Introduction
What are the functions of living things?
Homeostasis, responding to the environment, growth, reproduction, etc.

Why does life require energy?
Respiration, circulation, excretion, digestion, movement, growth, reproduction, etc.

How to study the human body from a reductionist approach (looking at smaller details)

How to study the human body from a holistic approach (looking at bigger things)
What are "Emergent Properties"

Basic Chemistry
What are the elements found in the body?
List of 11 most common elements

Organic and inorganic molecules

Covalent and ionic bonds

Acids, bases, pH, and buffers

Molecules in the body:
Water, carbon dioxide, oxygen, salts, carbohydrates, proteins, lipids, nucleic acids.
Functions and chemistry of these molecules

How to make larger molecules from smaller ones
(e.g., glucose $\rightarrow$ glycogen)
Catalysts, enzymes, and denaturation

Cells
Internal structure of a generalized cell:
Nucleus, RER, SER, ribosomes, Golgi complex, secretion granules, mitochondria, lysosomes, cytoskeleton, plasma membrane, cytoplasm, cilia/flagella, centrioles.

Movement of substances across membranes
Diffusion, osmosis, and active transport
Semipermeable membranes
Gradients
Hypo-, iso-, and hyperosmotic
Hypo-, iso-, and hypertonic
Is energy needed for movement to occur?
Speed of movement?
Phagocytosis, pinocytosis, and exocytosis

Mitosis and Meiosis
Somatic Cells, gametic cells, cellular differentiation; cancer
Cell Metabolism
- Catabolism and anabolism
- ATP/ADP and the phosphate bonds
- Glycolysis and Krebs cycle
  - Know select chemical names as described in lecture and where carbohydrates, fats, and proteins can be used in these pathways.
- Aerobic metabolism and accelerated glycolysis
- Anabolic metabolism: New protein synthesis
  - DNA organized into codons
  - RNA reads DNA and RNA is used to make proteins
  - Cellular proteins made in cytoplasm by free ribosomes
  - Membrane bound and exported proteins are made in rough endoplasmic reticulum (RER) by ribosomes attached to RER.

Tissues:
- Definitions
  - Epithelial, connective, muscular, and nerve.
- Describe each type
  - Epithelial tissues
    - Nomenclature for cell shape and layering
    - Glands
      - Single celled or multicellular
      - Patterns of secretion
  - Connective tissues
    - Types of extracellular fibers
    - Vascular c.t.
    - C.t. proper
      - Fibrous (dense)
      - Loose
      - Adipose
    - Cartilage
      - Hyaline (articualr), elastic, fibrous
    - Bone
      - Structure
      - Function
      - How is bone remodeled?
  - Muscle tissues
    - Skeletal, cardiac, smooth
    - Design and features of each
  - Nervous tissue
    - General design of neurons
Skin
Structure
Epidermis
  Cell layers, and cell division
  Keratinocytes
    Properties of keratin
  Melanocytes
Dermis and subcutaneous layer
  Collagen--compared to keratin
  Dermal inclusions
    Hair, glands, nerves, blood vessels, etc.

Skeletal system:
  6 functions of the skeletal system
  Structure of a typical long bone
    Osteoclasts, osteoblasts, osteocytes, and how bone is built
  Names of bone protrusions, indentations, and other features
  Bones of the axial skeleton
  Bones of the appendicular skeleton
  Types of joints