Delphine's handy dandy units and formula sheet

DIFFUSION

Important Quantities and their units:

x	position	[cm]
t	time	[sec]
c(x,t)	concentration	$[\frac{\text{mole}}{\text{cm}^3}]$
f	diffusive flux	$[\frac{\text{mole}}{\text{sec}\cdot\text{cm}^2}]$
D	diffusivity	$[\frac{\text{cm}^2}{\text{sec}}]$
k	partitioning coefficient	[unitless]
P	permeability	$[\frac{\text{cm}}{\text{sec}}]$
τ_{SS}	steady state time constant	[sec]
τ_{EQ}	equilibrium time constant	[sec]

General Equations:

$$f(x,t) = -D\frac{\partial}{\partial x}\left(c(x,t)\right)$$ Fick's First Law

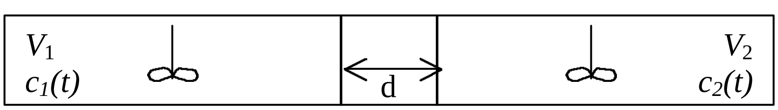
$$-\frac{\partial}{\partial x} f(x,t) = \frac{\partial}{\partial t}\left(c(x,t)\right)$$ Continuity Equation

combine to get:

$$\frac{\partial}{\partial t}\left(c(x,t)\right) = D\frac{\partial^2}{\partial x^2}\left(c(x,t)\right)$$ Diffusion Equation

if you have a partition coefficient, *k*, then stick *k* with *D* in the above equations.

2-Compartment Model:



$$P = \frac{kD}{d}$$ Membrane Permeability

$$t_{SS} = \frac{d^2}{p^2 D}$$ Steady State Time Constant

$$t_{EQ} = \frac{1}{AP\left(\frac{1}{V_1} + \frac{1}{V_2}\right)}$$ Equilibrium Time Constant

if $t_{SS} << t_{EQ}$ (thin membrane) and at steady state then:

$$f = P(c^1(t) - c^2 t))$$ Fick's Law for membranes