BE.430 / 6.561 / 2.795 / 10.539 / HST.544 ... 9/8/04

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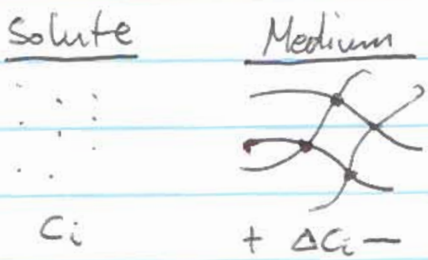
Handouts: (1) General Info & Lecture Outline
(2) Course Outline
(3) Overheads

Texts: (1) Deen (Coop) (2) Alan G's: in NE47-377

FFF: Overview



Starting simple:
solutes: neutral, low molec. weight; ions
medium: loose molec. network, water

$$N_{ix} = -D_i \frac{\partial c_i}{\partial x}$$
$$\bar{N}_i = -D_i \nabla c_i$$
Fick's Law

$c_i \equiv$ concentration $\left(\frac{mole}{m^3}\right)$; M
$\bar{N}_i \equiv$ flux $\left(\frac{mole}{m^2 \cdot s}\right)$
$D_i \equiv$ diffusivity $\left(\frac{m^2}{s}\right)$

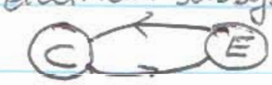
Chemical Subsystem (I) ⇒ More interesting case
Medium: Intra- & Extracellular space

Solutes: proteins, polysaccharides, nucleic acids
Macromolecules • bind to cells &/or ECM
(Equilibrium & Transient description of x-port

Case study: x-port of IGF-1 — hold on: both "solute" & medium are charged

Binding sites: cells, ECM

How does chemical subsystem interact w/ electrical subsystem?



Chemical transport equations + others

(1) $\bar{N}_I = -D_I \nabla C_I$ (Flux) $+ (\ )\bar{E} + C_i \underline{V}_{fl}$

(I ↑ IGF)

(2) 

(Continuity)

$$\frac{\partial C_I}{\partial t} = -\nabla \cdot \bar{N}_I + R_{vi}$$

R_{vi}: Binding term "Rate of formation" $\left(\frac{mole}{m^3 s}\right)$

For (E): Gauss' Law (→ Maxwell's Equations)

Faraday's Law

\+ Conservation of charge