Introduction

Objective 1: Describe “anatomical position.”

In the glossary of your textbook, the word anatomy is defined as “study of structures in the human body.” The word physiology is defined as “study of how body parts function together.” Your syllabus for BIO 2050 at Prince George’s Community College should include a list of Course Learning Outcomes. One of those outcomes should emphasize that students who successfully complete BIO 2050 should be able to demonstrate understanding of the relationships between structures and their functions within the human body. Thus, throughout the semester there will be an emphasis on learning the structures of the human body, and at the same time learning about their functions.

To begin learning the anatomy of the human body, it is important to have reference points to locate specific structures of the body. Imagine that a doctor asked you to clean an area of a patient’s skin on the lateral aspect of the brachial region, just proximal to the elbow. Would you know what the doctor was talking about? When describing the location of a certain body part, does it matter whether the person is sitting, standing, or lying down?

To provide a standard frame of reference for describing the locations of various parts of the human body, we will consider the body in a position known as the anatomical position. In the anatomical position a person is standing upright with his or her arms at his or her sides; palms of the hands face forward (Fig. 1-1).
Although this is a course in human anatomy and physiology, there are times when we will consider the anatomy of other animals. For example, in Human Anatomy and Physiology II students dissect cats. By virtue of the fact that we walk on two legs, humans are referred to as \textit{biped}s. Nearly all other mammals walk primarily on four legs, and they are called \textit{quadrupeds}. Therefore, the anatomical position for humans does not apply to most other animals.

\textbf{ACTIVITY 1}

Stand in anatomical position. Have your lab partner confirm that you are in the correct position. Note that many of the movable joints in your body (e.g., the elbow, hip, and knee) are aligned at angles of approximately 180°.

In the space at the top of the next page, draw a side view of a human standing in anatomical position. Next to it draw a picture of a cat, also viewed from the side. (If you are not artistically talented, feel free to use stick figures!)

\begin{figure}
  \centering
  \includegraphics[width=\textwidth]{anatomical_position}
  \caption{Anatomical position.}
\end{figure}
Terminology of the Body

I. Locating Parts of the Body

**Objective 2: Identify anterior, posterior, dorsal, and ventral surfaces of the body.**

When you wish to identify or describe a part of the body, it is certainly helpful to know where that part of the body is located. Or, imagine you have a bruise on your body and you wish to tell a nurse where the bruise is located. What terms would you use? In this section we will learn various terms that describe locations on the body.

A good place to start is with the front and the rear. Of course, the terms “front” and “rear” are not proper anatomical terms. Rather, we will use the term **anterior** to refer to the front of the body, and we will use the term **posterior** to refer to the rear. The words **ventral** and **dorsal** have meanings similar to, but subtly different from, the words anterior and posterior. Ventral refers to the surface of an animal where the belly is, and dorsal refers to the surface of the back. Be aware that these terms are applied to a body in anatomical position.

<table>
<thead>
<tr>
<th>Human</th>
<th>Cat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</table>
**ACTIVITY 2**

Take three Post-it notes and write the word “anterior” on each one. Place one note on the anterior surface of one of your legs, place another on the anterior surface of your torso, and place the third on the anterior surface of your head. Have your lab partner check for accuracy.

Take three more Post-it notes, write the word “posterior” on each one, and place them on the posterior surfaces of your leg, torso, and head.

Write the word “ventral” on one Post-it note and place it on your ventral surface; write the word “dorsal” on another note and place it on your dorsal surface.

**QUESTIONS**

2. What part of the hand is anterior? Remember to think of the body in anatomical position.

3. Consider a person standing with his palms facing backward. What part of the hand is anterior now?

**Objective 3:** Compare and contrast the use of the terms anterior, posterior, dorsal, and ventral in describing bipeds and quadrupeds.

You should see from Activity 2 that in a human, anterior and ventral have the same meaning. Likewise, posterior and dorsal have the same meaning. However, the front end of a cat is not the same as its belly. Neither is the rear end of a cat the same as its back.

**ACTIVITY 3**

Return to the pictures you drew for Activity 1. Write the words anterior, posterior, ventral, and dorsal to illustrate their respective meanings for both the human and the cat.

**QUESTION**

4. Which terms have similar meanings when referring to surfaces of the human body?
Objective 4: Use the following paired terms to describe locations of parts of the body: superior/inferior, medial/lateral, proximal/distal, and superficial/deep.

Knowing the difference between front and rear is a good start. However, you need to know more to give a good description of where to find a specific anatomical structure. Consider that both the knee cap and the nose are anterior. The terms that follow will help you narrow down a particular location of the body. As you study these terms, you should understand that their meanings are generally clear only when comparing the location of one structure in reference to another.

The meanings of the terms superior and inferior should be obvious. For example, the nose is superior to the mouth, and the chin is inferior to the mouth.

Imagine a line drawn from the top of the head straight down through the middle of the body. A structure closer to this midline of the body is medial. A structure farther to the side, away from the midline, is lateral. A person’s thumb is lateral to his little finger (remember anatomical position!). The little finger is therefore medial to the thumb.

The terms proximal and distal are used to refer to the positions of structures on the appendages (i.e., the arms, hands, legs, and feet). Any part of an appendage closer to the torso is proximal. Any part of an appendage farther away from the torso is distal. The ankle is distal to the knee, and the knee is proximal to the ankle. Avoid using these terms to describe parts of the torso, neck, and head.

Superficial refers to a structure closer to the surface of the body. The meaning of deep should be obvious. The biceps muscle is deep to the skin, and the skin is superficial to the biceps muscle.

ACTIVITY 4
Get out the Post-it notes again! Write each of the first six terms listed in Objective 4 on six separate notes. On the side of your hip you should feel a bony ridge. This is called the iliac crest. Compare the location of your iliac crest with the location of your belly button. Select the pair of Post-it notes that best describes the positional relationship between these two structures, and place one of the notes on your iliac crest and the other on your belly button.

Use another pair of notes to show the relationship between your sternum (breastbone) and your belly button.

Use another pair of notes to show the relationship between your elbow and your wrist.

QUESTIONS
5. Which one of the terms from Objective 4 is best used to describe the position of the right eye in relation to the right ear?
6. Which one of the terms from Objective 4 is best used to describe the position of the right eye in relation to the nose?

7. Which of the terms given in Objective 2 can be used to describe the position of the trachea relative to the esophagus?

II. Body Sections

Objective 5: Describe the results of making a longitudinal section through a body and a transverse section through a body.

Many of the structures we will discuss in Anatomy and Physiology are found inside the body. Examples include the brain, heart, and stomach. In order to view these structures, it is necessary to cut into the body. Often you will be viewing internal structures in pictures that show a body that has been cut. To understand what you are looking at, you need to know how the body has been cut.

Not only are there many ways to skin a cat, there are also many ways to cut into one! However, there are two basic directions in which cuts are typically made for study in A&P. Imagine a line extending from the top of a person’s head inferiorly through the length of the person’s body (Fig. 1-2). This line represents the long axis of the person’s body. Any cut made along or parallel to this line is a longitudinal cut. When you look at the part of the body that has been revealed by this cut, then you are looking at a longitudinal section of the body. Any cut made at a right angle across the long axis of the body is a transverse cut. When you look at the part of the body that has been revealed by this cut, you are looking at a transverse section of the body. This may also be called a cross-section, because the cut has been made across the long axis.

The terms you have just learned may also be applied to individual organs. Each organ of the body, when considered by itself, also has a long axis and can be cut into either longitudinal or transverse sections.

Figure 1-2. The long axis through a human body.
ACTIVITY 5
Obtain a piece of rubber tube about an inch or two long. Determine the long axis of the tube and make a transverse cut through the tube. In the space below, draw what you see when you look at the transverse section of the tube that you have created.

Take one of the pieces of tube that remains after you made the transverse cut, and make a longitudinal cut through the tube. In the space below, draw what you see when you look at the longitudinal section of the tube that you have created.

Objective 6: Describe the views produced by making sagittal, frontal, and transverse sections through a body.

Previously you were told there are two basic directions along which to cut the body: longitudinal and transverse. Now you will learn that when cutting an entire body and many organs, there are actually two ways to make a longitudinal cut. A **frontal** cut is a longitudinal cut that separates the ventral portion of the body or organ from the dorsal portion. A **sagittal** cut is a longitudinal cut that separates the left portion of a body or organ from the right portion. Figure 1-5 shows a body divided by sagittal, transverse, and frontal planes.
As you continue your studies of anatomy and physiology, you will frequently view images that show the body or an organ cut into sagittal, transverse, or frontal sections. You should now understand what these terms mean, and you should now understand that these are the three basic ways to cut through the body or an organ. Furthermore, you will come across some additional, but related, terms. In a clinical setting, a cut that separates the front of the head from the back of the head is often referred to as a coronal cut. “Coronal” has the same meaning as “frontal.” When a sagittal cut is made along the exact midline of the body, the result is a midsagittal section. Any sagittal cut that is made either to the left or the right of the midline of the body results in a parasagittal section.

**ACTIVITY 6**

Get a block of Styrofoam and a scalpel. Draw a stick figure on one side of the Styrofoam block. Identify the long axis of the person represented on the block, then make a midsagittal cut through the person. Take the right side of the body and make a transverse cut through it. Take the left side of the body and make a frontal cut through it.

**REVIEW QUESTIONS**

8. Why don’t the terms “sagittal” and “frontal” apply when cutting a tube?
9. List three organs in the human body that have the shapes of tubes.

10. Figure 1-4 shows an internal view of the heart. What type of cut was made to produce this view?
11. Figure 1-5 shows a cut through the esophagus and trachea. What kind of cut is this?

12. A midsagittal cut is often considered to produce two equal, but mirror-image, halves of the body. Identify two things that are not equal about the two halves produced by a midsagittal cut. (Hint: Think about some of the internal organs, such as the stomach.)

**CLEAN UP**
- Clean your scalpels and return them to the toolboxes where they are stored.
- Throw all used Post-it notes and cut pieces of tubing and Styrofoam away in the regular trash.
- Leave your tables clean (wipe them down if necessary) and push in your stools before you leave.