



**11**  
**CHAPTER**

## BIOENERGETICS

1. The quantitative study of energy relationship in the biological system is called:  
(A) Biochemistry (B) Biotechnology  
(C) Bioenergetics (D) Biophysics
2. Which of the following processes is not oxidation reduction reaction?  
(A) Photosynthesis (B) Respiration  
(C) Photorespiration (D) None of above
3. The compensation point comes in the:  
(A) Morning (B) Evening  
(C) Dawn (D) Night
4. The biologist who gave the hypothesis that plant spilt water and release water was:  
(A) Calvin (B) Krebs  
(C) Van Neil (D) Dixon
5. Which of the following is electron acceptor during light reaction of photosynthesis?  
(A) NAD (B) FAD  
(C) NADP (D) NADPH
6. Chlorophyll is present in:  
(A) Stroma (B) Thylakoids  
(C) Granum (D) Intergranum
7. Which of the followings is not the wavelength of visible light?  
(A) 280 nm (B) 380 nm  
(C) 180 nm (D) 580 nm

8. Which of the followings is not the wavelength of visible light?
- (A) Carotenoids (B) Carotenes  
(C) Xanthophylls (D) None of the above
9. Which of the following chlorophylls is present in bacteria?
- (A) a (B) b  
(C) c (D) None of the above
10. Which of the following wavelengths is least absorbed by the chlorophyll?
- (A) Red (B) Blue  
(C) Green (D) Orange
11. Match haem group of haemoglobin with one of the following:
- (A) Chlorophyll (B) Chloroplast  
(C) Porphyrin ring (D) Pyrrole
12. Which of the followings is the smallest unit?
- (A) Chlorophyll (B) Phytol  
(C) Porphyrin ring (D) Pyrrole
13. Which of the followings is tail of the chlorophyll molecule b?
- (A) Chlorophyll (B) Phytol  
(C) Porphyrin ring (D) Pyrrole
14. How many atoms of oxygen are present in chlorophyll b?
- (A) 2 (B) 4  
(C) 6 (D) 8
15. Which of the followings is not the accessory pigment?
- (A) Chlorophyll a (B) Chlorophyll b  
(C) Carotene (D) Xanthophylls
16. First action spectrum was obtained by:
- (A) Calvin (B) Krebs  
(C) Van Neil (D) Engelmann

17. The percentage of photosynthesis in land plants is:  
(A) 5% (B) 10%  
(C) 15% (D) 20%
18. The reduction of which of the following molecules takes place during photosynthesis?  
(A) Water (B) Carbon dioxide  
(C) Glucose (D) Oxygen
19. The oxidation of which of the following molecules takes place during photosynthesis?  
(A) Water (B) Carbon dioxide  
(C) Glucose (D) Oxygen
20. Which of the following components of the photo system has chlorophyll b molecules?  
(A) Antenna complex (B) Reaction center  
(C) Primary electron acceptor (D) ETC
21. Photosystem I absorbs which of the following lights?  
(A) 600 nm (B) 680 nm  
(C) 700 nm (D) 720 nm
22. Photosystem II absorbs which of the following lights?  
(A) 600 nm (B) 680 nm  
(C) 700 nm (D) 720 nm
23. The splitting of water and release of oxygen during light reaction is called:  
(A) Hydrolysis (B) Photolysis  
(C) Oxidation (D) Reduction
24. The synthesis of ATP during light reaction is called:  
(A) Oxidative phosphorylation (B) Photophosphorylation  
(C) Substrate phosphorylation (D) None of the above
25. Which of the following electron acceptors is absent during cyclic phosphorylation?  
(A) Cytochromes (B) Ferredoxin  
(C) NADP (D) PC

26. Which of the following mechanism is involved in the synthesis of ATP?
- (A) Reduction (B) Oxidation  
(C) Chemiosmosis (D) None of above
27. Which of the followings is irrelevant?
- (A) Calvin cycle (B) Dark reaction  
(C) Light reaction (D) C<sub>3</sub> pathway
28. Match rubisco with one of the followings:
- (A) RUBP (B) RBP  
(C) RUBP carboxylase (D) RUBP reductase
29. Which of the following is the end product of calvin cycle?
- (A) Glucose (B) PGA  
(C) G3P (D) Strach
30. The G3P molecules formed during Calvin cycle are:
- (A) 3 (B) 4  
(C) 5 (D) 6
31. The carbon dioxide acceptor during dark reaction is:
- (A) Glucose (B) RuBP  
(C) PGA (D) Rubisco
32. Which of the following compounds is formed during anaerobic reaction?
- (A) Pyruvic acid (B) Lactic acid  
(C) Ethyl alcohol (D) None of above
33. Which of the following compounds is formed during aerobic reaction?
- (A) Pyruvic acid (B) Lactic acid  
(C) Ethyl alcohol (D) None of above
34. How much Glucose is converted into ATP during anaerobic reaction?
- (A) 1% (B) 2%  
(C) 3% (D) 4%

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44. **Respiratory chain is present in:**  
(A) Cytosol (B) Matrix of mitochondria  
(C) Inner membrane (D) Outer membrane of mitochondria
45. **During respiratory chain, coenzyme Q is reduced by:**  
(A) Cytochrome a (B) Cytochrome b  
(C) Cytochrome c (D) Cytochrome a<sub>3</sub>
46. **Which of the following electron acceptors is oxidized by an atom of oxygen?**  
(A) Cytochrome a (B) Cytochrome b  
(C) Cytochrome c (D) Cytochrome a<sub>3</sub>
47. **The number of ATPs produced during transfer of electron from NADH to oxygen is:**  
(A) 1 (B) 2  
(C) 3 (D) 4
48. **The energy capturing process is:**  
(A) Photosynthesis (B) Respiration  
(C) Metabolism (D) Bioenergetics
49. **The energy releasing process is:**  
(A) Photosynthesis (B) Respiration  
(C) Metabolism (D) Bioenergetics
50. **The biological energy transformation is called:**  
(A) Photosynthesis (B) Respiration  
(C) Metabolism (D) Bioenergetics
51. **Which of the followings is not reactant in photosynthesis?**  
(A) CO<sub>2</sub> (B) Water  
(C) Light (D) Oxygen
52. **Which of the following is the most important factor for photosynthesis?**  
(A) CO<sub>2</sub> (B) Water  
(C) Light (D) Oxygen

53. **The difference between photosynthesis and respiration is:**
- (A) Photosynthesis occurs at day time while respiration take place at night
  - (B) Photosynthesis and respiration both occurs at daytime
  - (C) Photosynthesis occurs at day while respiration occur day and night
  - (D) None of the above
54. **The compensation point is a point when:**
- (A) Intake of oxygen but not carbon dioxide
  - (B) Intake of carbon dioxide but not oxygen
  - (C) Intake of both oxygen and carbon dioxide
  - (D) None of the gases is taken inside
55. **When does the rate of photosynthesis and respiration become equal?**
- (A) During day time
  - (B) During night
  - (C) At dawn
  - (D) In the morning
56. **The source of oxygen during photosynthesis is:**
- (A) Carbon dioxide
  - (B) Water
  - (C) Glucose
  - (D) Light
57. **During the isotope tracer technique one group of plants was given  $\text{H}_2\text{O}$  containing  $\text{O}_{18}$  with  $\text{CO}_2$  containing common oxygen  $\text{O}_{16}$ . The oxygen released during photosynthesis would be:**
- (A) Radioactive
  - (B) Not radioactive
  - (C) Some amount radioactive some none-radioactive
  - (D) None of the above
58. **During the isotope tracer technique second group of plant was given  $\text{H}_2\text{O}$  containing common oxygen with  $\text{CO}_2$  containing  $\text{O}_{18}$ . The oxygen released during photosynthesis would be:**
- (A) Radioactive
  - (B) Not radioactive
  - (C) Some amount radioactive some non-radioactive
  - (D) None of the above

59. A reducing agent is that compound which:
- (A) Can remove electron from another compound
  - (B) Can add electron into another electron
  - (C) Can absorb electron from another compound
  - (D) None of the above
60. The  $\text{NADPH}_2$  has:
- (A) Oxidizing power
  - (B) Reducing power
  - (C) Redox power
  - (D) None of above
61. Most of the photosynthetic enzymes are present in:
- (A) Stroma of chloroplast
  - (B) Thylakoids of chloroplast
  - (C) Granum of chloroplast
  - (D) Chlorophyll
62. Chlorophylls are present in the:
- (A) Stroma of chloroplast
  - (B) Thylakoids of chloroplast
  - (C) Granum of chloroplast
  - (D) Intergranum
63. Chemiosmosis during photosynthesis takes place in:
- (A) Stroma of chloroplast
  - (B) Thylakoid membranes of chloroplast
  - (C) Granum of chloroplast
  - (D) Intergranum
64. In prokaryotes chlorophylls is present in the:
- (A) Stroma of chloroplast
  - (B) Thylakoid membranes of chloroplast
  - (C) Granum of chloroplast
  - (D) Photosynthetic membranes
65. The pigment with red colour is:
- (A) Carotenoids
  - (B) Carotenes
  - (C) Xanthophylls
  - (D) Chlorophyll
66. The pigment with yellow colour is:
- (A) Carotenoids
  - (B) Carotenes
  - (C) Xanthophylls
  - (D) Chlorophyll
67. which of the following wavelengths is least absorb by chlorophyll?
- (A) Red
  - (B) Green
  - (C) Yellow
  - (D) Blue

68. Which of the followings is maximum absorbed by chlorophyll?  
(A) Red (B) Green  
(C) Yellow (D) Blue
69. The plants appear green because:  
(A) They absorb green light  
(B) They do not absorb green light  
(C) The chlorophyll has originally green colour  
(D) None of the above
70. The leaves of the plants become yellow due to deficiency of:  
(A) Magnesium (B) Iron  
(C) Sodium (D) Potassium
71. Which of the followings take part directly in the photosynthetic reactions?  
(A) Chlorophyll a (B) Chlorophyll b  
(C) Chlorophyll c (D) Chlorophyll d
72. Which of the followings is not an accessory pigment?  
(A) Chlorophyll a (B) Chlorophyll b  
(C) Carotenes (D) Xanthophylls
73. The absorption spectrum of light is maximum in the wavelength of:  
(A) 430 and 670 nm (B) 330 and 660 nm  
(C) 430 and 690 nm (D) 550 and 580 nm
74. The peaks of the action spectrum of photosynthesis are comparatively broader than the absorption spectrum of chlorophylls due to:  
(A) Chlorophyll a (B) Chlorophyll b  
(C) Accessory pigment (D) None of the above
75. The photosynthesis carried out by the terrestrial plants is:  
(A) 5% of the total photosynthesis (B) 10% of the total photosynthesis  
(C) 15% of the total photosynthesis (D) 20 % of the total photosynthesis
76. The photosynthesis carried out by the aquatic plants is:  
(A) 70% of the total photosynthesis (B) 80% of the total photosynthesis  
(C) 90% of the total photosynthesis (D) None of the above

77. **Air contains carbon dioxide about:**  
(A) 0.03 to 0.04% (B) 0.02 to 0.03%  
(C) 0.03 to 0.05% (D) None of above
78. **CO<sub>2</sub> is converted into sugar. This CO<sub>2</sub> is:**  
(A) Reduced (B) Oxidized  
(C) Both (A) and (B) (D) None of above
79. **ATP is synthesized during chemiosmosis in:**  
(A) Antenna complex (B) Reaction centre  
(C) Primary electron acceptor (D) Electron transport chain
80. **Cyclic phosphorylation starts when:**  
(A) There is less amount of glucose (B) There is less amount of NADH  
(C) There is less amount of ATP (D) None of the above
81. **Which of the following processes does not take place during chemiosmosis?**  
(A) Synthesis of NADH  
(B) Movement of H\* through electron transport chain  
(C) Synthesis of ATP  
(D) Movement of through ATP
82. **Rubisco is:**  
(A) Compound used during dark reaction  
(B) It is an electron acceptor  
(C) A coenzyme  
(D) An enzyme
83. **Which of the followings is common in aerobic anaerobic respiration?**  
(A) Glycolysis (B) Krebs cycle  
(C) Electron transport chain (D) Pyruvic acid oxidation
84. **Which of the following reactions does not take place in animals?**  
(A) Glycolysis (B) Lactic acid fermentation  
(C) Alcoholic fermentation (D) Krebs cycle
85. **Which of the following reactions take place during fatigue in the muscle of man?**  
(A) Glycolysis (B) Lactic acid fermentation  
(C) Alcoholic fermentation (D) Krebs cycle

86. In which reaction free energy is not required?
- (A) Respiration (B) Photosynthesis  
(C) Fermentation (D) None of above
87. Which of the following processes takes place in the presence and absence of oxygen?
- (A) Glycolysis (B) Lactic acid fermentation  
(C) Alcoholic fermentation (D) Krebs cycle
88. Which of the following reaction is included in the oxidative phase of glycolysis?
- (A) Glucose + ATP (B) Fructose + ATP  
(C) PAGL 6NAD (D) None of above
89. How many net ATPs are produced during glycolysis?
- (A) 2 (B) 3  
(C) 4 (D) 5
90. During oxidation of which electron acceptor, ATP is not produced:
- (A) Coenzyme Q (B) Cytochrome b  
(C) Cytochrome c (D) Cytochrome a and a<sub>3</sub>
91. Co-enzyme Q is in turn oxidized by cytochrome:
- (A) a<sub>3</sub> (B) a  
(C) b (D) a
92. Glycolysis is the break down of:
- (A) Maltose (B) Lactose  
(C) Fructose (D) Glucose
93. The power house of the cell is:
- (A) Ribosome (B) Mitochondria  
(C) SER (D) RER
94. Carbon fixation refers to the initial incorporation of:
- (A) Oxygen (B) Hydrogen  
(C) CO<sub>2</sub> (D) Carbon
95. The mechanism for ATP synthesis is:
- (A) Phosphorylation (B) Photosynthesis  
(C) Chemosmosis (D) Chemosynthesis

96. **Carbon dioxide enters the leaves through:**  
(A) Stroma (B) Cuticle  
(C) Guard cells (D) Stomata
97. **Haeme portion of haemoglobin contains:**  
(A) Carbon atom (B) Iron atom  
(C) Phosphorous atom (D) Magnesium atom
98. **Chlorophyll absorbs light energy, which is converted into chemical energy of:**  
(A) ATP (B) ATP & NADPH  
(C) NADPH (D) None
99. **Chlorophyll b is found alongwith chlorophyll a in all green plants and:**  
(A) Golden algae (B) Blue green algae  
(C) Algae (D) Green algae
100. **Pyruvic acid is the end product of:**  
(A) None (B) Electron transport chain  
(C) Glycolysis (D) Krebs cycle
101. **Stroma is fluid in the chloroplast which surrounds the:**  
(A) Thylakoids (B) Grana  
(C) Matrix (D) Envelop
102. **Which is a kind of chemical link between catabolism and anabolism?**  
(A) Double (B) ATP  
(C) CO<sub>2</sub> (D) Grana
103. **Van Niel hypothesized that plants split water as a source of:**  
(A) Oxygen (B) ATP  
(C) Hydrogen (D) Both A and C
104. **Chloroplast has ————— membrane envelop.**  
(A) No (B) single  
(C) Hydrogen (D) Double
105. **Thylakoid sacs are stacked in columns called:**  
(A) Double (B) CO<sub>2</sub>  
(C) Grana (D) ATP

106. Conventionally "P" in ATP stands for:
- (A) ATP molecule (B) 7.3 Kcal energy stored in it  
(C) Entire phosphate group (D) All these
107. Visible light ranges from about 380 to how many nm in wavelength?
- (A) 755 (B) 745  
(C) 750 (D) 760
108. Air contains 0.03 – 0.04 % of:
- (A) Oxygen (B) Nitrogen  
(C) H<sub>2</sub>O (D) CO<sub>2</sub>
109. Each \_\_\_\_\_ consist of light gathering antenna complex and a reaction center.
- (A) Grana (B) Stroma  
(C) Photo system (D) ATP
110. Dark reactions take place in the \_\_\_\_\_ of chloroplast.
- (A) ATP (B) Yellow  
(C) Stroma (D) CO<sub>2</sub>
111. Oxygen released during photosynthesis comes from:
- (A) Radioactive isotop (B) water  
(C) Air (D) Lumen
112. Water containing O<sup>18</sup>:
- (A) Water (B) Radioactive  
(C) Photosystem (D) Cyclic electron flow
113. Thylakoid interior space:
- (A) Water (B) Cyclic electron flow  
(C) Photosystem (D) Lumen
114. Photosynthetic pigments are organized into clusters:
- (A) Lumen (B) Radioactive  
(C) Water (D) Photosystem
115. Photo excited electrons take an alternative path:
- (A) Cyclic electron flow (B) Radioactive  
(C) Water (D) Lumen

**116. Pyruvic acid:**

- (A) Radioactive
- (B) Mitochondria
- (C) Photon
- (D) End product of glycolysis

**117. Light behaves as wave as well as particles:**

- (A) Photon
- (B) 7.3 k.Cal.
- (C) Mitochondria
- (D) Pyruvate

**118. Cristae:**

- (A) 7.3 k.Cal
- (B) End product of glycolysis
- (C) Mitochondria
- (D) Pyruvate

**119. Break down of terminal phosphate of ATP:**

- (A) Pyruvate
- (B) End product of glycolysis
- (C) 7.3 k.Cal
- (D) Photon

**120. Acetyl-CoA:**

- (A) Mitochondria
- (B) Photon
- (C) End product of glycolysis
- (D) Pyruvate

**121. Photosynthetic prokaryotes:**

- (A) Muscle cells of humans
- (B) Internal clock located in the guard cells
- (C) End product of glycolysis
- (D) Unstacked photosynthetic membrane

**122. Daily Rhythmic opening and closing of stomata:**

- (A) Internal clock located in the guard cells
- (B) Unstacked photosynthetic membrane
- (C) Muscle cells of humans
- (D) Laws of thermodynamics

**123. Lactic acid form of anaerobic respiration:**

- (A) Laws of thermodynamics
- (B) Unstacked photosynthetic membrane
- (C) Internal clock located in the guard cells
- (D) Muscle cells of humans

**124. Biological energy transformation:**

- (A) Electron transport intermediate
- (B) Muscle cells of humans
- (C) Laws of thermodynamics
- (D) Internal clock located in the guard cells

**125. Cytochromes:**

- (A) Unstacked photosynthetic membrane
- (B) Electron transport intermediate.
- (C) Laws of thermodynamics
- (D) Muscle cells of humans

# Answers

| Sr.  | Ans. | Sr.  | Ans. | Sr.  | Ans. | Sr.  | Ans. | Sr.  | Ans. |
|------|------|------|------|------|------|------|------|------|------|
| 1.   | (C)  | 2.   | (C)  | 3.   | (C)  | 4.   | (C)  | 5.   | (C)  |
| 6.   | (A)  | 7.   | (A)  | 8.   | (D)  | 9.   | (D)  | 10.  | (C)  |
| 11.  | (C)  | 12.  | (D)  | 13.  | (B)  | 14.  | (C)  | 15.  | (A)  |
| 16.  | (D)  | 17.  | (B)  | 18.  | (B)  | 19.  | (A)  | 20.  | (A)  |
| 21.  | (C)  | 22.  | (B)  | 23.  | (B)  | 24.  | (B)  | 25.  | (C)  |
| 26.  | (C)  | 27.  | (C)  | 28.  | (C)  | 29.  | (A)  | 30.  | (D)  |
| 31.  | (B)  | 32.  | (D)  | 33.  | (A)  | 34.  | (B)  | 35.  | (B)  |
| 36.  | (B)  | 37.  | (A)  | 38.  | (D)  | 39.  | (D)  | 40.  | (B)  |
| 41.  | (A)  | 42.  | (C)  | 43.  | (B)  | 44.  | (C)  | 45.  | (B)  |
| 46.  | (D)  | 47.  | (C)  | 48.  | (A)  | 49.  | (B)  | 50.  | (D)  |
| 51.  | (D)  | 52.  | (C)  | 53.  | (C)  | 54.  | (D)  | 55.  | (D)  |
| 56.  | (B)  | 57.  | (A)  | 58.  | (B)  | 59.  | (B)  | 60.  | (B)  |
| 61.  | (A)  | 62.  | (B)  | 63.  | (B)  | 64.  | (D)  | 65.  | (B)  |
| 66.  | (D)  | 67.  | (B)  | 68.  | (A)  | 69.  | (B)  | 70.  | (A)  |
| 71.  | (A)  | 72.  | (A)  | 73.  | (A)  | 74.  | (C)  | 75.  | (B)  |
| 76.  | (B)  | 77.  | (A)  | 78.  | (A)  | 79.  | (D)  | 80.  | (C)  |
| 81.  | (A)  | 82.  | (D)  | 83.  | (A)  | 84.  | (C)  | 85.  | (B)  |
| 86.  | (B)  | 87.  | (A)  | 88.  | (C)  | 89.  | (A)  | 90.  | (A)  |
| 91.  | (A)  | 92.  | (D)  | 93.  | (B)  | 94.  | (C)  | 95.  | (C)  |
| 96.  | (D)  | 97.  | (B)  | 98.  | (B)  | 99.  | (D)  | 100. | (C)  |
| 101. | (B)  | 102. | (B)  | 103. | (C)  | 104. | (D)  | 105. | (C)  |
| 106. | (C)  | 107. | (C)  | 108. | (D)  | 109. | (C)  | 110. | (C)  |
| 111. | (B)  | 112. | (B)  | 113. | (D)  | 114. | (D)  | 115. | (A)  |
| 116. | (D)  | 117. | (A)  | 118. | (C)  | 119. | (C)  | 120. | (D)  |
| 121. | (D)  | 122. | (A)  | 123. | (D)  | 124. | (C)  | 125. | (B)  |