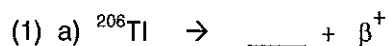


1. Consider a FRET experiment where the measured efficiency of energy transfer between two chromophores is 45%. If $R_0 = 35.0 \text{ \AA}$, estimate the separation of the two chromophores. ($R =$ _____)
(2)

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



(1) b) A radioisotope I-131 has a half-life of 8.06 days. Calculate the decay rate constant of the radioisotope.
Rate constant (with units) = _____

(1) c) The how many days will it take for 98% of a sample of I-131 radioisotope rated at 30 microCuries to undergo radioactive decay ? _____ days.

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) Bromophenol Blue

(1)

b) Coomassie Blue:

4. You performed a 2D IEF-SDS PAGE experiment on peptides P1, P2, P3, and P4 and obtained the following results. Match each spot with its peptide number.

A = ____; B = ____; C = ____; D = ____.

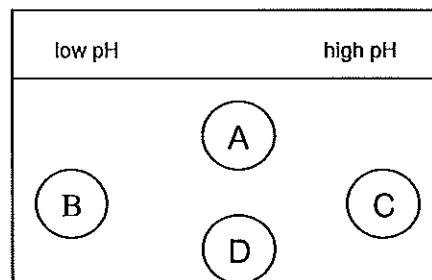
P1= FAGRRALVEDPIW

P2= RACKED

(2)

P3= IKLRGAKPV

P4= AGWDPLEFD



5. 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)

(1) b) Consider protein molecule that is assumed to be spherical with a diameter of 66 \AA , a density of 1.32 g/cm^3 and a \bar{v} of $0.72 \text{ cm}^3/\text{g}$. Calculate the expected diffusion constant for this protein (Assume $T = 20^\circ \text{ C}$ and $\eta = 0.01 \text{ (g/cm-s)}$).

6. What is typically measured by dynamic light scattering (LS)? _____

(1)

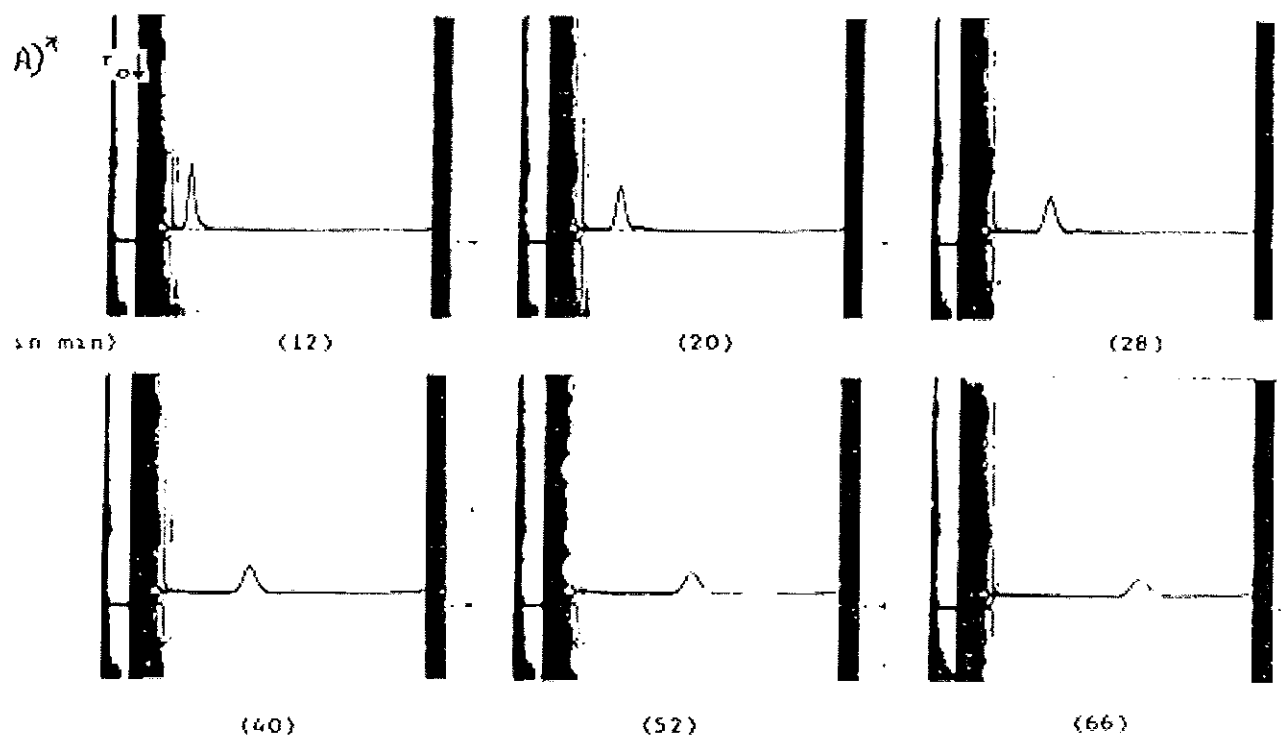
What wavelengths are normally employed in making circular dichroism (CD) spectra? _____

7. 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_0) and the magnification factors. Assume $T = 20^\circ \text{C}$, density of buffer = 0.9968 g/mL , and $\bar{v} = 0.717 \text{ cm}^3/\text{g}$ for the protein, and $\eta = 0.01 \text{ (g/cm-s)}$ for both experiments.

A) Sed. Vel. : $\omega = 36,000 \text{ rpm}$, magnification factor (2.5X), $r_0 = 5.72 \text{ cm}$. (times are given in minutes).

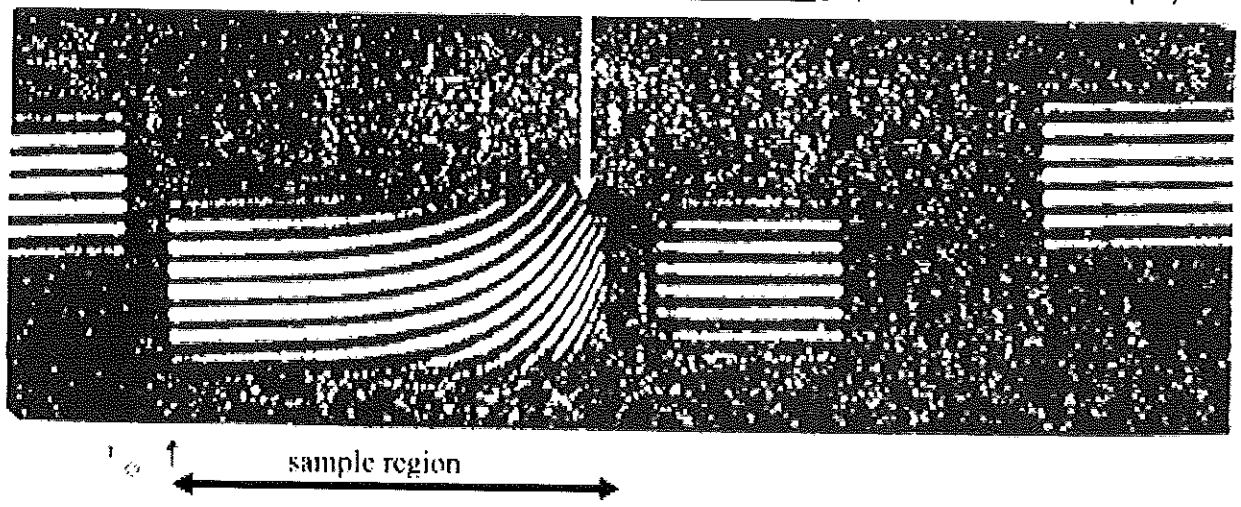
(4) Report "s" in proper units [$s = \underline{\hspace{2cm}}$] (Show work and attach plot).



B) Sed Equilibrium: $\omega = 5000 \text{ rpm}$, magnification factor (25X), $r_0 = 6.75 \text{ cm}$. Calculate M in g/mol (4pts) and

(4) 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 , $\lambda = 546 \text{ nm}$, and $(dn/dc = 0.186 \text{ (g/cm}^3\text{)}^{-1})$.

[$M = \underline{\hspace{2cm}}$; []_{arrow} = $\underline{\hspace{2cm}}$] (Show work and attach plot).



I hereby declare that I did this assignment independently: _____