Chapter 1 Anatomy

I. **Anatomy** (means to dissect) – the study of the structure of the body.
   A. **Systemic Anatomy** – the study of the body's structure by systems – approach taken by most introductory text books.
   B. **Regional Anatomy** – the study of the body's structure by region (head, abdomen, arm, etc…) – approach taken in most medical and dental schools.
   C. **Surface Anatomy** – study of external features (bony projections) which serve to locate deeper structures.
   D. **Anatomical Imaging** – technologies used to create pictures of internal structures (X-rays, ultrasound, magnetic resonance imaging (MRI)).

*****C & D provide important information for diagnosing disease.

II. **Physiology** – the study of the functions of the body and its parts.
   A. Two Major Goals of Physiology
      1. Prediction of the body's responses to stimuli.
      2. How the body maintains conditions with-in a narrow range of values in the presence of a continually changing environment.
   B. Physiology divisions
      1. The organism involved (**Human Physiology** – the study of a specific organism, the human)
      2. The levels of organization within a given organism (**cellular** and **systemic physiology** emphasize specific organizational levels)

III. **7 Structural Levels**
   A. **Chemical** – organization involving interactions among atoms and their combinations to form molecules.
   B. **Organelles** – organizations of molecules to form the structures of the cell (nucleus, mitochondria, etc…)
   C. **Cells** – organization by structure and function – *the smallest basic living unit*
   D. **Tissue** - a group of similar cells and the material surrounding them, characteristics of these cells determine function – 4 primary types
      1. Epithelial
      2. Connective
      3. Muscle
      4. Nervous
   E. **Organ** – composed of two or more tissue types that work together to perform one or more common functions – 12 major systems.
   F. **Organ System** – a group of organs classified as a unit because of common functions.
   G. **Organism** – any living thing considered as a whole whether composed of one cell (bacterium) or trillions of cells (human).

IV. **6 Characteristics of Life**
   A. **Organization** – condition in which the parts of an organism have specific relationships to each other and interact to perform specific functions.
   B. **Metabolism** – the ability to use energy to perform vital functions.
   C. **Responsiveness** – the ability to sense changes in the environment and make adjustments that help maintain life.
   D. **Growth** – an increase in size of all or part of the organism.

E. **Development** – the changes an organism undergoes through time – beginning at fertilization and ending at death.
F. **Reproduction** – the formation of new cells or organisms.

V. **Homeostasis** – the existence and maintenance of a relatively constant environment within the body – primary function of all normal cells which is dependant on the maintenance of each cells fluid environment within a narrow range of conditions (temp., volume, and chemical content). These changing conditions, called ***variables***, must be "kept at" or "brought back to" an ideal normal value or range, called a ***set point***, to maintain life. This is usually accomplished by one of two mechanisms.

A. **Negative Feedback Loop** – any mechanism that makes the deviation from normal smaller – most systems of the body are regulated by these – consists of 2 parts and operates as follows
    1. **Sensor** (Receptor) – monitors the value of the variable.
    2. **Effector** – has the ability to change the variable.

*Example: Body temperature

Sensor detects cold →→→ Effector (skin) creates shivering and goose bumps which produce and hold heat →→→ Sensor detects normal range

B. **Positive Feedback Loop** – any mechanism that makes the deviation from normal larger – **rare in healthy individuals** – must be monitored and negated by medical personnel or death can occur.

VI. **Directional Terms**

A. **Anatomic position** – refers to a person standing erect with face forward, upper limbs hanging to the sides and palms forward.
    1. **Superior** – replaces 'above' or 'up', means toward the head
    2. **Inferior** – replaces 'below' or 'down', means toward the feet
    3. **Anterior** – also called ventral on animals, means front
    4. **Posterior** – also called dorsal on animals, means back
    5. **Lateral** – means toward the side
    6. **Medial** – means toward the middle
    7. **Proximal** – means near or toward the point of attachment
    8. **Distal** – means distant or far from the point of attachment
    9. **Superficial** – means toward the surface
    10. **Deep** – means away from the surface or toward the inside (internal)

*****Proximal and distal mostly used for extremities (arms and legs).

B. **Body Regions & Parts**
    1. **Cephalic** – head
    2. **Cervical** – neck
    3. **Trunk**
        a. Thoracic – chest
        b. Abdominal
        c. Pelvic
    4. **Upper Extremity**
        a. Axillary –armpit
        b. Brachial – arm
        c. Cubital – elbow
        d. Forearm (Antebrachial)

e. Hand

5. **Lower Extremity**
   a. Coxal – hip
   b. Femoral – thigh
   c. Patellar – knee cap
   d. Leg (crural)
   e. Pedal - foot
6. **Regions** – 2 types
   a. Quadrants – crosshair at the umbilicus (belly button)
      - Right upper quadrant – patient's right
      - Left upper quadrant – patient's left
      - Right lower quadrant
      - Left lower quadrant
   b. Nine – imaginary tic-tac-toe centered on the abdomen – the following starts at the top row with 3 rows and 3 regions in each row
      - Right Hypochondriac
      - Epigastric
      - Left Hypochondriac
      - Right Lumbar
      - Umbilical
      - Left lumbar
      - Right Inguinal (iliac)
      - Hypogastric
      - Left Inguinal (iliac)

C. **3 Main Body Planes**
   1. **Frontal (coronal)** – divides the body into anterior and posterior
   2. **Sagital** – divides the body into right and left – ***midsagital*** divides body into <u>*equal*</u> right and left halves
   3. **Transverse (horizontal)** – divides the body into superior and inferior

D. **Body Cavities**
   1. **Dorsal Cavity** – contains the brain and spinal cord
   2. **Ventral Cavities** – contain all the trunk cavities
      a. **Thoracic cavity** – surrounded by the rib cage and separated from the other cavities by the diaphragm – contains three smaller cavities;
         - **Pleural cavities** (2) – contain the lungs
         - **Mediastinum** (1) – contains the pericardial cavity with the heart and the thymus, trachea, and esophagus
      b. **Abdominopelvic cavity** – is actually considered to be 2 cavities with no clear dividing line
         - **Abdominal cavity** – contains the stomach, intestines, liver, spleen, pancreas, and kidneys
         - **Pelvic cavity** – contains the urinary bladder, part of the large intestines, and the reproductive organs

E. **Serous Membranes** – there are 3 types of serous membranes each containing a 3 part structure
   1. **3 part structure**
      a. **Parietal membrane** – lines the cavity wall
      b. **Parietal space** – a thin cavity filled with serous fluid that lubricates
      c. **Visceral membrane** – covers or surrounds the organ

2. **3 types**
    a. **Pericardium** – serous membranes surrounding the ***heart***
    b. **Pleura** – serous membranes surrounding the ***lungs***
    c. **Peritoneum** – serous membranes surrounding ***Abdominopelvic***
        - **Mesenteries** – consist of two layers of peritoneum that function in connecting *most* Abdominopelvic organs to the cavity wall and provide a pathway for blood and nerves to the organ
        - **Retroperitoneal** – term used for Abdominopelvic organs not covered by mesenteries and are more closely attached to the body wall by parietal peritoneum (retro = behind)

F. **Body Fluids** – mostly water
    1. **Intracellular fluid** (ICF) – 2/3 of body fluid is located ***in*** the cells
    2. **Extracellular fluid** (ECF) – 1/3 of body fluid is located outside the cells - 3 main types
        a. **Interstitial fluid or tissue fluid** – bathes the cells
        b. **Blood plasma**
        c. **Cerebrospinal fluid**