

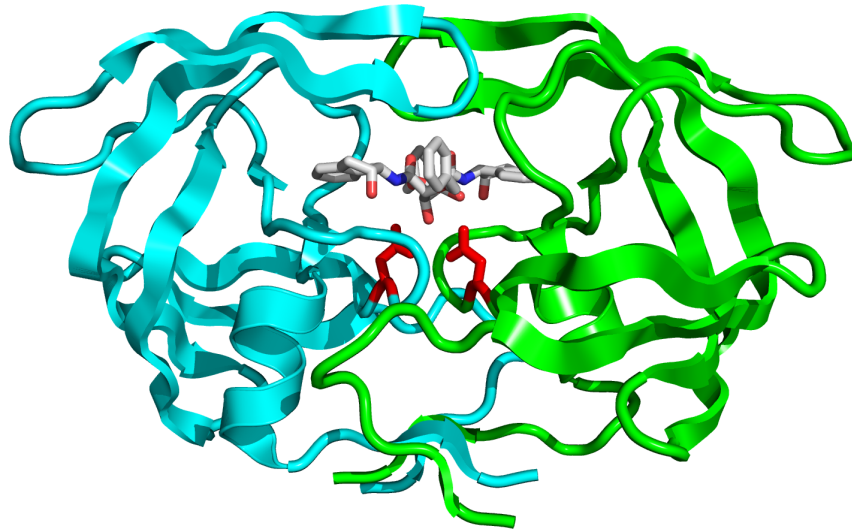
CHEM-C2230 Pintakemia

Markus Linder

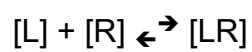
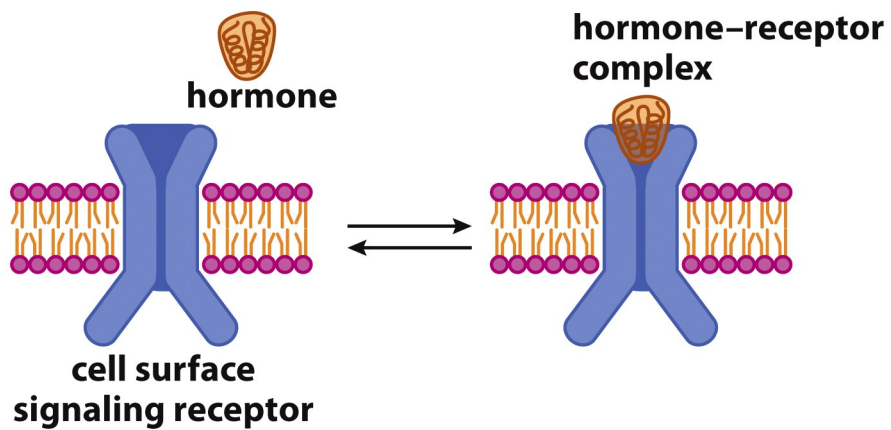
This lecture:

- 1. How the Langmuir model is used for quantifying binding affinities
- 2. Biological membranes; structures and properties

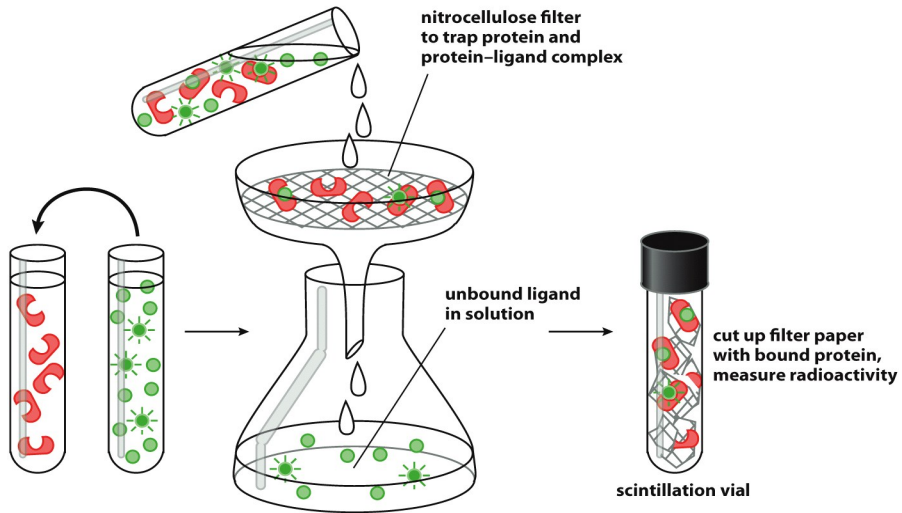
HIV protease with inhibitor



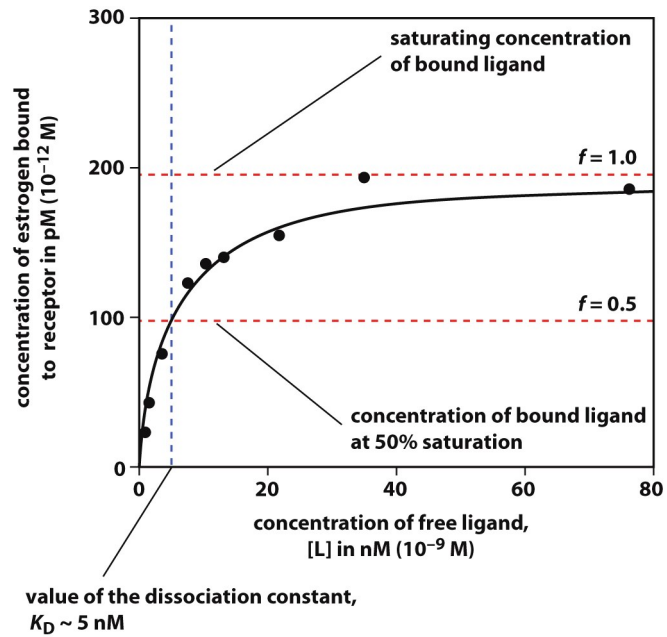
Receptor – ligand binding



Binding assay

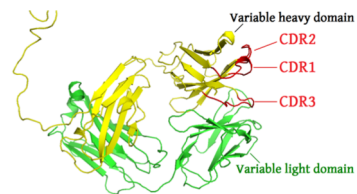
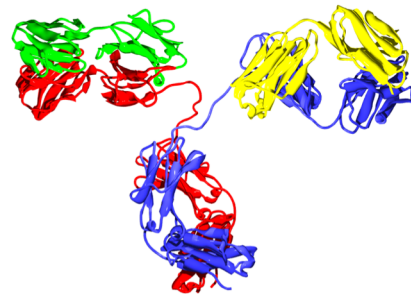
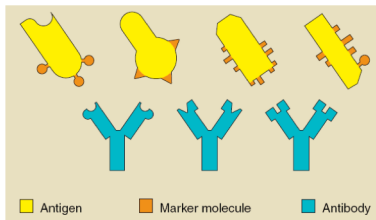


The binding isotherm



The affinity of various biological interactions

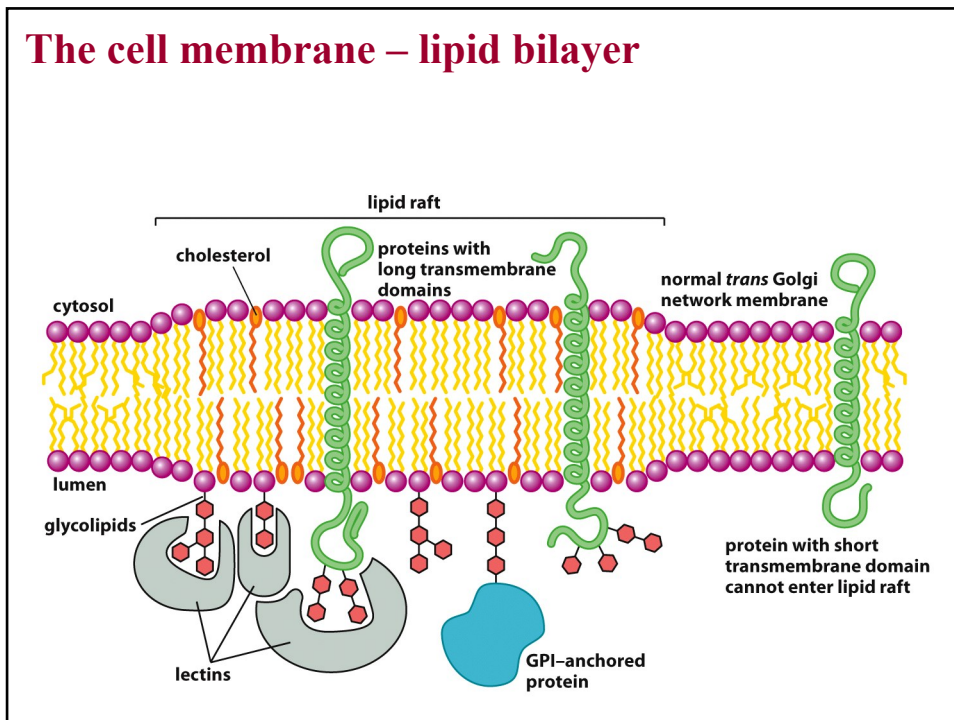
- Antibody antigen μM - nM
- Estrogen receptor 5 nM
- Cellulase $1 \mu\text{M}$
- Biotin-avidin $1 \cdot 10^{-15} \text{ M}$



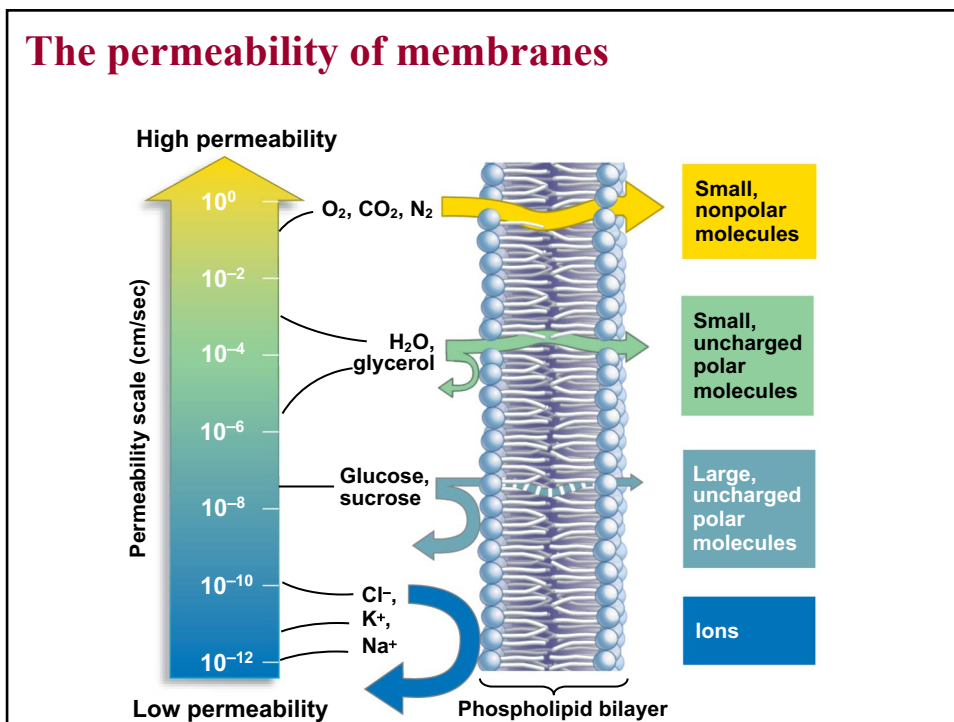
Gibbs energy

- $\Delta G = -RT \ln K_A$
- $\Delta G = \Delta H - T\Delta S$

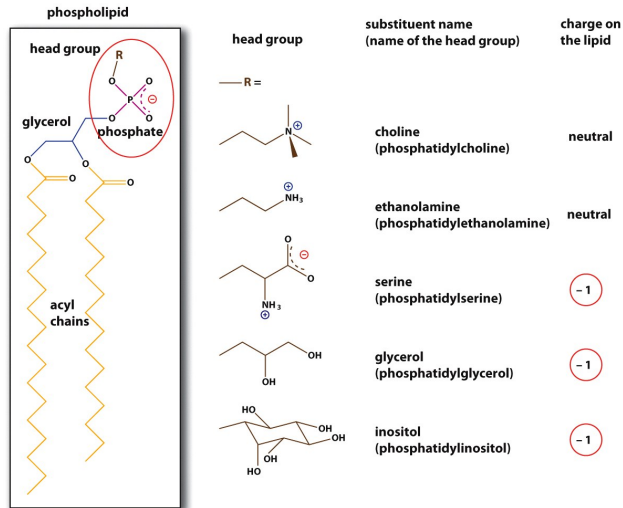
The cell membrane – lipid bilayer



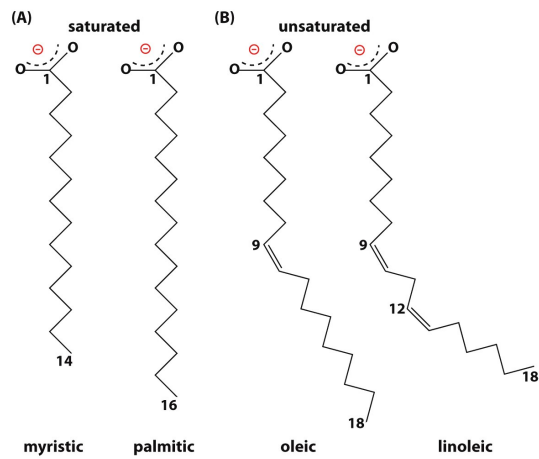
The permeability of membranes



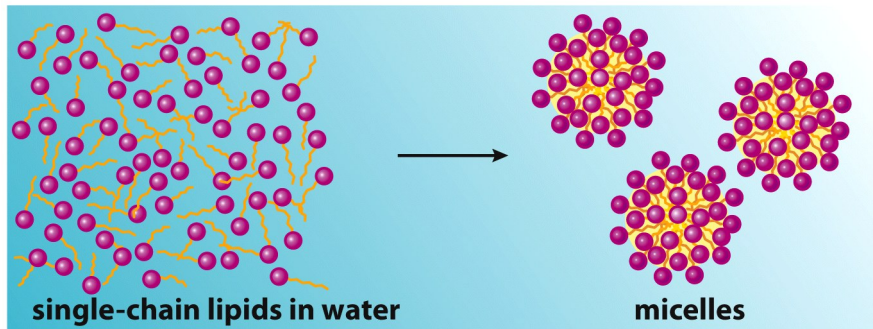
Lipid structures



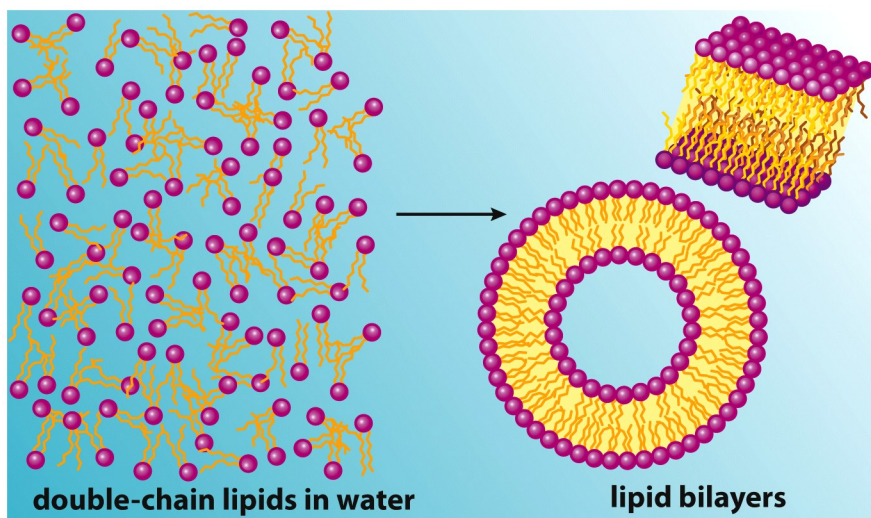
Fatty acids



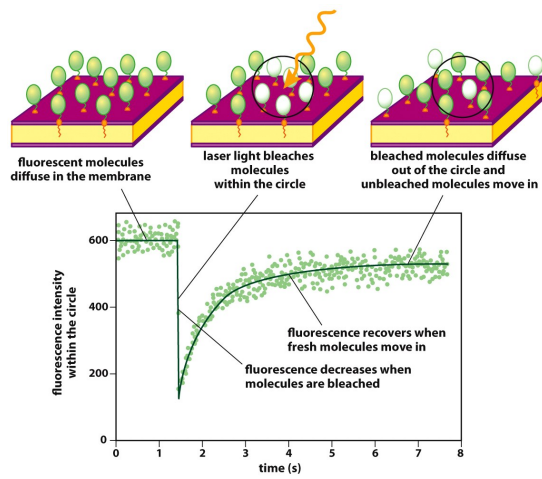
Micelles



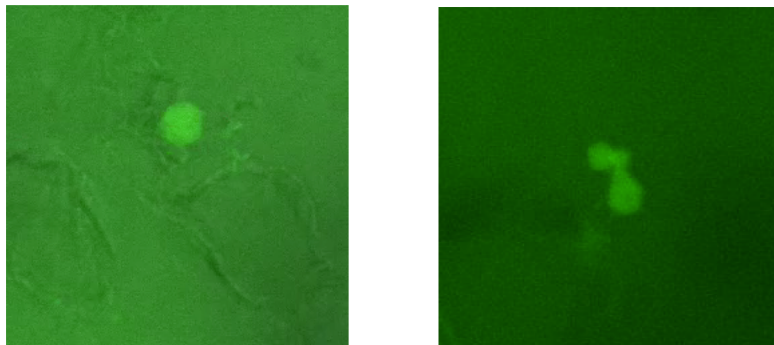
Liposomes



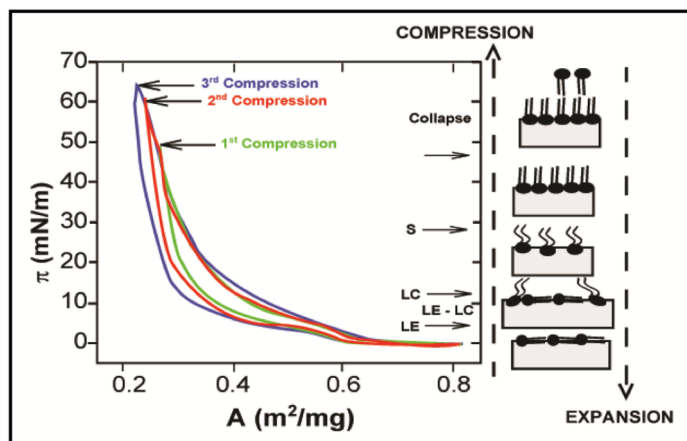
Fluorescence recovery after photobleaching FRAP



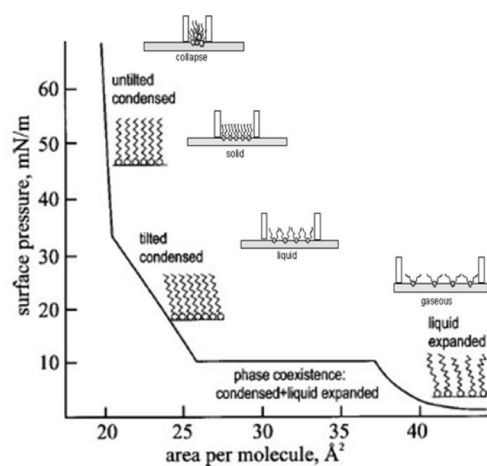
FRAP example



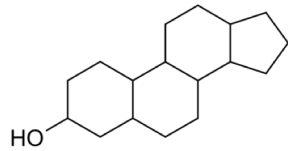
Lipids in a Langmuir trough



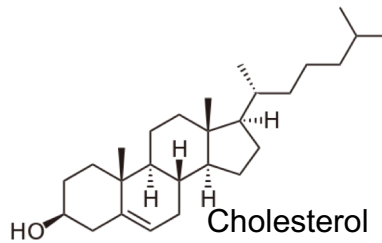
Different phases of compression of a lipid monolayer



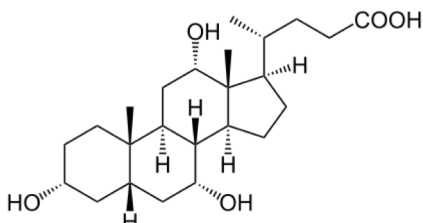
Sterols – different structures, different functions



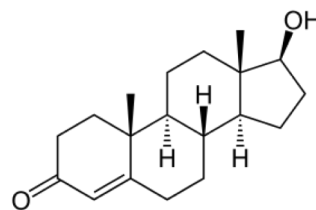
Sterol



Cholesterol

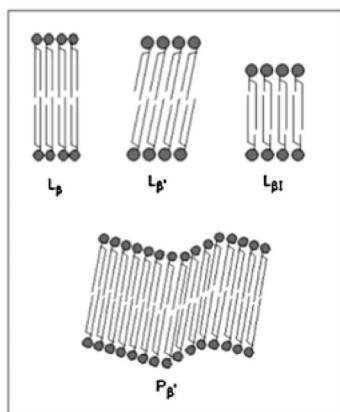


Cholic acid



Testosterone

Lipid interdigitation



L_{β} - Gel state
 $L_{\beta I}$ - Liquid crystal state
 $L_{\beta'}$ - Ripple phase

When acyl chains extend beyond mid plane – both acyl chain structure and polar head structure affect

Membrane proteins

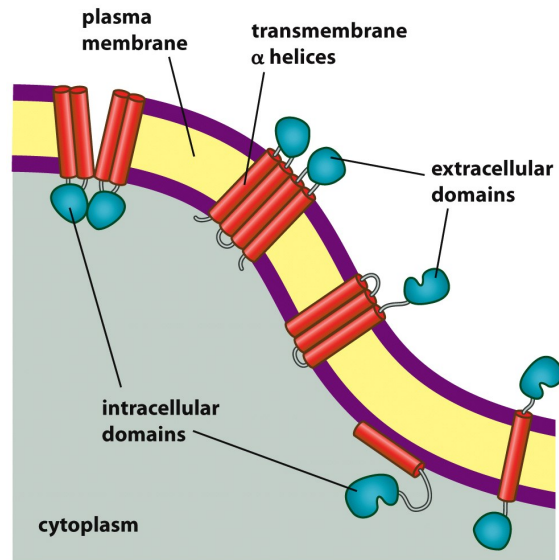
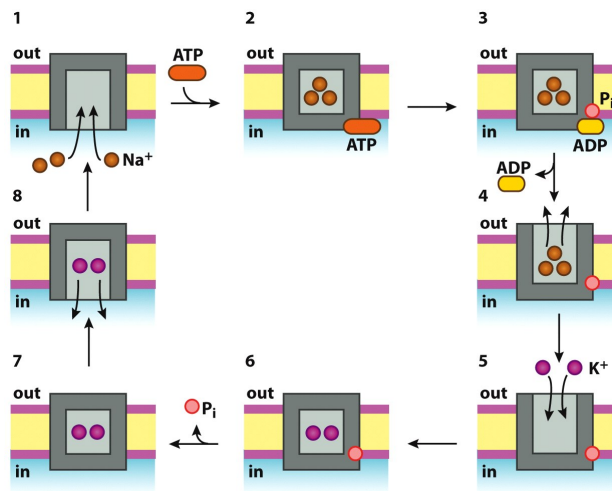


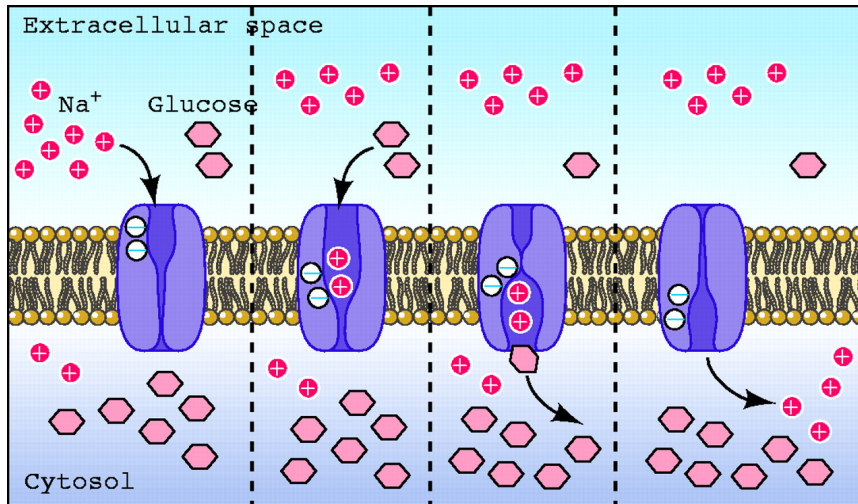
Figure 4.66 (part 2 of 2) The Molecules of Life (© Garland Science 2013)

The Na⁺ / K⁺ -ATPase pump

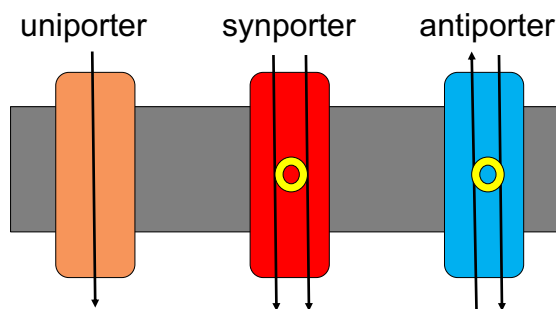


$$\mu_i^{\text{out}} - \mu_i^{\text{in}} = RT \ln(c_i^{\text{out}} / c_i^{\text{in}}) + z_i F(\phi^{\text{out}} - \phi^{\text{in}})$$

The sodium glucose cotransporter



Cotransporters



Effects of membranes

- Osmosis
- Permeability
- Hypertonic
- Hypotonic
- Isotonic

