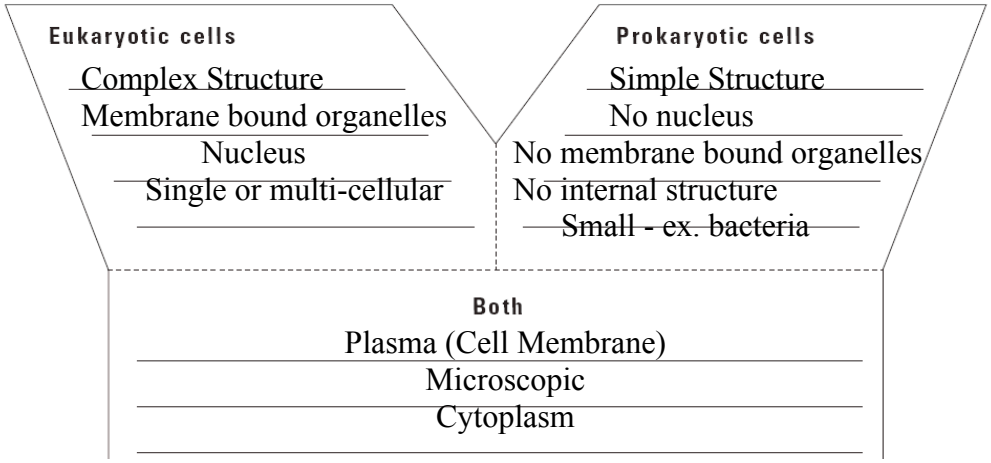
Parts of the Cell/Plasma (Cell) Membrane/Cell Transport Unit
Study Guide

Chapter 7

- Vocabulary - See vocab sheet
- Notes, HW, Labs, Textbook
- Scientists who helped develop the cell theory
    - Hooke - coined the term cells - looks like a room that monks live in
    - Leeuenhoek - first person to use the microscope (looked at water)
    - Schleiden - said that all plants are composed of cells
    - Schwann - conclusion that all animals were made of cells. All living things are made of cells.
    - Virchow - cells have to come from pre-existing cells
- Cell theory: 3 parts
    1. All living organisms are composed of one or more cells.
    2. Cells are the basic unit of structure and organization of all living organisms.
    3. Cells arise only from previously existing cells, with cells passing copies of their genetic material on to their daughter cells.
- Differences between prokaryotic and eukaryotic cells.



- Organelles (their functions, what they look like, what kinds of cells they are in, etc..): mitochondria, chloroplast, nucleus, nucleolus, ribosomes, smooth and rough endoplasmic reticulum, golgi apparatus, flagella, cilia, cytoplasm, centrioles, centrosomes, cell wall, vesicles, vacuoles, lysosomes, cytoskeleton, nuclear pore
- **P. 193 text**

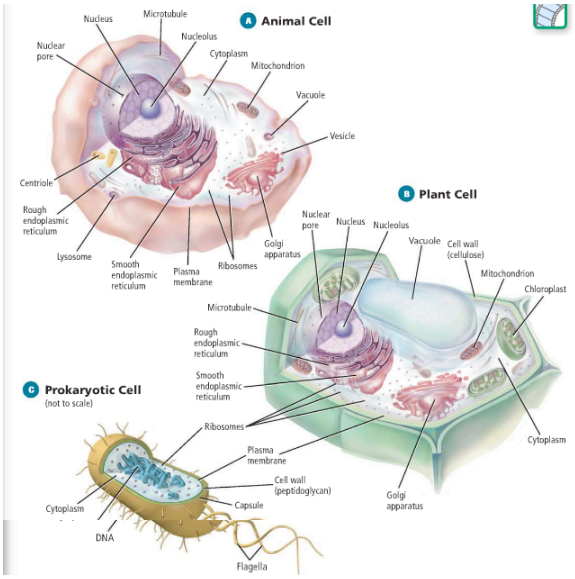
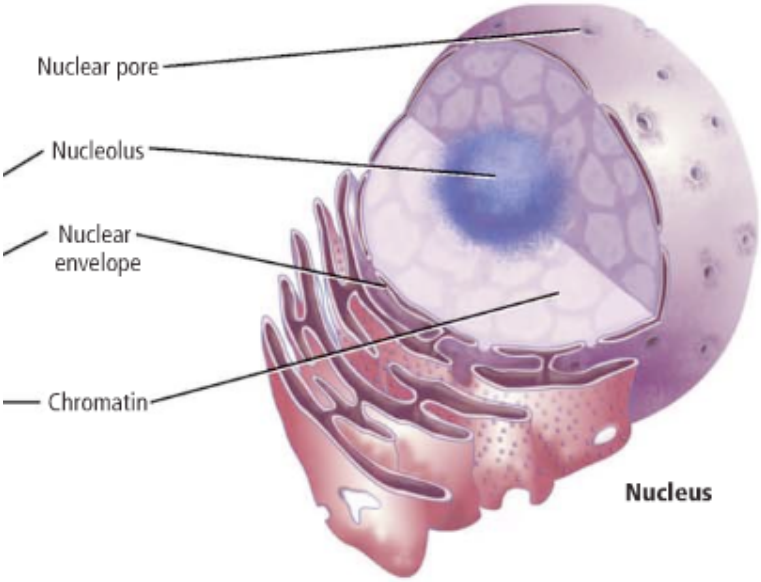


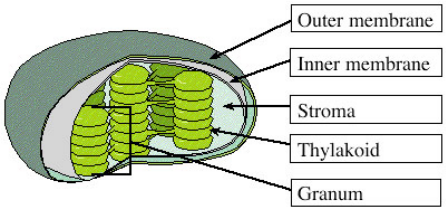
Table 7.1 Summary of Cell Structures

Cell Structure	Example	Function	Cell Type
Cell wall		An inflexible barrier that provides support and protects the plant cell	Plant cells, fungi cells, and some prokaryotes
Centrioles		Organelles that occur in pairs and are important for cell division	Animal cells and most protist cells
Chloroplast		A double-membrane organelle with thylakoids containing chlorophyll where photosynthesis takes place	Plant cells only
Cilia		Projections from cell surfaces that aid in locomotion and feeding; also used to sweep substances along surfaces	Some animal cells, protist cells, and prokaryotes
Cytoskeleton		A framework for the cell within the cytoplasm	All eukaryotic cells
Endoplasmic reticulum		A highly folded membrane that is the site of protein synthesis	All eukaryotic cells
Flagella		Projections that aid in locomotion and feeding	Some animal cells, prokaryotes, and some plant cells
Golgi apparatus		A flattened stack of tubular membranes that modifies proteins and packages them for distribution outside the cell	All eukaryotic cells
Lysosome		A vesicle that contains digestive enzymes for the breakdown of excess or worn-out cellular substances	Animal cells only
Mitochondrion		A membrane-bound organelle that makes energy available to the rest of the cell	All eukaryotic cells
Nucleus		Control center of the cell that contains coded directions for the production of proteins and cell division	All eukaryotic cells
Plasma membrane		A flexible boundary that controls the movement of substances into and out of the cell	All eukaryotic cells
Ribosome		Organelle that is the site of protein synthesis	All cells
Vacuole		A membrane-bound vesicle for the temporary storage of materials	Plant cells–one large; animal cells–a few small



Within the nucleus is the site of ribosome production called the nucleolus. - Found in all cells
Nuclear Pores - allow the movement of substances through it, it allows RNA to leave the nucleus - Found in all cells
Centrosomes - produce microctubles - found in plant and animal cells near the nucleus (round shape)
Vesicles - build lysosomes, pack in large molecules from golgi, transport large objects throughout the cell - Found in all Eukaryotic cells (Small blister like structures)

- Parts of the chloroplast:



  - Stroma - liquid in cholorplast
  - Grana - stack of disks
  - Thylakoid - disk-shaped compartments, where energy from sun is trapped by chlorophyll
- Mitochondria:
  - highly folded inner membrane – why is it there? - provides larger surface area and energy that is stored (through cellular respiration)
- Where cellular respiration occurs? - Mitochondria
- Where photosynthesis occurs? - Chloroplasts

- Differences between plant and animal cells. - Both have a nucleus
    - Plant cells have a rectangular/ square shape, a cell wall, and chloplasts
    - Animal cells have a circular shape and no cell wall

Structure/Organelle	Animal Cells	Plants Cells
Cell Wall		✔
Centrioles	✔	
Chloroplast		✔
Cilia	✔	
Cytoskeleton	✔	✔
Endoplasmic Reticulum	✔	✔
Flagella	✔	✔
Golgi Apparatus	✔	✔
Lysosome	✔	
Mitochondrion	✔	✔
Nucleus	✔	✔
Plasma Membrane	✔	✔
Ribosome	✔	✔
Vacuole	✔ (Small)	✔ (Large)

- Describe the structure of the cell/plasma membrane. (helps control what enters and leaves the cell)
    - 2 layers of phosolipids (bilayer) that mirror each other
    - Cholesterol - keeps it stable, prevents fatty acids from sticking together
    - Transport Proteins - move needed substances or waste materials through the plasma membrane, contributing to the selective permeability of the plasma membrane.
        - Why do some molecules pass through a membrane protein? (See above)
- Carbohydrate Chains - send signals in and out of cell Phospholipids:
    - polar head - facing watery environments that are inside and outside of the cell
    - non-polar tail - inside
    - hydrophilic head - water loving
    - hydrophobic tails - Repelling, tending not to combine with, or incapable of dissolving in water.
- Why are phospholipids arranged as mirror images of each other in the cell membrane? - So that the polar heads can be closest to the water molecules and the nonpolar tails can be farthest away from the water molecules
- Summarize how chemical signals are transmitted across the cell membrane.-**Carbohydrate chains**
- Fluid mosaic model (plasma membrane model) - the phospholipids create a "sea" in which other molecules can float. This "Sea" concept is the basis for the model.
- Selective permeability - a key property of the plasma membrane by which a membrane allow some substances to pass through while keeping others out.
- How many layers are there in the plasma/cell membrane? - **2**

- Concentration gradient - difference in concentration across a space

- Active transport: against the concentration gradient (low to high); requires energy (ATP)
- Passive transport: with the concentration gradient (high to low), not using energy

- Describe passive transport. - movement of particles across the cell membrane **without using energy.**
    - Distinguish between three types of passive transport: simple diffusion, facilitated diffusion and osmosis.
        - Simple diffusion - the net movement of particles from an area of higher concentration to an area of lower concentration. (Controlled by temp, press., and concentration)
            - Dynamic equilibrium is reached when the diffusion of material into the cell equals the diffusion of material out of the cell
        - Facilitated diffusion - movement of materials across the membrane using proteins
    - Osmosis - diffusion of water across a selectively-permeable membrane
    - Solutions:
        - **Isotonic -** water and dissolved substances diffuse into and out of the cell at the same rate

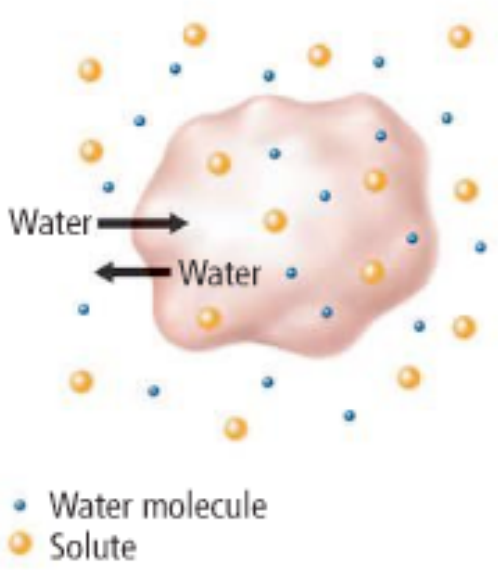


Figure 7.23 In an isotonic solution, water molecules move into and out of the cell at the same rate, and cells retain their normal shape. The animal cell and the plant cell have their normal shape in an isotonic solution.

        - **Hypotonic -** solute concentration is higher inside the cell, water diffuses into the cell

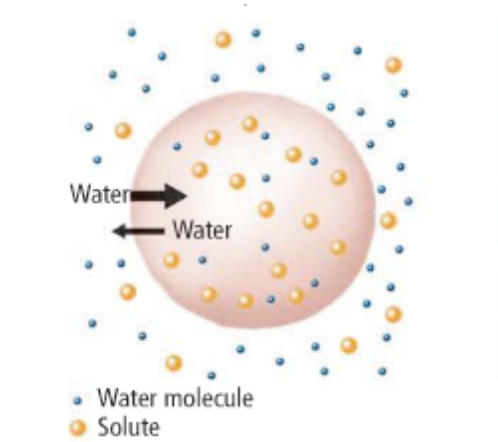


Figure 7.24 In a hypotonic solution, water enters a cell by osmosis, causing the cell to swell. Animal cells may continue to swell until they burst. Plant cells swell beyond their normal size as internal pressure increases.

- **Hypertonic -** solute concentration is higher outside the cell, water diffuses out of the cell

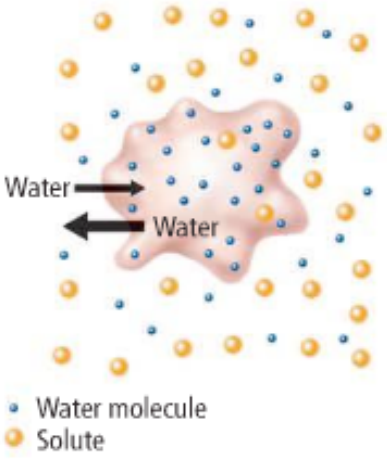


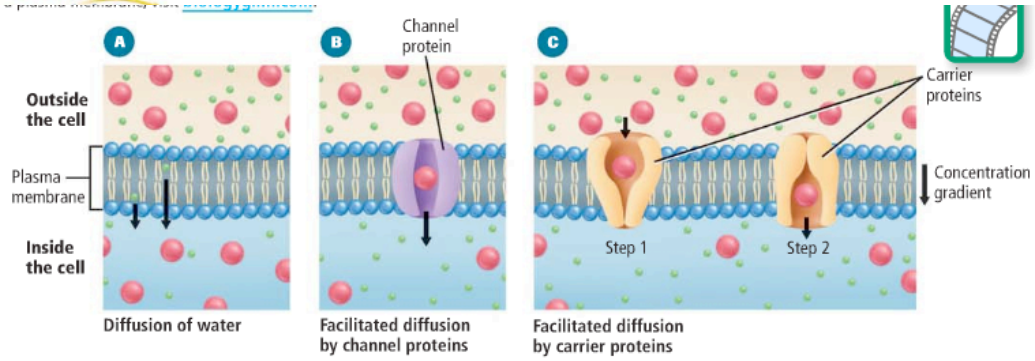
Figure 7.25 In a hypertonic solution, water leaves a cell by osmosis, causing the cell to shrink. Animal cells shrivel up as they lose water. As plant cells lose internal pressure, the plasma membrane shrinks away from the cell wall.

- What happens to a cell (animal and plant) in each of those solutions?
  - Isotonic - normal shape
  - Hypotonic - animal: may swell until it bursts plant: swell beyond normal size as press. increases.
  - Hypertonic - animal: shrivel up as they lose water plant: as lose int. press., the plasma membrane shrinks away from the cell wall

- Describe active transport. - the movement of particles from low concentration to high concentration, which is against the concentration gradient, using transport proteins
  - Distinguish between endocytosis and exocytosis.
    - Endocytosis - process by which the cell surrounds and takes particles **into** the cell
    - Exocytosis - secretion of material **out** of the plasma membrane
- Different types of endocytosis:
  - Phagocytosis - engulfing of large or small molecules by sudopods (fake feet)
  - Pinocytosis - cell drinking: uptake of large molecules (some type of liquid)
  - Receptor mediated endocytosis - takes up large quantities of specific substances - takes extracelluar substance into cell.
- How are endocytosis and exocytosis different than regular active transport? How are they different from diffusion? - Used when the substances are too large to move by diffusion or transport proteins

- Transport proteins:

Figure 7.21 Although water moves freely through the plasma membrane, other substances cannot pass through the phospholipid bilayer on their own. Such substances enter the cell by facilitated transport.



- carrier - change shape as the diffusion process continues to help move the particle through the membrane
- channel - opens and closes to allow the substance to diffuse through the plasma membrane

- How are pumps different from channels? - Pumps are enzymes that catalyze the breakdown of an energy-storing molecule. The **Na^+/K^+ ATPase** pump (sodium potassium) moves three Na out of the cells and two K into the cell. The high level of sodium creates a concentration gradient.