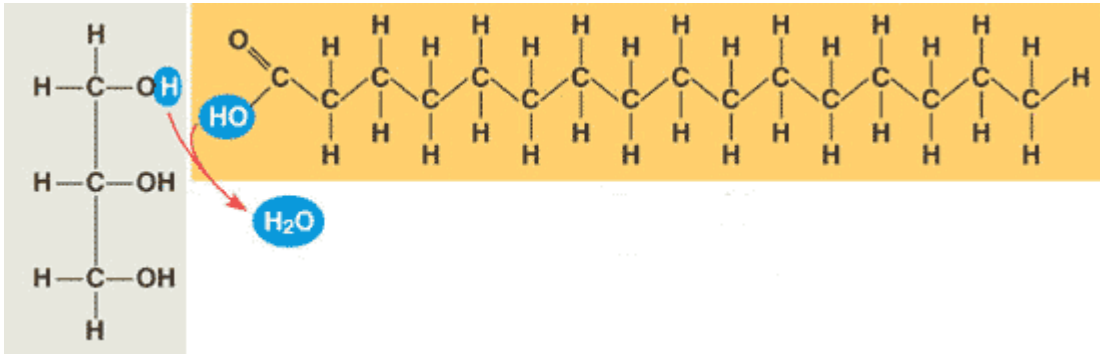
LIPIDS

Lipids

- Group of compounds
  - Little to no affinity to water
    - Hydrophobic
    - Due to nonpolar C-H bonds
      - End of fatty acid chain
- Types
  - Fats
  - Phospholipids
  - Steroids

Fats

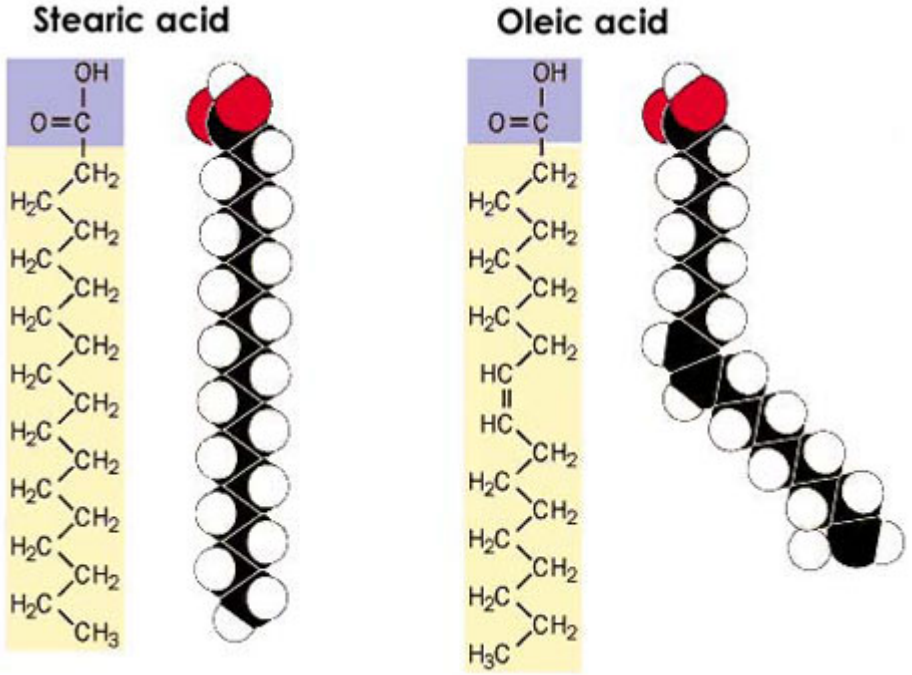
- Function
  - Energy storage
- Large molecules
  - Glycerol + fatty acid



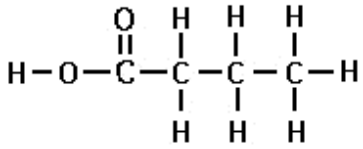
  - Fatty acid “tail” hydrophobic

Fats

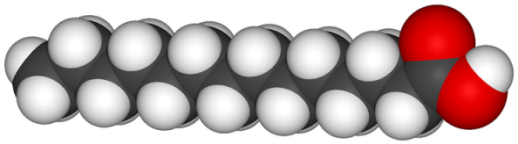
- Saturated fats
  - Solid at room temperature
  - Fatty acid is saturated
    - No double bonds
- Unsaturated fats
  - Liquid at room temperature
  - Double bonds (1+) in fatty acid

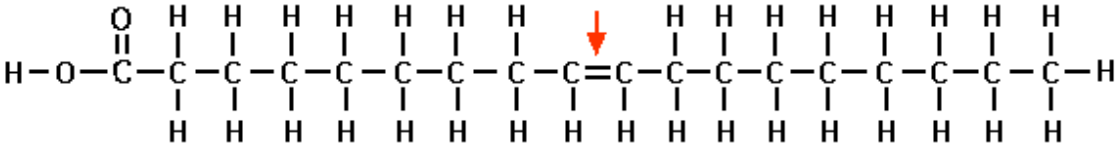


Fats

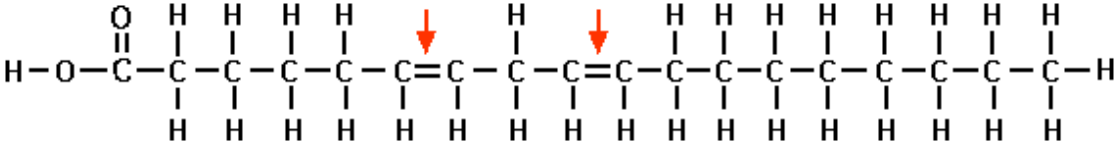


Butyric Acid-Saturated Fatty Acid

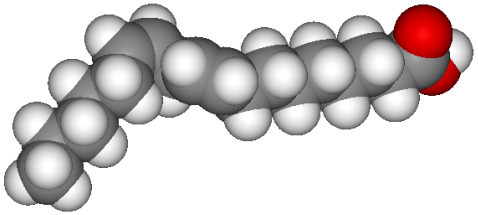




Oleic Acid- Monounsaturated Fatty Acid

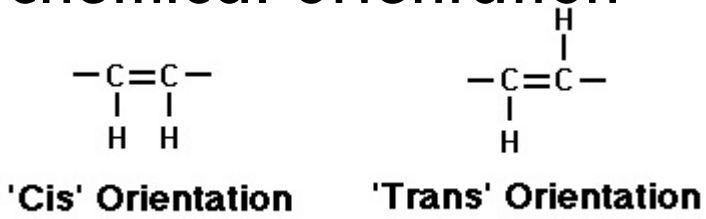


Linoleic Acid- Polyunsaturated Fatty Acid

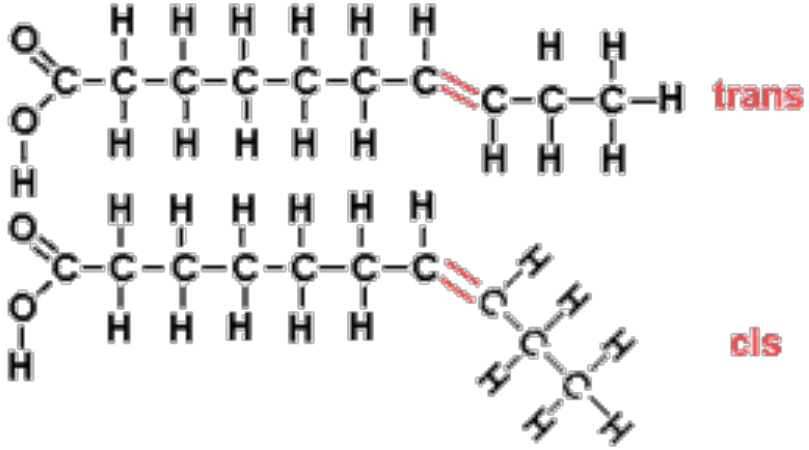


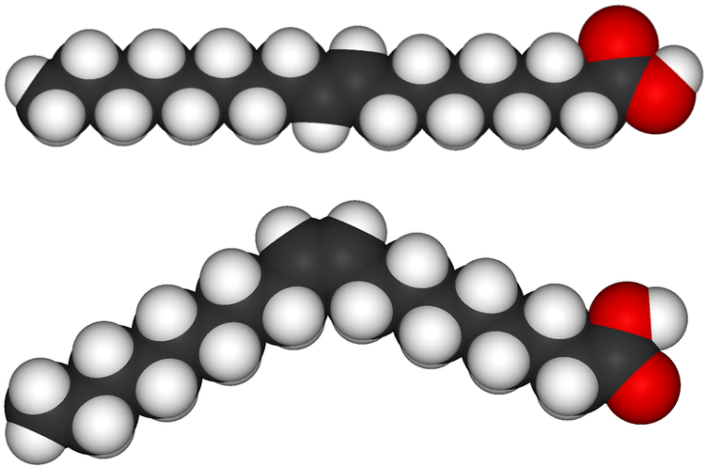
Cis- vs. Trans- Fats

- Differ in chemical orientation



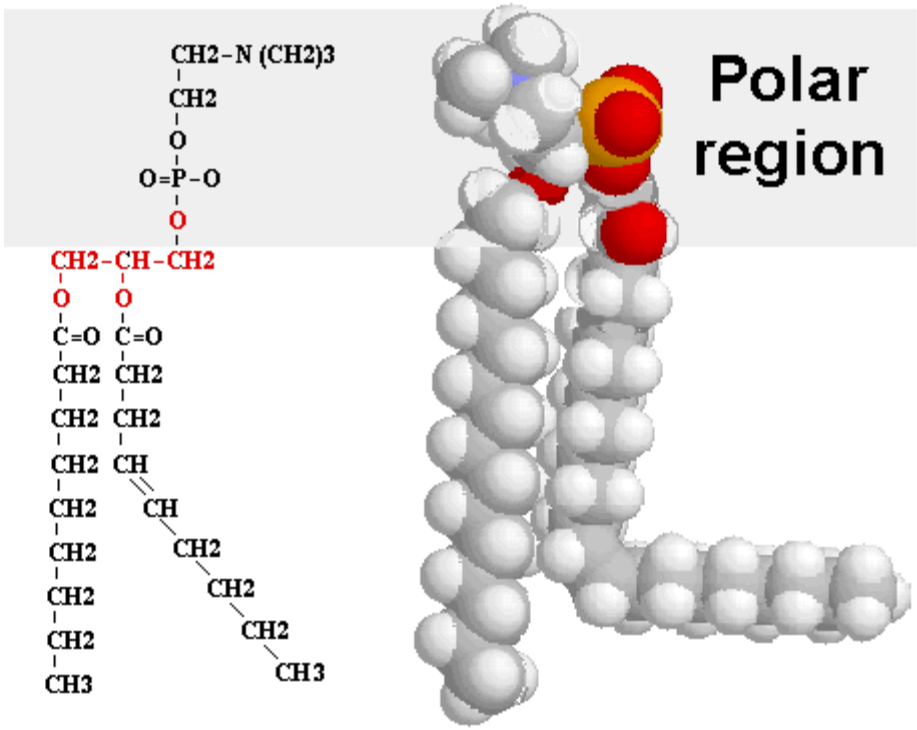
- Unsaturated cis- vs. trans- fats





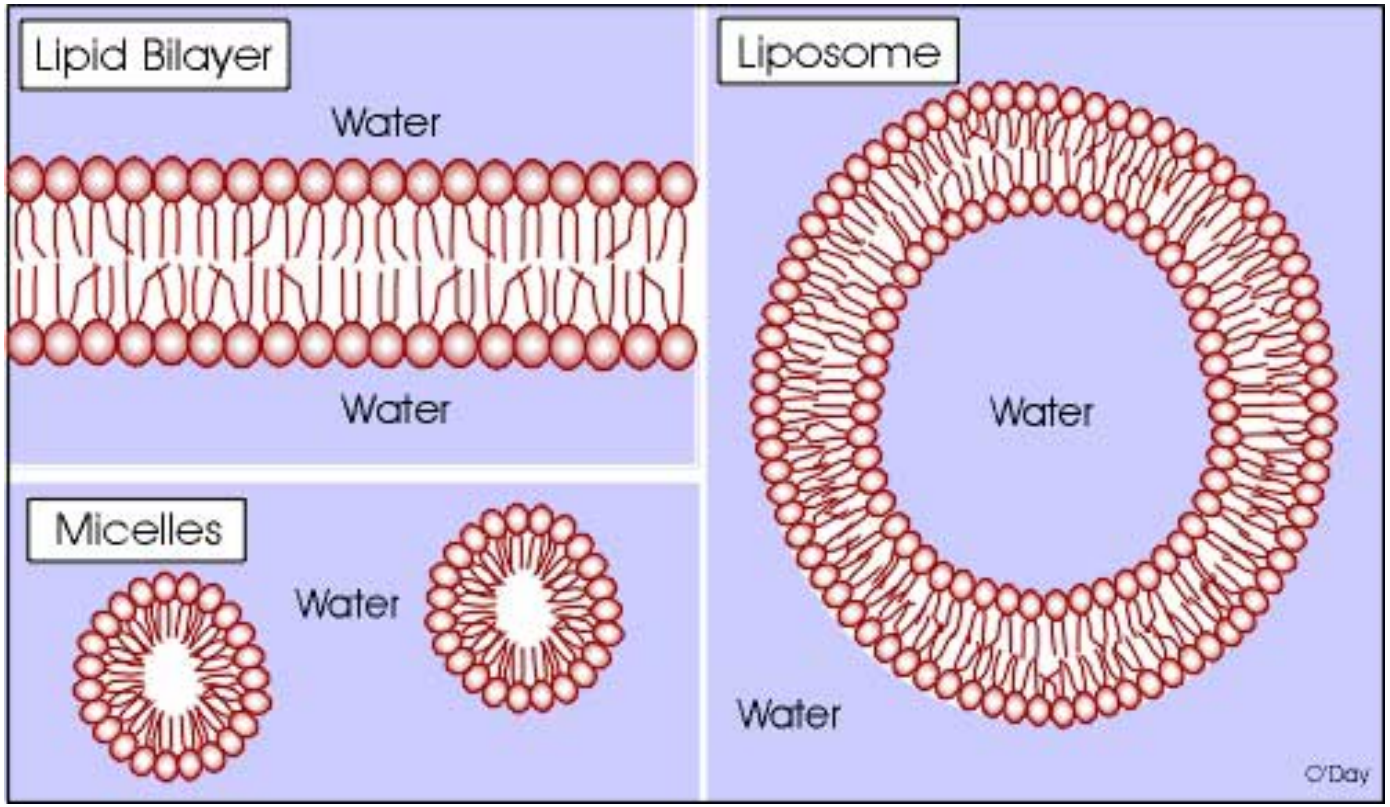
Phospholipids

- Structure
  - Hydrophobic tail
    - 2 fatty acid tails
    - Non-polar
  - Hydrophillic head
    - Due to Phosphate group



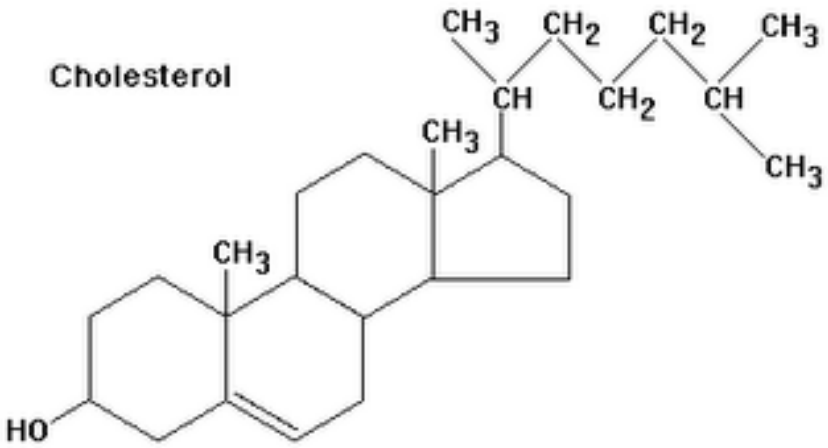
Phospholipids

- Self-assembly in water



Steroids

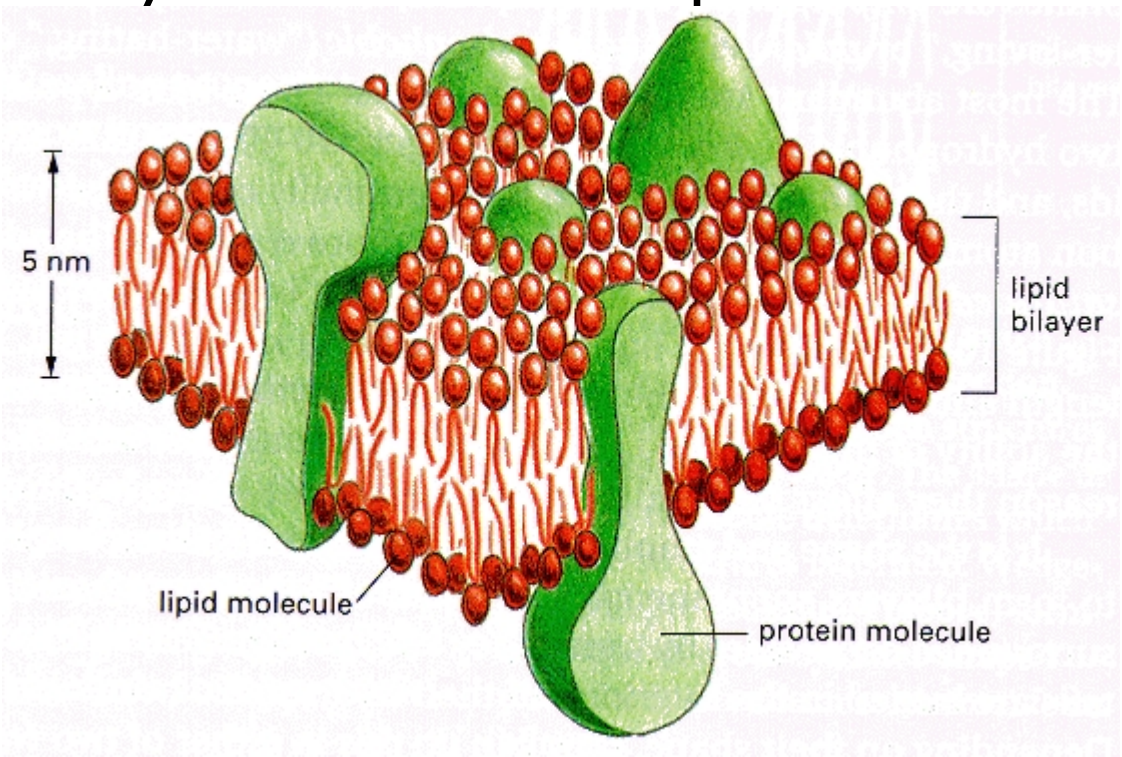
- Structure
  - Carbon skeleton
    - Four C rings
  - Vary by chain



- Cholesterol
  - Precursor for other steroids body uses

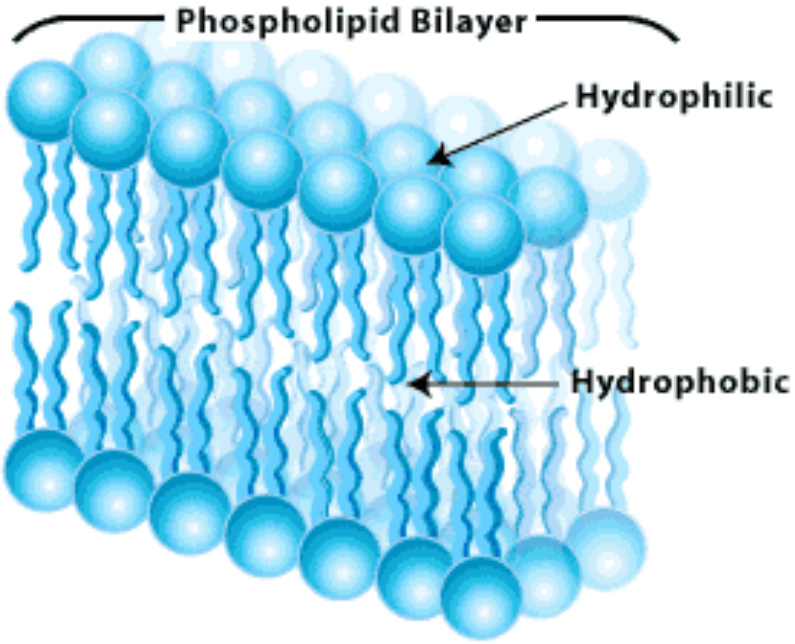
Cell membrane

- Selectively permeable
  - Controls movement of substances
- Lipid Bilayer + embedded proteins



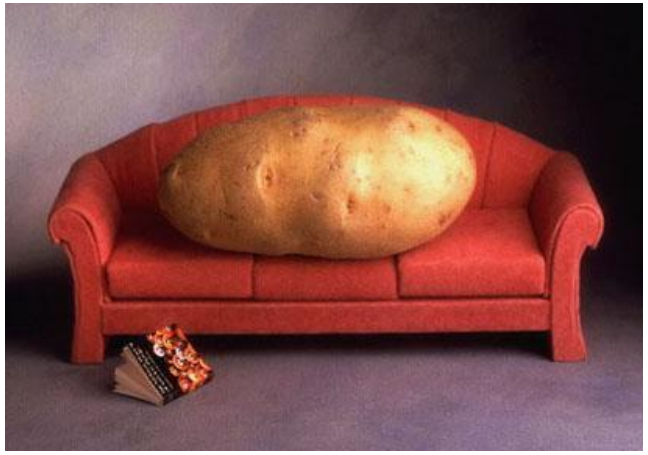
Phospholipid bilayer

- Phospholipid
  - Hydrophilic head
  - Hydrophobic tails
- Bilayer
  - Two layers
- Basic structure of cell membranes



Permeability

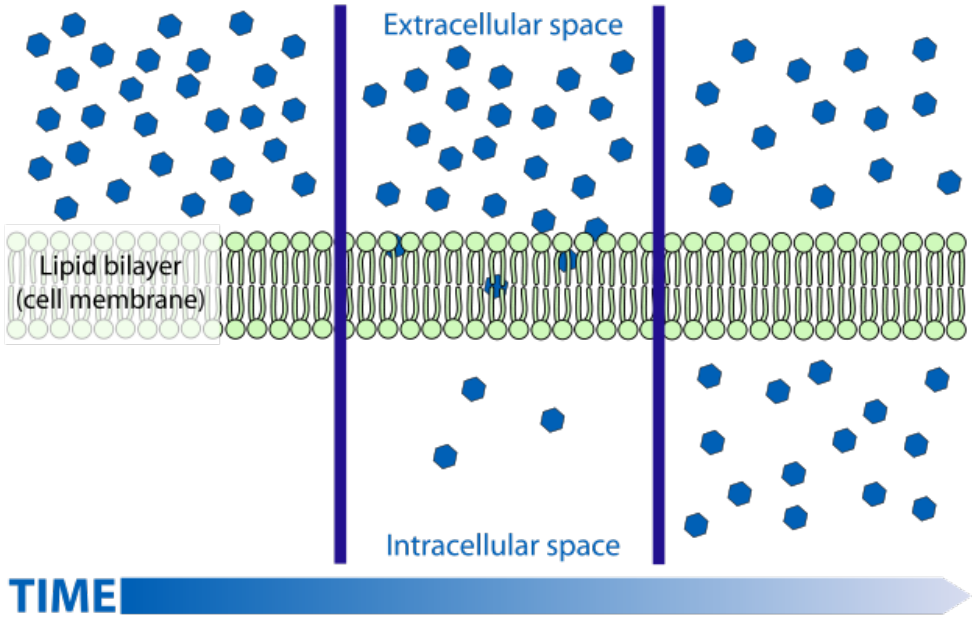
- Passive transport
  - Cross membrane with no energy
  - Movement from high concentration to low



- Active transport
  - Requires chemical energy to cross (ATP)
  - Movement from low concentration to high

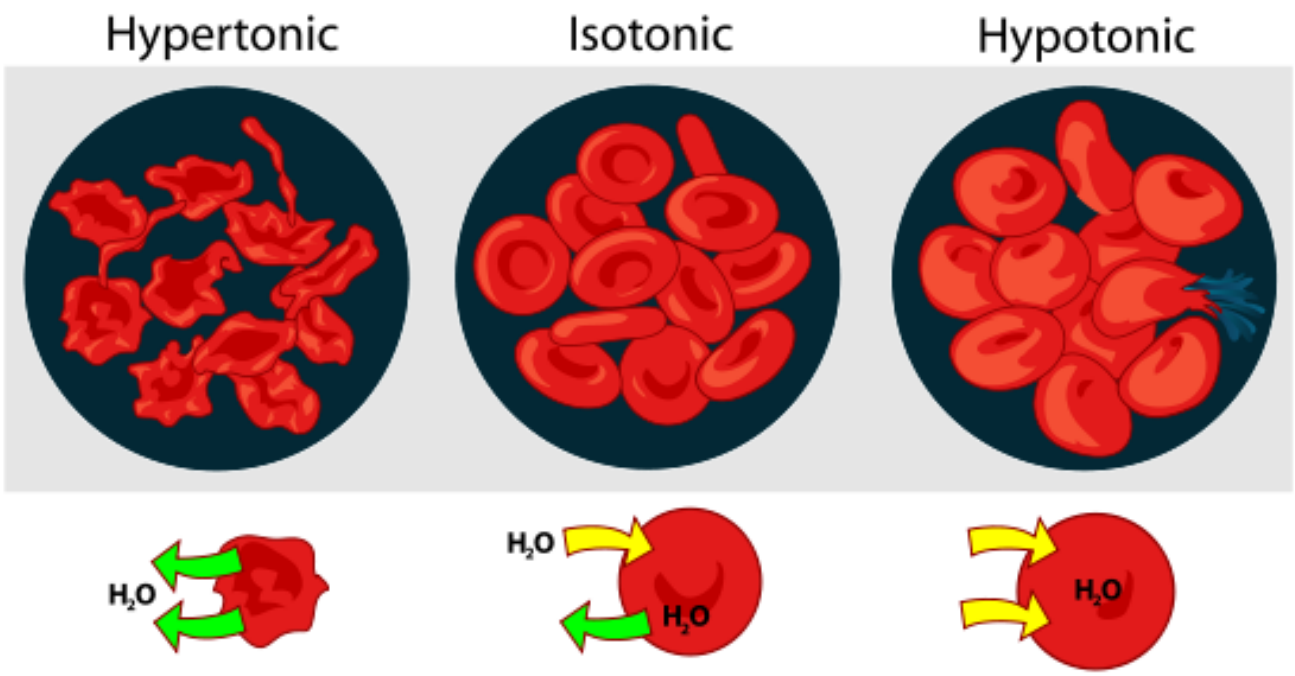
Passive Transport

- Simple diffusion
  - Movement of material from high concentration to low concentration



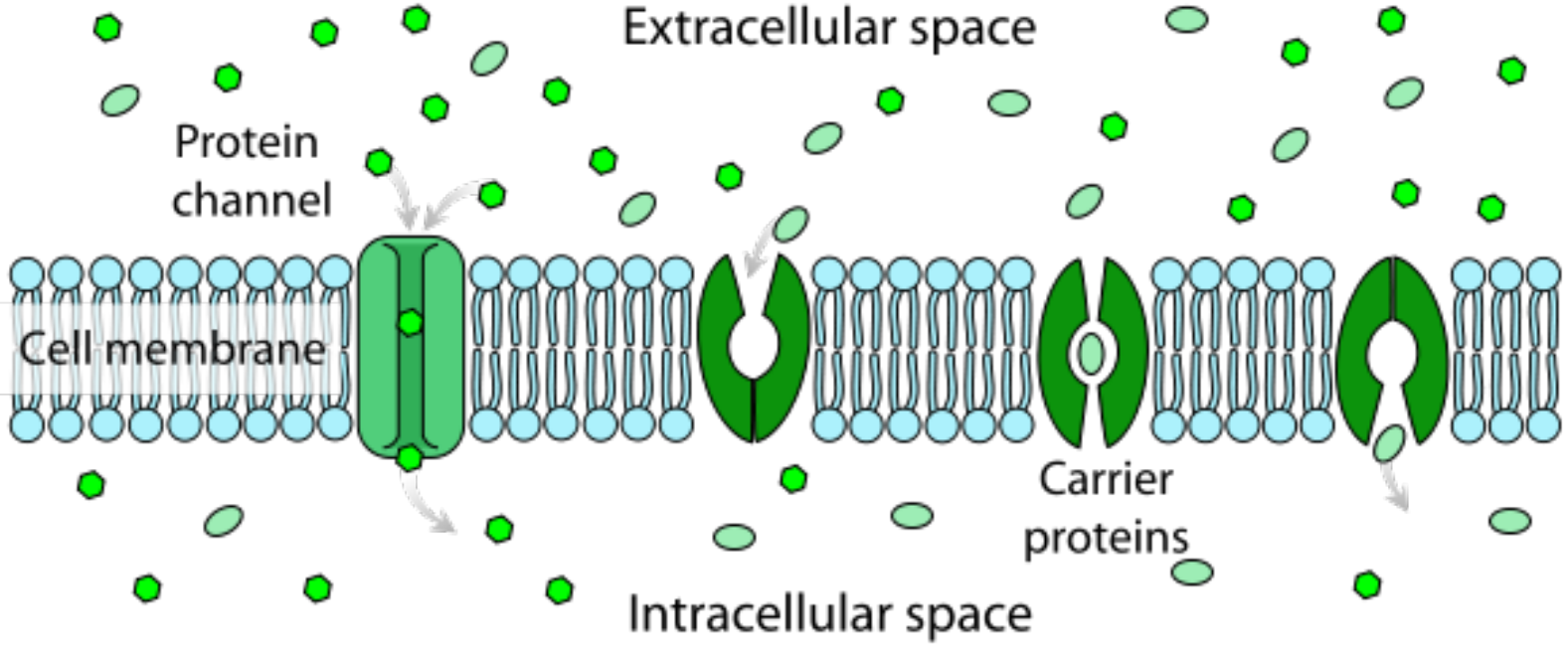
Passive transport

- Osmosis
  - Diffusion of water across membrane



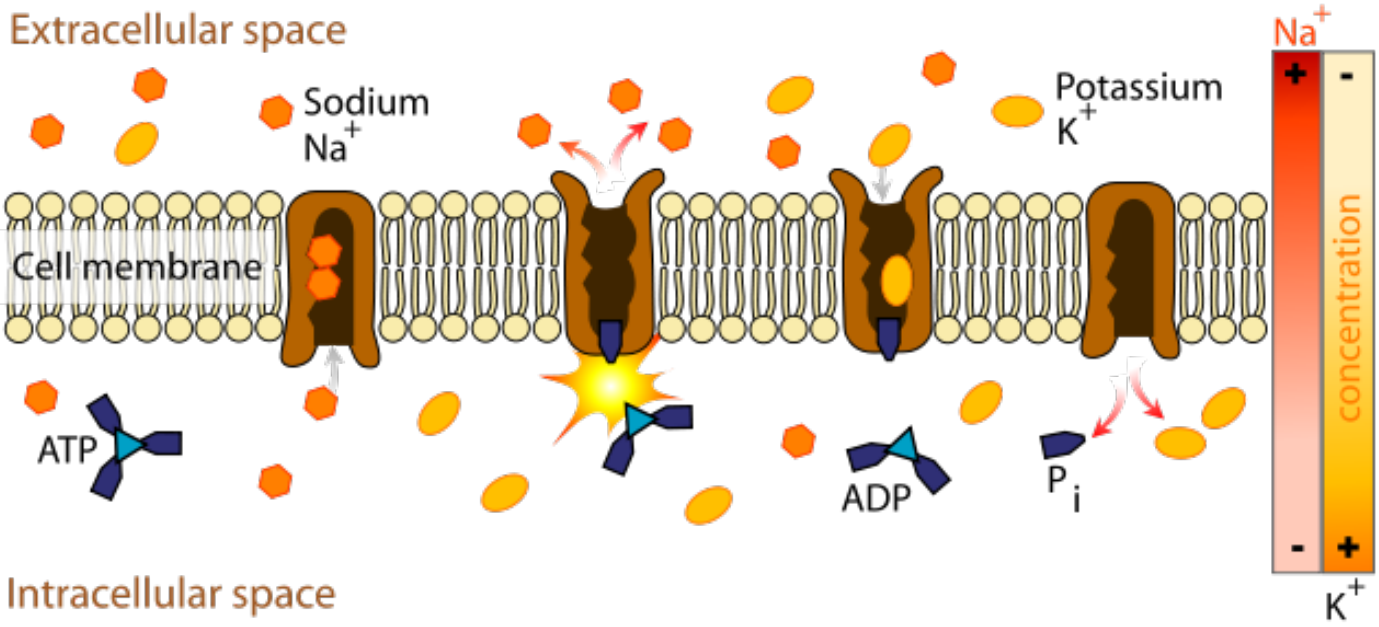
Passive transport

- Facilitated diffusion
  - Movement via transport proteins



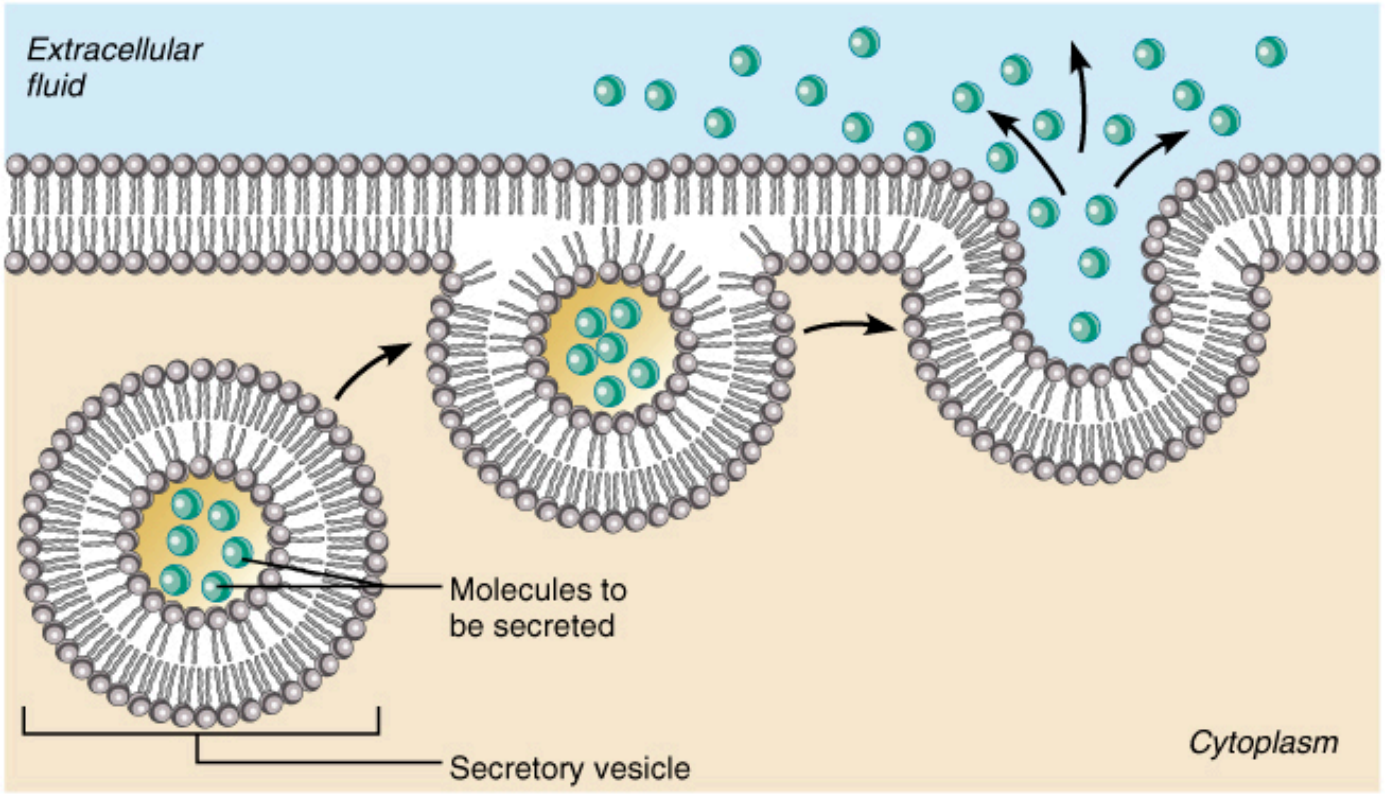
Active transport

- Primary active transport
  - Directly uses energy (ATP) to transport molecules
  - i.e. Sodium-potassium pump



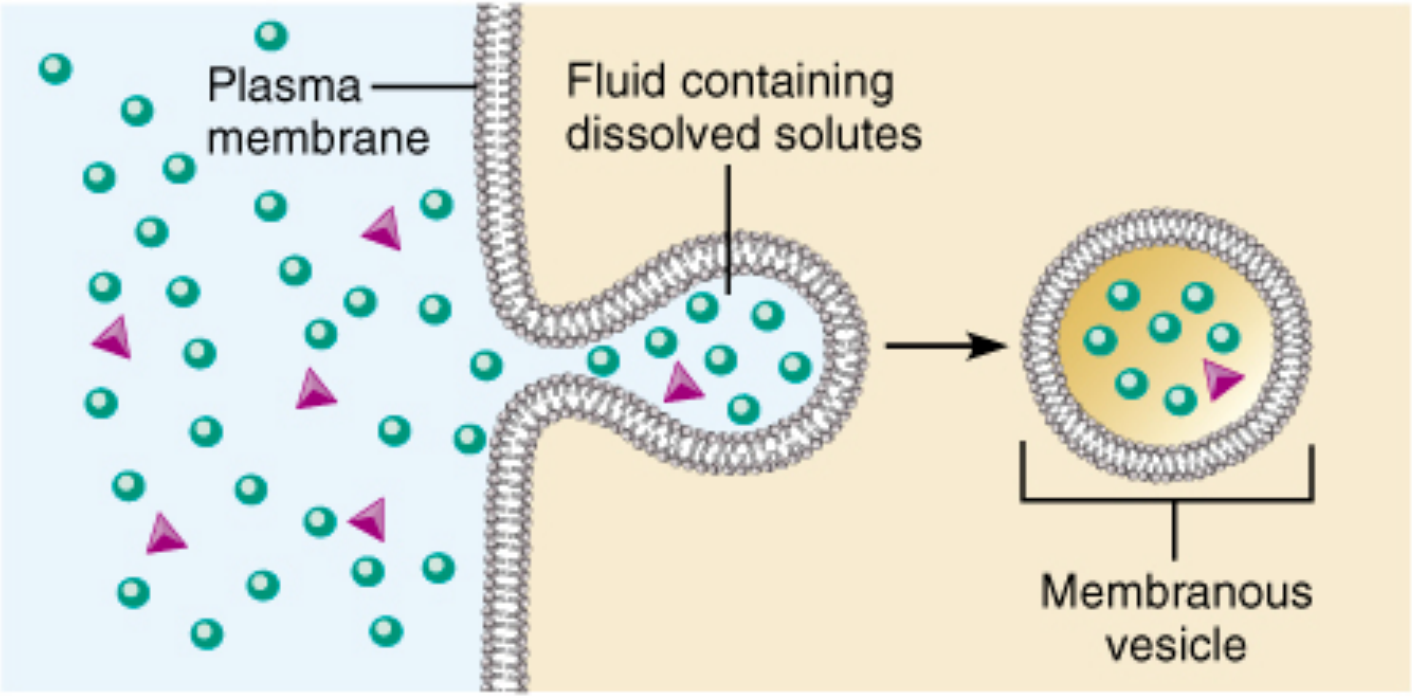
Exocytosis

- Excretion of macromolecules



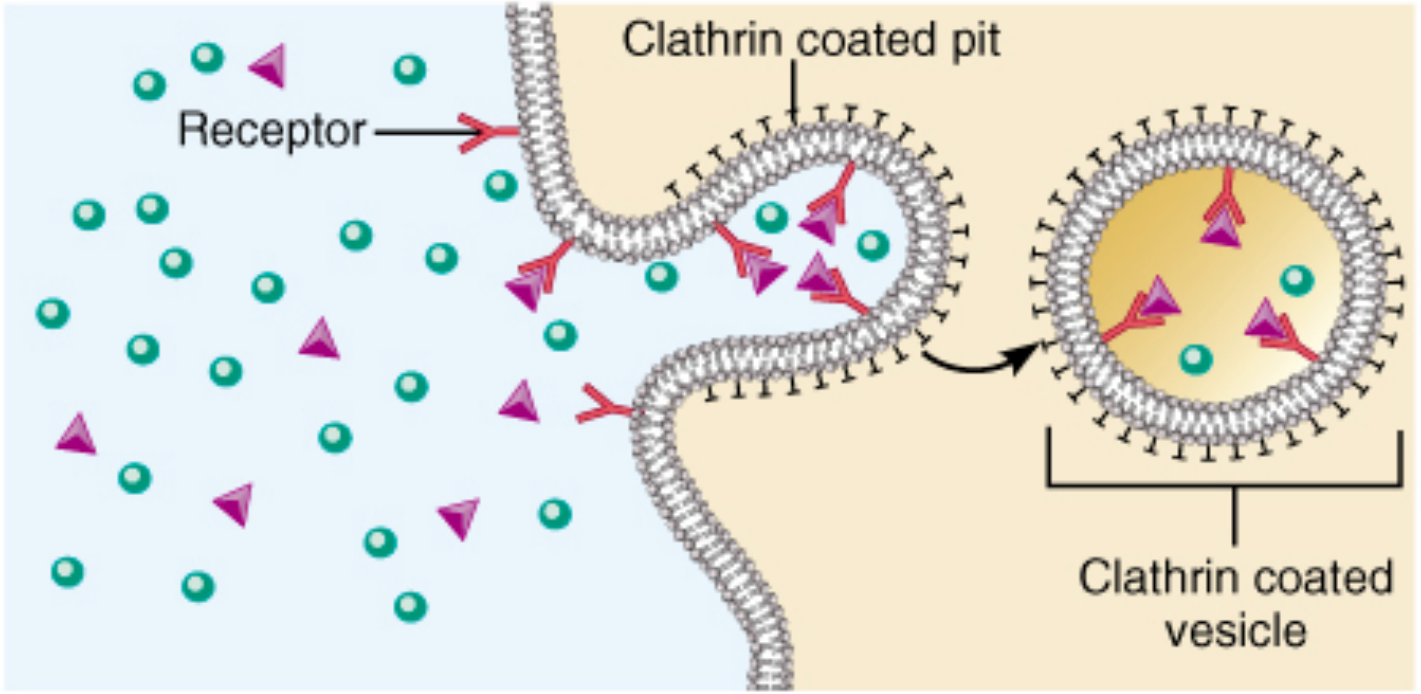
Endocytosis

- Pinocytosis
  - Consumption of dissolved solutes



Endocytosis

- Receptor-mediated endocytosis
  - Receptors bind to specific molecules



The first cell

- 4.0-4.3 billion years ago
- Several theories
  - Meteorites
  - Deep-sea vents
  - Lightning
- RNA assumed be first self-replicating molecule
- Heterotrophs (not able to make own energy)

The first cell

- Cell membranes crucial
  - Phospholipids spontaneously form bilayered vesicles in water
  - Could have preceded RNA