Human Physiology

- Physiology – how an organism works
    - Ions and proteins
    - Systems
- Integration of
    - Anatomy, Biology, Chemistry, and Physics

Three Critical Equations

- ATP <--> ADP +Pi + energy
    - Our currency to get things done
- Glucose +O2 +ADP +Pi → ATP+ CO2 +H2O +Heat
    - Our job to make the most currency
- CO2+ H2O <--> HCO3- + H+
    - Aiding transport, but creating a pH issue

Body Organization

- Cell: identical genetic info (mitosis)
    - Unspecialized → specialized (freshman)
        - = Differentiation
    - Undifferentiated → differentiated
- 4 Major Categories
    - Muscle: generate mechanical force
    - Nerve: Signals (initiate + transmit)
    - Epithelial: regulate interactions with environment
    - Connective: connect, anchor, support
- Tissues: Groupings of Cells
    - Organs: Group Tissues
        - Vary in proportion and pattern
        - Functional Units
            - Smallest yet still works
            - Ex. Kidney = nephron

        - Heart = Heart (why problems are serious)
    - Why?
        - Redundancy: Continue even if lose some
        - Expansion: add more without stopping
- Organ Systems: Organs with common function
    - Ex. Circulatory = heart, blood vessels, blood
    - Special: organ systems contain other organ systems
        - Ex. Immune = WBC's, spleen, thymus, circulatory system
- Is that all? No, Just cellular components

Extracellular

- Fluid
- Matrix: Mix of proteins and minerals
    - Provide Structure
    - Regulate into transfer
- Protein types
    - Fibers
        - Collagen – rope like
        - Elastin – rubber band like
    - Non-fibrous – carbohydrate

Fluid Compartments = 3

1. Intracellular fluid (cytosol) = within cells
    a. 67% of total water (~28L)
2. Extracellular (and 3)
    a. Interstitial fluid (IF) = between cells (actual "external")
        i. 26% (~11L)
    b. Plasma = fluid in blood vessels (always in vessel)
        i. 7% (~3L)

Plasma <--> Interstitial Fluid <--> Intracellular fluid

Capillary Wall Cell Membrane

These are barriers -> limit movement

Homeostasis

- Relatively stable maintenance of a body parameter (stay within a range, adjustable)
    - Dynamic constancy
- Homeostatic Control System
    - Set of interconnected components (insulin)
    - Purpose: Keep parameter at set point
        - =System not changing at steady state but energy is used =/ equilibrium (no change in energy) then equilibrium
        - Because Energy is limited
            - Trade offs required!
    - Disturbance from steady state
        - Reactive → response = feedback (responding after disturbance)
            - Negative = opposite of disturbance direction (return toward steady state)(most in body)
            - Positive = continue in disturbance direction
                - Move further from steady state
        - Proactive → Preparation = feedforward (FF)
            - Limits the degree of feedback required
            - Less E required
    - Reflex arc
        - Receptor
            - Receives stimulus
            - External or Internal (jumping jacks)
        - Afferent pathway (going towards)
        - Integrating center
            - Compare to set point
            - If relatively the same, done
            - If off,