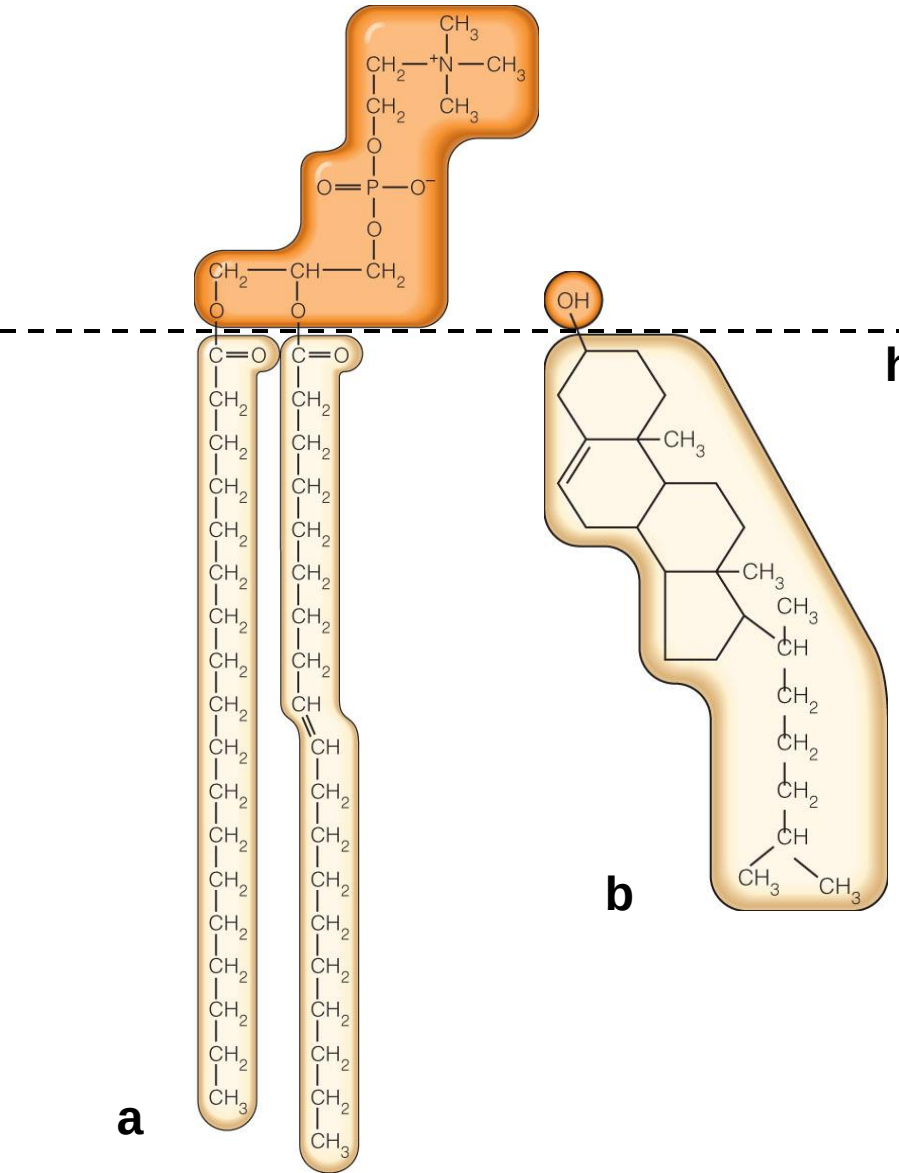
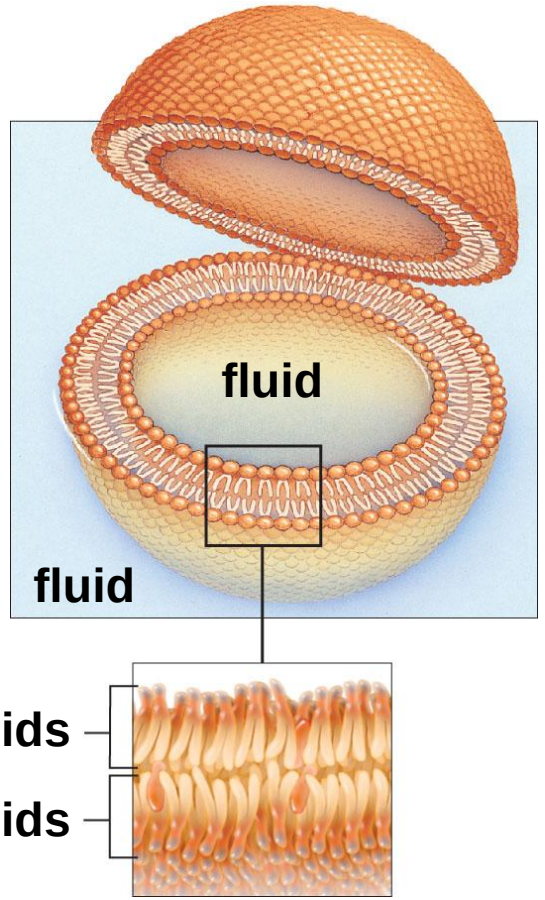
Chapter 5: A Closer Look at Membranes

Lipid Bilayer

- Cell membranes consist of a lipid bilayer containing different proteins
- Membrane is a continuous boundary layer that selectively controls the flow of substances across it

Lipid Bilayer



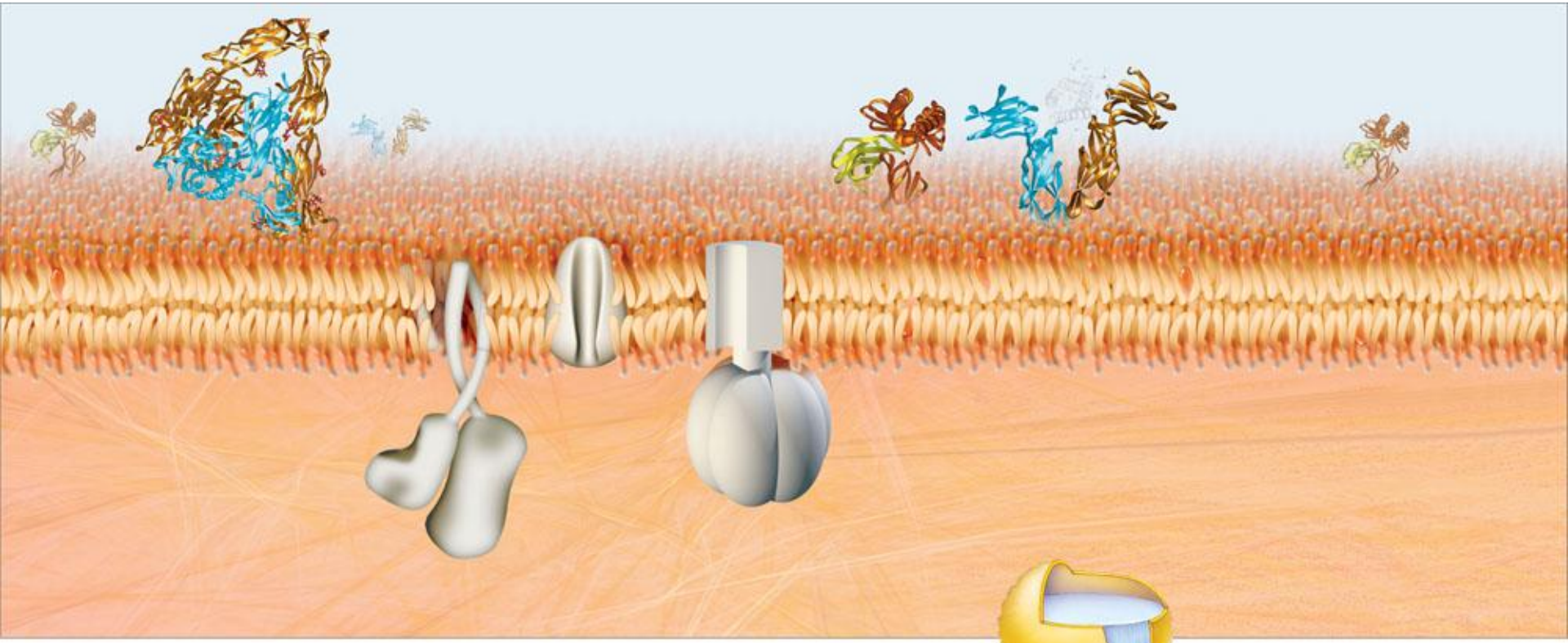


cross-section through lipid bilayer

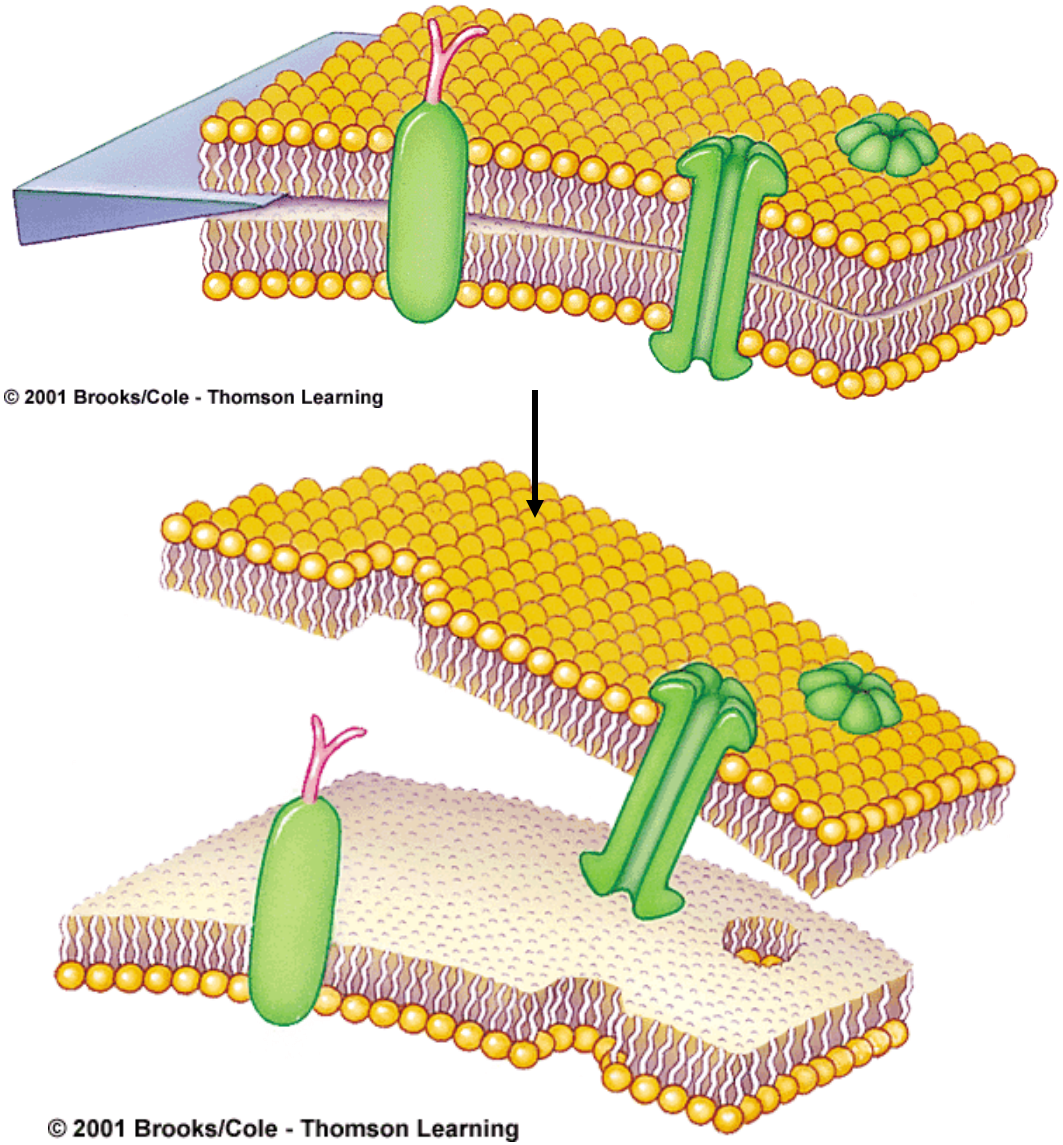
Fig. 5.3, pg. 76

Fluid Mosaic Model

- Every cell membrane has a mixed composition of phospholipids, glycolipids, sterols, and proteins



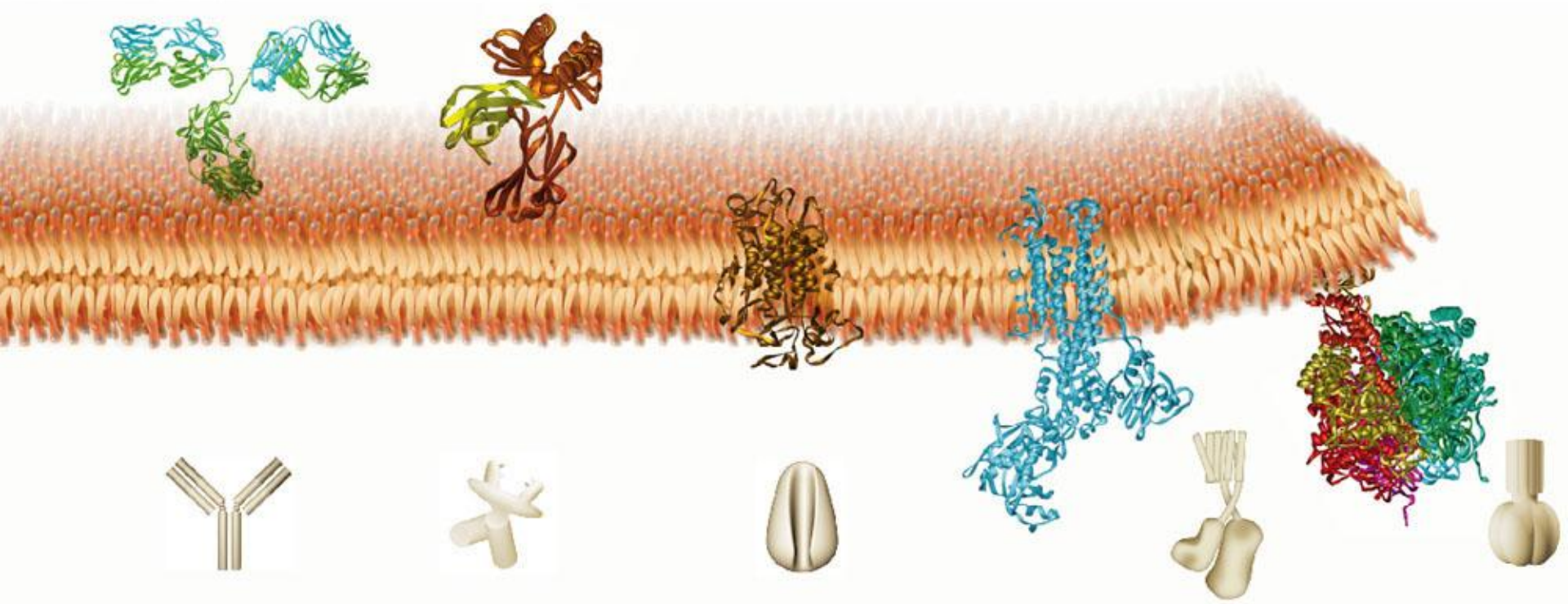
Studying Membranes



Stepped Art

Fig. 5.5a, pg. 77

Overview of Membrane Proteins



Receptor Proteins **Recognition Proteins** **Passive Transporters** **Active Transporters**

Fig. 5.6, p.79

Transport Proteins

- Span the lipid bilayer
- Interior is able to open to both sides
- Change shape when they interact with solute
- Play roles in active and passive transport

Concentration Gradient

- Means the number of molecules or ions in one region is different than the number in another region

- In the absence of other forces, a substance moves from a region where it is more concentrated to one one where it's less concentrated - "down" gradient

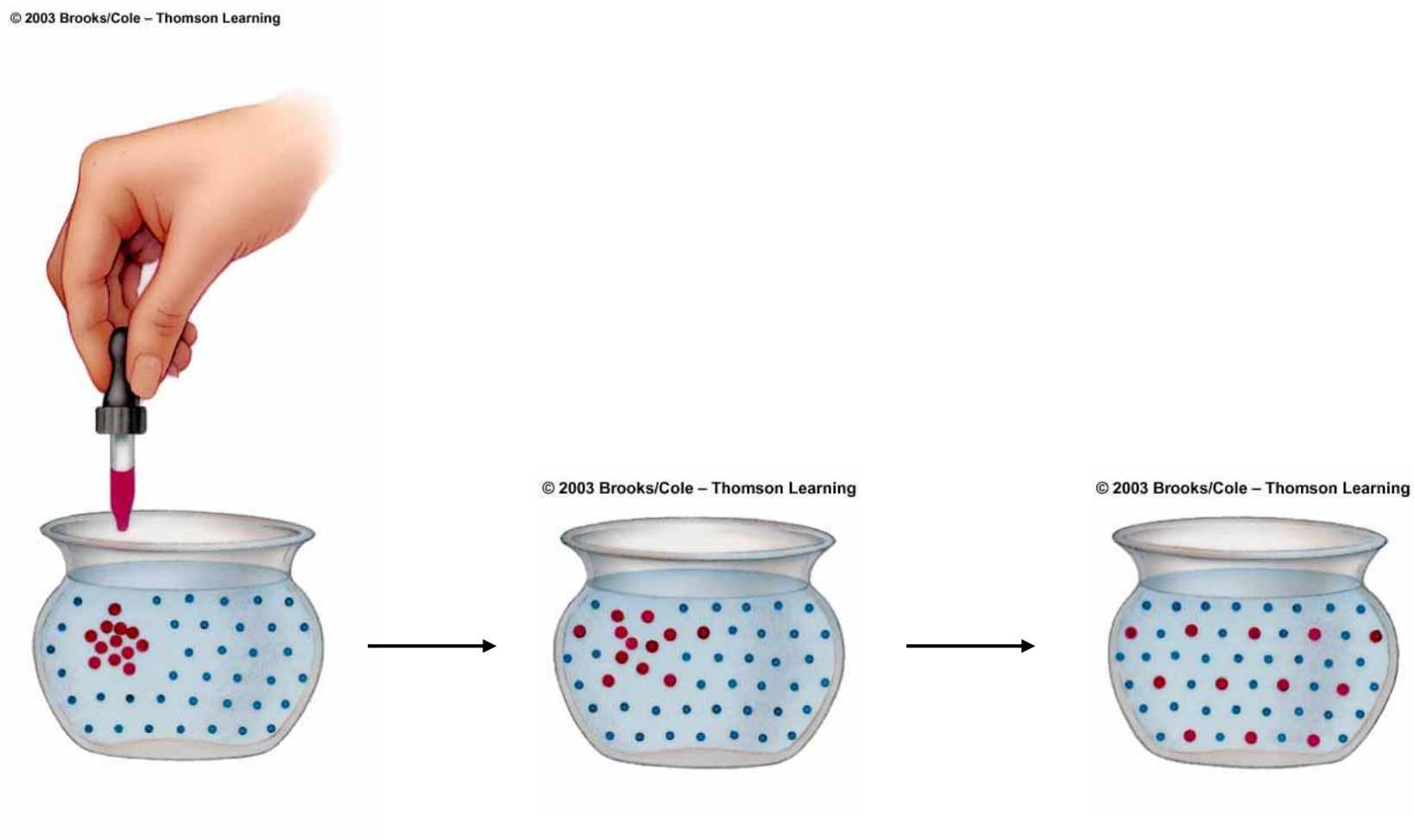
Diffusion

- The net movement of like molecules or ions down a concentration gradient

- Although molecules collide randomly, the net movement is away from the place with the most collisions (down gradient)

http://www.youtube.com/watch?v=9QCxTf0QfTo

Diffusion



Stepped Art

Fig. 5.7a, p.80

Cell Membranes Show Selective Permeability

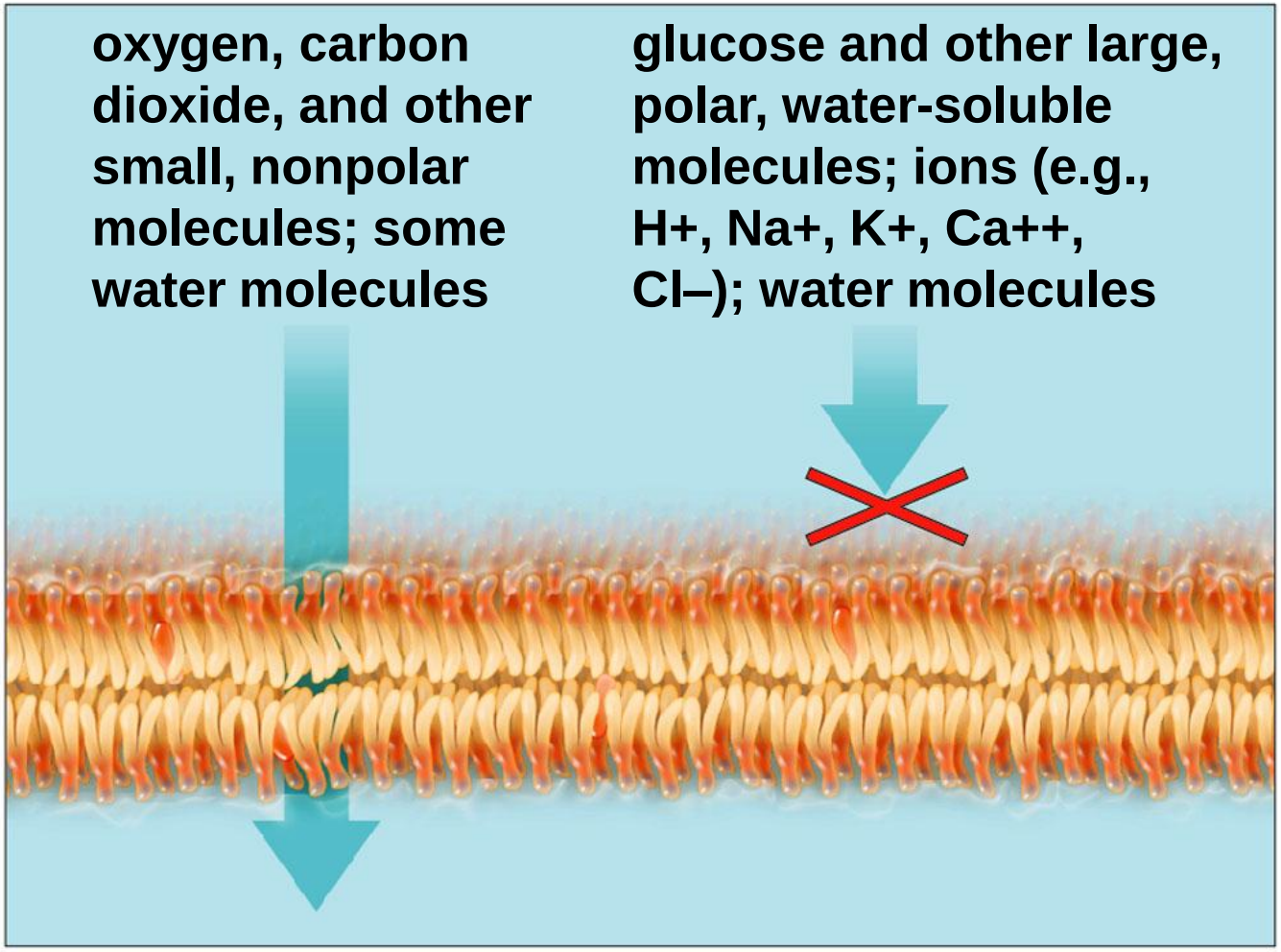
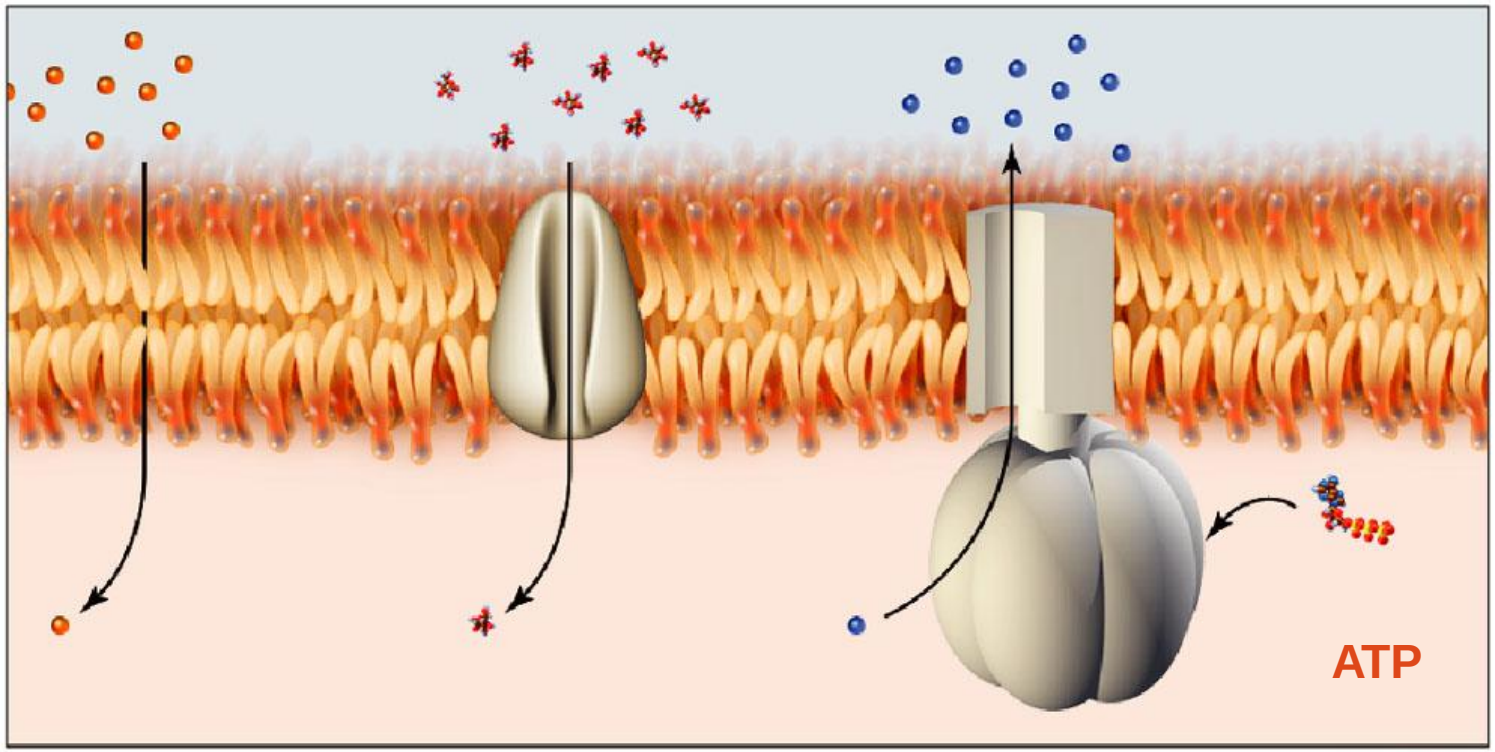


Fig. 5-8, p.80

Membrane Crossing: Overview I



High

Low

Diffusion of lipid-soluble Substances across bilayer	Passive transport of water-soluble substances through channel protein; no energy input needed	Active transport through ATPase; requires energy input from ATP

Fig. 5-9, p.81

Membrane Crossing: Overview II

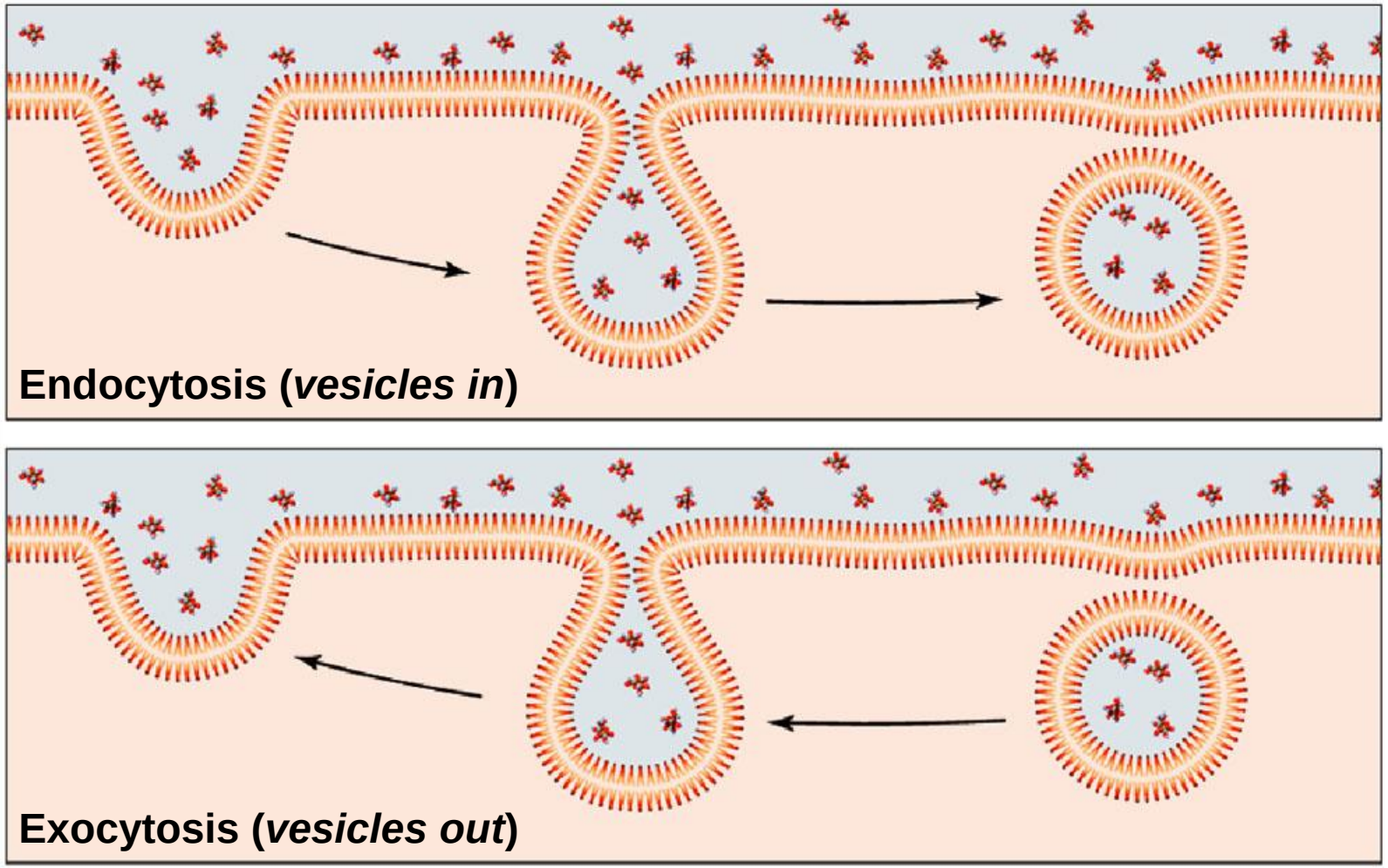


Fig. 5-9, p.81

Passive Transport

- Flow of solutes through the interior of passive transport proteins down their concentration gradients
- Passive transport proteins allow solutes to move both ways
- Does not require any energy input

Active Transport

- Net diffusion of solute is against concentration gradient
- Transport protein must be activated
- ATP gives up phosphate to activate protein
- Binding of ATP changes protein shape and affinity for solute

Active Transport

- ATP gives up phosphate to activate protein
- Binding of ATP changes protein shape and affinity for solute

Active Transport

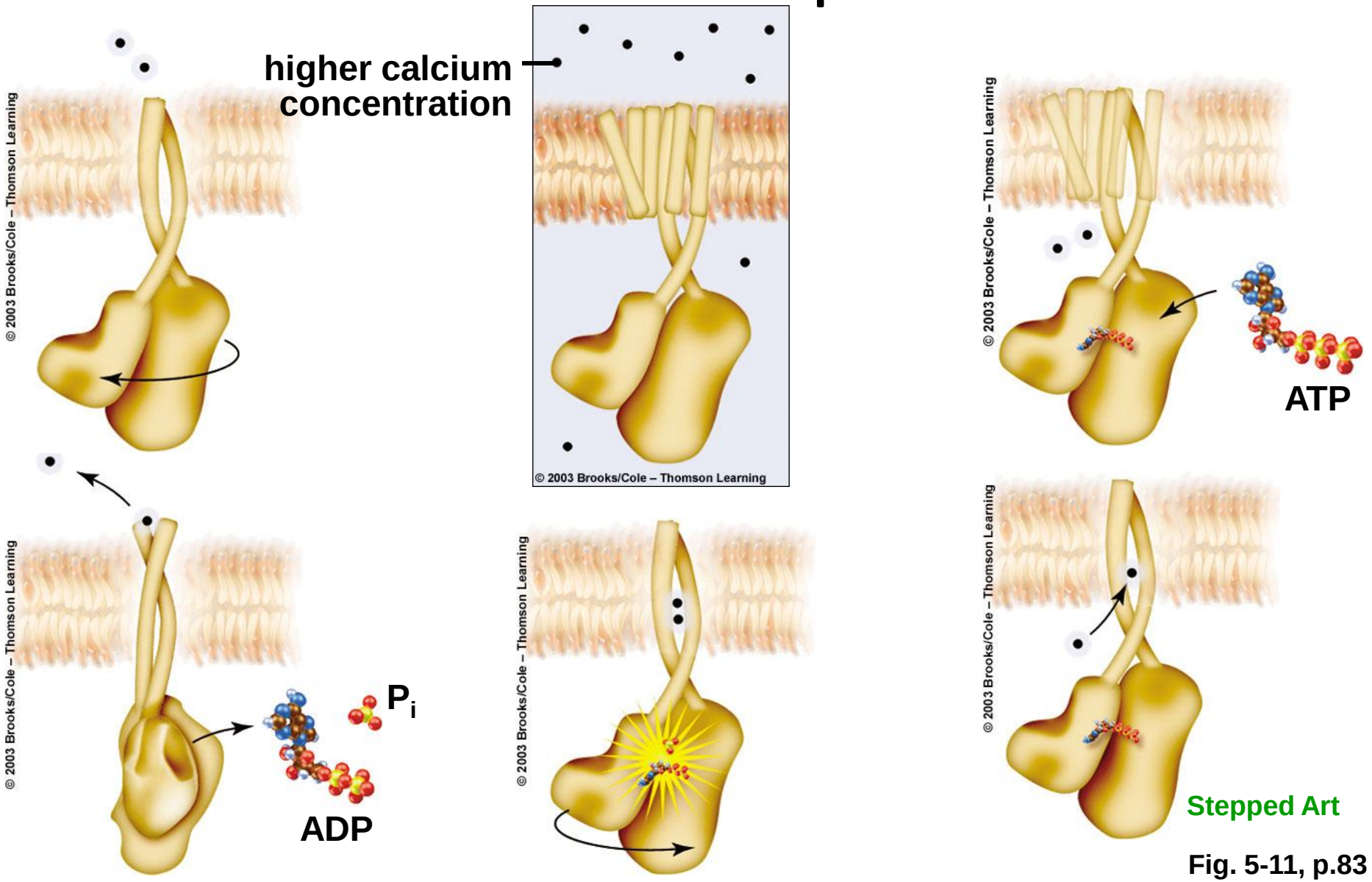
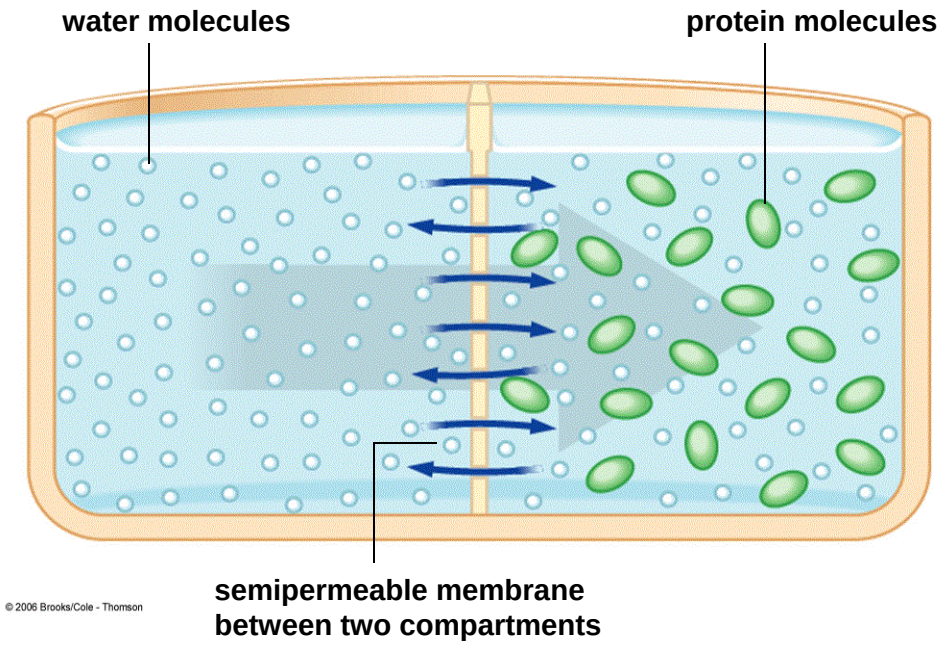


Fig. 5-11, p.83

Osmosis

- Diffusion of water molecules across a selectively permeable membrane
- Direction of net flow is determined by water concentration gradient
- Side with the most solute molecules has the lowest water concentration



Tonicity

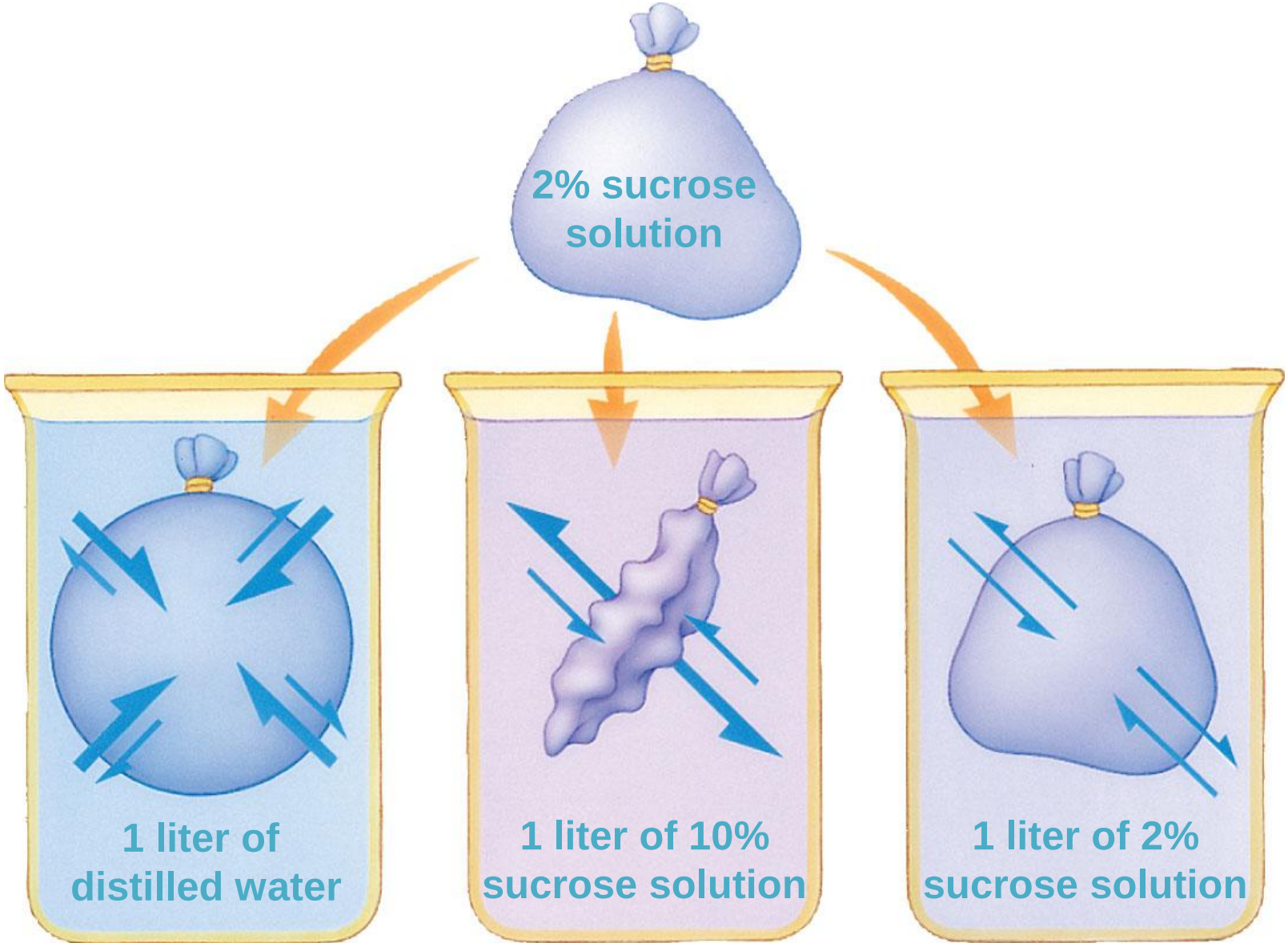
Refers to *relative* solute concentration of two fluids

Hypotonic - having fewer solutes

Hypertonic - having more solutes

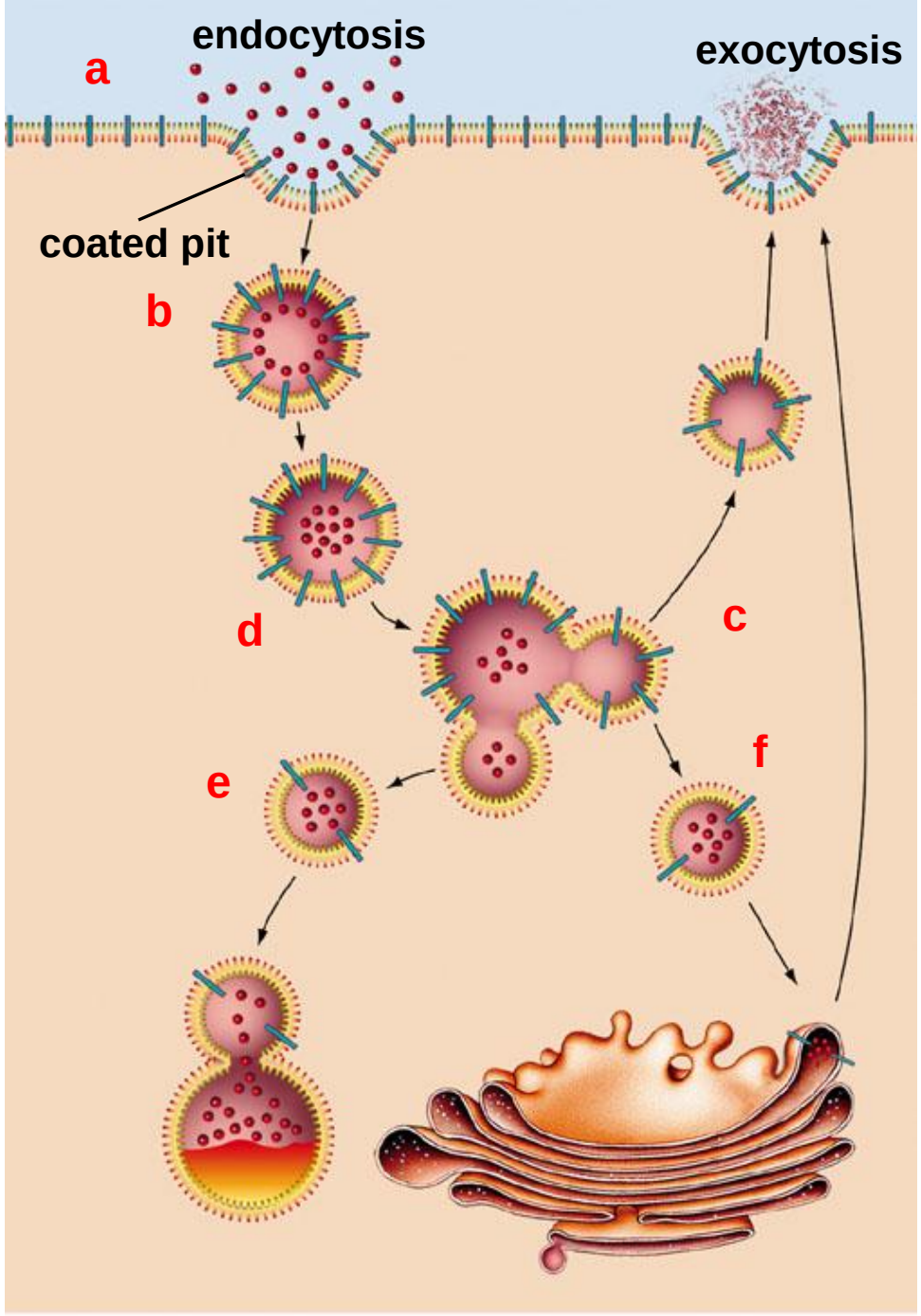
Isotonic - having same amount

Tonicity and Osmosis



Endocytosis and Exocytosis

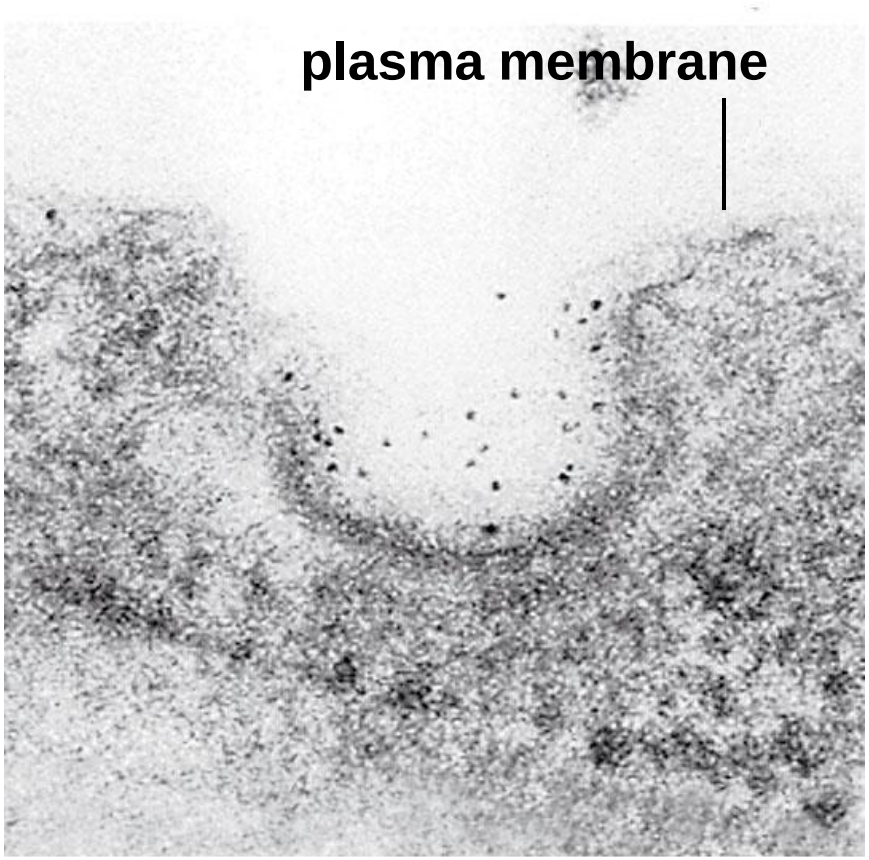
- **Exocytosis:** A cytoplasmic vesicle fuses with the plasma membrane and contents are released outside the cell
- **Endocytosis:** A small patch of plasma membrane sinks inward and seals back on itself, forming a vesicle inside the cytoplasm – membrane receptors often mediate this process

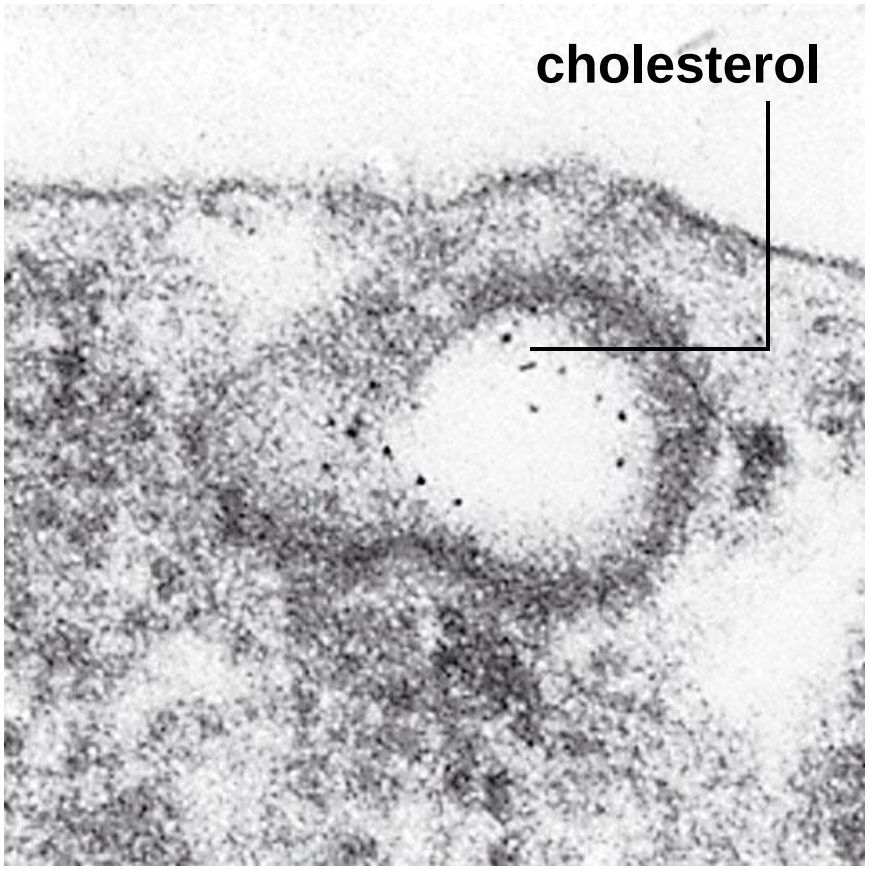


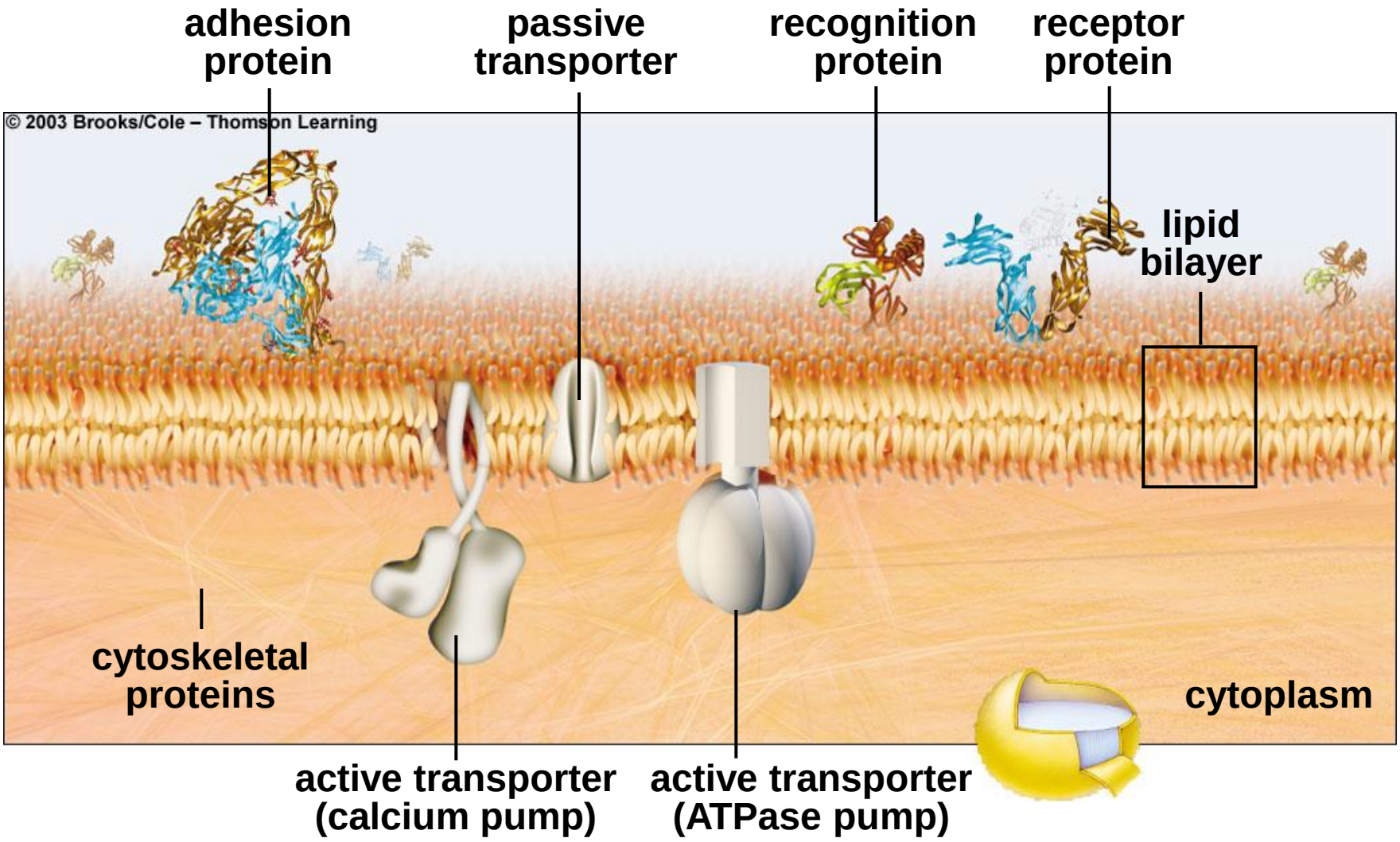
Endocytosis and Exocytosis

Fig. 5-15, p.86

Endocytosis of cholesterol






adhesion protein
passive transporter
recognition protein
receptor protein
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lipid bilayer
cytoskeletal proteins
cytoplasm
active transporter (calcium pump)
active transporter (ATPase pump)

Fig. 5-19, p.88

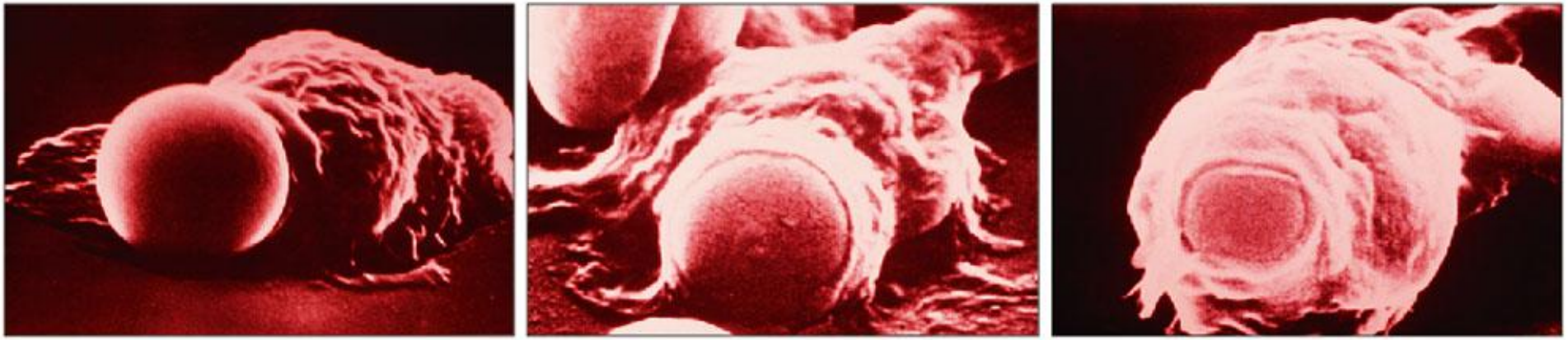
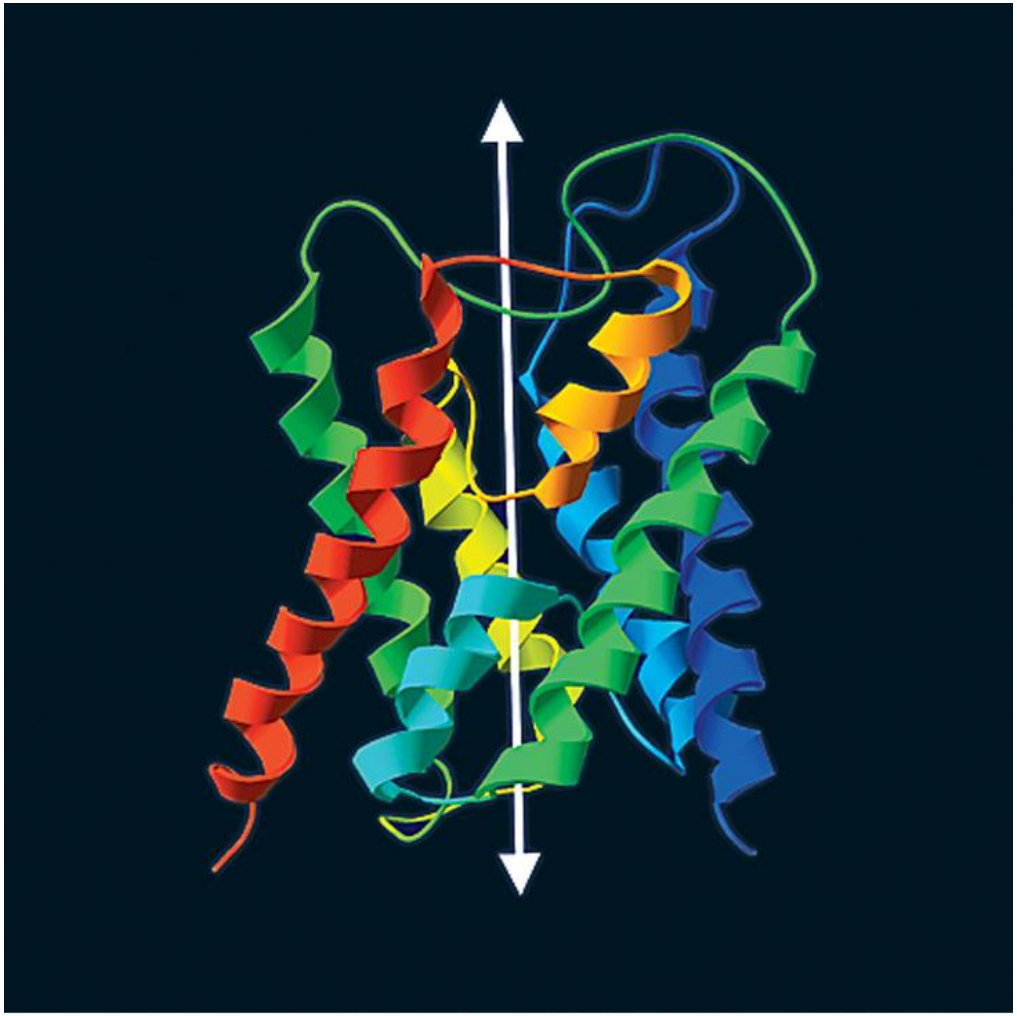


Fig. 5-20, p.89

extracellular fluid



cytoplasm

Fig. 5-22, p.89

http://www.youtube.com/watch?v=AYNwynwaALo

Fig. 5-22, p.89