Section I: Basic Biochemistry

Cell and Subcellular Components, Enzymes, Biochemical Processes Involved in Generation of Energy in Cells

1. A nucleoid is found in:

(a) Animal cell (b) Plant cell
(c) Bacterium (d) Virus

2. The following is *not* a true organelle:

(a) Ribosome (b) Mitochondrion
(c) Lysosome (d) Nucleus

3. Isolation of the following sub-cellular entity requires ultracentrifugation:

(a) Endoplasmic reticulum
(b) Lysosome
(c) Nucleus
(d) Peroxisome

4. Galactosyl transferase is the biomarker for the following subcellular entity:

(a) Cell membrane
(b) Cytoplasm
(c) Golgi apparatus
(d) Endoplasmic reticulum

5. Glucose-6-phospahatase is the biomarker for the following sub-cellular entity:

(a) Cell membrane
(b) Cytoplasm
(c) Golgi apparatus
(d) Endoplasmic reticulum

6. The following structure disappears during cell division:

(a) Nuclear membrane
(b) Chromosomes
(c) Nucleoplasm
(d) Nucleolus

7. Protein synthesis occurs in:

(a) Ribosomes only
(b) Mitochondria only
(c) Ribosomes and mitochondria
(d) Smooth endoplasmic reticulum and mitochondria

8. Protein sorting occurs in:

(a) Golgi apparatus
(b) Endoplasmic reticulum
(c) Cell membrane
(d) Mitochondria

9. Which of the following is called power house of the cell?

(a) Mitochondria (b) Lysosomes
(c) Nucleus (d) Ribosomes

10. The mitochondrial DNA encodes:

(a) 13 polypeptides only
(b) 13 polypeptides and 2 rRNAs only
(c) 13 polypeptides, 2 rRNAs and 22 tRNAs
(d) 2 rRNAs and 22 tRNAs only

11. In contrast to the outer mitochondrial membrane, the inner mitochondrial membrane has:

(a) More lipids than proteins
(b) More proteins than lipids
(c) Only proteins
(d) Only lipids

12. Mitochondrial DNA is:

(a) Paternally inherited and more prone to mutations than nuclear DNA
(b) Paternally inherited and less prone to mutations than nuclear DNA

(c) Maternally inherited and more prone to mutations than nuclear DNA
(d) Maternally inherited and less prone to mutations than nuclear DNA

13. Membrane folds called cristae are associated with:
(a) Outer nuclear membrane
(b) Inner nuclear membrane
(c) Outer mitochondrial membrane
(d) Inner mitochondrial membrane

14. 'Suicide bags' refer to:
(a) Lysosomes (b) Peroxisomes
(c) Ribosomes (d) Nucleus

15. The following enzyme is missing in cholesterol ester storage disease:
(a) Lysosomal acid lipase
(b) LCAT
(c) ACAT
(d) HMG CoA lyase

16. Zellweger syndrome is due to absence or loss of functions of:
(a) Lysosomes
(b) Peroxisomes
(c) Ribosomes
(d) Endoplasmic reticulum

17. The ideal source for obtaining stem cells is:
(a) Adult peripheral blood
(b) Adult bone marrow
(c) Neonatal peripheral blood
(d) Umbilical cord blood

18. All the following enzymes are found in lysosomes *except*:
(a) Acid phosphatase
(b) Cathepsin
(c) β-Galactosidase
(d) Lipoprotein lipase

19. When the cross-section of the hydrophilic head group of amphipathic lipids is more than that of the hydrocarbon tails, the following are formed:

(a) Liposomes
(b) Micelles
(c) Lipid bilayers
(d) Lipid monolayers

20. Which of the following entity can be the potential clinical use as carrier of drugs/enzymes/gene targeted to specific organs or cancer therapy?

(a) Lysosomes
(b) Liposomes
(c) Peroxisomes
(d) Endoplasmic reticulum

21. To avoid non-specific uptake of liposomes by the reticuloendothelial system, they are coated with:

(a) Polyethylene glycol
(b) Cholesterol
(c) Sphingolipids
(d) Cations

22. Liposomes can be used to deliver:

(a) Hydrophilic compounds
(b) Lipophilic compounds
(c) Any of the above
(d) None of the above

23. In the myelin sheath, lipid: protein ratio is nearly:

(a) 4:1 (b) 1:4 (c) 1:1 (d) 3:2

24. In the inner mitochondrial membrane, lipid: protein ratio is nearly:

(a) 4:1 (b) 1:4 (c) 1:1 (d) 3:2

25. The following is *not* true for glycophorin A:

(a) Present in RBC membrane
(b) Peripheral membrane protein
(c) Tightly bound by hydrophobic interactions
(d) Can be isolated by disrupting the membrane with detergents

26. The following is *not* true for cytochrome C:

(a) Integral membrane protein
(b) Present in inner mitochondrial membrane
(c) Can be isolated by gentle procedures
(d) Soluble component of electron transport chain

27. In biomembranes, oligosaccharides may be attached to:

(a) Protein
(b) Glycolipids
(c) Either of the above
(d) None of the above

28. Which of the following is *not* true about peripheral membrane proteins?

(a) Bound to integral proteins
(b) Bound to head groups of phospholipids
(c) Require the use of detergents for their release
(d) Require salt solutions of high ionic strength for their release

29. Membrane fluidity depends on:

(a) Cholesterol content
(b) Unsaturated fatty acid content
(c) Degree of unsaturation of unsaturated fatty acids
(d) All of the above

30. The following is *not* true for cholesterol present in biomembranes:

(a) Always esterified
(b) Steroid nucleus intercalates between phospholipid hydrocarbon tails
(c) Hydrocarbon chain embedded in non-polar membrane core
(d) OH-group interacts with polar head group of phospholipids

31. The transporter involved in apical transport of glucose across enterocyte and proximal convoluted tubules is:

(a) GLUT 1 (b) SGLT 1
(c) GLUT 2 (d) GLUT 5

32. In myasthenia gravis, autoantibodies are directed against the following membrane receptors:

(a) Dopamine (b) Epinephrine
(c) Acetylcholine (d) Serotonin

33. The following treatment modality is *not* employed for myasthenia gravis:

(a) Plasmapheresis
(b) Acetyl cholinesterase
(c) Acetyl cholinesterase inhibitors
(d) None of the above

34. Cystic fibrosis transmembrane conductance regulator (CFTR) is a:

(a) cGMP-dependent Ca^{2+}-channel
(b) cGMP-dependent Cl^{-}-channel
(c) cAMP-dependent Ca^{2+}-channel
(d) cAMP-dependent Cl^{-}-channel

35. Which of the following statement is true for aquaporins?

(a) They are tetrameric transmembrane proteins
(b) Permit passage of ions along with water
(c) Responsible for movement of water by active transport
(d) Mutation of aquaporin (AP) gene leads to central diabetes insipidus

36. In the renal collecting tubules, expression of aquaporin-2 (AQP2) is increased by:

(a) ADH (b) ANP
(c) Aldosterone (d) Angiotensin II

37. Which of the following may increase membrane fluidity in a eukaryotic cell membrane?

(a) Long chain fatty acids
(b) Peripheral proteins
(c) Transmembrane proteins
(d) Unsaturated fatty acids

38. The following is *not* true for diabetes insipidus:

(a) Increased urine specific gravity
(b) Polyuria

(c) Decreased expression of aquaporins in collecting tubules
(d) Treated with arginine-vasopressin

39. Which of the following is *not* an ionophore:
(a) Valinomycin (b) Gramicidin
(c) Dimercaprol (d) Dinitrophenol

40. Valinomycin and nigericin translocate:
(a) K^+ (b) Na^+ (c) Ca^{2+} (d) Cl^-

41. ATP-ADP translocase is present in:
(a) Cell membrane
(b) Nuclear membrane
(c) Inner mitochondrial membrane
(d) Lysosomal membrane

42. F-type transporters are present in:
(a) Lysosomal membrane
(b) Mitochondrial membrane
(c) Nuclear membrane
(d) Plasma membrane

43. V-type transporters are *not* present in:
(a) Lysosomal membrane
(b) Mitochondrial membrane
(c) Golgi membrane
(d) Secretory vesicles

44. The function of lysosomal V-type transporters is:
(a) Acidification of interior of lysosomes
(b) Alkalinization of interior of lysosomes
(c) ATP synthesis
(d) Promote membrane cleavage

45. Which of the following ATP-driven pump is inhibited by cardiac drug digitalis?
(a) Ca^{2+} ATPase
(b) Na^+-K^+-ATPase
(c) mtATP synthase
(d) CFTR, a chloride channel

46. Cardiac glycosides act by:

(a) Increasing intracellular Ca^{2+}
(b) Decreasing intracellular Ca^{2+}
(c) Decreasing intracellular Na^{+}
(d) Increasing intracellular K^{+}

47. Gastric proton pump is:

(a) A uniport
(b) A symport
(c) An electrogenic antiport
(d) A neutral antiport

48. Which of the following is responsible for receptor-mediated endocytosis?

(a) Clathrin
(b) Cytosine
(c) Cystine
(d) Pyrimidine

49. Which of the following ATP-Binding cassette transporter (ABC protein) is responsible for multidrug resistance?

(a) ABCB4 (b) ATP7A
(c) ATP7B (d) CFTR

50. Oral rehydration solution (ORS) therapy exploits the following transport system in the small intestine:

(a) GLUT
(b) SGLT-1
(c) AQP
(d) Neutral amino acid transporter

51. In group translocation, for each amino acid transported, the number of ATP required is:

(a) Zero (b) 1 (c) 2 (d) 3

52. The following is *not* true for adsorptive pinocytosis:

(a) Receptor-mediated
(b) Clathrin-dependent
(c) No secondary lysosomes are formed
(d) Explains the mechanism of action of some hormones

53. Which of the following molecules cannot be released from cell by mode of exocytosis?

(a) Insulin
(b) Collagen
(c) Glycosaminoglycans
(d) miRNA

54. Exosomes contain:

(a) RNase (b) mRNA
(c) miRNA (d) All of the above

55. Enzymes increase the rate of reaction by-

(a) Increasing the equilibrium constant of the reaction
(b) Increasing the energy of activation
(c) Decreasing the backward reaction
(d) Increasing the rate constant of the reaction

56. Lactate dehydrogenase is a/an-

(a) Oxidoreductase (b) Ligase
(c) Lyase (d) Isomerase

57. The following are multienzyme complexes with 3 different enzyme activities *except*:

(a) Fatty acid synthase
(b) Pyruvate dehydrogenase
(c) α-Ketoglutarate dehydrogenase
(d) Branched chain keto acid dehydrogenase

58. The enzyme nomenclature 1.1.1.1 stands for:

(a) Aldehyde dehydrogenase
(b) Alcohol dehydrogenase
(c) Isocitrate dehydrogenase
(d) Pyruvate dehydrogenase

59. The following is *not* a lyase:

(a) Glucose-6-phosphatase
(b) Aldolase
(c) Argininosuccinate
(d) Histidase

60. The cofactor for pyruvate kinase is:
(a) Cl^- (b) K^+ (c) Ca^{2+} (d) Cu^{2+}

61. The following is *not* true for coenzymes:
(a) Thermolabile (b) Dialyzable
(c) Low Mr (d) Organic

62. The following is *not* true for prosthetic group:
(a) Thermostable (b) Dialyzable
(c) Low Mr (d) Loosely bound

63. Hexokinase phosphorylates:
(a) Glucose (b) Fructose
(c) Mannose (d) All of the above

64. Glucokinase phosphorylates:
(a) Glucose (b) Fructose
(c) Mannose (d) All of the above

65. Hexokinase does not phosphorylate:
(a) Glucose (b) Fructose
(c) Mannose (d) Galactose

66. A substrate binds to an enzyme through the following *except*:
(a) Irreversible covalent linkage
(b) H-bonds
(c) Electrostatic bonds
(d) Hydrophobic interactions

67. Transamination is an example of a multisubstrate reaction showing:
(a) Ping-pong mechanism
(b) Sequential mechanism
(c) Both
(d) None of the above

68. The following is a rigid model of enzyme action:
(a) Substrate strain
(b) Lock and key
(c) Induced fit
(d) None of the above

69. In enzyme catalysis, free energy of activation refers to the energy difference between:

(a) Transition state and product
(b) Substrate and product
(c) Substrate and transition state
(d) A pair of substrates

70. In enzyme catalysis, the following is reduced:

(a) Free energy of substrate
(b) Free energy of transition state
(c) Free energy of product
(d) All of the above

71. Acid base catalysis by RNase A is attributed to:

(a) His-12
(b) His-119
(c) Both
(d) None of the above

72. During acid base catalysis, the following may act as an acid:

(a) –SH group of cysteine
(b) –OH group of tyrosine
(c) ε-Amino group of lysine
(d) Any of the above

73. Covalent catalysis is also called:

(a) Acid base catalysis
(b) Nucleophilic catalysis
(c) Metal ion catalysis
(d) Any of the above

74. Optimum pH for pepsin is:

(a) 1.0 (b) 2.0 (c) 3.0 (d) 4.0

75. When the maximum velocity of an enzyme catalyzed reaction is independent of substrate concentration, the reaction order is:

(a) First (b) Second
(c) Zero (d) None of the above

76. K_m is:

(a) Directly proportional to enzyme concentration
(b) Inversely proportional to enzyme concentration
(c) Half of enzyme concentration
(d) Independent of enzyme concentration

77. The slope of a Lineweaver-Burk plot is given by:

(a) $1/V_{max}$ (b) $-K_m$
(c) $-K_m/V_{max}$ (d) $-V_{max}/K_m$

78. The following is *not* true for hexokinase:

(a) Low K_m
(b) High affinity for glucose
(c) More important during fed state
(d) Not specific for glucose

79. The following is *not* true for glucokinase:

(a) High K_m
(b) Low affinity for glucose
(c) More important during fasting state
(d) Specific for glucose

80. The following is *not* true for K_m:

(a) Constant for a given enzyme
(b) A measure of enzyme-substrate affinity
(c) Can be experimentally determined
(d) For a given enzyme, the value never differs from person to person

81. The following is *true* for high K_m for aldehyde dehydrogenase:

(a) Oxidizes acetaldehyde slowly
(b) Person more prone to flushing and headache following alcohol intake
(c) Both
(d) None of the above

82. Sulphonamides inhibit dihydropteroate synthase by:

(a) Competitive inhibition
(b) Noncompetitive inhibition
(c) Uncompetitive inhibition
(d) Allosteric inhibition

83. Dicumarol inhibits epoxide reductase by:

(a) Competitive inhibition
(b) Noncompetitive inhibition
(c) Uncompetitive inhibition
(d) Allosteric inhibition

84. 5-Fluorouracil inhibits thymidylate synthetase by:

(a) Competitive inhibition
(b) Noncompetitive inhibition
(c) Uncompetitive inhibition
(d) Allosteric inhibition

85. Phenylalanine inhibits alkaline phosphatase by:

(a) Competitive inhibition
(b) Noncompetitive inhibition
(c) Uncompetitive inhibition
(d) Allosteric inhibition

86. Competitive inhibition is characterized by:

(a) Unchanged V_{max} but increased (apparent) K_m
(b) Decreased V_{max} but unchanged K_m
(c) Decreased V_{max} and decreased (apparent) K_m
(d) None of the above

87. Non-competitive inhibition is characterized by:

(a) Unchanged V_{max} but increased (apparent) K_m
(b) Decreased V_{max} but unchanged K_m
(c) Decreased V_{max} and decreased (apparent) K_m
(d) None of the above

88. Uncompetitive inhibition is characterized by:

(a) Unchanged V_{max} but increased (apparent) K_m
(b) Decreased V_{max} but unchanged K_m
(c) Decreased V_{max} and decreased (apparent) K_m
(d) None of the above

89. Irreversible inhibition is characterized by:

(a) Unchanged V_{max} but increased (apparent) K_m
(b) Decreased V_{max} but unchanged K_m
(c) Decreased V_{max} and decreased (apparent) K_m
(d) None of the above

90. Allopurinol is a:

(a) Competitive inhibitor of xanthine oxidase
(b) A substrate for xanthine oxidase
(c) Both
(d) None of the above

91. Mechanism-based enzyme inhibition is also called:

(a) Suicide inhibition
(b) Trojan-horse substrate inhibition
(c) Both
(d) None of the above

92. The following is *not* an inducible enzyme:

(a) Hexokinase
(b) HMG CoA reductase
(c) Tyrosine aminotransferase
(d) Tryptophan pyrrolase

93. ADP is *not* an allosteric activator of:

(a) Hexokinase
(b) Isocitrate dehydrogenase
(c) Glutamate dehydrogenase
(d) Pyruvate carboxylase

94. Covalent modification of enzyme activity commonly occurs through:

(a) Serine (b) Threonine
(c) Tyrosine (d) All of the above

95. The following is a monomeric allosteric enzyme:

(a) Ribonucleoside diphosphate reductase
(b) Pyruvate UDP-N-acetyl glucosamine transferase
(c) Both
(d) None of the above

96. The following is *not* true for isoenzymes:
(a) Differ in substrate specificity
(b) Differ in structure
(c) Differ in electrophoretic mobility
(d) Differ in immunological properties

97. Isoenzymes may be present in:
(a) Different tissues
(b) Different cell types of a tissue
(c) Different subcellular compartments of a cell
(d) All of the above

98. The following is *not* true for alkaline phosphatase (ALP):
(a) Its isoenzymes have identical carbohydrate content
(b) Monomeric
(c) α_1-ALP is present in liver
(d) Increased serum α_1-ALP is seen in obstructive jaundice

99. The following is *not* true for placental alkaline phosphatase (ALP):
(a) An α_2-ALP
(b) Heat labile
(c) Contains sialic acid
(d) Increased serum level is seen in pregnancy

100. A useful serum marker is some cases of bronchogenic carcinoma is:
(a) γ-Alkaline phosphatase (ALP)
(b) Regan alkaline phosphatase (ALP)
(c) LDH-2
(d) LDH-5

101. LDH-5 is present mainly in:
(a) Myocardium
(b) RBCs
(c) Liver and muscles
(d) Brain

102. In acute myocardial infarction, a flipped ratio refers to:
(a) LDH-2>LDH-1
(b) LDH-1>LDH-2
(c) LDH-1>CPK-MB
(d) LDH-2>CPK-MB

103. In acute myocardial infarction, the marker to rise earliest in serum is:

(a) CPK-MM
(b) LDH-1
(c) CPK-MB
(d) Alanine amino transferase (ALT)

104. The following is a normal finding:

(a) Increased serum alkaline phosphatase (ALP) in third trimester of pregnancy
(b) Increased serum ALP in growing children
(c) Both
(d) None of the above

105. One enzyme unit (IU) refers to:

(a) 1 mMol of substrate reacting in 1 min
(b) 1 nMol of substrate reacting in 1 min
(c) 1 mMol of substrate reacting in 1 sec
(d) 1 nMol of substrate reacting in 1 sec

106. The SI enzyme units are:

(a) King-Armstrong units
(b) Katals/litre
(c) International units
(d) Bodansky units

107. Katal is expressed as:

(a) Moles/sec (b) Moles/min
(c) mMol/sec (d) mMol/min

108. The following are functional plasma enzymes *except*:

(a) Pseudocholinesterase
(b) Lipoprotein lipase
(c) Amylase
(d) Coagulation factor VIII

109. Increased serum amylase occurs in:

(a) Acute parotitis
(b) Acute pancreatitis
(c) Both
(d) None of the above

110. The following serum analyte is a good index of recent alcohol intake:

(a) Alkaline phosphatase (ALP)
(b) γ-GT
(c) LDH-5
(d) Ceruloplasmin

111. Serum CPK-3 is increased in the following *except*:

(a) Myasthenia gravis
(b) Muscular dystrophy
(c) Rhabdomyolysis
(d) Myopathy

112. Total serum LDH is increased in:

(a) Megaloblastic anemia
(b) Hemolytic anemia
(c) Acute myocardial infarction
(d) All of the above

113. Maximum rise in serum alkaline phosphatase (ALP) occurs in:

(a) Paget's disease
(b) Osteoporosis
(c) Osteomalacia
(d) Acute hepatitis

114. The following enzyme is used as an analytical agent:

(a) Horseradish peroxidase
(b) Glucose-6-phosphate dehydrogenase
(c) Alkaline phosphatase (ALP)
(d) All of the above

115. The following enzyme is used as a therapeutic agent in cystic fibrosis:

(a) Streptokinase
(b) Tissue plasminogen activator
(c) Asparaginase
(d) DNase

116. The following enzyme is used as therapeutic agent in some leukemias:

(a) Streptokinase
(b) Tissue plasminogen activator
(c) Asparaginase
(d) DNase

117. The following enzyme is used in hypodermoclysis:

(a) Asparaginase
(b) Hyaluronidase
(c) Diastase
(d) Serratiopeptidase

118. The following is *not* true for ribozymes:

(a) Hydrolyze phosphodiester bonds
(b) Do not obey Michaelis-Menten kinetics
(c) May have a hair-pin or hammer-head like active centre
(d) Require divalent cations

119. Ribozymes may function in/as:

(a) Intron splicing
(b) Peptidyl transferase
(c) Both
(d) None of the above

120. The following is *true* for ribozymes:

(a) Less versatile and slower than protein catalysts
(b) Act only once in a chemical event and are not reused
(c) Bind to substrates mainly by H-bonding
(d) All of the above

121. Abzymes are directed against:

(a) Substrate
(b) Enzyme
(c) Enzyme-substrate complex in transition state
(d) Product

122. The following is *not* true for abzymes:

(a) May be present naturally in blood
(b) Possess catalytic activity
(c) Do not exhibit substrate specificity
(d) Monoclonal

123. The Michaelis-Menten constant (K_m) is:

(a) Equal to 1/2 V_{max}
(b) Dependent on pH
(c) Dependent on enzyme concentration
(d) Equal to the substrate concentration at half-maximal velocity

124. Enzyme increase reaction rate by:

(a) Altering change in the free energy of reaction
(b) Decreasing the energy of activation
(c) Inhibiting the backward reaction
(d) Enhancing the forward reaction

125. An abzyme is an:

(a) Abnormal enzyme
(b) Isoenzyme
(c) Allosteric enzyme
(d) Antibody with a catalytic activity

126. At physiological pH, the standard redox potential of a hydrogen electrode is:

(a) +0.42 V (b) –0.42 V (c) +4.2 V (d) –4.2 V

127. The free energy of hydrolysis is >–10 Kcal/mol for the following *except*:

(a) Phosphoenolpyruvate
(b) ATP
(c) Creatine phosphate
(d) 1, 3-BPG

128. The free energy of hydrolysis is maximum for:

(a) Phosphoenolpyruvate
(b) ATP
(c) Creatine phosphate
(d) 1,3-BPG

129. The free energy of hydrolysis is least for:

(a) Phosphoenolpyruvate
(b) ATP
(c) Creatine phosphate
(d) 1, 3-BPG

130. The free energy of hydrolysis is:

(a) More for acetyl CoA, less for ATP
(b) More for ATP, less for acetyl CoA
(c) Equal for both
(d) Not applicable for acetyl CoA

131. A reducing equivalent refers to:

(a) e^-
(b) H^+
(c) $H^+ + e^-$
(d) None of the above

132. During catabolism, more reducing equivalents are extracted from:

(a) Carbohydrates
(b) Lipids
(c) Proteins
(d) Same for all

133. The inner mitochondrial membrane is impermeable to:

(a) Glutamate
(b) Oxaloacetate
(c) Malate
(d) Aspartate

134. Flavoprotein dehydrogenase is located in:

(a) Outer surface of outer mitochondrial membrane
(b) Outer surface of inner mitochondrial membrane
(c) Inner surface of inner mitochondrial membrane
(d) Mitochondrial matrix

135. The following is *not* true for malate-aspartate shuttle:

(a) More efficient compared to glycerophosphate shuttle
(b) Limited distribution compared to glycerophosphate shuttle
(c) Does not require flavoprotein dehydrogenase
(d) Avoids the need to transport oxaloacetate across inner mitochondrial membrane

136. Both Fe^{2+} and Fe^{3+} forms of iron are critical in the functioning of:

(a) Myoglobin (b) Hemoglobin
(c) Cytochromes (d) Coenzyme Q

137. In the electron transport chain (ETC) following reacts directly with oxygen:

(a) Coenzyme Q (b) Cytochrome b
(c) Cytochrome c (d) Cytochrome a_3

138. Cytochromes transfer the following from coenzyme Q to oxygen:

(a) H^+ (b) e^-
(c) $H^+ + e^-$ (d) None of the above

139. Cytochrome a.a_3 requires:

(a) Cu^{2+} (b) Mg^{2+}
(c) Mn^{2+} (d) Ca^{2+}

140. In the sequence 'NAD+ to FMN to CoQ' in the ETC, the following is transferred:

(a) H^+ (b) e^-
(c) $H^+ + e^-$ (d) None of the above

141. The following is true regarding electron-affinity of various sequential components of the ETC:

(a) Progressively decreases
(b) Remains same
(c) Progressively increases
(d) Varies from time to time

142. The largest protein complex in the inner mitochondrial membrane is:

(a) Complex I (b) Complex II
(c) Complex III (d) Complex IV

143. Iron sulphur proteins are absent in:

(a) Complex I (b) Complex II
(c) Complex III (d) Complex IV

144. FMN is a constituent of:

(a) Complex I (b) Complex II
(c) Complex III (d) Complex IV

145. FAD is a constituent of:

(a) Complex I (b) Complex II
(c) Complex III (d) Complex IV

146. The following inhibits complex IV by binding to Fe^{3+}-heme *except*:

(a) Carbon monoxide (b) Sodium azide
(c) Potassium cyanide (d) None of the above

147. British anti-Lewisite (BAL) inhibits:

(a) Complex I (b) Complex II
(c) Complex III (d) Complex IV

148. The administration of nitrites followed by thiosulphate is an emergency treatment for poisoning by:

(a) KCN (b) CO
(c) BAL (d) Rotenone

149. For NAD^+-linked dehydrogenases, the P/O ratio is:

(a) 1.5 (b) 2.5 (c) 3.5 (d) 4

150. For FAD-linked dehydrogenases, the P/O ratio is:

(a) 1.5 (b) 2.5 (c) 3.5 (d) 4

151. Uncoupling protein-1 (UCP-1) is present mainly in:

(a) Brown adipose tissue
(b) White adipose tissue
(c) Liver
(d) Muscles

152. The following is not a physiological uncoupler:

(a) Free fatty acids
(b) Thyroxine
(c) Insulin
(d) Unconjugated bilirubin

153. The following is a proton ionophore:

(a) BAL (b) KCN
(c) 2,4-Dinitrophenol (d) Oligomycin

154. The F_0 subunit of mitochondrial F_1-F_0-ATPase is inactivated by:

(a) BAL (b) KCN
(c) 2,4-Dinitrophenol (d) Oligomycin

155. Compared to the mitochondrial matrix, the intermembrane space is:

(a) Alkaline

(b) Neutral

(c) Acidic

(d) May be either of the above

156. Following is the major source of ATP:

(a) Phosphoglycerokinase and pyruvate kinase reactions of glycolysis

(b) Creatine kinase reaction

(c) Succinate thiokinase reaction of TCA cycle

(d) Oxidative phosphorylation

157. The following is *not* an example of substrate level phosphorylation:

(a) Phosphoglycerokinase and pyruvate kinase reactions of glycolysis

(b) Creatine kinase reaction

(c) Succinate thiokinase reaction of TCA cycle

(d) Oxidative phosphorylation

158. The major use of oxygen in humans is for:

(a) Oxidative phosphorylation

(b) Hydroxylation reactions

(c) Oxygenation reactions

(d) Formation of reactive oxygen species (ROS)

159. The end product of complete reduction of oxygen in humans is:

(a) H_2O_2 (b) OH^- (c) H_2O (d) O_2^-

160. Which form of the nucleotide represents universal cellular energy currency?

(a) Adenosine triphosphate

(b) Adenosine diphosphate

(c) 3′, 5′-Cyclic adenosine monophosphate

(d) Adenosine-5′-monophosphate

161. In a biochemical reaction, if ΔG is negative the reaction is referred to as:

(a) A hypothermic reaction
(b) An exothermic reaction
(c) An endothermic reaction
(d) An ectothermic reaction

162. Hydrolysis of a molecule of ATP to ADP releases:

(a) 73.0 kcal of energy
(b) 0.73 kcal of energy
(c) 7.30 kcal of energy
(d) 730 kcal of energy

163. Universal cellular currency of energy is:

(a) AMP (b) ADP (c) ATP (d) GTP

164. ATP production in oxidative phosphorylation and electron transport chain are linked by:

(a) Chemical changes
(b) Chemiosmotic changes
(c) Conformational changes
(d) Physical changes

165. Complex I of the electron transport chain is inhibited by:

(a) Hydrogen sulphide
(b) Antimycin A
(c) Rotenone
(d) Carbon monooxide (CO)

166. The F_0–F_1 complex is involved in which of the following processes?

(a) Reduction of NAD^+ to NADH
(b) Production of ATP from ADP and Pi
(c) Reduction of FAD to $FADH_2$
(d) Translocation of protons of the matrix

167. FAD is firmly associated as a prosthetic group in which of the following enzymes?

(a) Glyceraldehyde-3-phosphate dehydrogenase
(b) Succinic dehydrogenase

(c) Creatine kinase
(d) Hexokinase

168. The following is true for flip-flop movement of membrane phospholipids:
(a) Catalyzed by flippases
(b) Move phospholipids from one leaflet to the other
(c) Establish lipid asymmetry
(d) All of the above

169. The following types of movements of phospholipids occur in biomembranes:
(a) Flexion
(b) Lateral shift
(c) Transverse diffusion (flip-flop)
(d) All of the above

170. Compared to the surrounding plasma membrane, lipid rafts are rich in:
(a) Sphingolipids (b) Cholesterol
(c) Both (d) None of the above

171. The following is true for lipid rafts-
(a) Planar rafts (non-caveolar) contain the protein flotillin
(b) Caveolar rafts contain the protein caveolin
(c) Employed by influenza viruses and HIV-1 for infecting host cells
(d) All of the above

172. Caveolins are:
(a) Integral membrane proteins
(b) Peripheral membrane proteins
(c) Cytosolic proteins
(d) ECM proteins

173. Freeze-fracture replication is used to study:
(a) DNA replication under cold conditions
(b) Integral membrane proteins
(c) Reverse transcription
(d) Transmembrane potential difference

Answer key

1. c	2. a	3. a	4. c	5. d	6. d
7. c	8. a	9. a	10. c	11. b	12. c
13. d	14. a	15. a	16. b	17. d	18. d
19. b	20. b	21. a	22. c	23. a	24. b
25. b	26. a	27. c	28. c	29. d	30. a
31. b	32. c	33. b	34. d	35. a	36. a
37. d	38. a	39. c	40. a	41. c	42. b
43. b	44. a	45. b	46. a	47. d	48. a
49. a	50. b	51. d	52. b	53. d	54. d
55. d	56. a	57. a	58. b	59. a	60. b
61. a	62. d	63. d	64. a	65. d	66. a
67. a	68. b	69. c	70. b	71. c	72. d
73. b	74. b	75. c	76. d	77. c	78. c
79. c	80. d	81. c	82. a	83. a	84. b
85. c	86. a	87. b	88. c	89. c	90. c
91. c	92. a	93. d	94. d	95. c	96. a
97. d	98. a	99. b	100. b	101. c	102. b
103. c	104. c	105. a	106. b	107. a	108. c
109. c	110. b	111. a	112. d	113. a	114. d
115. d	116. c	117. b	118. b	119. c	120. d
121. c	122. c	123. d	124. b	125. d	126. b
127. b	128. a	129. b	130. a	131. c	132. b
133. b	134. b	135. b	136. c	137. d	138. b
139. a	140. c	141. c	142. a	143. d	144. a
145. b	146. a	147. c	148. a	149. b	150. a
151. a	152. c	153. c	154. d	155. c	156. d
157. d	158. a	159. c	160. a	161. b	162. c
163. c	164. b	165. b	166. b	167. b	168. d
169. d	170. c	171. d	172. a	173. b	