CH370/387D FINAL EXAM - Sampler Name:_____

1. Given the following oligopeptide: H-A-P-P-Y-G-I-R-L-S
   What is the expected net charge on the peptide at **pH 1**?
   A) 4 B) 3 C) 2 D) 1 E) 0 F) -1 G) -2 H) -3 I) -4
2. What is the **approximate isoelectric point** of the oligopeptide?
   A) 2 B) 4 C) 6 D) 8 E) 10 F) 12
3. Proteins A, B, C, and D with MWs corresponding to 25kDa, 85 kDa, 60kDa, and 45kDa and pIs corresponding to 9.2, 6.9, 8.6, 4.5 respectively, are added onto a DEAE column at pH 6.9 and then eluted with an increasing salt gradient. Which protein would you off the column **last**? _____
4. Which single amino acid in proteins contributes **most** to the absorption at 280 nm? _____
   A) Trp B) His C) Arg D) Lys E) Ile
5. Number of different sequence alignments with equivalent or better "S" scores that are expected to occur by chance is referred to as the _____
6. Similarity attributed to descent from a common ancestor is (similarity / homology / identity / motif IQ).
7. Which of the general properties of proteins can be exploited to separate and purify proteins using an IMAC technique?
   A) Solubility B) Charge C) Temperature D) Size E) Specificity
8. Calculate the molar extinction coefficient at 280 nm and for a protein that is known to have a molecular weight of 48,000 and yields an OD_{280} of 0.63 for a 0.40 mg/mL solution using a 1.0 cm pathlength.
9. During a FRET experiment, it was determined that the efficiency was 15% using two chromophores with an R_o = 18Å. Recalling that there is a 6^{th} order dependence in FRET, calculate the estimated distance between the two chromophores. _____
10. What are the expected **magnitude** and **units** for the frictional coefficient of a 550,000 Da rod-like protein with a partial specific volume of 0.72 cm^3/g and a frictional coefficient ratio f/fmin = 5.5?
    _____
11. Calculate the molecular weight of a protein whose diffusion constant is reported in the literature to be 0.85 x 10^{-6} cm^2/sec and its sedimentation coefficient is 11.2S. _____
    (Assume T = 20°C; "v bar" = 0.74 cm^3/g)
12. Which of the following is a commonly used "staining dye" for SDS-PAGE.
    A) Coomassie blue B) N,N'-methylene-bis-acrylamide C) Sodium dodecyl sulfate
    D) Dithiothreitol E) Bromophenol blue
13. $^{50}_{25}Mn$ would turn into $^{50}_{24}Cr$ with the emission of which of the following particles?
    A) α B) β^- C) γ D) β^+
14. Three optic systems are commonly employed in ultracentrifugation experiments. What optical property is measured by **interference** optics? _____
15. What is closest to the pH normally used in the **stacking** gel of an SDS-PAGE experiment.
    A) 3.5 B) 4.7 C) 6.7 D) 8.9 E) 10.5
16. A dialysis equilibrium experiment is carried out using a radiolabelled ligand with the following results being obtained: At equilibrium the total concentrations of protein and ligand inside the dialysis tubing are 2.5 microM and 2.2 microM respectively; and the concentration of ligand in buffer outside dialysis tubing is 1.0 microM. Assuming a single binding site, the value of Kd calculated from these results is _____.
17. Which technique would be **best** suited for monitoring the folding stability of a mutant protein?
    A) Sedimentation velocity B) Light scattering C) Circular Dichroism
    D) Mass spec E) Fluoresence spectroscopy.
18. A sample containing 1,000,000 identical Aluminum-27 nuclei (I = 5/2) is placed in a magnetic field of 10 Tesla at a temperature of 20 °C. The gyromagnetic ratio for ^{27}Al = 6.9704 x 10^7 rad/sec-T . Which of the numbers below would be the best guess as to approximate the number of nuclei in the **upper-most energy state**?
    A) 0 B) 1,000,000 C) 500,000 D) 499,950
    E) 500,050 F) 333,000 G) 249,950 H) 166,000
19. What is the approximate limiting molecular weight for protein structure determination by the methods of multi-dimensional NMR? A) 2000 B) 25,000 C) 60,000 D) 280,000 E) 800,000
20. Which form of electron microscopy is analogous to using a "slide projector"? _____