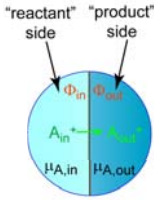
Oct. 22, 2008

Quiz 3, Oct. 20-24

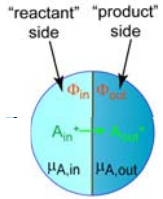
Physical equilibria up to boiling/freezing



$$\Delta\Phi = \Phi_{out} - \Phi_{in} = -\frac{RT}{zF}\ln\frac{a_{out}}{a_{in}}$$

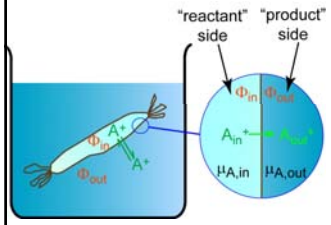
Example: Electric potential due to concentration gradient

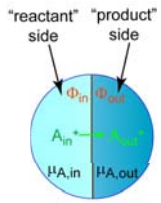
At neutral pH the amino acid aspartic acid has a net charge very close to -1. What is $\Delta\Phi$ between two solutions of Asp^-, one at 5 mM and one at 1 mM, if the system is at equilibrium? T = 25 °C.



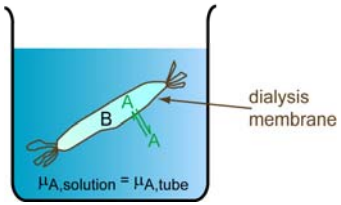
Example: Polyelectrolyte Donnan potential

At neutral pH the decapeptide $(Asp)_{10}$ has a net charge very close to -10. PolyAsp is added to aqueous solution as its sodium salt at 1 mM concentration. It is dialyzed against 100 mM NaCl. What is $\Delta\Phi$ across the dialysis membrane if T = 25 °C?



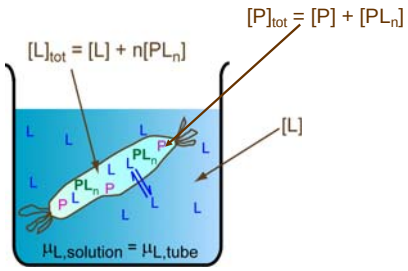


Ligand binding via dialysis



If A and B bind each other, the total concentration of A in the tube will be larger than the concentration of free A.

Ligand binding



Number of ligands bound per P

$$[PL_n]_{in} = \frac{[L]_{Tot} - [L]}{n}$$

Characteristics of the binding curve

P + n L $\rightleftharpoons$ PL_n $\qquad \nu = \dfrac{n[PL_n]}{[P]+[PL_n]}$

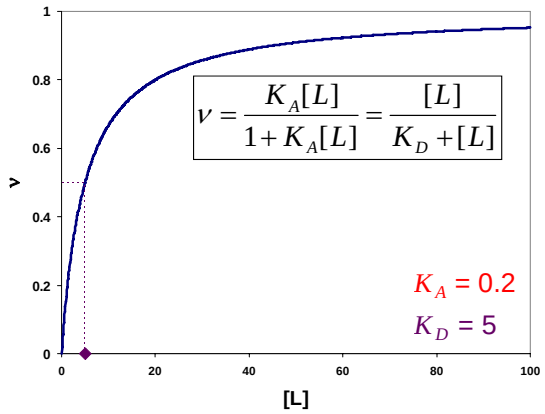
Monovalent ligand binding

P + L $\underset{}{\overset{K_A}{\rightleftharpoons}}$ PL

Monovalent ligand dissociation

PL $\underset{}{\overset{K_D}{\rightleftharpoons}}$ P + L

Monovalent ligand binding plot

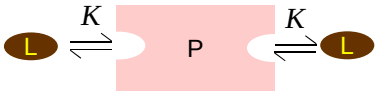


Example: Monovalent binding curve

At what [L] will the average number of ligands bound equal 0.9? At what [L] will the average number of ligands equal 0.99? Assume K_D = 5 mM.

Divalent ligand binding

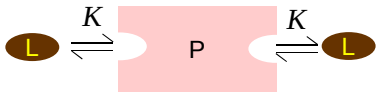
Assume that a molecule has two identical binding sites.



With the same *microscopic* binding site affinities, what is the *macroscopic* binding affinity?

$$P + L \overset{K_1}{\rightleftharpoons} PL + L \overset{K_2}{\rightleftharpoons} PL_2$$

Divalent ligand binding



$$P + L \overset{K_1}{\rightleftharpoons} PL + L \overset{K_2}{\rightleftharpoons} PL_2$$