Fall '11	**CH370**	Name ___________________
Hackert	**HW- 2 (20 pts)**	UTeID ________________

1. You have visited your doctor about a "lump" on your back. She runs a genomics marker test using a DNA microarray to compare "normal" cells vs. "lump" cells. After 24 hours exposure, mRNA is harvested, cDNA prepared using red-dye markers for the "normal" cell sample and green-dye markers for "your lump" cells. Any gene product that shows **no difference** in expression between the two cell lines would be indicated by a ____________ colored spot.

(1)

2. Balance the following radioactive decay equation by filling in the blank with the missing item.

(1) a) $^{201}W \rightarrow$ ____ + β^{+}

(1) b) A radioisotope has a **rate constant** of **0.037 / yr**. Calculate the **half-life** of the radioisotope**.**

Half-life = __________________

(1) c) How many **years** will it take for a sample of this radioisotope rated at 20 microCuries to undergo radioactive decay to the point where it loses 98% of its current activity ? _______________ **years.**

3. SDS gels are greatly improved in resolution by running a "stacking" gel and a "resolving" or "running" gel.

a) **Name two key property differences** between the "stacking" gel and the "resolving" gel that contribute to the improved resolution of running DISC PAGE.

(1) a)

b)

What is the role of each of the following in performing SDS-PAGE?

a) pH

(1)

b) Coomassie Blue:

4. The equation of motion for a small, spherical particle of mass (m) and frictional coefficient (f) that is initially at rest, and then acted on by a constant force (F) at time t = 0 is F –fv = ma.

(From calculus recall that F - fv = m(dv/dt) solves to v = (F/f) [1 - exp(-ft/m)].)

a) Show that such a particle will initially accelerate but over time will approach a "maximal" velocity.

(1)

(2) b) The diffusion constant for a protein is determined to be 0.258 x 10^{-6} cm^2/s at with T = 20^{o} C, and η = 0.01 (g/cm-s). It has a diameter of 80Å, a density of 1.3 g/cm^3 and a v-bar of 0.73 cm^3/g protein. Calculate the frictional coefficient ratio (f/f_{min}) for this protein and comment on the expected shape of the molecule (spherical or not).

5. What is typically measured by dynamic light scattering (LS)? ________________________

(2)

What wavelengths are normally employed in making circular dichroism (CD) spectra?

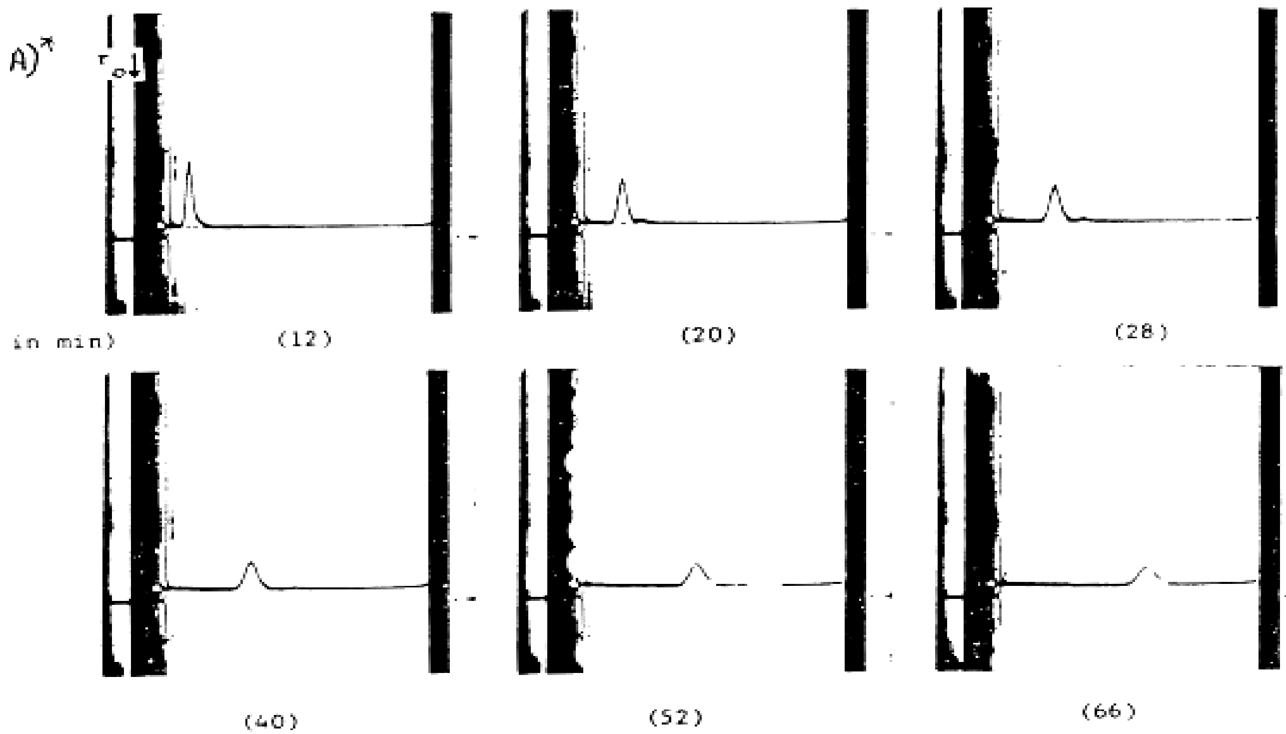
____

6. Determine the sedimentation coefficient (s) and molecular weight (M) for the sample that gave the following data when subjected to: A) a sedimentation velocity run using Schlieren optics, and B) a sedimentation equilibrium run using interference optics.

Note: the figures below have been magnified to allow you to make measurements from the figures. The "r" can be determined from the reference points (r_o) and the magnification factors. Assume T = 20^o C, density of buffer = 0.9978 g/mL, and v-bar = 0.737 cm^3/g for the protein, and η = 0.01 (g/cm-s) for both experiments.

A) Sed. Vel. : ω = 40,000 rpm, magnification factor (2.5X), r_o = 5.72 cm. (times are given in minutes).

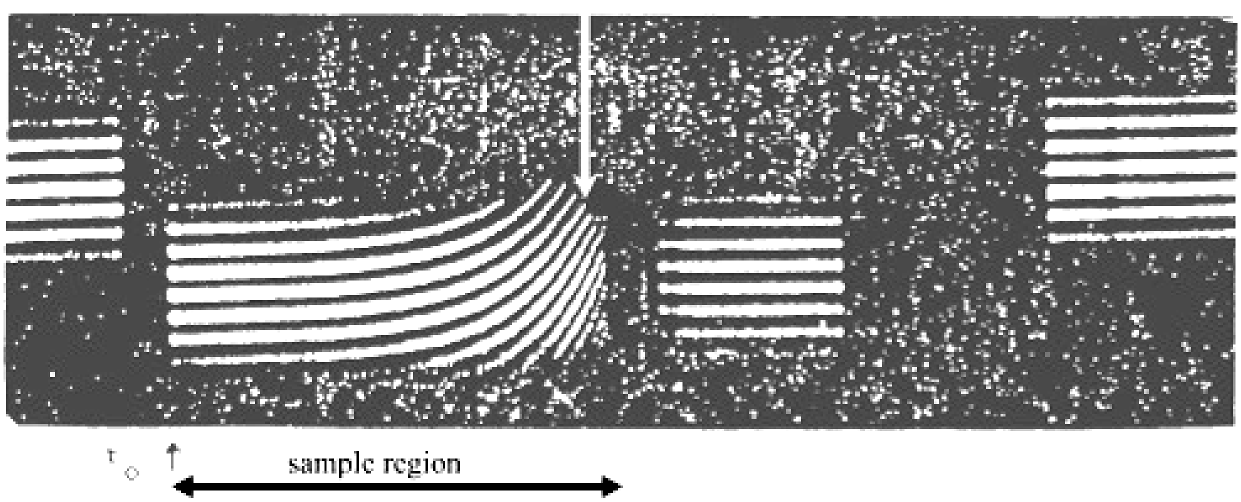
(4) Report "s" in proper units [s = ___________________________] (Show work and attach plot).



B) Sed Equilibrium: ω = 5200 rpm, magnification factor (25X), r_o = 6.75 cm. Calculate M in g/mol (4pts) and

(5) also estimate the concentration of the protein at the position with the white arrow (1 pt). Assume the cell path length to be 12.00 mm, λ = 546 nm, and (dn/dc = 0.186 (g/cm^3)$^{-1}$.

[M = ______________________ ; [ ]$_{arrow}$ = _______________] (Show work and attach plot).



I hereby declare that I did this assignment independently: ____