Chem 121 Sample Question Chapter 21: Enzymes and Vitamins

1. What is the function of enzymes within living systems?
   A) structural elements
   B) neurotransmitters
   C) catalysts
   D) hormones

2. Enzymes have names that
   A) always end in -ase
   B) always end in -in
   C) can end either in -in or -ase
   D) can end in either -in or -ogen

3. In which of the following is the pairing between enzyme type and enzyme function incorrect?
   A) nucleases - hydrolysis of sugar-phosphate ester bonds in nucleic acids
   B) synthetase - formation of new bond between two substrates
   C) kinase - transfer of amino groups between substrates
   D) carboxylase - removal of carbon dioxide from substrate

4. Which of the following is always present in both conjugated enzymes and simple enzymes?
   A) protein
   B) a vitamin
   C) a cofactor
   D) a coenzyme

5. The protein portion of a conjugated enzyme is called a(n)
   A) apoenzyme.
   B) coenzyme.
   C) holoenzyme.
   D) cofactor.

6. An enzyme active site is the location in the enzyme where
   A) protein side groups are brought together by bending and folding to form a site for interactions with substrates
   B) the catalyst interacts with the enzyme
   C) catalyst molecules are generated
   D) the substrate creates the catalyst molecules

7. Which of the following enzyme properties is explained by the lock-and-key model for enzyme action?
   A) high turnover rate
   B) absolute specificity
   C) susceptibility to denaturation
   D) susceptibility to deactivation
8. An enzyme that catalyzes the reactions of L-amino acids but not D-amino acids would be described as showing  
A) linkage specificity  
B) absolute specificity  
C) group specificity  
D) stereochemical specificity

9. A plot of enzyme activity (y-axis) vs. pH (x-axis) with other variables constant is a  
A) straight line with an upward slope.  
B) line with an upward slope and a long flat top.  
C) line with an upward slope followed by a downward slope.  
D) straight horizontal line.

10. A plot of enzyme activity (y-axis) versus substrate concentration (x-axis) with other variables constant is a  
A) straight line with an upward slope.  
B) line with an upward slope and a long flat top.  
C) line with an upward slope followed by a downward slope.  
D) straight horizontal line.

11. Which of the following statements concerning a competitive enzyme inhibitor is correct?  
A) it competes with substrate for occupancy of the enzyme's active site  
B) binds at the active site simultaneously with the substrate  
C) it breaks the enzyme down to its constituent amino acids  
D) its effect can be overcome by increasing the temperature

12. Which of the following binds to an enzyme at a location other than the active site?  
A) substrate  
B) irreversible inhibitor  
C) reversible competitive inhibitor  
D) reversible noncompetitive inhibitor

13. The number of substrate molecules acted upon per minute by one molecule of enzyme is called the  
A) active site number.  
B) enzyme activity number.  
C) turnover number.  
D) optimum number.
14. The final product of a series of enzyme-catalyzed reactions causes the enzyme that catalyzes the first reaction of the series to be inhibited. This is an example of
A) positive regulator control.
B) substrate control.
C) feedback control.
D) competitive control.

15. Which of the following substance is a zymogen?
A) angiotensin
B) pepsin
C) proelastase
D) subtilisin

16. The number of known vitamins is
A) 10.
B) 13.
C) 15.
D) 20.

17. In which of the following pairs of vitamins are both members of the pair water-soluble?
A) vitamin D and pantothenic acid
B) vitamin D and vitamin K
C) vitamin K and vitamin B₃
D) thiamin and biotin

18. Vitamins A and D are important, respectively, in
A) vision and proper use of calcium and phosphorus
B) vision and bone formation
C) antioxidant activity and blood clotting
D) proper use of calcium and phosphorus and blood clotting

19. The major function for B vitamins within the human body is as
A) antioxidants.
B) components of coenzymes.
C) regulators of cell differentiation.
D) regulators of calcium ion and phosphate ion concentrations in blood.

20. All of the B vitamins, except one, contain heterocyclic nitrogen ring systems as part of their structure. The exception is
A) riboflavin.
B) thiamin.
C) pantothenic acid.
D) biotin.
21. Which of the following would be the name for an enzyme?
   A) succinate dehydrogenase  
   B) pyruvate  
   C) pepsin  
   D) more than one correct response  
   E) no correct response

22. Which of the following pairings of terms is correct?
   A) A kinase is a transferase.  
   B) A mutase is a ligase.  
   C) A synthase is a lyase.  
   D) more than one correct response  
   E) no correct response

23. Which of the following could be a component of a conjugated enzyme?
   A) coenzyme  
   B) cofactor  
   C) apoenzyme  
   D) more than one correct response  
   E) no correct response

24. In which of the following pairs of terms do the two terms have the same meaning?
   A) holoenzyme and conjugated enzyme  
   B) coenzyme and simple enzyme  
   C) apoenzyme and cofactor  
   D) more than one correct response  
   E) no correct response

25. An enzyme active site is the location in an enzyme where substrate molecules
   A) are generated.  
   B) become catalysts.  
   C) undergo change.  
   D) more than one correct response  
   E) no correct response

26. Which of the following statements concerning enzyme active sites is incorrect?
   A) They generally involve only a small portion of the enzyme.  
   B) Noncompetitive inhibitors can change active site shape.  
   C) The lock-and-key model of enzyme activity assumes that an active site has a fixed, rigid geometrical conformation.  
   D) more than one correct response  
   E) no correct response
27. In which of the following pairs of enzymes is the first listed enzyme more limited in its scope than the second listed enzyme?
A) linkage-specific enzyme, absolute-specific enzyme
B) stereochemical-specific enzyme, linkage-specific enzyme
C) group-specific enzyme, stereochemical-specific enzyme
D) more than one correct response
E) no correct response

28. Which of the following statements concerning the effect of temperature change on an enzyme-catalyzed reaction is incorrect?
A) An increase in temperature can stop the reaction by denaturing the enzyme.
B) An increase in temperature can increase the reaction rate by increasing the speed at which molecules move.
C) An increase in temperature to the optimum temperature maximizes reaction rate.
D) more than one correct response
E) no correct response

29. Which of the following statements about a competitive inhibitor is correct?
A) It must resemble the substrate in general shape.
B) Its effect can be diminished by increasing substrate concentration.
C) It and the normal substrate simultaneously occupy the active site.
D) more than one correct response
E) no correct response

30. Which of the following binds to an enzyme at its active site?
A) irreversible inhibitor
B) reversible competitive inhibitor
C) reversible noncompetitive inhibitor
D) more than one correct response
E) no correct response

31. In which of the following pairs of substances are both members of the pair zymogens?
A) pepsin and pepsinogen
B) proelastase and elastase
C) prothrombin and pepsinogen
D) more than one correct response
E) no correct response

32. Which of the following is not a water-soluble vitamin?
A) vitamin C
B) vitamin A
C) vitamin D
D) more than one correct response
E) no correct response
33. Which of the following pairings of vitamins and functions is correct?
   A) vitamin E; an antioxidant
   B) vitamin C; a coenzyme
   C) vitamin D; maintenance of mucous membranes
   D) more than one correct response
   E) no correct response

34. Which of the following B vitamins has a structure in which a metal atom is present?
   A) folate
   B) biotin
   C) vitamin B12
   D) more than one correct response
   E) no correct response

35. Which of the following statements concerning sources for B vitamins is correct?
   A) Most fruits are poor sources.
   B) Most vegetables are good sources.
   C) Meat and dairy products are good sources.
   D) more than one correct response
   E) no correct response
Use the following to answer questions 36-45:

In each of the following multiple-choice questions, characterize EACH of the three given statements as being TRUE or FALSE and then indicate the collective true-false status of the statements using the choices
a) All three statements are true.
b) Two of the three statements are true.
c) Only one of the statements is true.
d) None of the statements is true.

36. Statements:
   (1) The active site of an enzyme always contains one or more metal atoms.
   (2) The water-soluble vitamins are the B vitamins and vitamins A and C.
   (3) An enzyme's turnover number is the rate at which it is degraded and resynthesized within the human body.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.

37. Statements:
   (1) An apoenzyme, by itself, has no biochemical activity.
   (2) Urease is an example of an enzyme with absolute specificity.
   (3) All enzymes have names which end in -ase.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.

38. Statements:
   (1) The primary function of vitamin D in the body is that of an antioxidant.
   (2) Holoenzymes are conjugated enzymes.
   (3) An increase in enzyme activity is always associated with an increase in the temperature of an enzyme-containing system.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.
39. Statements:
   (1) Activation of a zymogen produces a proteolytic enzyme.
   (2) An enzyme-substrate complex is the final product in most enzyme-catalyzed reactions.
   (3) Three forms are vitamin A are active in the human body.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.

40. Statements:
   (1) A substrate is the substance upon which an enzyme “acts.”
   (2) Competitive enzyme inhibition is a reversible process.
   (3) Vitamin C is necessary for the formation of the structural protein collagen.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.

41. Statements:
   (1) The enzyme lactase catalyzes the hydrolysis of lactose.
   (2) The spent form of vitamin E is regenerated by vitamin C.
   (3) All coenzymes are cofactors but not all cofactors are coenzymes.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.

42. Statements:
   (1) Enzymes undergo all of the reactions of proteins including denaturation.
   (2) Vitamin E, a cholesterol derivative, can be synthesized in the skin by sunlight irradiation.
   (3) The optimum pH for enzyme activity within the human body is always within the physiological pH range of 7.0 to 7.5.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.
43. Statements:
   (1) All of the B vitamins are water-soluble.
   (2) The induced-fit model for enzyme action allows for small changes in active-site geometry.
   (3) Noncompetitive enzyme inhibitors bind to an enzyme at sites other than the active site.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.

44. Statements:
   (1) The B vitamins serve as components of coenzymes.
   (2) Associated with allosteric enzyme action are substances known as regulators.
   (3) Kinases belong to the class of enzymes called isomerases.
   A) All three statements are true.
   B) Two of the three statements are true.
   C) Only one of the statements is true.
   D) None of the statements is true.

45. Statements:
   (1) The process of enzymatic browning requires the presence of oxygen.
   (2) The mode of action of penicillin drugs is selective competitive reversible inhibition.
   (3) Isoenzymes, enzymes which exist in several forms, are used to confirm the diagnosis of a heart attack.
   A) all three statements are true
   B) two of the three statements are true
   C) only one of the statements is true
   D) none of the statements is true

Use the following to answer questions 46-50:

For each of the enzyme actions, choose the general enzyme type from the response list. Responses may be used more than once or need not be used at all.

a) lyase
b) isomerase
c) transferase
d) oxidoreductase

46. Removal of CO₂ from a substrate
47. Transfer of a phosphate group between substances
48. Conversion of a D isomer to the L isomer
49. Introduction of a double bond by removal of hydrogen from a substrate

50. Transfer of an amino group between substrates

Use the following to answer questions 51-55:

For each of the descriptions of “enzyme action”, choose from the response list the type of inhibitor or regulator that is involved. Responses may be used more than once or need not be used at all.

a) reversible competitive inhibitor
b) reversible noncompetitive inhibitor
c) irreversible inhibitor
d) positive regulator

51. Forms one or more covalent bonds at an enzyme active site

52. Decreases enzyme activity by binding at a site other than the active site

53. Must resemble a substrate closely in shape and charge distribution

54. Mode of action of nerve gases

55. Mode of action of penicillins

Use the following to answer questions 56-60:

Match each of the enzyme descriptions with an appropriate characterization from the response list. Responses may be used more than once or need not be used at all.

a) component of all conjugated enzymes
b) component of some conjugated enzymes
c) has both protein and nonprotein parts
d) inactive precursor of an enzyme

56. Apoenzyme

57. Coenzyme

58. Holoenzyme

59. Zymogen

60. Cofactor
Use the following to answer questions 61-65:

Descriptions of the variables needed to plot a graph on which enzyme activity is the y-axis. For each description choose from the response list the “shape” of the resulting graph. Choices may be used more than once or need not be used at all.

a) line with an upward slope
b) line with a downward slope
c) line with an upward slope and a long flat top
d) line with an upward slope followed by a downward slope

61. Increase in pH with all other variables constant
62. Increase in temperature up to the optimum temperature with all other variables constant
63. Increase in temperature beginning at the optimum temperature with all other variables constant
64. Increase in substrate concentration with all other variables constant
65. Increase in enzyme concentration with all other variables constant

Use the following to answer questions 66-70:

For each of the descriptions of a vitamin, select from the response list the name of the vitamin. Responses may be used more than once or need not be used at all.

a) vitamin D
b) vitamin C
c) vitamin K
d) vitamin B₁₂

66. Cosubstrate in the formation of the structural protein collagen
67. Structure contains a cobalt atom
68. Important in the blood-clotting process
69. Structural derivative of cholesterol
70. Water-soluble vitamin that is not a B vitamin
Answer Key Chapter 21

1. C 45. B
2. C 46. a
3. D 47. c
4. A 48. b
5. A 49. d
6. A 50. c
7. B 51. c
8. D 52. b
9. C 53. a
10. B 54. c
11. A 55. c
12. D 56. a
13. C 57. b
14. C 58. c
15. C 59. d
16. B 60. a
17. D 61. d
18. A 62. a
19. B 63. b
20. C 64. c
21. D 65. a
22. A 66. b
23. D 67. d
24. A 68. c
25. C 69. a
26. E 70. b
27. B
28. E
29. D
30. D
31. C
32. D
33. A
34. C
35. D
36. D
37. B
38. C
39. C
40. A
41. A
42. C
43. A
44. B