Biology 10 - Introduction to Biology
West Valley College - Norris

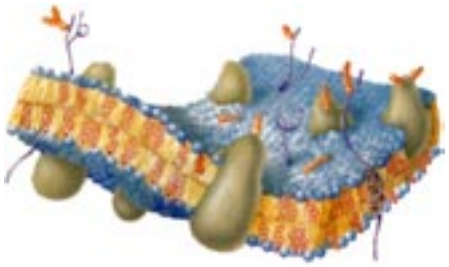
Cell Structure & Function

I. Definitions
  A. Cell

II. Basic Features of Cells
  A. Structural Divisions
    1. Plasma Membrane
    2. Cytoplasm
    3. Region of DNA
  B. Size Restrictions

III. Diversity of Cells
  A. Prokaryotic cells (before the nucleus)
  B. Eukaryotic cells (true nucleus)

IV. Eukaryotic Cells (note: animal cell used as a model of general cell structure)
  A. Membranes - plasma membrane encloses cell
    - internal membranes compartmentalize the cytoplasm
    1. Membrane Structure
      a. Phospholipids
      b. Proteins
      c. Other common membrane components
      d. Cell Junctions
        i. desmosomes
        ii. tight junctions
        iii. gap junctions



    2. Membrane Function (generalized)
    3. Methods of Transport Across Membranes
      a. passive transport (does not require energy from the cell)
        i. Simple Diffusion

Diffusion - *the net movement of molecules or ions from a region of high concentration to a region of low concentration until equilibrium is reached*

        ii. Facilitated Diffusion
        iii. Osmosis

Osmosis - *the net movement of solvent (water) across a selectively permeable membrane from a region of low solute (high solvent) concentration to a region of high solute (low solvent) concentration towards equilibrium*

b. active transport (energy is required from the cell in the form of ATP)

B. Organelles - "little organs"

1. Membrane Bound Organelles
   a. Mitochondria

   b. Endoplasmic Reticulum (ER)
      i. rough endoplasmic reticulum (RER)

      ii. smooth endoplasmic reticulum (SER)

   c. Golgi Apparatus (aka Golgi body)

   d. Vesicles (many types)
      i. transport & secretory vesicles

      ii. lysosomes & peroxysomes

2. Free organelles (no membrane)
   a. Ribosomes

   b. Cytoskeleton
      i. microfilaments
      ii. intermediate filaments
      iii. microtubules

   b. Centrioles (centrosome)

C. Other Cellular Structures / Organelles

1. Specialized Animal Structures / Organelles
   a. Extracellular Matrix

   b. Microvilli, Cilia and Flagella

2. Specialized Plant Structures / Organelles
   a. Chloroplast

   b. Central Vacuole
   c. Cell Walls

D. Nucleus

1. Nuclear Envelope
2. Nucleoplasm (w/ chromatin)

3. Nucleolus

V. Additional Selected Key Terms

ATP concentration gradient diffusion endocytosis exocytosis eukaryotic osmosis prokaryotic vesicle

Study Questions – Cell Structure & Function:

1. What is a cell? What is the significance of the cell to living things?.
2. What are the three divisions of the cell that are commonly visible under the light microscope?
3. Why are cells small? Some cells are not small, how is this possible (provide two different explanations)
4. Compare and contrast "prokaryotic" and "eukaryotic" cells. What do these terms mean? What are some examples of each of these cell types?
5. Describe the structure and characteristics of phospholipids. How do phospholipids interact with water and each other?
6. Describe the relationship between phospholipids and the structure of cell membranes.
7. Describe how membrane proteins fit into the membrane.
8. List and describe the different functional types of membrane proteins. What do they do?
9. What other components make up the cell membrane? Describe the overall structure of the cell membrane. Identify all of the components and their orientation in the membrane.
10. What is the overall function of the cell membrane?
11. Describe the three different types of cell to cell junctions. What structural and functional characteristics destinguish each type?
12. Compare and contrast "passive" and "active" membrane transport.
13. Define "diffusion". Describe the factors that influence the rate of diffusion?
14. Describe the different forms of passive membrane transport.
15. How do cells regulate the diffusion of ions & molecules?
16. Define "osmosis".
17. Explain how "hypertonic", "isotonic" and "hypotonic" solutions will effect the cell.
18. Define "active transport". What do cells use active transport for?
19. Name and describe all of the membrane bound organelles in the cell.
20. Describe the structure and function of mitochondria.
21. Describe the structure and function of the two types of endoplasmic reticulum.
22. Describe the structure and function of the Golgi apparatus.
23. Describe the different types of vesicles. Explain how proteins made in the RER are secreted by exocytosis (identify all of the cellular structures involved).
24. Name and describe all of the free organelles in the cell.
25. Describe the structure and function of ribosomes.
26. Describe the structure and function of the centrioles.
27. Describe the different fiber types that make up the cytoskeleton and the function of each.
28. What is the extracellular matrix?
29. Compare and contrast microvilli, cilia and flagella.
30. What specialized structures are typically found in plants but not animal cells? Describe each.
31. Describe the structure of the nucleus.
32. Explain the different ways the "genetic material" in the nucleus may be described or named under different conditions.

"Perfect as the wing of a bird may be, it will never enable the bird to fly if unsupported by the air. Facts are the air of science. Without them a man of science can never rise."
Ivan Pavlov (1849 - 1936)