Chapter 7 \ Cellular Structure and Function

Section 1: Cell Discovery and Theory

Section 2: The Plasma Membrane

Section 3: Structures and Organelles

Section 4: Cellular Transport

7.1 Cell Discovery and Theory

The Cell Theory

- All organisms are composed of one or more cells.
- The cell is the basic unit of structure and organization of organisms.
- All cells come from preexisting cells.

Light Microscopes

- Utilizes a series of glass lenses and visible light to magnify an image
- Magnifies images up to 1,000 times the actual size
7.1 Cell Discovery and Theory

**Electron Microscopes**
- Utilizes magnets to aim a beam of electrons at a cell to produce an image
- Magnifies images up to 500,000 times the actual size

**Prokaryotic Cell**
- Simple structure
- Contains a plasma membrane
- Does not contain membrane-bound organelles

**Eukaryotic Cell**
- More complex structure
- Contains a plasma membrane
- Contains membrane-bound organelles

**Plasma Membrane**
- Thin, flexible boundary between the cell and its environment
- Allows nutrients into the cell
- Allows waste to leave the cell
Selective Permeability
- The plasma membrane controls the movement of substances into and out of the cell.

Plasma Membrane
- Controls the amount of a substance entering the cell
- Controls the amount of a substance leaving the cell

Fluid Mosaic Model
- The phospholipid bilayer allows other molecules to "float" in the membrane.

Other Components
- Proteins
- Cholesterol
- Carbohydrates

The plasma membrane is composed of the phospholipid bilayer.
- A phospholipid molecule is composed of a glycerol backbone, two fatty acid chains, and a phosphate group.

Proteins
- Transmit signals inside the cell
- Act as a support structure
- Provide pathways for substances to enter and leave
7.2 The Plasma Membrane

Cholesterol

- Prevents fatty acid tails from sticking together

Carbohydrates

- Identify chemical signals

Plant and Animal Cell Structures

Animal Cell

Plant Cell
Chapter 7

7.3 Structures and Organelles
Chapter 7

7.3 Structures and Organelles

- Nuclear pore
- Nucleus
- Vacuole
- Cell wall
- Vesicle
- Mitochondrion
- Chloroplast
- Ribosomes
- Plasma membrane
- Goli apparatus
- Cytoplasm

http://biology.clc.uc.edu/courses/bio104/cells.htm
Cellular Structure and Function

- One or more per cell
- Spherical shape

Nucleus
- Collective term for cytosol and organelles contained within
- Colloidal suspension
- Cytosol mainly composed of water with free-floating molecules

Cytoplasm

Chromatin
- Contains genetic information
- Composed of DNA
- Forms chromosomes

Nuclear membrane
- Surrounds nucleus
- Composed of two layers
- Numerous openings for nuclear traffic

Nucleolus
- Spherical shape
- Visible when cell is not dividing
- Produces ribosomes

Centrioles
- Paired cylindrical organelles near nucleus
- Involved in cellular division
- Lie at right angles to each other
Chloroplasts
- A plastid usually found in plant cells
- Contain green chlorophyll where photosynthesis takes place

Cytoskeleton
- Composed of microtubules
- Supports cell and provides shape
- Aids movement of materials in and out of cells

7.4 Cellular Transport

Passive Transport
- Movement of particles across the cell membrane without using energy

Three Modes of Passive Transport
- Diffusion
- Facilitated Diffusion
- Osmosis

Diffusion
- Movement of particles from an area of high concentration to an area of lower concentration

Initial Conditions
Low
High
Dynamic Equilibrium
- Reached when diffusion of material into the cell equals diffusion of material out of the cell
- Molecules continue to move, but the overall concentration remains the same.
Facilitated Diffusion

- Movement of materials across the plasma membrane using proteins

Channel Proteins

Carrier Proteins
7.4 Cellular Transport

Osmosis

- Diffusion of water across a selectively permeable membrane

Three Types of Solutions

- Isotonic
- Hypotonic
- Hypertonic

Isotonic Solution

- Water and dissolved substances diffuse into and out of the cell at the same rate.

Hypotonic Solution

- Solute concentration is higher inside the cell.
- Water diffuses into the cell.
### Hypertonic Solution
- Solute concentration is higher outside the cell.
- Water diffuses out of the cell.

### Active Transport
- Movement of particles across the cell membrane using energy

#### Types of Active Transport Pumps
- **Na⁺/K⁺ ATPase pump**
  - Moves three Na⁺ ions out of the cell and two K⁺ ions into the cell
7.4 Cellular Transport

**Endocytosis**
- Process by which the cell surrounds and takes particles into the cell

**Exocytosis**
- Secretion of material out of the plasma membrane