Biological Membranes

• Structure
  – Phospholipid bilayer
  – Membrane Proteins
  – Fluidity

• Transport
  – Diffusion
  • Osmosis
  – Facilitated Diffusion
  – Active Transport
  – Endo/Exocytosis

Phospholipid Bilayer
Backbone of the Membrane
Membrane Proteins

Fluid Mosaic Model of Membrane Structure

3 Types of Membrane Proteins

- Transport Proteins
- Receptor Proteins
- Recognition Proteins
Maintaining Membrane Fluidity

Cholesterol – a fluidity buffer

Caribou Plasma membranes

Cells of lower leg are typically near freezing temperatures in winter

Cells of the upper leg are near 37°C

Predict how caribou might alter saturation levels in phospholipids of different cells to keep the cells functioning across this range of temperatures.
Semi-Permeable Membranes

-Only some molecules can move across the membrane

- Simple Diffusion
  – Osmosis
- Facilitated Diffusion
- Active Transport
- Endo/Exocytosis

Types of Molecules – Small uncharged molecules
Membrane proteins – non required
Direction of movement – with the concentration gradient
Energy – passive – no cellular energy required
Osmosis

- Movement of water across membranes

Types of Molecules – Water
Membrane proteins – non required
Direction of movement – From area of low solute concentration to high solute concentrations
Energy – passive – no cellular energy required
Facilitated Diffusion

Types of Molecules – **Specific** ions, monomer, dimer etc
Membrane Protein – Carrier Protein (or Channels)
Direction of movement – with the concentration gradient
Energy – passive – no cellular energy required

Active Transport

Types of Molecules – **Specific** ions, monomer, dimer etc
Membrane Protein – Membrane Pumps
Direction of movement – against the concentration gradient
Energy – requires cellular energy
Overview of membrane Transport

**Simple Diffusion**
- **Mol**: Small uncharged mol - hydrophobic mol
- **Mech**: dissolve in lipid bilayer - no protein needed
- **Direction**: With Conc Grad
- **Cell Energy**: none
- **Regulation**: none
- **Special**: Osmosis

**Facilitated Diffusion**
- **Mol**: Specific ions - specific hydrophilic mol
- **Mech**: Carrier Protein (Channels)
- **Direction**: With Conc Grad
- **Cell Energy**: none
- **Regulation**: Gated Channels
- **Special**: Specificity

**Active Transport**
- **Mol**: Specific ions - specific hydrophilic mol
- **Mech**: Protein Pumps
- **Direction**: Against Conc Grad
- **Cell Energy**: ATP - Electrochemical Gradient
- **Regulation**: Yes
- **Special**: Specificity

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**Endocytosis**

1. A dimple forms in the plasma membrane, which 2. deepens and surrounds the extracellular fluid. 3. The membrane encloses the extracellular fluid, forming a vesicle.

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Exocytosis

Endocytosis

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