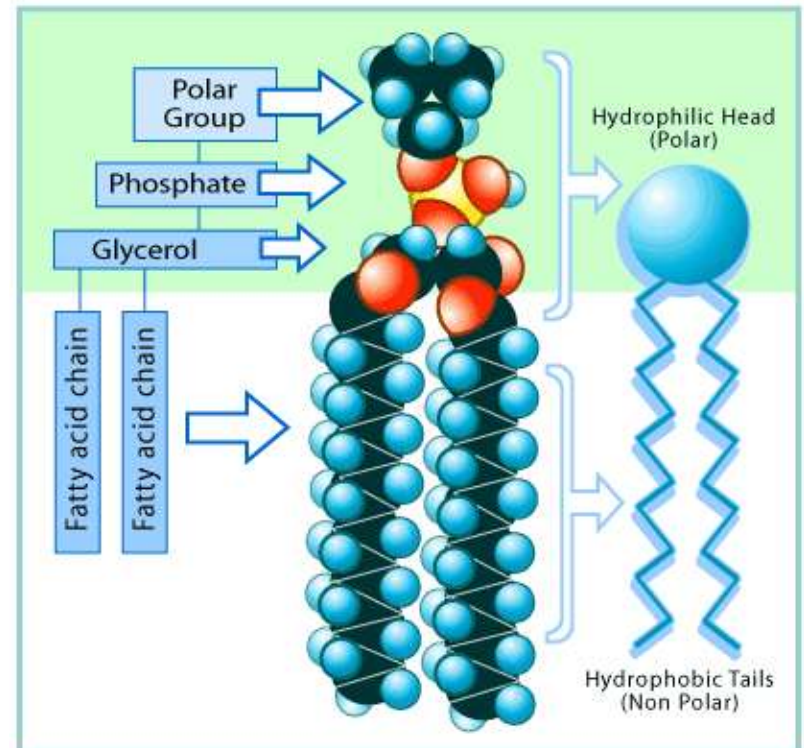


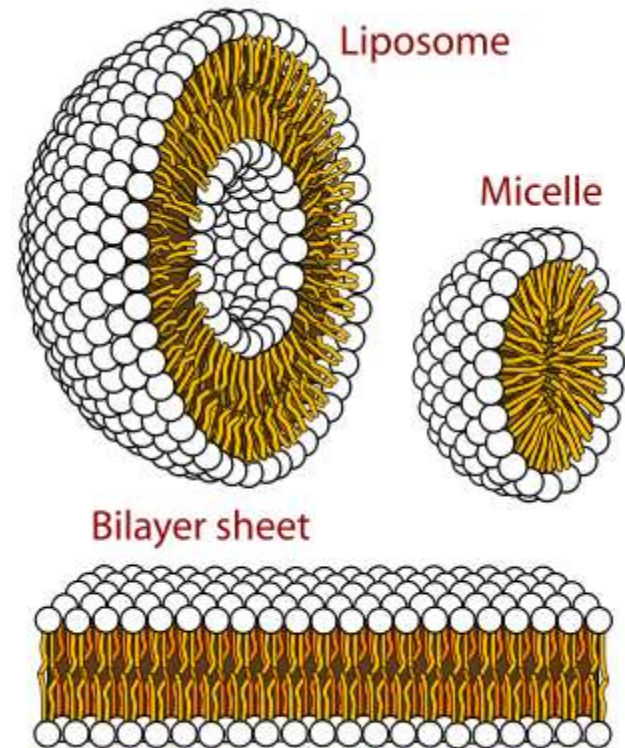
- Chapter 8~  
*Membrane  
Structure & Function*

# Phospholipids

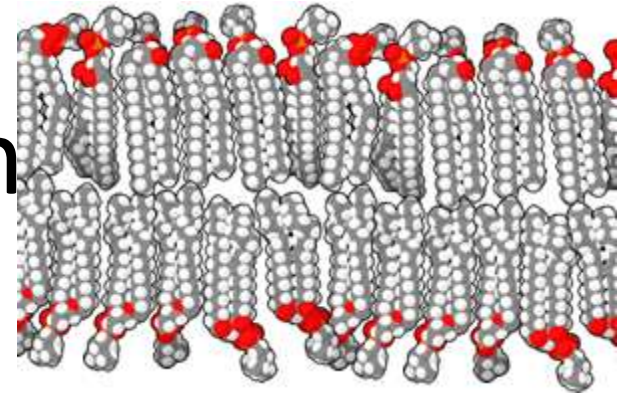
- Phosphate head plus lipid tail
- Phosphate is hydrophilic
- Lipid is hydrophobic



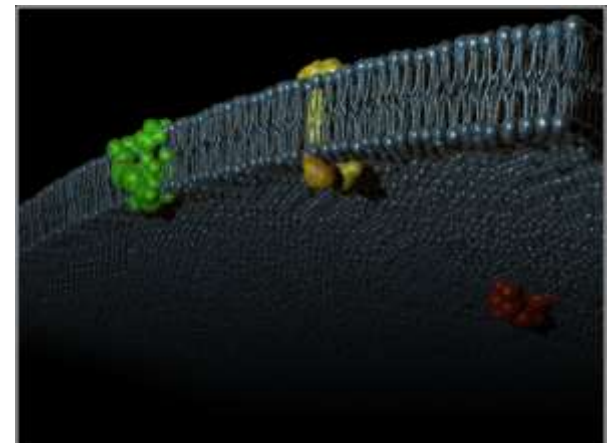
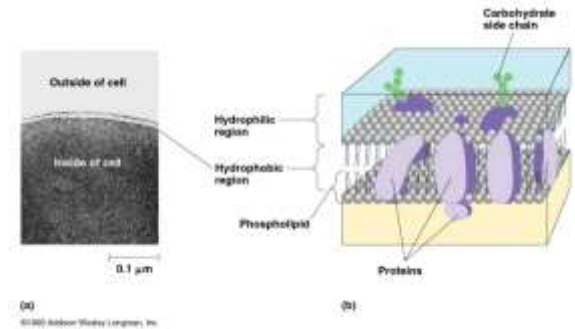
- Three main structures formed by phospholipids in water



# Plasma mem

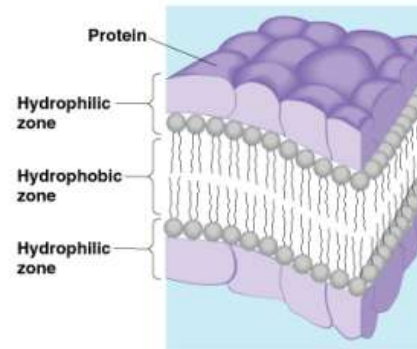


- Phospholipid bilayer
  - hydrophobic
  - hydrophilic
- Semi-permeable
- Embedded proteins
- Carbohydrate receptors
- Embedded cholesterol

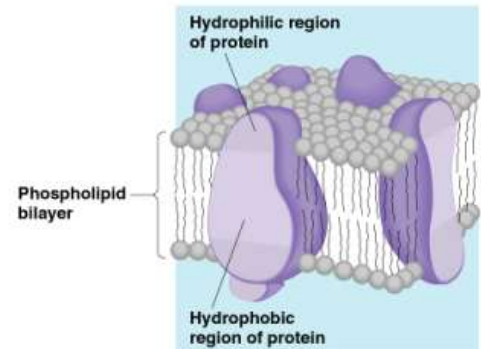


# Membrane structure, I

- Selective permeability
- Amphipathic~  
hydrophobic &  
hydrophilic regions
- Singer-Nicolson:  
fluid mosaic model



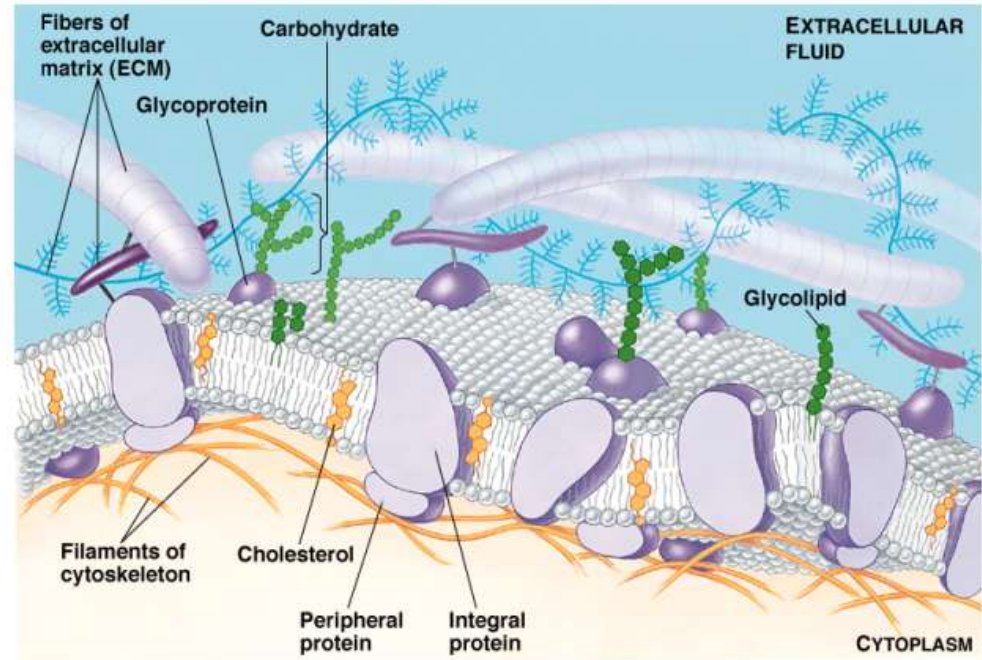
(a) Original Davson-Danielli model  
©1999 Addison Wesley Longman, Inc.



(b) Current fluid mosaic model

# Membrane structure, II

- Phospholipids~ membrane fluidity
- Cholesterol~ membrane stabilization
- “Mosaic” Structure~
- Integral proteins~ transmembrane proteins
- Peripheral proteins~ surface of membrane
- Membrane carbohydrates ~ cell to cell recognition;  
oligosaccharides (cell markers); glycolipids; glycoproteins



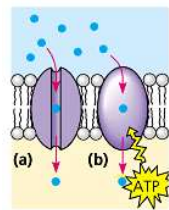
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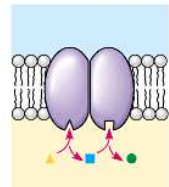
# Membrane structure, III

- Membrane protein function:

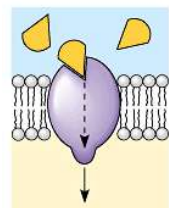
- transport
- enzymatic activity
- signal transduction
- intercellular joining
- cell-cell recognition
- ECM attachment



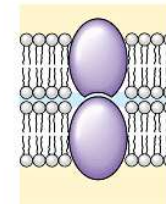
Transport



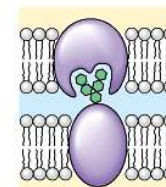
Enzymatic activity



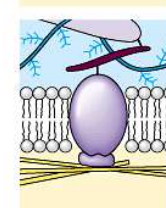
Signal transduction



Intercellular joining



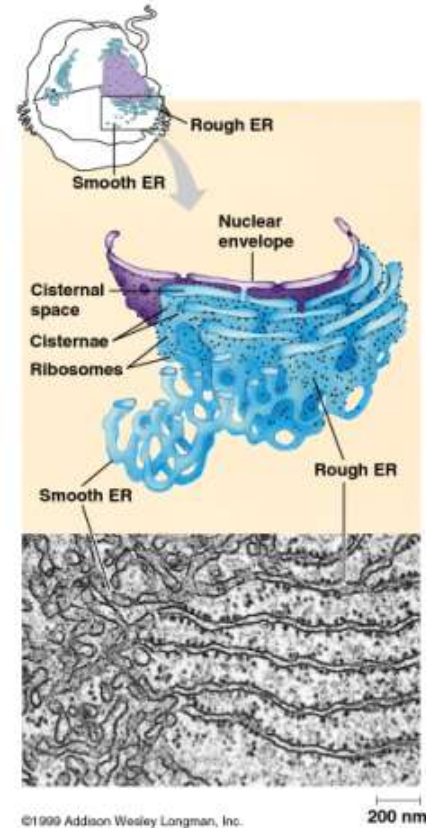
Cell-cell recognition



Attachment to the cytoskeleton and extracellular matrix (ECM)

# Endomembrane system, I

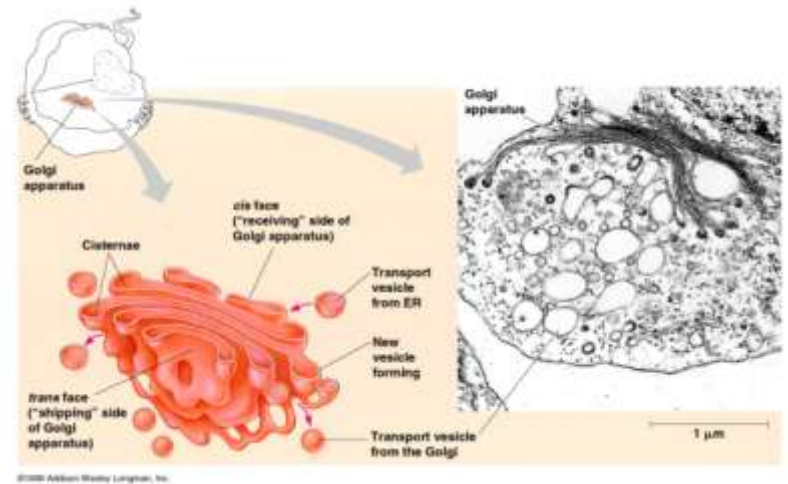
- Endoplasmic reticulum (ER)
- Continuous with nuclear envelope
- Smooth ER
  - no ribosomes;
  - synthesis of lipids,
  - metabolism of carbs;
  - detoxification of drugs and poisons
- Rough ER
  - with ribosomes;
  - synthesis of secretory proteins (glycoproteins), membrane production





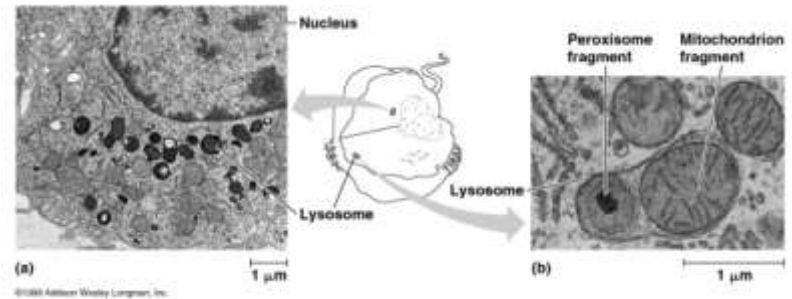
# Endomembrane system, II

- Golgi apparatus
  - ER products are modified, stored, and then shipped
- Cisternae (sacs)
- *trans* & *cis* face
  - shipping/receiving
- Transport vesicles



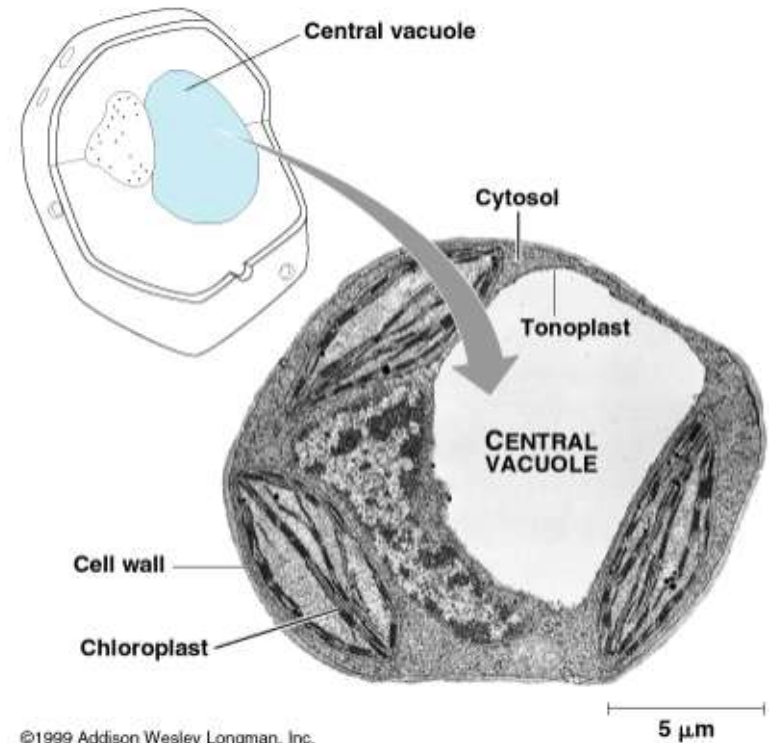
# Endomembrane system, III

- Lysosomes
  - sac of hydrolytic enzymes; digestion of macromolecules
- Phagocytosis
- Autophagy
- Tay-Sachs disease



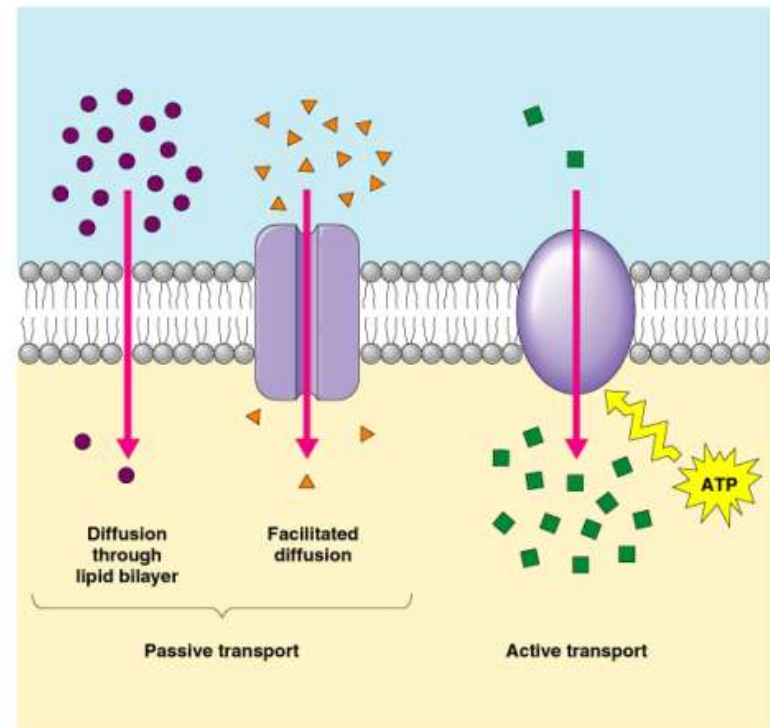
# Endomembrane system, IV

- Vacuoles
  - membrane-bound sacs (larger than vesicles)
- Food (phagocytosis)
- Contractile (pump excess water)
- Central (storage in plants)
  - tonoplast membrane



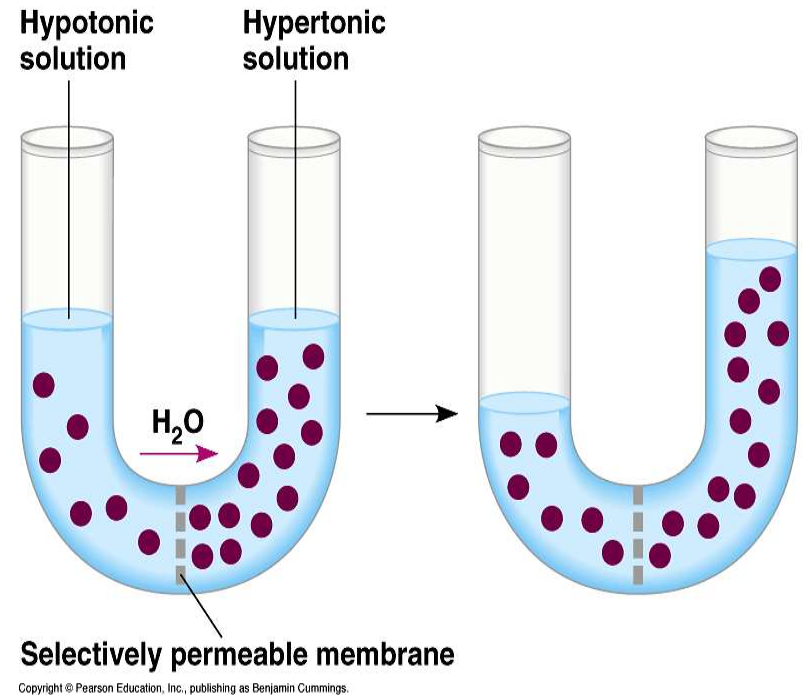
# Membrane traffic

- Diffusion
- Concentration gradient
- Passive transport
- Osmosis
- Transport proteins
- Facilitated transport
- Active transport



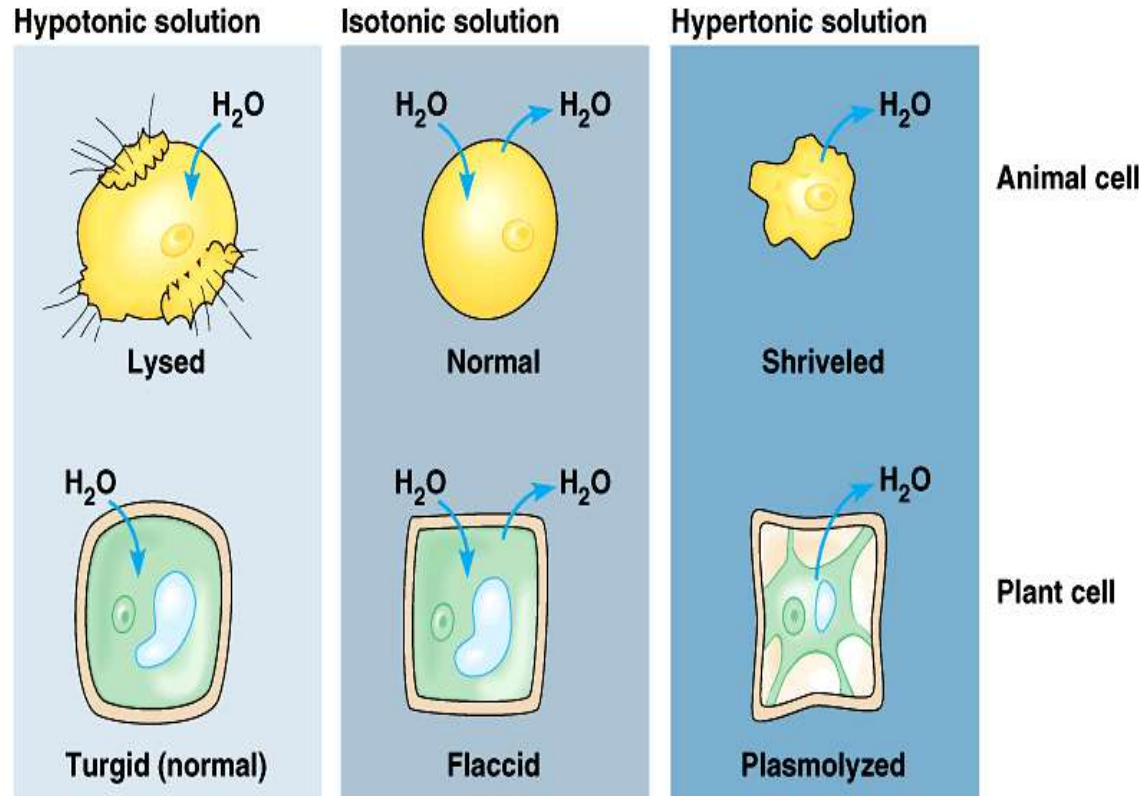
# Membrane traffic

- Diffusion~ tendency of any molecule to spread out into available space
- Concentration gradient
- Passive transport~ diffusion of a substance across a biological membrane
- Osmosis~ the diffusion of water across a selectively permeable membrane



# Water balance

- Osmoregulation~ control of water balance
- Hypertonic~ higher concentration of solutes
- Hypotonic~ lower concentration of solutes
- Isotonic~ equal concentrations of solutes
- Cells with Walls:
- Turgid (very firm)
- Flaccid (limp)
- Plasmolysis~ plasma membrane pulls away from cell wall

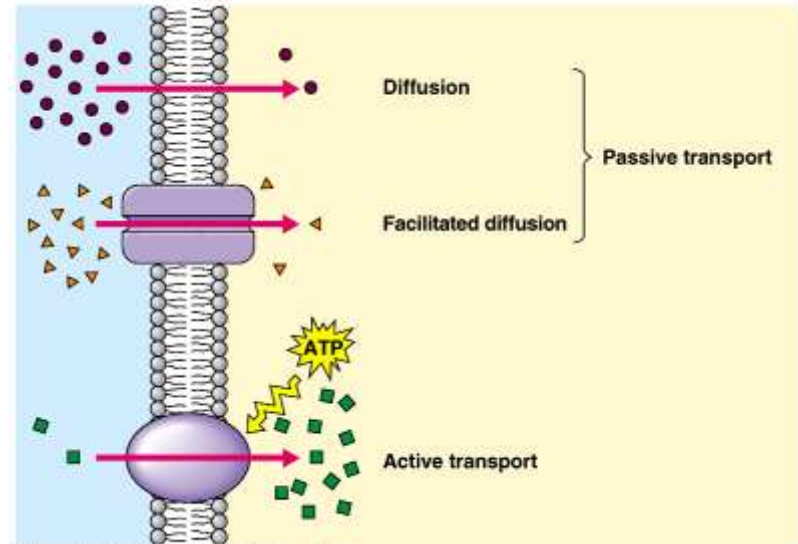


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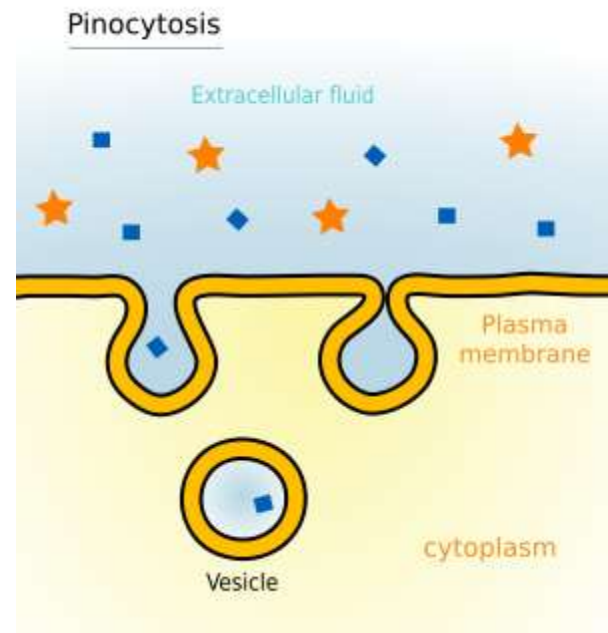
# Specialized Transport

- Transport proteins
- Facilitated diffusion~ passage of molecules and ions with transport proteins across a membrane down the concentration gradient
- Active transport~ movement of a substance against its concentration gradient with the help of cellular energy



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# Pinocytosis



# Types of Active Transport

- Sodium-potassium pump
- Exocytosis~ secretion of macromolecules by the fusion of vesicles with the plasma membrane
- Endocytosis~ import of macromolecules by forming new vesicles with the plasma membrane
  - phagocytosis
  - pinocytosis
  - receptor-mediated endocytosis (ligands)

