplied with _____ .
a) $O_3$ b) $H_2O$ with $^{18}O$ c) $CO_2$ with $^{18}O$ d) $C_6H_2O_6$ with $^{18}O$

175. Kranz anatomy is not exhibited by which of the following plants?
a) Maize b) Sorghum c) Sugarcane d) Sunflower

176. Which pair is wrong
a) $C_3$ plant - maize b) Calvin cycle - PGA c) Hatch-Stack cycle - OAA
d) $C_4$ -plant Kranz Anatomy

177. When wheat and sugarcane leaves are fed with radioactive $^{14}CO_2$, in which molecule would the radioactivity appear first in these plants?

a)

| Wheat | Sugarcane |
|---|---|
| 3-Phosphoglycerate | Oxaloacetate |

b)

| Wheat | Sugarcane |
|---|---|
| 3-Phosphoglycerate | 3-Phosphoglycerate |

c)

| Wheat | Sugarcane |
|---|---|
| Oxaloacetate | Oxaloacetate |

d)

| Wheat | Sugarcane |
|---|---|
| Malate | 3-Phosphoglycerate |

178. **Assertion:** Chloroplasts occur inside the leaves mostly in mesophyll cells along their walls.
**Reason:** The membrane system of chloroplast is responsible for trapping the light energy and also for the synthesis of ATP and NADPH.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

179. The Z scheme of photophosphorylation follows the following sequence:
$$PS \quad II \underset{A}{\rightarrow} e^{-} acceptor \underset{B}{\rightarrow} ETS \underset{B}{\rightarrow} PS \quad I \underset{C}{\rightarrow} e^{-} acceptor \underset{D}{\rightarrow} NADP^{+}$$
Which of the following options is correct for A, B, C and D transfer of electrons?
a)

| A | B | C | D |
|---|---|---|---|
| Uphill | Downhill | Uphill | Downhill |

b)

| A | B | C | D |
|---|---|---|---|
| Downhill | Uphill | Downhill | Uphill |

c)

| A | B | C | D |
|---|---|---|---|
| Downhill | Uphill | Uphill | Downhill |

d)

| A | B | C | D |
|---|---|---|---|
| Uphill | Downhill | Downhill | Uphill |

180. In an experiment in which photosynthesis is performed during the day, you provide a plant with radioactive carbon dioxide ($^{14}CO_2$) as a metabolic tracer. The $^{14}C$ is incorporated first into oxaloacetic acid. The plant is best characterised as a
a) CAM plant b) insectivorous plant. c) $C_4$ plant d) $C_3$ plant

181. Refer to the given reaction.
$2H_2O \longrightarrow 4H^+ + O_2 + 4e^-$
Where does this reaction take place in the chloroplasts of plants?
a) Outer surface of thylakoid membrane b) Inner surface of thylakoid membrane
c) In the matrix (stroma) d) Intermembrane space

182. In leaves of $C_4$ plants, malic acid synthesis during $CO_2$ fixation occurs in
a) Bundle sheath b) Gauard cells c) Epidermal cells d) Mesophyll cells

183. _____is the process of synthesis of ATP from ADP and Pi in the presence of light.
a) Phosphorylation b) Photophosphorylation c) Photosystem
d) Oxidative phosphorylation

184. Warburg effect refers to
a) decreased photosynthetic rate at very high $O_2$ concentration
b) increased photosynthetic rate at very high $O_2$ concentration

c) decreased photosynthetic rate at very low $O_2$ concentration

d) increased photosynthetic rate at very low $O_2$ concentration.

185. Accessory photosynthetic pigments in most green plants are

a) chlorophyll a b) chlorophyll b c) carotenoids and xanthophylls d) both (b) and (c).

186. Which one of the following is wrong in relation to photorespiration ?

a) It is a characteristic of $C_3$ plants. b) It occurs in chloroplasts.

c) It occurs in daytime only d) It is a characteristic of $C_4$ plants

187. Select the option which correctly depicts the functions of parts X, Y and Z.

a)

| X | Y | Z |
|---|---|---|
| Dark reaction | Light reaction | Cytoplasmic inheritance |

b)

| X | Y | Z |
|---|---|---|
| Light reaction | Carbohydrate synthesi | Carbohydrate storage |

c)

| X | Y | Z |
|---|---|---|
| Light reaction | Carbohydrate storage | Carbohydrate synthesis |

d)

| X | Y | Z |
|---|---|---|
| Carbohydrate synthesis | Carbohydrate storage | Cytoplasmic inheritance |

188. The correct sequence of cell organelles during photorespiration is_____

a) Chloroplast-Golgibodies-mitochondria

b) Chloroplast-Rough Encloplasmic reticulum. Dictyosomes

c) Chloroplast-peroxisome-mitochondria d) Chloroplast-vacuole-peroxisome

189. Consider following statements with respect to the $C_4$ pathway and select the correct ones.

(i) Mesophyll cells possess both RuBisCO and PEP case enzymes.

(ii) Initial $CO_2$ fixation occurs in mesophyll cells.

(iii) Final $CO_2$ fixation occurs in bundle sheath cells.

a) (i) and (ii) b) (ii) and (iii) c) (i) and (iii) d) (i), (ii) and (iii)

190. Breakdown of proton gradient developed during chemiosmosis leads to the release of

a) oxygen b) water c) energy d) protons

191. Select the option that correctly identifies X , Y and Z.

a)

| X | Y | Z |
|---|---|---|
| Stroma | Grana | Chloroplast DNA |

b)

| X | Y | Z |
|---|---|---|
| Stroma | Grana | Starch granule |

c)

| X | Y | Z |
|---|---|---|
| Grana | Stroma | Starch granule |

d)

| X | Y | Z |
|---|---|---|
| Grana | Stroma | Chloroplast DNA |

192. Photosynthetic pigments found in the chloroplasts occur in _____ .

a) thylakoid membranes b) plastoglobules c) matrix d) chloroplast envelope

193. Chromatophores take part in_____

a) Growth b) Movement c) Respiration d) photosynthesis

194. In $C_4$ pathway the fixation of $CO_2$ by PEPCase occurs in
a) Palisade tissue b) Mesophyll c) Bundle sheath d) Gaurd cell

195. Which fractions of the visible spectrum of solar radiations are primarily absorbed by carotenoids ofthe higher plants?
a) Violet and blue b) Blue and green c) Green and red d) Red and violet

196. Following table summarises the differences between light reactions and dark reactions.

| | **Light reactions** | **Dark reactions** |
|---|---|---|
| (i) | These are also called as biosynthetic phase | These are also called as photochemical |
| (ii) | These reactions occur over thylakoids. | These reactions occur in stroma of chloroplasts. |
| (iii) | These produce assimilatory power i.e; $NADPH_2$ and ATP | These consume $NADPH_2$ and ATP. |
| (iv) | These are directly dependent upon light. | These depend upon the products synthesised during light reactions |

Which of the above pairs of differences is/are incorrect?
a) (i) and (iv) b) (iii) and (iv) c) (ii) only d) (i) only

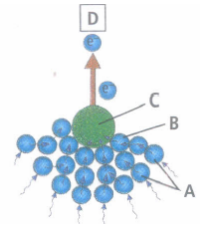
197. In $C_3$ plants, the first stable product of photosynthesis during the clark reaction is_____
a) Malic acid b) Oxaloacetic acid c) 3-phosphoglyceric acid d) Phospho glyceraldehyde

198. $CO_2$ is accepted by RUBP in $C_4$ plants in
a) Mesophyll cells b) Bundle sheath cell c) Stomatal gaurd cells d) Epidermal cells

199. Ferredoxin is a constituent of_____
a) PS - I b) PS - II c) Hill reaction d) $P_{680}$

200. Select the correct statement regarding the first stable product formed in Hatch and Slack pathway in $C_4$ plants.
a)
Oxaloacetate is formed by carboxylation of phosphoenol pyruvate (PEP) in the bundle sheath cells.
b)
Oxaloacetate is formed by carboxylation of phosphoenol pyruvate (PEP) in the mesophyll cells.
c) Phosphoglyceric acid is formed in the mesophyll cells.
d) Phosphoglyceric acid is formed in the bundle sheath cells.

201. Given figure depicts the light harvesting complex (LHC) of photosystem I (PS I).




Select the correct identification for A, B, C and D

a)

| A | B | C | D |
|---|---|---|---|
| Core molecules | Antenna molecule | $P_{680}$ | Primary eacceptor |

b)

| A | B | C | D |
|---|---|---|---|
| Antenna molecules | Core molecule | $P_{700}$ | Primary e- accepto |

c)

| A | B | C | D |
|---|---|---|---|
| Antenna molecules | Core | $P_{700}$ | Plastocyanin molecule |

d)

| A | B | C | D |
|---|---|---|---|
| Core molecules | Reaction center | $P_{680}$ | Plastocyanin |

202. Refer to the given reaction

$$RuBP + O_2 \xrightarrow[Oxygenase]{RuBP} \text{phosphoglyceric acid + Phosphoglycolic acid}$$

It is the first reaction of

a) $C_3$ pathway b) $C_4$ pathway c) $C_2$ pathway d) glycolysis

203. Who used prism, green alga Cladophora and aerobic bacteria and plotted the first action spectrum for photosynthesis?

a) Sachs b) Arnon c) Arnold d) Engelmann

204. A tadpole like configuration is found in

a) Chlorophyll b) Carotenoids c) Phycobilins d) Anthocyanin

205. Moll's half-leaf experiment proves that_____ is essential for photosynthesis to take place.

a) chlorophyll b) $CO_2$ c) light d) $H_2O$

206. Chlorophyll-a molecule at its carbon atorn 3 of the pyrrole ring-II has one of the following_____

a) aldehyde group b) methyl group c) carboxyl group d) magnesium

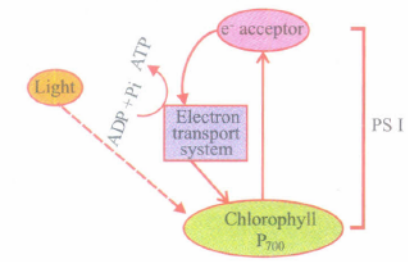
207. If the total incident solar radiation the proportion of PAR is:

a) About 60% b) Less than 50% c) More than 80% d) About 70%

208. Which is not a step in Calvin cycle?

a) Caboxylation b) Glycolytic reversal c) Regerneration d) Photophosphorylation

209. What does the given diagram represent with respect to the various photosynthetic processes?




a) $C_2$ cycle b) Cyclic photophosphorylation c) Non-cyclic photophosphorylation

d) Z -scheme of phosphorylation

210. **Assertion:** The first product of $CO_2$ fixation in $C_3$ pathway is OAA.
**Reason:** The first product of $CO_2$ fixation in $C_4$ pathway is PGA.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

211. Given table shows the $CO_2$ compensation point and optimum $CO_2$ concentration for photosynthesis for $C_3$ and $C_4$ plants.

| | **$C_3$ plants** | **$C_4$ plants** |
|---|---|---|
| $CO_2$ compensation point | 25-100 ppm | **A** |
| Optimum $CO_2$ concentration | **B** | 360 ppm |

Select the correct values for A and B

a)

| A | B |
|---|---|
| 0-50 ppm | 300 ppm |

b)

| A | B |
|---|---|
| 0-10 ppm | 450 ppm |

c)

| A | B |
|---|---|
| 100-150 ppm | 250 ppm |

d)

| A | B |
|---|---|
| 100-110 ppm | 290 ppm |

212. Which one of the following pigments does not occur in the chloroplast?
a) Carotene b) Xanthophyll c) Chlorophyll 'b' d) Anthocyanin

213. If green plant cells are incubated with 0'8 - labelled water, which of the following molecules will become radioactive when the cells are exposed to light?
a) $O_2$ b) $CO_2$ c) $H_2O$ d) Suga

214. Which metal ion is a constituent of chlorophyll?
a) Iron b) Copper c) Magnesium d) Zinc

215. Which of the following photosynthetic bacteria have both PS-I & PS-II?
a) Purple sulphur bacteria b) Cyanobacteria c) Purple non sulphur bacteria
d) Green sulphur bacteria

216. Study the following statements.
(i) Red light falling in the range of wavelength 660-760 nm is the most effective for photosynthesis.
(ii) Greenlight falling in the range of wavelength 500-580 nm is the least effective for photosynthesis.
(iii) Chl a, chl b, carotenes and xanthophylls are soluble in organic solvents.
(iv) Phycobilins (phycocyanin, allophycocyanin and phycoerythrin) are soluble in water.
Which of the above statements is/are incorrect?
a) (ii) and (iii) b) (iii) and (iv) c) (i) only d) None of these

217. During chemiosmotic synthesis of ATP, protons diffuse through $CF_0$ channels that activates ATPase enzyme. As a result, one molecule of ATP is formed when _____ passes through ATPase.
a) $4H^+$ b) $H^+$ c) $2H^+$ d) $6H^+$

218. Which technique has helped in investigation of Calvin cycle?
a) X-ray crystallography b) X-ray technique c) Radioactive isotope technique
d) Intermittent light

219. Photochemical phase does not include
a) light absorption b) water splitting and $O_2$ release c) ATP and NADPH formation
d) $CO_2$ fixation

220. Anoxygenic photosynthesis is characteristic of____
a) Rhodospirillum b) Spirogyra c) Chlamydomonas d) Ulva

221. **Assertion:** $C_3$ plants respond to increased $CO_2$ concentration by increasing rate of photosynthesis.
**Reason:** The higher productivity of some greenhouse crops such as tomatoes and bell pepper is due to increased $CO_2$ concentration.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

222. Which of the following factors, besides being one of the reactants in the process of photosynthesis, indirectly affects its rate?
a) Oxygen b) Carbon dioxide c) Water d) Chlorophyll

223. Yellowish colour of autumn foliage is due to the presence of a type of xanthophyll pigment called as
a) lutein b) lycopene c) fucoxanthin d) zeaxanthin

224. **Assertion:** The proton gradient is broken down due to the movement of protons across the membrane to stroma through the transmembrane channel of the $F_0$ of the ATPase.
**Reason:** The breakdown of proton gradient leads to release of energy.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false d) If both assertion and reason are false.

225. The oxygen evolved during photosynthesis comes from water molecules. Which one of the following pairs of elements is involved in this reaction?
a) Manganese and Potassium b) Magnesium and Molybdenum
c) Magnesium and Chlorine d) Manganese and Chlorine

226. During light reaction in photosynthesis the following are formed
a) ATP and sugar b) hydrogen, $O_2$ and sugar c) ATP, hydrogen donor and $O_2$
d) ATP, hydrogen and $O_2$ donor

227. Chemosynthetic bacteria obtain energy from
a) sun b) infra red ray c) organic chemicals. d) inorganic chemicals.

228. Stomatal movement is not affected by____
a) $O_2$ concentration b) Light c) Temperature d) $CO_2$ concentration

229. **Assertion:** The primary $CO_2$ acceptor in $C_4$ pathway is 3-carbon molecule phosphoenol pyruvate (PEP).
**Reason:** The enzyme responsible for this fixation is PEPcarboxylase or PEPcase.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

230. Read the given statements and select the correct option.
**Statement 1:** Crassulacean acid metabolism occurs in succulent plants which grow in xeric conditions.
**Statement 2:** Stomata are generally sunken in succulent plants.
a) Both statements 1 and 2 are correct.

b) Statement 1 is correct but statement 2 is incorrect.

c) Statement 1 is incorrect but statement 2 is correct.

d) Both statements 1 and 2 are incorrect.

231. In sugarcane plant $^{14}CO_2$ is fixed in malic acid, in which the enzyme that fixes $CO_2$ is _____ .
a) fructose phosphatase b) ribulose biphosphate carboxylase
c) Phosphoenol pyruvic acid carboxylase d) ribulose phosphate kinase

232. In a chloroplast the highest number of protons are found in_____
a) stroma b) lumen of thylakoids c) inter membrane space d) antennae complex

233. Pigment acting as a reaction centre during photosynthesis is_____
a) carotene b) phyochrome c) $P_{700}$ d) cytochrome

234. The most common limiting factor for photosynthesis is
a) $CO_2$ b) $O_2$ c) $H_2O$ d) Temperature

235. During photorespiration, the oxygen consuming reaction(s) occur in_____
a) stroma of chloroplasts and peroxisomes b) grana of chloroplasts and peroxisomes
c) stroma of chloroplasts d) stroma of chloroplasts and mitochondria

236. The first acceptor of electrons from an excited chlorophyll molecule of photosystem II is___
a) iron-sulphur protein b) ferredoxin c) quinone d) cytochrome

237. **Assertion:** The stroma lamellae have both PS I and PS II
**Reason:** The grana lamellae lack PSII as well as NADP reductase enzyme.
a) If both assertion and reason are true and reason is the correct explanation of assertion.

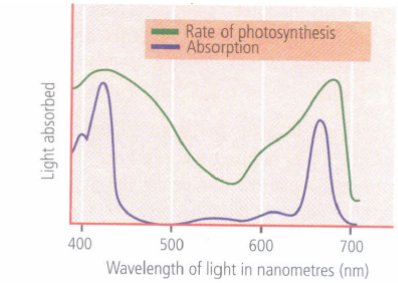
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false

238. If green plant cells are incubated with $O^{18}$-labelled $CO_2$, which of the following molecules will become radioactive when the cells are exposed to light?
a) ATP b) Water c) Sugar d) $O_2$

239. Who demonstrated that green plants purify the foul air produced by breathing animals and burning candles?
a) Priestley b) Ingenhousz c) Sachs d) Engelmann

240. Consider the above given figure and select the option that can be best concluded from it.




a)
The action spectrum shows a graphic representation of amount of light of different wavelengths absorbed by a pigment.
b)
Absorption spectrum depicts the relative rates of photosynthesis at different wavelengths of light.
c) Action spectrum corresponds closely to absorption spectra of chi a. d) None of these

241. Which one occurs both during cyclic and non-cyclic modes of photophosphorylation?
a) Involvement of both PS-I and PS-II b) Formation of ATP c) Release of $O_2$
d) Formation of NADPH

242. Which one is a $C_4$ - plant?
a) Papaya b) Pea c) Potato d) Maize/Com

243. Which one of the following is represented by Calvin cycle?
a) Reductive carboxylation b) Oxidative carboxylation c) Photophosphorylation
d) Oxidative phosphorylation

244. Tropical plants have a_____ temperature optimum than the plants adapted to temperate climates.
a) lower b) equal c) higher d) none of these

245. The enzyme that is not found in a $C_3$ plant is
a) RuBP carboxylase b) PEP carboxylase c) NADP reductase d) ATP synthase.

246. The herbicide DCMU kills the weeds because it inhibits
a) respiration b) $CO_2$ fixation c) cell division d) $NO_3^{2-}$ uptake

247. During $C_2$ cycle, there occurs
a) synthesis of sugars b) utilisation of ATP c) synthesis of ATP d) synthesis of NADPH.

248. Read the given statements and select the correct option.
**Statement 1:** In photosynthesis, during ATP synthesis, protons accumulate in the lumen of thylakoid.
**Statement 2:** In respiration, during ATP synthesis, protons accumulate in the intermembranal space of mitochondria.
a) Both statements 1 and 2 are correct.
b) Statement 1 is correct but statement 2 is incorrect.
c) Statement 1 is incorrect but statement 2 is correct.
d) Both statements 1 and 2 are incorrect

249. During Z scheme, electrons excited by absorption of light in PSI are transferred to the primary acceptors, and therefore must be replaced. The replacements come directly from
a) NADP b) ATP c) PS II d) water