ALQUSOUR ACADEMY

أكاديمية القصور

BIOCHEMISTRY

Subject: First Exam - Questions - Part One

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ALQUSOUR ACADEMY

1. **The amino acids at their isoelectric points (PI) have:**
   A. No ionizable group.
   B. No positively charged groups.
   C. No negatively charged groups.
   D. All acidic groups are protonated.
   E. No tendency to migrate in the electric field.

2. **Glutathione (GSH) is:**
   A. Dipeptide
   B. Single amino acid
   C. Tripeptide
   D. None of the above

3. **Choose the incorrect statement about pKa of a weak acid (HA).**
   A. It is equal to the pH of the solution.
   B. It is the pH when the ratio of the $[A^-]$ / [HA] is equal to one.
   C. It is the pH when 50% of the weak acid is dissociated.
   D. It is equal to the pH minus (log $[A^-]$ / [HA].

4. **Which of the following is incorrect about buffers:**
   A. The equivalent point is the point when the acid and base are neutralized.
   B. The inflection point is the point when [HA] = $[A^-]$.
   C. Buffer can work at pH range (4 – 10).
   D. If pH < pKa the buffer is mostly protonated.

5. **Glutathione in the form of GSSG is considered:**
   A. Reduced.
   B. Oxidized.
   C. Dephosphorylated.
   D. Phosphorylated.

6. **Which of the following increase the binding of O_2 to hemoglobin?**
   A. Increase in $[H^+]$
   B. Decrease CO_2 level
   C. Increase BPG concentration
   D. Oxidation of the heme iron
   E. Increased temperature

7. **A titration curve for an amino acid:**
   A. Is generally a straight line.
   B. Show buffering of the change in pH near the pKa of each titretable group.
   C. Show buffering of the change in pH far from the pKa of each titretable group.
   D. Has two inflection points for each functional group.
   E. Is usually hyperbolic.

Consider the following peptide and answer questions (8 - 10).

Phe — Glu — Ser — Met

8. **What is the C terminal?**
   A. Glu
   B. Phe
   C. Met
   D. Ser

9. **The net charge at pH 1 is:**
   A. −1
   B. −2
   C. +1
   D. +2
   E. Zero

10. **At pH 1, this peptide will travel in the electric field toward:**
    A. The anode.
    B. The cathode.
    C. It will not move at all
    D. None of the above

11. **Which of the following is a modified amino acid?**
    A. Glutamine
    B. Asparagines
    C. Hydroxyproline.
    D. Both A and B.

12. **An uncompetitive inhibitor of an enzyme catalyzed reaction:**
    A. Binds to ES complex
    B. Decrease Vmax
    C. Is without effect at saturating substrate concentration
    D. A + B are correct
    E. None of the above

13. **Amino acid not stable in alpha helix is:**
    A. Proline.
    B. Alanine.
    C. Glutamine.
    D. Tryptophan.

* **In questions 14 - 18 choose the amino acid that's matched correctly with**
A. His B. Aspartic acid C. Glutamine D. Proline E. Threonine
F. Glycine

14. **Has amide group in its side chain**
15. **Devoid an amino group**
16. **Has the smallest side chain**
17. **Proton donor**
18. **Has a role in myoglobin functioning**

19. **The most common type of supersecondary structure is:**
    A. β-α-β
    B. α-α
    C. β- meander
    D. Greek key

20. **The Michaelis-Menten equation:**
    A. Is a plot of Vmax versus [S]
    B. Relates the intial rate of the reaction (V_0) to the [S]
    C. Applies to all enzyme catalyzed reactions
    D. Give sigmoidal curve when plotted
    E. All of the above is correct

21. **The isoelectric point of a protein is defined as:**
    A. The PH at which the net charge on the molecule is 0.
    B. The PH at which all groups are protonated.
    C. The PH at which all groups are unprotonated.
    D. The PH at which each acidic group is protonated and each basic group is unprotonated.

22. **Which is true for the following proteins; Collagen, Hemoglobin, Myoglobin, Oxytocin.**
    A. They all have primary structure.
    B. They all have secondary structure.
    C. They all have tertiary structure.
    D. They all have quaternary structure.

23. The Ramachandran diagram shows the sterically allowed values for the:
    A. Angles of the side chains of the alpha-helix and of beta-pleated sheet.
    B. Psi and phi angles of the alpha carbon in a polypeptide.
    C. Angle between the C=O and the N-H of the peptide bond.
    D. Angle of the right-turn twist of the beta-pleated sheet.

24. Which of the following amino acids may participate in the formation of covalent cross links that stabilize the tertiary structure of many globular proteins?
    A. Methionine.
    B. Cysteine.
    C. Serine.
    D. Histidine.

25. Scurvy, defective collagen is due to insufficient vitamin C which:
    A. Is ordinarily incorporated into crosslinks between tropocollagen molecules.
    B. Is usually involved in the hydroxylation of prolyl residues.
    C. Inhibits the oxidative degradation of collagen.
    D. Is required for the conversion of lysyl residues into aldehydes.
    E. Conversion from tense to relaxed conformation at increased pCO_2.

26. Hemoglobin binds oxygen cooperatively whereas myoglobin does not. This is because:
    A. Myoglobin contains mostly beta sheets while hemoglobin has none.
    B. Heme lies on the surface of myoglobin, while hemoglobin binds heme in a hydrophobic pocket.
    C. Myoglobin contains Fe^{+2} while hemoglobin contains Fe^{+3}.
    D. Myoglobin is monomeric while hemoglobin is multimeric.

27. In an enzyme assay in which substrate is much lower than Km, the rate of the reaction is:
    A. Approaches Vmax
    B. Show zero-order reaction
    C. Proportional to [S]
    D. Dependent on [E]
    E. Independent on temperature

28. The amino acid with a net negative charge at pH = 6 is:
    A. His
    B. Asn
    C. Glu
    D. Gly
    E. Lys

29. All of the following is correct about fibrous protein except:
    A. Water insoluble.
    B. Extended conformation.
    C. Spherical shape.
    D. Collagen and fibrin are fibrous proteins.

30. **Hb F has higher affinity for O_2 because:**
    A. It is not allosteric.
    B. It binds CO_2 strongly.
    C. It cannot bind 2,3-BPG.
    D. It has no Bohr effect

31. **Which statement about the amino acid cysteine is false?**
    A. It can form peptide bonds.
    B. It can form disulfide bonds.
    C. It is found in some proteins.
    D. It can be important to quaternary structure.
    E. It can be important to tertiary structure.

32. **Similarities between hemoglobin and myoglobin include:**
    A. Heme as prosthetic group.
    B. The effect of pH on O_2 binding.
    C. The effect of BPG.
    D. The shape of O_2 dissociation curve.

33. **Which structure is unique to collagen?**
    A. The alpha helix.
    B. The double helix.
    C. The triple helix.
    D. The beta structure.
    E. The beta barrel.

34. **The secondary structure of a protein refers to:**
    A. Repetitive regular structures including (α-helix and beta sheets).
    B. The hydrophobic or hydrophilic nature of the protein.
    C. Local, regular conformations in space resulting from noncovalent interactions between a.a side chains (R groups).
    D. The formation of peptide bonds between adjacent a.a residues.
    E. B & C.

35. **What types of bonds stabilize α-helix of proteins?**
    A. Peptide bonds.
    B. H-bonds.
    C. Electrostatic bonds.
    D. Hydrophobic interactions.

36. **Which of the following effects is NOT used during enzyme catalysis?**
    A. Binding of the correct stereoisomer of the substrates.
    B. Decreasing the overall free energy of the reaction.
    C. Lowering the activation energy of the reaction.
    D. Interaction between substrate and active site.
    E. Binding substrate to the enzyme.

37. When enzymes are heated above a certain temperature, what process they undergo?
    A. Disintegration.
    B. denaturation.
    C. petrification.
    D. Desiccation.

38. Which of the following statements is correct:
    A. The α-helix can be composed of more than one polypeptide chain.
    B. β-sheets exist only in antiparallel form.
    C. β bends often contain proline.
    D. Motifs are types of secondary structure.
    E. The helix is stabilized primarily by ionic interactions between the R groups of the a.a.

39. Asp is similar to Glu in the same way that:
    A. His is similar to Pro
    B. Cys is similar to Ser
    C. Gln is similar to Asn
    D. Asn is similar to Gln
    E. Gly is similar to Val

40. The oxygen binding curve of Hb F differ from that of Hb A in that:
    A. Hb F binds oxygen more strongly than Hb A.
    B. Hb A binds oxygen more strongly than Hb F.
    C. There is no difference.
    D. Cannot decide.

41. For an enzyme that displays Michaelis-menten kinetics, what is the reaction velocity, V (as a percentage of Vmax) when [S] = 0.1 Km?
    A. V = 0.5 Vmax
    B. V = 0.33 Vmax
    C. V = 0.09 Vmax
    D. V = 0.67 Vmax

42. Competitive inhibiter of an enzyme:
    A. Increase Km without affecting the V max.
    B. Decrease Km without affecting the Vmax.
    C. Increase Vmax without affecting the K m.
    D. Decrease Vmax without affecting the Km.
    E. Decrease both of them.

43. Which of the following amino acids is present in one third of the total amino acids of collagen?
    A. Glutamic acid
    B. Lysine
    C. Proline and hydroxyl proline
    D. Methionine
    E. Cystine

44. Ascorbate is required for the hydroxylation of which of the following amino acids in collagen biosynthesis?

A. Lys
B. Pro
C. His
D. Tyr
E. Arg

45. Which statement is not true about the effects of various conditions on the activity of the enzyme:

A. Higher temperature generally increases the activity of the enzyme up to a point.
B. Above a certain range of temperature, the protein of an enzyme denatured.
C. A change in pH can cause the enzyme to be inactivated.
D. An enzyme activity is generally reduced by an increase in substrate concentration.
E. When sufficient substrate is available; the active site will nearly always be occupied.

46. Allosteric effect that occur in hemoglobin:

A. Only occur in human.
B. Important for maintaining Fe in Fe+2 state.
C. Minimize oxygen delivery to the tissue.
D. Optimize oxygen delivery to the tissue.
E. Can also be observed in myoglobin.

47. Spontaneous oxidation of heme-bound Fe II to F III is prevented in hemoglobin by:

A. The symmetry of its primary structure.
B. The four heme-protein covalent bonds.
C. The surrounding protein structure in each subunit.
D. A highly ordered water molecule within the heme pocket.

48. What is the highest level of organization in myoglobin?

A. Primary
B. Secondary
C. Tertiary
D. Quaternary
E. None of the above

49. The Km of the enzyme is:

A. Numerically equal to 1/5 Vmax.
B. Independent of pH.
C. It is higher for aspartate transcarbamoylase than other enzymes.
D. Substrate concentration when half of highest rate of the reaction is reached.

50. In sickle cell anemia, the basis of the malfunction of the hemoglobin molecule is:
    A. Incorrect secondary structure.
    B. Substitution of a single amino acid.
    C. Faulty binding of heme groups.
    D. Reduced affinity for oxygen.
    E. Insufficient iron in the diet.

51. In an enzyme catalyzed reaction, when the [S] is lower than the Km. The rate of the reaction is:
    A. Independent of [S].
    B. Proportional to [S].
    C. Independent of [E].
    D. Independent of temperature.

52. In the oxygenated form of hemoglobin, oxygen binds to:
    A. Fe +3
    B. F8 His
    C. E7 His
    D. Fe +2
    E. Pyrol ring

53. Which one is correct?
    A. Protein consisting of one polypeptide can have quaternary structure.
    B. Formation of disulfide bridge in protein requires that 2 cysteine to be adjacent to each other in the primary sequence.
    C. Denaturation of protein leads to irreversible loss of its structure.
    D. The information required for correct folding is contained in specific sequence of amino acids along polypeptide chain.

54. The net charge for Val-Ala-Gly-Val in neutral pH :
    A. +1
    B. – 1
    C. 0
    D. +2

55. The net charge for Val-His-Gly-Val in neutral PH:
    A. +1
    B. – 1
    C. 0
    D. +2

56. Interaction between $CH_3CH_2CH_2CH_3$ & CH_4 is an example of:
    A. Dipole induced dipole.
    B. Ionic dipole.
    C. Van der waal.
    D. Hydrophilic.

57. When [S] is much greater than Km and the velocity is equal Vmax, then we have what type of kinetics?
   A. Zero order.
   B. First order.
   C. Second order.
   D. None

58. Your research results show that your enzyme has a sigmoidal curve. This may indicate:
   A. Michaelis-Menten kinetics.
   B. Cooperative binding.
   C. Noncompetitive inhibition.
   D. All of the above.

59. The only polar residues inside myoglobin is / are:
   A. His residue
   B. Two His residues
   C. Glutamate residue
   D. Two glutamate residue
   E. Serine residue

60. All of the following cause hemoglobin to shift to the left except:
   A. Active tissue.
   B. Decrease [CO_2].
   C. Increase in the pH.
   D. Hb F
   E. A & C

61. All of the following is false except:
   A. Increase [CO_2] affect the binding of myoglobin to O_2 and cause the curve to shift to the right.
   B. Decrease [CO_2] affect the binding of myoglobin to O_2 and cause the curve to shift to the right
   C. Increase the concentration of (2, 3 BPG) affects the binding of myoglobin to O_2 and cause the curve to shift to the right.
   D. Decrease the concentration of (2, 3 BPG) affects the binding of myoglobin to O_2 and cause the curve to shift to the right.
   E. None of the above.

62. Denaturation of proteins involves the disruption of all of the following interactions except:
   A. Van der Waal
   B. S-S bonds
   C. Hydrogen bonds
   D. Peptide bonds
   E. Hydrophobic interactions

63. **All are true except:**
   A. All enzymes are proteins.
   B. The structure of noncompetitive inhibitors is similar to the structure of the substrate.
   C. Catalysts alter the value of activation energy.
   D. Catalysts do not alter the values of free energy and the equilibrium constant.
   E. A and B

64. **You have the hypothetical reaction: $3A + 2B \rightarrow 2C + 3D$. The rate of the reaction was Experimentally determined to be: $R = k [A]^1 [B]^1$. The over all order of the reaction is:**
   A. 2
   B. 5
   C. 1
   D. 0
   E. None of them is correct

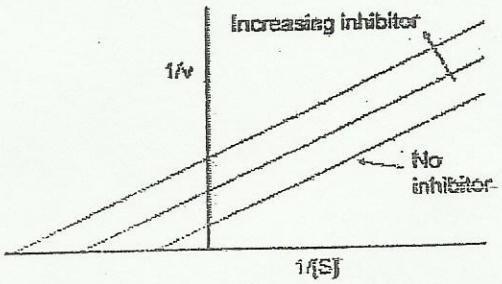
65. **The lines in Lineweaver-Burk plot intercept with the:**
   A. Y axis and gives the Vmax value.
   B. X axis and gives the - 1/Km value.
   C. X axis and gives the 1/Vmax value.
   D. Y axis and gives the -1/Vmax value.
   E. Y axis and gives the Km/Vmax value.

66. **Which of the following participate in the buffering of blood?**
   A. Hemoglobin.
   B. Bicarbonate.
   C. Myoglobin.
   D. A and B
   E. A and C

67. **Which is true?**
   A. A fetus who is homozygous for Sickle-cell hemoglobin (Hb S) has normal Hb F.
   B. β-chain hemoglobin has Ser while γ-chain hemoglobin has His.
   C. Fibrous proteins are soluble in water while globular proteins are not.
   D. α-helix is fully extended and its H-bonds are parallel to the protein fibers, while β-sheets are not fully extended and its H-bonds are perpendicular to the protein fiber.
   E. A and D

68. **The tertiary structure of a protein refers to:**
   A. Sequence of amino acids in the polypeptide chain.
   B. The unique three dimensional folding of the molecule.
   C. A combination of supersecondary structures packed together.
   D. A combination of secondary structures packed together.

69. This curve represents:



A. Competitive inhibitor.

B. Non-competitive inhibitor.

C. Uncompetitive inhibitor.

D. Mixed inhibition.

70. The amino acid that has no isomer is:

A. Ala

B. Tyr

C. Gly

D. Asp

71. When the pH is equal to pKa of a weak acid, what is the ratio of the dissociated to the undissociated forms of this weak acid?

A. 1:0

B. 1:1.5

C. 1:10

D. 1:1

E. 1:3

Answers sheet

Question #	Answer	Question #	Answer	Question #	Answer
1		25		49	
2		26		50	
3		27		51	
4		28		52	
5		29		53	
6		30		54	
7		31		55	
8		32		56	
9		33		57	
10		34		58	
11		35		59	
12		36		60	
13		37		61	
14		38		62	
15		39		63	
16		40		64	
17		41		65	
18		42		66	
19		43		67	
20		44		68	
21		45		69	
22		46		70	
23		47		71	
24		48			

Answers Key

QUESTION #	ANSWERS
1	E. No tendency to migrate in the electric field.
2	C. Tripeptide
3	A. It is equal to the pH of the solution
4	C. Buffer can work at pH range (4 – 10)
5	B. Oxidized
6	B. Decrease CO_2 level
7	B. Show buffering of the change in pH near the pKa of each titretable group
8	C. Met
9	C. + 1
10	B. The cathode
11	C. Hydroxyproline
12	D. A + B are correct
13	A. Proline
14	C. Glutamine
15	D. Proline
16	F. Glycine
17	B. Aspartic acid
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20	B. Relates the intial rate of the reaction (V_0) to the [S]
21	A. The PH at which the net charge on the molecule is 0
22	A. They all have primary structure
23	B. Psi and phi angles of the alpha carbon in a polypeptide
24	B. Cysteine
25	B. Is usually involved in the hydroxylation of prolyl residues
26	D. Myoglobin is monomeric while hemoglobin is multimeric
27	C. Proportional to [S]
28	C. Glu
29	C. Spherical shape.

30	C. It cannot bind 2,3 BPG.
31	D. It can be important to quaternary structure
32	A. Heme as prosthetic group
33	C. The triple helix
34	A. Repetitive regular structures including (α-helix and beta sheets)
35	B. H-bonds
36	B. Decreasing the overall free energy of the reaction
37	B. denaturation.
38	C. β bends often contain proline
39	D. Asn is similar to Gln
40	A. Hb F binds oxygen more strongly than Hb A
41	C. V = 0.09 Vmax
42	A. Increase Km without affecting the V max
43	C. Proline and hydroxyl proline
44	B. Pro
45	D. An enzyme activity is generally reduced by an increase in substrate concentration
46	D. Optimize oxygen delivery to the tissue
47	C. The surrounding protein structure in each subunit.
48	C. Tertiary
49	D. Substrate concentration when half of highest rate of the reaction is reached
50	B. Substitution of a single amino acid
51	B. Proportional to [S].
52	D. Fe +2
53	D. The information required for correct folding is contained in specific sequence of amino acids along polypeptide chain
54	C. 0
55	C. 0
56	C. Van der waal
57	A. Zero order
58	B. Cooperative binding
59	B. Two His residues

60	A. Active tissue.
61	E. None of the above
62	D. Peptide bonds
63	E. A and B
64	A. 2
65	B. X axis and gives the - 1/Km value.
66	D. A and B
67	A. A fetus who is homozygous for Sickle-cell hemoglobin (Hb S) has normal Hb F
68	B. The unique three dimensional folding of the molecule
69	C. Uncompetitive inhibitor
70	C. Gly
71	D. 1:1

THE END

IZZELDEEN ALMOMANI