5 B I O C H E M I S T R Y E X A M

November 4, 2008

NAME_____

1. Which of the following sets of amino acid 'R' groups contains BOTH a hydrophobic 'R' group and a polar charged 'R' group. (NOTE: Carboxylate groups -COOH, and primary amine groups $-NH_2$ are charged at pHs around 7, but might not be charged at other pHs)

A) CH_3- and $HOCH_2$- B) $HOOCCH_2$- and CH_3- C) $(CH_3)_2CH_2$- and $HSCH_2$-
D) $CH_3SCH_2CH_2$- and $HOCH_2$- E) $HOOCCH_2$- and $H_2N(CH_2)_4$-

2. For an amino acid with the following features: a non-polar 'R' group; pK_1 = 2.7; pK_2 = 8.9; choose the pH at which the amino acid would be the best buffer.

A) 2.8 B) 1.4 C) 11.6 D) 6.0 E) 5.8

3. If one has a solution containing 1 millimole of an amino acid (hydrophobic 'R' group; pK_1 = 3; pK_2 = 9) in an environment having a pH of 6, how many millimoles of NaOH must be added to the solution to produce a system having a pH of 9? (NOTE: Answers are in millimoles)

A) 1 B) 2 C) 0.25 D) 0.5 E) 1.5

4. The tripeptide: MET-SER-ALA; will demonstrate _____ peptide linkages and _____ acid base functional groups. (NOTE: Assume the amino acids have either hydrophobic or polar uncharged 'R' groups

A) 2 -- 2 B) 2 -- 3 C) 2 --1 D) 3 -- 2 E) 3 -- 3

5. Which of the following types of interactions, or bonding, must be disrupted in order to alter the primary structure of a polypeptide?

A) disulfide linkages B) covalent bonds C) hydrogen bonds D) ion-dipole interactions
E) hydrophobic interactions

6. An 'amide plane' forms due to restricted rotation about a _____ bond.

A) C - H B) C - O C) N - O D) H - N E) N - C

7. The energy content of an α-helix is _____ than that of a straight chain polypeptide due to the formation of hydrogen bonds between _____.

A) greater -- amide planes B) less -- 'R' groups C) less -- amide planes
D) greater -- 'R' groups E) less -- different polypeptide systems

8. Which sort of bond is found in the covalent interactions associated with the tertiary structure of a polypeptide?

A) C - C B) S - S C) H - O D) C - N E) C - S

9. Which of the following types of tertiary structure defining interactions is most likely to be impacted by a change in the pH of the polypeptide's environment?

A) electrostatic interactions B) disulfide linkages C) hydrogen bonds
D) hydrophobic interactions E) Both 'C' and 'D' are correct

10. The 'ropelike' structure noted in agents such as procollagen and tropocollagen is enabled by the presence of the amino acid _____, which demonstrates a tendency to _____.

A) proline -- display a small 'R' group B) proline -- become hydroxylated
C) glycine -- display a small 'R' group D) glycine -- become hydroxylated
E) lysine -- become hydroxylated

11. Red blood cells support the conversion: _____; at pulmonary capillary sites.

A) $HHbO_2 \rightarrow HHb$ B) $CO_2 \rightarrow HCO_3^-$ C) $HCO_3^- \rightarrow CO_2$ D) $HbO_2^- \rightarrow HCO_3^-$ E) $HbO_2^- \rightarrow Hb^-$

12. The protons generated from metabolically produced CO_2 typically react with _____ in red blood cells at peripheral capillary sites.

A) Hb^- B) $HHbO_2$ C) HHb D) HbO_2^- E) HCO_3^-

13. How many hydrogen atoms would be associated with an eighteen carbon monounsaturated fatty acid? (NOTE: Assume the fatty acid in question is in its carboxylic acid form - protonated)

A) 32 B) 36 C) 34 D) 38 E) More than 38

14. Which of the following types of lipids is normally associated with depot fat?

A) sphingolipids B) diacyglycerols C) phosphatides D) sterols E) triacylglycerols

15. How many oxygen atoms would be expected to appear in the formula of a simple sugar described as a ketohexose?

A) 4 B) 3 C) 5 D) 6 E) Impossible to determine

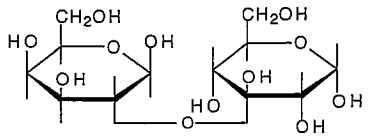
16. Which of the sets of carbohydrates shown below contains two hexoses?

A) dihydroxyacetone and deoxyribose B) deoxyribose and galactose C) glucose and glyceraldehyde
D) glucose and fructose E) ribose and deoxyribose

17. The two features which must be specified to define a disaccharide are the two monosaccharides that form upon hydrolysis of the disaccharide, and the disaccharide's _____.

A) ring size B) reducing power C) anomeric carbons D) stereoisomers E) glycosidic linkage

18. The glycosidic linkage displayed in the carbohydrate at the right is best described as _____.



A) β1-6 B) β1-4 C) 2-4 D) 2-3 E) α1-4

19. Most of the glycosidic linkages found in starch are _____ with occasional _____ linkages.
A) β1-4 -- α1-4 B) β1-4 -- β1-6 C) α1-α4 -- β1-β6 D) α1-6 -- β1-6 E) α1-4 -- α1-6

20. The glycemic index for a food is evaluated by: 1) determining the change in _____ over time; graphing the data obtained in this fashion; and then measuring the _____ displayed on the graph.
A) blood [glucose] -- area under the resultant curve
B) blood [glucose] -- peak value of [glucose] in plasma
C) blood [specific sugar] -- peak value of [glucose]
D) peak value of [glucose] in plasma -- area under the resultant curve
E) glucose ingested -- maximum time elapsed

M A T C H I N G

THE ITEMS 21-25 REFER TO THE LIST AT THE RIGHT. THERE IS ONLY ONE CORRECT ANSWER FOR EACH ITEM 21-25, BUT A GIVEN RESPONSE FROM THE LIST AT THE RIGHT MAY BE USED MORE THAN ONCE.

21. This is the form in which most metabolically produced carbon dioxide is moved to the lungs via the blood plasma.

22. Amino acids are the worst buffers at this pH.

23. Simple sugars having this designation will usually show ten hydrogen atoms in their structure.

24. When this type of glycosidic linkage appears between two glucose residues, the carbohydrate is referred to a 'dietary fiber'.

25. The structure of collagen takes advantage of the very small 'R' group displayed by this amino acid.

A) Glycine
B) pH = 7
C) Proline
D) Isoelectric pH
E) pH = K_a
AB) Lysine
AC) Ketoses
AD) Disaccharides
AE) Pentoses
BC) 1-6
BD) β1-4
BE) Oxygenated hemoglobin
CD) CO_2
CE) HCO_3^-
DE) α1-6

T R U E - - - F A L S E
(A) (B)

26. Even though the Cal/g for aspartame (Nutrisweet) is the same as one finds for cane sugar, aspartame is useful in a weight management menu because one uses so much less of aspartame than one would use of cane sugar.

27. Triacylglycerols are the most water soluble of all the lipids.

28. A polypeptide's secondary structure is based on intrachain interactions between amino acid 'R' groups.

29. The Bohr Effect predicts that the equilibrium: $HHbO_2 \rightleftharpoons HHb + O_2$; will shift to the right when the $[H^+]$ is increased.

30. Amino acid 'R' groups which are classified as polar uncharged are often capable of forming hydrogen bonds with water.

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1-B 2-A 3-D 4-A 5-B 6-E 7-C 8-B 9-A 10-C 11-C 12-D 13-C 14-E 15-D 16-D 17-E 18-D 19-E
20-A 21-CE 22-D 23-AE 24-BD 25-A 26-A 27-B 28-B 29-A 30-A