i. Taxonomy is the assignment of binomial each species
ii. **Binomial** (Two names)
1. *Genus name, species name*
2. Example: *Homo sapiens*

d. Human species depend on ecosystems
e. Biodiversity
i. 5-30 million species on earth
ii. Human activities cause about 400 species per day to become extinct.

III. Scientific Method
a. All scientists use the scientific method
i. Observation → Hypothesis → Experiment → Conclusion → Scientific Theory
ii. Controlled study
1. 2 groups
a. **Control Group:** no treatment
b. **Experimental Group:** receives treatment
2. 2 Variables
a. **Experimental (Independent) Variable:** Factor of the experiment being tested. (Something)
b. **Response (Dependent) Variable:** Result or change that occurs due to experimental variable. "Dependent" on Independent variable.
iii. Process of science
1. **Inductive reasoning:** creative reasoning. Creating a hypothesis
2. **Deductive reasoning:** logical reasoning. Testing a hypothesis
iv. Scientific Theory
1. Supported by broad range of observations, experiments, data, and related hypotheses.
a. Example: Evolution

Chapter Two

I. Carbohydrates
a. Simple carbohydrate
i. **Monosaccharides** are sugars with 3 to 7 carbon atoms
1. Pentose refers to a 5 carbon sugar
2. Hexose refers to a 7 carbon sugar
ii. **Disaccharides**- contains two monosaccharides
1. Examples
a. Maltose, sucrose, lactose
iii. **Polysaccharides-** long polymers that contain many glucose subunits

2. A peptide bond joins 2 amino acids

iii. **Level on protein organization**

1. 3 levels of organization
2. Some have 4
3. Final shape of a protein is very important to its function
    a. Denatured, a protein loses structure due to heat of pH

IV. Nucleic Acids

a. **DNA** (Deoxyribonucleic acid)

i. DNA stores genetic information in the cell and in the organism

b. **RNA** (Ribonucleic acid)

i. both are polymers of nucleotides

1. components of a nucleotide
    a. phosphate
    b. pentose sugar (ribose or deoxyribose)
    c. nitrogen- containing base (1 of 5)

c. DNA is a double helix

i. 2 strands held together by hydrogen bonding

ii. Complementary base pairing

1. Adenine (A) always pairs with thymine (T)
2. Cytosine (C) always pairs with Guanine (G)

d. RNA is single stranded

i. Several types involved in carrying information in DNA to make proteins

e. ATP (Adenosine Triphosphate)

i. High energy molecule

ii. ATP undergoes hydrolysis and energy is released

iii. Energy "currency" of the cell

iv. ATP is the high energy form

v. Last phosphate bond broken to release energy

vi. Forms ADP (adenosine diphospahte)

vii. ATP can be rebuilt

1. Add P to ADP to make ATP

Chapter 3
Cell Structure and Function

I. Cellular level of organization

a. A cell

i. The structural and functional unit of an organism

ii. Smallest structure capable of performing all the functions necessary for life

IV. Evolution of Eukaryotic Cell
- a. First cells were prokaryotes
- b. Evidence suggests archaea are more closely related to eukaryotes
- c. Evolved in stages
- d. Endosymbiotic theory
    - i. Mitochondria and chloroplasts were derived from prokaryotes that were taken up by a much larger cell

Chapter 4
Membrane Structure and function

I. Plasma Membrane structure and function
- a. Regulates the entrance and exit of molecules into and out of the cell
- b. Phospholipid bilayer with embedded proteins
    - i. Hydrophilic (water-loving) polar heads
    - ii. Hydrophobic (water-fearing) non polar tails
    - iii. Cholesterol
- c. Membrane proteins may be:
    - i. **Peripheral proteins**- associated with only 1 side of membrane
    - ii. **Integral proteins**- span the membrane
        1. can protrude from 1 or both sides
        2. can move laterally
- d. 5 Membrane Protein Functions
    - i. **Channel Protein**
        1. Allows molecule or ion to cross the plasma membrane freely
        2. Cystic fibrosis caused by faulty chloride channel
    - ii. **Carrier Protein**
        1. Selectively interacts with a specific molecule or ion so it can cross the plasma membrane
        2. GLUT carriers transfer glucose in and out of various cell types of body
    - iii. **Cell Recognition Protein**
        1. The major histocompatibility complex (MHC) glycoproteins are different for each person
            a. Makes organ transplants difficult
                i. MHC glycoproteins are attacked by white blood cells responsible for immunity
    - iv. **Receptor Protein**
        1. Shaped so specific molecules can bind to it
        2. Dwarfism is caused by faulty receptors that cannot interact with growth hormone

Human Organization

Tissues and Organs

I. Types of tissues
   a. A tissue is composed of similarly specialized cells that perform a common function in the body
   b. Four Major Types of Tissues in the Human Body
      i. Epithelial: covers body surfaces and lines cavities
      ii. Connective: supports and binds body parts-includes bone and blood
      iii. Muscular: moves the body and its parts
      iv. Nervous: receives stimuli, processes that information, and conducts impulses
   c. Cancer
      i. Cancers are classified according to the type of tissue in which they are found.
         1. Epithelial tissue-carcinoma
         2. Most common
            a. Read Health Focus pg 206
      ii. Muscle or connective tissue-sarcoma
         1. Blood-Leukemia –common type of cancer
         2. Lymphatic -Lymphoma
      iii. Epithelial Tissue-epithelium
         1. Features: tightly packed cells that form a continuous layer
         2. Location:
            a. Covers surfaces
            b. Lines body cavities
         3. Functions
            a. Protective
               i. Protects the body from injury, drying out, invasion by pathogens
            b. Secretion (glands)
               i. Secrete mucus along digestive tract
            c. Absorption
               i. Absorbs molecules from kidney tubules
               ii. From intestines with minute extensions-microvilli
            d. Excretion
            e. Filtration
         4. Basement membrane
            a. Joins epithelium to underlying connective tissue
            b. Consists of glycoproteins secreted by epithelial cells
            c. And collagen fibers – a part of the connective tissue
         5. Classified According to
            a. Cell Shape
            b. Number of layers in the tissue
         6. Cell Shape:
            a. Squamous: flattened cells
            b. Cuboidal: cubed-shaped cells
            c. Columnar: cells resembling rectangular pillars or columns

Chapter 12

Cardiovascular System

I. Cardiovascular System
   a. Major cause of death in developed countries
   b. In US 1 in 3 people die of heart disease
   c. Greater than 50-50 chance of developing cardiovascular disease (heart and/or blood vessels)
   d. 2 out of 3 cardiovascular deaths occur without prior diagnosis

II. The Blood Vessels
   a. Three Types of Blood Vessels
      i. Arteries: carry blood away from the heart
      ii. Capillaries: permit exchange of materials with tissues
      iii. Veins: carry blood toward the heart
   b. Three layers to an arterial wall
      i. Endothelium
         1. Inner layer - simple squamous epithelium with basement membrane
      ii. Middle layer
         1. Thickest layer, contains smooth muscle
      iii. Outer layer
         1. Fibrous and loose connective tissue
   c. The Capillaries
      i. Join arterioles to venules
      ii. Extremely narrow and only a single layer of endothelium thick
      iii. Form vast networks in all regions of the body
      iv. Very important role in homeostasis – exchange of substances
         1. Oxygen and nutrients
         2. Wastes and carbon dioxide
         3. Excess fluid picked up by lymphatic system
   d. The Veins
      i. Walls are structured similarly to the walls of arteries (three layers)
         1. Less smooth muscle and connective tissue in veins
      ii. Often have valves to prevent the backflow of blood
         1. Varicose veins, hemorrhoids
      iii. Great capacity to expand
         1. Serve as blood reservoir

III. The Heart
   a. Size of a fist
   b. Lies between the lungs
   c. Behind the sternum
   d. Tilted so apex pointed to body's left
   e. Pericardium

1. Release stimulated by entrance of acidic chyme

iv. CCK (cholecystokinin) produced by duodenal wall
1. Release stimulated by proteins and fat in chyme

v. Both secretin and CCK stimulate
1. Pancreas to increase pancreatic juice output
2. Liver to increase bile output
3. Gallbladder to contract to release bile

i. The Large Intestine
i. Includes cecum, colon, rectum and anal canal
ii. Larger in diameter but shorter length compared to the small intestine
iii. Absorbs water, salts, and some vitamins
iv. Stores indigestible materials until it can be eliminated
v. Colon
1. Ascending, transverse, descending, and sigmoid
vi. Rectum
1. Last 20 cm of large intestine
vii. Anus
1. Where defecation occurs
2. Defecation reflex

II. Accessory Organs of Digestion

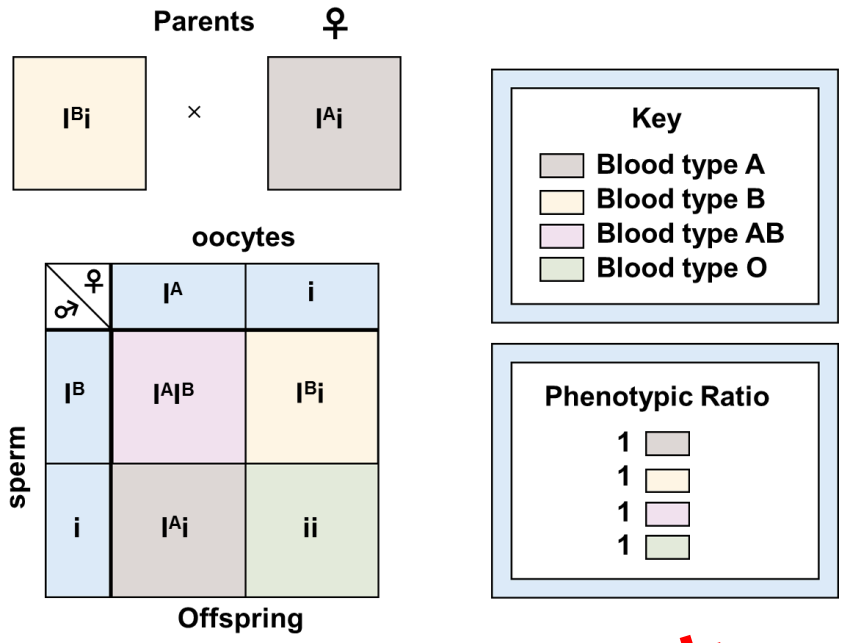
a. The Pancreas
i. Endocrine function
1. Insulin and glucagon
2. Regulates blood glucose
ii. Exocrine function - pancreatic juice
1. Sodium bicarbonate: neutralizes the stomach acid
2. Pancreatic amylase: starch digestion
3. Trypsin: protein digestion
4. Lipase: fat digestion

b. The Liver
i. Largest gland in the body
ii. Acts as a gatekeeper for the blood
1. Removes poisonous substances and detoxifies them
2. Removes and stores iron and vitamins A, D, E, K, and B_{12}
3. Makes plasma proteins
4. Regulates cholesterol
5. Regulates blood glucose – stored as glycogen
6. Produces bile
a. Bilirubin – hemoglobin breakdown product
b. Bile salts – emulsify fat

c. The Gallbladder
i. Liver produces 400-800 ml of bile each day
ii. Stores excess bile
iii. Water reabsorbed – thickens bile
iv. Secreted through common bile duct into duodenum via common bile duct

III. Nutrition

a. Nutrient- component of food that performs physiological function
i. Six major classes - carbohydrates, fats, proteins, vitamins, minerals, and water



2.

d. Polygenic Inheritance
   i. Occurs when a trait is governed by two or more genes (sets of alleles)
   ii. Allelic pairs are possible located on different pairs of chromosomes
   iii. Continuous variation of phenotypes
   iv. Dominant alleles have a quantitative effect on the phenotype, and these effects are additive.
   v. Skin color
      1. Possibly controlled by many pairs of alleles
      2. Example will be simplified to 2 pairs of alleles
      3. Aa and Bb
      4. Each capital letter contributes pigment to skin
         a. Very dark person reproduces with very light person, children have medium brown skin

i. Genotypes	i. Phenotypes
i. AABB	k. Very dark
k. AABb or AaBB	i. Dark
i. AaBb or AAbb or aaBB	i. Medium Brown

1. Environmental agents or viruses can cause break
2. Ordinarily, break reunites with the same sequence of genes
3. Failure to reunite correctly can result in
    a. Deletion, duplication, translocation, or inversion.

vi. Deletion
1. a single break causes a chromosome to lose an end piece
2. or when two simultaneous breaks lead to the loss of an internal chromosomal segment
3. Inheriting one normal chromosome and one with a deletion can result in a syndrome due to not having a pair of alleles

vii. Duplication

1. Chromosomal segment is repeated in the same chromosome or in a nonhomologous chromosome
2. Individual has more than two alleles for certain traits
3. Inv dup 15 syndrome
4. Inverted duplication on chromosome 15

viii. Translocation
1. Exchange of chromosomal segments between two nonhomologous chromosomes
2. A person who has both of the involved chromosomes has the normal amount of genetic material and is healthy
    a. Unless the chromosome exchange breaks an allele into two piece
3. The person who inherits only one of the translocated chromosomes will have only one copy of certain alleles and three copies of certain other alleles

ix. Inversion
1. Segment of a chromosome is turned 180 degrees
2. Reverse sequence of alleles can lead to altered gene activity
3. Crossing-over between an inverted chromosome and the noninverted homologue can lead to recombinant chromosomes that have both duplicated and deleted segments