Learning Outcomes

- Identify anatomical position and be able to reference it when describing anatomical locations.

- Know where to cut to create each of the following and be able to recognize the views created by a cut in each of the following:
  - mid-sagittal plane
  - para-sagittal plane
  - frontal plane
  - transverse plane

- Be able to look up anatomical nouns and adjectives for external body areas and find what they refer to.

- Apply each pair of terms to locate a structure or direct someone to a structure:
  - superior/inferior
  - anterior/posterior
  - medial/lateral
  - proximal/distal
  - superficial/deep
  - dorsal/ventral
  - cephalad/caudal
  - supine/prone

- Locate each of the following:
  - dorsal body cavity
  - cranial cavity
  - spinal cavity
  - ventral body cavity
  - thoracic body cavity
  - diaphragm
  - abdominopelvic cavity
  - abdominal cavity
  - pelvic cavity

- List the major organs and identify at least two physiological roles for each of the 11 human organ systems:
  - integumentary
  - skeletal
  - muscular
  - nervous
  - endocrine
  - cardiovascular
lymphatic/immune
respiratory
digestive
urinary
reproductive

- Identify each organ in the anatomical model and know its location within the model body:
  - cranial cavity
  - palate
  - parotid salivary gland
  - sublingual salivary gland
  - submandibular salivary gland
  - larynx
  - trachea
  - esophagus
  - aorta
  - left lung (2 lobes)
  - right lung (3 lobes)
  - diaphragm
  - kidney
  - adrenal (supra-renal) glands
  - liver
  - gall bladder
  - pancreas
  - stomach
  - spleen
  - large intestine
  - small intestine
  - appendix
  - ovaries
  - uterus
  - female urethra
  - testes
  - scrotum
**Anatomical Position**

**Information**

When anatomists or health professions identify the location of a structure in the human body, they do so in reference to a body in *anatomical position*. That is, you figure out the location based on the assumption the body is starting out in anatomical position.

Anatomical position for a human is when the human stands up, faces forward, has arms extended, and has palms facing out.

![Figure 1.1. These two people are both in anatomical position.](image)

When referencing a structure that is on one side of the body or the other, we use the terms “anatomical right” and “anatomical left”. **Anatomical right** means the structure is on the side that a person in anatomical position would consider their right-hand side (not necessarily on the right of the viewer) and **anatomical left** means the structure is the side that a person in anatomical position would consider their left-hand side (which likewise is not necessarily the left side of the viewer.)
**Anatomical planes**

**Information**

To view the interior of a body, we expose the organs and structures that are visible when that body is cut open along one of four commonly used sectional planes. These planes are the different directions a body is cut to reveal different views of its internal structures.

**Frontal plane** – A vertical cut that separates the front from the back of the specimen. Also known as a coronal plane.

**Transverse plane** – A horizontal cut that separates the top from the bottom of the specimen.

**Midsagittal plane** – A vertical cut down the exact center line of the specimen that separates the left half from the right half.

**Parasagittal plane** – A vertical cut that is off-center that separates the left of the specimen from the right in unequal portions. It does not matter whether it is the left side or the right side that is larger, as long as they are not equal.

![Fig 1.2 The different sectional planes used to expose internal structures.](image)
**Lab exercises 1.1**

You will be provided with a banana and a plastic knife.

i. Using a sharpie, draw on your banana a face and simple body: 2 eyes, a nose, mouth, 2 ears, 2 arms, 2 legs.

ii. Using a scalpel carefully cut along the transverse plane about halfway down your banana person.

iii. Look at the banana organs exposed by the transverse cut and imagine what you would see if the banana were a human.

iv. Using the bottom half the body you just cut, use the scalpel to cut along the frontal plane.

v. Look at the banana organs exposed by the frontal cut and imagine what you would see if the banana were human.

vi. The class will divided into two groups. Using the top half of the banana body created by the transverse cut, one group will use the scalpel to carefully cut along the midsagittal plane; the other group will use the scalpel to carefully cut along a parasagittal plane.

vii. Look at the banana organs exposed by the mid- or parasagittal cut and imagine what you would see if the banana were human.

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*Figure 1.3* A banana person prior to being cut along transverse, frontal, and midsagittal or parasagittal planes.
Anatomical nouns and adjective for external body parts

Information
Like all areas of science, there is a lot of jargon associated with anatomy and physiology. Often terms are used within the field that differ from what we would name things in everyday conversation. Such jargon usually allows the specialist in the field to be more precise in what exactly they are referring to, but the jargon also can be intimidating and exclusionary. If you don’t know it, you are not in the club.

Lab exercises 1.2
Here are a bunch anatomical adjectives (followed in parentheses by the noun version of the same term). For each, use your smart phone or laptop or whatever is most convenient to you to find what body part the term refers to. (Shortcut hint: the Google search engine will return definitions for words if you type “define: word” in the search box, leaving out the quotation marks.)

Write down the body part or body region next to each term. Use Figure 1.4 to help you make sure you have the correct definition, but look up each definition to make sure you are being accurate.

1. Find the body part or region indicated by each of the following terms. Use everyday language to describe the part or region. (Forearm, belly, etc.)

Abdominal (abdomen) _______________ Acromial (acromion) _______________
Antebrachial (antebrachium) __________ Antecubital (antecubitis) ______________
Auricle (auris) ______________________ Axillary (axilla) _______________________
Brachial (brachium) ________________ Buccal (bucca) _________________________
Carpal (carpus) _____________________ Cephalic (cephalus) _____________________
Cervical (cervicis) _________________ Coxal (coxa) ___________________________
Cranial (cranium) _________________ Crural (crus) ___________________________
Digital (digit) _____________________ Dorsal (dorsa) __________________________
Facial (facies) _____________________ Femoral (femur) _________________________
Frontal (frons) _____________________ Gluteal (gluteus) _______________________
Inguinal (inguen) _________________ Lumbar (lumbus) _______________________
Mammary (mamma) _________________ Manual (manus) ______________________
Mental (mentum) _________________ Nasal (nasus) __________________________
Olecranal (olecranon) ______________ Oral (oris) ____________________________
Ocular (oculus)  
Palmar (palma)  
Patellar (patella)  
Pelvic (pelvis)  
Plantar (planta)  
Popliteal (popliteus)  
Pubic (pubis)  
Sacrum (sacral)  
Sural (sura)  
Tarsal (tarsus)  
Thoracic (thorax)  
Umbilical (umbilicus)  

Figure 1.4 Anatomical adjectives for common surface features.
Anatomical orientation and directions

Information

To be able to direct others to specific anatomical structures, or to find structures based on someone else’s directions, it is useful to have specific pairs of terms that allow you to orient your search with respect to the location of known structures. The following pairs of terms are used to make comparisons. Each term is used to orient a first structure or feature with respect to the position of a second structure or feature.

**Superior/Inferior** – Equivalent to above and below when moving along the long axis of a body in anatomical position. The structure that is superior to another is above the second structure when the body is in anatomical position. A feature that is inferior to another is below the second feature when the body is in anatomical position.

**Proximal/Distal** – Equivalent to near and far. Usually used to orient the positions of structures and features along the limbs with respect to the trunk of the body. A feature that is proximal to something else is closer to the limb’s point of attachment to the trunk. A structure that is distal to something else is farther away from the limb’s point of attachment. Less precisely but still occasionally used in the trunk of the body itself to indicate whether something is closer to (proximal) or farther away from (distal) something else.

**Medial/Lateral** – Equivalent to towards the middle or towards the edge. Used with respect to the midline of the trunk of a body in anatomical position. A structure that medial to another is closer to the midline of the body’s trunk. A feature that is lateral to another is farther away from the midline of the trunk.

**Anterior/Posterior** – Equivalent to the front and back of a body in anatomical position. A structure that is anterior to another is closer to the front of the body when the body is in anatomical position. A feature that is posterior to another is closer to the back of the body when the body is in anatomical position.

**Dorsal/Ventral** – Equivalent to belly-side and back-side of a body in anatomical position. For a human in anatomical position, this pair of terms is equivalent to anterior and posterior. However, for four-legged animals in what is considered their anatomical position, the belly-side is not equivalent to the front of the animal. A structure that is dorsal to another is closer to the belly-side of the body. A feature that is ventral to another is closer to the back of the body.

**Superficial/Deep** – Equivalent to closer to the surface and farther from the surface.

**Cephalic/Caudal** – Equivalent to closer to the head and closer to the tail. This is more useful for four-legged animals with tails than for upright humans with only a vestigial tail.
Lab exercises 1.3

1. Fill in the blank with the appropriate directional term to complete the following sentences. More than one answer may be correct.

i. The heart is ______________________ to the lungs.

ii. The knee is ______________________ to the hip.

iii. The wrist is ______________________ to the hand.

iv. The mouth is ______________________ to the nose.

v. The thorax is ______________________ to the abdomen.

vi. The thumb is ______________________ to the ring finger.
vii. The sternum is ______________ to the heart.

viii. The skull is ______________ to the scalp.

ix. The ears are ______________ to the nose.

x. Dorsal refers to the ______________ of the human body, while ventral refers to the ______________ of the human body.

2. Find the indicated structures in the diagrams provided, based on the directional terms given. The structure to find will be one of those at the end of an unlabeled line.

i. Label the extensor digitorum muscle in the figure below. It is:
   Distal to the anconeus muscle
   Lateral to the extensor digiti minimi muscle
   Superficial to the Extensor pollicis brevis muscle

![Figure 1.6 Muscles of the forearm.](image-url)
ii) Label the **Incus** in the figure below. It is:
   * Superior* to the lateral end of the cochlear nerve
   * Medial* to the malleus
   * Lateral* to the stapes

![Figure 1.7 Anatomy of the human ear.](image)

3. Using your knowledge of the different body planes shown in **Figure 1.2**, fill in the appropriate body plane for each of the following descriptions.

   i. The plane that divides the body into anterior and posterior parts is the _________________ plane.

   ii. A transverse plane divides the body into _________________ and _________________ regions.

   iii. A _________________ or _________________ plane divides the body into right and left parts.
The human body cavities

Information
The major cavities of the human body are the spaces left over when internal organs are removed. There are additional body cavities which we will only discuss in lecture. These are the cavities created by serous membranes – the pleural cavities, the pericardial cavity, and the peritoneal cavity – and the mediastinum.

Dorsal body cavity – the cranial cavity and the spinal cavity in combination.

Cranial cavity – the space occupied by the brain, enclosed by the skull bones.

Spinal cavity – the space occupied by the spinal cord enclosed by the vertebrae column making up the backbone. The spinal cavity is continuous with the cranial cavity.

Ventral body cavity – the thoracic cavity, the abdominal cavity, and the pelvic cavity in combination.

Thoracic cavity – the space occupied by the ventral internal organs superior to the diaphragm.

Abdominopelvic cavity – the abdominal cavity and the pelvic cavity in combination.

Abdominal cavity – the space occupied by the ventral internal organs inferior to the diaphragm and superior to the pelvic cavity.

Pelvic cavity – the space occupied by the ventral internal organs that are bordered by the bones of the pelvic girdle.

Figure 1.8 The locations of the major body cavities of the human body.
Lab exercises 1.4

1. Fill in the blank with the appropriate body cavity.

i. The two main body cavities are the ____________ and the ____________ cavities.

ii. The stomach is found in the ____________ cavity.

iii. The heart is found in the ____________ cavity, which is part of the ____________ cavity.

iv. The brain is found within the ____________ cavity which is part of the ____________ cavity.

v. The urinary bladder and reproductive organs are found within the ____________ cavity.
The human organ systems

Information

Organ systems are groups of organs within the body that can be thought of as working together as a unit to carry out specific tasks or functions within the body. The human body is most commonly divided into eleven organ systems, the ones listed below.

It should be kept in mind that these divisions are somewhat arbitrary as to which organs are included and which are excluded. Skeletal muscles attached to bones are part of the muscular system, but the smooth muscles around soft tissues are not. Skeletal muscles are attached to bones, and serve to move the bones, but bones are part of the skeletal system, not the muscular system.

It also bears remembering that no one organ system ever functions independently of the others. The nervous system sends instructions to the muscular system as to when to move particular muscles. The cardiovascular system delivers nutrients and removes wastes from the muscle fibers of the muscular system to allow them to continue to function, etc. Dividing the human body into eleven organ systems is simply a way for the human mind to organize information about what parts do what. In the body itself, the parts that need to interact do interact, regardless of which system they have been grouped into.

The eleven organ systems are shown in Figure 1.9. The figure also lists the organs in each system and some roles for each system.

Lab exercises 1.5

1. For each of the following organs, identify the organ system to which it belongs. There is one organ which belongs to two organ systems; in that case, list them both.

<table>
<thead>
<tr>
<th>Organ</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain</td>
<td>______________________</td>
</tr>
<tr>
<td>Cartilage</td>
<td>______________________</td>
</tr>
<tr>
<td>Skin</td>
<td>______________________</td>
</tr>
<tr>
<td>Heart</td>
<td>______________________</td>
</tr>
<tr>
<td>Lungs</td>
<td>______________________</td>
</tr>
<tr>
<td>Mammary glands</td>
<td>______________________</td>
</tr>
<tr>
<td>Thymus</td>
<td>______________________</td>
</tr>
<tr>
<td>Ovaries</td>
<td>______________________</td>
</tr>
<tr>
<td>Pancreas</td>
<td>_______________ &amp; ______</td>
</tr>
<tr>
<td>Spleen</td>
<td>______________________</td>
</tr>
<tr>
<td>Kidneys</td>
<td>______________________</td>
</tr>
<tr>
<td>Testes</td>
<td>______________________</td>
</tr>
<tr>
<td>Gall bladder</td>
<td>______________________</td>
</tr>
<tr>
<td>Pituitary gland</td>
<td>______________________</td>
</tr>
</tbody>
</table>
Figure 1.9 The eleven organ systems of the human body.
Identifying the major internal organs of the body

**Lab exercises 1.6**

1. Use Google on your smartphones, the texts lying around the lab, and any other resource you like to complete the table below using the half-torso models in the lab.

Each cell in the table below must have:
- An identifying number (from the green sticker)
- Organ name (that corresponds to the number on the sticker attached to that organ)
- Organ system name the organ belongs to (from list on p10 lab manual.)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>a.</td>
<td>a.</td>
<td>a. 29</td>
<td>a.</td>
</tr>
<tr>
<td>b. Adrenal</td>
<td>b.</td>
<td>b. Anus</td>
<td>b.</td>
<td>b. Heart</td>
</tr>
<tr>
<td>c.</td>
<td>c. Nervous</td>
<td>c. Digestive</td>
<td>c.</td>
<td>c.</td>
</tr>
<tr>
<td>a. 3</td>
<td>a.</td>
<td>a. 8</td>
<td>a.</td>
<td>a. 2</td>
</tr>
<tr>
<td>b.</td>
<td>b. Liver</td>
<td>b.</td>
<td>b. Pancreas</td>
<td>b.</td>
</tr>
<tr>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
</tr>
<tr>
<td>a.</td>
<td>a. 20</td>
<td>a.</td>
<td>a. 14</td>
<td>a.</td>
</tr>
<tr>
<td>b. Uterus</td>
<td>b.</td>
<td>b. Right lung</td>
<td>b.</td>
<td>b. Larynx</td>
</tr>
<tr>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
</tr>
<tr>
<td>a. 7</td>
<td>a.</td>
<td>a. 30</td>
<td>a.</td>
<td>a. 6</td>
</tr>
<tr>
<td>b.</td>
<td>b. Submandibular salivary gland</td>
<td>b.</td>
<td>b. Large intestine</td>
<td>b.</td>
</tr>
<tr>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
</tr>
<tr>
<td>a.</td>
<td>a. 10</td>
<td>a.</td>
<td>a. 15</td>
<td>a.</td>
</tr>
<tr>
<td>b. Trachea</td>
<td>b.</td>
<td>b. Appendix</td>
<td>b.</td>
<td>b. Vena cava</td>
</tr>
<tr>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
</tr>
<tr>
<td>a. 1</td>
<td>a.</td>
<td>a. 27</td>
<td>a.</td>
<td>a. 28</td>
</tr>
<tr>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c.</td>
<td>c. Urinary</td>
</tr>
</tbody>
</table>
How to reassemble organs in human torso model

1. Hang the heart.

2. Insert left and right lungs. Remember, lung with three lobes goes on anatomical right.

3. Insert pancreas and spleen. Spleen is on the anatomical left.

4. Insert liver. Fatter side of liver is on anatomical right.

5. Combine the two halves of the uro-genital tract. Insert the whole between the legs with the colon at back and pointing upwards.

6. Insert the small intestine.

7. Insert the stomach under the liver and on top of the small intestine. The fatter side is on anatomical left and both valves point upwards.
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