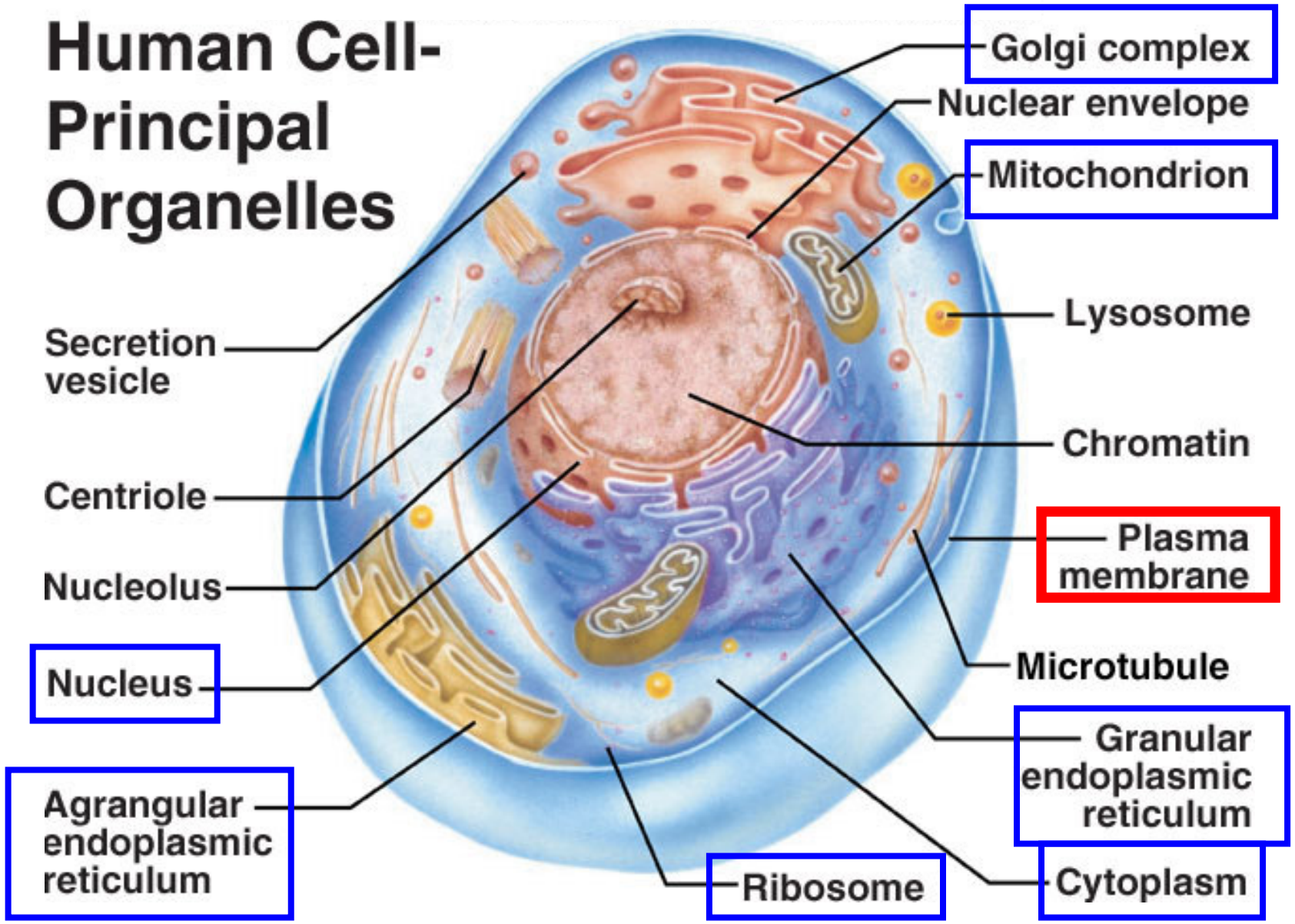
Cell Membrane Physiology

reading: p. 126-129, 134-139



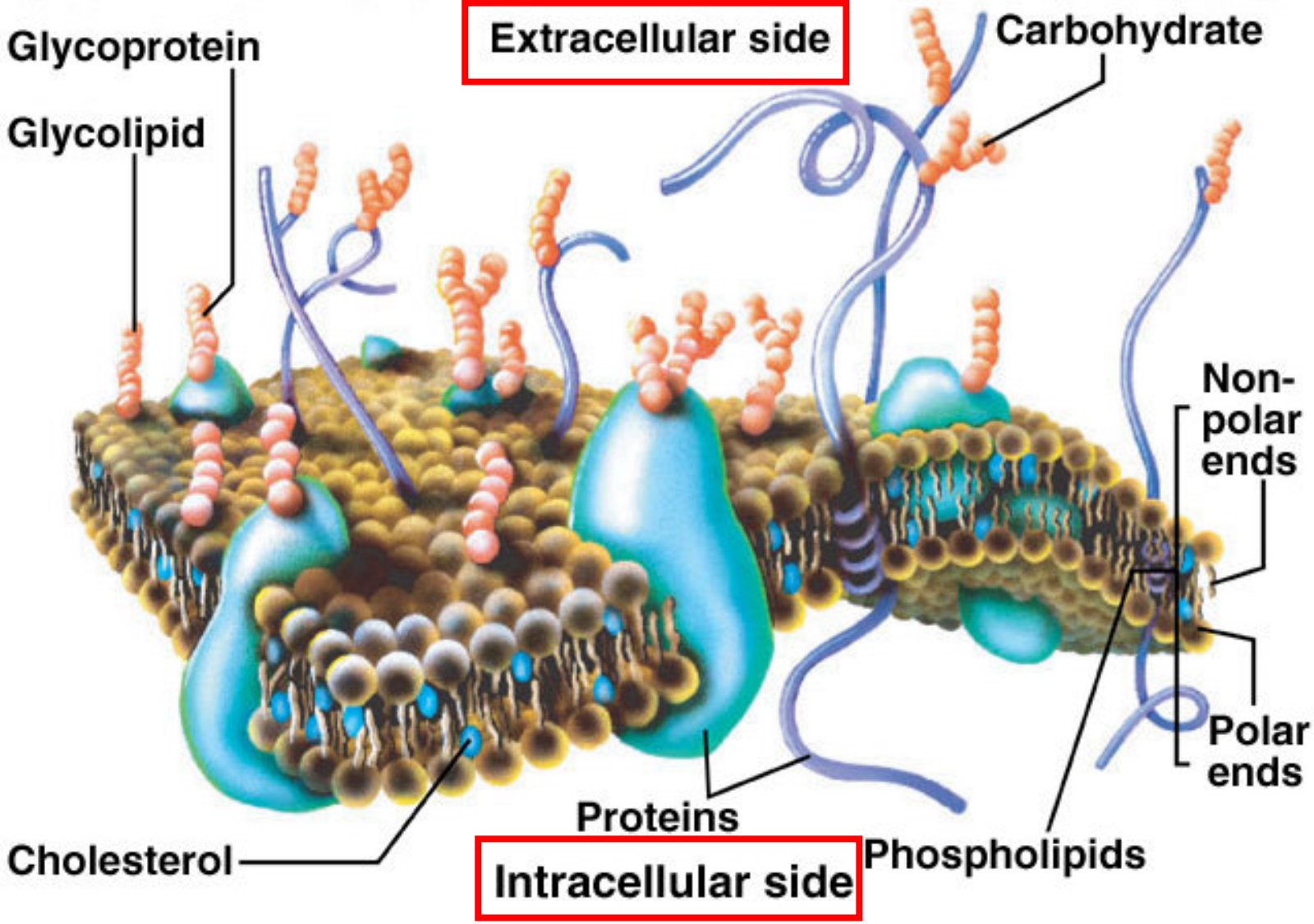
Review: Table 3.1, pp. 50-52

Plasma Membrane

- Separates intracellular & extra-cellular spaces
- Regulates entry & exit of substances

- Referred to as the Fluid Mosaic Model

Cell Membrane – Fluid-Mosaic Model



Membrane Function: Transport

- Selective permeability

1) Passive transport (no energy)

- simple diffusion, via gradients

- facilitated diffusion, via carriers

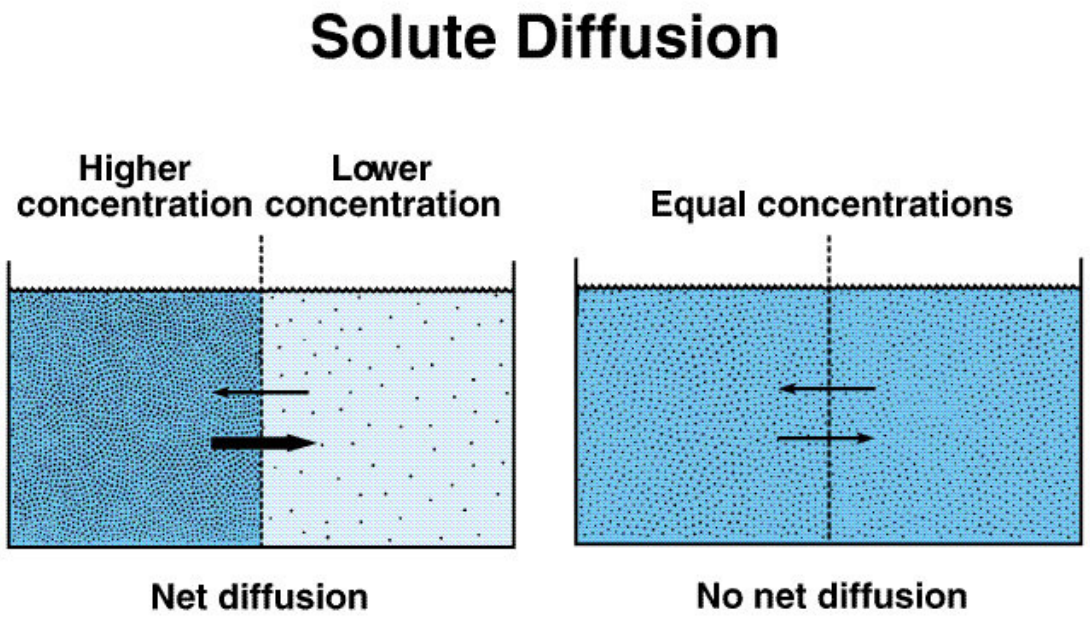
2) Active transport (energy)

3) Bulk transport

Passive Transport: Simple Diffusion

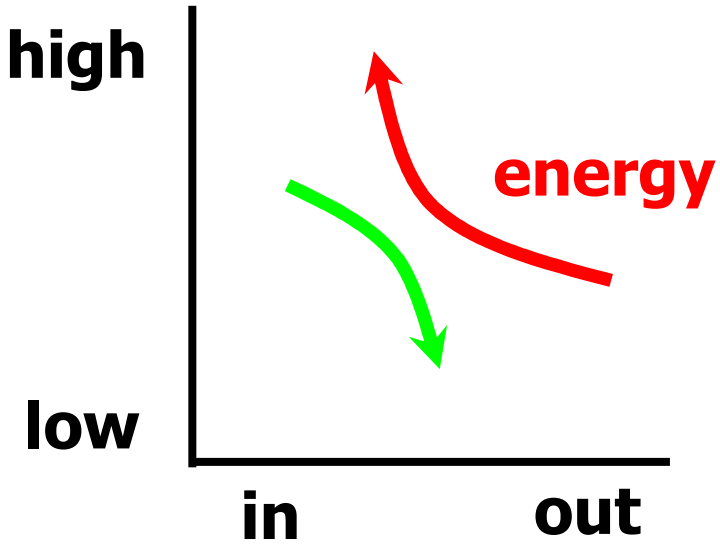
Need:

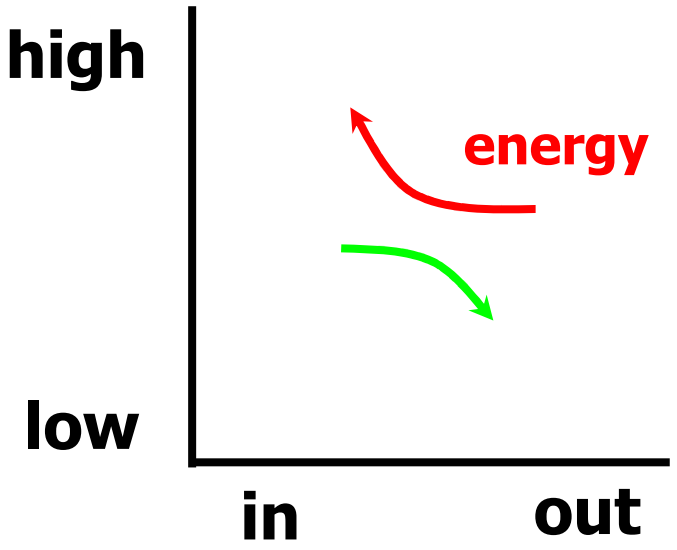
- **Concentration gradient**
- **Permeability to the diffusing substance**



Gradients

Types: **concentration, electrochemical, pressure, thermal**



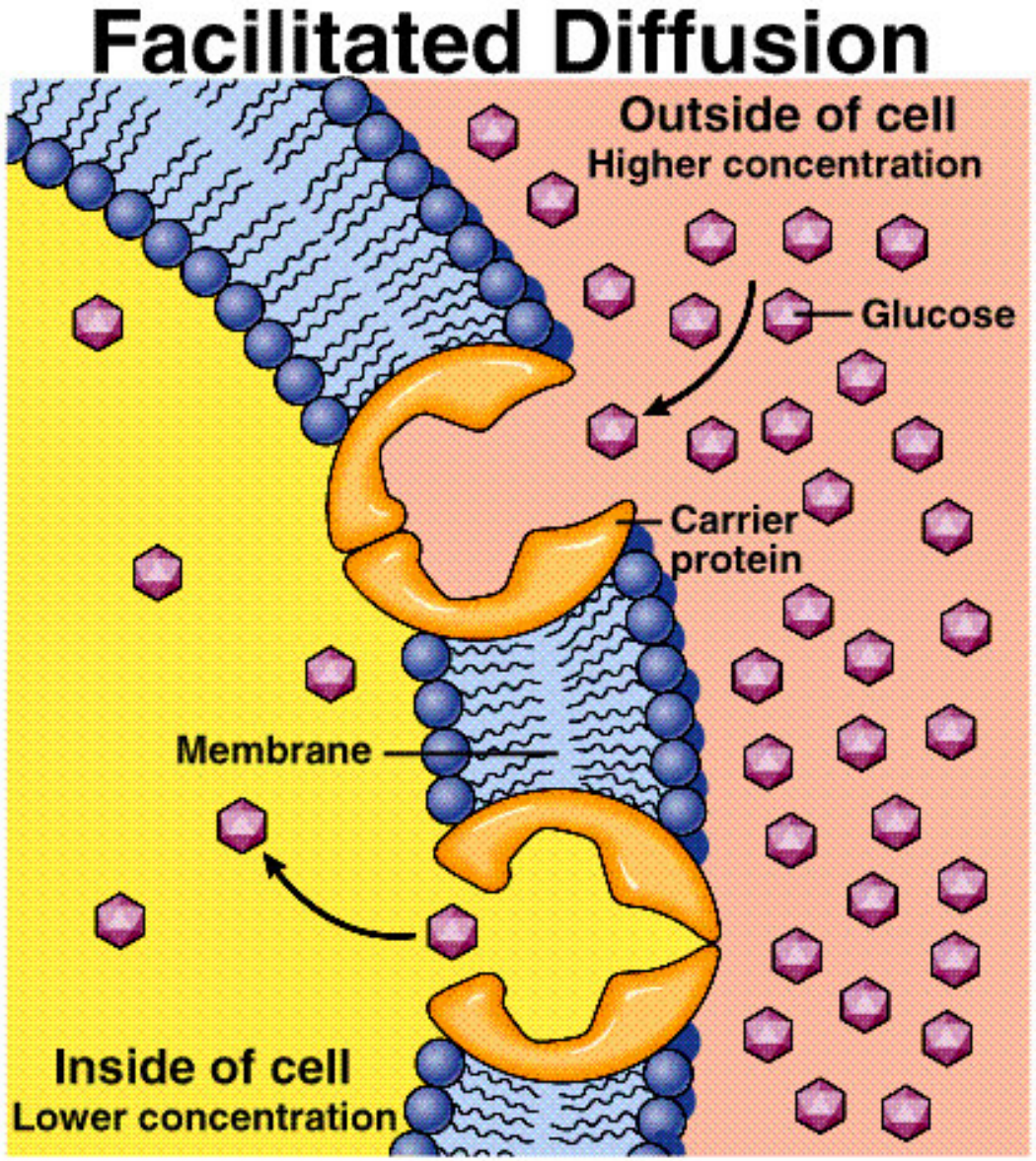


Rate of diffusion depends upon:

1) **Magnitude of concentration gradient**
   - Driving force of diffusion
2) **Permeability of the membrane**
   - Neuronal cell membrane 20x more permeable to K^+ than Na^+
3) **Temperature**
   - Higher temperature, faster diffusion rate
4) **Surface area of the membrane**
   - Microvilli increase surface area

Passive Transport:

"Carrier-mediated"



Active Transport

1) **movement of molecules and ions <u>against</u> their concentration gradients**

2) **uses specific protein carriers**

3) **requires ATP**

4) **2 types: primary, secondary**

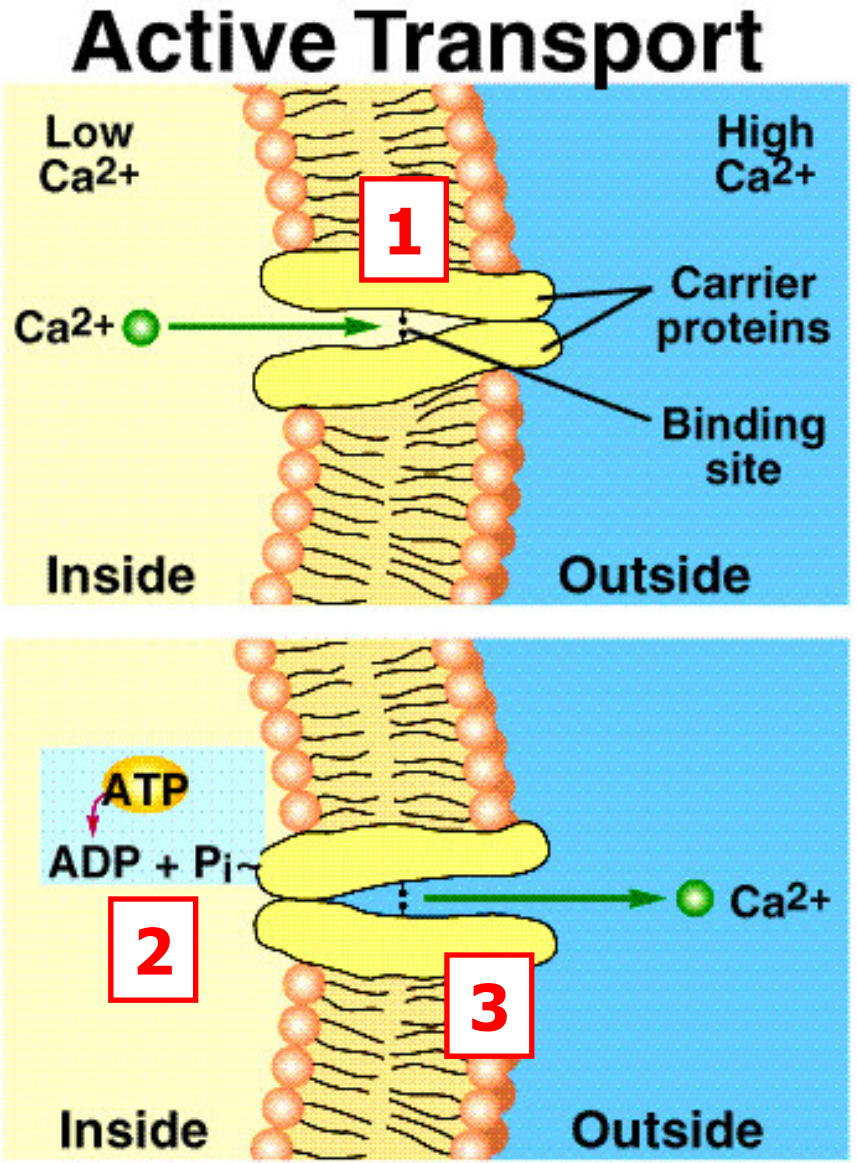
Primary Active Transport

1) **Molecule or ion binds to carrier site**

2) **Binding stimulates breakdown (hydrolysis) of ATP**

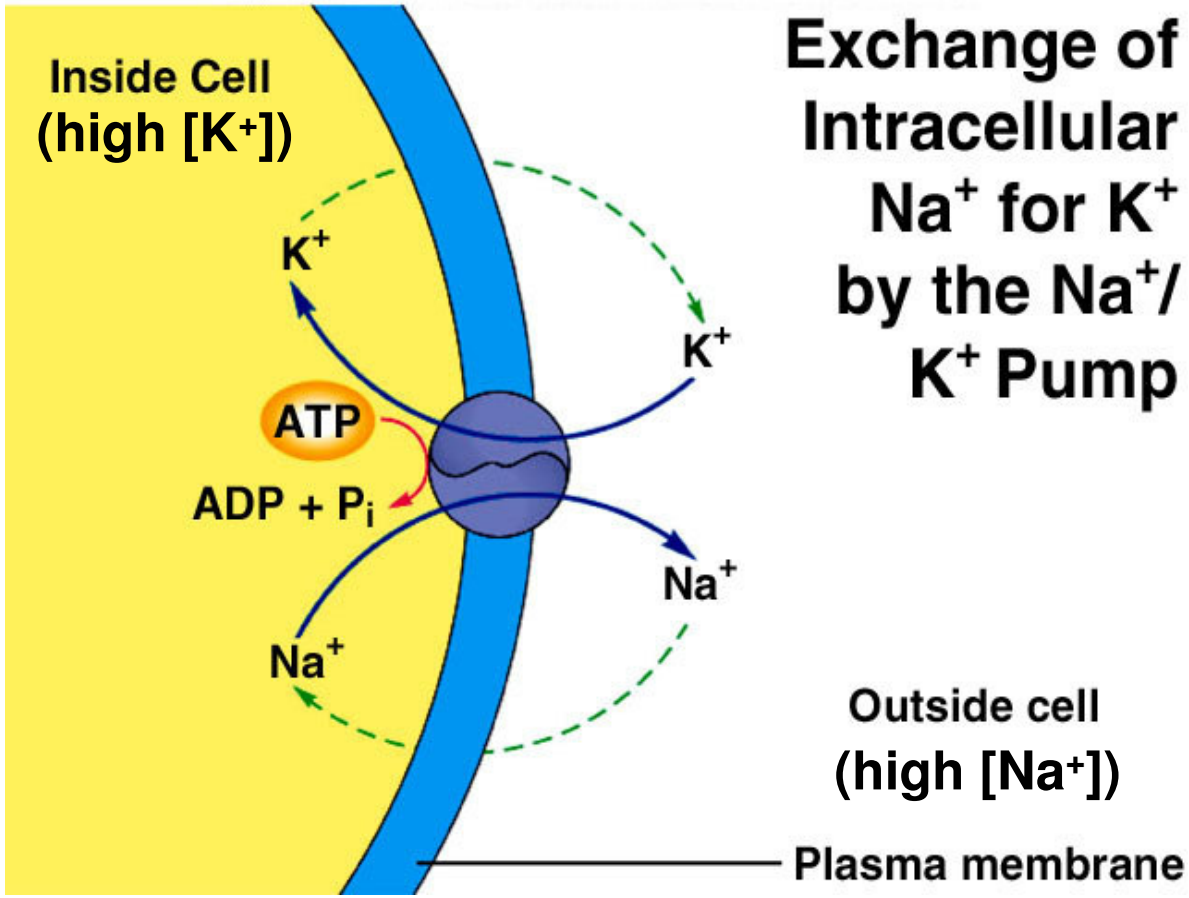
3) **Conformational change moves molecule to other side of membrane.**

Thus, *direct* use of ATP



Primary Active Transport: The Na^+ - K^+ Pump

- **An *exchange* pump**
- **3 Na^+ out for every 2 K^+ in**
- **Energy is used to move ions against their gradients**

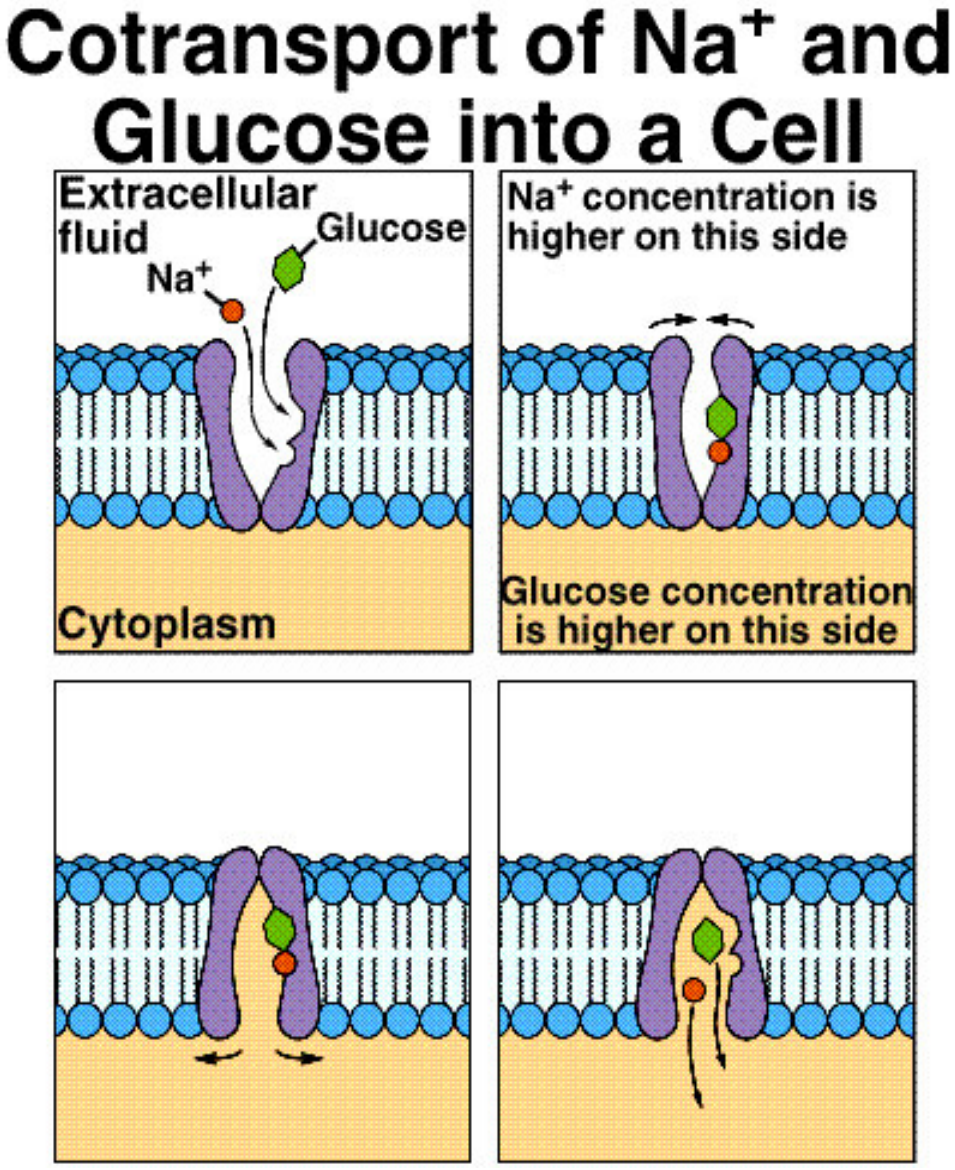


Secondary Active Transport

- **Coupled transport**
- **Energy for uphill movement of glucose is obtained from transport of Na^+ down its [gradient]**

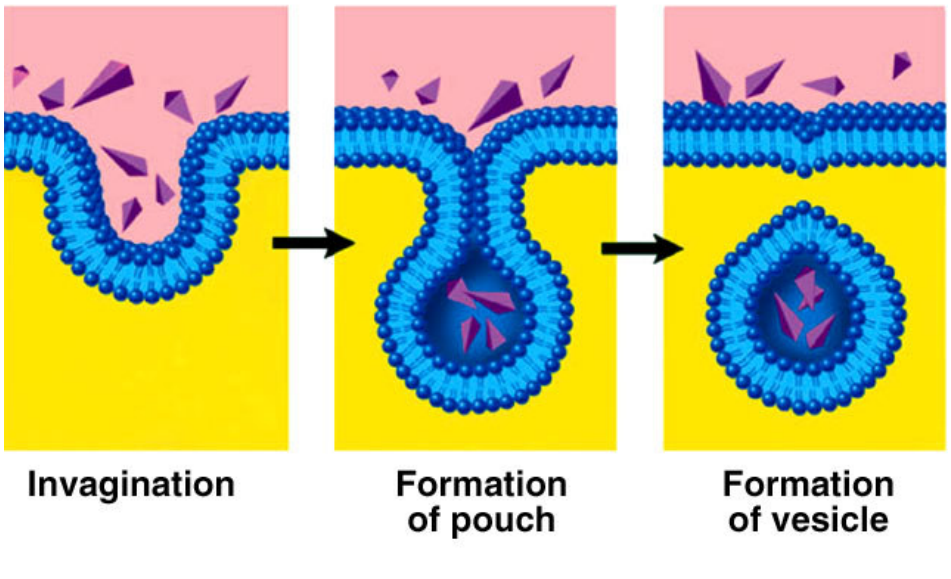
Thus, *indirect* use of ATP (to maintain Na^+ gradient)

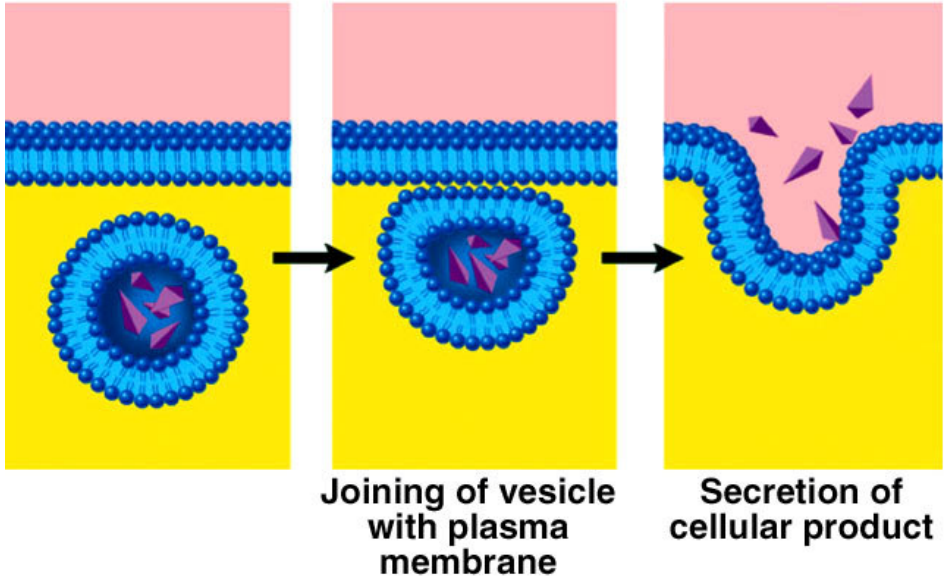
- **Cotransport**
- **Countertransport**

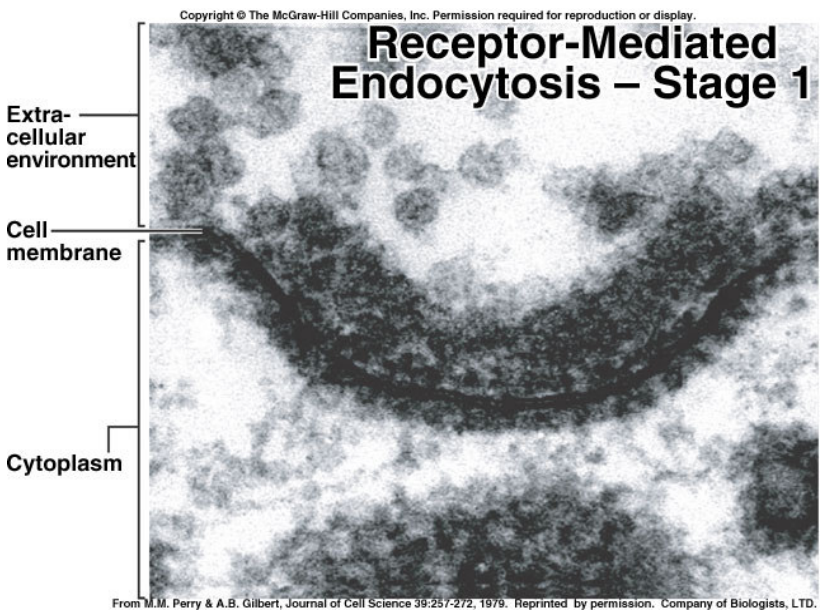


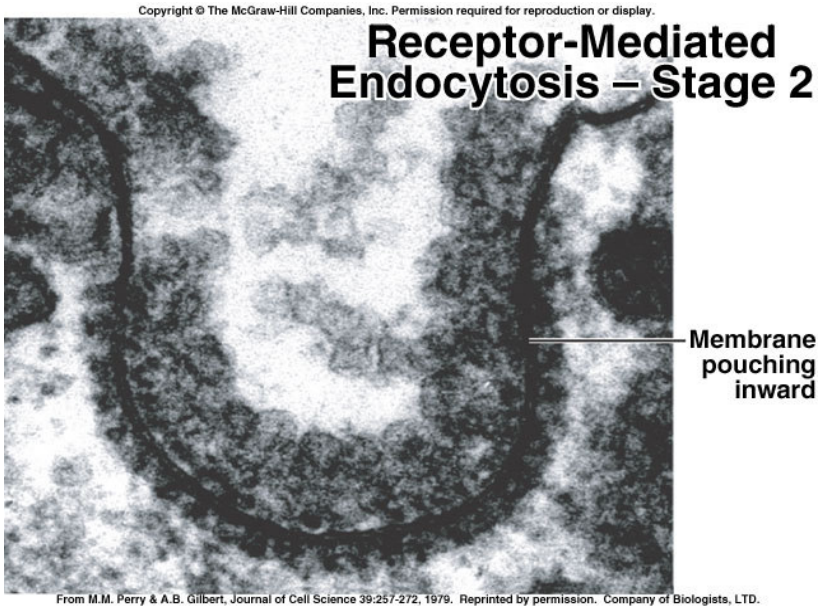
Bulk Transport

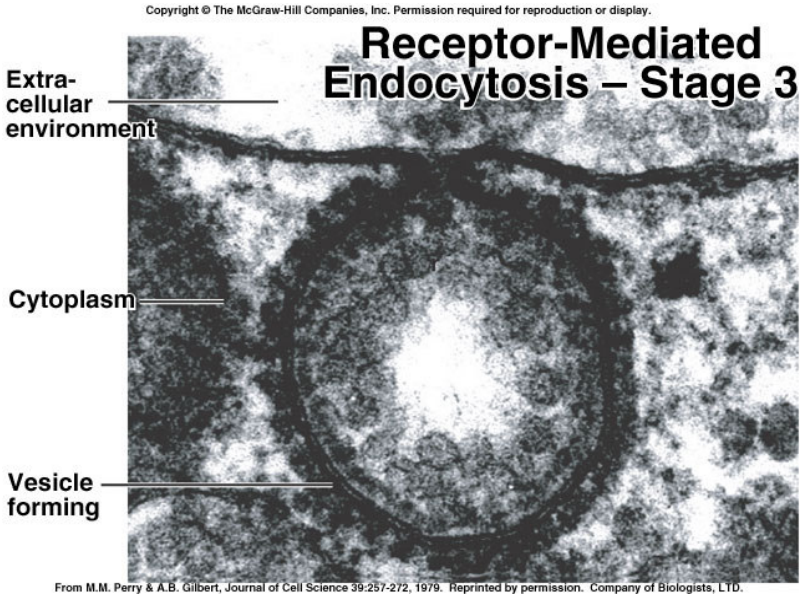
- **Many large molecules moved at the same time**











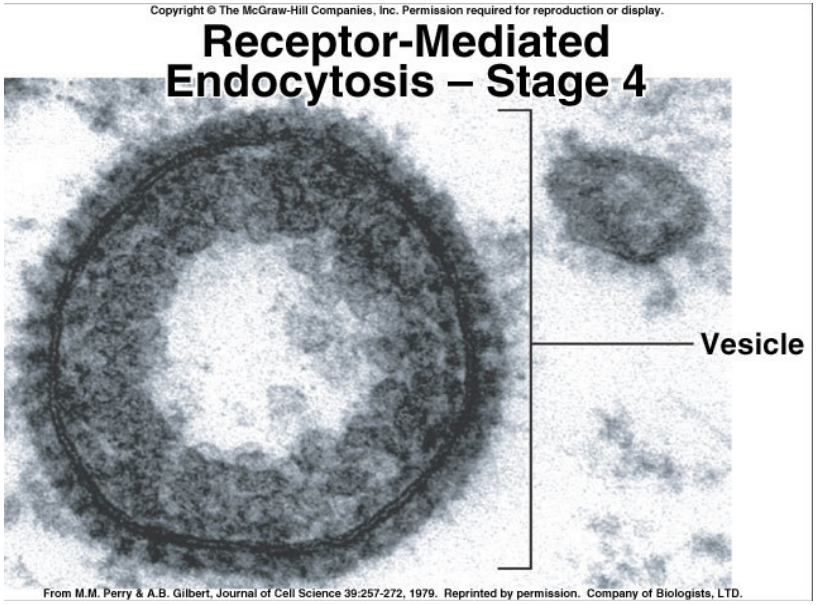


Figure 3.4, p. 54