NBCE
MOCK BOARD QUESTIONS
Chemistry

1. The repeating disaccharide unit of glycosaminoglycans are routinely made up of ____ and _____.
   A. fructose and sucrose
   B. glucose and galactose
   C. a long chain fatty acid and a shorter chained fatty acid
   D. an amino sugar and a carboxylated or sulfated sugar

2. The required compound in sulfation reactions of glycosaminoglycans is ___.
   A. ATP
   B. PGPS
   C. PAPS
   D. UTP

3. The carrier molecule, used in the synthesis of the carbohydrate core oligosaccharide to be added, to a glycoprotein is called _____ phosphate
   A. transferrin
   B. dolichol
   C. carbonyl
   D. glycoprotein

4. The linkage between glycosaminoglycans and protein is most commonly through a trihexoside _____ and a _____ residue, respectively
   A. galactose, glucose, xylose; glycine
   B. glucose, fructose, mannose; serine
   C. galactose, galactose, xylose; glycine
   D. galactose, galactose, xylose: serine

5. Which of the following is a carboxylated sugar?
   A. glucosamine
   B. galactosamine
   C. iduronic acid
   D. chondroitin sulfate

6. The primary energy for synthesis of glycosaminoglycans comes from ____.
   A. CMP
   B. GDP
   C. UDP
   D. ADP

7. Which of the following supplements is recommended for those with osteoarthritis?
   A. glucosamine + galactosamine
   B. keratin sulfate and heparin
   C. hyaluronic acid and dermatan sulfate
   D. chondroitin sulfate + glucosamine

8. The bond between two monosaccharides, in a disaccharide is called a ___ bond.
   A. ester
   B. amide
   C. glycosidic
   D. acyl

9. Isomaltose is formed when the body breaks down starch. What portion of the starch molecule is the source of the isomaltose?
   A. α 1→4 linked glucose
   B. α 1→6 linked glucose
   C. β 1→4 linked glucose
   D. β 1→6 linked glucose

10. Disaccharidases are found ____.
   A. free in the lumen of the intestine
   B as integral membrane proteins of the columnar epithelium
   C. as peripheral membrane proteins of the columnar epithelium
   D. cytoplasmic proteins within the columnar epithelium

11. The isoenzyme form of hexokinase in the liver is called _____.
   A. phosphofructokinase
   B. glyceraldehydes 3 P dehydrogenase
   C. glucokinase
   D. galactokinase

12. The end product of glycolysis under anaerobic conditions is
   A. pyruvate
   B. NAD^+
   C. citrate
   D. lactate

13. Which of the following inner mitochondrial membrane electron carriers has lipid properties?
   A. coenzyme Q
   B. cytochrome a_3
   C. cytochrome b
   D. cytochrome c

14. Once taken inside, glucose is prevented from diffusing out of the cell by the action of
    A. glucose-6-phosphatase
    B. hexokinase
    C. phosphofructokinase
    D. aldolase

15. The acetyl CoA formed in the bridging reaction requires ____ to form citrate.
    A. malate
    B. fumarate
    C. oxaloacetate
    D. succinyl CoA

16. The activated intermediate used in the synthesis of glycogen is _____.
    A. CDP-glucose
    B. ADP-glucose
    C. GDP-glucose
    D. UDP-glucose

17. Cytochrome oxidase has a mineral requirement for ____.
    A. Ca^{+2}
    B. Cu^{+2}
    C. Fe^{+2}
    D. Mg^{+2}

18. The ratio of _____ to _____ must be kept 1 to 1, to keep the tricarboxylic acid cycle turning.
    A. acetyl CoA to succinyl CoA
    B. malate to α-ketoglutarate
    C. acetyl CoA to oxaloacetate
    D. succinyl CoA to malonyl CoA

19. A genetic defect in the glucose 6 phosphate dehydrogenase, enzyme produces a ____ when the person is exposed to oxidizing drugs.
    A. diarrhea
    B. leukopenia
    C. hemolytic anemia
    D. thrombocytopenia

20. Which of the following is the method of regulating the pentose P pathway?
    A. The ratio of NADH / NAD^{+}
    B. The ratio of NADPH / $NADP^{+}$
    C. The ratio of $FADH_2$ / FAD
    D. The ratio of FMN_2 / FMN

21. Ketone bodies are produced when excess of which focal metabolite builds up in the body?
    A. glucose 6 phosphate
    B. fructose 1,6 bisphosphate
    C. pyruvate
    D. acetyl CoA

22. Which of the following conditions would lead to the production of ketone bodies?
    A. breakdown of carbohydrates
    B. synthesis of carbohydrates
    C. synthesis of fatty acids
    D. breakdown of fatty acids in the absence of sufficient carbohydrates

23. Which of the following are considered ketone bodies?
    A. acetoacetate
    B. β-hydroxybutyrate
    C. acetone
    D. all of the above

24. In extreme circumstances such as starvation, ketogenesis may be so active that a life threatening conditions may exist. What is the immediate problem that exists when excess ketones are found in circulation?
    A. alkalosis
    B. acidosis
    C. hyperglycemia
    D. hyperlipidemia

25. The positive allosteric effector for acetyl Co A carboxylase is _____.
    A. Citrate
    B. Glucose
    C. α-ketoglutarate
    D. succinyl Co A

26. Which of the following lipoproteins transports, phospholipids, triacylglycerols and other lipid materials in hepatic circulation from the intestines to the liver.
    A. LDL
    B. VLDL
    C. Chylomicron
    D. HDL

27. Which of the following is an enzyme associated with extracellular matrix of endothelial cells and is responsible for the breakdown of triacylglycerols of various circulating lipoproteins?
    A. hormone sensitive lipase
    B. lipoprotein lipase
    C. general lipase
    D. C_{II} apoprotein

28. The lipid component of lung surfactant missing in premature infants that leads to respiratory distress syndrome is _____.
    A. dipalmitoyl phosphatidyl choline
    B. phosphatidyl serine
    C. phosphatidyl ethanolamine
    D. phosphatidyl inositol

29. Which organ of the body does the majority of synthesis of cholesterol?
    A. kidneys
    B. skeletal muscle
    C. adipose tissue
    D. liver

30. The cholesterol biosynthetic pathway starts with the condensation of 3 _____ molecules.
    A. pyruvate
    B. lactate
    C. phosphoenol pyruvate
    D. acetyl CoA

31. Which of the following enzymes is the committed and regulated step for cholesterol biosynthesis?
    A. mevalonic acid synthetase
    B. hydroxymethylglutaryl CoA reductase
    C. farnesyl pyrophosphate synthetase
    D. geranyl pyrophosphate synthetase

32. The allosteric effector that feedback inhibits the regulated step in cholesterol biosynthesis is _____.
    A. squalene
    B. farnesyl pyrophosphate
    C. cholesterol
    D. testosterone

33. Which of the following is a cholesterol-lowering drug that acts by being a competitive inhibitor of the first committed step reaction of cholesterol biosynthesis?
    A. cholestyramine
    B. lovastatin
    C. cholesterol esters
    D. farnesyl pyrosulfite

34. The mechanism that allows for removal of cholesterol from the body is:
    A. loss due to passage of bile salts out of the body in the feces.
    B. oxidation of cholesterol to CO_2 and H_2O.
    C. reduction of cholesterol to vitamin D_3.
    D. excretion of cholesterol in the urine.

35. The major lipoprotein complex that carries lipids from the liver to the body tissues is ____.
    A. chylomicrons
    B. VLDL's
    C. HDL's
    D. lipoprotein A

36. The majority of lipid material taken in by tissue cells is brought in by receptor mediated endocytosis of _____ lipoproteins.
    A. chylomicrons
    B. VLDL's
    C. LDL's
    D. HDL's

37. The major lipoprotein involved in movement of lipid material from the body tissues back to the liver is _____.
    A. chylomicrons
    B. VLDL's
    C. LDL's
    D. HDL's

38. Which of the following is the **major** mechanism that leads to injury to the intima of arterial walls and plaque development seen in arthrosclerosis?
    A. Cytotoxic effect of lipid peroxidation of LDL lipids and the development of Foam cells due to the clean-up by macrophages.
    B. Antioxidant damage by vitamin C, E and beta-carotene.
    C. Nicotinic acid damage to the intima.
    D. Agents within smoke causing direct chemical damage to the intima of artery walls.

39. Odd chain fatty acid degradation leads to the production of some _____, in addition to acetyl CoA.
    A. propionyl CoA
    B. malonyl CoA
    C. acetoacetyl CoA
    D. β-hydroxybutyrate

40. The name of the compound found in the mitochondrial membranes that is involved in shuttling fatty acids into the matrix is _____.
    A. squalene
    B. farnesyl
    C. dolichol
    D. carnitine

41. Which of the following is the best definition of pI?
    A. the point on the pH scale where one observes 100% of a weak acid in the conjugate base form.
    B. the point on the pH scale where one observes 100% of a weak acid in the acid form.
    C. the point on the pH scale where an amino acid or protein is electrically neutral.
    D. the point on the pH scale where we have a 50:50 mixture of a weak acid and its conjugate base

42. The point at which a buffer works optimally is best described:
    A. as plus or minus one pH unit either side of its pKa.
    B. the point at which it reaches total dissociation of the weak acid.
    C. the point at which it reaches total protonation of the weak base form
    D. the point on the pH scale where it is totally in the conjugate base form

43. A peptide bond is an example of a(n) ____ bond.
    A. phosphoester
    B. ester
    C. amide
    D. acetal

44. Which of the following amino acids is observed to occur at the end of a α-helix and is known to disrupt the α-helix?
    A. leucine
    B. lysine
    C. valine
    D. proline

45. The amino group from amino acid deamination is ____.
    A. converted to fat
    B. stored in the liver
    C. converted to glucose
    D. converted to urea and excreted in the urine

46. Pick the essential amino acid.
    A. glutamine
    B. alanine
    C. cysteine
    D. leucine

47. The final step in the urea cycle involves arginine and the production of urea and ____.
    A. citrulline
    B. ornithine
    C. homocysteine
    D. lysine

48. The ammonia released in the liver that is picked up by the urea cycle comes from the amino acid _____.
    A. lysine
    B. aspartate
    C. asparagine
    D. glutamate

49. Amino acid catabolism generally first addresses the removal of which of the following?
    A. amino group
    B. carbonyl group
    C. carboxyl group
    D. the hydrogen of the alpha carbon

50. Deamination occurs almost exclusively in which of the following?
    A. liver
    B. kidney
    C. skeletal muscle
    D. pancreas

51. A person diagnosed with Phenylketonuria (PKU) should avoid products containing _____.
    A. sweet and low
    B. sugar twin
    C. cyclamate
    D. aspartame

52. Which of the following amino acids can be converted to nicotinic acid?
    A. tyrosine
    B. serine
    C. tryptophan
    D. phenylalanine

53. When branched chain amino acids are incompletely broken down, what is the common observation. The affected individual:
    A. is short of breath all the time.
    B. has urine that turns a maple sugar brown upon standing.
    C. the person has sickled red blood cells.
    D. the persons gait is affected.

54. In heme biosynthesis which of the following are starting materials for the first step?
    A. arginine and lysine
    B. ornithine and citrulline
    C. aspartate and oxaloacetate
    D. glycine and succinyl CoA

55. A diet that is helpful in controlling high circulating levels of homocysteine is one that include _____.
    A. large amounts of protein
    B. large amounts of nucleic acid
    C. large amounts of fat
    D. large amounts of fruits and vegetables

56. Which of the following TCA cycle intermediates is the connection point for the breakdown of glutamate by transamination?
    A. citrate
    B. α-ketoglutarate
    C. succinyl CoA
    D. oxaloacetate

57. Transamination allows for the _____ of an amino acid to be catabolized for energy.
    A. nitrogen
    B. carbon skeleton
    C. sulfhydryl groups
    D. aromatic groups

58. The RDA for protein is based on _____ grams of protein per kilogram (kg) body weight.
    A. 0.8
    B. 1.0
    C. 10.0
    D. 20.0

59. In the presence of a positive allosteric effector, the [$S_{0.5}$] for an allosteric enzyme would be _____ than the no effector present curve.
    A. higher
    B. lower
    C. stays the same in presence of (+) effector
    D. none of the above

60. A Lineweaver-Burke plot is useful because:
    A. it makes the interpretation of Km and Vmax easier
    B. it has a more gentle curve than the Michaelis-Menten plot
    C. it makes the data input less difficult
    D. none of the above

61. An example of a zymogen is _____.
    A. pepsinogen
    B. phosphofructokinase (PFK)
    C. citrate synthetase
    D. hexokinase

62. Covalent modification of an enzyme switches and enzyme on or off (increases or decreases the catalytic rate). Which of the following is a common covalent addition?
    A. glucose
    B. CDP-acyl CoA
    C. fructose
    D. phosphate

63. Variant forms of the same enzyme found in different tissues are called _____.
    A. zymogens
    B. isoenzymes
    C. dehydrogenases
    D. kinases

64. In competitive inhibition the inhibitor binds to:
    A. same site as the substrate.
    B. same site as the allosteric effector.
    C. same site as protein subunit interactions.
    D. different site that substrate or allosteric effectors,

65. The definition of Km is:
    A. concentration of substrate at Vmax.
    B. concentration of substrate at 1/2 Vmax.
    C. concentration of enzyme at Vmax.
    D. concentration of enzyme at 1/2 Vmax.

66. Glucagon stimulates formation of _____ , a second messenger, in hepatocytes with the net physiological effect being release of glucose to the circulation.
    A. cAMP
    B. inositol triphosphate
    C. Ca^{+2}
    D. diacylglycerol

67. Antidiuretic hormone is chemically classified as a _____ hormone.
    A. amino acid
    B. peptide
    C. protein
    D. steroid

68. The process of a hormone binding to a receptor and generating a second messenger which then alters cellular physiology is called _____.
    A. hormone response
    B. signal transduction
    C. Go response
    D. operon model

69. Growth factors (like epidermal growth factor) typically have a receptor that has a _____ activity on the intracellular or cytosolic portion of the protein.
    A. tyrosine kinase
    B. phosphorylase
    C. phosphatase
    D. calmodulin binding

70. Which enzyme below causes release of arachidonic acid from membrane phospholipids?
    A. phospholipase A_2
    B. phospholipase B
    C. phospholipase C
    D. phospholipase D

71. Signaling by steroid hormones is typically achieved by:
    A. interaction with a plasma membrane receptor
    B. interaction with a cytosolic or nuclear receptor that once associated become transcription factors in the nucleus effecting transcription.
    C. interaction with ER membrane proteins which allow Ca^{+2} ions to leak into the cytosol; increasing the $[Ca^{+2}]$
    D. none of the above

72. Activated G proteins can in turn activate:
    A. adenylate cyclase
    B. phospholipase C
    C. both
    D. neither

73. The nitrogen donated to UTP to make CTP, by the action of the enzyme CTP synthetase, comes from _____.
    A. uric acid
    B. urea
    C. glutamine
    D. aspartate

74. Which level is the level at which ribonucleotides are reduced to deoxyribonucleotides?
    A. monophosphate level
    B. diphosphate level
    C. triphosphate level
    D. tetraphosphate level

75. The drug allopurinol is given as a treatment for _____.
    A. obesity
    B. cardiac arthymias
    C. jaundice
    D. gout

76. Which of the following nucleotide triphosphates is utilized in steps involved in the biosynthesis of GMP?
    A. ATP
    B. GTP
    C. UTP
    D. TTP

77. The lagging strand, found at a replication fork requires a _____ every 1,000 base pairs to allow for DNA replication away from the fork.
A. Glycosylated bases
B. DNA primer
C. RNA primer
D. Methylated bases

78. All purines are catabolized to _____, which is then filtered by the kidneys and excreted in the urine.
A. xanthine
B. hypoxanthine
C. urea
D. uric acid

79. The substrate for thymidylate synthetase is an activated tetrahydrofolate (FH_4) and _____, which come together in this reaction to produce dTMP.
A. dAMP
B. dUMP
C. dCMP
D. dIMP

80. The high fidelity of DNA is at least in part due to the _____ exonuclease activity of the DNA polymerases.
A. 5' $\rightarrow$ 3'
B. 3' $\rightarrow$ 5'
C. 2' $\rightarrow$ 3'
D. 5' $\rightarrow$ 1'

81. The observation that the amino acid serine has six codons reveals _____ of the Genetic Code.
A. length
B. complexity
C. box like nature
D. degeneracy

82. The proteins involved in the starting of translation are called ____.
A. elongation factors
B. initiation factors
C. start factors
D. semifactors

83. Which of the following results when one is deficient in Vitamin B12?
A. angular stomatitis
B. neural tube defects
C. beri beri
D. pernicious anemia

84. A deficiency of thiamin vitamin B one produces a disease called _____.
A. hyperlipidemia
B. megaloblastic anemia
C. beriberi
D. pernicious anemia

85 The important form of vitamin A that is a growth factor for epidermal tissues is ____.
A. retinol
B. retinal
C. retinoic acid
D. β-carotene

86. In the western world and within the population of your future potential patients, Wernicke-Korsakoff syndrome will most frequently be observed in _____.
A. those with pernicious anemia
B. alcoholics
C. smokers
D. marathon runners

87. Absorption of vitamin B12 is dependent upon a protein secreted by parietal cells in the stomach and is called ____.
A. extrinsic factor
B. intrinsic factor
C. von Willdebrand factor
D. transforming factor

88. A vitamin like compound important in transmission of intracellular signal transduction events is ____.
A. inositol
B. lipoic acid
C. taurine
D. carnitine

89. Pantothenic acid is the vitamin that becomes part of which of the following coenzymes?
A. NAD
B. ascorbate
C. PLP
D. Coenzyme A

90. Which of the following water soluble vitamins actually has some storage and breaks the fundamental rule of no stores?
A. vitamin C
B. vitamin B1
C. vitamin B6
D. vitamin B12

91. The recommended daily value for sodium is _____.
A. 1,000 mg / day
B. 2,400 mg / day
C. 5,000 mg / day
D. 10,000 mg / day

92. One of the leading causes of childhood blindness is due to a deficiency of vitamin A. This deficiency leads to the condition known as _____.
A. xerophthalmia xerokeratitis
B. xerophthalmia
C. cirrhopthalmia
D. xeroderma pigmentosum

93. To get calcium from plant foods, one needs to concentrate on those low in ___ content.
A. amino acid
B. carbohydrate
C. phytic and oxalic acid
D. nucleic acid

94. The recommendation for potassium intake is ____ per day.
A. 1,000 mg
B. 2,000 mg
C. 5,000 mg
D. 7,000 mg

95. Excessive Zn and Cu in the diet may interfere with ____ absorption.
A. Fe
B. Mo
C. Na
D. K

96. Cobalt is a component of which of the following vitamins.
A. B1
B. B2
C. B6
D. B12

97. When considering calcium supplementation, one should also take into account the mineral _____.
A. manganese
B. magnesium
C. molybdenum
D. zinc

98. The mineral that strengthens bone matrix is____.
A. Zn^{+2}
B. Cu^{+2}
C. Mg^{+2}
D. Mn^{+2}

99. The major transport molecule for delivery of iron to cells is ____.
A. ferritin
B. hemoglobin
C. transferrin
D. metallothionein

100.. The component of vitamin A involved in sensing light by the retina of the eye is _____.
A. retinol
B. 11-trans retinal
C. retinoic acid
D β-carotene

101. The cytochrome bc1 complex (III) receives electrons from:
A. coenzyme NADH
B. coenzyme Q
C. coenzyme $FADH_2$
D. coenzyme TPP

102. The ΔH for a biochemical reaction is referring to the _____.
A. change in entropy
B. change in enthalpy
C. change in temperature
D. reduction potential

103. The $\Delta E^{o'}$ for a biochemical reaction involving the electron transport system is referring to the _____.
A. change in entropy
B. change in enthalpy
C. change in temperature
D. reduction potential

104. A reaction that has an overall $\Delta G^{\circ\prime}$ that is very near zero or is zero is one that:
   A. proceeds only to the left hand side of the equation.
   B. will not occur without input of excess free energy.
   C. is moved in either direction by the concentrations of substrate(s) and product(s).
   D. proceeds only to the right hand side of the equation.

105. The free energy change for a reaction at equilibrium:
   A. is less than 1.
   B. is greater than 1.
   C. is negative.
   D. is zero.

106. Except for one ATP the majority of the energy derived from the TCA cycle needed to power ATP synthesis comes from the harvesting of _____ on coenzymes.
   A. high energy phosphates
   B. high energy thioesters
   C. high energy esters
   D. high energy electrons

107. Which of the following reactions **utilizes** ATP?
   A. Glucose -----> Glucose-6-P
   B. 3-phosphoglycerate -----> 2-phosphoglycerate
   C. Phosphoenol pyruvate -----> pyruvate
   D. 1,3 bisphosphoglycerate-----> 3-phosphoglycerate

108. Which of the following is considered a high energy bond?
   A. ester
   B. ether
   C. thioester
   D. phosphoester

109. The acetyl CoA formed in the bridging reaction requires ____ to form citrate.
   A. succinyl CoA
   B. fumarate
   C. malate
   D. oxaloacetate

110. The ratio of _____ to _____ must be kept 1 to 1, to keep the tricarboxylic acid cycle turning.
   A. acetyl CoA to succinyl CoA
   B. malate to □-ketoglutarate
   C. acetyl CoA to oxaloacetate
   D. succinyl CoA to malonyl CoA

NBCE
MOCK BOARD
QUESTIONS
CHEMISTRY
Answer Key

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