BIOL/CHEM 3361

EXAMPLE EXAM I QUESTIONS

There will also be several short answer questions that you can answer on the back of the Scantron sheet. These will include drawing the structures of one or more amino acids.

2. Which of the following amino acids has the least reactive side chain?
   a. phe
   b. ser
   c. cys
   d. tyr

4. What is the charge on the peptide Glu-Lys-Phe-Thr-Cys-Arg at a pH of 6?
   a. +2
   b. +1
   c. 0
   d. -1

6. How would the pK_a value of a glutamic acid residue be affected if it were moved from the outside of a protein into the interior, which contained primarily hydrophobic residues?
   a. pKa would be increased
   b. pKa would be decreased
   c. pKa would not be changed
   d. cannot predict the behavior

11. The Edman reagent, phenylisothiocyanate, reacts with which amino acid?
   a. W
   b. C
   c. N
   d. none of the above
   e. all of the above

14. Which amino acids absorb UV light with a maximum at about 280 nm?
   a. Phe and Tyr
   b. Tyr and Trp
   c. His, Tyr, Trp
   d. Phe, Tyr, Trp

15. Indicate in which solvent the electrostatic force between oppositely charged ions would be the strongest, given the same separation distance, r, for the ions. The dielectric constants of the solvents are: water (80.4), methyl alcohol (32.6), ethyl alcohol (24.3), and acetone (6.5).
   a. methyl alcohol
   b. water
   c. ethyl alcohol
   d. acetone

20. If the standard state free energy for folding of a protein is -11.4 kJ/mol at 25°C, what is the equilibrium ratio of folded to unfolded molecules of the protein at this temperature? R is 8.31 J/°K·mol
   a. 10:1
   b. 100:1
   c. 1000:1

d. 10,000:1

22. The Cleland reagent dithiothreitol is used to
    a. identify the C-terminus of a peptide
    b. identify the N-terminus of a peptide
    c. oxidize disulfide bonds to sulfonates
    d. reduce disulfide bonds to sulfhydryls

23. Calculate the final pH of a solution made by the addition of 10 ml of 0.05 M HCl to 10 ml of 0.55 M sodium acetate. The pKa of acetic acid is 4.76.
    a. 4.76
    b. 5.76
    c. 6.10
    d. none of the above

24. SDS-PAGE separates proteins on the basis of
    a. charge
    b. size
    c. density
    d. shape
    e. all of the above

26. Histidine has pKa values of 1.80, 6.04, and 9.33. What is its pI?
    a. 3.92
    b. 5.72
    c. 6.04
    d. 7.68

28. What amino acid has the one letter symbol of F?
    a. glutamic acid
    b. lysine
    c. histidine
    d. phenylalanine

29. A protein with 460 amino acid residues will have a molecular weight of about
    a. 40,000
    b. 55,000
    c. 65,000
    d. 150,000

33. The $\Delta G^{o\prime}$ for the reaction below is -15 kJ/mol at 37º C. What is the Gibbs free energy change for the reaction at 37° C if [A] = 1 x 10^{-4} M and each of the products are 1 mM? R is 8.31 J/ºK·mol

$$A \leftrightarrow B + C$$

    a. -20 kJ/mol
    b. -17 kJ/mol
    c. -54 kJ/mol
    d. -27 kJ/mol

34. At what pH will the carboxyl group of tyrosine be 50% deprotonated? The pKa values for tyrosine are 2.2, 9.1, and 10.2.
    a. 2.2

b. 5.6
c. 9.1
d. none of the above

35. Which pair of amino acids will have the weakest hydrophobic interactions between their side chains?
a. phenylalanine & tryptophan
b. tyrosine & glycine
c. arginine & valine
d. isoleucine & asparagine

38. Which amino acid is classified as an aromatic amino acid?
a. Y
b. L
c. R
d. C

40. CNBr is commonly used to generate peptides from proteins for sequence analysis. After which amino acid will it cleave?
a. asp
b. arg
c. cys
d. none of the above

41. In what order will the following proteins elute from a gel filtration (aka gel exclusion) column? Protein A, M_r 84,000, pI 7.1; protein B, M_r 36,000, pI 3.4; protein C M_r 14,000, pI 5.6
a. a, b, c
b. a, c, b
c. c, a, b
d. c, b, a

42. Entropy is a
a. linear function of the number of states that can be attained by a system, all at equivalent energy
b. log function of the number of states that can be attained by a system, all at equivalent energy
c. log function of the work done by or to a system
d. property of state defined by the First Law of Thermodynamics

43. The pKa of an acidic group can sometimes depend on the solution conditions or the immediate environment of the group. If an aspartic acid residue is near a glutamate residue in a protein, how will the pKa value of its side chain be affected?
a. it will increase
b. it will decrease
c. it will be essentially unchanged
d. cannot predict

44. Archaea
a. are primative fungi found in unusual environments
b. represent fossilized bacteria from the beginning of life on earth
c. are bacteria which grow in hot springs
d. form one of the three domains of organisms on earth

50. What is the enthalpy change for a solution when a salt such as ammonium sulfate is dissolved in water? Remember, the solvation of ammonium sulfate was endothermic.

a. no significant change
b. decrease
c. increase
d. cannot predict