Name: ____________________________________________

Introduction / Terminology

Objectives:
1. Obtain an understanding of anatomy and the subdivisions which comprise the major disciplines in the study of the structure of the human body.
2. Obtain an understanding of the generalized body structure.
3. Mastery of anatomical terms: Body Regions, Planes of Section, Directional Terms, Body Cavities.
4. Understanding of serous membranes and their significance.

I. Anatomy: Human Anatomy is the scientific discipline concerned with the organization and structure of the human body. The term anatomy originates from its Greek roots meaning literally to “cut up.” Anatomy was born from the discoveries of these early anatomists. Since their study was limited to observations made available through the dismemberment of unfortunate individuals, their study was confined only to those structures discernible with the naked eye: large, dissectible, physical attributes.

Today this aspect of anatomy is described as macroscopic (large) or gross anatomy. As with all other scientific disciplines, the study of anatomy has paralleled technology. Unlike the early anatomists, who were limited to structures they could see with the unaided eye, today anatomists go beyond elucidating just macroscopic structures and include descriptions and understanding of structures visible through the use of technology. Anatomy today includes structures which are discernible through the use of highly advanced microscopic and computerized digital equipment, such as electron microscopes, CT scans (Computerized Tomography), and MRI’s (Magnetic Resonance Imaging).

We will begin our understanding of the structure of the human body with the smallest structural unit of life: the cell. This study of cell and cellular function is referred to as cytology. It will serve the same purpose in our studies as it does in the body; it will form the framework onto which we will build our understanding of anatomy.

Anatomy is more than just observing the physical structure of the body and body parts. The goal of anatomy is to be able to discern the plausible function in the structure. The beauty and the challenge of anatomy is to be able to determine the functional significance for a specific structural design. Beneath every structural design lies the function. It is through the understanding of anatomy that we will build the foundation for understanding the function, or the physiology, of the human body.

II. Divisions of Anatomy: Anatomy is a broad field of study consisting of several divisions or subdisciplines. Each division of anatomy specializes on a specific aspect of the body’s arrangement. These divisions are outlined below:

1. Macroscopic (Gross) Anatomy: Study of structures which can be seen with an unaided eye.
   a. Surface Anatomy -- Study of the general form and superficial markings of the body.
   b. Systemic Anatomy -- Study of 11 specific body systems (i.e. Digestive, Endocrine, Nervous Systems)
   c. Regional Anatomy -- Study of specific regions of the body, including all tissues residing within the region (i.e. Upper extremity, head & neck, abdominal region).

2. Microscopic Anatomy: Study of structures which cannot be seen without the aid of magnifying equipment.
   a. Cytology -- (Cyto = cell) Study of the internal structure of individual cells.
   b. Histology -- (Hist = tissue) Study of the structure of groups of cells and how they interact to form functional tissues.
3. **Specialized Anatomical Study**:
   
   a. **Developmental Anatomy** -- Study of the structural changes in the form of an individual from the fertilized egg to the mature adult. Embryology is a sub-branch of developmental anatomy.
   
   b. **Medical / Radiological** -- Study of the characteristic changes in anatomy during disease. Study of anatomical features visible with radiographic technology.

III. **Generalized Body Structure**: The human body is not a solid mass of cells, but rather one large hollow structure (trunk), subdivided into smaller spaces. Within these hollow spaces (cavities), specialized organs are contained. The extremities, while advantageous, are not explicitly necessary, serving simply to move the body in its surroundings or manipulate objects. The head sits atop the trunk, surveying the internal and external environments and making the necessary adjustments to ensure continued body function.

A. **Body Divisions**: On a very basic level, the body can be divided into three main divisions:

   1. **Body Wall** -- The body wall consists of the structures forming the body’s framework, which support and enclose vital organs. The skin, skeleton, and skeletal muscles all comprise the body wall. The head, arms, and legs are considered specialized modifications of the body wall.
   
   2. **Body Cavities** -- Body cavities are the large internal body spaces filled with the vital organs. The largest body cavity is the **ventral (abdominal side) cavity**. This cavity is further divided into the **thoracic cavity**--housing the heart and lungs, and the **abdominopelvic cavity**--housing the abdominal and pelvic organs (stomach, liver, intestines, bladder, reproductive structures, etc). Body cavities function to protect and house the internal organs while still allowing them the freedom of movement. The heart, for example, would be a very ineffective pump if it were housed in a solid structure, unable to move and beat.
   
   3. **Organs** -- Organs are the structures within the body capable of performing specific functions.

B. **Body Systems**: Together the body wall, cavities, and organs interact to form a beautifully constructed human composition. Body organs which perform similar functions are grouped together in a body system; each system is responsible for accomplishing a specific, essential task. Eleven body systems comprise the human organism:

   1. **Integumentary System** -- Forms the outermost part of the body wall (the skin). Parts: epidermis, dermis, accessory structures (hair, nails, glands, sensory endings). Function: Temperature control and protection from the environment.
   
   
   
   4. **Nervous System** – Parts: central (brain & spinal cord) and peripheral (motor & sensory nerves) nervous systems. Function: Function: controls body systems, perceiving internal and external environments.
   
   5. **Endocrine System** -- Glandular tissue throughout the body. Function: coordinates and controls body systems (using chemical chemical signals, or hormones).


8. Respiratory System -- Structures involved in the exchange of gases, including lungs, nose, larynx, trachea, bronchi. Exchange of gases (O2 & CO2) between the body and the environment.

9. Digestive System – Found primarily within the abdominal cavity. Function: processing food and absorbing nutrients, minerals, vitamins, and water; and the elimination of waste.

10. Urinary System – Located primarily within the pelvic cavity; consists of the kidneys, ureters, bladder, and urethra. Function: regulation of blood chemistry via the elimination of excess water, salts, and waste products.


IV. Anatomical Terminology: Anatomy is the study of the body's internal and external structures and the physical relationships between them. In the study of anatomy it is essential to be able to express yourself correctly and without confusion. Anatomy uses an international language of terms which enables one to correctly convey information to healthcare professionals around the world as well as to scholars in basic and applied health sciences. Your successful study of the body's structures will rely on your ability to not only communicate using the correct terminology and spelling, but also to understand the language of directionality and organization.

A. Standard Anatomical Position: All descriptions of the human body are based on the assumption that the individual is standing in what is known as the Standard Anatomical Position (SAP).

Standard Anatomical Position: An individual in SAP adheres to the following positions: (See Fig. 1.2)

• Stand erect
• Upper limbs are at one's sides
• Lower limbs are together
• Face, palms, and feet are directed forward

B. Principle Body Regions: In your study and use of the following regional terminology, it is important to be able to communicate correctly to your peers as well as to the lay person. It is therefore important to learn the anatomical term in conjunction with the common names. The anatomical terms and common names used to describe the principle body regions are given below.

∗ You are responsible for knowing all anatomical names, regions, and areas (common names) listed!

Figure 1.2 – Principle Body Regions

<table>
<thead>
<tr>
<th>Anatomical Name</th>
<th>Anatomical Region</th>
<th>Area indicated (common name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cephalon</td>
<td>Cephalic</td>
<td>Head</td>
</tr>
<tr>
<td>a. Cranium</td>
<td>Cranial</td>
<td>Skull</td>
</tr>
<tr>
<td>b. Nasus</td>
<td>Nasal</td>
<td>Nose</td>
</tr>
<tr>
<td>c. Bucca</td>
<td>Buccal</td>
<td>Cheek</td>
</tr>
<tr>
<td>d. Auris (Otic)</td>
<td>Aurical</td>
<td>Ear</td>
</tr>
<tr>
<td>e. Oculus</td>
<td>Ocular</td>
<td>Eye</td>
</tr>
<tr>
<td>f. Oris</td>
<td>Oral</td>
<td>Mouth</td>
</tr>
<tr>
<td>2. Cervicis</td>
<td>Cervical</td>
<td>Neck</td>
</tr>
<tr>
<td>3. Thoracis</td>
<td>Thoracic</td>
<td>Chest</td>
</tr>
<tr>
<td>a. Mamma</td>
<td>Mammary</td>
<td>Breast</td>
</tr>
<tr>
<td>4. Axilla</td>
<td>Axillary</td>
<td>Armpit</td>
</tr>
<tr>
<td>5. Acromium</td>
<td>Acromial</td>
<td>Shoulder</td>
</tr>
<tr>
<td>6. Brachium</td>
<td>Brachial</td>
<td>Portion of upper limb closest to trunk (arm)</td>
</tr>
<tr>
<td>7. Antebrachium</td>
<td>Antebrachial</td>
<td>Forearm</td>
</tr>
<tr>
<td>8. Antecubitis</td>
<td>Antecubital</td>
<td>Front of elbow</td>
</tr>
<tr>
<td>Number</td>
<td>Region</td>
<td>Synonym</td>
</tr>
<tr>
<td>--------</td>
<td>----------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Olecranon</td>
<td>Olecranal</td>
</tr>
<tr>
<td>10</td>
<td>Carpus</td>
<td>Carpal</td>
</tr>
<tr>
<td>11</td>
<td>Manus</td>
<td>Manual</td>
</tr>
<tr>
<td></td>
<td>a. Palma</td>
<td>Palmar</td>
</tr>
<tr>
<td></td>
<td>b. Digits (phalanges)</td>
<td>Digital (phalangeal)</td>
</tr>
<tr>
<td>12</td>
<td>Abdomen</td>
<td>Abdominal</td>
</tr>
<tr>
<td>13</td>
<td>Pelvis</td>
<td>Pelvic</td>
</tr>
<tr>
<td></td>
<td>a. Coxa</td>
<td>Coxal</td>
</tr>
<tr>
<td></td>
<td>b. Pubis</td>
<td>Pubic</td>
</tr>
<tr>
<td>14</td>
<td>Inguen</td>
<td>Inguinal</td>
</tr>
<tr>
<td>15</td>
<td>Lumbus</td>
<td>Lumbar</td>
</tr>
<tr>
<td>16</td>
<td>Gluteus</td>
<td>Gluteal</td>
</tr>
<tr>
<td>17</td>
<td>Femur</td>
<td>Femoral</td>
</tr>
<tr>
<td>18</td>
<td>Patella</td>
<td>Patellar</td>
</tr>
<tr>
<td></td>
<td>a. Popliteus</td>
<td>Popliteal</td>
</tr>
<tr>
<td>19</td>
<td>Crus</td>
<td>Crural</td>
</tr>
<tr>
<td>20</td>
<td>Sura</td>
<td>Sural</td>
</tr>
<tr>
<td>21</td>
<td>Tarsus</td>
<td>Tarsal</td>
</tr>
<tr>
<td>22</td>
<td>Pes</td>
<td>Pedal</td>
</tr>
<tr>
<td></td>
<td>a. Planta</td>
<td>Plantar</td>
</tr>
<tr>
<td></td>
<td>b. Digits (phalanges)</td>
<td>Digital (phalangeal)</td>
</tr>
<tr>
<td>23</td>
<td>Calcaneus</td>
<td>Calcaneal</td>
</tr>
</tbody>
</table>

Figure 1.3 - Principle Body Regions - Anterior

Cephalon - Cephalic
  Cranium - Cranial
  Nasus - Nasal
  Cervicis - Cervical
Axilla - Axillary
Brachium - Brachial
Antebrachium - Antebrachial
Carpus - Carpal
Manus - Manual
  Palma - Palmar
  Digits - Digital
Femur - Femoral
Patella - Patellar
Crus - Crural
Pes - Pedal

Oculus - Ocular
Bucca - Buccal
Oris - Oral
Thoracis - Thoracic
Mamma - Mammary
Antecubitis - Antecubital
Abdomen - Abdominal
Pelvis - Pelvic
Coxa - Coxal
Inguen - Inguinal
Pubis - Pubic
Tarsus - Tarsal
Digits (phalanges) – Digital (phalangeal)
C. **Planes of Section**: The human body can be dismantled (dissected) into pieces (sections) along imaginary planes (flat surfaces that pass through the body). See Figure 1.3.

1. **Sagittal Plane** -- Divides the body or organ into **Right & Left** sections.
   - **Midsagittal Plane**: Passes through the mid-line & divides the body or organ into exactly **EQUAL** right and left halves.
   - **Parasagittal Plane**: Divides the body or organ into **UNEQUAL** right & left sections.

2. **Frontal (Coronal) Plane** -- Divides the body or organ into **anterior** (front) and **posterior** (back) sections.

3. **Transverse (Cross-sectional or Horizontal) Plane** -- Divides the body or organ into **superior** (top) and **inferior** (bottom) sections.

4. **Oblique Plane** -- Passes through the body or organ at an angle and divides into unequal sections.
D. Directional Terms: When expressing anatomical locations it is important to utilize correct directional terms. Various adjectives, arranged in antagonistic pairs, describe the relationship of body parts and compare the relationship of anatomical structures with each other. See Figure 1.6.

★ All directional terms express relative location; i.e. The cephalon is superior to the cevicis.

1. **Superior**: Above; at a higher level (in humans - toward the head).
   - The cranial region is superior to the cervical region.
   - The patellar region is inferior to the inguinal region.

2. **Cephalic or Cranial**: Toward the head.
   - The cranial border of the pelvis is the attachment site for many abdominal muscles.

3. **Anterior (Ventral)**: Near the front of the body or structure (belly side).
   - The crus is anterior to the sura.
   - The tarsus is posterior to the phalanges.

4. **Medial**: Toward the midline (longitudinal axis) of body or structure.
   - The medial portions of the thighs may touch.
   - The lateral digit is the pollex (thumb).

5. **Ipsilateral**: On the same side of the body.
   - The appendix and gall bladder are ipsilateral.
   - The spleen and liver are contralateral.

6. **Proximal**: Near to attachment point (trunk); used to describe relative distance down a limb.
   - The femur is proximal to the crus.
   - The antebrachium is distal to the brachium.
7. a. **Superficial**: Toward the surface of the body or organ.
   b. **Intermediate**: Between a superficial structure and a deep structure.
   c. **Deep**: Away from the surface of the body or organ (more internal).
      - The skin is superficial to the muscle.
      - The muscle is intermediate between the skin and the bone.
      - The bone is deep to the muscle and the skin.

**Figure 1.6 - Directional Terminology**

E. **Body Cavities**: When viewed in section, one realizes that the human body is not a solid object. It has numerous spaces and internal chambers. These internal chambers, called cavities, house the body's organs. The two major body cavities (*ventral* & *dorsal*) are further subdivided into smaller cavities housing specific organs.

**Functional significance** — Body cavities have several functions:
1. They house and separate body organs;
2. They protect and cushion organs from external impact
3. They allow considerable freedom for movement of internal organs without disrupting the function of other organs;
   - The heart, lungs, and small intestine all require a relatively uninhibited ability to move.
4. They enable different pressures to be created within the body without disrupting other organs.
   - Lung cavity: Breathing results from changes in pressures within the thoracic cavity.

F. **Two Principal Body Cavities** — With further subdivisions:
1. **Dorsal Body Cavity** — Cushions and protects the central nervous system (brain & spinal cord).
   a. **Cranial Cavity**: Cavity formed by the bones of the skull; houses the brain.
   b. **Spinal (Vertebral) Cavity**: Cavity formed by the vertebral column; houses the spinal cord.
2. **Ventral Body Cavity (Coelom)** – Enclosed by the ribs and abdominal and lumbar musculature. Surrounds organs of the Respiratory, Digestive, Cardiovascular, Urinary, and Reproductive systems.

   * Ventral Cavity is further divided into 2 cavities by the transversely-oriented diaphragm.

   a. **Thoracic Cavity**: Enclosed by the rib cage and separated from the abdominopelvic cavity by the diaphragm.
      1. **Right & Left Pleural Cavities** -- House the right and left lungs.
      2. **Pericardial Cavity** -- Houses the heart.

   b. **Abdominopelvic Cavity**: Enclosed by the abdominal and lumbar muscles, inferior to the diaphragm. Houses abdominal viscera (organs).
      1. **Abdominal Cavity** -- Separated from inferior pelvic cavity by an imaginary line at the pelvic brim. Houses digestive organs and glands.
      2. **Pelvic Cavity** -- Separated from superior abdominopelvic cavity by an imaginary line at the pelvic brim. Houses Urinary, Reproductive, & distal portions of Digestive Systems.

   * There is no definitive structure which separates Abdominal & Pelvic Cavities

![Figure 1.7 - Body Cavities – Lateral](image1)

![Figure 1.7 - Body Cavities – Anterior](image2)
V. **Serous Membranes**: All body cavities and organs are lined with a thin, continuous layer of fluid-secreting cells. These cells form a specialized membrane called a *serous membrane*. The serous membrane, which lines all cavities and organs, functions to secrete a slippery fluid called serous fluid or *transudate*. Serous membranes are significant because they allow the frictionless movement of moist organs across one another.

**Serous Membrane Terminology**: Serous Membranes are named according to their location.

1. **Visceral Serous Membranes (Visceral Serosa)** -- Cover all *body organs*.
   - a. **Visceral Pleura**: Membrane covering the lungs.
   - b. **Visceral Pericardium**: Membrane covering the heart.
   - c. **Visceral Peritoneum**: Membrane covering all abdominal organs.

2. **Parietal Serous Membranes (Parietal Serosa)**: Cover and line all *body cavities*.
   - a. **Parietal Pleura**: Membrane lining the pleural cavity.
   - b. **Parietal Pericardium**: Membrane lining the pericardial cavity.
   - c. **Parietal Peritoneum**: Membrane lining the abdominopelvic cavity.

The serous membranes which line the pleural cavities meet in the middle of the thoracic cavity. The space within the thoracic cavity which lies between the pleural cavities is called the *mediastinum*. The mediastinal space contains the pericardial cavity and portions of the trachea and esophagus, thymus, and major arteries and lymph vessels which pass through. (See Fig. 1.8)

**Clinical Significance**: Peritonitis is an inflammation of the abdominal peritoneum. Peritonitis can occur after an injury or infection to the abdominal peritoneal serous linings. The injuries or infection can cause an increase in the production and an accumulation of serous fluid (called ascites), resulting in abdominal swelling. Several symptoms can follow: heartburn, indigestion, and lower back pain.

![Figure 1.8 - Body Cavities - Transverse](image_url)
Define the following:

1. Anatomy:
2. Histology:
3. Body Cavity:
4. Standard Anatomical Position:
5. Midsagittal Plane:
6. Serous Membrane
7. Mediastinum:

Matching 1.1: Body Systems

2. Respiratory System ___  b. Controls body systems, perceiving internal and external environments.
3. Cardiovascular System ___  c. Glandular tissue throughout the body; coordinates and controls body systems.
5. Endocrine System ___  e. Internal defense and blood volume maintenance.
7. Reproductive System ___  g. Support, mobility, and heat production.
8. Skeletal System ___  h. Forms the outermost part of the body wall (the skin); includes epidermis, dermis.
9. Digestive System ___  i. Production and support of sex cells and hormone production.
10. Integumentary System ___  j. Support, protection, blood formation, mineral storage.

Matching 1.2: Body Regions (Anterior Surface)

1. Patella ___  a. Armpit
2. Antebrachium ___  b. Leg
3. Axilla ___  c. Ankle
4. Brachium ___  d. Groin
5. Pes ___  e. Forearm
6. Thoracis ___  f. Back of Knee
7. Cervicis ___  g. Foot
8. Phalanges (digits) ___ h. Buttock
9. Inguin ___ i. Chest
10. Popliteus ___ j. Arm
11. Gluteus ___ k. Knee
12. Femur ___ l. Neck
13. Tarsus ___ m. Fingers
14. Crural ___ n. Thigh
15. Olecranon ___ o. Elbow

**Labeling 1.1 : Body Regions – Anterior :** Label the figures below with all relevant anatomical terms.
Labeling 1.2: Body Region - Posterior

Labeling 1.3: Planes of Section: Label the specific planes of section identified.
Labeling 1.4: Body Cavities

Labeling 1.5: Transverse section through the Thoracic Cavity

Fill-ins 1.1: Directional Terms: For each set of structures or regions, give the directional term that best describes the relationship.

1. The antebrachium is ________________________________ to brachium.

2. Cranial region is ________________________________ to cervical region.

3. Phalanges are ________________________________ to the carpus.

4. Inguen is ________________________________ to the coxa.

5. Crural region is ________________________________ to sural region.

6. ________________________________ is lateral to the thoracic region.
7. The axilla is proximal to the _________________________________.

8. Patellar is anterior to the _________________________________.

9. _______________________________________ is inferior to the cervical region.

10. The antecubital region is ________________________________ to the phalanges.

**Fill-ins 1.2 : Body Cavities & Membranes**

1. The _________________________ cavity contains the brain; the _________________________ cavity contains the spinal cord. Both cavities are a part of the larger _________________________ cavity.

2. The abdominopelvic cavity is separated by the muscular ______________________________ from the ______________________________ cavity.

3. In the thoracic cavity, the esophagus, thoracic nerves, and pericardial cavity (with the heart) occupy an area called the _________________________________.

4. The _________________________ cavity includes the _________________________ cavity which houses the heart and the _________________________ cavity which houses the lungs.

5. The ________________________________ membrane functions to line the abdominal cavity.

6. The ________________________________ lines the heart, functioning to reduce friction by the secretion of transudate (serous fluid).

7. The ________________________________ lines the plueral cavity.