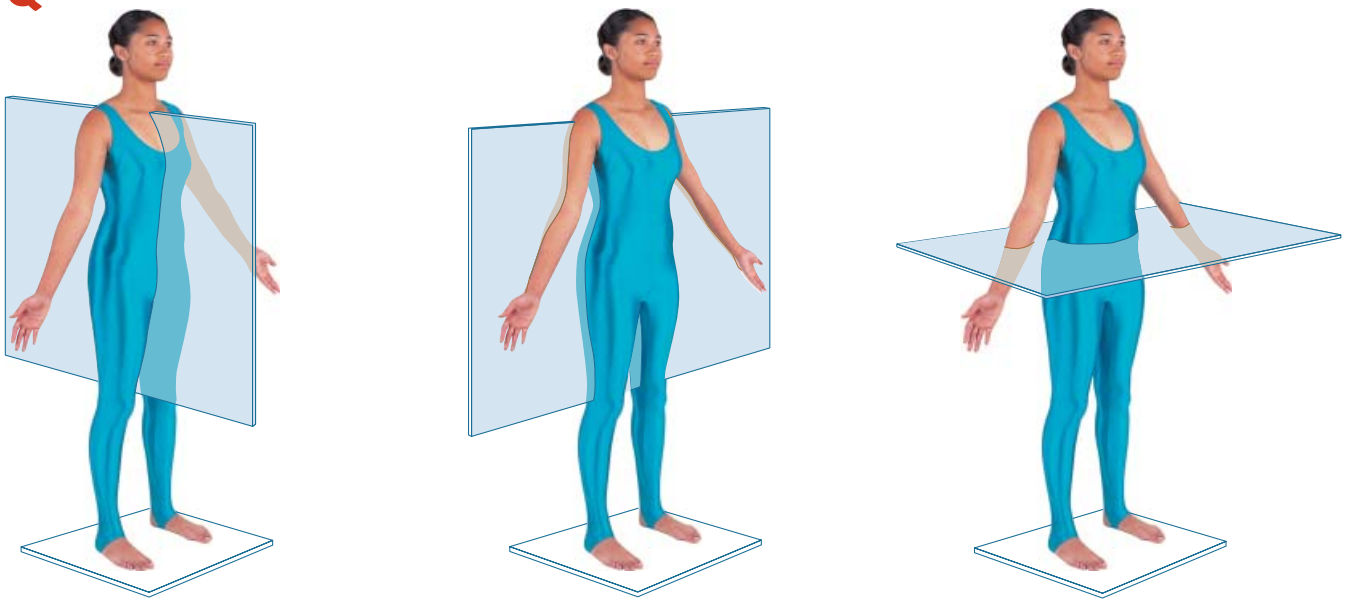
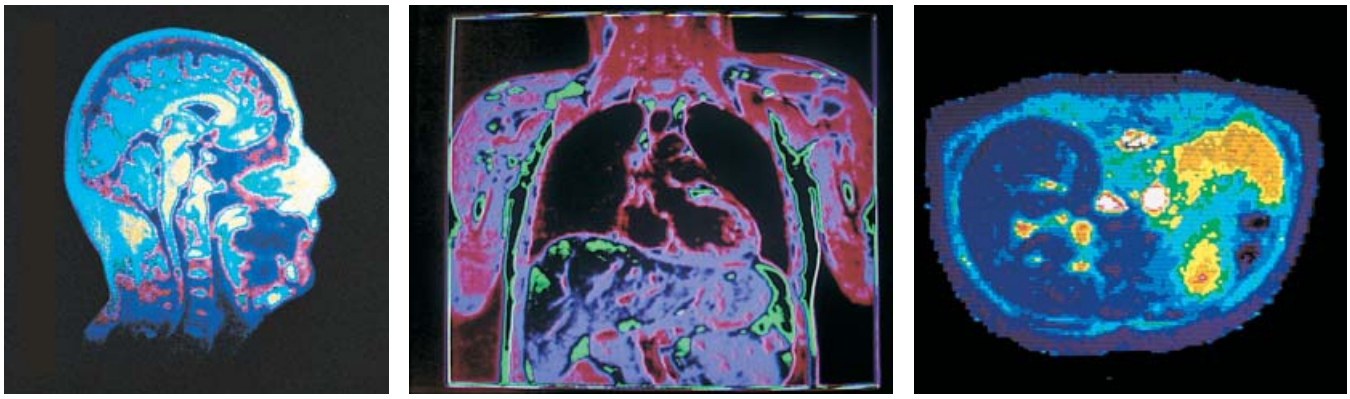
Q *Which section type would separate the two eyes?*



(a) Midsagittal (median) **(b)** Frontal (coronal) plane **(c)** Transverse plane



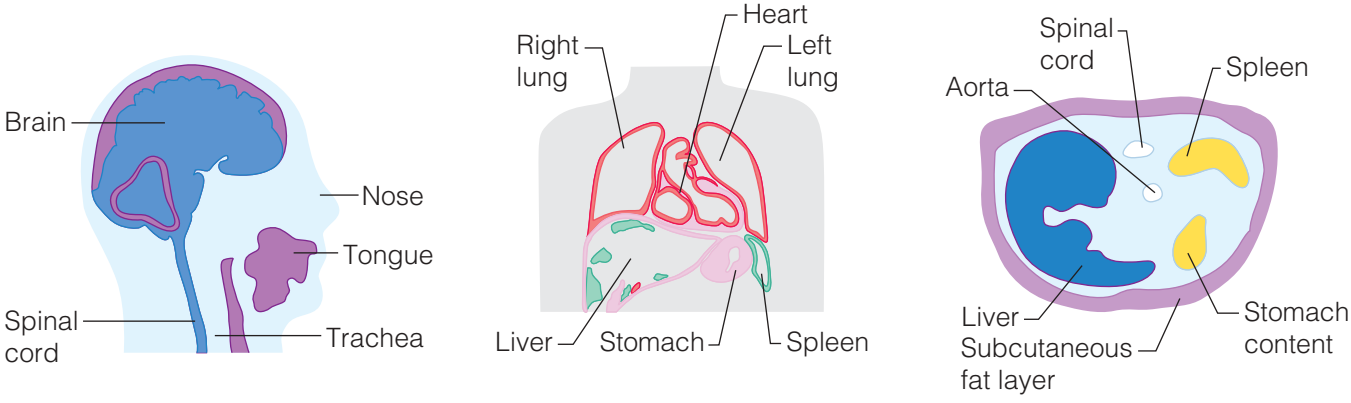


FIGURE 1.6 **The anatomical position and planes of the body.** The top row of the figure illustrates three major planes of space (midsagittal, frontal, and transverse) relative to humans in the anatomical position. Selected areas of the body, visualized using MRI scans taken at corresponding planes, are illustrated in the center row. Diagrams identifying body organs seen in the MRI scans are at the bottom.

A *A midsagittal section would separate the two eyes.*

Body Planes and Sections

When preparing to look at the internal structures of the body, medical students find it necessary to make a **section,** or cut. When the section is made through the body wall or through an organ, it is made along an imaginary line called a **plane.** Since the body is three-dimensional, we can refer to three types of planes or sections that lie at right angles to one another (Figure 1.6).

A **sagittal** (saj′ĭ-tal) **section** is a cut made along the lengthwise, or longitudinal, plane of the body, dividing the body into right and left parts. If the cut is made down the median plane of the body and the right and left parts are equal in size, it is called a **midsagittal, median, section.**

A **frontal section** is a cut made along a lengthwise plane that divides the body (or an organ) into anterior and posterior parts. It is also called a **coronal** (ko-ro′nal) **section.**

A **transverse section** is a cut made along a horizontal plane, dividing the body or organ into superior and inferior parts. It is also called a **cross section.**

Sectioning a body or one of its organs along different planes often results in very different views. For example, a transverse section of the body trunk at the level of the kidneys would show kidney structure in cross section very nicely; a frontal section of the body trunk would show a different view of kidney anatomy; and a midsagittal section would miss the kidneys completely. Information on body organ positioning that can be gained by taking magnetic resonance imaging (MRI) scans along different body planes is illustrated in Figure 1.6. (MRI scans are described further in the "A Closer Look" box on pp. 20–21).

Body Cavities

Anatomy and physiology textbooks typically describe two sets of internal cavities that provide different degrees of protection to the organs within them (Figure 1.7). These cavities differ in their mode of embryological development and purpose and in their lining membranes. Consequently, the dorsal, or neural, body cavity is not named as an internal body cavity in many anatomical references. However, the idea of two major sets of internal body cavities is a useful learning concept and will continue to be used here.

Dorsal Body Cavity

The **dorsal body cavity** has two subdivisions, which are continuous with each other. The **cranial cavity** is the space inside the bony skull. The brain is well protected because it occupies the cranial cavity. The **spinal cavity** extends from the cranial cavity nearly to the end of the vertebral column. The spinal cord, which is a continuation of the brain, is protected by the vertebrae, which surround the spinal cavity.

Ventral Body Cavity

The **ventral body cavity** is much larger than the dorsal cavity. It contains all the structures within the chest and abdomen, that is, the visceral organs

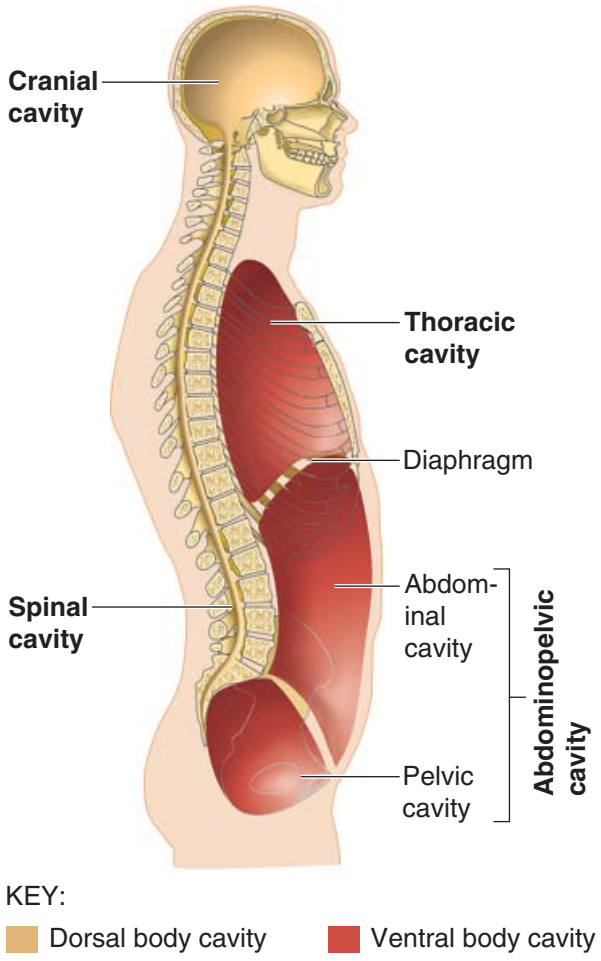


FIGURE 1.7 Body cavities. Notice the angular relationship between the abdominal and pelvic cavities.

in those regions. Like the dorsal cavity, the ventral body cavity is subdivided. The superior **thoracic cavity** is separated from the rest of the ventral cavity by a dome-shaped muscle, the **diaphragm** (di′ah-fram). The organs in the thoracic cavity (lungs, heart, and others) are somewhat protected by the rib cage. A central region called the **mediastinum** separates the lungs into right and left cavities in the thoracic cavity. The mediastinum itself houses the heart, trachea, and other visceral organs.

The cavity inferior to the diaphragm is the **abdominopelvic** (ab-dom″ĭ-no-pel′vik) **cavity.** Some prefer to subdivide it into a superior **abdominal cavity,** containing the stomach, liver, intestines, and other organs, and an inferior **pelvic cavity,** with the reproductive organs, bladder, and rectum. However, there is no actual physical structure dividing the abdominopelvic cavity. If you look carefully at Figure 1.7, you will see that the pelvic cavity is not continuous with the abdominal cavity in a straight plane, but that it tips away from it in the posterior direction.

Homeostatic Imbalance

When the body is subjected to physical trauma (as often happens in an automobile accident, for example), the most vulnerable abdominopelvic organs are those within the abdominal cavity, because the cavity walls of that portion are formed only of trunk muscles and are not reinforced by bone. The pelvic organs receive a somewhat greater degree of protection from the bony pelvis in which they reside. ▲

Because the abdominopelvic cavity is quite large and contains many organs, it is helpful to divide it up into smaller areas for study. A scheme commonly used by medical personnel divides the abdominopelvic cavity into four more or less equal regions called *quadrants*. The quadrants are then simply named according to their relative positions—that is, right upper quadrant, right lower quadrant, left upper quadrant, and left lower quadrant (Figure 1.8a).

Another system, used mainly by anatomists, divides the abdominopelvic cavity into nine separate *regions* by four planes, as shown in Figure 1.8b. Although the names of the nine regions are unfamiliar to you now, with a little patience and study they will become easier to remember. As you locate these regions in the figure, notice the organs they contain by referring to Figure 1.8c.

- The **umbilical region** is the centermost region, deep to and surrounding the umbilicus (navel).
- The **epigastric** (ep″ĭ-gas′trik) **region** is located superior to the umbilical region (*epi* = upon, above; *gastric* = stomach).
- The **hypogastric (pubic) region** is inferior to the umbilical region (*hypo* = below).
- The **right** and **left iliac,** or **inguinal, regions** are lateral to the hypogastric region (*iliac* = superior part of the hip bone).
- The **right** and **left lumbar regions** lie lateral to the umbilical region (*lumbus* = loin).
- The **right** and **left hypochondriac** (hi″po-kon′dre-ak) **regions** flank the epigastric region and contain the lower ribs (*chondro* = cartilage).

Prove It Yourself

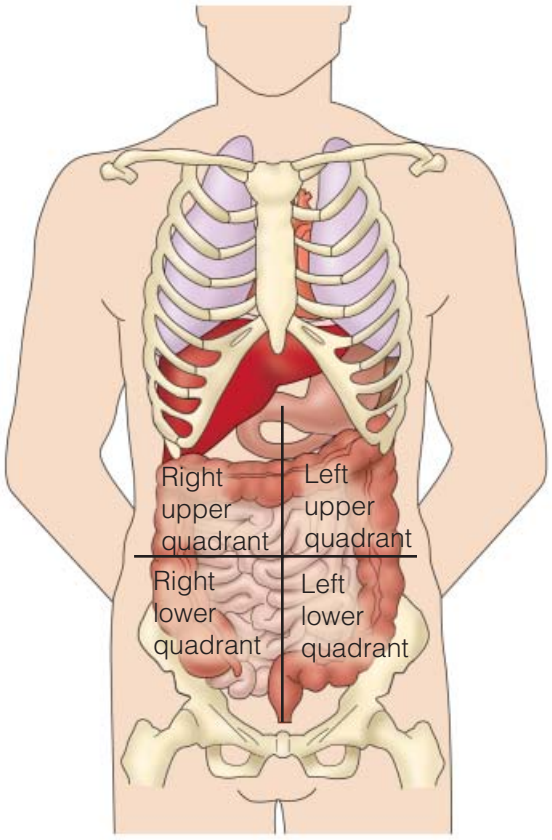
Negative Feedback Systems Operate Continuously

Generally, negative feedback systems keep controlled variables within their acceptable range most of the time. Any variations usually are so small that we do not notice them.

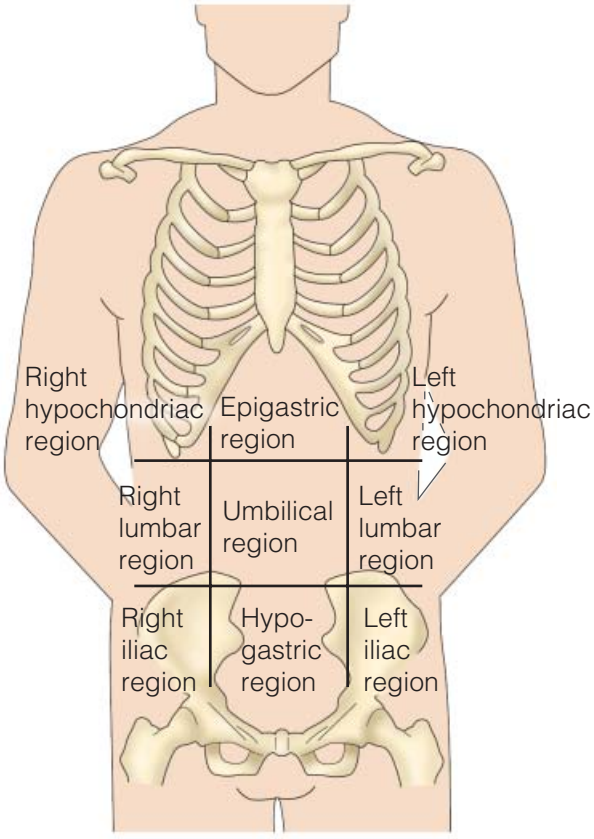
You can demonstrate the small, ongoing changes that occur in controlled variables with the following exercise. In this case, the controlled variables are your balance and your ability to control voluntarily the position of your limbs.

First, stand still and look at a distant point. Everything appears stable, as if your body is not moving at all. Then look at the same point through powerful binoculars, and notice that your field of vision appears unsteady.

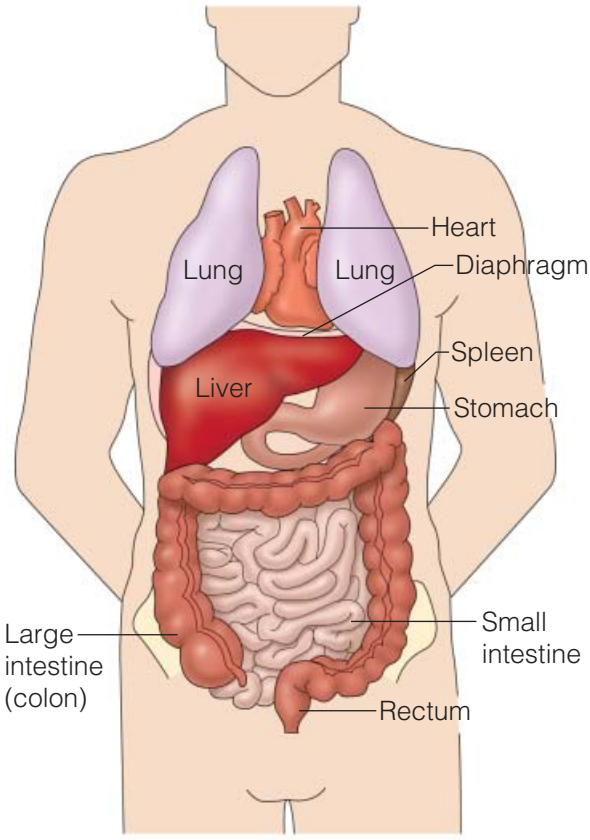
Why? Your body is constantly making small muscular adjustments to keep you upright and to hold your hands and arms steady. You become aware of these tiny motions only because the binoculars have magnified their effect on your vision.



(a)



(b)



(c)

FIGURE 1.8 Abdominopelvic surface and cavity. **(a)** The four quadrants. **(b)** Nine regions delineated by four planes. The superior horizontal plane is at the inferior aspect of the ribs; the inferior horizontal plane is at the superior aspect of the hip bones, and the vertical planes are just medial to the nipples. **(c)** Anterior view of the ventral body cavity showing superficial organs.