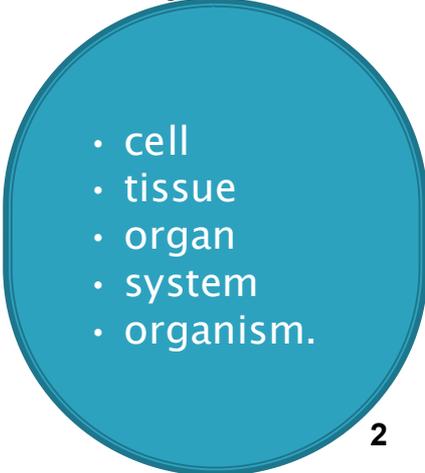
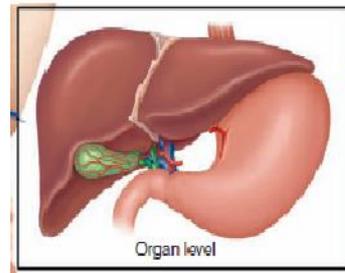
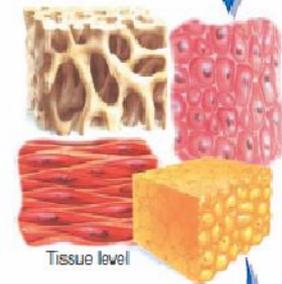
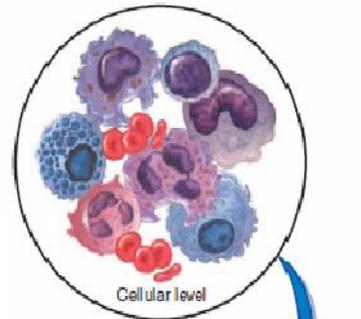
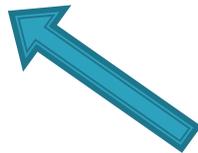
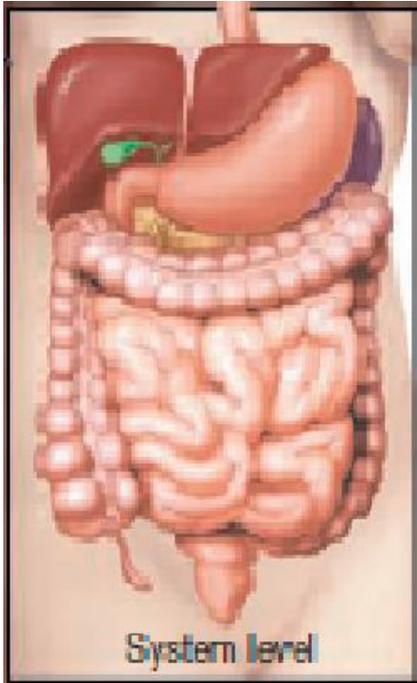


BODY STRUCTURE
by
Dr/ Heba Kareem

Levels of Organization

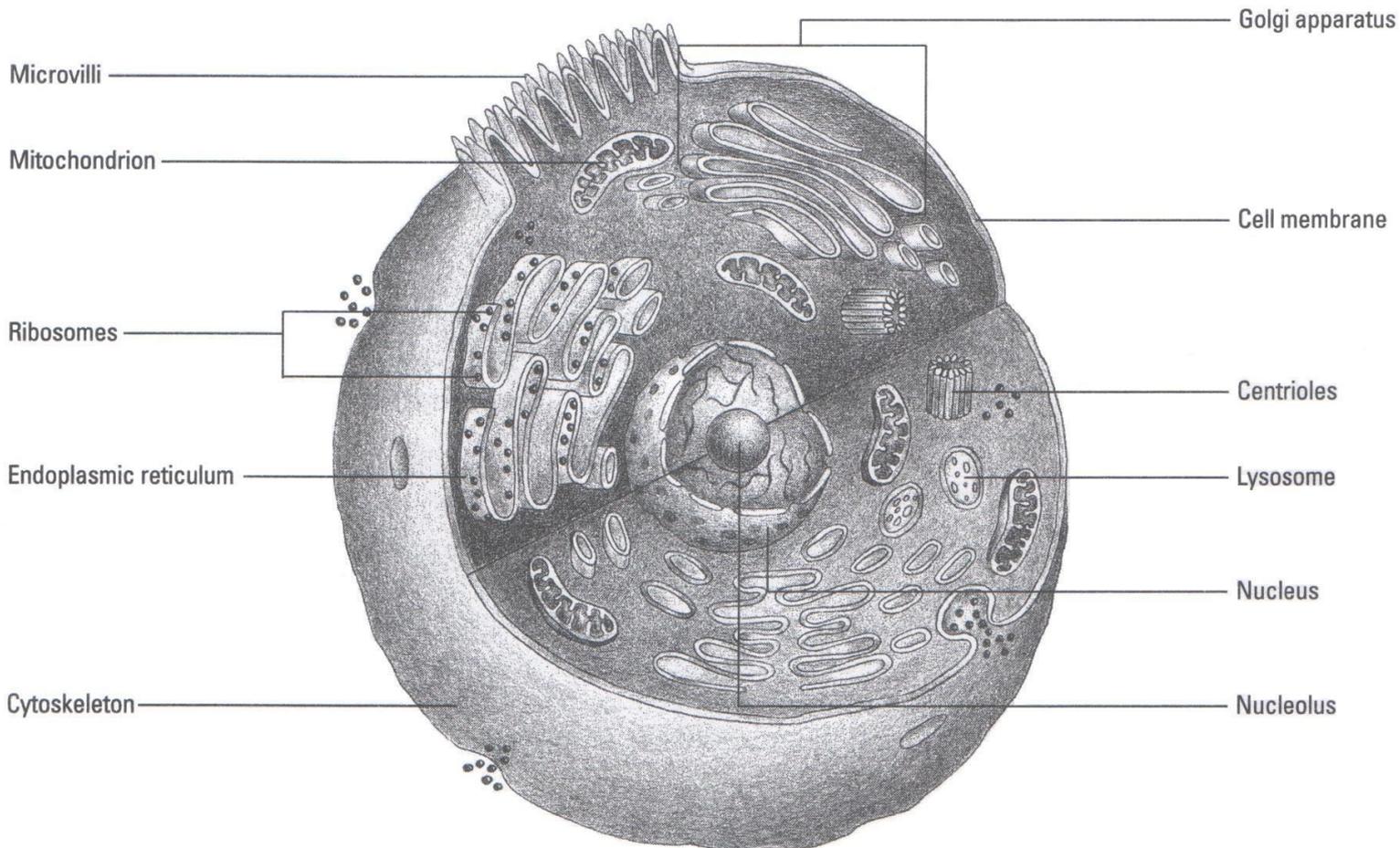
- ▶ Large group of specialized cells that perform the same role → tissues (e.g. muscle, blood, and bone).
- ▶ Group of tissues → organs (e.g. brain, heart, and liver).
- ▶ Organs and tissues are integrated into → body systems (e.g. central nervous system, and digestive system)

- 
- cell
 - tissue
 - organ
 - system
 - organism.



The cell organelles:

- ▶ **Nucleus:** the name derived from Latin word (*nuculeus*) which means kernel (i.e. core or seed).
 - ❖ Function = Stores deoxyribonucleic acid (DNA), which carries the genetic materials and is responsible for cellular reproduction or division.
- ▶ **Mitochondria:** the cell's power plant
 - ❖ Function = Production of adenosine triphosphate (ATP), the high energy molecule that fuels cellular activity
- ▶ **Ribosomes and endoplasmic reticulum:**
 - ❖ Function = Synthesis of proteins and metabolism of fat within the cell
- ▶ **The Golgi apparatus:**
 - ❖ Function = Holds enzyme systems that assist in completing the cellular metabolic functions
- ▶ **Lysosomes:**
 - ❖ Function = Contain enzymes that allow cytoplasmic digestion



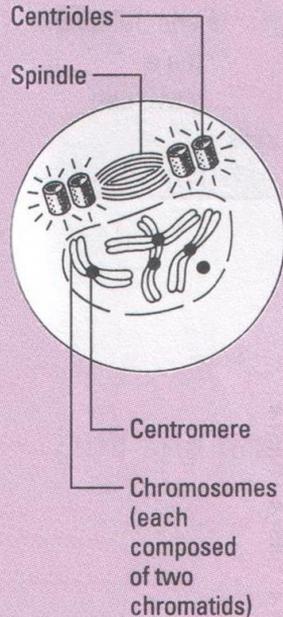
Cell division and reproduction:

- Cells **reproduce to replace** cells that are lost by **wear and tear**
- Cells reproduce by splitting into two separate daughter cells by **mitosis** [root = mitos (Greek) means **thread** + suffix = **-osis means action or state**]
- **Before** getting into mitosis the cellular mass **double** and **chromatin** begins to form. Mitosis is composed of Four phases, they are
 - ❖ **Prophase** (chromosomes coil and shorten, nuclear membrane dissolve, chromatids and centromeres appear)
 - ❖ **Metaphase** (centromeres divide and align themselves in the middle of the spindle)
 - ❖ **Anaphase** (centromere separate and pull chromosomes toward opposite sides of the cell, 46 chromosomes are present on each side of the cell)
 - ❖ **Telophase** (spindle fibers disappear, cytoplasm divides, a new membrane forms around each set of 46 chromosomes). Telo- (Greek) means ultimate end
- **Meiosis** only occurs in gametes (**ova and spermatozoa**). In this division, the number of chromosomes in the Four daughter cells is **reduced** to half (i.e. 23 chromosomes). Meiosis (Greek, meaning **lessening**) consists of two divisions separated by a resting phase.

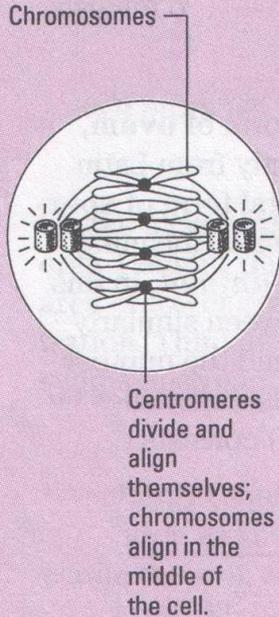
Replicate and divide

The illustrations here show the different phases of mitosis, or cell reproduction.

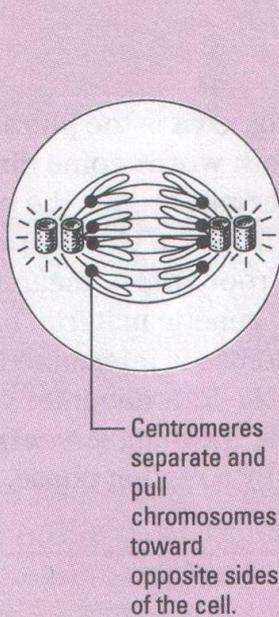
Prophase



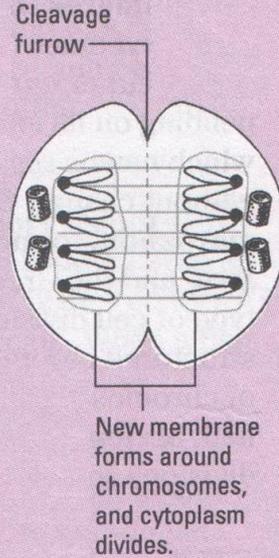
Metaphase



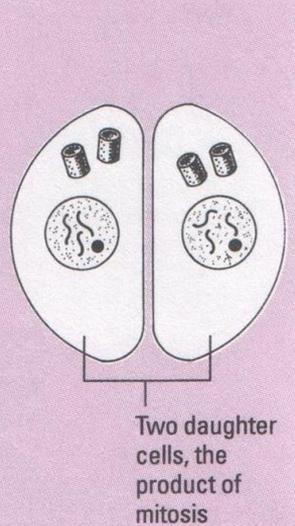
Anaphase



Telophase



Division complete



Body Tissues:

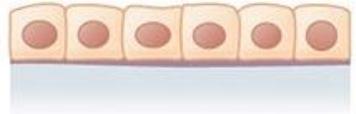
Tissues are classified by structure and function into **Four** types:

1- Epithelial tissue:

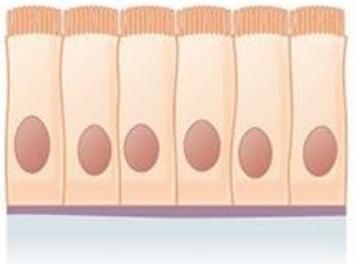
- Epithelium is a continuous cellular sheet that covers the body's surface, lines body organs, and forms certain glands.
 - ❖ Endothelium = Single layer of squamous cells attached to a basement membrane e.g. blood vessels
 - ❖ Mesothelium = Lines the surface of serous membranes, such as the pleura, pericardium, and peritoneum
- Epithelial tissue may be recognized by **number of layers** into:
 - ❖ Simple = one layer of cells
 - ❖ Stratified = two or more layers
 - ❖ Pseudostratified = one layer of cells but appears to have more
- Epithelial tissue may be classified by **shape** into:
 - ❖ Squamous = flat surface cells
 - ❖ Columnar = tall, cylindrical, prism-shaped surface cells
 - ❖ Cuboidal = cube-shaped surface cells



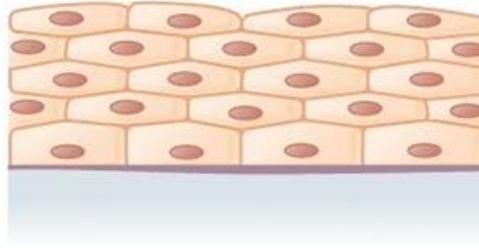
Simple squamous epithelium



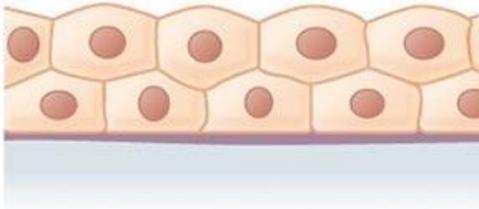
Simple cuboidal epithelium



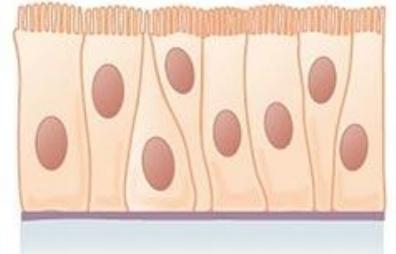
Simple columnar epithelium



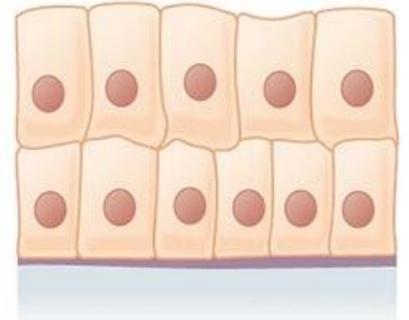
Stratified squamous epithelium



Stratified cuboidal epithelium



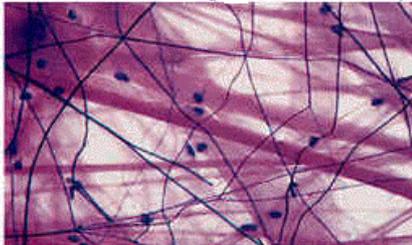
Pseudostratified columnar epithelium



Stratified columnar epithelium

2-Connective tissue:

- Includes bone, cartilage, and adipose (fatty) tissue. This tissue bonds together and support structure. Connective tissue is classified as loose or dense.
- **Loose** connective tissue has large spaces that separate the fibers and cells with much intercellular fluid.
- **Dense** connective tissue has greater fiber concentration and provides structural support.
- Adipose tissue is a specialized type of loose connective tissue. It cushions internal organs and acts as a reserve supply of energy.



LOOSE CONNECTIVE TISSUE



DENSE CONNECTIVE TISSUE

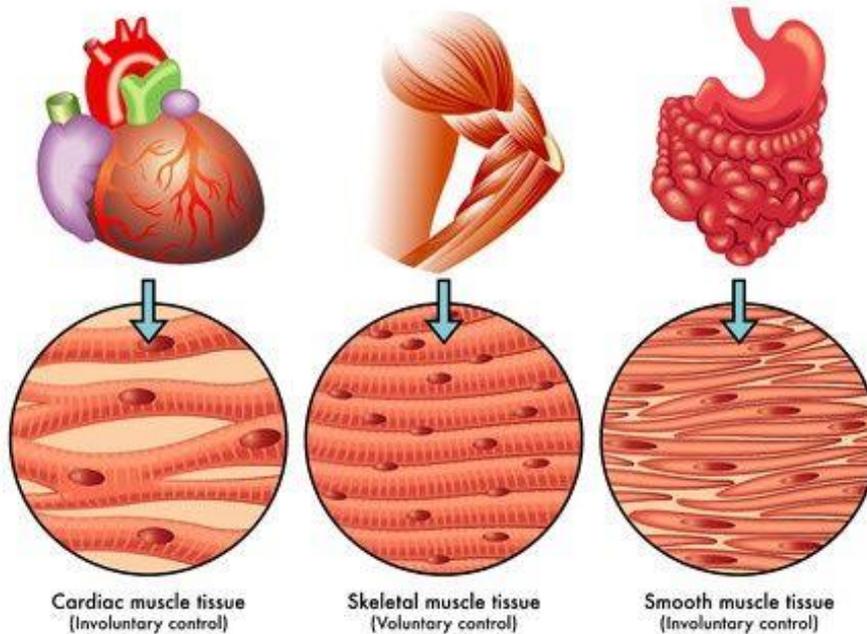
Connective Tissue (1)

3- Muscle tissue:

Skeletal muscle tissue (striated and voluntary)

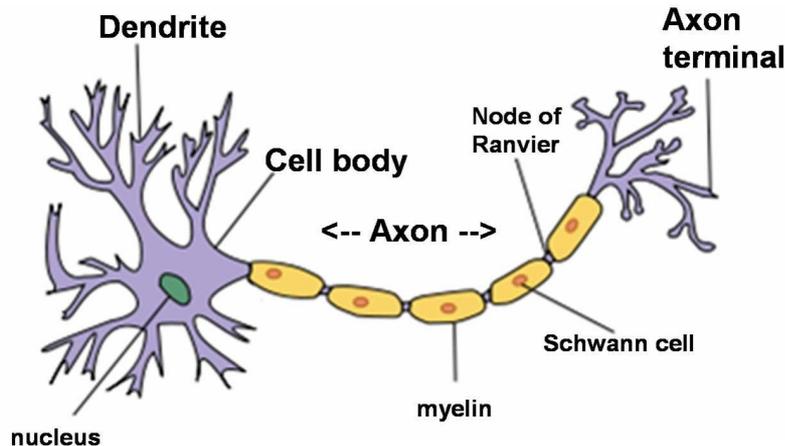
Cardiac muscle tissue (striated and involuntary)

Smooth muscle tissue (non-striated and involuntary). Lines the wall of many internal organs and other structures such as walls of arteries and veins.



4- Nervous tissue:

- It's a reactive tissue. Its main function is communication. Nervous tissue cells may be Neurons or Neuroglia.
- Neurons consist of:
 - ❖ Cell body
 - ❖ Axons
 - ❖ Dendrites
- Neuroglia form the support structure of nervous tissue. They found only in the central nervous system. They insulate and protect neurons.



Body organs and systems:

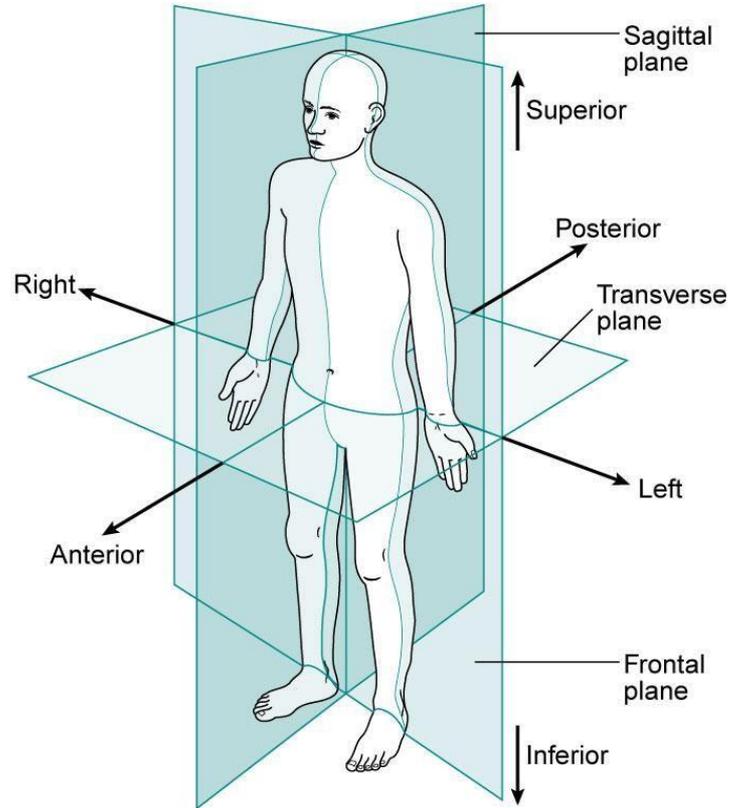
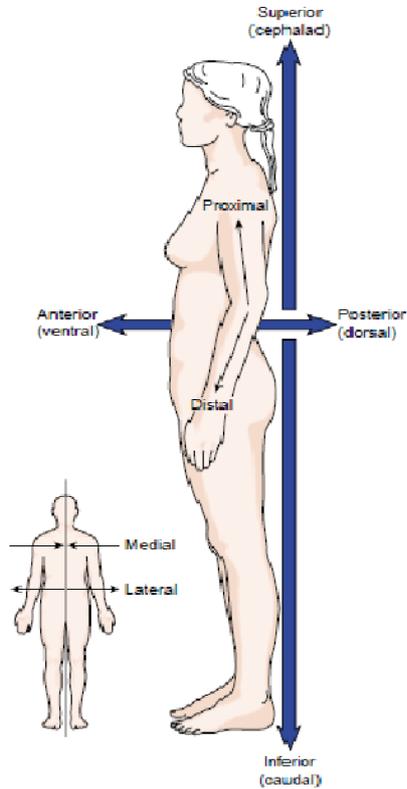
- ▶ A body system is composed of varying numbers of organs and accessory structures that have similar or related functions.
- ✓ The hemopoietic and immune system. The suffix -poiesis = to make.
- ✓ The nervous system and special senses
- ✓ The genitourinary system
- ✓ The gastrointestinal system
- ✓ The cardiovascular system
- ✓ The respiratory system
- ✓ The endocrine system
- ✓ The integumentary system (includes skin, hair, nails, and sweat glands. It protects the body and helps regulate body temperature). **Integumentum in Latin means to cover.**
- ▶ The musculoskeletal system

Directional Terms :

- Superior = above
- Inferior = below
- Anterior = in front of. **Ventral** is sometimes used instead of anterior
- Posterior = in back of. **Dorsal** is sometimes used instead of posterior
- Medial = toward the center
- Lateral = away from the midline (to the sides)
- Proximal = nearest to
- Distal = refers to a point farthest from point of origin
- Superficial = refers to a point nearest the body surface
- Deep = away from the surface
- Inversion = turning inward or inside out
- Eversion = turning outward
- Parietal = pertaining to the outer wall of the body cavity
- Visceral = pertaining to the viscera, or internal organs, especially the abdominal organs

Body planes and sections:

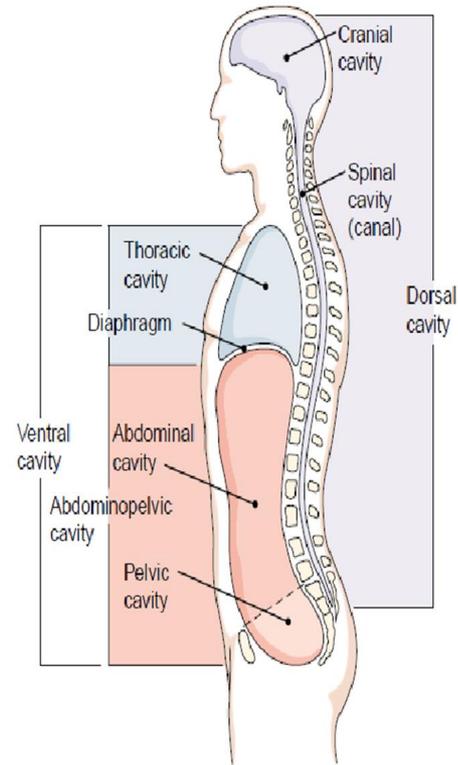
- ▶ **Sagittal plane.** It runs lengthwise from front to back and divides the body into right and left sides, each containing an arm and a leg.
- ▶ **Frontal plane.** It runs lengthwise from side to side, dividing the body into ventral and dorsal (front and back) sections.
- ▶ **Transverse plane (horizontal plane).** Cuts the body into upper and lower parts. These are known as the cranial (head) and the caudal (tail) portions.



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Body cavities:

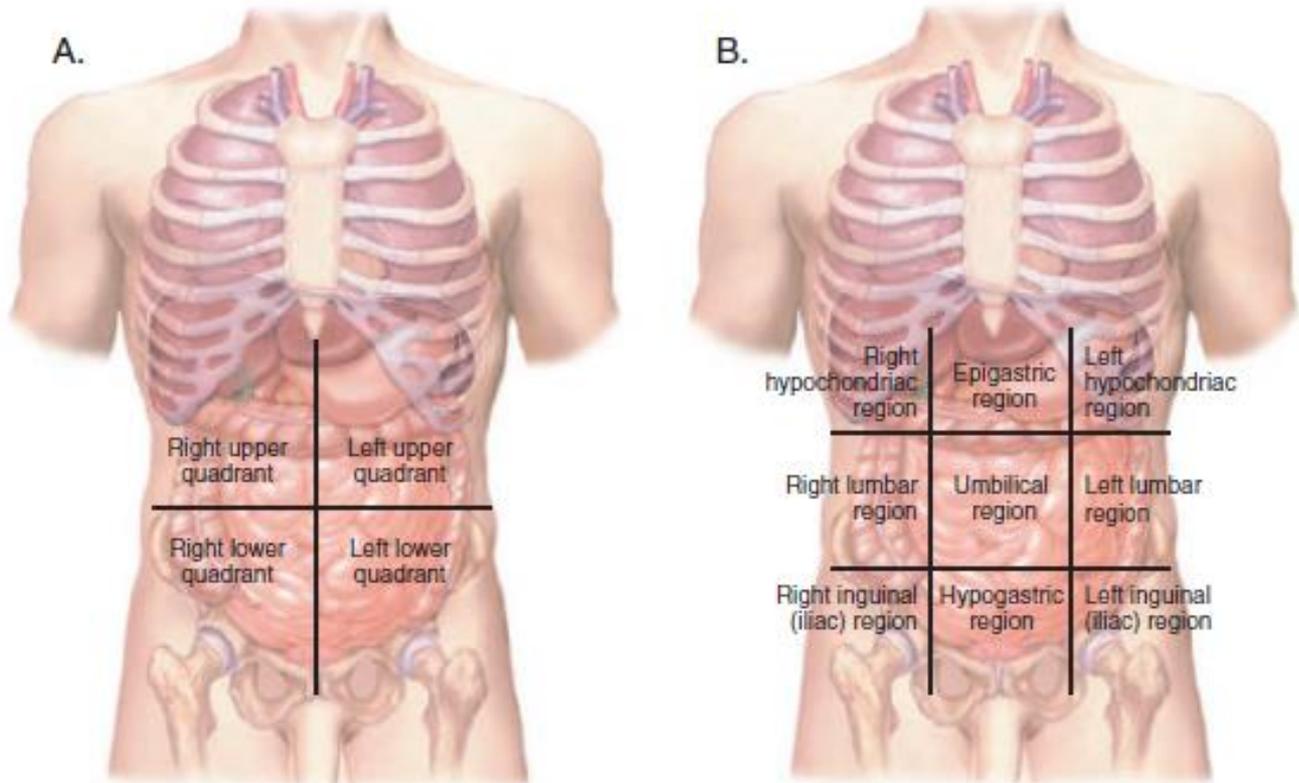
- ▶ Ventral cavity
 - ❖ Thoracic (chest) cavity includes the mediastin and pleural cavities
 - ❖ Abdominopelvic cavity
- ▶ Dorsal cavity
 - ❖ Cranial cavity
 - ❖ Spinal cavity



What is the difference between a region and quadrant?

The quadrants of the abdomen are used primarily to identify topographical sites.

The abdominopelvic regions are used mainly to identify the location of underlying body structures and visceral organs.



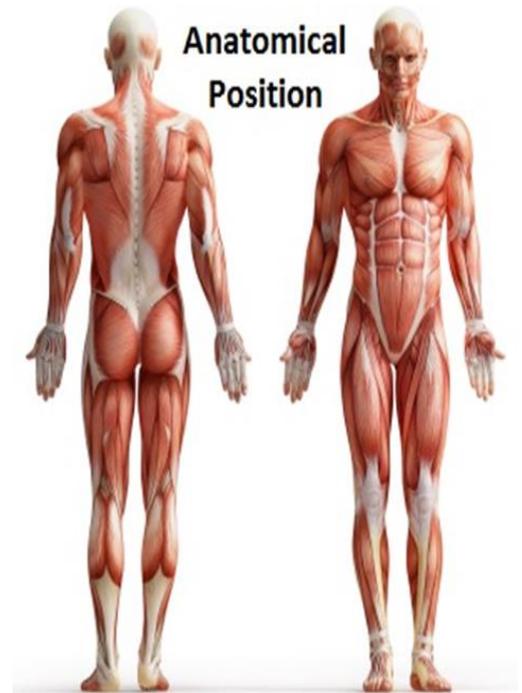
Quadrants and regions. (A) Four quadrants of the abdomen. (B) Nine regions of the abdomen

Abdominal regions:

- ▶ **Right hypochondriac region** (contains the liver, right kidney, and portion of the diaphragm)
- ▶ **Epigastric region** (contains the pancreas and portion of the stomach, liver, inferior vena cava, abdominal aorta, and duodenum)
- ▶ **Left hypochondriac region** (contains a portion of the diaphragm, the spleen, the stomach, the left kidney, and part of the pancreas)
- ▶ **Right lumbar region** (contains portions of the large intestines and the right kidney)
- ▶ **Umbilical region** (contains sections of the small and large intestines and a portion of the left kidney)
- ▶ **Left lumbar region** (contains portions of the small and large intestines and a portion of the left kidney)
- ▶ **Right iliac (inguinal) region** (includes portions of the small and large intestines)
- ▶ **Hypogastric region** (includes a portion of the sigmoid colon, the urinary bladder and ureters, and portions of the small intestine)
- ▶ **Left iliac (inguinal) region** (contains portions of the small and large intestines)

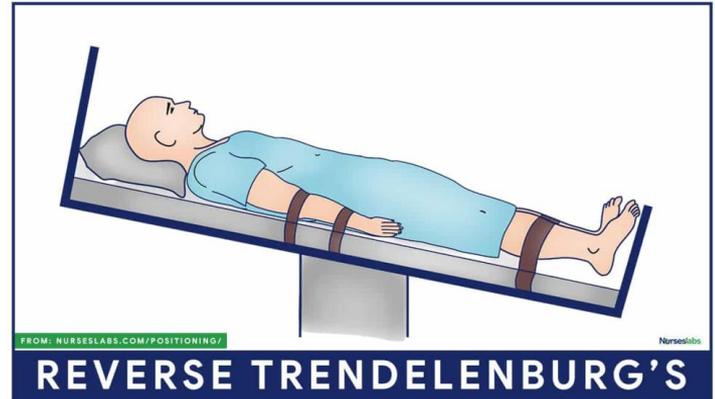
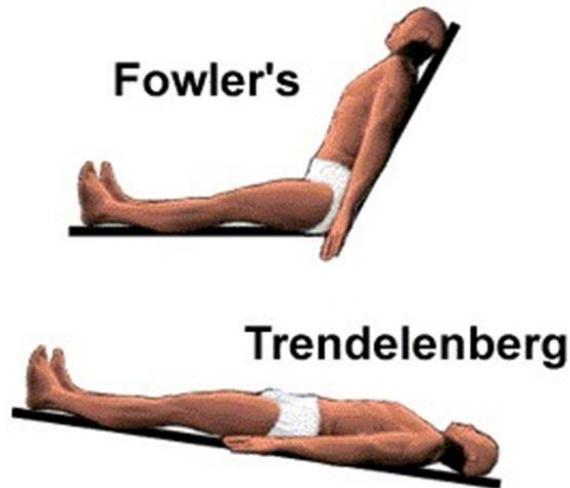
Anatomical Position

- The **anatomical position** is a body posture used to locate anatomical parts in relation to each other.
- In is position, the body is erect and the eyes are looking forward. The upper limbs hang to the sides, with the palms facing forward. The lower limbs are parallel, with toes pointing straight ahead.
- No matter how the body is actually positioned—standing or lying down, facing forward or backward—or how the limbs are actually placed, the positions and relationships of a structure are always described as if the body were in the anatomical position.

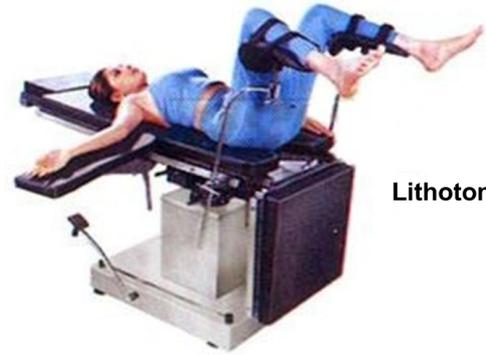


Other Positions:

- ▶ Fowler's position – head of bed raised, knees slightly flexed
- ▶ Trendelenburg's position – lying flat with the head lower than the body or legs
- ▶ Reverse Trendelenburg's position – lying flat with the head higher than the body or legs



- ▶ Lithotomy position – lying on the back with the hips and knees flexed and the thighs abducted and externally rotated



Lithotomy Position

- ▶ Supine position – lying flat on the back
- ▶ Prone position – lying face down



Supine



Prone

