Chapter 2
Body Organization and Anatomical Directions

Objectives

After studying this chapter, you will be able to:

1. Identify the systems of the body
2. List the components of the body systems
3. Translate medical words pertaining to areas of the body
4. Identify anatomical direction and positions
5. Label the planes of the body

Checklist of New Combining Forms in this Chapter

- ❑ **abdomen/o**
- ❑ **adip/o**
- ❑ **anter/o**
- ❑ **brachi/o**
- ❑ **bronch/o**
- ❑ **cardi/o**
- ❑ **carp/o**
- ❑ **cephal/o**
- ❑ **crani/o**
- ❑ **crur/o**
- ❑ **infer/o**
- ❑ **later/o**
- ❑ **medi/o**
- ❑ **neur/o**
- ❑ **ocul/o**
- ❑ **or/o**
- ❑ **patell/o**
- ❑ **ped/i**
- ❑ **ped/o**
- ❑ **phalang/o**
- ❑ **derm/o**
- ❑ **dermat/o**
- ❑ **dist/o**
- ❑ **dors/o**
- ❑ **femor/o**
- ❑ **glute/o**
- ❑ **hem/o**
- ❑ **hemat/o**
- ❑ **hist/o**
- ❑ **pod/o**
- ❑ **poster/o**
- ❑ **proxim/o**
- ❑ **pub/o**
- ❑ **pulm/o**
- ❑ **pulmon/o**
- ❑ **super/o**
- ❑ **umbilic/o**
- ❑ **ventr/o**

Chapter Outline

- The systems of the human body
- Body cavities
- Body anatomical position and planes
- Combining forms and terms relating to movement
- Combining forms associated with parts of the body
- Learning activities

The Systems of the Human Body

The human body is organized into specialized systems (Figure 2.1). Each system is unique, but interacts with other systems to function properly. Knowing the names, components, and functions of the systems is critical to fully appreciating medical terminology.

Health care providers typically evaluate patients by performing a review of systems (ROS). In a ROS, the health care provider begins the examination at the patient's head and continues by body system (e.g., neurological, cardiovascular, etc.) through the whole body. Therefore, knowledge of the composition of each system is important to those working in the health care field. Table 2.1 provides a list of the human body systems and the contents of them.

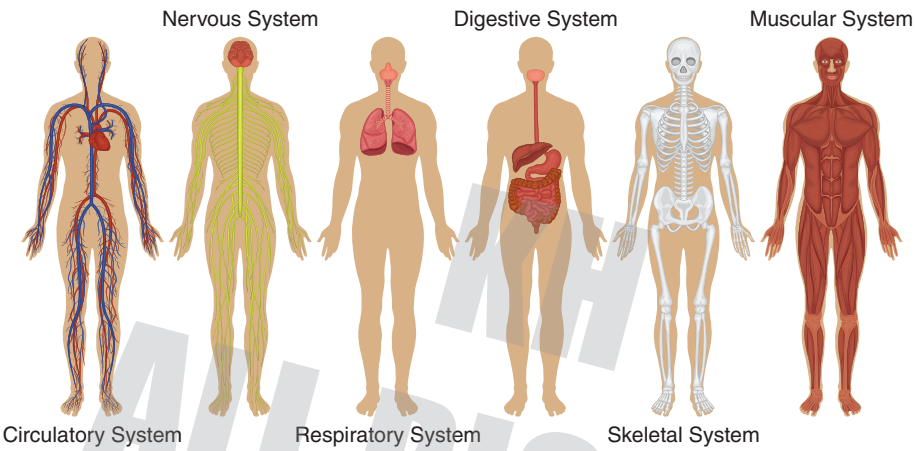


Figure 2.1 Human body systems.

Table 2.1 The Systems of the Body and Their Components

System	Components
Musculoskeletal (Chapter 5)	Muscles, bones, ligaments, joints
Cardiovascular (Chapter 6)	Heart, blood vessels, lymph nodes and vessels, spleen, thymus, tonsils
Respiratory (Chapter 7)	Lungs, pharynx (throat), larynx (voice box), trachea (windpipe)
Neurological (Chapter 8)	Brain, spinal cord, nerves
Gastrointestinal (Chapter 9)	Mouth, tongue, teeth, esophagus, stomach, intestines, liver, gall bladder, pancreas
Integumentary (Chapter 10)	Skin, hair, sweat glands, sebaceous glands
Endocrine (Chapter 11)	Thyroid, pituitary gland, adrenal glands, pancreas, parathyroid
Urinary (Chapter 12)	Kidneys, ureters, urinary bladder, urethra
Reproductive (Chapter 13)	Male: testes, penis, prostate gland Female: ovaries, fallopian tubes, uterus, vagina, mammary glands
The Senses (Chapter 14)	Nose, eyes, ears

Body Cavities

In addition to body systems, there are specific anatomical regions in the body. These regions relate to the general location of certain body organs. All of these have terms related to them so health care providers can be accurate when describing locations (of pain, swelling, etc.) to colleagues. The body has two distinct locations (dorsal and ventral) that are further divided into five body cavities (see Figures 2.2 and 2.3 Table 2.2). **Dorsal** (posterior) cavities hold the brain and spinal cord; and **ventral** (anterior) cavities contain most of the rest of the body's organs. If you notice, some organs are not contained within a cavity. The kidneys are two organs that reside in the **retroperitoneal (retro** – behind; peritoneum – the tough membrane that lines the entire abdominal cavity) space and are therefore not within a cavity.

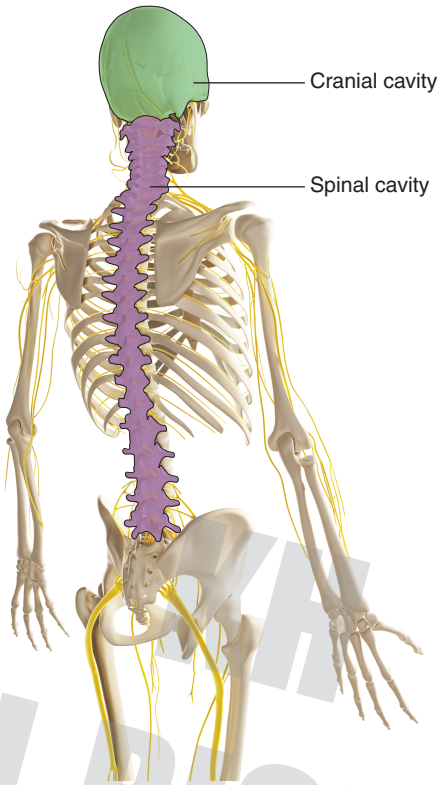


Figure 2.2 Cranial and spinal body cavities lie in the dorsal aspect of the body.

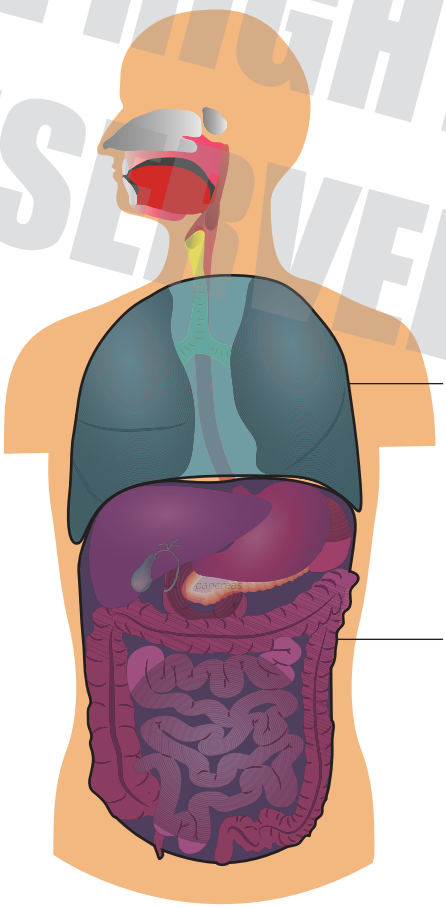


Figure 2.3 Thoracic and abdominal body cavities are found in the ventral (anterior) aspect of the body.

Table 2.2 Body Cavities

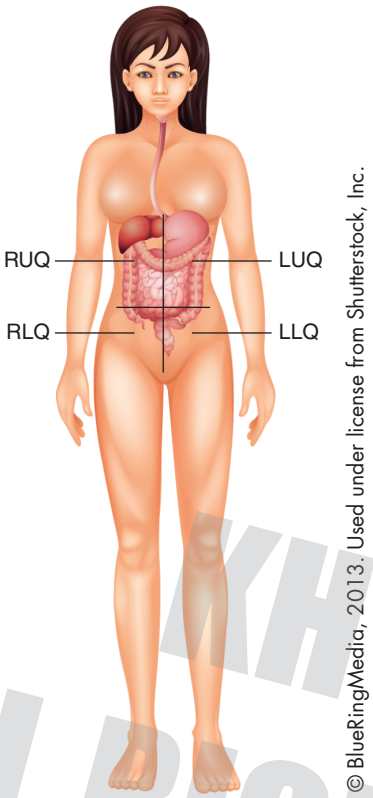
Body Cavity	Components
Cranial	• Brain
Spinal	• Spinal cord
Thoracic	• Pleural cavity (lungs) • Mediastinum (heart, thymus, trachea, esophagus)
Abdominal	• Stomach • Spleen • Liver • Gallbladder • Pancreas • Intestines
Pelvic	• Urinary bladder, ureters, urethra, some of the intestines • Males: prostate • Females: ovaries, fallopian tubes, uterus, vagina

The dorsal and ventral cavities are general locations, whereas the abdominal cavity, for example, is not only divided into four quadrants (Figure 2.4), but it also has nine identified surface regions (Figure 2.5). Both the quadrants and regions are named for their anatomical location.

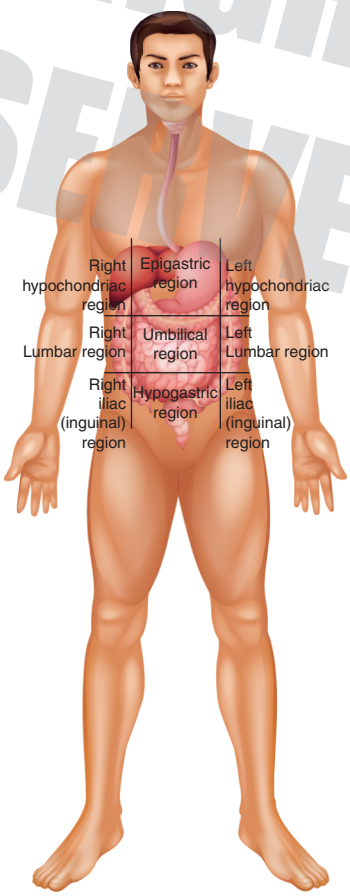
Table 2.3 Abdominal Quadrants

Abdominal Quadrant	Major Contents
Right upper quadrant (RUQ)	• Gallbladder • Liver • Upper Right Kidney • Pancreas* • Small intestine* • Large intestine*
Right Lower quadrant (RLQ)	• Appendix • Lower Right Kidney • Right ovary • Right fallopian tube • Right ureter • Small intestine* • Large intestine*
Left upper quadrant (LUQ)	• Spleen • Stomach • Liver* • Pancreas* • Small intestine* • Large intestine*
Left lower quadrant (LLQ)	• Left ovary • Left fallopian tube • Left ureter • Lower Left Kidney • Small intestine* • Large intestine*

* Indicates that only a portion of the organ lies within the specified quadrant.



■ **Figure 2.4** Quadrants of the abdomen.



■ **Figure 2.5** The nine regions of the abdomen.

Body Anatomical Position

The anatomical position refers to a person standing with arms at the sides, palms facing forward, and with the head and feet facing forward. It is the position from which anatomical directions begin, and is a reference to describe sites (Figure 2.6).

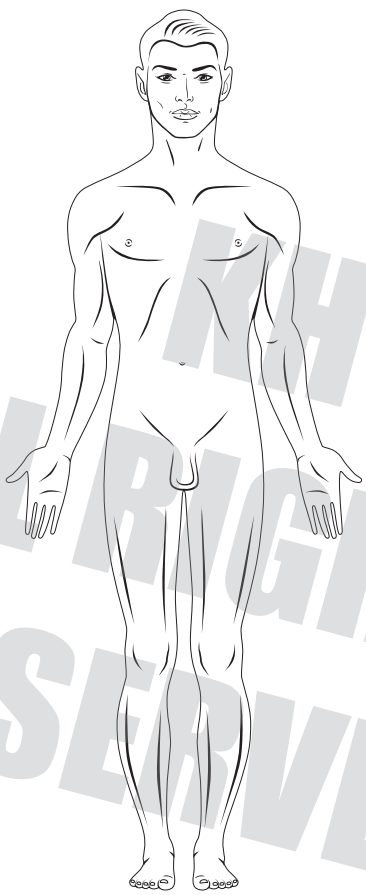
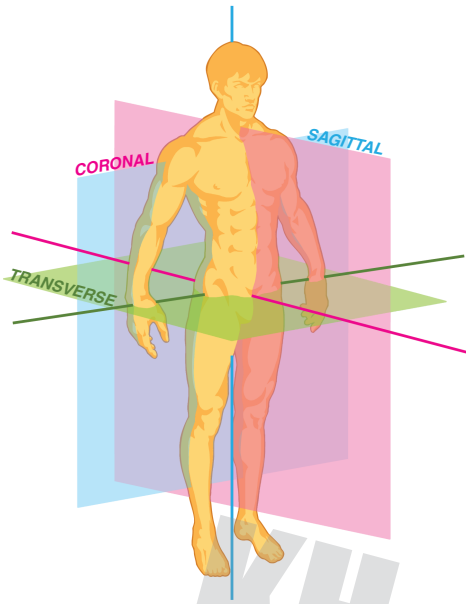


Figure 2.6 Anatomical position — facing forward with palms of the hands and feet also facing forward.

Body Planes

There are three main anatomical planes of the body that assist when describing the location of something, or with performing certain tests (e.g., x-rays). The **frontal (coronal)** plane divides the body into front (anterior) and back (posterior) halves, the **sagittal** plane passes through the body separating the right and left sides, and the **transverse (horizontal)** plane splits the upper (superior) and lower (inferior) aspects. These planes do not necessarily split in perfect halves, and are shown in Figure 2.7.



■ **Figure 2.7** Planes of the body.

Combining Forms and Terms Relating to Movement

Table 2.4 Anatomical Directions/Explanations

Combining Form	Direction/Description
anter/o	Anterior; pertaining to the front of the body
dist/o	Distal; a farther **dist**ance from another body part/main body. The tips of the fingers are distal to the wrist.
dors/o	Dorsal; pertaining to the back of the body (think of the dorsal fin on a shark)
infer/o	Inferior; below – in relation to another body part
later/o	Lateral; away from the midline of the body – in relation to another body part
medi/o	Medial; toward the midline of the body – in relation to another body part
poster/o	Posterior; pertaining to the back of the body
proxim/o	Proximal; closer to the main body, or point of attachment.
super/o	Above – in relation to another body part
ventr/o	Ventral; pertaining to the front of the body

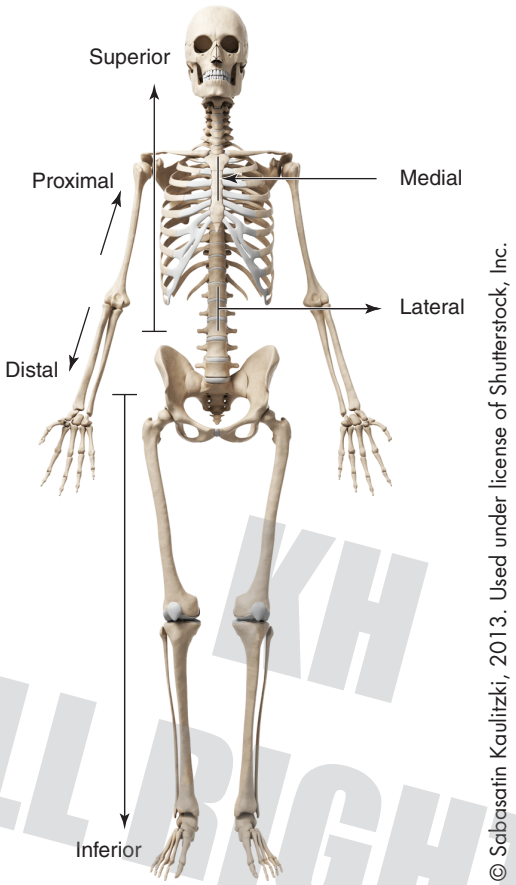
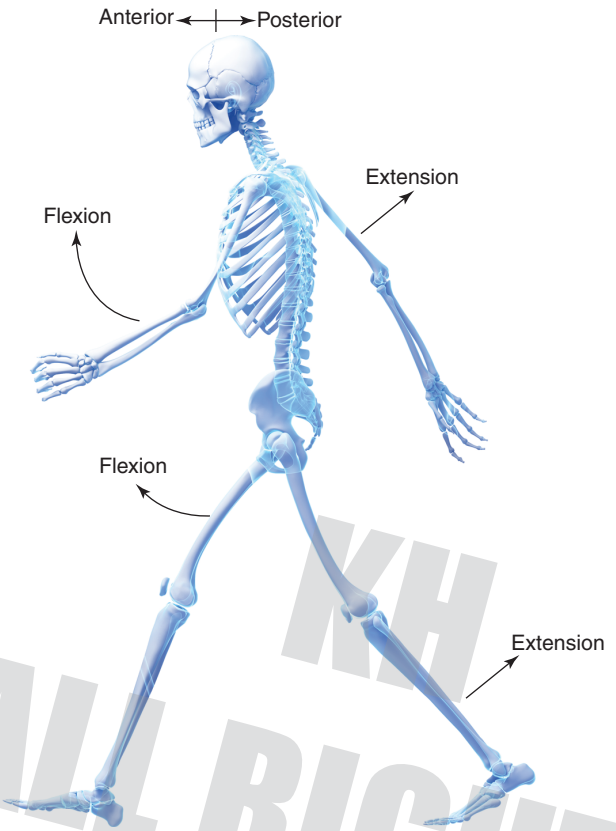


Figure 2.8 Directional terms.

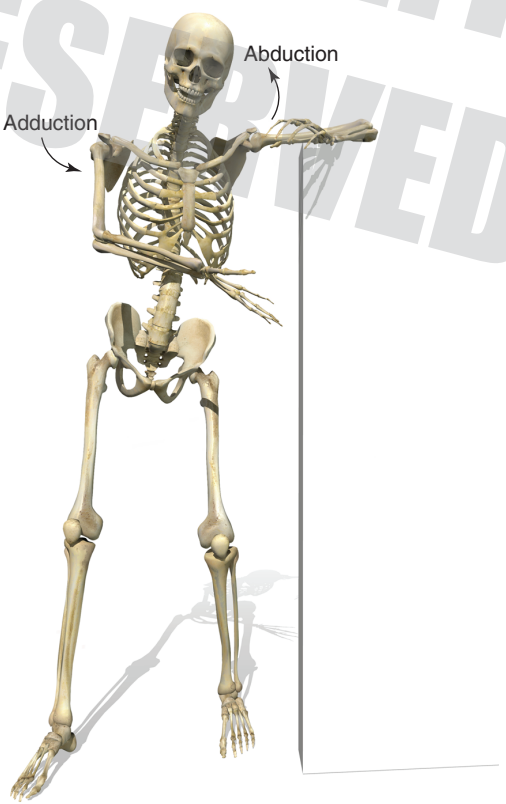
Table 2.5 Terms Relating to Movement of the Body

Word	Meaning
adduction	To move an arm or leg closer to the body (to 'add' to the body)
abduction	To move an arm or leg away from the body
extension	To straighten a joint, increasing the angle between two bones
flexion	To bend a joint, moving two bones closer together
lateral bend	To bend the trunk sideways
rotation	To rotate a body part, such as the neck or shoulder. Not all body parts rotate. The humerus internally (turns in toward the body) and externally (turns away from the body) rotates.

Note that these terms refer to movement from a body in anatomical position (Figures 2.9 & 2.10).



■ **Figure 2.9** Flexion occurs on the anterior aspect of the body; extension occurs on the posterior aspect.



■ **Figure 2.10** Adduction (or move towards; to 'add') and abduction (to move away) occur at the shoulder and hip joints.

Table 2.6 Movement Pertaining to the Limbs

Movement specific to the ankle

Inversion	To turn the ankle by rolling the sole of the foot inward; also *invert*. Opposite of eversion
Eversion	To turn the ankle by rolling the sole of the foot outward; also *evert*. Opposite of inversion
dorsiflexion	To pull the toes up toward the shin
plantarflexion	To point the toes down

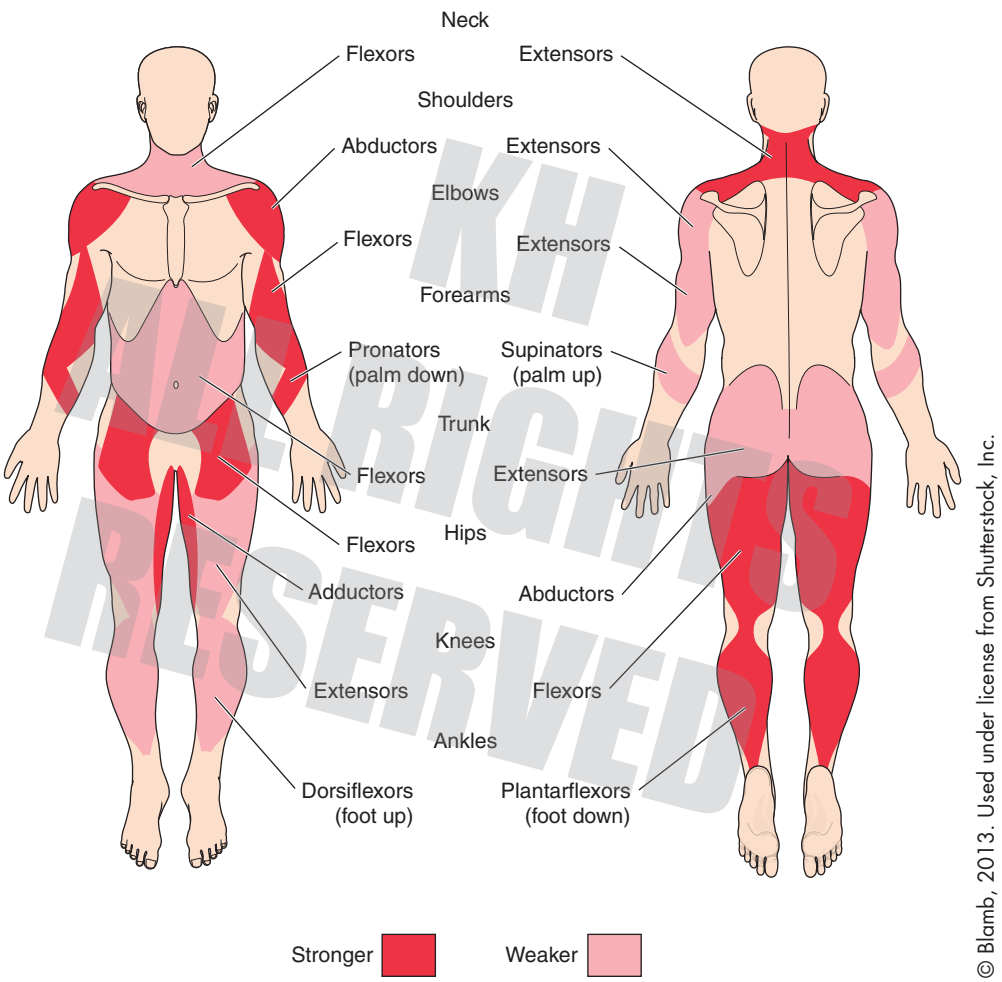


Figure 2.11 Muscles that act on body movement according to function.

Movement specific to the hands and feet

pronation	*In the forearm/hand:* To turn the palm downward *In the foot:* to move the heel of the foot outward
radial deviation	To move the thumb side of the wrist away from the body
supination	*In the forearm/hand:* To turn the hand upward (holding a bowl of soup) *In the foot:* to roll the heel of the foot inward
ulnar deviation	To move the pinky (5th phalange) side of the wrist toward the body

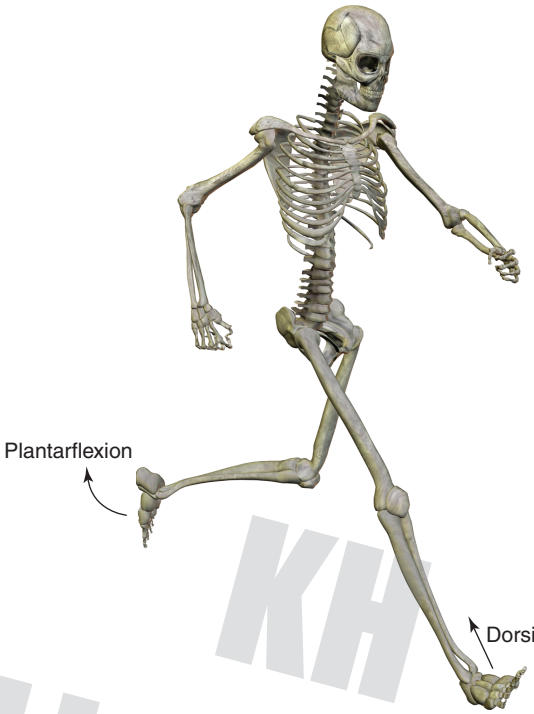


Figure 2.12 Dorsiflexion and plantarflexion.

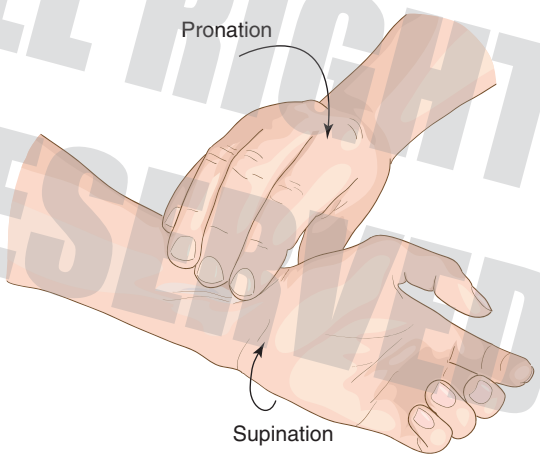


Figure 2.13 Pronation and supination.

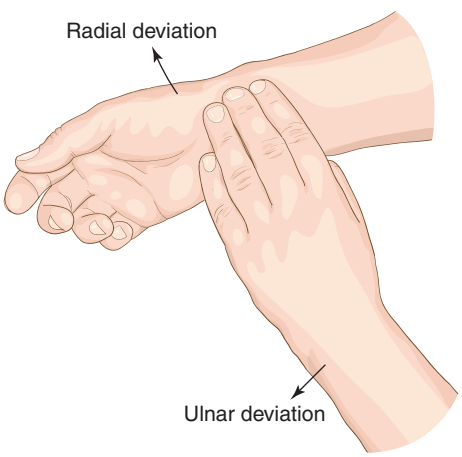


Figure 2.14 Ulnar and radial deviation.

Combining Forms Associated with Parts of the Body

Table 2.7 Combining Forms Associated with Body Components

Word	Meaning
abdomen/o	abdomen
adip/o	fat
brachi/o	pertaining to the arm
bronch/o	bronchial tubes
cardi/o	heart
carp/o	wrist bones
caud/o	tail
cephal/o	head; toward the head; pertaining to the head
crani/o	skull, pertaining to the skull
crur/o	leg
derm/o; dermat/o	skin
femor/o	thigh bone
glute/o	buttocks
hem/o; hemat/o	blood
hist/o	tissue
lymph/o	lymph
neur/o	nerve
ocul/o	eye
or/o	mouth
patell/o	kneecap
ped/i; ped/o	foot or child
phalang/o	fingers or toes (bones of)
pod/o	foot
pub/o	pubic bone (of pelvis)
pulm/o; pulmon/o	lungs
umbilic/o	navel
verterb/o	vertebrae

Table 2.8 Other Terms Associated with the Human Body

Word	Relates to
palmar	The palm of the hand
plantar	The sole of the foot
prone	Lying on the front, the abdomen
supine	Lying on the back facing up (**sup**ine)
tarsal	The ankle

Figure 2.15 Prone position is to lie on your belly.

Figure 2.16 Supine position is to lie face up.

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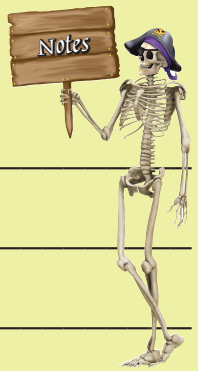

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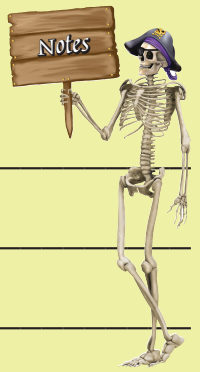


Name: _____

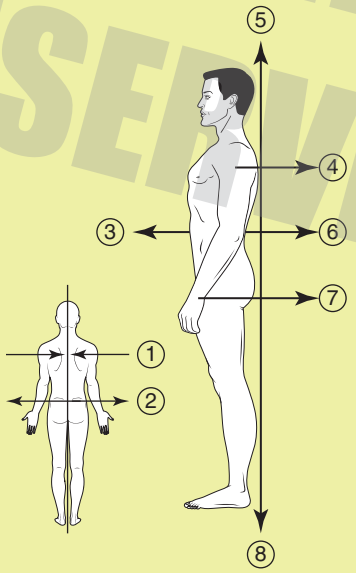
Body Organization and Anatomical Directions

A. Matching

Match the combining form with its meaning.

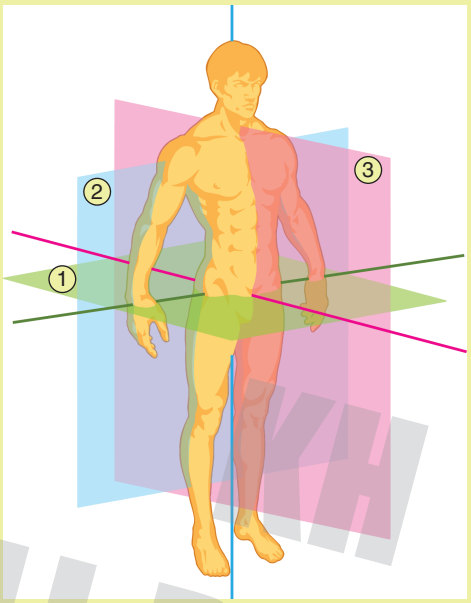
1. brachi/o _____	a. below
2. pod _____	b. eye
3. or/o _____	c. ear
4. dors/o _____	d. tissue
5. ocul/o _____	e. fat
6. hist/o _____	f. blood
7. adip/o _____	g. back
8. infer/o _____	h. mouth
9. ot/o _____	i. foot
10. hem/o _____	j. arm

B. Label the body with the correct directional terms from the list below



- anterior _____
- posterior _____
- proximal _____
- distal _____
- superior _____
- inferior _____
- lateral _____
- medial _____

C. Label the correct plane



1. _____
2. _____
3. _____

D. Using this list, place the tissues in the correct row identified by system. One has been done for you

System	Tissue	Tissue	Tissue
Endocrine	*thyroid*		
Reproductive			
Integumentary			
Respiratory			
Neurological			
Gastrointestinal			
Urinary			
Musculoskeletal			
Cardiovascular			

E. Separate the combining form from the prefix or suffix and define the following words

List: bones, brain, fallopian tubes, gall bladder, hair, heart, kidneys, ligaments, liver, lungs, muscles, nerves, ovaries, pancreas, pharynx, pituitary, prostate gland, sebaceous glands, skin, spinal cord, spleen, thymus, tongue, trachea, ureter, urinary bladder

1. neurogenesis — *neur/o/genesis: formation of a nerve cell*
2. epicardium _____
3. bronchitis _____
4. cephalgia _____
5. otorrhea _____
6. periumbilical _____
7. extraoccular _____
8. erythroderma _____
9. pulmonologist _____
10. hematoma _____