Problems

The transport of ovalbumin. Imagine a solution of 25°C containing 0.004 g/cm^3 of ovalbumin, a protein of molecular weight 45,000. The solution is buffered at a pH of 3.5 and has the velocity close to water, 8.9 X 10^3 g/cm sec. Under these conditions, the protein has a charge of +10, a diffusion coefficient of 7.8 X10^{-7} cm^2/sec, and a sedimentation coefficient of 3.5 X 10^{-13} seconds.

(a) Estimate the diameter of the protein
(b) What are the flux and velocity when this protein diffuses from the solution across a 1 cm film into pure water?
(c) What is the protein's velocity under the influence of gravity?
(d) What are the flux and velocity due to a force of 1 volt/cm?

Two oxidases, one of which is specific for testosterone, are to be separated by gel electrophoresis at 4°C. Within the gel, these enzymes have diffusion coefficients of 1.15×10^{-7} and 3.20×10^{-7} cm^2/sec, respectively. At the pH chosen, they have charges of +7 and +1, respectively. If we use a field of 1.8 V/cm, how long will it take until the two enzymes are separated by a distance of 1 cm?

You want to separate α_1 globulin and α_2 globulin by' membrane electrophoresis with mobilities of $-5.1*10^5$ & $-4.1*10^5$ cm^2/v sec respectively You plan to use a flow opposed to an electric field of 0.82 V/cm such that one protein will move against the flow but the second will be swept along with it. What flow should you use?

The surface concentration for chymotrypsin ultrafiltration. We are carryin out the ultrafiltration of chymotrypsin in a spiral wound module at a rate of 1.3×10^{-3} cm/sec (28 gal/ft^2 day). The solution concentration is 0.44 wt%, the protein's diffusion coefficient is 9.5×10^{-7} cm^2/sec, and the boundary layer is about 180×10^{-4} cm thick. How high is the surface concentration?

Oxidase purification by gel electrophoresis. Two oxidases one of which is specific for testosterone, are to be separated by gel electrophoresis at 4 °C. Within the gel, these enzymes have diffusion coefficient of 1.15×10^{-7} and 3.20×10^{-7} cm^2/sec, respectively. At the pH chosen, they have charges of +7 and +1, respectively. If we use a field of 1.8V/cm, how long will it take until the two enzymes are separated by a distance of 1 cm?