**CELLS Notes**

**The basic living, structural, and functional unit of all organisms**

**Basic Cell Structure (p. 62 text; p. 67 lab)**

Cell (Plasma) Membrane

Cytosol

Organelles

Nucleus

**Basic Cell Structures**

**I. Cytosol (p.62)-** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

75% - 95% \_\_\_\_\_\_\_\_\_\_

May contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, large carbohydrates, \_\_\_\_\_\_\_\_, and protein molecules

**Function of Cytosol**

1. Location of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (anaerobic energy metabolism)

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of cellular substances

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of chemicals for transport

4. Facilitates\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of waste material

**II. The Cell (Plasma) Membrane(p. 63-66) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**A. Structure of the Cell Membrane**

Sketch phospholipid bilayer & label heads and tails:

Phospholipid bilayer

Hydrophilic phosphoric heads face outward

Hydrophobic fatty acid tails face inward

Carbohydrates assist in cell identification/communication

Cholesterol increases strength of cell membrane

**B. Cell Membrane Proteins**

\_\_\_\_\_\_\_\_\_proteins are proteins embedded in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Transport proteins are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Receptor sites for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. enzymes
4. cellular identity markers

\_\_\_\_\_\_\_\_ Proteins are loosely bound to plasma membrane but their function is not completely understood

**C. Functions of the Cell Membrane**

a. Flexible \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. Facilitates contact with other cells and environment

c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sites - hormones, enzymes, neurotransmitters, nutrients, antibodies

d. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - mediates entrance and exit of material into and out of cell.

**D. Factors Influencing Permeability of Plasma Membrane**

Size of molecules

Solubility in lipids

Charge on ions

Presence of carrier molecules

**E. Movement Across the Cell Membrane**

1) Intracellular Fluid- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Comprises > \_\_\_\_\_\_% of body’s total water

Mostly water but may also contain potassium, phosphates, magnesium, chloride, and other ions

2) The Extracellular Environment

a. Interstitial Fluid (Intercellular Fluid)- Fluid found in the microscopic spaces\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells

b. Plasma- Extracellular fluid within \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ vessels

3) Movement Across the Plasma Membrane (p. 68-73)

a. Passive Processes

\_\_\_\_\_\_ energy expenditure

Moves down a concentration gradient

\_\_\_\_\_\_\_\_ →\_\_\_\_\_\_\_\_\_\_ concentration

b. Active Processes

\_\_\_\_\_\_\_\_\_\_ energy expenditure

Moves \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a concentration gradient

\_\_\_\_\_\_→ \_\_\_\_\_\_\_\_ concentration

May utilize 40% of cells\_\_\_\_\_\_\_\_ supply

**Passive Transport** includes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Diffusion-** The movement of molecules from a \_\_\_\_\_\_\_\_\_\_ concentration to a \_\_\_\_\_\_\_\_\_\_\_\_concentration. Does not require\_\_\_\_\_\_\_\_\_\_\_\_\_\_.Ex: perfume, electrolytes
2. **Osmosis** is the diffusion of water

Effects of Osmosis- Describe what happens to a RBC in each solution (p.70; Fig3.9 p.72)

Isotonic Solutions - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hypotonic Solutions- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hypertonic Solutions- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Facilitated Diffusion-** the process of diffusion through the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the cell membrane.Ex: glucose
2. **Dialysis-** the diffusion of small solute particles through a selectively permeable membrane resulting in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ solutes. Example: Kidney dialysis
3. **Filtration-** the process of removing particles from a solution by \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. It is influenced by gravity and hydrostatic pressure. Example: Filtration in the glomerulus of the kidney nephron.

**Active Transport Processes (p. 73-79)**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs when the molecules are too big to enter the cell by diffusion or active transport, a vesicle is formed from the cell membrane. Example: Phagocytosis or cell eating. Endo= “Into”

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-Any remaining particles from phagocytosis may be expelled from the cell when the vesicle joins with the cell membrane and the contents are removed from the cell. Exo= “Exit”

**Active Transport**

* Uses energy
* Ions move against a concentration gradient

**Na+/K+ pump**

* Estimated 40% ATP use in the body

**Cytosis (Bulk Transport)**

1. Endocytosis(p. 77)

* Phagocytosis - cell eating
* Pinocytosis - cell drinking
* Receptor mediated endocytosis

1. Exocytosis

**Cell Structures= Nucleus and Organelles**

**I. Nucleus (p. 91-93)-** The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the cell

* Usually the largest structure in the cell
* Contains genetic information
* Controls cellular function and structure

***Nuclear Structures***

* Nuclear Membrane
* Nucleoplasm
* Nucleolus- site of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ synthesis
* Genetic Material (DNA)
* Chromatin contains DNA in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form (cell is not dividing)
* Chromosomes contains DNA in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structures (cell is reproducing)

**II. Organelles-** Specialized structures and portions of the cell with characteristic shapes that assume specific roles:

* growth
* repair
* maintenance
* control of cellular functions

***Organelles and Structures- Know these structures & their functions; Be able to label them on a diagram(Chart p. 94-96; Diagram p. 62 text and p. 67 lab)***

Ribosomes Microtubules

Endoplasmic Reticulum (smooth & rough) Centrioles

Golgi Complex (Golgi Body) Centrosomes

Mitochondria Flagella

Lysosomes Cilia

Vacuoles Microvilli

Peroxisomes

Microfilaments

**Organelles/ Structures**

**I. Ribosomes (p. 84)** - Sites of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by assembling the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the correct order.

* Appear as small, round, granular structures within the cell
* Made up of special type of RNA called ribosomal RNA (rRNA)

**II. Endoplasmic Reticulum (p. 84-85) -** Double membranous channels which are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Granular (Rough) Endoplasmic Reticulum**

* studded with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* site of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Agranular (Smooth) Endoplasmic Reticulum**

* free of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* site of\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Functions of Endoplasmic Reticulum

* Mechanical support and distribution of cytoplasm
* Surface area for chemical reactions
* Intracellular transport system
* Storage of synthesized molecules
* Protein (RER) and lipid (SER) synthesis
* Detoxification of certain molecules
* Release of calcium ions in muscles

**III. Golgi Complex (Golgi Body) (p. 85-86)** - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and delivers proteins to various parts of the cell

* Flattened membranous sacs (4 - 8) stacked upon one another
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of lipid (fat) molecules from the cell

**IV. Mitochondria (p. 83-84) -** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the cell

* Small, spherical or rod-shaped structures
* Sites of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + conversion of glucose and lipids to ATP
  + aerobic energy metabolism

**V. Lysosomes (p. 86-87)-** Nicknamed “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”

* Small membrane enclosed spheres of digestive enzymes
* Intracellular digestion
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the process by which old worn out organelles are digested
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the process by which lysosomes digest themselves

**VI. Vacuoles-**  Used to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ digested cellular food or water

* Fluid filled organelles enclosed by a membrane

**VII. Peroxisomes (p. 86)**- Similar to lysosomes but much\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Usually found in the liver and kidney
* Must have metabolic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ present to function properly
* Role in detoxifying molecules (alcohol)

**VIII. The Cytoskeleton (p. 88-89)-** Complex \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that consists of small lattice-like or web-like structures

* Provides support and maintains shape of the cell
* Provides organization for chemical reactions
* Assists in transport of substances through the cytosol

**Structures of the Cytoskeleton**

A. Microfilaments are rod-like, variable length - Actin and Myosin in muscles

B. Microtubules are straight cylindrical structures

C. Intermediate Filaments provide structural support and framework

\*\*Microfilaments, Microtubules, and Intermediate Filaments make up the Microtrabecular Lattice

**IX. Centrioles (p. 89)-** A pair of cylindrical structures located within the centrosome which serves as \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ during cell division (mitosis)

**X. Centrosomes (p. 89)**- Dense area of spherical cytoplasm generally located \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**XI. Modifications of the Plasma Membrane (p. 90-91)**

Microvilli- folds in the cell membrane ; increase \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for absorption of nutrients

Cilia- slender projections of the cell membrane; \_\_\_\_\_\_\_\_\_\_substances across surface of the cell

Flagellum- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ projection; used for cellular locomotion

**Cell Division (Mitosis) (p. 96-98)-**Process by which cells reproduce themselves

* Results in increased number of cells or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Nuclear Division
  + Somatic (BODY) cell nuclear division (MITOSIS)
  + Sex cell (EGG or SPERM) nuclear division (MEIOSIS)
* Cytoplasmic Division or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Results of Mitosis- Formation of \_\_\_\_\_\_\_\_\_ new daughter cells with\_\_\_\_\_\_\_\_\_\_\_\_\_\_ genetic make-up of parent cell

**Mitosis Overview (Fig 3.3 p. 100-101 overview)**

**Interphase (p. 96)**

* metabolic phase - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cell division
* replication of chromosomes
* replication of centrioles
* time - highly variable from: non existent to years; normally about 18 to 24 hours

**Meiosis (p. 98)-** results in the production of sex cells or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Cytokinesis (p. 98)**- division of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_