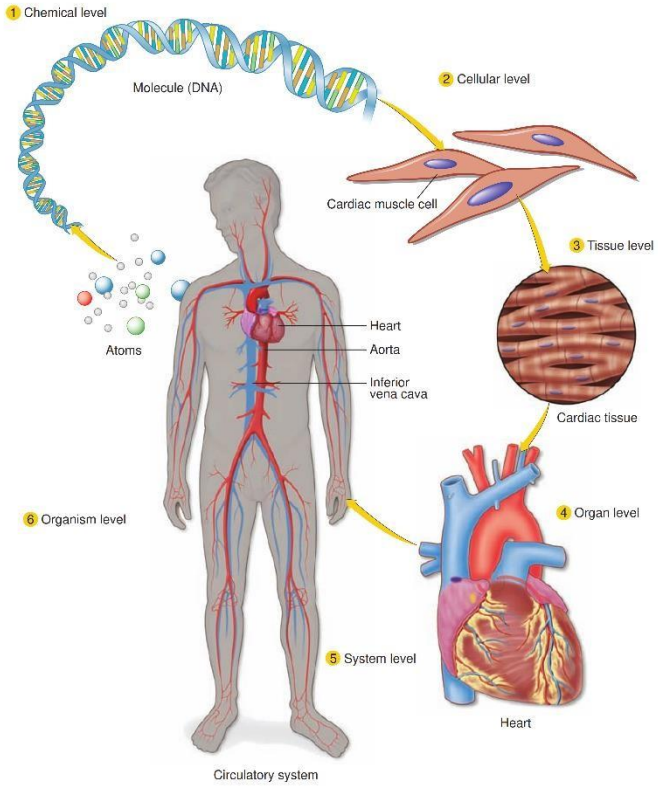
Basic Body Structure

The Cell

All life consists of microscopic living structures called **cells**. They perform various functions throughout the body. All cells are similar in structure, but not identical. Each cell has a **cell membrane**, which acts as a barrier separating the inside of the cell from its surroundings. The inside of the cell is called the **cytoplasm**. The cytoplasm contains small organs called **organelles**. These organelles carry on life's functions.



The central portion of the cell is the **nucleus**. The nucleus contains **DNA**. Human DNA contains thousands of **genes**, which are responsible for transmitting hereditary characteristics such as the shape of the body and colour of the hair. **Chromosomes** are structures in the nucleus that carry the DNA and likewise the genetic information of each cell. **DNA analysis** is used to identify individuals and to prove genetic relationships. Trillions of cells make up the **cellular level**, which is the first level of organization of the body.

The Tissue

Similar cells working together to perform a specific function combine to make up tissues. For example, muscle cells form muscle tissue. Nerve cells form

nervous tissue. A **histologist** is someone who specializes in the study of tissues.

The major tissue types are:

1. **Epithelial tissue**: Epithelial tissue covers external surfaces of the body, lines body structures, and forms glands. The **skin** is an example of an organ that is made up of epithelial tissue. **Mucous membrane** is also made up of epithelial tissue. It is found lining the digestive, respiratory, reproductive, and urinary tracts.
2. **Connective tissue**: Connective tissue functions to support and shape the body structures and keeps them in place. Tendons and ligaments, blood, bone, cartilage, and fat are examples of connective tissue.
3. **Muscle tissue**: Muscle tissue takes its name from its location in the body; for example, in the heart it is called cardiac muscle tissue. Within organs, such as the **stomach** and **intestines**, it is called **visceral** muscle tissue. Muscle associated with bones is called skeletal muscle tissue. All muscles, no matter where their location, create movement of some kind. Muscle cells are not round, but long and slender. For this reason, muscle cells are often referred to as **fibres**.

The Organs

Groups of tissue that work together to perform a specific function are called **organs**. Examples are the **kidneys**, which maintain water and salt balance in the blood, and the **stomach**, which breaks down food into substances that the circulatory system can transport throughout the body as nourishment for its cells.

Body Systems

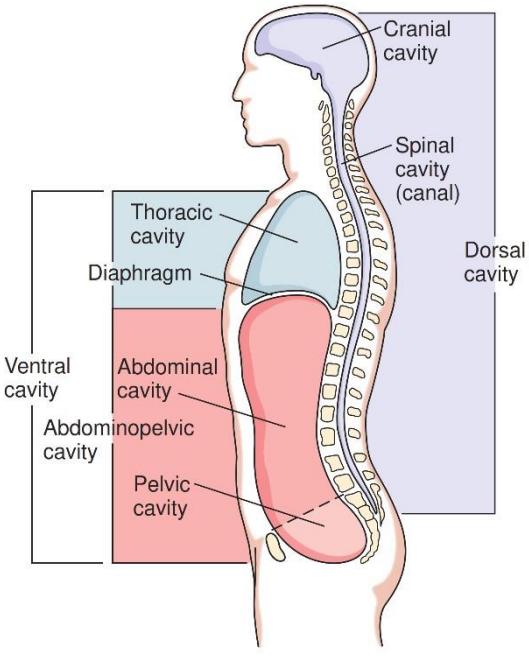
Groups of organs that work together to perform one of the body's major functions form a **system**. These systems work together to perform all of the necessary functions of life.

1. The **integumentary system** consists of the skin and the accessory structures derived from it—hair, nails, sweat glands, and oil glands.
2. The **musculoskeletal system** supports the body, protects organs, and provides body movement. It includes muscles, bones, and cartilage.
3. The **cardiovascular system** includes the heart and blood vessels, which pump and transport blood throughout the body. Blood carries nutrients to and removes waste from the tissues.
4. The **respiratory system** includes the lungs and the airways. This system performs respiration.
5. The **nervous system** consists of the brain, spinal cord, and peripheral nerves. The nervous system regulates most body activities and sends and receives messages from the sensory organs.
6. The **urinary system** includes the kidneys, ureters, bladder, and urethra. It eliminates metabolic waste, helps to maintain acid-base and water-salt balance, and helps regulate blood pressure.
7. The **reproductive system** controls reproduction and heredity. The female reproductive system includes the ovaries, vagina, uterine (fallopian) tubes, uterus, and mammary glands. The male reproductive system includes the testes, penis, prostate gland, vas deferens, and the seminal vesicles.
8. The **blood system** includes the blood and all its components.

9. The **lymphatic and immune systems** include the lymph, the glands of the lymphatic system, lymphatic vessels, and the nonspecific and specific defences of the immune system.
10. The **digestive system** includes all the organs of digestion and excretion of waste.
11. The **endocrine system** includes the glands that secrete hormones for regulation of many of the body's activities.
12. The **sensory system** covers the eyes and ears and those parts of other systems that are involved in the reactions of the five senses.

Body Cavities

The body has two main cavities (spaces)—the dorsal and the ventral. The dorsal cavity, on the back side of the body, is divided into the cranial cavity which holds the brain, and the spinal cavity, which holds the spinal cord. The ventral cavity, on the front side of the body, is divided (and separated by a muscle called the diaphragm) into the thoracic cavity, which holds the heart, lungs, and major blood vessels, and the abdominal cavity, which holds the organs of the digestive and urinary systems.



The bottom portion of the abdominal cavity is called the pelvic cavity. It contains the reproductive system.

Directional Terms, Planes, and Regions

In making diagnoses or prescribing treatments, health care providers use standard terms to refer to different areas of the body. These terms describe each anatomical position as a point of reference. The **anatomical position** always means the body is standing erect, facing forward, with upper limbs at the sides and with the palms facing forward.

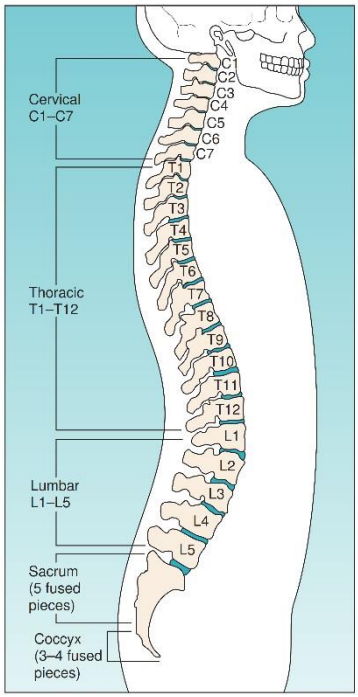
Directional Terms

Planes of the Body

For anatomical and diagnostic discussions, some standard terms are used for the planes and positions of the body. The imaginary planes of the body when it is vertical and facing front are: **frontal (coronal) plane**, which divides the body into anterior and posterior positions; **sagittal (lateral) plane**, which is the plane parallel to the medial and divides the body into left and right sections; **medial or midsagittal plane**, which divides the body into equal left and right halves; and **transverse (cross-sectional) plane**, which intersects the body horizontally and divides the body into upper and lower sections.

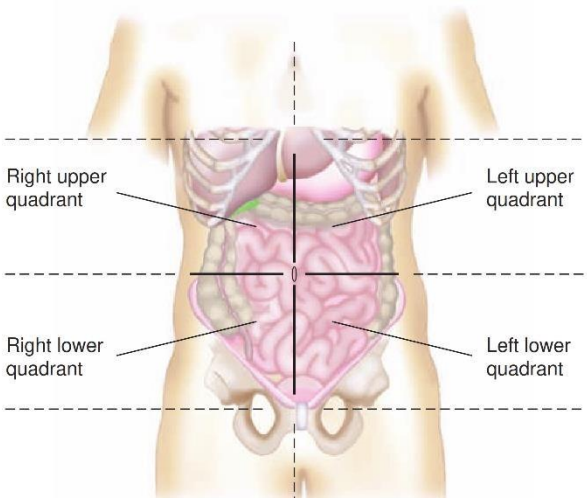
Regions of the Body

Health care practitioners usually refer to a specific organ, area, or bone when speaking of the upper body. In the back, the spinal column is divided into specific regions (**cervical, thoracic, lumbar, sacral, and coccygeal**).



The middle portion of the body (abdominal and pelvic cavities) is often the site of pain. Doctors use two standard sections to describe this area of the body. The larger section is divided into four quarters with the navel being the centre point.

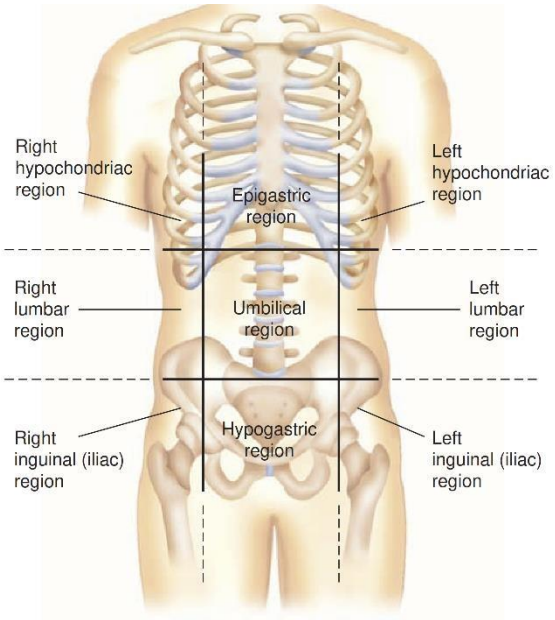
- **Right upper quadrant**: On the right anterior side; contains part of the liver, the gallbladder, and parts of the pancreas and intestinal tract.
- **Right lower quadrant**: On the right anterior side; contains the appendix, parts of the intestines, and parts of the reproductive organs in the female.



- **Left upper quadrant**: On the left anterior side; contains the stomach, spleen, and parts of the liver, pancreas, and intestines.
- **Left lower quadrant**: On the left anterior side; contains parts of the intestines and parts of reproductive organs in the female.

The smaller divisions of the abdominal and pelvic areas are the nine regions, each of which correspond to a region near a specific point in the body:

- **Epigastric region**: the area above the stomach.
- **Hypochondriac regions (left and right)**: the two regions just below the cartilage of the ribs, immediately over the abdomen.
- **Umbilical region**: the region surrounding the umbilicus (navel).
- **Lumbar regions (left and right)**: the two regions near the waist.



- **Hypogastric region:** the area just below the umbilical region.
- **Iliac (inguinal) regions (left and right):** the two regions near the upper portion of the hip bone.