

Exercise 2

LABORATORY

Organs, Systems, and Organization of the Body

Introduction

The study of the human body requires an understanding of the orientation of the body or organ of study and the detail of presentation and knowledge of body regions. In this exercise, you examine the major organ systems of the body, directional terms, levels of organization of the body (from the subatomic level to the whole organism), and describe the major regions of the body. These topics are covered in your lecture text in Atlas A “General Orientation to Human Anatomy.”

Objectives

At the end of this exercise you should be able to

1. list the eleven organ systems;
2. place major organs such as the heart, lungs, and stomach in the proper organ system;
3. determine from an illustration whether a section is in the frontal, transverse, or sagittal plane;
4. give directional terms equivalent to up, down, front, back, toward the midline or edge, and toward the core or surface of the body;
5. explain what is meant by anatomical position;
6. identify the quadrants and nine abdominal regions;
7. list the major regions of the body and provide a common name if known.

Materials

Models of human torso

Charts of human torso

Procedure

Levels of Organization

The human body can be studied from a number of perspectives. The earliest study involved gross anatomy, or cutting up part or all of the body and examining its details. As more sophisticated equipment was developed, other levels of organization became apparent. Today, the manipulation of the atomic nuclei under magnetic fields has led to magnetic resonance imaging (MRI) studies that do not depend on dissection of the body (figure 2.1). Examine the following list for the numerous levels of study along with cited examples:

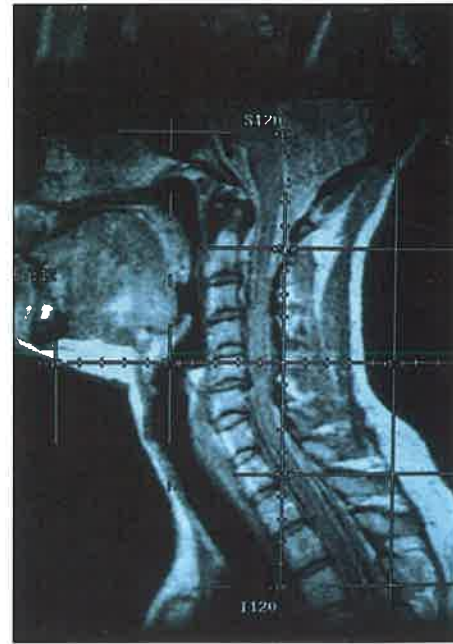


Figure 2.1
MRI Image of the neck.

Level	Example
Subatomic	Neutrons
Atomic	Oxygen
Molecular	Proteins
Cellular	Squamous epithelium
Tissue	Epithelial
Organ	Stomach
Organ system	Digestive system
Organism	<i>Homo sapiens</i>

Organ Systems

Anatomy can be studied in many ways. **Regional anatomy** is the study of particular areas of the body such as the head or leg. Most undergraduate college courses in anatomy and physiology (and the format of this lab manual) involve **systemic anatomy**, the study of **organ systems** such as the skeletal system and nervous system. Although organ systems are studied separately, it is important to realize the intimate connections

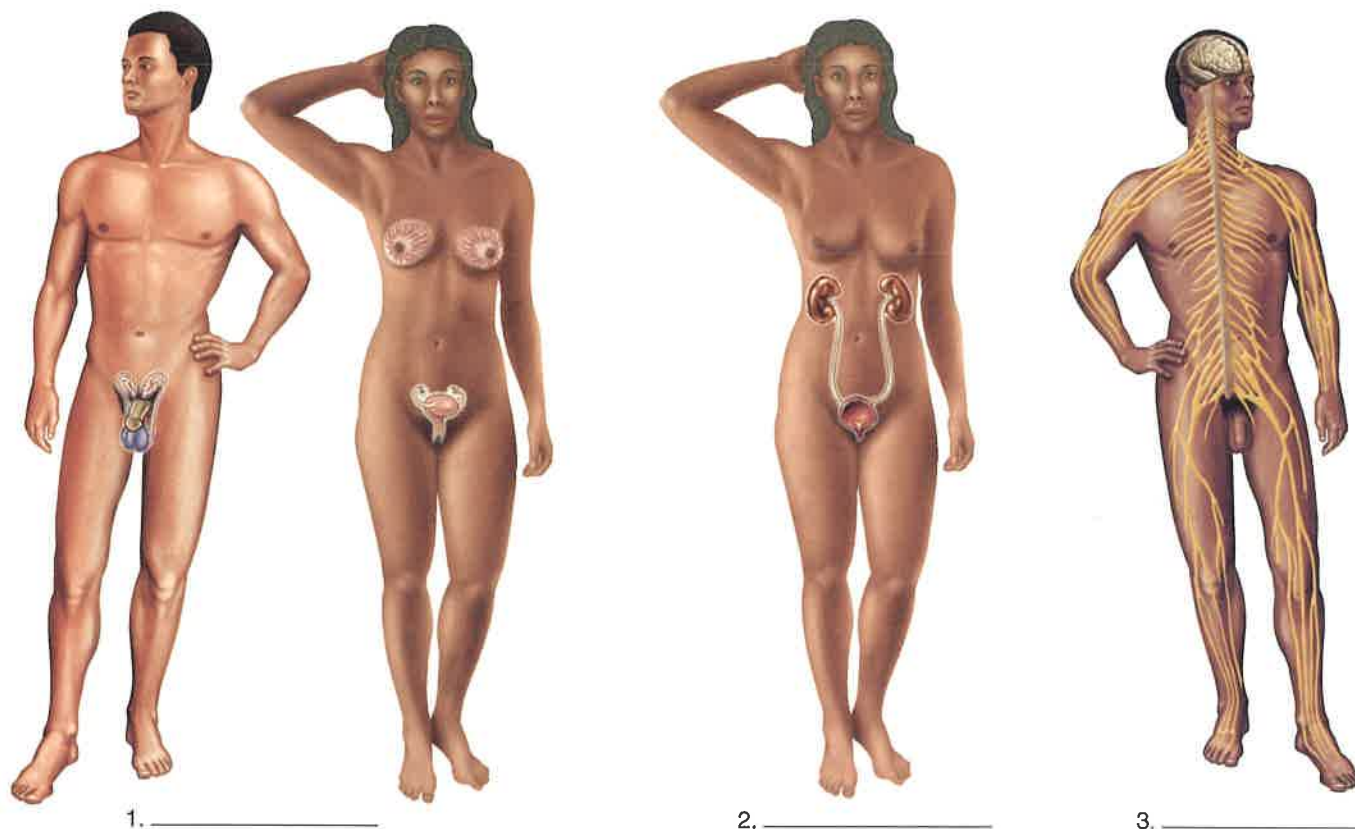


Figure 2.2

Organ systems of the human body

Continued

between the systems. If the heart fails to pump blood as part of the cardiovascular system, then the lungs do not receive blood for oxygenation and the intestines do not transfer nutrients to the blood as fuel. The brain is no longer capable of functioning, and the result is death. From a clinical standpoint, the failure of one system has impacts on many other organ systems.

Examine the torso models and charts in the lab and locate various organs. Using figure 2.2, find the following organ systems:

- | | | |
|----------------------|-----------------------|------------------|
| Muscular | Respiratory | Endocrine |
| Nervous | Reproductive | Urinary |
| Integumentary | Cardiovascular | Digestive |
| Lymphatic | Skeletal | |

A quick way to recall all eleven systems is to remember this phrase: “Run Mrs. Lidec.” Each letter of the phrase represents the first letter of one of the names of the organ systems.

Reproductive The gonads (testes and ovaries) contain the sex-producing cells of the body, and the accessory organs such as the uterus, vagina, penis, and seminal vesicles play a part in the transport of the sex cells and the development of the fetus.

Urinary The kidneys serve as filters of the body, and the urinary bladder is a storage organ. The ureters connect the kidneys to the bladder and the urethra is the exit tube from the body. The urinary system plays an important role in ridding the body of nitrogenous wastes while maintaining the chemical balance of body fluids.

Nervous The brain and spinal cord as well as the numerous nerves make up the nervous system. The nervous system coordinates body regions, interprets environmental cues, and integrates information.

Muscular Individual muscles are the organs of this system. Muscles move and strengthen joints, generate heat, and serve other functions such as abdominal compression.

Respiratory The nose, larynx, trachea, and lungs are part of the respiratory system. The function of the system is the exchange of gases (oxygen and carbon dioxide) between the blood and the air.

Skeletal Each bone is considered an organ, with blood vessels and nerves found in each bone. The skeletal system functions to support the body, protect delicate organs, and produce blood.

Lymphatic The lymph nodes, spleen, and tonsils are involved as part of the lymphatic system. A major function of the lymphatic system is to protect the body from foreign particles such as bacteria, viruses, and fungi.

Integumentary The skin is the largest organ of the body and makes up most of the integumentary system. The system also contains associated structures such as hair follicles, hair, nails, and the glands of the skin. The skin protects the body against microorganisms, drying out, and produces vitamin D.



4. _____



5. _____



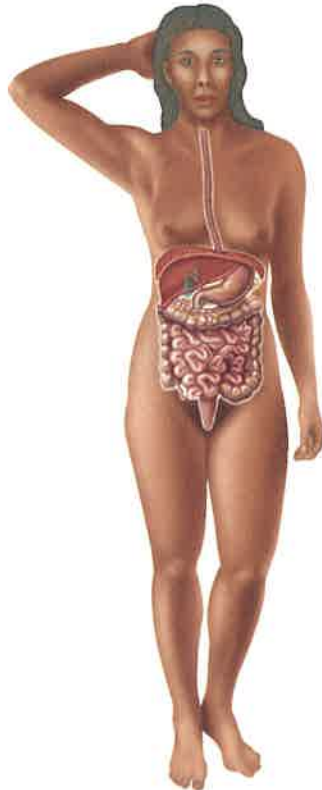
6. _____



7. _____



8. _____



9. _____



10. _____



11. _____

Figure 2.2—Continued.

Digestive The mouth, esophagus, stomach, intestines, and liver are parts of the digestive system, which functions to provide nutrients and water to the body.

Endocrine This system is determined by function, since endocrine organs produce hormones. Organs such as the thyroid gland and the adrenal glands are primarily endocrine glands (glands that secrete hormones without the use of ducts). Organs such as the pancreas and the gonads have dual functions; one is endocrine and the other is exocrine (secretion of material through ducts). Hormones are vital in regulating growth and development and maintaining a constant internal body condition.

Cardiovascular The heart and blood vessels make up this system, sometimes included with the lymphatic system as the circulatory system. The heart is the pump of the system and the blood vessels are the delivery and return portion of the system. The cardiovascular system is primarily involved in transporting oxygen, carbon dioxide, and other materials throughout the body.

You should examine models or charts in lab and locate the organs of the various organ systems.

Anatomical Position

In clinical settings it is vital to have a proper orientation when dealing with patients. If two physicians are operating on a patient and one tells the other to make an incision to the left, the physician making the cut does not have to ask, “My left or your left?” because the cut is always to the *patient’s* left side. When referring to the human body you will orient the body in **anatomical position**. In this position, the body is upright, facing forward, arms and legs straight, palms facing forward, feet flat on the ground, and eyes open (figure 2.3).

Directional Terms

With the body in anatomical position, there are specific terms used to describe the location of one part with respect to



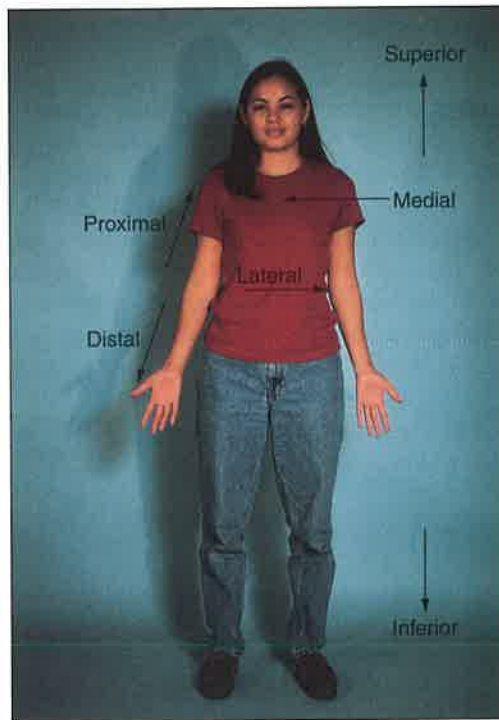
Figure 2.3
Anatomical position

another. These terms are somewhat different for four-footed animals and for humans, so both examples are given. Table 2.1 lists the directional terms used for humans.

Locate the terms in figure 2.4. In quadrupeds (four-footed animals) the directional terms are somewhat different. Quadrupeds do not have a superior/inferior designation. Dorsal refers to the back and ventral is on the belly side, while

Table 2.1 Directional Terms Used for Humans

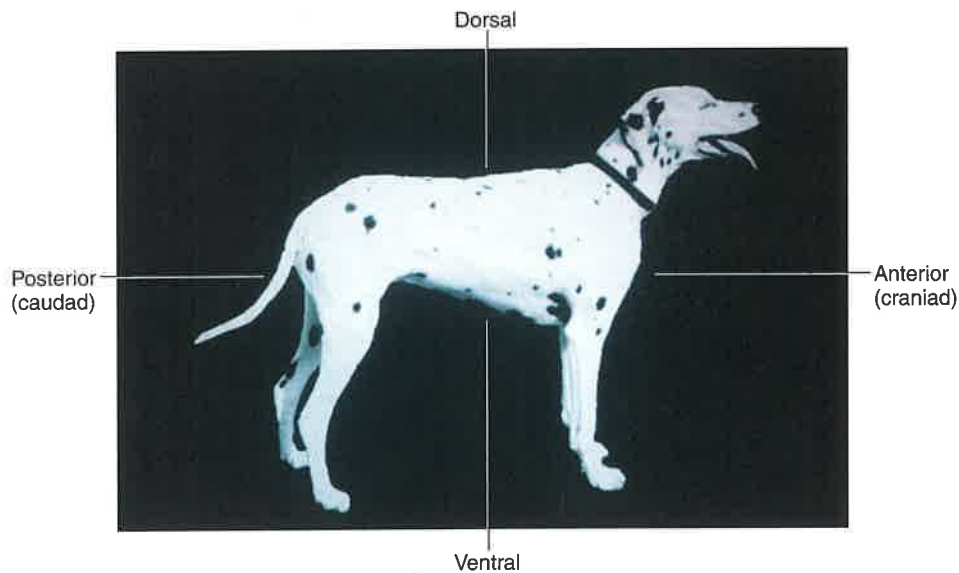
Term	Meaning	Example
Superior	Above	The nose is superior to the chin
Inferior	Below	The stomach is inferior to the head
Medial	Toward the midline	The sternum is medial to the shoulders
Lateral	Toward the side	The ears are lateral to the nose
Superficial	Toward the surface	The skin is superficial to the heart
Deep	Toward the core	The lungs are deep to the ribs
Anterior	To the front	The toes are anterior to the heel
Posterior	To the back	The spine is posterior to the sternum
Proximal	For extremities meaning near the trunk	The elbow is proximal to the wrist
Distal	For extremities meaning away from the trunk	The toes are distal to the knee
Ventral	Toward the belly side	The toes are ventral to the heel
Dorsal	Toward the vertebral side	The spine is dorsal to the sternum



(a)



(b)



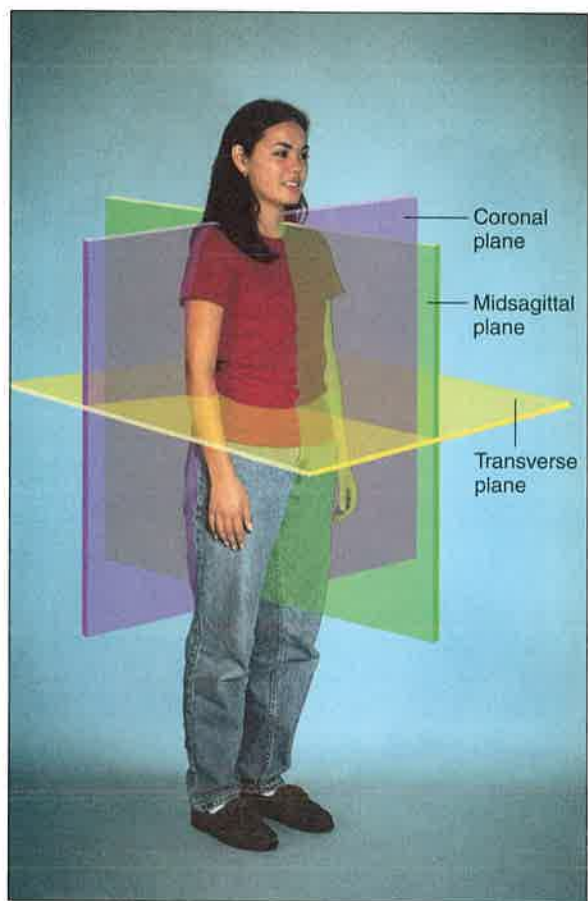
(c)

Figure 2.4

Directional terms (a) For humans, anterior view; (b) for humans, 3/4 view; (c) for quadrupeds, lateral view.

anterior (or craniad) is the front, or head-end, of the animal and posterior (or caudad) is the rear, or tail-end, of the animal. There are other terms for location that have unique meanings. For the digestive system, **proximal** refers to regions closer to the mouth while **distal** is in reference to regions closer to the anus. **Parietal** is in reference to the body wall when compared to **visceral**, which refers to areas closer to the internal organs. The heart, for example, has a visceral layer closer to the heart

proper, while it also has a parietal layer farther from the heart. **Ipsilateral** refers to being on the same side of the body, and **contralateral** refers to being on the other half (left side/right side). The right hand and right arm are ipsilateral, while the ears are contralateral. Directional terms do not change if the body position changes. If you stand on your head, it is still superior to your feet because you reference the body as if it is in anatomical position.



Planes of Sectioning

When viewing a picture of an organ that has been cut it is important to understand how the cut was made. Just as an apple looks different when cut crosswise as opposed to lengthwise, so do some organs. Examine figure 2.5 for the following sectioning planes. A cut that divides the body or organ into superior and inferior parts is in the **transverse**, or **horizontal**, plane. A cut that divides the body into anterior and posterior portions is in the **coronal**, or **frontal**, plane. A cut that divides the body into left and right portions is in the **sagittal plane**. A cut that divides the body equally into left and right halves is called **midsagittal**, while one that divides the body into unequal left and right parts is called a **parasagittal plane**.

Body Cavities

The body contains two major body cavities, the **dorsal cavity** and the **ventral cavity**. These can be further divided into smaller cavities. The dorsal cavity is composed of the **cranial cavity** and the **vertebral canal** (figure 2.6). Compare the models and charts in the lab with this figure. The ventral cavity is divided into (1) the thoracic cavity, above the diaphragm, which is divided into the mediastinum and the pleural and pericardial cavities, and (2) the abdominopelvic cavity, below the diaphragm, divided into the abdominal and pelvic cavities.

Figure 2.5
Sectioning planes

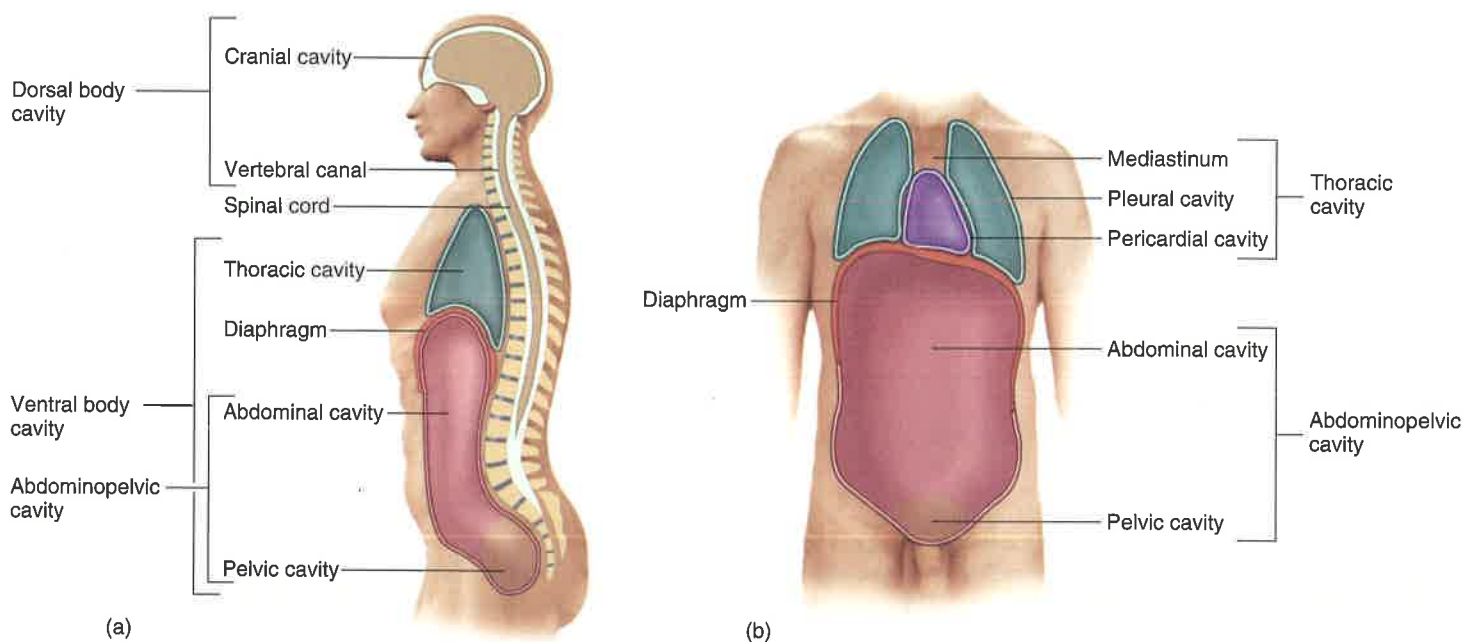


Figure 2.6
Body cavities (a) Lateral view; (b) anterior view.

Regions of the Body

Overview

Examine figure 2.7 for the various regions of the body. You will refer to these areas throughout this lab manual, so a complete study of these regions here is essential. Locate these regions on a torso model in lab.

Examine a muscle model in lab, and name the region where the following muscles are found.

Pectoralis major _____

Trapezius _____

External oblique (front) _____

Rectus femoris _____

Gastrocnemius _____

Gluteus maximus _____

Flexor carpi radialis _____

Triceps brachii _____

Latissimus dorsi _____

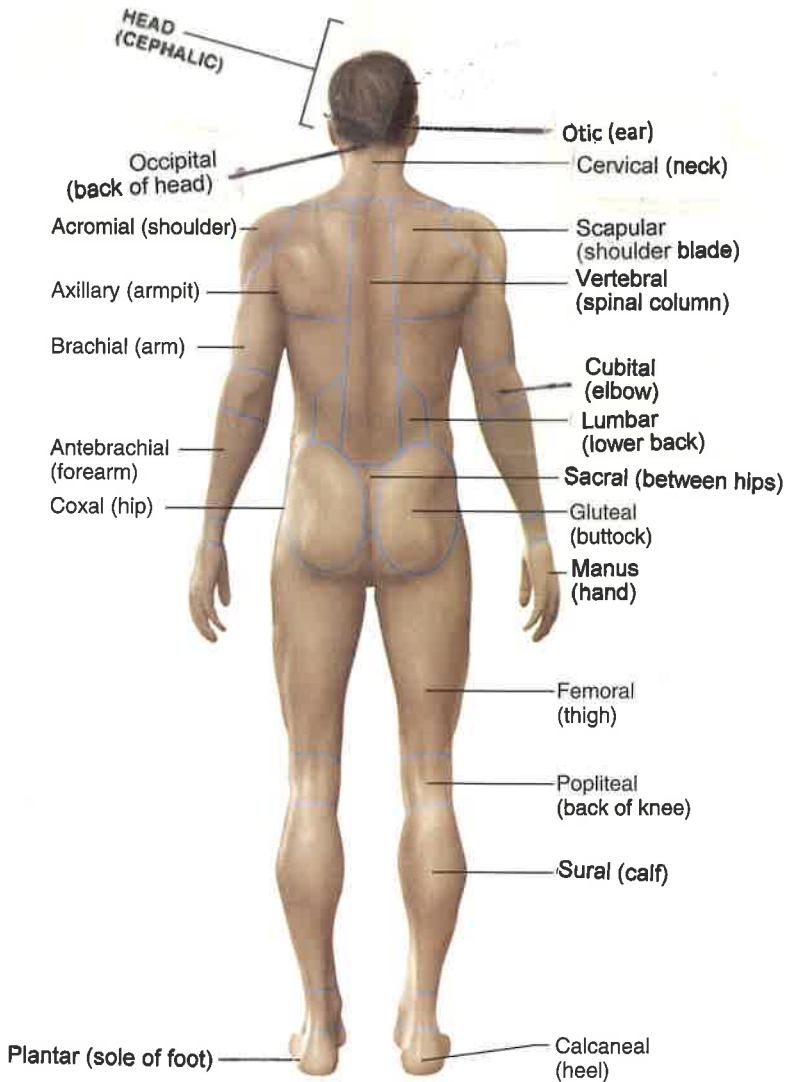
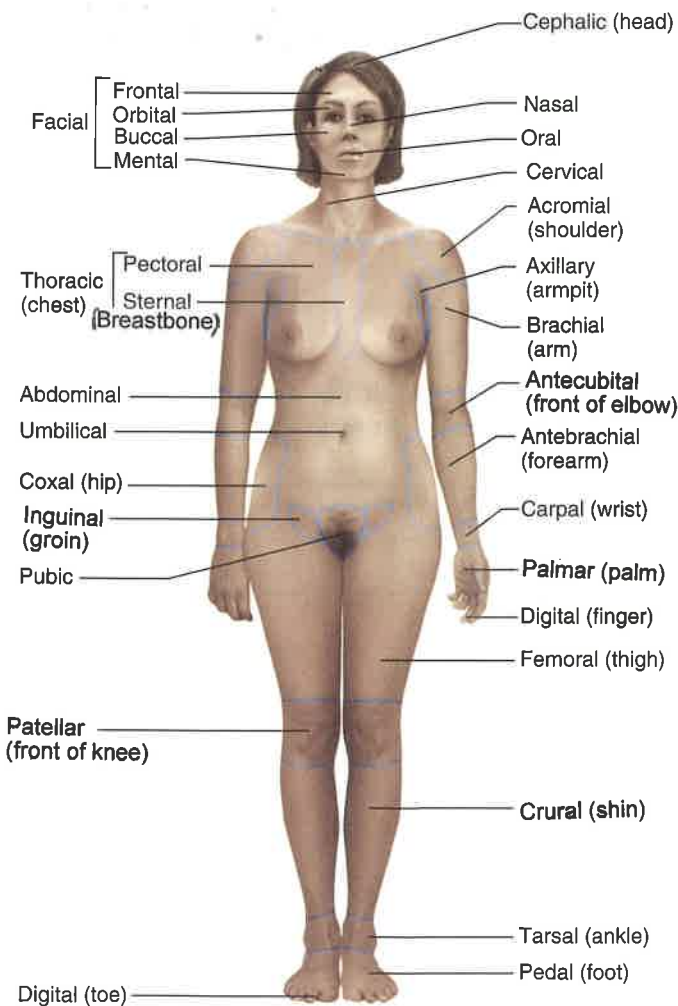


Figure 2.7
Regions of the body

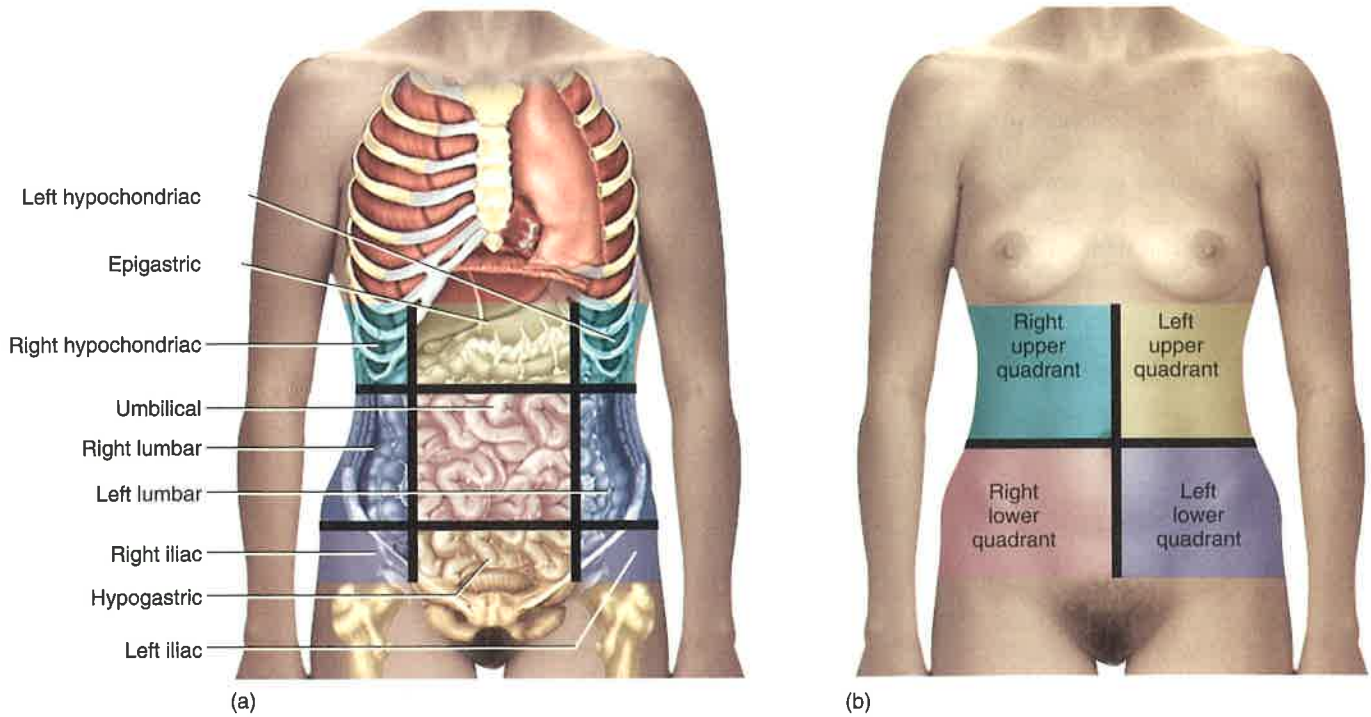


Figure 2.8
Abdominal regions (a) Nine regions; (b) four quadrants.

Abdominal Regions

The abdomen can be further divided into either four quadrants or nine regions (figure 2.8). Clinicians typically use the four quadrants terminology, while anatomists generally use the nine regions approach.

- Right hypochondriac
- Left hypochondriac
- Epigastric
- Right lumbar (lateral abdominal)
- Left lumbar (lateral abdominal)
- Umbilical
- Hypogastric
- Right iliac (inguinal)
- Left iliac (inguinal)

- Right upper quadrant
- Left upper quadrant
- Right lower quadrant
- Left lower quadrant

Examine a torso model in lab. For each of the following organs write what abdominal organ region(s) contain that organ.

- Liver _____
- Urinary bladder _____
- Small intestine _____
- Descending colon _____
- Left kidney _____