RESPIRATION IN PLANTS

1. In the electron transport system present in the inner mitochondrial membrane, complexes I and IV are respectively
   a) NADH Dehydrogenase and $FADH_2$
   b) $NADH_2$ and NADH Dehydrogenase
   c) NADH Dehydrogenase and cytochrome-c oxidase complex
   d) NADH dehydrogenase and ATP synthase
2. In respiration incomplete oxidation of glucose is done under
   a) Aerobic respiration
   b) Anaerobic respiration
   c) Both (a) and (b)
   d) None of these
3. The cellular respiration first takes place in the
   a) Cytoplasm
   b) Golgi bodies
   c) ER
   d) Lysosomes
4. Which of the following scientist has given the scheme of glycolysis?
   a) Gustav Embden *et. al*
   b) Kreb *et. al*
   c) Fritz Lipmann *et. al*
   d) None of these
5. Which metabolic pathway is a common pathway to both anaerobic and aerobic metabolism?
   a) Glycolysis
   b) EMP pathway
   c) Both (a) and (b)
   d) None of the above
6. In mitochondria, enzyme cytochrome oxidase is present in
   a) Outer membrane
   b) Perimitochondrial space
   c) Inner membrane
   d) Matrix
7. TCA cycle enzymes are present in
   a) Cytoplasm
   b) Inter membrane space of mitochondria
   c) Mitochondrial matrix
   d) Inner membrane of mitochondria
8. Among the following, identify the substrate required for the only oxidative reaction that occurs in the process of glycolysis.
   a) 3-phosphoglyceric acid
   b) Glyceraldehyde 3-phosphate
   c) Fructose-6-phosphate
   d) Glucose-6-phosphate
9. Aerobic respiration is
   a) The process in which complete oxidation of organic substances in the absence of oxygen
   b) The process in which complete oxidation of organic substances in the presence of oxygen
   c) The process in which incomplete oxidation of organic substances in the absence of oxygen
   d) The process in which incomplete oxidation of organic substances in the presence of oxygen
10. What will happen, when glucose is administered orally?
    a) Excretion
    b) Digestion
    c) Circulation
    d) Respiration
11. How many ATP molecules could maximally be generated from one molecule of glucose, if the complete oxidation of one mole of glucose to carbon dioxide and water yields 686 kcal and the useful chemical energy available in the high energy phosphate bond of one mole of ATP is 12 kcal?
    a) Two
    b) Thirty
    c) Fifty seven
    d) One
12. In photosynthesis, $NADPH_2$ is formed but in respiration it forms during
    a) HMP
    b) ETS
    c) Krebs' cycle
    d) None of these
13. Plants does not need specialised respiratory organ because

a) Each plant part takes care of its own gas exchange needs
b) Plants do not need great demands for gas exchange
c) Both (a) and (b)
d) None of the above

14. Lactic acid is formed in
a) Fermentation b) Glycolysis c) HMP pathways d) None of these

15. In which part of mitochondria does ATP synthesis occur?
a) F_1
b) F_0
c) Cristae
d) Inner membrane of mitochondria

16. In oxidative decarboxylation, enzyme used to
a) Pyruvate decarboxylase
b) Pyruvate dehydrogenase
c) Pyruvate hydrogeneticase
d) Pyruvate dehydrogeneticase

17. Select the wrong statement.
a) When tripalmitin is used as a substrate in respiration, the RQ is 0.7
b) The intermediate compound which links glycolysis with Krebs' cycle is malic acid
c) One glucose molecule yields a net gain of 36 ATP molecules during aerobic fermentation
d) One glucose molecule yields a net gain of 2 ATP molecules during fermentation

18. Enzymes found attached to inner membrane of mitochondria instead of matrix is/are
a) Succinic Dehydrogenase
b) Cytochrome oxidase
c) Both (a) and (b)
d) Malic Dehydrogenase

19. Four respiratory enzymes are given below. Arrange them in increasing order of the carbon number of the substrates on which they act.
I. Enolase
II. Aconitase
III. Fumarase
IV. Alcohol Dehydrogenase
a) II, IV, III, I b) IV, I, II, III c) I, IV, III, II d) IV, I, III, II

20. Link enzyme in cellular respiration is
a) Citrate synthetase
b) Pyruvate Dehydrogenase
c) Isocitrate Dehydrogenase
d) Succinyl thiokinase

21. Beer and butter milk are products of fermentation by
a) *Rhizopus stolonifer*
b) *Caedobacter taeniospiralis*
c) *Bacillus subtilis*
d) *Saccharomyces cerevisiae*

22. Apparatus to measure rate of respiration and respiratory quotient is
a) Auxanometer b) Potometer c) Respirometer d) Manometer

23. Acetyl Co-A binds to oxaloacetic acid to form
a) Formaldehyde b) Citrate c) Acetate d) Isocitrate

24. In fermentation NADH is oxidised to NAD^+ in ..... rate
a) Fast b) Slow c) Usual d) None of these

25. Last electron acceptor in respiration is
a) Oxygen b) Hydrogen c) Carbon dioxide d) NADH

26. In animal cells, like muscle, during exercise when O_2 is inadequate for cellular respiration, pyruvic acid is reduced into lactic acid by
a) O_2
b) Carboxylation
c) Lactate dehydrogenase
d) None of the above

27. Glucose break down takes place ..... in fermentation
a) Partially
b) Completely
c) According to substrate
d) None of these

28. Plants need one of the following for ATP formation
a) N and P b) N and Cu c) N and Ca d) K

29. First vitamin to be produced through fermentation process using a wild bacterium was

a) Vitamin-D b) Vitamin-C c) Vitamin- B_{12} d) Vitamin-B_2

30. Fate of pyruvic acid during aerobic respiration is
a) Lactic acid fermentation b) Alcoholic acid fermentation
c) Oxidative decarboxylation d) Oxidative phosphorylation

31. In respiration, respiratory substances can be used
a) Carbohydrate b) Protein c) Organic acid d) All of these

32. In oxidative decarboxylation, only a carbon molecule of pyruvic acid is get oxidised, other two carbon molecule goes to form
a) Acetyl Co-A b) CO_2 c) Citric acid d) Both (a) and (b)

33. Enzymes of electron transport system are present in
a) Inner mitochondrial membrane b) Matrix
c) Intermembranous space d) Endoplasmic reticulum

34. Fungi are dependent on dead and decaying matter for feeding, it is called
a) Saprophytes b) Halophytes c) Xerophytes d) Nanophytes

35. Which of the following reaction does not take place in the cell organelle, that is referred to as 'Power house of the cell'?
a) Glycine Decarboxylation b) Glyceraldehyde 3-phosphate dehydrogenation
c) Fumaric acid hydration d) Cytochrome oxidation

36. Which of the following is true regarding glycolysis?
I. Takes place in cytosol
II. Produces no ATP
III. Has no connection with electron transport chain
IV. Reduces two molecules of NAD^+ for every glucose molecule processed
Choose the correct option
a) Only I b) I, II and III c) I and II d) None of these

37. The reaction which is catalysed by a protein that is not found in the matrix of mitochondria is
a) Conversion of pyruvic acid to acetyl coenzyme-A b) Oxidative Decarboxylation of α-ketoglutaric acid
c) Oxidation of Succinic acid d) Cleavage of Succinyl coenzyme-A

38. All enzymes of TCA cycle are located in the mitochondrial matrix except one, which is located in inner mitochondrial membranes in eukaryotes and in cytosol in prokaryotes. This enzyme is
a) Lactate Dehydrogenase b) Isocitrate Dehydrogenase
c) Malate Dehydrogenase d) Succinate Dehydrogenase

39. Identify enzyme A in the given reaction of Kreb's cycle
$OAA + \text{Acetyl Co} - A + H_2O \xrightarrow{A} \text{Citric acid} + \text{Co} - A$
a) Oxaloacetate synthetase b) Citrate synthetase
c) Aconitase d) Dehydrogenase

40. The enzymes for TCA cycle are present in
a) Plastids b) Golgi complex
c) Mitochondria d) Endoplasmic reticulum

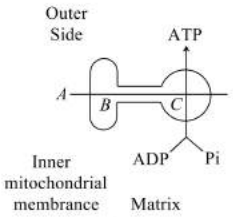
41. Which one of the following is the terminal electron acceptor?
a) Molecular CO_2 b) Molecular O_2 c) Molecular H_2 d) $NADPH_2$

42. In electron transport system, which of the following acts as a final hydrogen acceptor
a) Oxygen b) Hydrogen c) Calcium d) Ubiquinone

43. If a starving plant is provided with glucose, the rate of respiration would
a) First rise then fall b) Become constant c) Decrease d) Increase

44. Which one is product of aerobic respiration?
a) Malic acid b) Ethyl alcohol c) Lactic acid d) Pyruvic acid

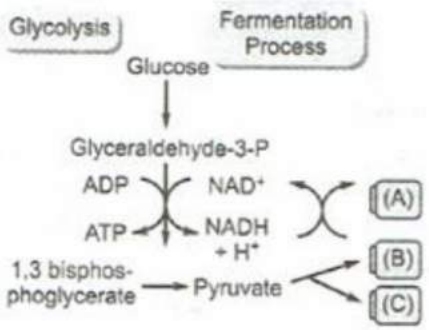
45. Given below the diagrammatic presentation of ATP synthesis in mitochondria. Identify A-C and Choose the correct option accordingly



a) $A - H^+, B - F_1, C - F_0$ b) $A - 3H^+, B - F_0, C - F_1$

c) $A - 2H^+, B - F_0, C - F_1$ d) $A - 5H^+, B - F_1, C - F_0$

46. In Krebs' cycle,
    a) ADP is converted into ATP
    b) Pyruvic acid is converted into CO_2 and H_2O
    c) Glucose is converted into CO_2
    d) Pyruvic acid is converted into ATP
47. Decline in the activity of the enzyme Hexokinase by glucose-6-phosphate is caused by
    a) Non-competitive
    b) Competitive inhibitors
    c) Allosteric modulators
    d) Denaturation of enzyme
48. In which of the following reactions of glycolysis, oxidation takes place?
    a) Glucose 6-PO_4 to fructose 6-PO_4
    b) Glyceraldehydes 3-phosphate to 1, 3-diphosphoglycerate
    c) 1,3-diphosphoglycerate to 3-phosphoglycerate
    d) 2-phosphoglycerate to phosphoglycerate
49. During conversion of pyruvic acid into acetyl Co-A, pyruvic acid is
    a) Oxidized b) Reduced c) Isomerized d) Condensed
50. During anaerobic respiration in yeast
    a) H_2O and CO_2 are end-products
    b) CO_2 , ethanol and energy are end-products
    c) CO_2 , and H_2O are end-products
    d) CO_2 , acetic acid and energy are end-products
51. Choose the correct combination of A and B according to NCERT text book.
    All living organisms need ...A... for carrying out daily life activities and is obtained by ...B... of macromolecules
    a) A-oxygen; B-reduction b) A-energy; B-reduction
    c) A-energy; B-oxidation d) A-oxygen; B-oxidation
52. Most of the biological energy is supplied by mitochondria through
    a) Breaking of proteins b) Reduction of $NADP^+$
    c) Breaking of sugars d) Oxidising TCA (tricarboxylic acid) substrate
53. Chemiosmotic mechanism of ATP production in aerobic respiration was given by
    a) Krebs b) Calvin c) Hatch and Slack d) Peter Mitchell
54. Choose the correct combination of labeling the molecules involved in the pathway of anaerobic respiration in yeast



a) A – Ethanol, B – CO2 , C – Acetaldehyde
b) A - CO2 , B – Ethanol, C- Acetaldehyde
c) A - CO2, B - Acetaldehyde, C- Ethanol
d) A – Ethanol, B - Acetaldehyde, C - CO2

55. Which of the metabolites is common to respiration mediated breakdown of fats, carbohydrates and proteins?
a) Glucose-6-phosphate
b) Fructose, 6-bisphosphate
c) Pyruvic acid
d) Acetyl Co-A

56. In succulent plants like Opuntia, the RQ value will be
a) Less than one
b) More than one
c) Infinite
d) Zero

57. The pyruvic acid formed during glycolysis is oxidized to CO_2 and H_2O in a cycle called
a) Calvin cycle
b) Nitrogen cycle
c) Hill reaction
d) Krebs' cycle

58. Respiratory enzymes are present in the following organelle
a) Peroxisome
b) Chloroplast
c) Mitochondrion
d) Lysosome

59. An ATP molecule is structurally most similar to a molecule of
a) RNA nucleotide
b) DNA nucleotide
c) Amino acid
d) Fatty acid

60. Read the following and choose the option containing correct pair
I. DCMU Herbicide Inhibitor of non-cyclic electron transport
II. PMA Fungicide Reduce transpiration
III. Colchicine Alkaloid Causes male sterility
IV. Soilrite Sodium alginate Encapsulation of somatic embryos
a) I and II
b) I and III
c) II and III
d) II and IV

61. Oxidation of one molecule of NADH gives rise to
a) 3 ATP molecules
b) 12 ATP molecules
c) 2 ATP molecules
d) 1ATP molecule

62. Aerobic respiratory pathway is appropriately termed as
a) Catabolic
b) Parabolic
c) Amphibolic
d) Anabolic

63. In alcohol fermentation,
a) There is no electron donor
b) Oxygen is the electron acceptor
c) Triose phosphate is the electron donor, while acetaldehyde is the electron acceptor
d) Triose phosphate is the electron donor, while pyruvic acid is the electron acceptor

64. In respiration breaking down of glucose with oxygen is known as
a) Oxidation process
b) Reduction process
c) Oxidation-oxaloacitation process
d) All of the above

65. Net gain of ATP molecules per hexose during aerobic respiration is
a) 12
b) 18
c) 36
d) 30

66. Which of these are respiratory poisons or inhibitors of electron transport chain?
a) Cyanides
b) Antimycin-A
c) Carbon monoxide
d) All of these

67. Kreb's cycle is completed with the formation of
a) Citric acid
b) Oxaloacetic acid (OAA)
c) Succinic acid
d) Malic acid

68. Where is ATP synthesised in glycolysis?
    a) When 1, 3 di PGA is changed into 3PGA
    b) When glucose is converted into glucose-6-phosphate
    c) Both (a) and (b)
    d) When, 1, 6 diphosphate is broken in triose phosphate
69. Maximum number of ATP is obtained from
    a) Glucose b) Palmitic acid c) Malic acid d) β-amino acid
70. Glycolysis takes place in
    a) All living cells b) Eukaryotic cells only
    c) Prokaryotic cells only d) None of these
71. Krebs' cycle begins with the reaction
    a) Citric acid +acetyl Co-A b) Oxaloacetic acid + pyruvic acid
    c) Oxaloacetic acid + citric acid d) Oxaloacetic acid + acetyl Co-A
72. Co-Factor required for formation of acetyl Co-A is
    a) TPP b) Lipoic acid c) Mg^{2+}, Co-A d) All of these
73. In anaerobic respiration in plants
    a) Oxygen is absorbed b) Oxygen in released
    c) Carbon dioxide is released d) Carbon dioxide is absorbed
74. The respiratory quotient (RQ) of some of the compounds are 4,1 and 0.7. These compounds are identified respectively as
    a) Malic acid, palmitic acid and tripalmitin b) Oxalic acid, carbohydrate and tripalmitin
    c) Tripalmitin, malic acid and carbohydrate d) Palmitic acid, carbohydrate and oxalic acid
75. The enzyme ..... is used to catalysed when condensation of acetyl group with oxaloacetic acid and to yield citric acid
    a) Citrate permeate b) citrate synthase c) Citrate burate d) Citrate maliate
76. The respiratory quotient (RQ) of a germinating castor seed is
    a) Equal to one b) Greater than one c) Less than one d) Equal to zero
77. Glycolysis
    I. causes partial oxidation of glucose (one molecule) to form 2-molecules of pyruvic acid and 2 ATP as net gain
    II. takes place in all living cells
    III. uses 2 ATP at two steps
    IV. scheme was given by Gustav Embden, Otto Mayerhof and J Parnas
    Choose the correct option containing appropriate statements from the above
    a) I, II and III b) I, II and IV c) I, II, III and IV d) Only I
78. During oxidative phosphorylation, the net gain of ATP is
    a) 40 b) 38 c) 34 d) 30
79. Decarboxylation is involved in
    a) Electron transport system
    b) Glycolysis
    c) Krebs' cycle
    d) Lactic acid fermentation
80. Alternate name of TCA cycle is
    a) Kreb's cycle b) Grab's cycle c) Mayerhoff cycle d) Embden cycle
81. A businessman of 80 kg weight requires 4800 kcal energy daily. How many ATP molecules and glucose molecules does he require to produce this much energy?
    a) 20 molecules of glucose and 384 molecules of ATP
    b) 40 molecules of glucose and 264 molecules of ATP
    c) 18 molecules of glucose and 657 molecules of ATP
    d) 20 molecules of glucose and 460 molecules of ATP

82. Which one of the following pairs is wrongly matched?
a) Methanogens – Gobar gas
b) Yeast – Ethanol
c) Streptomycetes – Antibiotic
d) Coliforms – Vinegar

83. In hurdle race, which of the following is accumulated in the leg muscle?
a) Performed ATP
b) Glycolysis
c) Lactate
d) Oxidative metabolism

84. During the exercise, pyruvic acid is reduced to
a) Lactic acid
b) Fumaric acid
c) Glutamic acid
d) Oxaloacetic acid

85. The compounds which are oxidised during respiration are known as
a) Respiratory substrates
b) Oxalo acid
c) TCA cycle
d) None of these

86. Refer the given equation
$2(C_{51}H_{98}O_6) + 145\ O_2 \rightarrow 102\ CO_2 + 98\ H_2O + \text{Energy}$
The respiratory quotient in this case is
a) 1
b) 0.7
c) 1.45
d) 1.62

87. Energy required for life processes is obtained by
a) Oxidation
b) Reduction
c) Deduction
d) Antilation

88. Choose the correct statement for the given options
a) Intermediates in the pathway are utilised to synthesise other compounds
b) No alternative substrates other than glucose is allowed to enter the pathway at intermediate stages
c) None of the substrate is respired in the pathway at intermediary stages
d) Pathway functioning is insequential

89. In plants, glucose is derived from which of the following?
a) Protein
b) Fat
c) Oxalic acid
d) Sucrose

90. The chemiosmotic coupling hypothesis of oxidative phosphorylation proposes that adenosine triphosphate (ATP) is formed because
a) High energy bonds are formed in mitochondrial proteins
b) ADP is pumped out of the matrix into the intermembrane space
c) A proton gradient forms across the inner membrane
d) There is a change in the permeability of the inner mitochondrial membrane towards adenosine diphosphate (ADP)

91. The process by which there is inhibition of aerobic respiration by atmospheric oxygen is
a) Pasteur's effect
b) Calvin's effect
c) Darwin's effect
d) None of these

92. More carbon dioxide is evolved than the volume of oxygen consumed when the respiratory substrate is
a) Fat
b) Sucrose
c) Glucose
d) Organic acid

93. Anaerobic respiration is also called as
a) β-oxidation
b) Fermentation
c) Oxidation
d) None of these

94. The main purpose of cellular respiration is to
a) Convert potential energy to kinetic energy
b) Convert kinetic energy to potential energy
c) Create energy in the cell
d) Convert energy stored in the chemical bonds of glucose to an energy that the cell can use

95. Which of the following substances yield less than 4 kcal/mol when its phosphate bond is hydrolysed?
a) Creatine phosphate
b) ADP
c) Glucose-6-phosphate
d) ATP

96. Five gram mole of glucose on complete oxidation releases
a) 3430 kcal of energy
b) 343 kcal of energy
c) 2020 kcal of energy
d) 430 kcal of energy

97. NADP, NAD and FAD are acceptors of
a) Phosphate
b) Electrons
c) Oxygen
d) Hydrogen

98. How many PGAL are produced by glycolysis of 3 molecules of glucose? How many ATP are released by respiration of these PGAL till formation of CO_2 and H_2O?
a) 4 PGAL- 80 ATP
b) 6 PGAL-160ATP
c) 4 PGAL-40ATP
d) 6 PGAL-120ATP

99. Identify the specific group, which carries out the following biochemical reaction:
Aspartic acid+α-ketoglutaric acid →Oxaloacetic acid+Glutamic acid
a) Synthetases b) Peptidases c) Transaminases d) Lyases

100. Which of following is connecting link between glycolysis and Krebs' cycle?
a) Pyruvic acid
b) Isocitric acid
c) Acetyl Co-A
d) Phosphoglyceric acid

101. Which one of the following reactions is an example of oxidative Decarboxylation?
a) Conversion of succinate to fumarate b) Conversion of fumarate to malate
c) Conversion of pyruvate to acetyl Co-A d) Conversion of citrate to isocitrate

102. If O_2 is not present, yeast cells break down glucose to
a) $CO_2 + H_2O$ b) CO_2+ Lactic acid c) $C_2H_5OH + H_2O$ d) C_2H_5OH and CO_2

103. How many ATP is released respectively when NADH and $FADH_2$ molecules get oxidised?
a) 3 ATP, 2 ATP b) 2 ATP, 3 ATP c) 5 ATP, 4 ATP d) 3 ATP, 5 ATP

104. Release of energy by breaking down of C-C bond of various organic molecules by oxidation process for cellular use is known as
a) Respiration b) Photorespiration
c) Oxidative phosphorylation d) Combustion

105. Krebs' cycle was discovered by Krebs in pigeon muscles in 1940. Which step is called gateway step/link reaction/transition reaction in respiration?
a) Glycolysis b) Formation of acetyl Co-A
c) Citric acid formation d) ETS terminal oxidation

106. Correct sequence of electron acceptor of ATP synthesis is
a) cyt-a, a_3 , b, c b) cyt-b, c ,a, a_3 c) cyt-b, c , a_3, a d) cyt-c, b, a, a_3

107. The number of ATP produced when a molecule of glucose undergoes fermentation
a) 4 b) 36 c) 2 d) 38

108. Oxidative decarboxylation is
a) Pyruvic acid is oxidised to carbon dioxide b) Pyruvic acid is subsidised to oxygen
c) Pyruvic acid is oxidised to oxygen d) Pyruvic acid is subsidised to carbon dioxide

109. An example of Pasteur's effect is
a) *Penicillium* b) *Pinnularia* c) *Saccharomyces* d) *Nostoc*

110. Fermentation is
a) Anaerobic respiration b) Incomplete oxidation of carbohydrate
c) Complete oxidation of carbohydrate d) None of the above

111. Citric acid cycle is the alternate name of which of the following?
a) HMP shunt b) Glycolysis c) TCA cycle d) Calvin cycle

112. When one molecule of glucose is completely oxidized during aerobic respiration, how many molecules of carbon dioxide are released due to Tricarboxylic acid cycle?
a) One b) Two c) Three d) Four

113. Fat prior to its oxidation associate with
a) Cyclic AMP b) Co-A c) GMP d) ATP

114. The RQ value of oxalic acid is
a) 1.0 b) 0.7 c) 4 d) $\propto$

115. Energy currency of cell is
a) Mitochondria b) Chloroplast c) ATP d) Glucose

116. Break down process is also called
a) Catabolism b) Anabolism c) Both (a) and (b) d) All of these

117. The energy-releasing metabolic process in which substrate is oxidized without an external electron acceptor, is called

a) glycolysis b) Fermentation c) Aerobic respiration d) Photorespiration

118. How many times ATP is utilised in glycolysis?
a) 2 b) 3 c) 4 d) 5

119. Aerobic respiration takes place in
a) Mitochondria b) Ribosome c) Glogi body d) Both (a) and (b)

120. Sequence of events in Kreb's cycle is
a) Acetyl Co-A → Citrate → Pyruvate → Oxaloacetic acid ← fumarate ← Malate ← Succinate **α**-ketoglutaralte
b) Acetyl Co-A → Citric acid → **α**-ketoglutarate acid → Oxaloacetic acid ← Malic acid ← Fumaric acid ← Succinic acid
c) Acetyl Co-A → Citric acid → Malic acid Oxaloacetic ← Oxaloacetic acid Succinic ← **α**-ketoglutaric acid ←
d) All are wrong

121. Which of the following is a 4-carbon compound?
a) Oxaloacetic acid b) Phosphoglyceric acid
c) Ribulose bisphosphate d) Phosphoenol pyruvate

122. An example of non-competitive inhibition is
a) The inhibition of succinic Dehydrogenase by Malonate b) Cyanide action on cytochrome oxidase
c) Sulpha drug on folic acid synthesizing bacteria d) The inhibition of Hexokinase by glucose 6-phosphate

123. What is the net ATP molecules gain, when 4 molecules of glucose undergo anaerobic respiration in plant?
a) 8 ATP b) 20 ATP c) 144 ATP d) 16 ATP

124. Chemiosmosis hypothesis given by Peter Mitchell proposes the mechanism of
a) Synthesis of NADH b) Synthesis of ATP c) Synthesis of $FADH_2$ d) Synthesis of NADPH

125. Glycolysis
a) Takes place in the mitochondria
b) Produces no ATP
c) Has no connection with electron transport chain
d) Reduce two molecules of NAD^+ for every glucose molecule processed

126. Citric acid cycle is also known as
a) Tricarboxylic acid cycle b) Oxidative decarboxylation
c) Fermentation cycle d) Both (a) and (b)

127. Instantaneous source of energy is
a) Protein b) Lipid c) Fats d) Glucose

128. Before entering into the respiratory pathway fats breakdown into
a) Fatty acid and glycerol b) Fatty acid and ascorbic acid
c) Fatty acid and ascorbic acid d) Fatty acid and amino acid

129. In which of the following reactions of glycolysis, a molecule of water is removed from the substrate?
a) Fructose-6-phosphate → Fructose-1, 6-bisphosphate b) 3-phosphate-glyceraldehyde → 1, 3 bisphosphoglyceric acid
c) PEP → Pyruvic acid d) 2- phosphoglycerate → PEP

130. The reactions of Pentose Phosphate Pathway (PPP) take place in
a) Mitochondrion b) Cytoplasm
c) Chloroplast, peroxisome and mitochondrion d) Chloroplast, glyoxysome and mitochondrion

131. In citric acid cycle first step is
a) Acetyl Co-A combines with oxalo acetic acid b) Acetyl Co-A combines with citric acid
c) Citric acid combines with oxaloacetic acid d) Citric acid combines with malic acid

132. Pyruvate → $C_2H_3OH + CO_2$
The above reaction needs two enzymes named as
a) Pyruvate decarboxylase and alcohol dehydrogenase

b) Pyruvate decarboxylase and enolase
c) Pyruvate decarboxylase and pyruvate kinase
d) Pyruvate carboxylase and aldolase

133. FAD is electron acceptor during oxidation of which of the following?
a) α-ketoglutarate→Succinyl Co-A
b) Succinic acid → Fumaric acid
c) Succinyl Co-A → Succinic acid
d) Fumaric acid → Malic acid

134. Which of the following substrate can enter into the respiration?
a) Glucose
b) Amino acid
c) Fatty acid
d) All of these

135. RQ value of 4 may be expected for the complete oxidation of which one of the following?
a) Glucose
b) Malic acid
c) Oxalic
d) Tartaric acid

136. When act as a respiratory substrate, which of the following would be broken down to acetyl Co-A?
a) Fatty acid
b) Protein
c) Carbohydrate
d) All of these

137. Anaerobic respiration generally occurs in
a) Lower organism, *e.g.,* bacteria and fungi
b) Higher organism, *e.g.,* animal
c) Both (a) and (b)
d) None of the above

138. In which of the following, reduction of NAD does not occur?
a) Isocitric acid→ α-ketoglutaric acid
b) Malic acid →Oxaloacetic acid
c) Pyruvic acid →Acetyl coenzyme
d) Succinic acid →Fumaric acid

139. How many NADH + H^+ molecule is released in Kreb's cycle?
a) 3
b) 6
c) 12
d) 14

140. Cell respiration is carried out by
a) Ribosome
b) Mitochondria
c) Chloroplast
d) Golgi bodies

141. The released energy obtained by oxidation is stored as
a) A concentration gradient across a membrane
b) ADP
c) ATP
d) NAD^+

142. Respiratory Quotient (RQ) is one in case of
a) Fatty acids
b) Nucleic acids
c) Carbohydrates
d) Organic acids

143. Which of the following substrates is used in the formation of alcohol?
a) Sucrose
b) Glucose
c) Galactose
d) Fructose

144. Which one is correct sequence in glycolysis?
a) G-6-P→PEP → 3-PGAL → 3-PGA
b) G-6-P→3-PGAL → 3-PGA → PEP
c) G-6-P→PEP → 3-PGA → 3-PGAL
d) G-6-P→3-PGA →3-PGAL → PEP

145. Cyanide resistant pathway is
a) Anaerobic respiration
b) Aerobic respiration
c) Both (a) and (b)
d) None of these

146. Common enzyme in glycolysis and pentose phosphate pathway is
a) Hexokinase
b) aconitase
c) Fumarase
d) Dehydrogenase

147. In aerobic respiration complete oxidation of pyruvate by the stepwise removal of all the hydrogen atom makes ..... molecule of CO_2
a) 2
b) 3
c) 4
d) 5

148. Phase common in aerobic and anaerobic respiration is
a) TCA cycle
b) Glycolysis
c) Glycogenolysis
d) ETS

149. 2NADH(H^+) produced during anaerobic glycolysis yield
a) 6 ATP molecules
b) 4 ATP molecules
c) 8 ATP molecules
d) None of these

150. In the production of ethanol, pyruvic acid is first converted to acetaldehyde by the enzyme.
a) Alcohol Dehydrogenase
b) Alcohol oxidase
c) Pyruvate Dehydrogenase
d) Pyruvate decarboxylase

151. The activity of succinate Dehydrogenase is inhibited by

a) Pyruvate b) Glycolate c) Melonate d) Phosphoglycerate

152. Citric acid is industrially best produced by
a) Streptococcus lactis b) Aspergillus niger
c) Penicillium purpurogenum d) Lactobacillus delbreukii

153. Respiratory substrate are the organic substance which are ..... during respiration to liberate energy
a) Oxidised b) Reduced c) Both (a) and (b) d) Synthesised

154. The oxidation of pyruvic acid to CO_2 and H_2O is called
a) Fermentation b) Citric acid cycle
c) Glycolysis d) Oxidative phosphorylation

155. Preparatory phase before fermentation is
a) Upstream process b) Downstream process c) Inoculation d) Filtration

156. For retting of jute the fermenting microbe used is
a) *Helicobactor pylori* b) *Methophilic bacteria*
c) *Streptococcus lactis* d) *Butyric acid bacteria*

157. The respiratory quotient during cellular respiration would depend on the
a) Nature of enzymes involved b) Nature of the substrate
c) Amount of carbon dioxide released d) Amount of oxygen utilized

158. Which one of following is complex V of the ETS of inner mitochondrial membrane?
a) NADH Dehydrogenase b) Cytochrome oxidase
c) Ubiquinone d) ATP synthase

159. Protein directly cannot be used as a respiratory substrate, it breaks down into
a) Amino acid b) Fatty acid c) Glycolytic acid d) Fumaric acid

160. Ethyl alcohol is commercially manufactured from
a) Bajra b) Grapes c) Maize d) Sugarcane

161. Biological oxidation in Krebs' cycle involves
a) O_2 b) CO_2 c) O_3 d) NO_2

162. Last electron acceptor during ETS is
a) O_2 b) cyt-*a* c) cyt-a_2 d) cyt-a_3

163. Which enzyme converts glucose into alcohol?
a) Zymase b) Diastase c) Invertase d) Lipase

164. Glycolysis is a part of
a) Anaerobic respiration only b) Aerobic respiration only
c) Both (a) and (b) d) Krebs' cycle

165. When tripalmitin is used as a substrate in respiration, the RQ is
a) >1 b) 1.0 c) 0.9 d) 0.7

166. Read the following table and choose the correct pair.

V.	DCMU	Herbicide	Inhibitor of non-cyclic electron transport
VI.	PMA	Fungicide	Reduce transpiration
VII.	Colchicine	Alkaloid	Causes male sterility
VIII.	Soilrite	Sodium alginate	Encapsulation of somatic embryos

a) I, II b) I, III c) II, III d) II, IV

167. In aerobic respiration removal 3 molecules of CO_2 occurs in
a) Matrix of the mitochondria b) Inner membrane of the mitochondria
c) Both (a) and (b) d) Anywhere in the mitochondria

168. In anaerobic respiration bacteria produce
a) Lactic acid b) Formic acid c) Acetic acid d) Glutamic acid

169. During its formation, bread becomes porous due to release of Carbon dioxide by the action of
a) Yeast b) Bacteria c) Virus d) Protozoans

170. Before entering respiratory pathway amino acids are
a) Decarboxylated b) Hydrolysed c) Deaminated d) Phosphorylated

171. The intermediate compound common for aerobic and anaerobic respiration is
a) Citric acid b) Pyruvic acid c) Acetyl Co-A d) Succinic acid

172. How many ATP molecules are obtained from fermentation of 1 molecule of glucose?
a) 2 b) 4 c) 3 d) 5

173. During which stage in the complete oxidation of glucose are the greatest number of ATP molecules formed from ADP?
a) Conversion of pyruvic acid to acetyl Co-A
b) Electron transport chain
c) Glycolysis
d) Krebs' cycle

174. In plants the cells in the interior parts are
a) Dead and for mechanical support
b) Live and for various purpose
c) Both (a) and (b)
d) None of the above

175. Ultimate source of energy in biosphere, is
a) Sunlight b) Protein c) Fats d) Enzymes

176. Dough kept overnight in warm weather becomes soft and spongy because of
a) Absorption of carbon dioxide from atmosphere
b) Fermentation
c) Cohesion
d) Osmosis

177. The respiratory quotient (RQ) or respiratory ratio is
a) $RQ = \frac{\text{Volume of } O_2 \text{ evolved}}{\text{Volume of } CO_2 \text{ consumed}}$
b) $RQ = \frac{\text{Volume of } O_2 \text{ consumed}}{\text{Volume of } CO_2 \text{ evolved}}$
c) $RQ = \frac{\text{Volume of } CO_2 \text{ consumed}}{\text{Volume of } O_2 \text{ evolved}}$
d) $RQ = \frac{\text{Volume of } CO_2 \text{ evolved}}{\text{Volume of } O_2 \text{ consumed}}$

178. Maximum amount of energy/ATP is liberated on oxidation of
a) Fats b) Proteins c) Starch d) Vitamins

179. $NADH_2 \rightarrow FAD \rightarrow FADH_2$
The given reaction occurs in
a) Heart cells b) Kidney cells c) Liver cells d) Nerve cells

180. Net yield of ATP molecules in aerobic respiration during Krebs' cycle per glucose molecule is
a) 2 ATP molecules
b) 8 ATP molecules
c) 36 ATP molecules
d) 38 ATP molecules

181. Respiratory quotient can very due to
a) Temperature
b) Respiratory substrate
c) Light and oxygen
d) Respiratory product

182. In anaerobic respiration the correct sequence of catabolism of glucose is
a) Glycolysis, TCA cycle, oxidative phosphorylation
b) Glycolysis, fermentation
c) Glycolysis, oxidative phosphorylation, TCA cycle
d) Oxidative phosphorylation, TCA cycle, glycolysis

183. In eukaryotes, photosynthesis occurs in
a) Chloroplast b) Stomatal opening c) Bark d) Roots

184. In yeast during anaerobic respiration, how many glucose molecules are required for production of 38 ATP molecules?
a) 1 b) 2 c) 19 d) 38

185. Which of the following is involved in the catalysis of link reaction during aerobic during aerobic respiration?
a) Vitamin- A b) Vitamin- B_1 c) Vitamin- B_6 d) Vitamin- K

186. Respiratory quotient in anaerobic respiration is
a) 0.7 b) 0.9 c) Unity d) Infinity

187. Choose the correct combination of A and B in accordance with the NCERT text book.
The NADH synthesised in ...A... is transferred into the mitochondria and undergoes oxidative ...B...
a) A-EMP; B-carboxylation
b) A-ETS; B-phosphorylation

c) A-glycolysis; B-phosphorylation
d) A-TCA cycle; B-decarboxylation

188. Total gain of ATP molecules during aerobic respiration of one molecule of glucose
a) 36 b) 38 c) 40 d) 34

189. Which of the following enzyme is responsible for formation of glucose from glucose-6-phosphate?
a) Kinase b) Aldolase c) Dehydrogenase d) Phosphatase

190. Alcoholic fermentation takes place in the presence of
a) Maltase b) Zymase c) Amylase d) Invertase

191. Which of these steps in Krebs' cycle indicates substrate level phosphorylation?
a) Conversion of succinyl acid to ∝-ketoglutaric acid
b) Conversion of succinic acid to malic acid
c) Conversion of succinyl Co-A to succinic acid
d) Conversion of malic acid to oxalo acetic acid

192. Identify *A* and *B* in the given reaction
Pyruvic acid

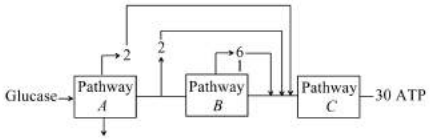
$$+\text{Co-A} + \text{NAD}^+ \xrightarrow[\text{Pyruvate dehydrogenase}]{\text{Mg}^{2+}} \text{A} + \text{B} + \text{NADH} + \text{H}^+$$

a) A-PEP; B-CO_2
b) A-Acetyl Co-A; B-CO_2
c) A-CO_2; B-H_2O
d) A-Acetyl Co-A; B-H_2O

193. In which one of the following reactions, oxidative Decarboxylation does not occur?
a) Malic acid → Pyruvic acid
b) Pyruvic acid → Acetyl Co-A
c) Glyceraldehyde 3-phosphate → 1, 3-bisphosphoglycolysis acid
d) α-ketoglutaric acid → Succinyl Co-A

194. Anaerobic respiration can occur
a) Lower organism
b) Higher plants and animals
c) Both (a) and (b)
d) None of the above

195. The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products



The numbered 2, 2, 6 can all be
a) NADH b) ATP c) H_2O d) FAD^2 or $FADH_2$

196. The main purpose of electron transport chain is to
a) Cycle NADH + H^+ back to NAD^+
b) Use the intermediate from TCA cycle
c) Breakdown pyruvic acid
d) All of the above

197. How many ATP are formed during the citric acid cycle?
a) 12 b) 24 c) 32 d) 35

198. RQ is always less than one in
a) Wheat b) Millets c) Bean d) Castor

199. In glycolysis from glucose to pyruvic acid involves more than seven reaction. Each individual reaction needs
a) One molecule of ATP
b) One molecule of ADP
c) One molecule of NAD
d) One molecule of specific enzyme

200. Which one is true for ATP?
a) ATP is prosthetic part of an enzyme
b) ATP is an enzyme
c) ATP is organic ions of enzyme
d) ATP is a coenzyme

201. Oxidative phosphorylation refers to
a) Anaerobic production of ATP
b) The citric acid cycle production of ATP
c) Production of ATP by chemiosmosis
d) Alcoholic fermentation

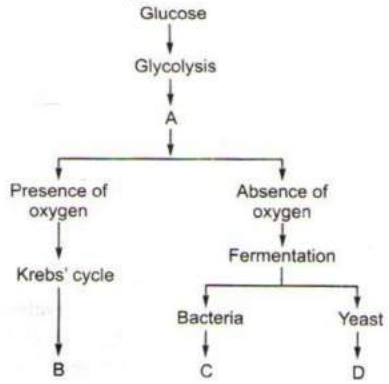
202. Which one is not correct about Krebs' cycle?
a) It is also called citric acid cycle
b) The intermediate compound which links glycolysis with Krebs' cycle is malic acid
c) It occurs in mitochondria
d) It starts with six carbon compound

203. Which specialised cell provides interconnectivity for air spaces?
a) Parenchyma b) Chlorenchyma c) Sclerenchyma d) None of these

204. Steps of respiration are controlled by
a) Substrates b) Enzymes c) Hormone d) Bile juice

205. The similarity between NAD^+ and $NADP^+$ is that
a) Take up electron at a time
b) Take up two protons at a time
c) Take up two electrons at a time
d) Give up one protons at a time

206. The following is a simplified scheme showing the fate of glucose during aerobic and anaerobic respiration. Identify the end products that are formed at stages indicated as A, B, C and D. identify the correct option from these given below.



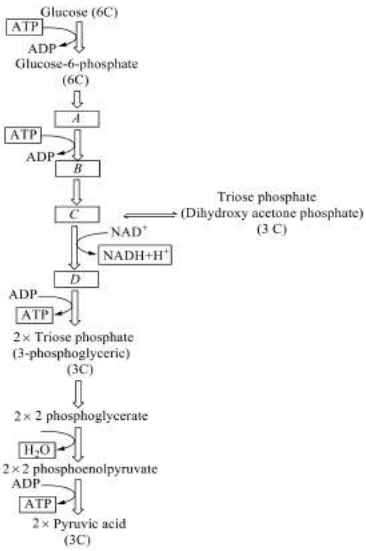
a) 1. Carbon dioxide and water, B- Pyruvic acid, C- Ethyl alcohol and carbon dioxide, D- lactic acid
b) 1. Pyruvic acid, B- Carbon dioxide and water, C- Lactic acid , D- Ethyl alcohol and carbon dioxide
c) 1. Pyruvic acid, B- Carbon dioxide and water, C- Ethyl alcohol and carbon dioxide, D- Lactic acid
d) 1. Pyruvic acid, B- Ethyl alcohol and carbon dioxide, C- Lactic acid, D- Carbon dioxide and water

207. The process by which ATP is produced in the inner membrane of a mitochondrion, the electron transport system transfers protons from the inner compartment to the outer, as the protons flow back to the inner compartment, the energy of their movement is used to add phosphate to ADP, forming ATP is
a) Chemiosmosis b) Phosphorylation c) Glycolysis d) Fermentation

208. The haem protein complexes, which act as oxidizing agents are known as
a) Haemoglobin b) Myoglobin c) Chlorophyll d) Cytochrome

209. If RQ is 0.6 in a respiratory metabolism, it would mean that
a) Carbohydrates are used as respiratory substrate
b) Organic acids are used as respiratory substrate
c) The oxidation of the respiratory substrate consumed more oxygen than the amount of CO_2 released
d) The oxidation of respiratory substrate consumed less oxygen than the amount of CO_2 released

210. The flowchart given below shows the steps in glycolysis. Select the option that correctly fills in the missing steps A, B, C and D



a) A-Fructose-6-phosphate, B-Fructose-1, 6-biphosphate, C-3-PGAL, D-1, 3-biphosphoglyceric acid
b) A-Fructose-1, 6-biphosphate, B-3-PGAL, C-1, 3-biphosphoglyceric acid, D-3-PGA
c) A-3-PGA, B-1, 3-biphosphoglyceric acid, C-3-PGAL, D-Fructose-1, 6-biphosphate
d) A-Fructose-1, 6-biphosphate, B-Fructose-6-biphosphate, C-3-PGAL, D-1, 3-biphosphoglyceric acid

211. A scientist added a chemical (cyanide) to an animal cell to stop aerobic respiration. Which of the following is most likely to have been affected by this treatment?
a) Active transport of substances across the plasma membrane
b) Passive transport of substances across the plasma membrane
c) Diffusion of substances across the plasma membrane
d) The thickness of the plasma membrane

212. Wine and beer are produced directly by fermentation. Brandy and whisky require both fermentation and distillation because
a) Fermentation is inhibited at an alcohol level of 10-18%
b) Distillation prolongs storage
c) Distillation improves quality
d) Distillation purifies the beverage

213. For gaseous exchange plants have
a) Stomata b) Lenticels c) Pores d) Both (a) and (b)

214. Citric acid cycle was discovered by
a) Hans Krebs'; 1937 b) Jon Mathai; 1937 c) Parna; 1936 d) Embeden; 1936

215. Vitamin-C was the first vitamin to be produced by a fermentation process using
a) Penicillium b) E. coli c) Yersinia pestis d) Acetobacter

216. Net gain of ATP from one molecule of glucose in glycolysis, is
a) 3 b) 6 c) 8 d) 2

217. In Krebs' cycle, GTP is formed in
a) Oxidative phosphorylation b) Substrate level phosphorylation
c) Photophosphorylation d) Decarboxylation

218. A competitive inhibitor of Succinic Dehydrogenase is
a) Malonate b) Oxaloacetate c) α-ketoglutarate d) Malate

219. The net gain of ATP from complete oxidation of one molecule of glucose in eukaryote is
a) 2 b) 4 c) 24 d) 36

220. Animals are
a) Heterotrophic b) Autotrophic c) Both (a) and (b) d) None of these

221. During Kreb's cycle of ...A... NADH, ...B... ATP is produced through ETS in mitochondria. Choose, the correct pair from the option given below

a) A-2; B-4 b) A-4; B-2 c) A-6, B-18 d) A-2; B-8

222. Product of glycolysis is
a) Citric acid
b) Dihydroxy acetone
c) Pyruvic acid
d) Phosphoenol pyruvate

223. Electron Transport System (ETS) occurs in
a) Inner mitochondrial membrane b) Outer mitochondrial membrane
c) Both (a) and (b) d) Not specific place

224. In aerobic respiration, citric acid cycle takes place in
a) Cytosol b) Mitochondria
c) Peroxisome d) Endoplasmic reticulum

225. If RQ is less than 1.0 in a respiratory metabolism, it would mean that
a) Carbohydrates are used as respiratory substrate
b) Organic acids are used as respiratory substrate
c) The oxidation of the respiratory substrate consumed more oxygen than the amount of CO_2 released
d) The oxidation of the respiratory substrate consumed less oxygen than the amount of CO_2 released

226. Calorie is the unit of
a) Sound b) Temperature c) Light d) Heat

227. Which of the following organism is useful in the preparation of Roquefort cheese?
a) Mucor b) Rhizopus c) Aspergillus d) Penicillum

228. What is the correct order of the stages of cellular respiration?
a) Krebs' – Electron – Glycolysis cycle transport chain
b) Electron – Krebs' cycle – Glycolysis transport chain
c) Glycolysis –Krebs' cycle – Electron transport chain
d) Glycolysis – Electron transport chain – Krebs' cycle

229. The term glycolysis has originated from the Greek word ..... and ....
a) Glycos, lysis b) Glycol, analysis c) Glycerol, lysis d) Glycol, lysis

230. The organelle associated with aerobic respiration is
a) Chloroplast b) Centriole c) Nucleus d) Mitochondria

231. Incomplete breakdown of sugar in anaerobic respiration forms
a) Glucose and carbon dioxide b) Alcohol and carbon dioxide
c) Water and carbon dioxide d) Fructose and water

232. The total energy trapped per gm mole of glucose is 1292 kJ with on efficiency of
a) 35% b) 55% c) 45% d) 25%

233. Phase common in aerobic and anaerobic respiration is
a) Krebs' cycle b) Glycolysis c) Glycogenolysis d) ETS

234. Synthesis process in organism is also called
a) Catabolism b) Anabolism c) Both (a) and (b) d) None of these

235. Oxalosuccinic acid, an intermediary compound of Krebs' cycle is a
a) 5-carbon compound b) 6-carbon compound c) 4-carbon compound d) 3-carbon compound

236. Which of the following process takes place in mitochondria?
a) Photolysis b) Photophosphorylation
c) Carboxylation d) Oxidative phosphorylation

237. How much percentage of energy is released during lactic acid and alcoholic of fermentation?
a) 2 b) 9 c) 8 d) Less than 7

238. Calculation of ATP gain for every glucose is made on certain assumptions. Choose the correct option in accordance with the statement given above
a) The pathway functioning is sequential and orderly
b) One substrate forms the reactant for the others

c) TCA cycle and ETS pathway follow one after another
d) All of the above

239. Sucrose is converted into
a) Glucose and fructose
b) Triose phosphate and pyruvic acid
c) Oxlic acid and citric acid
d) Citric acid and pyruvic acid

240. Which of the following respiratory substrates requires the highest number of oxygen molecules for its complete oxidation?
a) Tripalmitin
b) Triolein
c) Tartaric acid
d) Oleic acid

241. The metabolic pathway through which the electron passes from one carrier to another is called
a) Electron transport system
b) Electron procedure system
c) Electron moving procedure
d) None of the above

242. In which one of the following options, the two names refer to one and the same thing?
a) Citric acid cycle and Calvin cycle
b) Tricarboxylic acid cycle and urea cycle
c) Krebs' cycle and Calvin cycle
d) Tricarboxylic acid cycle and citric acid cycle

243. The complete combustion of glucose in respiration is represented by
a) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Energy}$
b) $C_6H_{12}O_6 + 6CO_2 \rightarrow +6O_2 + 6H_2O + \text{Energy}$
c) $C_6H_{12}O_6 + 6O_2 + 6CO_2 \rightarrow +6CO_2 + 6H_2O + \text{Energy}$
d) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + \text{ATP} \rightarrow 6CO_2 + 6H_2O + 6O_2 + \text{Energy}$

244. The overall goal of glycolysis, Krebs' cycle and the electron transport system is the formation of
a) ATP in small stepwise units
b) ATP in one large oxidation reaction
c) Sugars
d) Nucleic acids

245. In glycolysis, $NADH + H^+$ is formed from NAD, when
a) 3-phosphoglyceral dehyde (PGAL) is converted to 1, 3-bisphosphoglycerate (BPGA)
b) Triose phosphate is converted to 2-phosphoglycerate
c) 2-phosphoglycerate is converted to 2-phosphopyruvate
d) 2-phosphopyruvate is converted to 2-pyruvic acid

RESPIRATION IN PLANTS

: ANSWER KEY :

1)	c	2)	b	3)	a	4)	a	129)	d	130)	b	131)	a	132)	a
5)	c	6)	c	7)	c	8)	c	133)	b	134)	d	135)	c	136)	d
9)	b	10)	d	11)	b	12)	a	137)	a	138)	d	139)	a	140)	b
13)	c	14)	a	15)	a	16)	b	141)	c	142)	c	143)	a	144)	b
17)	b	18)	c	19)	d	20)	b	145)	a	146)	a	147)	b	148)	b
21)	d	22)	c	23)	b	24)	b	149)	d	150)	d	151)	c	152)	a
25)	b	26)	c	27)	a	28)	a	153)	a	154)	b	155)	a	156)	d
29)	b	30)	c	31)	d	32)	a	157)	b	158)	d	159)	a	160)	d
33)	a	34)	a	35)	b	36)	a	161)	a	162)	a	163)	a	164)	c
37)	c	38)	d	39)	b	40)	c	165)	d	166)	a	167)	a	168)	a
41)	b	42)	a	43)	d	44)	a	169)	a	170)	c	171)	b	172)	a
45)	c	46)	b	47)	c	48)	b	173)	b	174)	c	175)	a	176)	b
49)	a	50)	b	51)	c	52)	d	177)	d	178)	a	179)	d	180)	a
53)	d	54)	d	55)	c	56)	d	181)	b	182)	b	183)	a	184)	c
57)	d	58)	c	59)	a	60)	a	185)	b	186)	d	187)	c	188)	b
61)	a	62)	c	63)	c	64)	a	189)	a	190)	b	191)	c	192)	b
65)	c	66)	a	67)	b	68)	a	193)	c	194)	c	195)	b	196)	a
69)	b	70)	a	71)	d	72)	d	197)	b	198)	d	199)	d	200)	d
73)	c	74)	b	75)	b	76)	c	201)	c	202)	b	203)	a	204)	b
77)	c	78)	c	79)	c	80)	a	205)	c	206)	b	207)	a	208)	d
81)	c	82)	d	83)	b	84)	a	209)	c	210)	a	211)	a	212)	a
85)	a	86)	b	87)	a	88)	a	213)	d	214)	a	215)	d	216)	d
89)	d	90)	c	91)	a	92)	d	217)	b	218)	a	219)	d	220)	a
93)	b	94)	d	95)	c	96)	a	221)	c	222)	c	223)	a	224)	b
97)	b	98)	d	99)	c	100)	c	225)	c	226)	d	227)	c	228)	c
101)	c	102)	d	103)	a	104)	a	229)	a	230)	d	231)	b	232)	c
105)	b	106)	b	107)	c	108)	a	233)	b	234)	b	235)	b	236)	d
109)	c	110)	a	111)	c	112)	d	237)	d	238)	d	239)	a	240)	b
113)	b	114)	c	115)	c	116)	a	241)	a	242)	d	243)	a	244)	a
117)	b	118)	a	119)	a	120)	b	245)	a						
121)	a	122)	b	123)	a	124)	b								
125)	d	126)	a	127)	d	128)	a								

RESPIRATION IN PLANTS

: HINTS AND SOLUTIONS :

1 **(c)**
Complex I of electron transport system (ETS) is NADH dehydrogenase, which oxidase NADH produced in the mitochondrial matrix during citric acid cycle. Complex IV of cytochrome-and a_3 and two copper centres.

2 **(b)**
In fermentation, incomplete oxidation of glucose is achieved under anaerobic condition by sets of reactions where pyruvic acid is converted to CO_2 ethanol and sometimes lactic acid

3 **(a)**
The cellular respiration first takes place in the cytoplasm.

4 **(a)**
The scheme of glycolysis was given by Gustav Embden, Otto Mayerhof and J Parnas. It is the only process in respiration for anaerobic organism. It is ofter referred as the EMP pathway

5 **(c)**
Glycolysis was discovered by Gustav Embden, Otto Mayerhof and J Parnas. To give honour to them the glycolysis pathway is also called EMP pathway by taking initial name of theirs

6 **(c)**
Mitochondria contains various enzymes as follows:
1.Outer Membrane: Acetyl transferase, glycerophosphatase, phospholipase-A, monoamine oxidase, etc.

2.Inner Membrane: Cytochrome oxidase, dehydrogenase, succinate, NADH dehydrogenase, ATPase, etc.

3.Perimitochondrial Space: Adenylate kinase, nucleoside diphosphokinase, etc.

4.Matrix : Pyruvate dehydrogenase, citrate synthase, Aconitase, isocitrate dehydrogenase, fumerase, α-ketogulatrate dehydrogenase, malate dehydrogenase, etc.

7 **(c)**
In eukaryotes, all the reactions of tricarboxylic acid (TCA) cycle or Krebs' cycle takes place in the matrix of mitochondria because all enzymes of this cycle are found in the matrix of mitochondria except Succinic dehydrogenase, which is located in the inner membrane of mitochondria.
In prokaryotes, Krebs' cycle occurs in cytoplasm.

8 **(c)**
Glyceraldehyde-3-phosphate is required for the oxidative reaction during glycolysis.

9 **(b)**
Aerobic respiration occurs in the presence of oxygen that leads to a complete oxidation of organic substances and releases CO_2, water and a large amount of energy. This type of respiration is most common in higher organism

10 **(d)**
On administration of glucose orally respiration will take place.

11 **(b)**
30 ATP molecules could be generated from 686 kcal energy.

12 **(a)**
NADPH is formed during light reaction of photosynthesis and also formed during hexose monophosphate shunt (HMP shunt) of glucose oxidation.

13 **(c)**
Plants can get along without respiratory organ because plant part takes care of its own gas exchange needs and less demand for gas exchange. Because only during photosynthesis are large volumes of gases exchanges and each leaf is well adapted to take care of its own needs, during these period

15 **(a)**

During the oxidation process (occurs in inner mitochondrial membrane during electron transport system) enormous amount of free energy is released, some of which is utilized by inner membrane sub units of F_1 particles containing three coupling factors and ATPase enzyme, in the synthesis of ATP molecules.

16 **(b)**
Pyruvate which is formed by the glycolytic catabolism of carbohydrate undergoes oxidative decarboxylation by a complex set of reactions catalysed by pyruvate dehydrogenase

17 **(b)**
The intermediate compound which link glycolsis with Krebs' cycle is acetyl Co-A.

18 **(c)**
All the enzymes of Krebs' cycle, fatty acid synthesis and amino acid synthesis are found in matrix but **Succinic dehydrogenase** and **cytochrome oxidase** are present on inner membrane of mitochondria.

19 **(d)**
Enolase works on 2-phosphoglyceric acid (3C-compound), Aconitase on citric acid (6C-compound). Fumerase on Fumaric acid (4C-compound) and alcohol dehydrogenase on acetaldehyde (2C-compound). Thus, increasing order of these enzymes based on the carbon number of the substrates on which they act is – IV, I, III, II.

20 **(b)**
Pyruvic acid synthesized in glycolysis must enter inside the mitochondnia, where oxidative Decarboxylation occurs in presence of NAD^+, pyruvic acid Dehydrogenase complex and coenzyme-A.

$$\text{Pyruvic acid} + NAD^+ + \text{Co-A} \xrightarrow[+Co-A]{} \text{Acetyl Co-A} + CO_2 + NADH$$

21 **(d)**
Saccharomyces cerevisiae is a species of budding yeast. It is commonly known as 'baker's yeast' or 'brewer's yeast'. The yeast ferments sugars present in the flour or added to the dough, giving off carbon dioxide (CO_2) and alcohol (ethanol). The carbon dioxide is trapped as tiny bubbles in the dough, which rises.

22 **(c)**
Respiration and respiratory quotient is measured by respirometer

23 **(b)**
In Krebs' cycle, acetyl Co-A adds its two-carbon fragment to oxaloacetate, a four-carbon compound. The unstable bond of acetyl Co-A is broken as oxaloacetate the coenzyme and attaches to the acetyl group. The product is the 6C-citrate.

24 **(b)**
NADH is oxidised to NAD^+ slowly in fermentation, through the reaction is very vigorous in case of aerobic respiration

25 **(b)**
Electron transport chain takes place in the inner mitochondrial membrane and consists of flavins, ubiquinone, cytochromes and oxygen as electron carriers.
Sequence of electron transport :
$NADH_2 \rightarrow FAD \rightarrow$ Co-Q $\rightarrow$
Cytochrome -b $\rightarrow$ Cyt-c_1 $\rightarrow$ Cyt-a $\rightarrow$ Cyt $-a_3 \rightarrow$ O_2

26 **(c)**
During exercise where O_2 is inadequate for cellular respiration, pyruvic acid is reduced into lactic acid by lactate dehydrogenase

27 **(a)**
Fermentation accounts for only a partial breakdown of glucose whereas in aerobic respiration it is completely degraded to CO_2 and H_2O

28 **(a)**
N and P are required by plants for ATP formation.

30 **(c)**
Pyruvic acid, generated in the cytosol is transported to mitochondria and thus initiate the second phase of respiration. Before pyruvic acid enters Kreb's cycle, operative in the mitochondria, one of the three carbon atoms of pyruvic acid is oxidised to carbon dioxide in a reaction called oxidative decarboxylation

31 **(d)**
Usually carbohydrate are oxidised to release energy, but proteins, fats and even organic acids can be used as respiratory substances in some plants, under certain condition

32 **(a)**
One of the three carbon atoms of pyruvic acid is oxidised to carbon dioxide. The combination of the remaining two carbon acetate unit is readily accepted by a sulphur containing compound coenzyme A (Co-A) to form acetyl Co-A. This is the

connecting link between glycolysis and Kreb's cycle

33 **(a)**
In eukaryotes, electron transport and oxidative phosphorylation occur in the inner membrane of mitochondria. The significant enzymes of inner mitochondrial membrane are enzymes of electron transport pathways viz. NAD, FAD, DPN (diphosphopyridine nucleotide) dehydrogenase, five cytochromes (cytochrome-b, cytochrome-c, cytochrome-c_1, cytochromes-a and cytochrome-a_3), ubiquinone or coenzyme-Q_{10}, non-haem copper and iron, ATP synthetase, succinate fatty acid acyl transferase.

34 **(a)**
Saprophytes like fungi are dependent on dead and decaying matter

35 **(b)**
Mitochondria are known as power house of cell. Glyceraldehyde-3-phosphate dehydrogenation reaction is found in cytoplasm during glycolysis, other three reactions take place in mitochondria.

36 **(a)**
In the process of glycolysis, 6 carbon molecules of glucose is split into 2, 3-carbon molecules of pyruvic acid. In this, one molecules of NAD^+ are reduced for each glucose molecule. The energy stored with the NADH is released in the electron transport chain. This process (glycolysis) occurs in cytosol

37 **(c)**
The oxidation of Succinic acid to Fumaric acid in Krebs' cycle is catalyzed by Succinic dehydrogenase. Succinic dehydrogenase is attach to mitochondrial inner membrane.

38 **(d)**
Succinate dehydrogenase enzyme is present on inner membrane of mitochondria and catalysed the oxidation of succinate to fumarate.

39 **(b)**
The TCA cycle starts with the condensation of acetyl group with oxaloacetic acid (OAA) and water to yield citric acid. The reaction is catalyzed by the enzyme citrate synthase and molecule of Co-A is released

40 **(c)**
Krebs' cycle is also called as citric acid cycle because citric acid is the first product of this cycle and also called Tricarboxylic acid cycle (TCA) because citric acid is a called Tricarboxylic acid. In eukaryotic organisms, all reactions of Krebs' cycle take place in matrix of mitochondria because all enzymes of this cycle are found in matrix of mitochondria except Succinic dehydrogenase (located in inner membrane of mitochondria).

41 **(b)**
In electron transport chain, cytochrome-a is an electron carrier, which contains copper with iron. It picks up electrons to oxygen. Therefore, oxygen accepts the terminal electrons.

42 **(a)**
In electron transport system oxygen acts as the final hydrogen acceptor where it derives the whole process by removing hydrogen from the system

43 **(d)**
If a starving plant is provided with glucose, its rate of respiration will increase because of the availability of food for respiration.

44 **(a)**
Malic acid is a product of aerobic respiration. Ethyl alcohol and lactic acid are formed as a result of anaerobic respiration (fermentation), while pyruvic acid is produced during both-aerobic and anaerobic respiration.

45 **(c)**
$A - 2H^+$, $B - F_0$, $C - F_1$

46 **(b)**
In Krebs' cycle, pyruvic acid is converted into carbon dioxide and water.

47 **(c)**
An enzyme may have areas that control the confirmation of active sites. They are called Allosteric sites. Such an enzyme is called Allosteric enzyme, e.g., glucokinase, phosphofructokinase. Substance, which bring about changes in Allosteric sites are called modulators.

48 **(b)**
In glycolytic pathway, 3PGAL is converted into 1, 3-diphosphoglyceric acid by an oxidation and phosphorylation reaction, which occurs in presence of H_3PO_4 and coenzyme NAD.
3-phosphoglyceraldehyde + NAD^+ + Pi^{-2} → 3-phosphoglyceraldehyde dehydrogenase 1, 3-diphosphplyceric acid + NADH + H^+

49 **(a)**
Pyruvic acid forms as a result of glycolysis in cytoplasm of cell. Oxidation of pyruvic acid into

acetyl Co-A begins the citric acid cycle (Krebs' cycle) in mitochondria.

50 **(b)**

When oxygen is not available, yeast or some other microbes respire anaerobically. In case of anaerobic respiration, the value of respiratory quotient is not utilized, eg,

$$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 3C_2H_5OH + 2CO_2 + \text{Energy}$$

Glucose Ethyl alcohol

51 **(c)**

All living organisms need energy for carrying out daily life activities and is obtained by oxidation of macromolecules

52 **(d)**

In TCA cycle TCA substrate oxidise by releasing NADH + H^+, which produces three ATP molecules. So, one glucose molecule through TCA produces 6 NADH + H^+. So 18 ATP produced through electron transport chain. 2 $FADH_2$ of Kreb's cycle produced 4 ATP

53 **(d)**

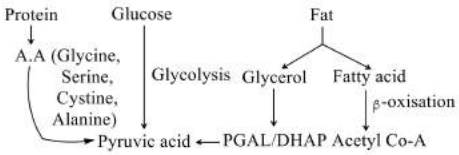
Chemiosmotic hypothesis of ATP synthesis was proposed by Peter Mitchell in 1961.

54 **(d)**

Alcoholic fermentation by yeast causes decorboxylation of pyruvate to acetaldehyde producing CO2 as byproduct. Acetalatehyde accepts 2H atoms from NADH2 to produce ethanol

55 **(c)**

Pyruvic acid is intermediate compound, which is produced during oxidation of all types of respiratory substrates carbohydrates, fats and proteins



Option **(d)** Acetyl Co-A may also be answer but more appropriate is pyruvic acid as it formed directly by all these respiratory substrates

56 **(d)**

Respiratory quotient (RQ) is the ratio of the volume of carbon dioxide produced to the volume of oxygen consumed in respiration over a period of time. The values of RQ for various substrates are :

Carbohydrate – One

Fat, protein - Less than one

Organic acid - More than one

Succulents - Zero

57 **(d)**

Pyruvic acid inters in the matrix of mitochondria and undergoes acetylation by oxidative Decarboxylation to form 2-carbon compound acetyl Co-A. Krebs' cycle is basically a catabolic cycle as it oxidises acetyl Co-A and organic acids into carbon dioxide and water.

58 **(c)**

Out of the four phases of cellular respiration all except glycolysis (occur in cytoplasm-outside mitochondria) take place in mitochondria. The enzymes of Krebs' cycle are located in the matrix of mitochondria, while that of oxidative phosphorylation are located in inner mitochondrial membrane.

59 **(a)**

ATP is an energy rich compound, which is structurally most similar to a molecule of RNA nucleotide.

60 **(a)**

DCMU is a herbicide which acts as an inhibitor of non-cyclic electron transport; PMA is fungicide which reduces transpiration; colchicine is an antimicrobial drug, it causes prevention of mitotic spindle formation thus blocking the mitosis

61 **(a)**

Oxidation of one molecule of NADH gives rise to 3 molecules of ATP.

62 **(c)**

An amphibolic pathway is a biochemical pathway that serves both anabolic and catabolic processes. An important example of an amphibolic pathway is the Krebs' cycle, which involves both the catabolism of carbohydrates and fatty acid and the synthesis of anabolic precursors for amino acid synthesis, eg, α-ketogluturate and oxaloacetate.

63 **(c)**

In alcoholic fermentation,

1.NADH (formed during conversion of triose-3phosphate to 3-phosphoglycerate) is oxidized to NAD^+

2.Electrons are accepted by acetaldehyde formed by Decarboxylation of pyruvate.

64 **(a)**

Wherever oxygen involves as a substrate is known as oxidation. Therefore respiration is oxidation process

65 **(c)**

Net gain of ATP during aerobic respiration

1.Glycolysis provides 2ATP molecules and $2NADH+H^+$

2.Pyruvate oxidation yields $2NADH + H^+$

3.Krebs' cycle produces 2GTP molecules, $6NADH + H^+$ and $2FADH_2$ molecules.

4.In electron transport system one $NADH + H^+$ produce 3ATP and $FADH_2$ produces 32 or 34 ATP.

2ATP from glycolysis + 2GTP from TCA cycle and 32/34 ATP from ETS/ETC =38/36 ATP molecule.

66 **(a)**

Cyanides, antimycin A, carbon monoxide inhibits the process of electron transport chain

68 **(a)**

There is two step in glycolysis where ATP is formed or synthesised by ADP

(i) When 1, 3, bisphosphoglyceric acid is changed into 3-phosphoglyceric acid

(ii) When phosphoenolpyruvate (PEPA) is changed into pyruvic acid

69 **(b)**

Fats give maximum energy on oxidation. As palmitic acid is a fatty acid produced by hydrolysis of fat, hence, produces maximum number of ATP on oxidation.

70 **(a)**

Glycolysis is a series of reactions that takes place in the cytoplasm of all prokaryotes and eukaryotes. The role of glycolysis is to produce energy (both directly and by supplying substrate for the citric acid cycle and oxidative phosphorylation) and to produce intermediates for biosynthetic pathway.

71 **(d)**

Krebs' cycle begins with the reaction of acetyl Co-A with oxaloacetic acid in presence of the enzyme citrate synthase.

72 **(d)**

Acetyl Co-A is the link between glycolysis and Kreb cycle, for formation of acetyl Co-A the Co-factor TPP, lipoic acid and Mg^{2+}, Co-A is required

73 **(c)**

Carbon dioxide is released by anaerobic repiration in plants

74 **(b)**

Respiratory quotient is the ratio of carbon dioxide output to oxygen used during respiration.

$$RQ = \frac{volume\ of\ carbon\ dioxide\ formed}{volume\ of\ oxygen\ utilized}$$

Substrate	RQ
Carbohydrate	1
Protein	0.80
Fat (tripalmitin)	0.70
Mixed diet	0.85
Organic acids (oxalic acid)	4.0

75 **(b)**

TCA cycle starts with the condensation of acetyl group with Oxalo Acetic Acid (OAA) and water to yield citric acid. The reaction is catalysed by the enzyme citrate synthase

76 **(c)**

Respiratory quotient (the ratio between the volume of carbon dioxide liberated to the volume of oxygen absorbed in respiration) is less than one, when fats and proteins are respired. Castor oil is rich in fatty substances.

77 **(c)**

Before entering respiratory pathway amino acids are deaminated

78 **(c)**

34 molecules of ATP (30 through NADH and 4 through $FADH_2$) are obtained as a result of oxidative phosphorylation. Rest 4 molecules are obtained as a result of direct phosphorylation.

79 **(c)**

Decarboxylation occurs in Krebs' cycle.

80 **(a)**
The citric acid cycle for production of energy in the cell was described by Kreb's, therefore TCA cycle is also known as Kreb's cycle

81 **(c)**
1 molecule of glucoses yields 262 8 kcal of usable energy
No. of glucose molecule required to produce 4800 kcal energy $= \frac{4800}{262.8} = 18$
1 molecule of ATP yield 7.3 kcal of usable energy
No. of ATP molecules required to produce 4800 kcal energy $= \frac{4800}{7.3} = 657$

82 **(d)**
Coliforms are defined as aerobic or facultative anaerobic, Gram negative, non-endospore forming, rod-shaped bacteria that ferment lactose to form gas.

83 **(b)**
Due to excessive contraction of muscles (eg, leg muscles in hurdle race), the metabolic products of glycolysis accumulate in them which leads to muscle fatigue. Normally, pain is experienced in the fatigued muscle.

84 **(a)**
Like the bacterial respiration, in animal cells during the exercise when oxygen is inadequate for cellular respiration pyruvic acid is reduced to lactic acid by lactate dehydrogenase. The reducing agent is $NADH + H^+$ which is reoxidised to NAD^+ in both the process

85 **(a)**
During the respiration, compounds are needed to break and perform the next step to release ATP. It is specifically called respiratory substrate

86 **(b)**
The given compound ($C_{51}H_{98}O_6$) is tripalmitin (2 molecules) used as a substrate. This substrate is used in respiration the respiratory quotient is less than 1. The given below derivation explained much clear way
Respiratory quotient $= \frac{\text{Evolved } CO_2}{\text{Consumed } O_2} = \frac{102\ CO_2}{145\ O_2} =$ 0.7

87 **(a)**
All the energy required for life processes is obtained by oxidation of some macromolecules that we call food.
Only green plants and cyanobacteria can prepare their own food by the process of photosynthesis. They trap light energy and convert it into chemical energy that is stored in the bond of carbohydrates like glucose, sucrose and starch

88 **(a)**
Intermediate in the pathway are utilised to synthesise other compound

89 **(d)**
In plants, glucose is derived from sucrose which is the end product of photosynthesis or form storage carbohydrate

90 **(c)**
As per chemiosmotic hypothesis ATP synthetase becomes active in ATP formation only where there is a proton gradient having higher concentration of H^+ or protons on the inner side as composed to outer side.

91 **(a)**
Louis Pasteur observed that yeast cells grew rapidly in air but used little sugar and produced little carbon dioxide and ethanol. Under anaerobic conditions, they grew slower but used more sugar and produced more carbon dioxide and ethanol. This phenomenon of inhibition of breakdown of carbohydrate and production of ethanol is known as **Pasteur effect**. Biochemically, Pasteur effect is an Allosteric inhibition of phosphofructokinase enzyme in the presence of oxygen.

92 **(d)**
Organic acid evolves more carbon dioxide than volume of oxygen consumed when broken down as respiratory substrate under aerobic conditions, i.e., RQ is more than unity.

93 **(b)**
Anaerobic respiration in microorganisms is called **fermentation**. It takes place in absence of oxygen and produced lactic acid, ethyl alcohol, etc, from glucose. It is useful in manufacture of wine, beer and bread.

94 **(d)**
The main purpose of cellular respiration is to get energy that is utilised for functioning various purpose. Glucose energy is converted into ATP, which is utilised by cell

95 **(c)**
Glucose-6-phosphate yields less than 4 kcal/mol, when its phosphate bond is hydrolysed.

96 **(a)**
5g moles glucose on complete oxidation releases **3430** kcal of energy.

97 **(b)**

NADP, NAD and FAD are coenzyme formed from vitamins and work as electron acceptor in cellular metabolism.

98 **(d)**
Glycolysis of one molecule of glucose produces 2PGAL, thus of three molecules will produce 6PGAL.
Respiration of one molecule of glucose or 2PGAL produces 38ATP molecules, thus, of 6PGAL will produce 114 ATP molecules. Out of the given option, 120 ATP is the nearest correct answer.

99 **(c)**
Aspartic acid + α-ketoglutaric acid $\longrightarrow$oxaloacetic acid + glutamic acid
This is an example of transamination reaction. In this, amino group of aspartic acid is transferred to glutamic acid.

100 **(c)**
Acetyl Co-A is a common intermediate of carbohydrate and fat metabolism. It is a substrate entrant of Krebs' cycle and acts as a connecting link between glycolysis and Krebs' cycle.

101 **(c)**
The pyruvic acid formed during glycolysis enters to mitochondria where oxidative Decarboxylation takes place and acetyl Co-A is formed. It occurs in presence of NAD^+, pyruvic acid Dehydrogenase complex and coenzyme-A. pyruvic acid + $NAD^+ \rightarrow$ Acetyl Co-A + NADH + H^+ + CO_2

103 **(a)**
Oxidation of one molecule of NADH give rise to 3 molecules of ATP while that of one molecule of $FADH_2$ produces 2 molecules of ATP

104 **(a)**
Respiration is defined as breaking down of C-C bond of various organic molecules by oxidation process for cellular use

105 **(b)**
If oxygen is not available, pyruvic acid undergoes anaerobic respiration/fermentation, but under aerobic condition, the pyruvic acid enters into mitochondria and converted to **Acetyl Co-A**. Acetyl Co-A functions as substrate entrant for Krebs' cycle so, a connecting link between glycolysis and Krebs' cycle.
Glycolysis is the process of breakdown of glucose (hexose sugar) to two molecules of pyruvic acid through a series of enzyme mediated reactions. It occurs in cytoplasm and is common both to aerobic and anaerobic respiration. Last product is pyruvic acid.

106 **(b)**
The electron acceptors of respiratory chains occur in linear sequences (cyt.-b, c, a, a_3) and their enzymes are components of the inner mitochondrial membrane.

107 **(c)**
In microorganisms, the term anaerobic respiration is replaced by fermentation. The pyruvic acid formed in glycolysis is transformed to ethyl alcohol and release 2 ATP molecules.

108 **(a)**
One of the three carbon atoms of pyruvic acid which is the end product of glycolysis is oxidised to carbon dioxide in a reaction called oxidative decarboxylation. Pyruvate is first decarboxylated and oxidised by the enzyme pyruvate dehydrogenase

109 **(c)**
Saccharomyces shows Pasteur's effect.

110 **(a)**
Fermentation is a type of cellular respiration found in plants and some unicellular microorganism, which does not require oxygen, i.e., **anaerobic respiration**, and that results in the production of ethanol from glucose and release of small amount of energy.

111 **(c)**
Krebs' cycle is also called as citric acid cycle. Citric acid (Tricarboxylic acid) is the first product of this cycle.

112 **(d)**
Six carbon dioxide molecules are released by complete oxidation of one glucose molecules. Two carbon dioxide molecules are released during oxidative Decarboxylation reaction and four carbon dioxide molecules are released in Krebs' cycle or tricarboxylic Acid cycle.

113 **(b)**
The respiratory decomposition of fatty acids is known as beta oxidation, which occurs in liver and adipose tissue. First of all, there is activation of fatty acid, then dehydrogenation of activated fatty acid takes place. This is followed by hydration. The β-hydroxyl acyl derivative is converted to β-keto derivative which then reacts with Co-A.

114 **(c)**

Respiratory Quotient (RQ) is the ratio of volume of CO_2 released to the volume of O_2 absorbed during respiration. In case of organic acids (eg., oxalic acid), more CO_2 is released than the O_2 absorbed. Hence, RQ of organic acids is always more than one.

$2(COOH)_2 + O_2 \rightarrow 4CO_2 + 2H_2O + \text{Energy}$

$RQ = \frac{4CO_2}{1O_2} = 4$

115 **(c)**
ATP is called as energy currency of cell.

116 **(a)**
Breakdown processes within the living organism is also called catabolism

117 **(b)**
In fermentation, the incomplete oxidation of glucose is achieved under, anaerobic condition by set of reactions, where pyruvic acid is converted into carbon dioxide and ethanol. The enzyme, pyruvic acid decarboxylase and alcohol Dehydrogenase catalyse these reactions.

118 **(a)**
ATP is utilised at two steps – First in the conversion of glucose into glucose – 6 phosphate and second in the conversion of fructose – 6 – phosphate to fructose 1, 6 biphosphate

119 **(a)**
Aerobic respiration takes place within the mitochondria, the final product of glycolysis, pyruvate is transported from the cytoplasm into the mitochondria

121 **(a)**
Oxaloacetic acid – 4C. Phosphoglyceric acid – 3C Ribulose bisphosphite – 3C. Phosphoenl pyruvate – 3C

122 **(b)**
In the non-competitive inhibition of enzymes, the inhibitor (cyanide) has no structural similarity with the substrate (cytochrome-c) and binds to the enzyme at a point other than its active site which leads to change in globular structure of enzyme. Hence, even if the substrate is able to bind with the enzyme, catalysis will not take place.

123 **(a)**
During anaerobic respiration, one molecule of glucose gives two molecules of ATP. Thus, 8 molecules of ATP are produced.

124 **(b)**
Peter Mitchell (1961) proposed the chemiosmotic mechanism of ATP synthesis which, states that ATP synthesis occurs due to H^+ flow through a membrane. It includes development of proton gradient and proton flow.

125 **(d)**
In the process of glycolysis, 6-carbon molecules of glucose are split into two 3-carbon molecules of pyruvic acid. In this, two molecules of NAD^+ are reduced for each glucose molecule. The energy stored within the NADH is released in the electron transport chain.

126 **(a)**
Citric acid cycle is also known as Tricarboxylic acid cycle (TCA)

127 **(d)**
In respiration, whether it is aerobic or anaerobic glucose undergoes oxidation to form energy. In plants glucose is derived from sucrose which is the end product of photosynthesis or from storage carbohydrate. Sucrose is converted into glucose and fructose by the enzyme invertase to enter into the first step of respiration which is glycolytic pathway

128 **(a)**
Fat breakdown into fatty acid and glycerol before entering into the respiratory pathway

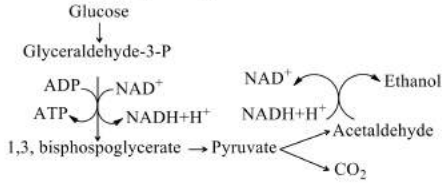
129 **(d)**
In glycolysis, water molecule is removed during conversion of 2-phosphoglycerate to phosphoenol pyruvate.
Conversion of fructose-6-phosphate to fructose 1-6 biphosphate is characterized by phosphorylation.

130 **(b)**
Pentose Phosphate Pathway (or Warburg-Lippman Dickens cycle) is an alternate method of aerobic respiration, which occurs in the cytoplasm of mature cell. This pathway accounts for 60% of total respiration in liver cells. In this, for every six molecules of glucose, one molecule is completely oxidized in CO_2 and reduced coenzymes, while 5 are regenerated.

131 **(a)**
In the first reaction of citric acid cycle one molecule of acetyl Co-A combines with 4-carbon Oxalo Acetic Acid (OAA) to form 6 carbon citric acid and Co-A is released

132 **(a)**

During fermentation, the pyruvic acid releases one molecule of CO_2 to produce acetaldehyde. The acetaldehyde, then reoxidises NADH and is itself reduced to ethanol. These reactions are catalysed by the enzyme, pyruvic acid decarboxylase and alcohol dehydrogenase



133 **(b)**
In the Krebs' cycle, when Succinic acid undergoes oxidation or dehydrogenation to form Fumaric acid, two hydrogens are transferred to FAD. FAD is reduced to FADH and enzyme involved in this step is Succinic acid dehydrogenase.

134 **(d)**
Respiratory pathway involved in both anabolism and catabolism, hence it is regarded as amphibolic pathway. In respiratory pathway not only the glucose but also amino acid and fatty acid can be used as intermediatory substances

135 **(c)**
The RQ value of 4 may be expected from complete oxidation of oxalic acid.

136 **(d)**
Fatty acid, protein and earbohydrak would be broken down to acetyl Co-A before entering the respiratory pathway when it is used as a substrate

137 **(a)**
Anaerobic arespiration occurs without O_2 which convince that it happens in lower organism

138 **(d)**
During the step of Krebs' cycle, where Succinic acid undergoes oxidation or dehydrogenation to form Fumaric acid, FAD is reduced to $FADH_2$ and enzyme involved in this step is Succinic acid dehydrogenase.
Conversion of isocitric acid to α-ketoglutaric acid, malic acid to oxaloacetic acid and pyruvic acid to acetyl Co-A, all involve reduction of NAD to $NADH+H^+$

139 **(a)**
One molecule of pyruvic acid converted in acetyl Co-A for 3 molecule of $NADH + H^+$

140 **(b)**
In 1950, **Kolliker** for the first time seen mitochondria. Later on **C Benda** coined the term mitochondria. These are the sites of cellular respiration, oxidative phosphorylation, synthesis of haeme protein, cytochrome, myoglobin, etc.

141 **(c)**
The energy released by oxidation in respiration is not directly used but it stored as ATP. Which is broken down whenever energy needs to be utilised

142 **(c)**
RQ is one in case of **carbohydrates**, while for fatty acids is less than one and for organic acids RQ is more than one.

143 **(a)**
Sucrose or cane sugar is widely distributed among higher plants. Its commercial sources are solely sugarcane and beet. It is used as substrate for the formation of alcohol.

144 **(b)**
The correct sequence in glycolysis is
Glucose-6-phosphate → 3-phosphoglyceraldehyde
Phosphoenol ←3-phosphoglyceric acid↲
Pyruvate
↓
Pyruvic acid.

145 **(a)**
Cyanide is a deadly poison of respiration and inhibit the activity of cytochrome-c oxidase complex (which contains cytochrome-a and cytochrome-a_3) of electron transport chain of aerobic respiration. Thus, no proton gradient will be established and no ATP will be formed. Along with as the reduction of NADH and $FADH_2$ is also ceased due to blockage of ETS, the availability of hydrogen acceptors like NAD^+ and FAD is ceased for Krebs' cycle and glycolysis. Cyanide resistance pathway is anaerobic respiration.

146 **(a)**
Hexokinase causes phosphorylation of glucose to glucose-6 phosphate in both glycolysis and pentose phosphate pathway. Both glycolysis and phosphate pathway occur in cytoplasm. Glucose + ATP $\xrightarrow{\text{Hexokinase}}$ Glucose 6-phosphate + ADP

147 **(b)**
The aerobic respiration takes place within the mitochondria, the final product of glycolysis pyruvate is transported from the cytoplasm into the mitochondria. *The major events in aerobic respiration are*

The complete oxidation of pyruvate by the stepwise removal of all the hydrogen atoms, leaving 3 molecules of CO_2.
The passing on of the electrons removed as part of the hydrogen atoms to molecular O_2 with simultaneous synthesis of ATP

148 **(b)**
Glycolysis is an essential and first path of respiration. It is common in both aerobic and anaerobic respiration and occurs in the cytosol of all living cells of prokaryotes as well as eukaryotes

149 **(d)**
Oxidative phosphorylation or ATP synthesis from NADH occur only under aerobic condition.

150 **(d)**
In ethyl alcohol fermentation,

(i) $2CH_3COCOOH \xrightarrow[TPP,\ Mg^{2+}]{\text{pyruvate decarboxylase}} 2CH_3CHO + 2CO_2\ (\uparrow)$

Pyruvic acid → Acetaldehyde

(ii) $2CH_2CHO + 2NADH_2 \xrightarrow{\text{Alcohol}} 2CH_3CH_2OH + 2NAD^+$

Acetaldehyde → Ethyl alcohol

151 **(c)**
The activity of succinate dehydrogenase is inhibited by Malonate.

152 **(a)**
Citric acid is produced by the fermentation of sugar by Aspergillus niger, *Mucor* sp and yeast.

153 **(a)**
In the process of respiration the compound, *i.e.*, glucose reacts with oxygen which is called oxidation therefore organic substance gets oxidised

154 **(b)**
Pyruvate is broken down to CO_2 and H_2O in citric acid of tricarboxylic acid cycle (TCA)

155 **(a)**
Preparatory phase before fermentation is called **upstream processing** while downstream processing is the name given to the stage after fermentation, when the desired product is recovered and purified.

156 **(d)**
Retting is facilitated by anaerobic butyric acid bacteria such as Clostridium botulinum, Clostridium tetani and Clostridium perfringens.

157 **(b)**
RQ is the ration of the volume of carbon dioxide released to the volume of oxygen taken in respiration. It depends on the nature of the substrate, which is oxidised. For carbohydrates RQ is one, for fats and proteins less than one but more than one for organic acids, etc.

158 **(d)**
The complex V of ETS of mitochondrial membrane is ATP synthase, which has a head piece, stalk and a base piece. Out of these, the head piece is identified as the coupling factor 1(F_1), stalk portion is necessary for binding *i* to inner mitochondrial membrane and base piece is isolated as F_0 and present within the inner mitochondrial membrane.

159 **(a)**
Protein breaks down into amino acid then enter into the glycolytic pathway

160 **(d)**
Ethyl alcohol is commercially manufactured from sugarcane. Molasses is the byproduct of sugar industry. Ethanol is produced by the fermentation of molasses (contains glucose and fructose) by using yeast, *Saccharomyces cerevisiae.*

161 **(a)**
Krebs' cycle takes place in matrix of mitochondria. Largest amount of phosphate bond energy is produced in Krebs' cycle due to oxidation by O_2. We get $6CO_2$, $8NADH_2$, $2FADH_2$ and 2ATP molecules in Krebs' cycle.

162 **(a)**
In electron transport system, last electron acceptor is oxygen

163 **(a)**
Glucose and fructose are both converted to ethanol and carbon dioxide in presence of Zymase enzyme.

$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2C_2H_5OH + 2CO_2$

Glucose or Fructose → Ethanol

164 **(c)**
Glycolysis is the degradation of glucose molecule with net gain of 2ATP molecules per glucose molecule. It occurs both in **aerobic** and **anaerobic** conditions.

165 **(d)**
For fatty substances, RQ is generally less than one.
$2C_{51}H_{96}O_6 + 145O_2 \rightarrow 102CO_2 + 98H_2O$
$RQ = \frac{co_2}{O_2} = \frac{102}{145} = 0.7$ (less than unity)

166 **(a)**
DCMU is a herbicide which acts as an inhibitor of non-cyclic electron transport; PMA is fungicide which reduces transpiration; colchicines is an antimicrobial drug, it causes prevention of mitotic spindle formation thus blocking the mitosis.

167 **(a)**
With the complete oxidation of pyruvate by the stepwise removal of all the hydrogen atoms form 3 molecules of CO_2, which occurs in matrix of the mitochondria

168 **(a)**
In anaerobic respiration bacteria produce lactic acid from pyruvic acid

169 **(a)**
Strains of Saccharomyces cerevisiae (yeast) are extensively used for leavening of bread. During fermentation, the yeasts produce alcohol and carbon dioxide, which leave and the leavened bread becomes porous.

170 **(c)**
Before entering respiratory pathway amino acids are deaminated

171 **(b)**
Pyruvic acid is an intermediate compound common for aerobic and anaerobic respiration because it is the end product in glycolysis and initial product in anaerobic respiration.

172 **(a)**
During alcoholic fermentation of glucose molecule, pyruvic acid is first decarboxylated to form acetaldehyde and CO_2, which is then changed to ethyl alcohol with help of NADH. Net gain is 2ATP molecules per glucose molecule.
$C_6H_{12}O_6 + 2ADP + 2Pi \rightarrow 2C_2H_5OH$
Glucose Ethyl alcohol
$+ 2CO_2 + 2ATP + 2H_2O$

173 **(b)**
4 ATP are formed in glycolysis but 2 ATP used
2 ATP in Krebs' cycle
34 ATP from electron transport chain
40 ATP

174 **(c)**
It is a fact that the living cells are organised in thin layers inside and beneath the bark. They also have dead cells in the interior which provide mechanical support

175 **(a)**
Sunlight is the ultimate source of energy on earth. Green plants converted sunlight in form of sucrose. Animals take food from plants and get energy by oxidation of glucose.

176 **(b)**
Dough kept overnight in warm weather becomes soft and spongy due to fermentation.

177 **(d)**
RQ is the ratio of volume of carbon dioxide evolved and volume of oxygen consumed.

178 **(a)**
On oxidation of fats, maximum amount of energy is liberated.

179 **(d)**
$NADH_2 \rightarrow NAD \rightarrow NADH_2$
$NADH_2 \rightarrow FAD \rightarrow FADH_2$
The former operates in liver heart and kidney cells and no energy is spent, while the second operates in muscle and nerve cells and lowers the energy level of $2NADH_2$ by 2 ATP molecules

180 **(a)**
Krebs 'cycle involves 8 steps to oxidize 2 molecules of acetyl Co-A produced in transition reaction completely into $4CO_2$, $10H_2O$, 2ATP, $2FADH_2$ and $6NADH+H^+$

181 **(b)**
Respiratory quotient $= \frac{\text{Evolved } CO_2}{\text{Consumed } O_2}$
Hence, how much O_2 will consume. It all depends substrate

182 **(b)**
In anaerobic respiration, *i.e.*, absence of O_2, glycolysis and fermentation involves. In fermentation incomplete oxidation of glucose is processed by sets of reaction where pyruvic acid is converted to CO_2 and ethanol

183 **(a)**
It is well known fact that photosynthesis in eukaryotes occurs in chloroplast whereas in prokaryotes it is in cytoplasm

184 **(c)**
Anaerobic respiration occurs in absence of oxygen. It is found in deep-seated tissues of plants and animals, germinating seeds, yeasts and bacteria. During anaerobic respiration of yeast,

two ATP produced from each glucose molecule. Hence, 38 ATP will produce from 19 glucose molecules.

185 **(b)**
In aerobic respiration, glycolysis is linked with Krebs' cycle through acetyl Co-A because pyruvic acid (end-product of glycolysis) first converted into acetyl Co-A. The acetyl Co-A enters in the Krebs' cycle. The formation of acetyl Co-A is involved with some cofactors like Mg ions, thiamine pyrophosphate (Vitamin-B_1), NAD^+, Co-A and lipoic acid.

186 **(d)**
In anaerobic respiration CO_2 is evolved but oxygen is not used. Therefore in such case respiratory quotient will be infinite. *e. g.*,

$$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2\,C_2H_5OH + 2\,CO_2 + \text{Energy}$$

Glucose

Where, respiratory quotient $= \frac{\text{Evolved } CO_2}{\text{Consumed } O_2}$

$= \frac{2\,CO_2}{0\,O_2} = \infty(\text{Infinity})$

187 **(c)**
The NADH synthesised in glycolysis is transferred into the mitochondria and undergoes oxidative phosphorylation

188 **(b)**
Total gain of 38 ATP molecules during aerobic respiration of one molecule of glucose

189 **(a)**
During glycolysis, in the presence of enzyme Hexokinase, glucose is converted into glucose-6-phosphate by using one ATP molecule in presence of Mg^{2+}

190 **(b)**
In the presence of Zymase, alcoholic fermentation takes place.

191 **(c)**
During the conversion of Succinyl Co-A to Succinic acid, a molecule of GTP is synthesized. This is a substrate level phosphorylation. In a coupled reaction, GTP is converted to GDP with the simultaneous synthesis of ATP from ADP.

192 **(b)**
Pyruvic acid is 3C-compound. One of the three carbon atoms of pyruvic acid is oxidised to carbon dioxide in a reaction called oxidative decarboxylation. Pyruvate is first decarboxylated and then oxidised by the enzyme pyruvate dehydrogenase. The combination of the remaining 2-carbon acetate unit is readily accepted by a sulphur containing compound, coenzyme A (Co-A) to form acetyl Co-A

194 **(c)**
Generally lower organism, *e. g.*, bacteria and fungi performs anaerobic respiration but also occur in higher organism

195 **(b)**
Pathway – A is glycolysis $\longrightarrow$ 2 NADH + H^-
Pathway – B is Kreb's cycle $\longrightarrow$ 6 NADH + H^+
Pathway – C is Electron transport system
Between pathway A and pathway B $\longrightarrow$ 2 NADH + H^+ produced

196 **(a)**
In electron transport chain respiratory process are to release and utilise the energy stored in NADH + H^+ and $FADH_2$. This is accomplished when they are oxidised through the electron transport system and the electron are passed on to O_2 resulting in the formation of H_2O

197 **(b)**
During citric acid cycle, 3 molecules of NAD^+ and one molecule of FAD (Flavin Adenine Dinucleotide) are reduced to produce NADH and $FADH_2$ respectively. These reduced electron carriers pass on the hydrogen atoms to oxygen through electron transport system, yielding II more ATP molecules for each molecule of pyruvic acid.
In addition one ATP molecules is generated directly during the cycle to give a total of 12 ATP molecule per pyruvic acid molecules. As two molecules of pyruvic acid are produced from each molecule of glucose a total of 24 molecules of ATP are formed during the citric acid cycle

198 **(d)**
When the fats respire, the value of RQ is less than one.

199 **(d)**
Glycolysis involves ten step for each step, specific enzyme needs to go next step

200 **(d)**
ATP is a coenzyme. Coenzyme is an organic cofactor molecule smaller than protein that bonds with a specific enzyme, while the reaction is being catalysed.

201 **(c)**
Oxidative phosphorylation refers to the synthesis of ATP from ADP and inorganic phosphate by chemiosmosis. It occurs with the help of energy

obtained from oxidation of reduced enzymes formed in cellular respiration.

202 **(b)**
Krebs' cycle or citric acid cycle occurs in the matrix of mitochondria. It occurs in aerobic respiration. Acetyl Co-A is the connecting link between glycolysis and Krebs' cycle. Pyruvic acid is oxidized into acetyl Co-A (6C), which is the first or initiating organic acid of Krebs' cycle.

203 **(a)**
Most cells of a plants have a part of their surface in contact with air. This is also facilitated by the loose packing of parenchyma cells in leaves

204 **(b)**
A variety of enzymes control different steps of cellular respiration.

205 **(c)**
NAD^+ and $NADP^+$ accepts two electrons and one proton to get reduced to NADH and NADPH respectively

206 **(b)**
The product of glycolysis is pyruvic acid the products of Krebs' cycle are CO_2 and water.

207 **(a)**
Chemiosmosis is the diffusion of ions across a selectively permeable membrane. More specifically, it relates to the generation of ATP by the movement of hydrogen ions across a membrane during cellular respiration.
ATP synthase is the enzyme that makes ATP by chemiosmosis. The generation of ATP by chemiosmosis occurs in chloroplasts and mitochondria as well as in some bacteria.

208 **(d)**
Cytochromes are small proteins (intrinsic membrane proteins) that contain a cofactor, haem, which holds an iron atom. The iron carries electrons and cycles between +2 and +3 oxidation states. These form a part of electron transport chain in mitochondria and chloroplast and act as an electron transporter or electron acceptor in respiration and photosynthesis.

209 **(c)**
RQ is the ratio of volume of carbon dioxide evolved and volume of oxygen consumed. If RQ is less than one it means the oxidation of the respiratory substrate consumed more oxygen than the amount of carbon dioxide released.
Volume of carbon dioxide < Volume of oxygen

210 **(a)**
The flowchart given shows the step in glycolysis. The glucose 6-phosphate breaks into fructose 6-phosphate and then fructose 1, 6-bisphosphate. Fructose -1, 6 bisphosphate convert into 3-phophoglyceraldehydes and then 1, 3-bisphosphoglyceric acid

211 **(a)**
Cyanide reacts with one of the proteins (cytochrome-a_3) in the electron transport system and prevents transfer of electron to oxygen. It leads to checking the ATP formation through oxidative phosphorylation. ATP is required for active transport of substances across the plasma membrane, besides some other metabolic reactions.

212 **(a)**
Brandy and whisky requires both distillation and fermentation as fermentation inhibited at an alcohol level of 10-18%.

213 **(d)**
Plants, unlike animals have no specialised organs for gaseous exchange but they have stomata and lenticels for this purpose

214 **(a)**
Citric acid cycle was discovered by British Chemist Hans Kreb's in 1937

215 **(d)**
Acetobacter sp. Are of particular importance, commercially they also used in the production of vinegar by converting the ethanol in the wine to acetic acid.

216 **(d)**
In glycolysis, two molecules of ATP are consumed initially in converting glucose to fructose 1, 6-bisphosphate. Two triose phosphate molecules are formed from one glucose molecule. Four molecules of ATP are produced at substrate level phosphorylation. Therefore, net gain of ATP is $2ATP \times 2 - 2ATP = 2$.

217 **(b)**
The synthesis of ATP from ADP is called phosphorylation. Substrate level phosphorylation is directly linked to liberation of energy in chemical reaction of respiration, e.g., formation of GTP is Krebs' cycle.

218 **(a)**
Malonate an analogue of succinate is a strong competitive inhibitor of succinate dehydrogenase and, therefore, blocks the activity of citric acid cycle.

219 **(d)**
There is a total gain of 38 ATP molecules during aerobic respiration of one molecules of glucose. Out of these, two molecules of ATP are required for transporting the NADH produced in glycolysis (in cytoplasm) into the mitochondria for further oxidation. Hence, the net gain of ATP is 36 molecules.

220 **(a)**
Animals are heterotrophic, *i.e.*, they obtain food from plants directly (herbivores) or indirectly (carnivores)

221 **(c)**
During Kreb's cycle as a result of formation of 6NADH, 18 ATP are produced through ETS in mitochondria

222 **(c)**
In glycolysis, one molecule of glucose changes into two molecules of pyruvic acid. Glycolysis takes place in cytoplasm.

223 **(a)**
Electron transport system occurs in inner mitochondrial membrane. Electron from NADH produced in the mitochondrial matrix during citric acid cycle are oxidised by an NADH dehydrogenase (complex) and electrons are then transferred to ubiquinone located within the inner membrane

224 **(b)**
Krebs' cycle is also known as citric acid cycle (first compound of Krebs' cycle) or Tricarboxylic acid cycle (TCA). This cycle takes place in the matrix of mitochondria because all necessary enzymes are found in the matrix of mitochondria.

225 **(c)**
Ratio of the volume of carbon dioxide liberated to the volume of oxygen absorbed during respiration is called Respiratory Quotient (RQ)
Carbohydrate – One
Fat, protein - Less than one
Organic acid - More than one
Succulents - Zero

226 **(d)**
Calorie is the unit of heat

227 **(c)**
Aspergillus is used to prepare the Roquefort cheese.

228 **(c)**
Cellular respiration is the process, in which energy stored in a glucose molecule is released by oxidation. Hydrogen atoms are lost by glucose and gained by oxygen.

229 **(a)**
The term 'glycolysis' has originated from the greek words, glycos for sugar and lysis for splitting

230 **(d)**
Mitochondria are called power house of cell, as the food material is gradually oxidised and energy generated is stored in the form of ATP. The enzymes for Krebs' cycle (aerobic respiration) and fatty acid oxidation are found in the matrix of mitochondria.

231 **(b)**
Incomplete breakdown of sugar in anaerobic respiration forms alcohol and dioxide.

232 **(c)**
The total energy trapped per gm mole of glucose is 1292 kJ or 309.7 kcal with on efficiency of 45%

233 **(b)**
Glycolysis is an essential and first path of respiration. It is common in both aerobic and anaerobic respiration and occurs in the cytosol of all living cells of prokaryotes as well as eukaryotes.

234 **(b)**
Synthesis is anabolism

235 **(b)**
Oxalosuccinic acid -6 C-compound
Malate -4 C-compound
α-ketoglutarate -5 C-compound
Pyruvic acid -3 C-compound

236 **(d)**
Respiratory chain for oxidative phosphorylation is located in the inner membrane of mitochondrial envelope.

237 **(d)**
In both lactic acid and alcohol fermentation 7% of the energy in glucose is released and all of it is trapped as high energy bonds of ATP

238 **(d)**
There is a sequential, orderly pathway functioning, with one substrate forming the next and with glycolysis TCA cycle and ETS pathway following one after another

239 **(a)**
Sucrose is converted into glucose and fructose by the enzyme invertase and these two monosaccharide readily enter the glycolytic pathway

240 **(b)**
Triolein is unsaturated glyceride, whereas tripalmitin is a saturated glyceride. The required number of oxygen molecule for oxidation of unsaturated glyceride is always more than for saturated glyceride.

241 **(a)**
The pathway through which the electron passes from one carrier to another is called the electron transport system. It is operative in the inner mitochondrial membrane

242 **(d)**
Tricarboxylic acid cycle is also known as citric acid cycle or Krebs' cycle. This is an aerobic process which takes place in the matrix of mitochondria. Krebs discovered this cycle in 1937. So, this is also known as Hens Krebs' cycle.

243 **(a)**
It is the fact that in respiration glucose is broken down in oxidation within the cell and CO_2, water and energy is released therefore the suitable equations is
$C_6H_{12}O_6 + 6O_2 \rightarrow +6CO_2 + 6H_2O + \text{Energy}$

244 **(a)**
Glycolysis, Krebs' cycle and electron transport system are meant for ATP synthesis in different steps. ATP is the energy currency of cell.

245 **(a)**
There is one step in glycolysis where $NADH + H^+$ is formed from NAD^+ when 3-phosphoglyceraldehyde (PGAL) is converted to 1, 3- bisphosphoglycerate (BPGA)