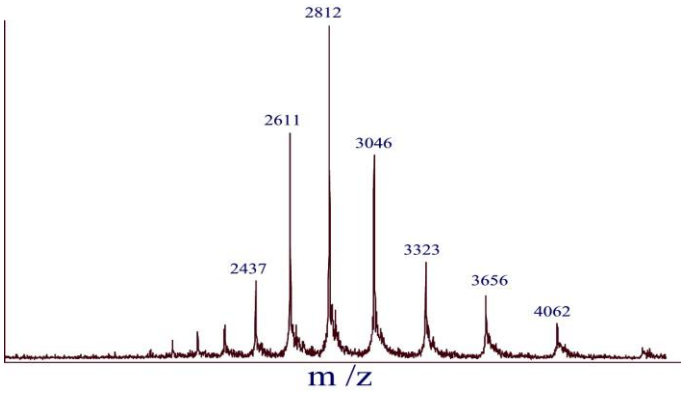
Fall '11 **CH370** Name _____
Hackert **HW- 3 (due 11/22)** UTeID _____

Mass Spec (2/2 - pts)

a) ESI m**ass spec:**

Est. mass of protein: _____



b) Consider a time-of-flight experiment. A 50 kDa protein with a single charge arrives in 28 μs in a time-of-flight experiment. What is the estimated mass of a protein that arrives in 18 μs and is known by other means to have twice the charge as the 50 kDa protein?

Note: kinetic energy KE = *(Ze)Es or zV;* $(m/z) = 2V(t/D)^2$, or $m = [2V(1/D)^2]\, z\, t^2$.

Ligand Binding (2/1)

a) 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 4.0 microM and 3.6 microM respectively; and the concentration of ligand in buffer outside dialysis tubing is 0.4 microM. Assuming a single binding site, the value of Kd calculated from these results is _____.

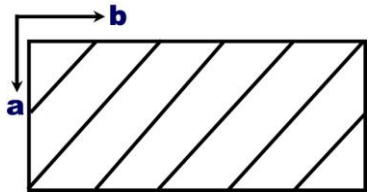
b) Which ligand binding method would provide thermodynamic information in addition to determining the binding constant?

A) Equilibrium dialysis B) Pulse chase C) SPR D) ITC E) Fast kinetics

X-ray (2/2/3)

a) Consider the following illustration of a unit cell where the "**a**" axis is vertical and the "**b**" axis horizontal. Identify the Miller indices associated with the Bragg planes shown in the blanks provided.

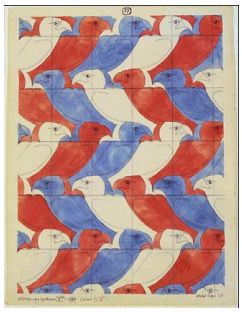
(2)

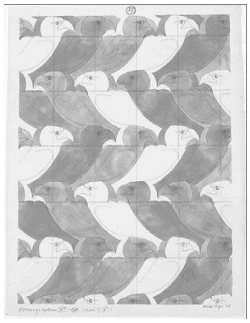


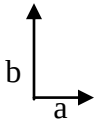
h = _ k = _

b) Consider the following two illustrations of packed birds. In Figure A consider the three types of birds (different colors or shades of gray) to be different. In Figure B consider all the birds to be identical. Indicate by **drawing solid lines on each figure** the "best" choice for the **smallest unit cell** in each system, and then answer the questions below.

(2) **A)** **B)**







	__A__	__B__
Number of birds / unit cell:	_____	_____
Number of birds / asym unit	_____	_____

c) Given that a "reciprocal lattice" shows three, orthogonal reciprocal lattice vectors belonging to a tetragonal space group with the following diffraction data measurements, calculate the lattice constants and volume of this tetragonal unit cell. (Assume $\lambda = 0.154$ nm).

(3)

hkl	***2θ***
8 8 0	26.79°
0 0 19	26.79°

a = ____
b = ____
c = ____
V = ____

EM (1/1)

Which EM method is most similar to light microscopy? _____

Which "imaging" method we discussed used the sense of "touch"? _____

NMR (2/2)

a) A sample containing 1,000,000 identical nuclei (I = 1) is placed in a magnetic field of 10 Tesla at a temperature of 20 °C. The gyromagnetic ratio for this nucleus is 3.333×10^7 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) 500,050 C) 333,000 E) 249,950 G) 166,000
B) 0 D) 1,000,000 F) 500,000 H) 499,950

b)

NOE: Consider the NMR spectrum of asparagine shown below in part (a). The sample is then irradiated with RF waves at 4.5 ppm. In part (b) sketch the resulting NMR spectrum expected using the same scale as in part (a).