

BIOL 2210L

Unit 1: Introduction to Anatomy and Physiology

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Terms to Know for Unit 1

Anatomical position

Surface Anatomy

Cephalic	Thoracic	Dorsum	Upper Limb	Lower Limb
Frontal	Sternal	Scapular	Acromial	Coxal
Orbital	Mammary (Pectoral)	Vertebral	Brachial	Femoral
Nasal	Axillary	Lumbar	Antecubital	Patellar
Buccal		Sacral	Olecranal	Popliteal
Oral	Pelvic	Gluteal	Antebrachial	Sural
Occipital	Inguinal		Carpal	Crural
				Fibular
Manus	Pedal	Cervical	<u>Organ systems</u>	
Digits	Digits	Pubic	A&P 1	A&P 2
Pollex	Hallux		Integumentary	Cardiovascular
Palmar	Plantar		Skeletal	Immune/Lymphatic
	Tarsal		Muscular	Respiratory
	Calcaneal		Nervous	Digestive
				Urinary
				Endocrine
				Reproductive

Body Planes and Body Orientation

Planes	Orientation		
Frontal (Coronal)	Anterior and Posterior	Dorsal and Ventral	
Transverse	Superior and Inferior	Proximal and Distal	
Sagittal	Medial and Lateral	Cephalic and Caudal	
Midsagittal	Intermediate		
Parasagittal	Deep and Superficial (External and Internal)		

Body Cavities, Abdominopelvic Regions and Quadrants

Cavities	Regions	Quadrants
Ventral	Dorsal	Right Upper
Thoracic	Cranial	Left Upper
Mediastinum	Vertebral	Right Lower
Pleural		Left Lower
Abdominopelvic		
Abdominal	Right and Left Iliac	
Pelvic	Hypogastric	

Learning Objectives (modified from [HAPS learning outcomes](#))

1. Anatomical position
 - a. Describe a person in anatomical position.
 - b. Describe how to use the terms right and left in anatomical reference.
2. Body planes & sections
 - a. Identify the various planes in which a body might be dissected.
 - b. Describe the appearance of a body presented along various planes.
3. Body cavities & regions
 - a. Describe the location of the body cavities and identify the major organs found in each cavity.
 - b. List and describe the location of the major anatomical regions of the body.
 - c. Describe either the location of the four abdominopelvic quadrants or the nine abdominopelvic regions and list the major organs located in either each of the quadrants or regions.
4. Directional terms
 - a. List and define the major directional terms used in anatomy.
 - b. Describe the location of body structures, using appropriate directional terminology.
5. Basic terminology
 - a. Define the terms anatomy and physiology.
 - b. Describe the location of structures of the body, using basic regional and systemic terminology.
6. Survey of body systems
 - a. List the organ systems of the human body and their major components.
 - b. Describe the major functions of each organ system.

Explanation of Anatomy

For this first lab of A&P, we'll begin by exploring surface anatomy, which will be repeated throughout your careers as A&P students. In addition, we'll learn how the body can be divided within body planes and how body orientation terms describe how body areas and regional locations are related to one another. The body contains cavities that house internal organs like the brain, heart and stomach. We'll learn the names of those different body cavities while also looking at how organs are distributed within abdominopelvic regions, quadrants and organ systems. We'll finish by learning the general functions of all the organ systems of the body.

Think about how an MRI image looks. It is an image of internal body organs seen as a plane through the body. Knowing what body cavity the image came from, how the body is divided through the different body planes, understanding regional terms, and what organs are within the different organs systems will help you better understand an MRI image. This first A&P lab is the first step at gaining a foundational tool, A&P terminology, that you'll use again and again as healthcare professionals.

Surface Anatomy

The foundation of Anatomy and Physiology (A&P) is learning **surface anatomy** (see Image 1). Surface anatomy are regional names given to external areas of the body that can be used as landmarks to help clinicians during physical examinations. This terminology is repeated in subsequent chapters and is often used for nearby or related anatomical structures. For example, **femoral** means thigh and the bone that is the thigh bone is called the femur, the group of muscles that make up the thigh are called the

quadriceps femoris and the blood vessel that supplies those muscles branches from the femoral artery. It is important to take the time to learn surface anatomy for later study of A&P.

Surface anatomy is divided into main body regions and within those main body regions specific areas are named. The main body regions are the **cephalic** (head), **cervical** (neck), **thoracic** (upper front torso), **dorsum** (back), **abdominal** and **pelvic** (lower front torso), **upper limb**, **lower limb**, **manus** (hand), **pedal** (foot), and **pubic**. Notice that many of the terms are synonyms of words you already know from the English language.

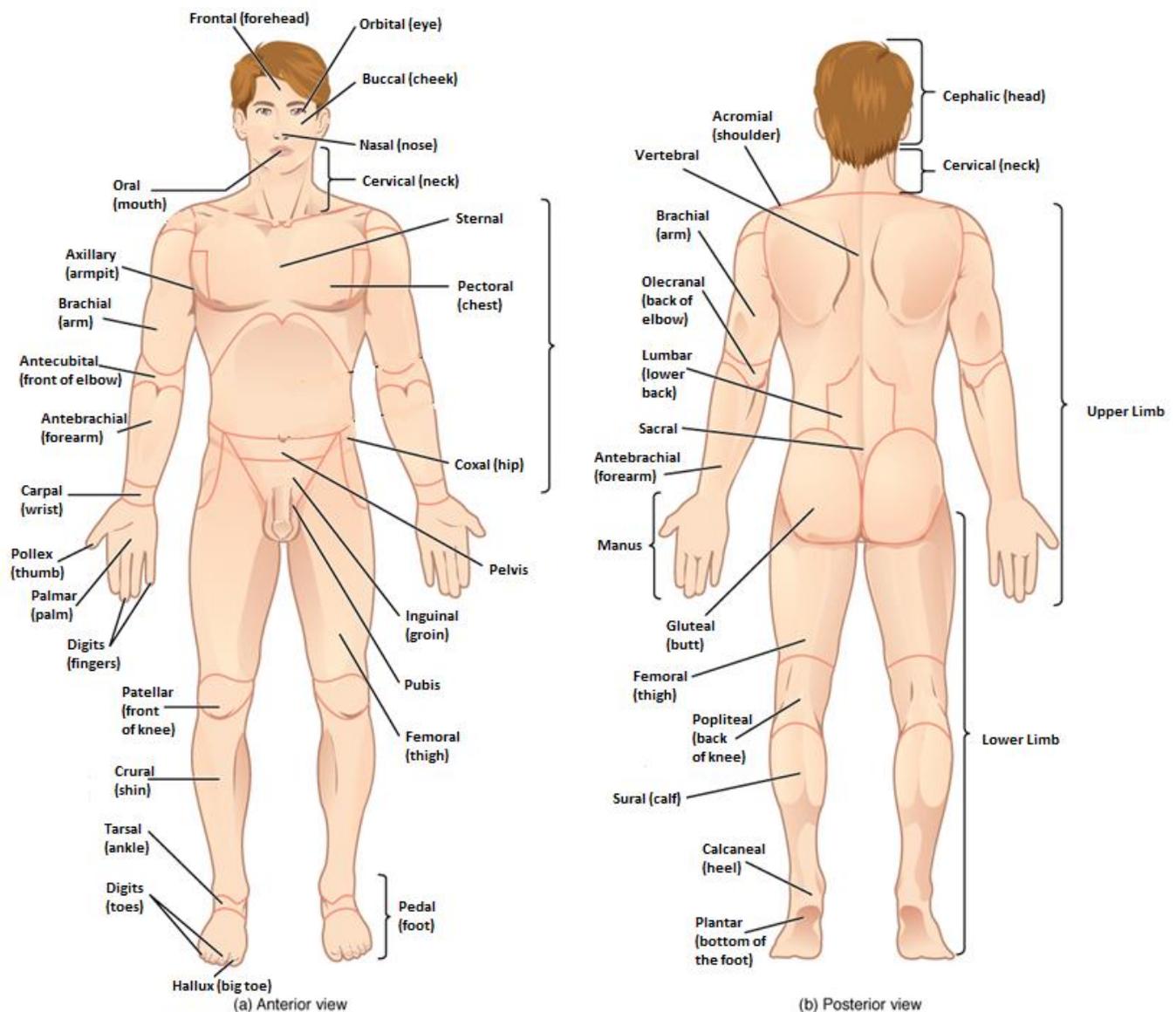


Image 1: Surface anatomy - anterior (a) and posterior (b) view of human figure in anatomical position

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Surface anatomy can be used as a noun or an adjective. The noun form can end in “um”, “is”, or “a” like brachium, oris, axilla, and patella. The adjective form can end in “al”, “ry”, and “ar” like brachial, oral,

axillary and patellar. When using surface anatomy as an adjective you are describing a noun. A region is a noun so surface anatomy in adjective form is written “brachial region”, “oral region”, “axillary region”, and “patellar region”.

Below is a list of the other surface anatomy terms that are within the main body regions:

- Cephalic region contains the **frontal** (forehead), **orbital** (eye), **buccal** (cheek), **nasal** (nose), **oral** (mouth), and **occipital** (back of the head) regions.
- Thoracic region contains **mammary** or **pectoral** (chest), **sternal**, and **axillary** (armpit) regions.
- Dorsal region contains **scapular**, **vertebral**, **lumbar**, **sacral**, and **gluteal** (butt) regions.
- Abdominal region contains the **umbilical** region and pelvis contains the **inguinal** region.
- Upper limb region can be subdivided into the **acromial** (shoulder), **brachial** (upper arm), **antecubital** (front of elbow), **olecranal** (elbow), **antebrachial** (forearm), and **carpal** (wrist) regions.
- Lower limb region can be subdivided into the **coxal** (hip), **femoral** (thigh), **patellar** (knee), **popliteal** (back of the knee), **sural** (calf or back of lower leg), **crural** (leg), and **fibular** (outside, lateral, of lower leg) regions.
- The manus contains the **digits** (fingers), **pollex** (thumb), and **palmar** (palm) regions.
- The pedal region contains the **digits** (toes), **hallux** (big toe), **plantar** (bottom of the foot), **tarsal** (ankle), and the **calcaneal** (heel) regions.
- The cervical and pubic regions do not contain further regions/areas.

As you are probably discovering, A&P involves a lot of memorization. This requires a daily study of learning new words. There are many ways to approach the study of A&P, but a key strategy is repetition. Some ways to study include:

- saying the words and their meaning out loud,
- writing the words on paper and saying their meaning out loud,
- drawing what the words mean,
- using models and labeling models with tape where you’ve written what an area is named,
- coming up with mnemonics to remember groups of structures,
- relating the new information to information you already know,
- forming study groups and quizzing each other, and the list goes on.

Find out early what the best ways for you to start committing to memory this new language of the body. Remember, you’ll see these terms not only later in this course, but also in your healthcare career.

Mini Activity: Ways to study, top three list

Write out the top three active strategies you will use to start studying A&P terminology. Recommend “read the chapter” is NOT on the list.

Body Planes and Body Orientation

In anatomy, body planes and body orientation are used when the body is in **anatomical position**. Anatomical position is standing erect with arms along the side of the body and head, palms of the hand and the toes of the feet are facing forward (anteriorly) (see Images 1, 2, and 3).

There are three body planes that separate the body into two opposing parts (see Image 2). A **frontal plane**, also known as the **coronal plane**, separates the body into **anterior** (front) and **posterior** (back) parts; a **transverse plane** separates the body into **superior** (upper) and **inferior** (lower) parts; and a **sagittal plane** separates the body into right and left-parts. A **midsagittal plane** (median) separates right and left sections of the body equally where a parasagittal plane separates right and left parts unequally. Not only are body orientation terms used when describing how a dissection through a body plane separates the body, but also to describe the relationship between two different body structures (see Image 3). Other body orientation terms, in addition to anterior, posterior, superior, and inferior, are **medial** (towards the midline), **lateral** (away from the midline), **intermediate** (between and in the middle), **proximal** (towards the torso or, with tubular organs, towards the beginning of the structure), **distal** (farther away from the torso or, with tubular organs, towards the end of the structure), **deep** (internal), and **superficial** (external). Also, **ventral** (belly or front), **dorsal** (back), **cephalic** (head) and **caudal** (tail) are body orientation terms commonly used for quadrupeds. Still, they can be used when describing a human and are preferentially used for certain body parts. For example, the ventral and dorsal body cavities, the cephalic surface anatomy term, and the cauda equina, which is an inferior nerve structure in the body.

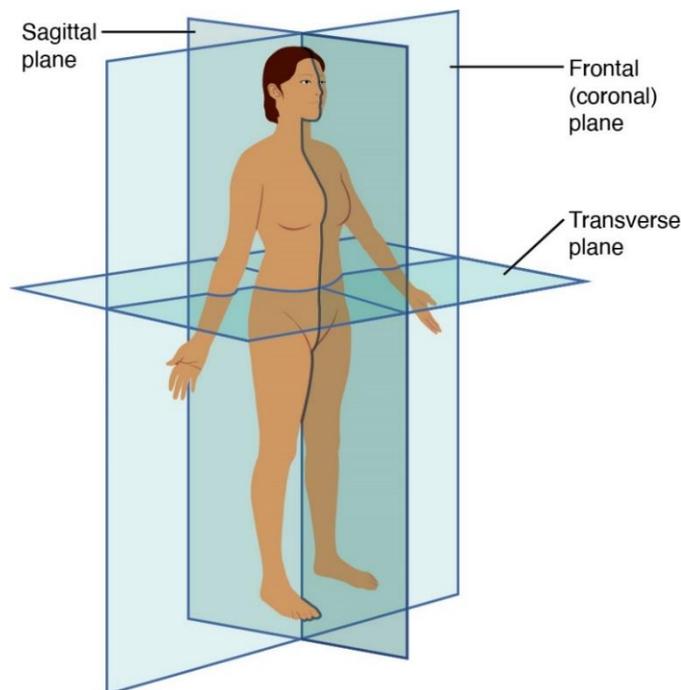


Image 2: Body planes dividing the body

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Remember that orientation terms are used when the body is in **anatomical position**. You'll notice that the body orientation terms are paired and opposing one another. When describing the relationship between structures you can use multiple orientation terms.

Mini Activity: Examples of how to practice body orientation terms

1. What is the relationship between sternal and scapular?

You could say that the sternal region is anterior and medial when compared to the scapular region.

2. What is the relationship between acromial and carpal regions on the right arm?

In this example, you'll use either proximal or distal, since these body orientation terms are used when describing structures that are within the same limb. The acromial region is proximal to the carpal region.

So, to understand the relationship of the shoulder as it pertains to the wrist, place your right hand on your left wrist. Move your right hand along your upper limb towards your left shoulder. As you move your hand towards the torso within the upper limb, your right hand is moving closer towards the torso, (namely the axial skeleton) in this relationship. Think of proximal as approximating, getting closer, to the torso. Distal is the opposite, where the relationship of one structure to another is farther, a greater distance, from the torso. Once you've learned all the surface anatomy, start to compare the body regions to each other using body orientation terms.

Continue practicing terminology in the next Mini-Activity

Mini Activity: Superior/inferior versus proximal/distal

Let's get some practice with superior, inferior, proximal, and distal. In the examples below you'll insert one of those four terms in the blank to compare the two body regions to one another.

1. The acromial region is _____ to the brachial region.
2. The pedal region is _____ to the femoral region.
3. The pelvic region is _____ to the pectoral region.
4. The antebrachial region is _____ to the patellar region.

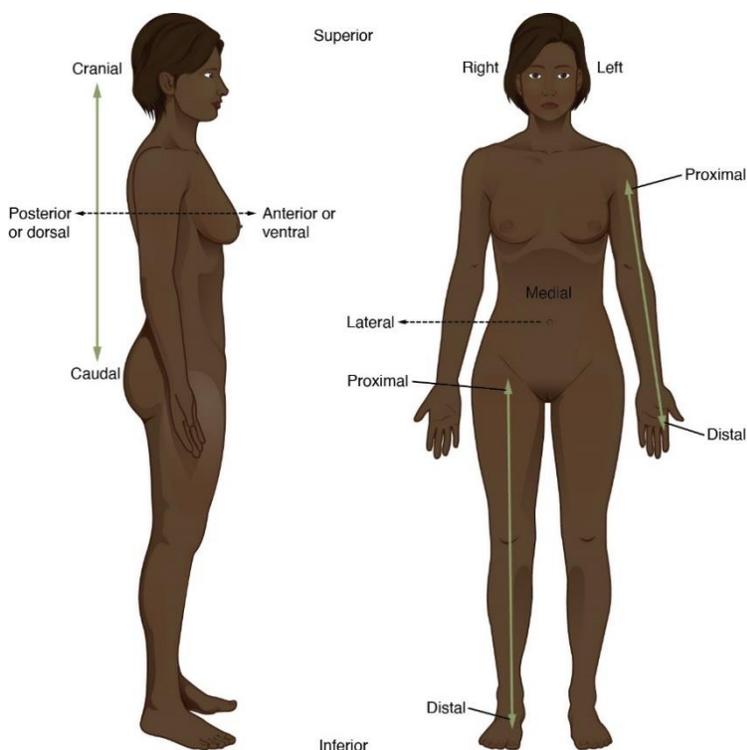


Image 3: Body orientation terms shown on body

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Body Cavities and Abdominopelvic Regions

So far we've only been looking at the surface regions of the body, but there are cavities that contain more body structures (see Image 4). Just like surface anatomy, body cavities also have a hierarchy of divisions where there are main body cavities that are further divided into smaller body cavities. The two main body cavities are the ventral and dorsal body cavities.

The **ventral body cavity** is the cavity that contains the "guts" of the human body. It is further divided into the **thoracic body cavity** and **abdominopelvic body cavity**. The diaphragm is a wide muscle that when contracted (tightened) pulls the lungs downward in order to draw air in; we call this breathing. It is the diaphragm, which runs through a transverse body plane, that separates the thoracic and abdominopelvic body cavities of the ventral body cavity. The thoracic body cavity contains the heart and lungs and the abdominopelvic body cavity mainly contains digestive, urinary, and reproductive organs. The thoracic body cavity is yet further divided where the heart is within a cavity called the **mediastinum** and the right and left lungs are within each of their own **pleural body cavities**. The abdominopelvic body cavity is also further divided into the **abdominal body cavity** and the **pelvic body cavity**. The pelvic body cavity is distinguished from the abdominal body cavity in that its exterior walls are bony, making it more protected.

The **dorsal body cavity** is the posterior cavity that contains the central nervous system: brain and spinal cord. This body cavity is further divided into the **cranial body cavity** whose bony wall protects the brain and the **vertebral body cavity** that contains the spinal cord. Body cavities typically have at least one part of their wall made of bone. In the case of the dorsal body cavity, the skull forms the bony wall of the

cranial body cavity that protects the brain and the vertebrae make up the bony wall of the vertebral body cavity, which protects the spinal cord.

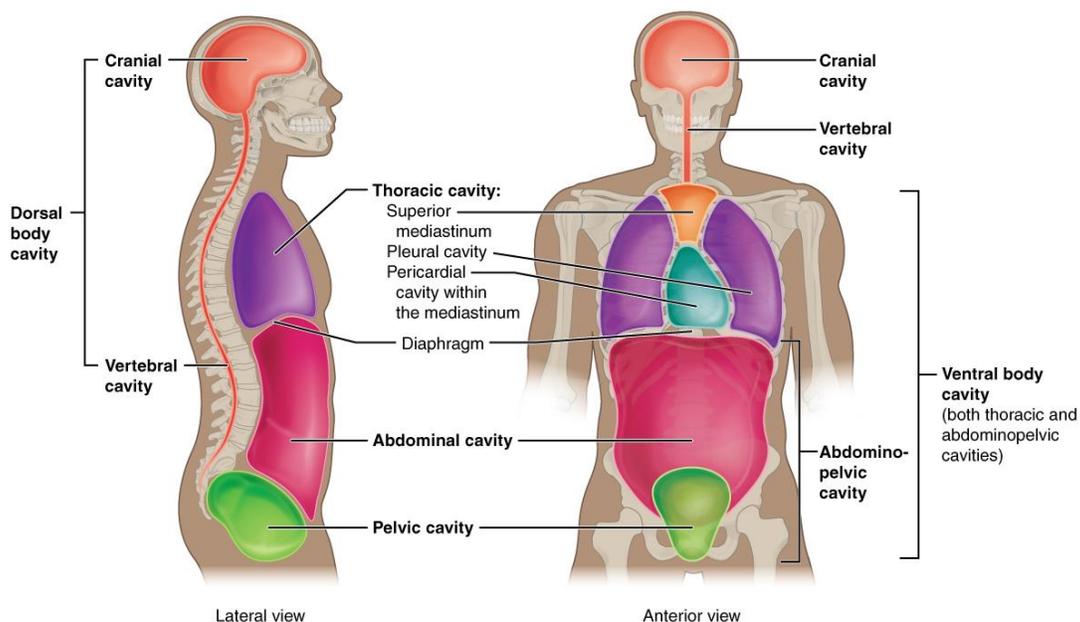


Image 4: Body cavities

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The heart and lungs are important internal organs that also require a substantial amount of bony protection. The thoracic body cavity's bony wall consists of vertebrae and ribs on the posterior side and the sternum and ribs on the anterior side. The abdominal body cavity is the most vulnerable section of the ventral body cavity since its anterior wall is muscle rather than bone. The pelvic body cavity, which contains the urinary bladder, has a bony wall that is made up of the sacrum and coccyx (inferior parts of the vertebrae) posteriorly along with sections of the coxal (hip) bones laterally and anteriorly.

The abdominopelvic body cavity also has named regions. These regions can be used when diagnosing illness and when describing the location of internal body organs. The abdominal body cavity is divided into a *tic-tac-toe* grid (see Image 5) or into four quadrants (see Image 6).

In Image 5, the superior row of boxes in the grid are made up of left and right **hypochondriac regions** laterally; those two regions are covered by lower rib bones that are connected to the sternum through cartilage. *Hypo-* means below and *-chondriac* means cartilage, making these two regions, and the organs within them, below the rib cartilage.

The box in the midline of the superior row is named the **epigastric region**. *Epi-* means above; this region is above where many of the gastric (stomach) processes occur.

To separate the superior and middle rows from each other use the large intestines that travel across (transverse) the body as a line. The middle row of boxes has **left and right lumbar** (lower back) regions and the center-most box in the grid is the **umbilical region**. You may find it confusing that the anterior abdominal area has two regions called "left and right lumbar" since typically lumbar is referring to the

posterior (back) of the body. Sometimes, in A&P, historical usage of terms creates conventions that are strange and those you must simply memorize.

The most inferior row in the grid has a **left and right iliac region**. These are named this because the two regions are nestled within the shallow depressions of the iliac bones on either side of the body. A&P often has a lot of synonyms for terms. In some places, the iliac regions are called the inguinal region. You do not need to memorize this but you may come across it in your lecture course.

The center box of this inferior row is the **hypogastric region**; *hypo-* means below and it is the region that contains organs that are below where most gastric processes have already occurred.

To separate the inferior row from the middle row, find the crest of the iliac bone, which is the most superior part of the coxal bone. Place your hands on the bony upper part of your hips off to the sides of your body. You are resting your hands on your iliac crests! For the two vertical lines in the grid visualize each starting just medial to each of the nipples.

Mini Activity: Visualize a tic-tac toe grid on a torso model

Use the painter's tape¹ to visualize the grid on a torso model or a full human figure model in the lab. Now that you can see where the lines of the grid are located, take the time to list out what organs belong in each region (box).

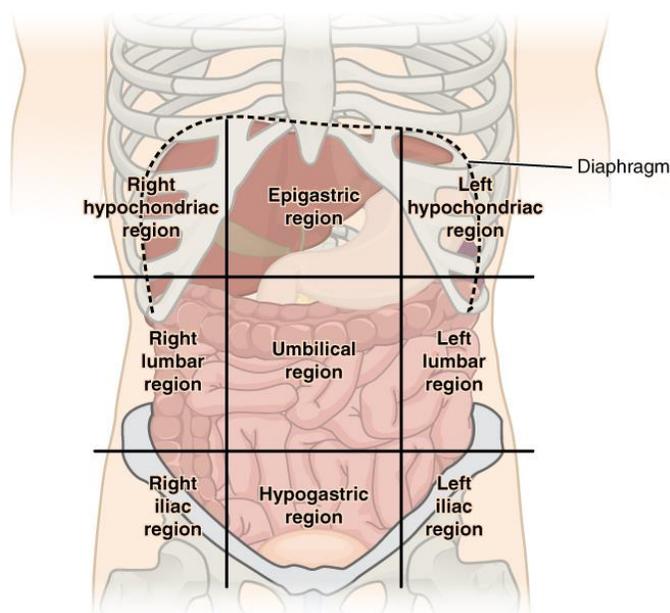


Image 5: Abdominopelvic regions

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¹ Our CNM anatomy lab provides "painter's tape" for students use because the tape is less sticky than others and will not damage the models or strip paint from the models. Please do not use any other type of tape on the models.

Your instructor might also want you to divide the abdominopelvic body cavity into the four quadrants: right upper quadrant, left upper quadrant, right lower quadrant, and left lower quadrant. Notice in Image 6 that the transverse colon is a good landmark to use to separate the upper and lower quadrants. A cut through the midsagittal plane separates the right and left quadrants from each other.

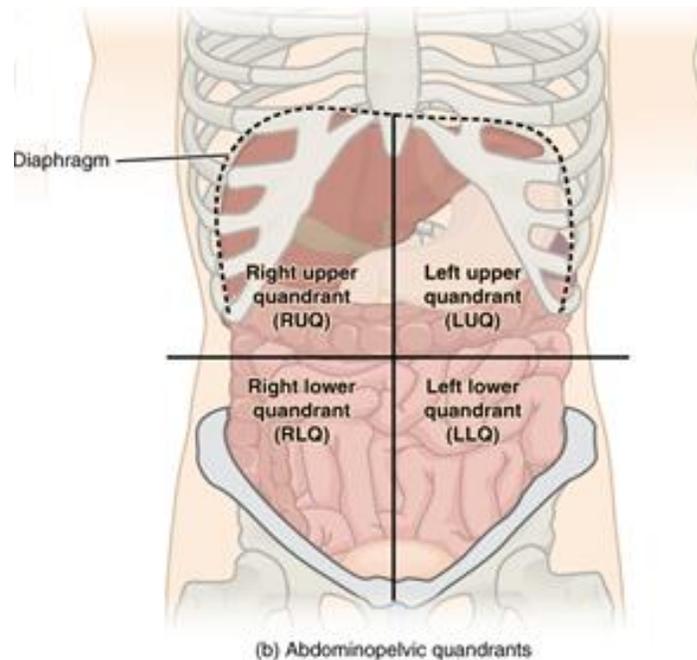


Image 6: Abdominopelvic quadrants

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Hierarchy of the Human Body and Organ Systems

You've already learned in your general biology class that there is a hierarchy of life where the cell is the smallest level in that hierarchy that is alive. As we go up through the levels of life, a group of cells working together is a tissue, a structure that has two or more tissues is an organ, organs working together to perform specific tasks are organ systems, and an organism is made up of organ systems working together to maintain the organism, in this case the human body. In the A&P I lab course you will study in detail four organ systems: **Integumentary, Skeletal, Muscular, and Nervous Systems**. In the A&P II lab course you will study in detail the remaining seven organ systems: **Cardiovascular, Immune/Lymphatic, Respiratory, Digestive, Urinary, Endocrine, and Reproductive Systems**. While you won't be learning in detail all the organ systems this term, you are expected to know major organs within each of the organ systems along with the main function of each of the organ systems. See the following Images 7 and 8 for this information.

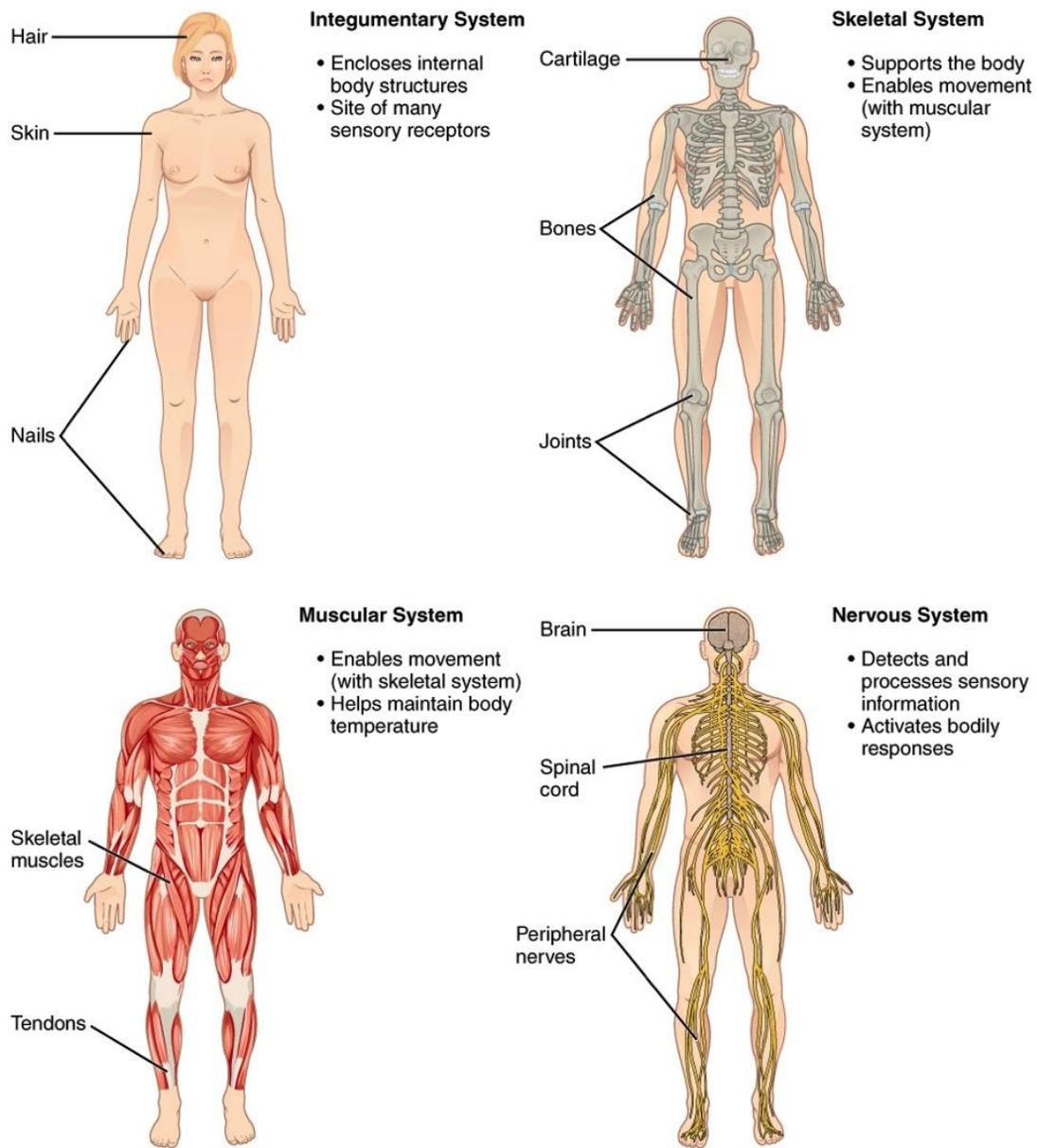


Image 7: Organ systems for A&P I lab

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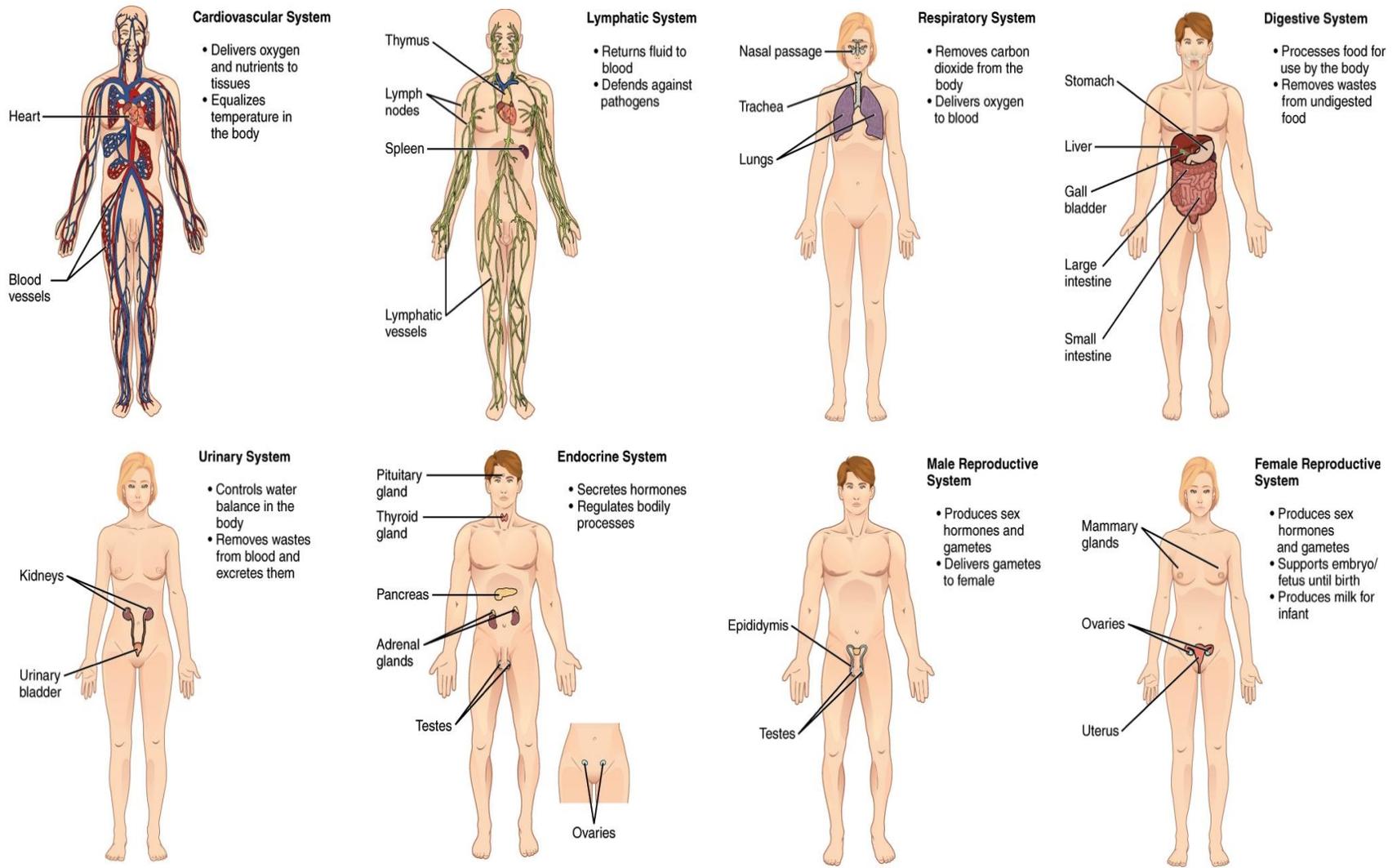
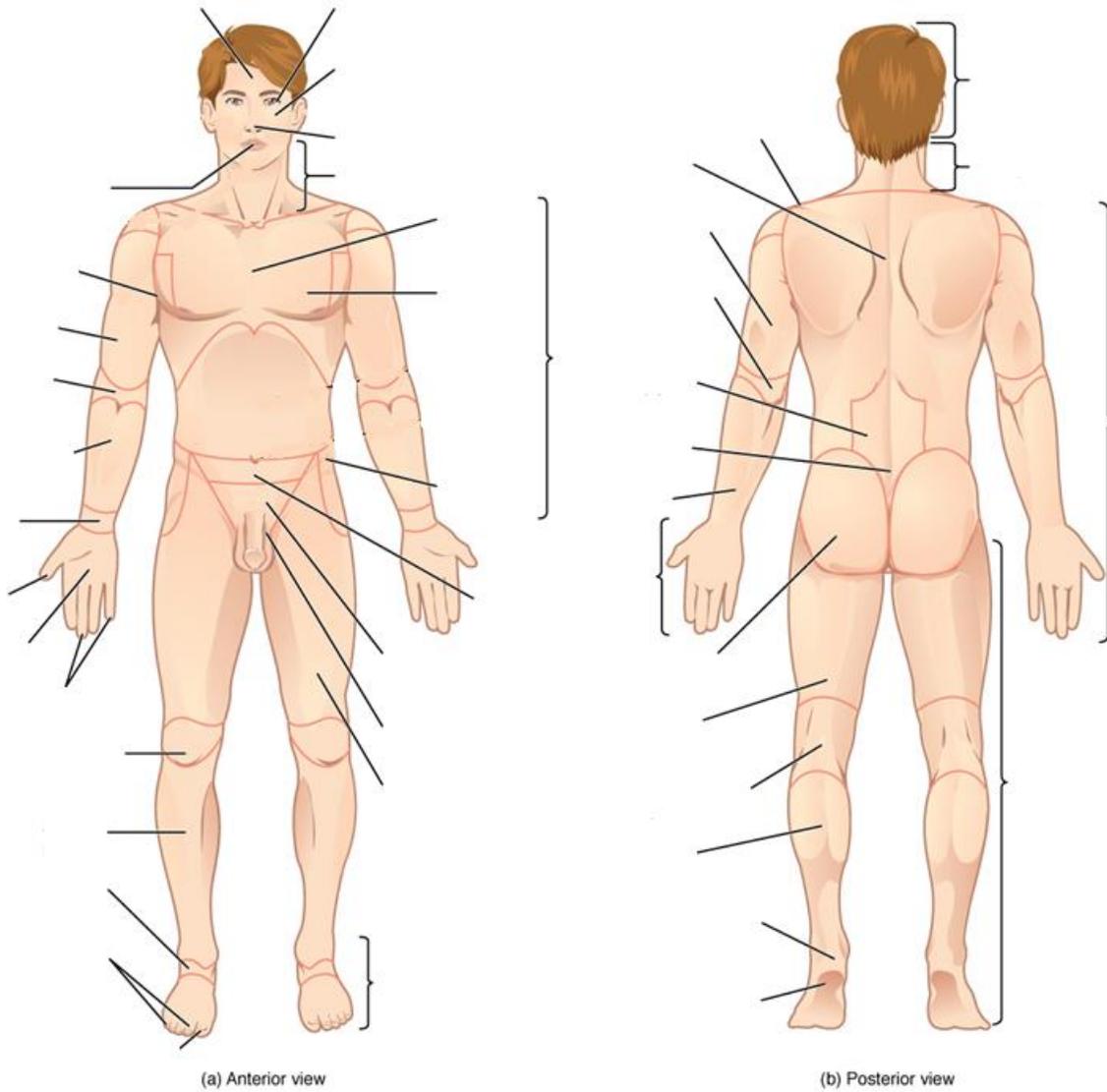


Image 8: Organ systems for A&P II lab

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Activity 1: Surface Anatomy and Body Orientation

Part 1 - Label (write in) all surface anatomy terms on the anterior and posterior view of the human figure seen below; take note of what are the major regions and the smaller regions that are within those major regions. You should write the correct term by EVERY leader line and bracket.



Part 2 - Fill in the blanks below with the appropriate body orientation term while viewing your completed labeling activity of the human figure in Activity 1 Part 1. In some cases, you can combine the orientation terms to be even more specific.

Head/Torso/Surface Terms: superior, inferior, anterior, posterior, medial, lateral, superficial, deep

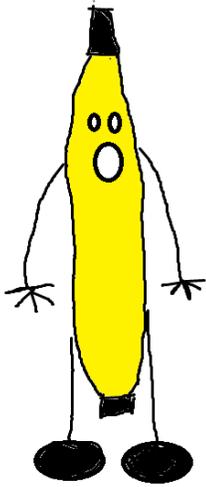
1. The sternal region is _____ to the vertebral region.
2. The nasal region is _____ to the buccal region.
3. The cephalic region is _____ to the thoracic region.
4. The umbilical region is _____ to the coxal region.
5. The axillary region is _____ to the mammary region.
6. The skin is _____ to skeletal muscles.
7. Bones are _____ to skeletal muscles.

Upper and Lower Limb Terms: proximal, distal, anterior, posterior, ventral, dorsal, medial, lateral, superficial, deep

8. The popliteal region is _____ to the patellar region.
9. The plantar region is _____ to the dorsum of the pedal region.
10. The antebrachial region is _____ to the brachial region.
11. The 5th hand digit (pinky finger) is _____ to the pollex.
12. The femoral region is _____ to the tarsal region.

Activity 2: Body Planes

Part 1 - Dissect a banana along the three different body planes. Below is an image of a banana in "anatomical position." Draw in the designated boxes what the banana looks like when dissected in each of the different body planes.



Sagittal plane

Coronal plane

Transverse

Part 2 – Your instructor has laid out models that have the body dissected through a body plane. Fill in the table below with a description of the model and the body plane that the dissection is traveling through within the model.

Description (or drawing) of Model	Body Plane of Dissection

Activity 3: Gunshots Galore

Part 1 - You or your instructor, will randomly choose three points to mark a torso model or torso image with an "X", using painter's tape in the lab. The "X"s indicate where gunshot wounds (GSWs) are located on a recently deceased person (ie., cadaver) that has come into the New Mexico Office of Medical Investigator (OMI). You will be acting as an employee of the OMI and it is your job to document the location of the bullet wounds using surface anatomy terms where the bullet first entered and/or exited the body, body cavity location that the bullet passed through and might still be located within, organs that have been damaged by the bullet along with the organ system that the damaged organs belong to, and, if the bullet is within an abdominopelvic region, which of the nine regions (tic-tac-toe board) is impacted.

	Surface Anatomy of Entry and Exit of Bullet	Main Body Cavity (Dorsal or Ventral)	Specific Body Cavity	Abdominopelvic Region (if applicable)	Organs Possibly Damaged	Organ System of Damaged Organs
GSW 1						
GSW 2						
GSW 3						

Part 2 - In a court of law, the medical pathologist from OMI needs to be able to specifically describe the location of each GSW using the accepted orientation/directional terms. In a complete sentence, describe the location of each GSW in relationship to another body region using the orientation terms: proximal, distal, anterior, posterior, superior, inferior, medial, lateral. For example, "GSW1 is located **lateral** to the left nipple and **inferior** to the clavicle (collar bone).

GSW 1:

GSW 2:

GSW 3: