

An anatomical illustration of the human torso, showing the ribcage, heart, lungs, stomach, and intestines. The circulatory system is highlighted with red and blue vessels. The text "Terms Pertaining to the Body as a Whole" is overlaid on the left side of the image.

Terms Pertaining to the Body as a Whole

2

STRUCTURAL ORGANIZATION OF THE BODY

This chapter provides you with an orientation to the body as a whole—cells, tissues, organs, systems, and terminology describing positions and directions within the body. We begin with the smallest living unit, the **cell**, and build to an understanding of complex body systems. In order to know how organs function in both health and disease, it is important to appreciate the workings of their individual cellular units.

CELLS

The cell is the fundamental unit of all living things (animal or plant). Cells are everywhere in the human body—every tissue, every organ is made up of these individual units.

Similarity in Cells. All cells are similar in that they contain a gelatinous substance composed of water, protein, sugar, acids, fats, and various minerals. Several parts of a cell, described next, are pictured in Figure 2-1 as they might look when photographed with an electron microscope. Label the structures on Figure 2-1. Throughout the book, numbers in brackets indicate that the boldface term preceding it is to be used in labeling.

The **cell membrane** [1] not only surrounds and protects the cell but also regulates what passes into and out of the cell.

The **nucleus** [2] controls the operations of the cell. It directs cell division and determines the structure and function of the cell.

Chromosomes [3] are rod-like structures within the nucleus. All human body cells—except for the sex cells the egg and the sperm (short for spermatozoon)—contain 23 pairs of chromosomes. Each sperm and each egg cell have only 23 unpaired chromosomes. After

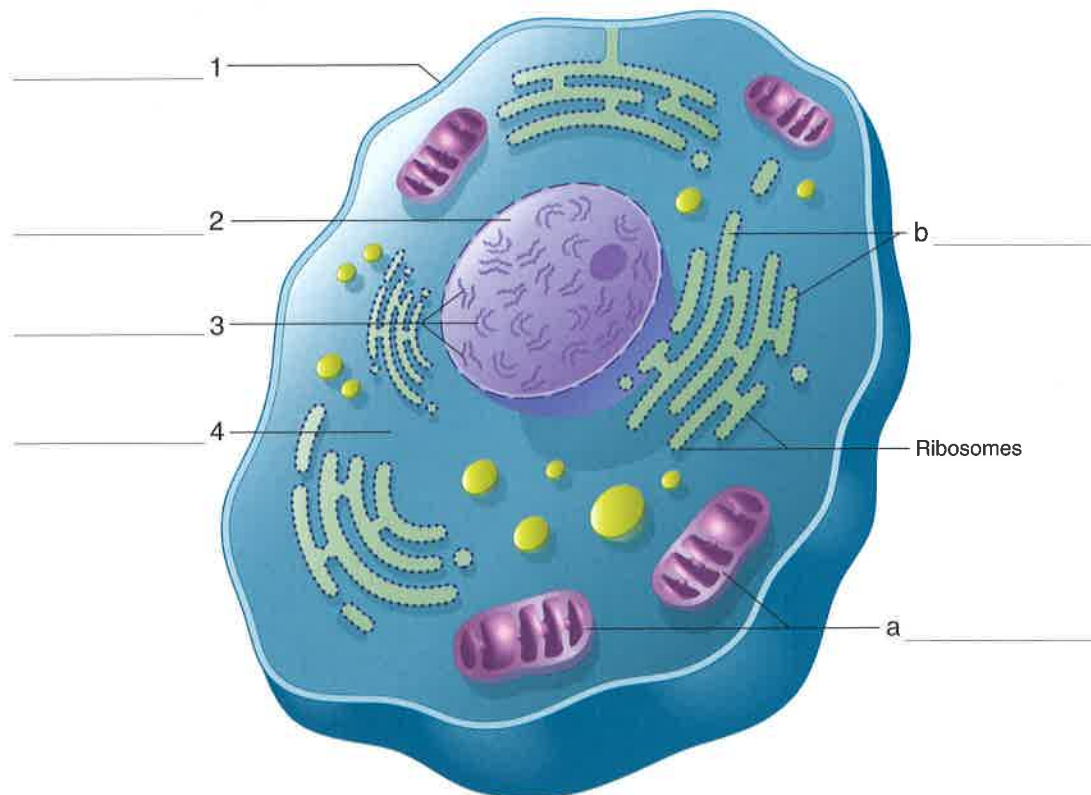


FIGURE 2-1 Major parts of a cell. **Ribosomes** (RĪ-bō-sōmz) are small granules that help the cell make proteins.

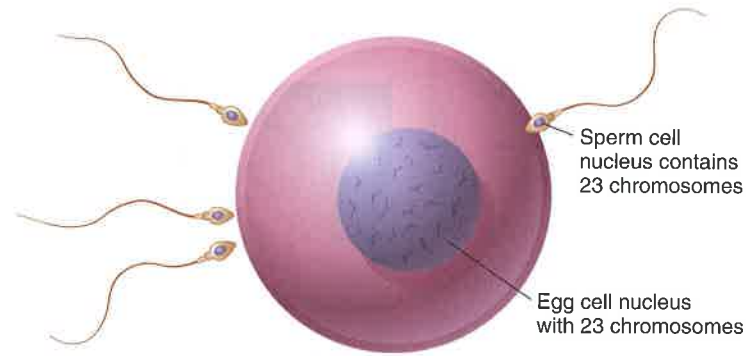


FIGURE 2-2 Egg and sperm cells, each containing 23 chromosomes.

an egg and a sperm cell unite to form the embryo, each cell of the embryo then has 46 chromosomes (23 pairs) (Figure 2-2).

Chromosomes contain regions called **genes**. There are several thousand genes, in an orderly sequence, on every chromosome. Each gene contains a chemical called **DNA** (deoxyribonucleic acid). DNA regulates the activities of the cell according to its sequence (arrangement into genes) on each chromosome. The DNA sequence resembles a series of recipes in code. This code, when passed out of the nucleus to the rest of the cell, directs the activities of the cell, such as cell division and synthesis of proteins.

A **karyotype** is a photograph of an individual's chromosomes, arranged by size, shape, and number (Figure 2-3). Karyotyping can determine whether chromosomes are normal. For example, an obstetrician may recommend amniocentesis (puncture of the sac around

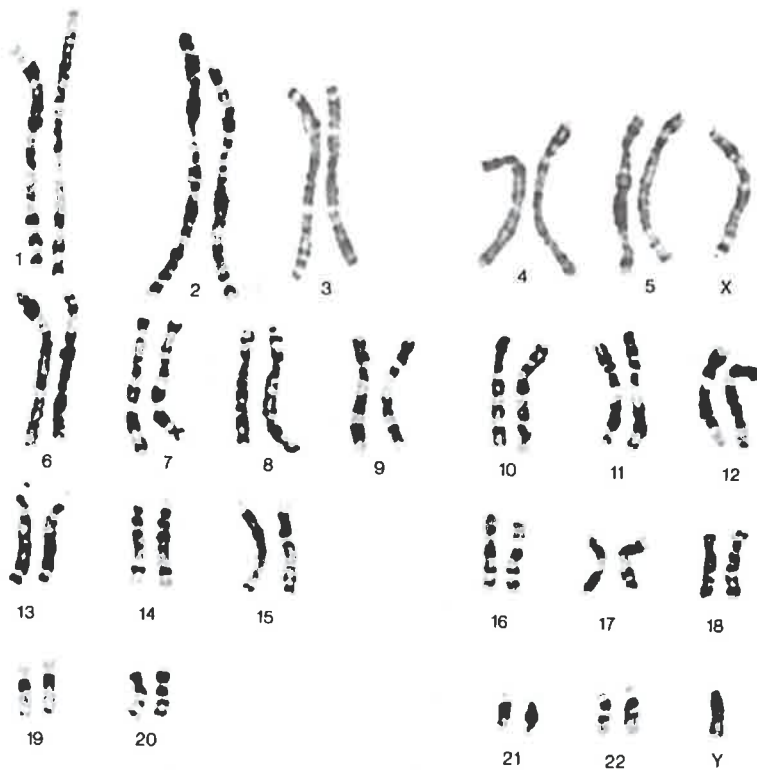


FIGURE 2-3 Karyotype of a normal male. Twenty-three pairs of chromosomes are shown. The 23rd pair is the XY pair present in normal males. In normal females, the 23rd pair is XX. For this karyotype, the chromosomes were treated with chemicals so that bands of light and dark areas are seen. (From Goldman L, Ausiello D: Cecil Textbook of Medicine, 22nd ed., Philadelphia, Saunders, 2004.)

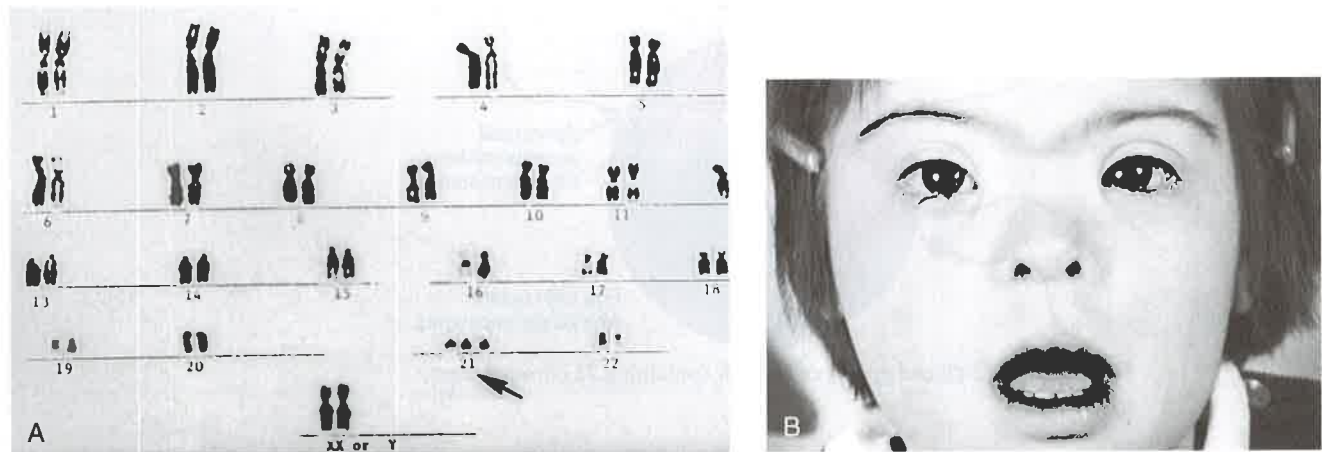


FIGURE 2-4 (A) Karyotype of a Down syndrome female patient showing trisomy 21. There is an extra copy of chromosome 21, in addition to the usual pair, for a total of three (tri-). (B) Photograph of a 3½-year-old girl with the typical facial appearance in Down syndrome. Features include a flat nasal bridge, an upward slant of the eyes, and a protruding tongue. Other characteristics of Down syndrome patients are mental deficiency and heart defects. (A, Courtesy Urvashi Surti, PhD, Pittsburgh Cytogenetics Laboratory. From Zitelli BJ, Davis HW: *Atlas of Pediatric Physical Diagnosis*, 4th ed., St. Louis, Mosby, 2002, p. 11; B, from Baraloz M, Baramki TA: *Medical Cytogenetics*, Baltimore, Lippincott Williams & Wilkins, 1967.)

the fetus for removal of fluid and cells) for a pregnant woman so that the karyotype of the baby can be examined.

If a baby is born with a chromosomal abnormality, serious problems can result. In Down syndrome, the karyotype shows 47 chromosomes instead of the normal number, 46 (Figure 2-4). The extra chromosome 21 results in the development of a child with Down syndrome (also called trisomy 21 syndrome). Its incidence is about 1 in every 750 live births, but as the mother's age increases, the presence of the chromosomal abnormality increases.

Continue labeling Figure 2-1.

The **cytoplasm** [4] (cyt/o = cell, -plasm = formation) includes all of the material outside the nucleus and enclosed by the cell membrane. It carries on the work of the cell (e.g., in a muscle cell, it does the contracting; in a nerve cell, it transmits impulses). The cytoplasm contains specialized apparatus to supply the chemical needs of the cell.

Mitochondria [a] are small sausage-shaped bodies that act like miniature power plants to produce energy by burning fuel (food) in the presence of oxygen. During this chemical process, called **catabolism** (cata = down, bol = to cast, -ism = process), complex foods (sugar and fat) are broken down into simpler substances and energy is released. In this way, catabolism provides the energy for cells to do the work of the body.

The **endoplasmic reticulum** [b] is a network (reticulum) of canals within the cell. These canals (containing small structures called ribosomes) are a cellular tunnel system that manufactures proteins for use in the cell. This process of building up complex materials, such as proteins, from simpler parts is **anabolism** (ana = up, bol = to cast, -ism = process). During anabolism, small pieces of protein (called amino acids) are fitted together like links in a chain to make larger proteins. Anabolism supports the growth of new cells.

Together, these two processes—anabolism and catabolism—are **metabolism** (meta = change, bol = to cast, -ism = process). Metabolism, then, is the total of the chemical processes occurring in a cell. If a person has a “fast metabolism,” foods such as sugar and fat are used up very quickly, and energy is released. If a person has a “slow metabolism,” foods are burned slowly, and fat accumulates in cells.



STUDY SECTION 1

Practice spelling each term, and know its meaning.

anabolism	Process of building up complex materials (proteins) from simple materials. Anabolism produces proteins such as hormones and enzymes that are important to growth of cells. Anabolism occurs in the endoplasmic reticulum of a cell.
catabolism	Process of breaking down complex materials (foods) to form simpler substances and release energy.
cell membrane	Structure surrounding and protecting the cell. It determines what enters and leaves the cell.
chromosomes	Rod-shaped structures in the nucleus that contain regions of DNA called genes. There are 46 chromosomes (23 pairs) in every cell except for the egg and sperm cells, which contain only 23 individual, unpaired chromosomes.
cytoplasm	All the material that is outside the nucleus and yet contained within the cell membrane.
DNA	Chemical found within each chromosome. Arranged like a sequence of recipes in code, it directs the activities of the cell.
endoplasmic reticulum	Structure (canals) within the cytoplasm. Site in which large proteins are made from smaller protein pieces. Anabolism takes place on the ribosomes of the endoplasmic reticulum (see Figure 2-1).
genes	Regions of DNA within each chromosome.
karyotype	Picture of chromosomes in the nucleus of a cell. The chromosomes are arranged in numerical order to determine their number and structure.
metabolism	The total of the chemical processes in a cell. It includes catabolism and anabolism.
mitochondria	Structures in the cytoplasm in which foods are burned to release energy. Catabolism takes place in mitochondria.
nucleus	Control center of the cell. It contains chromosomes and directs the activities of the cell.

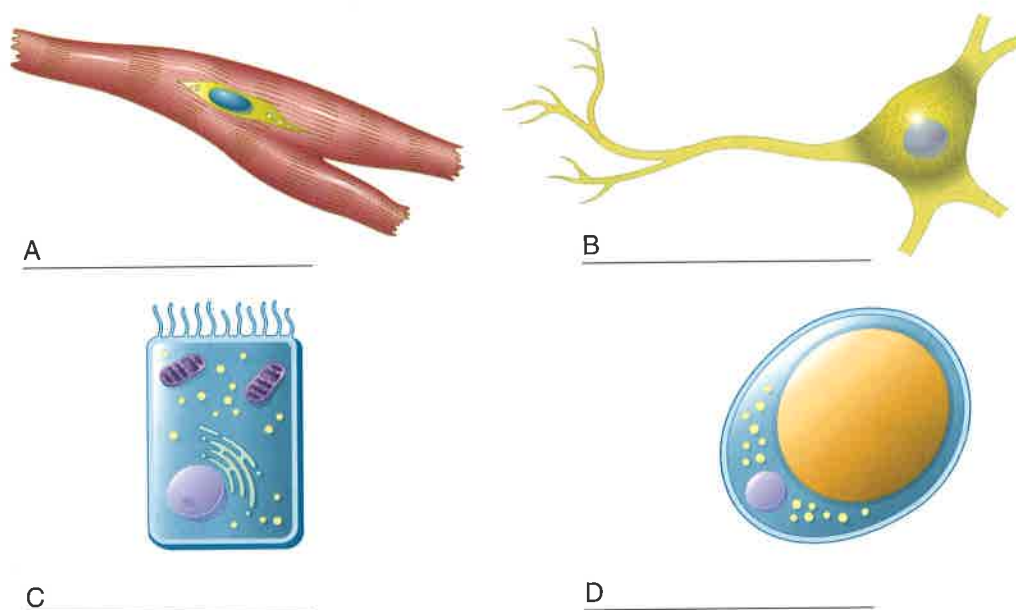


FIGURE 2-5 Types of cells. Label the **muscle cell (A)**, the **nerve cell (B)**, the **epithelial cell (C)**, and the **fat cell (D)**.

Differences in Cells. Cells are different, or specialized, throughout the body to carry out their individual functions. For example, a **muscle cell** is long and slender and contains fibers that aid in contracting and relaxing; an **epithelial cell** (a lining and skin cell) may be square and flat to provide protection; a **nerve cell** may be long and have various fibrous extensions that aid in its job of carrying impulses; a **fat cell** contains large, empty spaces for fat storage. These are only a few of the many types of cells in the body. Figure 2-5 illustrates the different sizes and shapes of muscle, nerve, fat, and epithelial cells.

TISSUES

A tissue is a group of similar cells working together to do a specific job. A **histologist** (hist/o = tissue) is a scientist who specializes in the study of tissues. Several different types of tissue are recognized. Tissues of the same type may be located in various regions of the body.

Epithelial Tissue. Epithelial tissue, located all over the body, forms the linings of internal organs, and the outer surface of the skin covering the body. It also lines exocrine and endocrine glands. The term **epithelial** originally referred to the tissue on (epi-) the breast nipple (thel/o). Now it describes all tissue that covers the outside of the body and lines the inner surface of internal organs.

Muscle Tissue. Voluntary muscle is found in arms and legs and parts of the body where movement is under conscious control. Involuntary muscle, found in the heart and digestive system, as well as other organs, allows movement that is not under conscious control. Cardiac muscle is a specialized type of muscle found only in the heart. Contractions of this muscle type can be seen as a beating heart in an ultrasound scan of a 6-week-old fetus.

Connective Tissue. Examples are **adipose** (fat) tissue, **cartilage** (elastic, fibrous tissue attached to bones), bone, and blood.

Nerve Tissue. Nerve tissue conducts impulses all over the body.

ORGANS

Different types of tissue combine to form an organ. For example, an organ such as the stomach is composed of muscle tissue, nerve tissue, and glandular epithelial tissue. The medical term for internal organs is **viscera** (singular: **viscus**). Examples of abdominal viscera (organs located in the abdomen) are the liver, stomach, intestines, pancreas, spleen, and gallbladder.

SYSTEMS

Systems are groups of organs working together to perform complex functions. For example, the mouth, esophagus, stomach, and small and large intestines are organs that do the work of the digestive system to digest food and absorb it into the bloodstream.

The body systems with their individual organs are listed next. Learn to spell and identify the organs in **boldface**.

SYSTEM	ORGANS
Digestive	Mouth, pharynx (throat), esophagus, stomach, intestines (small and large), liver, gallbladder, pancreas.
Urinary or excretory	Kidneys, ureters (tubes from the kidneys to the urinary bladder), urinary bladder, urethra (tube from the bladder to the outside of the body).
Respiratory	Nose, pharynx, larynx (voice box), trachea (windpipe), bronchial tubes, lungs (where the exchange of gases takes place).
Reproductive	<i>Female:</i> Ovaries, fallopian tubes, uterus (womb), vagina, mammary glands. <i>Male:</i> Testes and associated tubes, urethra, penis, prostate gland.
Endocrine	Thyroid gland (in the neck), pituitary gland (at the base of the brain), sex glands (ovaries and testes), adrenal glands, pancreas (islets of Langerhans), parathyroid glands.
Nervous	Brain, spinal cord, nerves, and collections of nerves.
Circulatory	Heart, blood vessels (arteries, veins, and capillaries), lymphatic vessels and nodes, spleen, thymus gland.
Musculoskeletal	Muscles, bones, and joints.
Skin and sense organs	Skin, hair, nails, sweat glands, and sebaceous (oil) glands; eye, ear, nose, and tongue.



STUDY SECTION 2

Practice spelling each term, and know its meaning.

adipose tissue	Collection of fat cells.
cartilage	Flexible connective tissue attached to bones at joints. For example, it surrounds the trachea and forms part of the external ear and nose.
epithelial cells	Skin cells that cover the external body surface and line the internal surfaces of organs.
histologist	Specialist in the study of tissues.
larynx	“Voice box”; located at the upper part of the trachea.
pharynx	Throat. The pharynx serves as the common passageway for food (from the mouth going to the esophagus) and air (from the nose to the trachea).
pituitary gland	Endocrine gland at the base of the brain.
thyroid gland	Endocrine gland that surrounds the trachea in the neck.
trachea	“Windpipe” (tube leading from the throat to the bronchial tubes).
ureter	One of two tubes, each leading from a single kidney to the urinary bladder. <i>Spelling clue:</i> Ureter has two e’s, and there are two ureters.
urethra	Tube from the urinary bladder to the outside of the body. <i>Spelling clue:</i> Urethra has one e, and there is only one urethra.
uterus	The womb. The organ that holds the embryo/fetus as it develops.
viscera	Internal organs.

BODY CAVITIES

A body cavity is a space within the body that contains internal organs (viscera). Label Figure 2-6 as you learn the names of the body cavities. Some of the important viscera contained within those cavities are listed as well.

CAVITY	ORGANS
Cranial [1]	Brain, pituitary gland.
Thoracic [2]	Lungs, heart, esophagus, trachea, bronchial tubes, thymus gland, aorta (large artery). The thoracic cavity is divided into two smaller cavities (Figure 2-7): <ol style="list-style-type: none"> Pleural cavity—space between the folds of the pleura surrounding each lung. The pleura is a double-folded membrane that surrounds the lungs and protects them. If the pleura is inflamed (as in pleuritis, also called pleurisy), the pleural cavity may fill with fluid. Mediastinum—centrally located area outside of and between the lungs. It contains the heart, aorta, trachea, esophagus, thymus gland, bronchial tubes, and many lymph nodes.

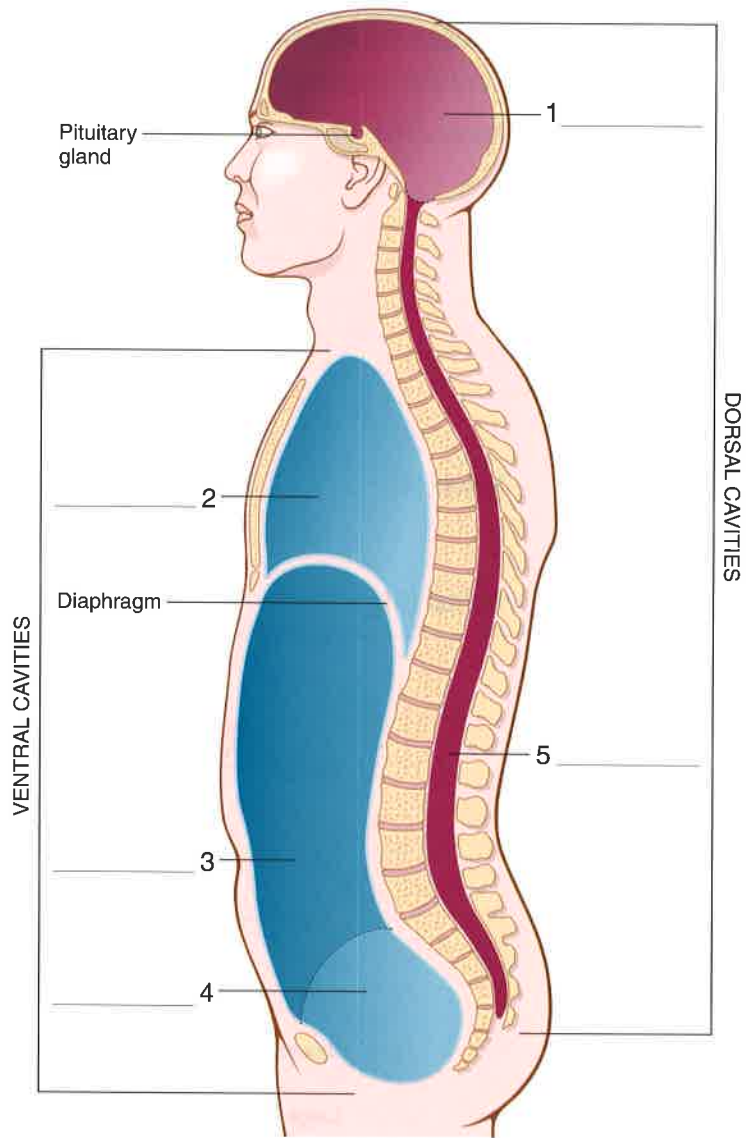


FIGURE 2-6 Body cavities. **Ventral** (anterior) cavities are in the front of the body. **Dorsal** (posterior) cavities are in the back.

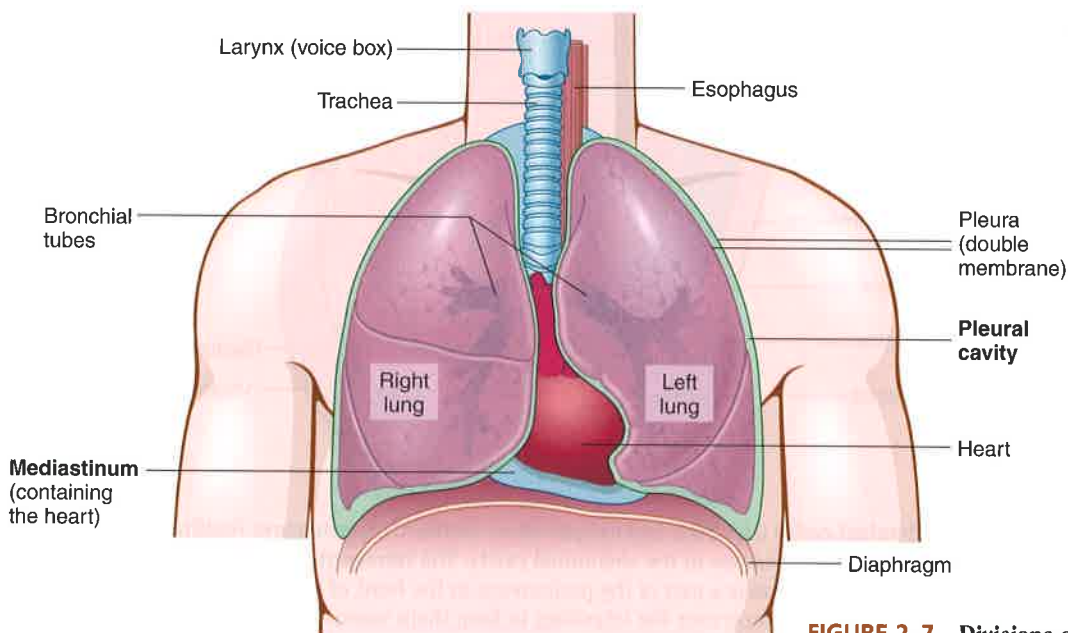


FIGURE 2-7 Divisions of the thoracic cavity.

CAVITY

ORGANS

Continue labeling Figure 2-6.

Abdominal [3]

The **peritoneum** is the double-folded membrane surrounding the abdominal cavity (Figure 2-8). The kidneys are two bean-shaped organs situated behind (retroperitoneal area) the abdominal cavity on either side of the backbone (see Figures 2-8 and 2-10). Stomach, small and large intestines, spleen, pancreas, liver, and gallbladder. The **diaphragm** (a muscular wall) divides the abdominal and thoracic cavities (see Figure 2-6).

Pelvic [4]

Portions of the small and large intestines, rectum, urinary bladder, urethra, and ureters; uterus and vagina in the female.

Spinal [5]

Nerves of the spinal cord.

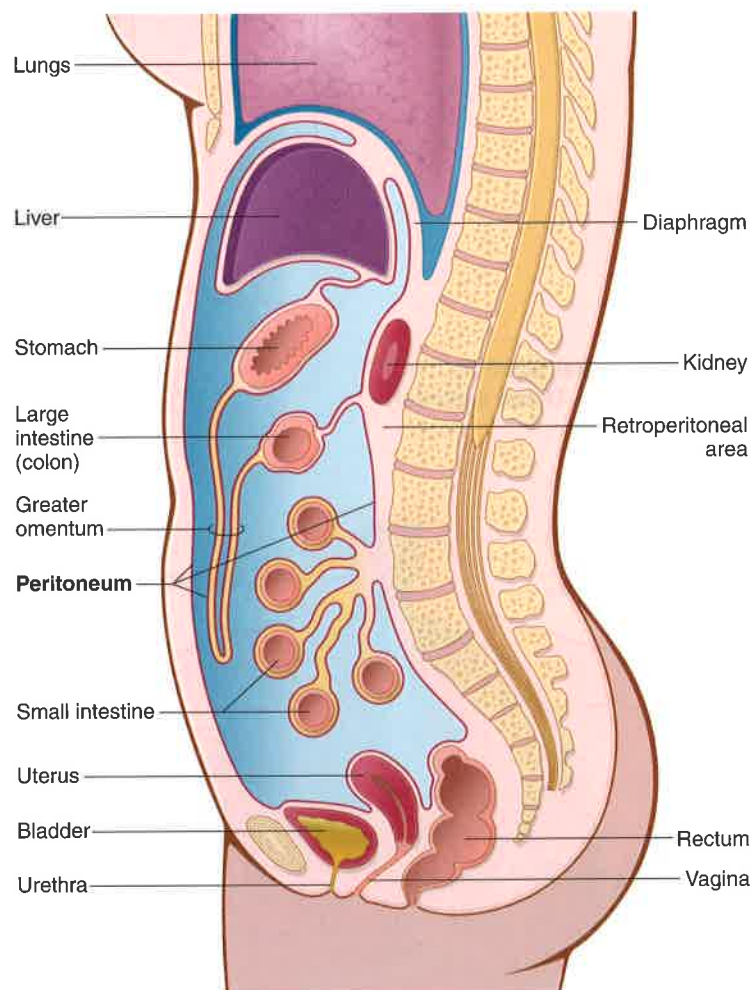


FIGURE 2-8 Abdominal cavity (side view and in light blue). Notice the **peritoneum** (outlined in red), which is a membrane surrounding the organs in the abdominal cavity. The **retroperitoneal area** is behind the peritoneum. The **greater omentum** is a part of the peritoneum in the front of the abdomen. It contains fat and hangs down loosely like an apron over the intestines to keep them warm.

The cranial and spinal cavities are the **dorsal** body cavities because of their location on the back (posterior) portion of the body. The thoracic, abdominal, and pelvic cavities are **ventral** body cavities because they are on the front (anterior) portion of the body (see Figure 2-6).

The thoracic and abdominal cavities are separated by a muscular wall called a **diaphragm**. Because the abdominal and pelvic cavities are not separated by a wall, they are frequently referred together as the **abdominopelvic cavity**. Figures 2-9 and 2-10 show the abdominal and thoracic viscera from anterior (ventral) and posterior (dorsal) views.

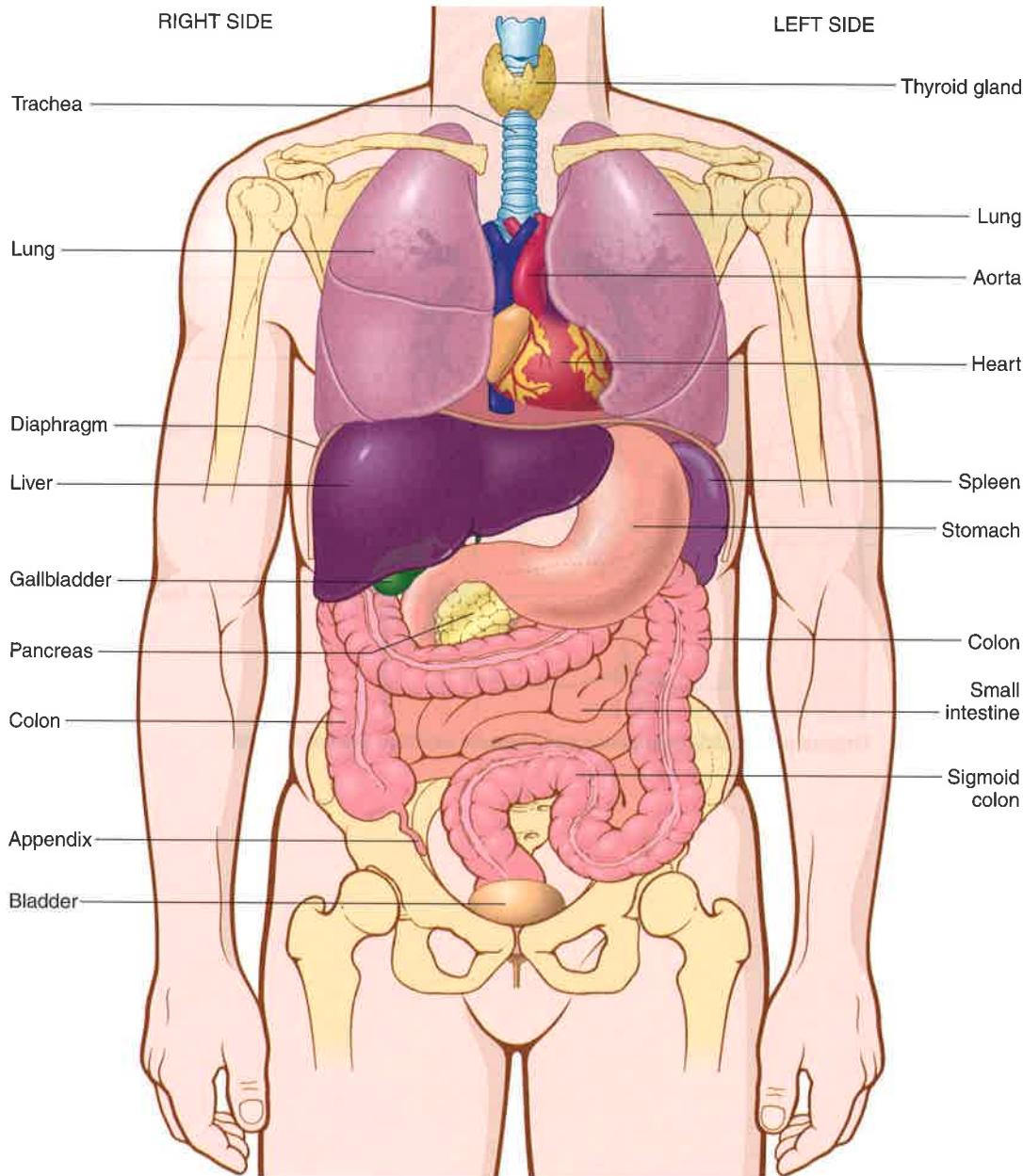


FIGURE 2-9 Organs of the abdominopelvic and thoracic cavities, anterior view.

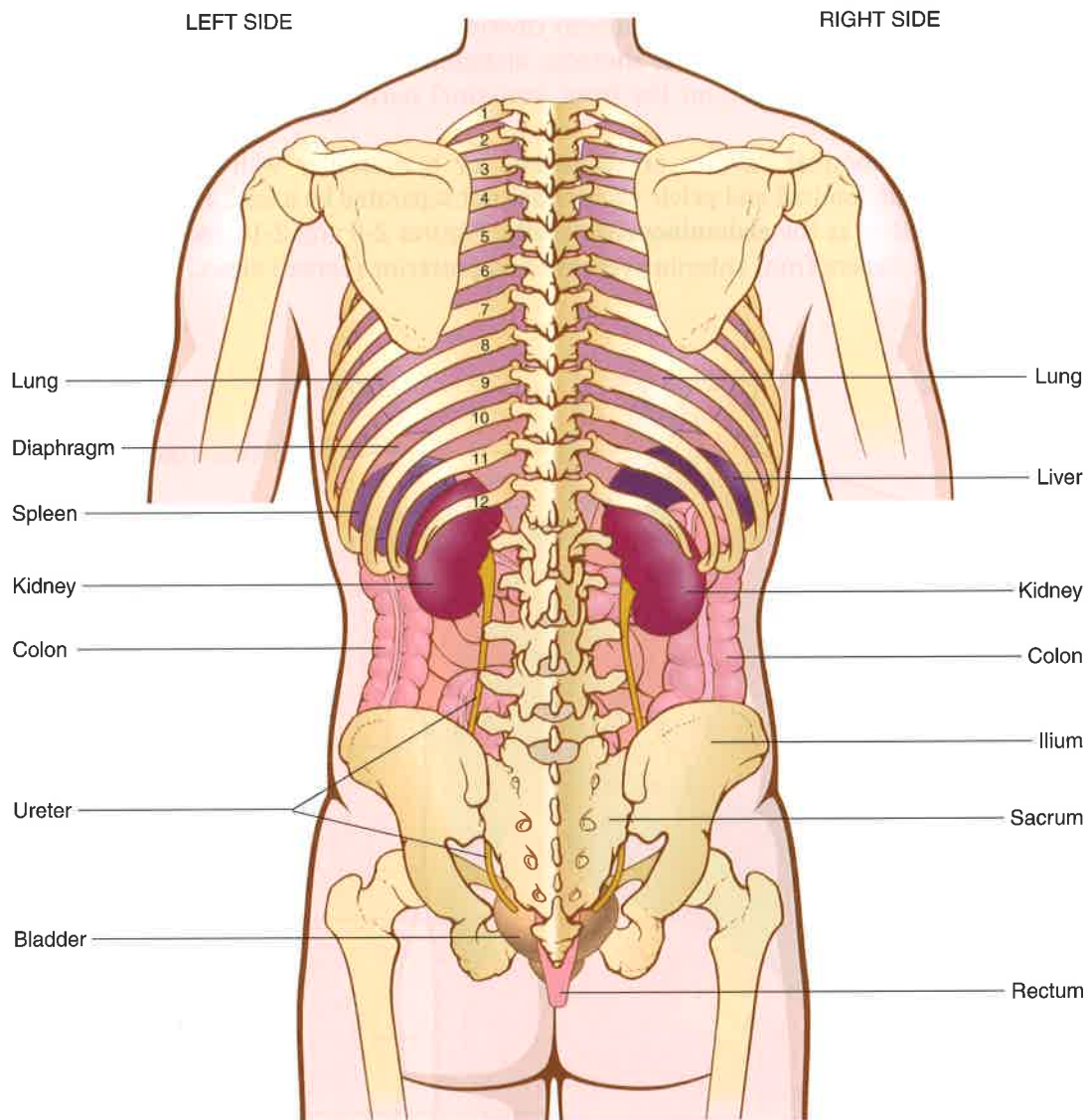




FIGURE 2-10 Organs of the abdominopelvic and thoracic cavities, posterior view.



STUDY SECTION 3

Practice spelling each term, and know its meaning.

abdominal cavity	Space below the chest containing organs such as the liver, stomach, gallbladder, and intestines; also called the abdomen .
cranial cavity	Space in the head containing the brain and surrounded by the skull. Cranial means pertaining to the skull .
diaphragm	Muscle separating the abdominal and thoracic cavities. The diaphragm moves up and down and aids in breathing.
dorsal (posterior)	Pertaining to the back.
mediastinum	Centrally located space between the lungs.
pelvic cavity	Space below the abdomen containing portions of the intestines, rectum, urinary bladder, and reproductive organs. Pelvic means pertaining to the pelvis , composed of the hip bones surrounding the pelvic cavity.
peritoneum 	Double-layered membrane surrounding the abdominal organs.
pleura	Double-layered membrane surrounding each lung.
pleural cavity	Space between the pleural membranes. 
spinal cavity	Space within the spinal column (backbones) and containing the spinal cord. Also called the spinal canal .
thoracic cavity	Space in the chest containing the heart, lungs, bronchial tubes, trachea, esophagus, and other organs.
ventral (anterior)	Pertaining to the front.



Peritoneum and Other Membranes

Many vital organs are covered and protected by membranes. The **peritoneum** surrounds abdominal viscera (liver, small and large intestines, stomach), the **pleura** covers the lungs, the **periosteum** protects bones, and the **meninges** are membranes surrounding the brain and spinal cord.



Pleural/Plural

Don't confuse *pleural*, which refers to the membranes surrounding the lungs, with *plural*, which means more than one.

ABDOMINOPELVIC REGIONS AND QUADRANTS

REGIONS

Doctors divide the abdominopelvic area into nine regions. Label these regions in Figure 2-11.

Right hypochondriac region [1]: right upper region below (hypo-) the cartilage (chondr/o) of the ribs that extend over the abdomen.

Left hypochondriac region [2]: left upper region below the rib cartilage.

Epigastric region [3]: region above the stomach.

Right lumbar region [4]: right middle region near the waist.

Left lumbar region [5]: left middle region near the waist.

Umbilical region [6]: region of the navel or umbilicus.

Right inguinal region [7]: right lower region near the groin (inguin/o = groin), which is the area where the legs join the trunk of the body. This region also is known as the **right iliac region** because it lies near the ilium (the upper portion of the hip bone).

Left inguinal region [8]: left lower region near the groin. Also called the **left iliac region**.

Hypogastric region [9]: middle lower region below the umbilical region.

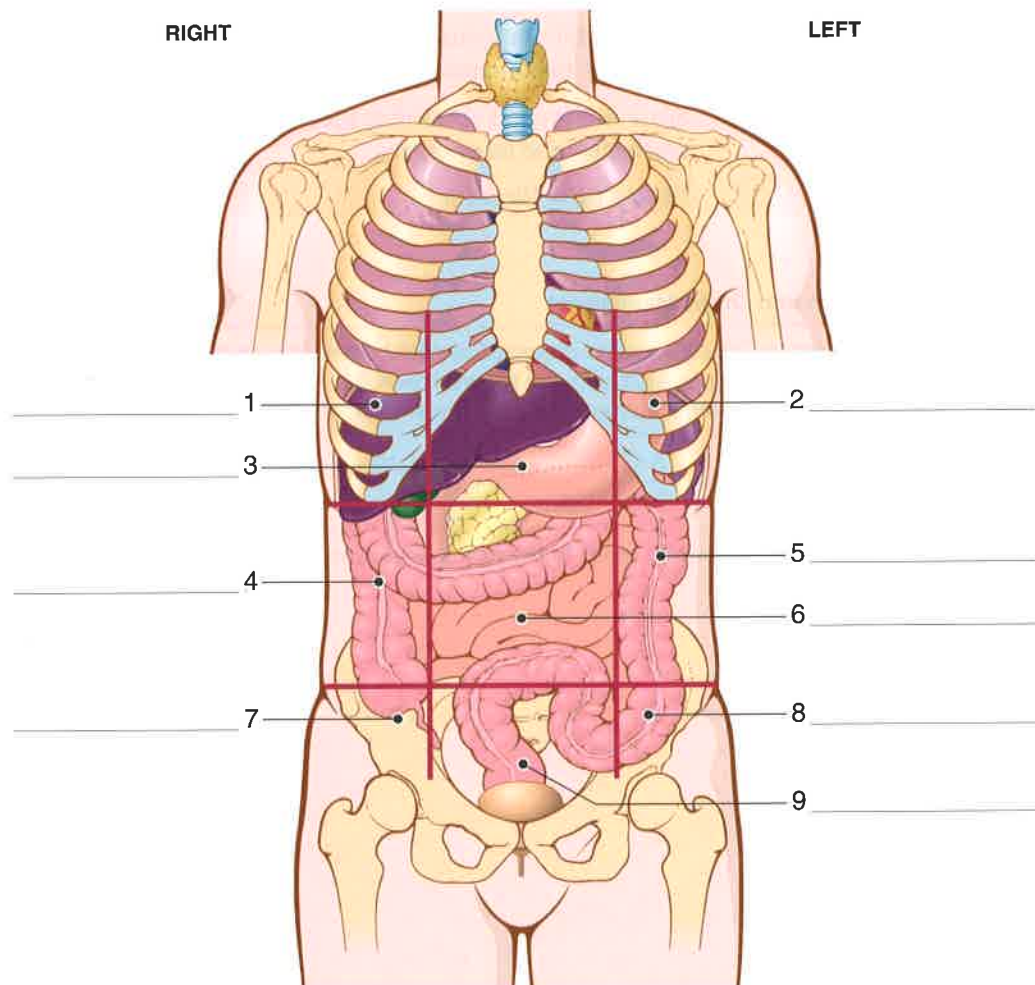


FIGURE 2-11 Abdominopelvic regions. These regions can be used clinically to locate internal organs.

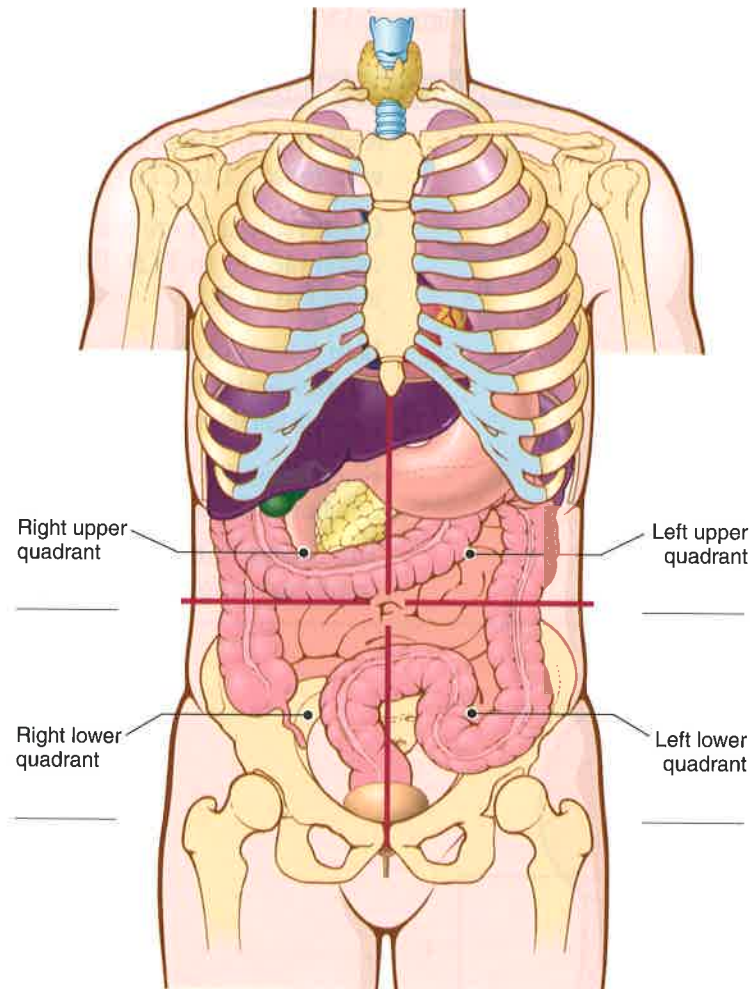


FIGURE 2-12 Abdominopelvic quadrants. Write the abbreviation for each quadrant on the line provided.

QUADRANTS

The abdominopelvic area can be divided into four quadrants by two imaginary lines—one horizontal and one vertical—that cross at the midsection of the body. Figure 2-12 shows the four abdominopelvic quadrants; add the proper abbreviation on the line under each label on the diagram.

Right upper quadrant (RUQ)—contains the liver (right lobe), gallbladder, part of the pancreas, parts of the small and large intestines

Left upper quadrant (LUQ)—contains the liver (left lobe), stomach, spleen, part of the pancreas, parts of the small and large intestines

Right lower quadrant (RLQ)—contains parts of the small and large intestines, right ovary, right fallopian tube, appendix, right ureter

Left lower quadrant (LLQ)—contains parts of the small and large intestines, left ovary, left fallopian tube, left ureter

DIVISIONS OF THE BACK (SPINAL COLUMN)

The spinal column is composed of a series of bones that extend from the neck to the tailbone. Each bone is a **vertebra** (plural: **vertebrae**).

Label the divisions of the back on Figure 2-13 as you study the following:

DIVISION OF THE BACK	ABBREVIATION	LOCATION
Cervical [1]	C	Neck region. There are seven cervical vertebrae (C1 to C7).
Thoracic [2]	T	Chest region. There are 12 thoracic vertebrae (T1 to T12). Each bone is joined to a rib.
Lumbar [3]	L	Loin (waist) or flank region (between the ribs and the hipbone). There are five lumbar vertebrae (L1 to L5).
Sacral [4]	S	Five bones (S1 to S5) are fused to form one bone, the sacrum .
Coccygeal [5]		The coccyx (tailbone) is a small bone composed of four fused pieces.

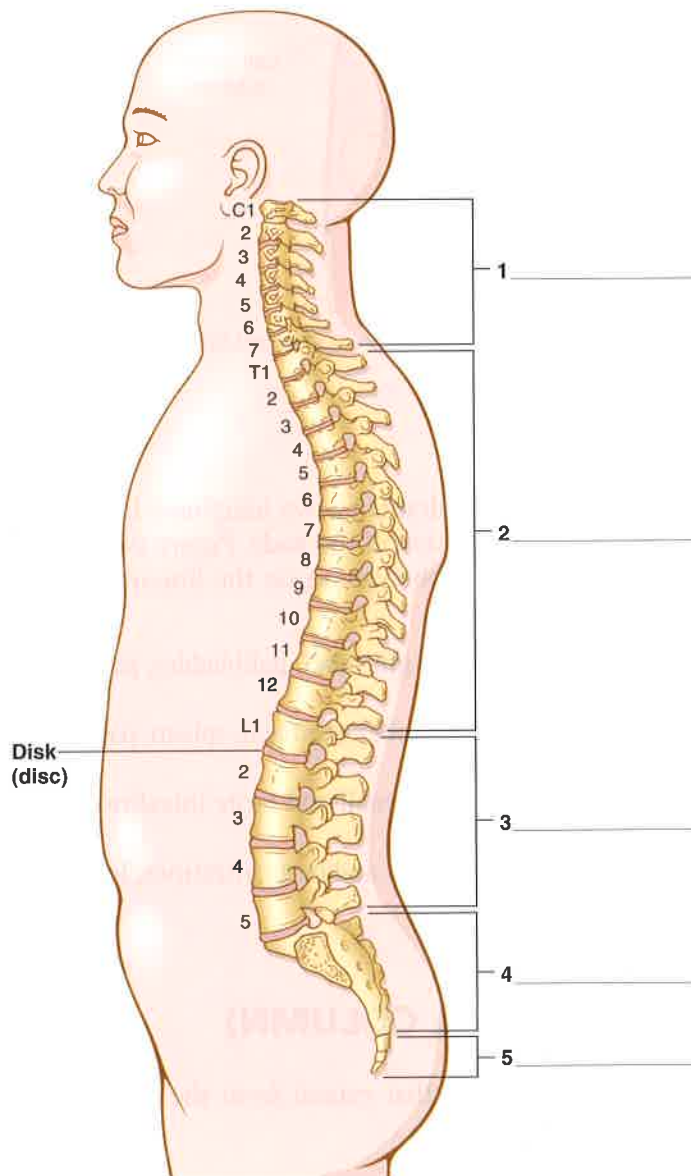


FIGURE 2-13 Anatomic divisions of the back (spinal column). A disk (disc) is a small pad of cartilage between each backbone.

Do not confuse the **spinal column** (back bones or vertebrae) with the **spinal cord** (nerves surrounded by the column). The column is bone tissue, whereas the cord is nervous tissue.

The spaces between the vertebrae (intervertebral spaces) are identified according to the two vertebrae between which they occur—for example, the L5–S1 space is between the fifth lumbar vertebra and the first sacral vertebra; T2–3 is between the second and third thoracic vertebrae. Within the space and between vertebrae is a small pad called a **disk**, or **disc**. The disk, composed of water and cartilage, is a shock absorber. Occasionally, a disk may move out of place (rupture) and put pressure on a nerve. This **slipped disk** can cause pain in an area of the body affected by the nerve.



STUDY SECTION 4

Practice spelling each term, and know its meaning.

ABDOMINOPELVIC REGIONS

hypochondriac	Right and left upper regions beneath the ribs.
epigastric	Middle upper region above the stomach.
lumbar	Right and left middle regions near the waist.
umbilical	Central region near the navel.
inguinal	Right and left lower regions near the groin. Also called iliac regions .
hypogastric	Middle lower region below the umbilical region.

ABDOMINOPELVIC QUADRANTS

RUQ	Right upper quadrant.
LUQ	Left upper quadrant.
RLQ	Right lower quadrant.
LLQ	Left lower quadrant.

DIVISIONS OF THE BACK

cervical	Neck region (C1 to C7).
thoracic	Chest region (T1 to T12).
lumbar	Loin (waist) region (L1 to L5).
sacral	Region of the sacrum (S1 to S5).
coccygeal	Region of the coccyx (tailbone).

RELATED TERMS

vertebra	Single backbone.
vertebrae	Backbones.
spinal column	Bone tissue surrounding the spinal cavity.
spinal cord	Nervous tissue within the spinal cavity.
disk (disc)	Pad of cartilage between vertebrae.

POSITIONAL AND DIRECTIONAL TERMS

Label Figure 2-14A and B to identify the following positional and directional terms.

LOCATION	RELATIONSHIP
Anterior (ventral) [1]	Front surface of the body. <i>Example:</i> The forehead is on the anterior side of the body.
Posterior (dorsal) [2]	The back side of the body. <i>Example:</i> The back of the head is posterior (dorsal) to the face.
Deep [3]	Away from the surface. <i>Example:</i> The stab wound penetrated deep into the abdomen.
Superficial [4]	On the surface. <i>Example:</i> Superficial veins can be viewed through the skin.
Proximal [5]	Near the point of attachment to the trunk or near the beginning of a structure. <i>Example:</i> The proximal end of the upper arm bone (humerus) joins with the shoulder bone.
Distal [6]	Far from the point of attachment to the trunk or far from the beginning of a structure. <i>Example:</i> At its distal end, the humerus joins with the lower arm bones at the elbow.

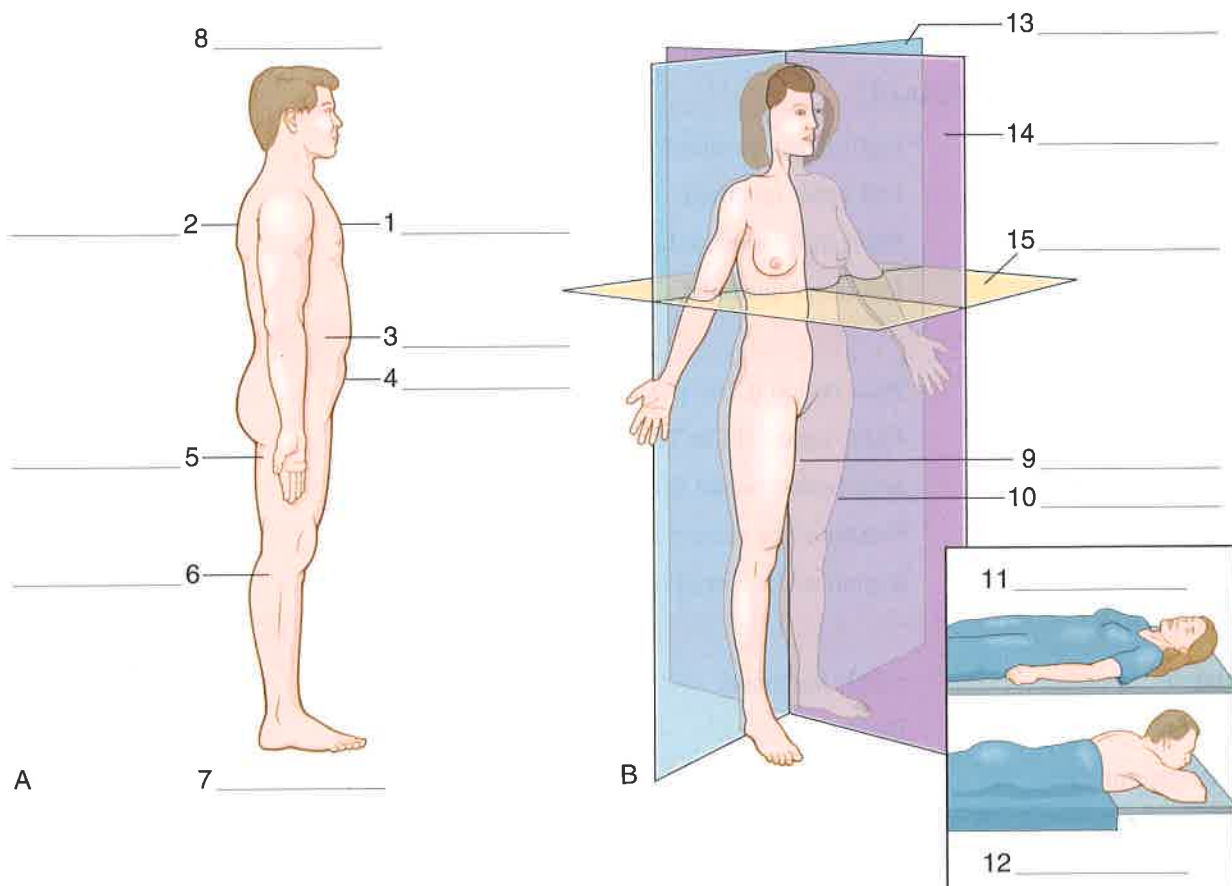


FIGURE 2-14 (A) Positional and directional terms. (B) Planes of the body. The figure is standing in the **anatomic position**, with the palms of the hands facing outward and the fifth (little) finger in a medial position (closer to the center of the body).

LOCATION	RELATIONSHIP
Inferior [7]	Below another structure. <i>Example:</i> The feet are at the inferior part of the body. They are inferior to the knees. The term caudal (pertaining to the tail, or to the lower portion of the body) also means away from the head or below another structure.
Superior [8]	Above another structure. <i>Example:</i> The head lies superior to the neck. Cephalic (pertaining to the head) also means above another structure.
Medial [9]	Pertaining to the middle, or nearer the medial plane of the body. <i>Example:</i> The inner thigh is medial in relation to the outer thigh.
Lateral [10]	Pertaining to the side. <i>Example:</i> The outer thigh is lateral in relation to the body.
Supine [11]	Lying on the back. <i>Example:</i> The patient lies supine during an examination of the abdomen. (The face is up in the supine position.)
Prone [12]	Lying on the belly. <i>Example:</i> The backbones are examined with the patient in a prone position. (The patient lies on his or her stomach in the prone position.)

PLANES OF THE BODY

A plane is an imaginary flat surface. Label Figure 2-14B to identify the following planes of the body:

PLANE	LOCATION
Frontal (coronal) plane [13]	Vertical plane dividing the body or structure into anterior and posterior portions. A common chest x-ray view is a PA (posteroanterior—viewed from back to front) view, which is in the frontal (coronal) plane.
Sagittal (lateral) plane [14]	Lengthwise vertical plane dividing the body or structure into right and left sides. The midsagittal plane divides the body into right and left halves. A lateral (side-to-side) chest x-ray film is taken in the sagittal plane.
Transverse plane (cross-sectional or axial) [15]	Horizontal plane running across the body parallel to the ground. This cross-sectional plane divides the body or structure into upper and lower portions. A CT (computed tomography) scan is one of a series of x-ray pictures taken in the transverse (axial or cross-sectional) plane.



STUDY SECTION 5

Practice spelling each term, and know its meaning.

anterior (ventral)	Front surface of the body.
deep	Away from the surface.
distal	Far from the point of attachment to the trunk or far from the beginning of a structure.
frontal (coronal) plane	Vertical plane dividing the body or structure into anterior and posterior portions.
inferior (caudal)	Below another structure; pertaining to the tail or lower portion of the body.
lateral	Pertaining to the side.
medial	Pertaining to the middle or near the medial plane of the body.
posterior (dorsal)	Back surface of the body.
prone	Lying on the belly (face down, palms down).
proximal	Near the point of attachment to the trunk or near the beginning of a structure.
sagittal (lateral) plane	Lengthwise, vertical plane dividing the body or structure into right and left sides. From the Latin <i>sagitta</i> , meaning arrow. As an arrow is shot from a bow it enters the body in the sagittal plane, dividing right from left. The midsagittal plane divides the body into right and left halves.
superficial	On the surface.
superior (cephalic)	Above another structure; pertaining to the head.
supine	Lying on the back (face up, palms up).
transverse (cross-sectional or axial) plane	Horizontal plane dividing the body into upper and lower portions.



COMBINING FORMS, PREFIXES, AND SUFFIXES

Divide each term into its component parts, and write its meaning in the space provided.

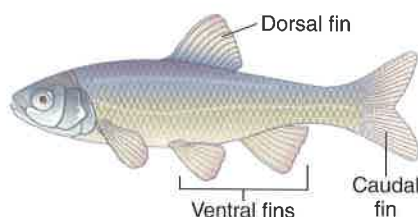
COMBINING FORMS

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
abdomin/o	abdomen	<u>abdominal</u> _____ <i>The abdomen is the region below the chest containing internal organs (such as the liver, intestines, stomach, and gallbladder).</i>	
adip/o	fat	<u>adipose</u> _____ <i>The suffix -ose means pertaining to or full of.</i>	
anter/o	front	<u>anterior</u> _____ <i>The suffix -ior means pertaining to.</i>	

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
bol/o	to cast (throw)	<u>anabolism</u> _____ <i>The prefix ana- means up. The suffix -ism means process. In this cellular process, proteins are built up (protein synthesis).</i>	
cervic/o	neck (of the body or of the uterus)	<u>cervical</u> _____ <i>The cervix is the neck of the uterus. The term cervical can mean pertaining to the neck of the body or the neck (lower part) of the uterus.</i>	
chondr/o	cartilage (type of connective tissue)	<u>chondroma</u> _____ <i>This is a benign tumor.</i> <u>chondrosarcoma</u> _____ <i>This is a malignant tumor. The root sarc indicates that the malignant tumor arises from a type of flesh or connective tissue.</i>	
chrom/o	color	<u>chromosomes</u> _____ <i>These nuclear structures absorb the color of dyes used to stain the cell. The suffix -somes means bodies. Literally, this term means "bodies of color," because this is how they appeared to researchers who first saw them under the microscope.</i>	
coccyg/o	coccyx (tailbone)	<u>coccygeal</u> _____	
crani/o	skull	<u>craniotomy</u> _____	
cyt/o	cell	<u>cytoplasm</u> _____ <i>The suffix -plasm means formation.</i>	
dist/o	far, distant	<u>distal</u> _____	
dors/o	back portion of the body	<u>dorsal</u> _____ <i>The dorsal fin of a fish is on its back (Figure 2-15). 🐟</i>	
hist/o	tissue	<u>histology</u> _____	
ili/o	ilium (part of the pelvic bone)	<u>iliac</u> _____ <i>See Figure 2-10 for a picture of the ilium.</i>	

**Dorsal/Caudal/Ventral**

Notice the names of the different fins of a fish.

**FIGURE 2-15**

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
inguin/o	groin	<u>inguinal</u> _____	
kary/o	nucleus	<u>karyotype</u> _____ <i>The suffix -type means classification or picture.</i>	
later/o	side	<u>lateral</u> _____	
lumb/o	lower back (side and back between the ribs and the pelvis)	<u>lumbosacral</u> _____	
medi/o	middle	<u>medial</u> _____	
nucle/o	nucleus	<u>nucleic</u> _____	
pelvi/i	pelvis, hip region	<u>pelvic</u> _____ <i>The pelvis includes all the bones that surround the pelvic cavity (Figure 2-16). 📖</i>	
poster/o	back, behind	<u>posterior</u> _____	
proxim/o	nearest	<u>proximal</u> _____	
sacr/o	sacrum	<u>sacral</u> _____	
sarc/o	flesh	<u>sarcoma</u> _____	
spin/o	spine, backbone	<u>spinal</u> _____	



Pelvis: Comparison of Female and Male

The female pelvis is wider and more massive than the male pelvis. The female pelvic opening is a larger, rounded, oval shape, whereas the male pelvic opening is deep, narrow, and funnel- or heart-shaped. Thus, the female pelvis can accommodate the fetus during pregnancy and its downward passage through the pelvic cavity in childbirth.

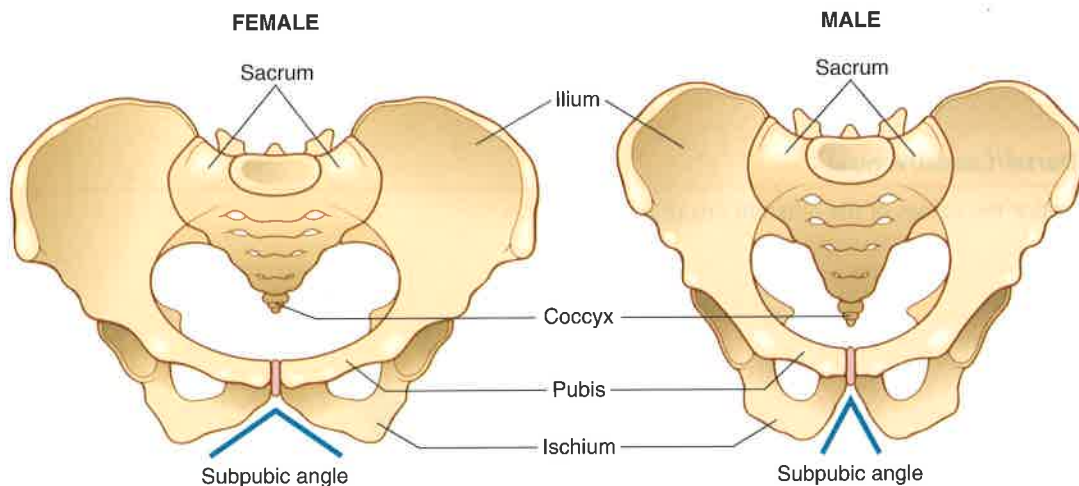


FIGURE 2-16

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
thel/o	nipple	epithelial cell _____ <i>This cell, originally identified in the skin of the nipples, lies on body surfaces, externally (outside the body) and internally (lining cavities and organs).</i>	
thorac/o	chest	thoracic _____ thoracotomy _____	
trache/o	trachea, windpipe	tracheal _____	
umbilic/o	navel, umbilicus	umbilical _____	
ventr/o	belly side of the body	ventral _____	
vertebr/o	vertebra(e), backbone(s)	vertebral _____	
viscer/o	internal organs	visceral _____	

PREFIXES

PREFIX	MEANING	TERMINOLOGY	MEANING
ana-	up	anabolic _____	
cata-	down	catabolism _____ <i>The cellular process of breaking down foods to release energy.</i>	
epi-	above	epigastric _____	
hypo-	below	hypochondriac region _____ <i>The Greeks thought that organs (liver and spleen) in the hypochondriac region of the abdomen were the origin of imaginary illnesses—hence the term hypochondriac, a person with unusual anxiety about his or her health and with symptoms not attributable to any disease process.</i>	
inter-	between	intervertebral _____ <i>A disk (disc) is an intervertebral structure.</i>	
meta-	change	metabolism _____ <i>Literally, to cast (bol/o) a change (meta-), meaning the chemical changes (processes) that occur in a cell.</i>	

SUFFIXES

The following are some new suffixes introduced in this chapter. See the Glossary, page 954, for additional suffixes meaning “pertaining to.”

SUFFIX	MEANING	SUFFIX	MEANING
-eal	pertaining to	-ose	pertaining to, full of
-iac	pertaining to	-plasm	formation
-ior	pertaining to	-somes	bodies
-ism	process, condition	-type	picture, classification

**PRACTICAL APPLICATIONS**

Be sure to check your answers with the Answers to Practical Applications on page 62.

SURGICAL PROCEDURES

Match the surgical procedure in Column I with a reason for performing it in Column II. *Note:* You are not looking for the exact meaning of each surgical procedure, but rather why it would be performed.

COLUMN I**Procedures**

1. Craniotomy _____
2. Thoracotomy _____
3. Diskectomy _____
4. Mediastinoscopy _____
5. Tracheotomy _____
6. Laryngectomy _____
7. Arthroscopy _____
8. Peritoneoscopy _____

COLUMN II**Indications**

- A. Emergency effort to remove foreign material from the windpipe
- B. Inspection and repair of torn cartilage in the knee
- C. Removal of a diseased or injured portion of the brain
- D. Inspection of lymph nodes* in the region between the lungs
- E. Removal of a squamous cell† carcinoma in the voice box
- F. Open heart surgery, or removal of lung tissue
- G. Inspection of abdominal organs and removal of diseased tissue
- H. Relief of symptoms from a bulging intervertebral disk

*Lymph nodes are collections of tissue containing white blood cells called lymphocytes.

†A squamous cell is a type of epithelial cell.