

Introduction to Anatomy:

Characteristics of all Living Organisms:

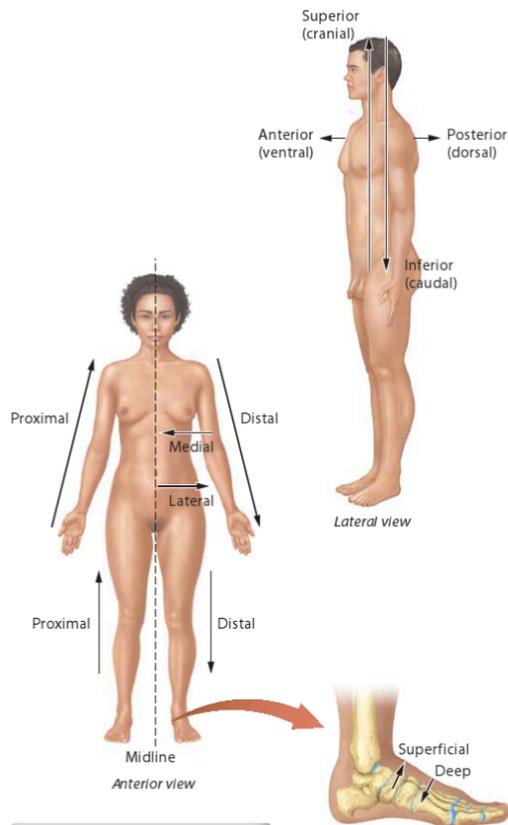
- **Cellular Composition:** cells are the basic units of life
 - Smallest unit that can carry out functions of life
- **Metabolism:** formation and breakdown, modification of chemicals in the body
 - **Chemicals:** substances with unique molecular composition
 - Living organisms carry out several chemical reactions collectively known as metabolism
- **Growth:** where building outweighs breaking down processes
 - Increase in size of the individual cells
 - Increase in the number of cells
- **Excretion:** process that an organism uses to **eliminate** potentially harmful waste products created by metabolic processes.
- **Responsiveness:** ability of organism to sense and react to changes or stimuli
 - Through senses, including sight, smell, touch
- **Movement:** ability of an entire organism to move or movement of individual cells or of materials within or between cells of an organism
- **Reproduction:**
 - Individual cells reproduce within an organism during growth and to replace damaged/old cells
 - Organism itself reproduces to yield similar offspring

Levels of Structural Organisation:

- **Chemical level** - smallest level and is the foundation for each successive level.
 - Ranges from atoms to molecules
- **Cellular level:** molecules combine in specific ways to form cellular structures
- **Tissue level:** two or more cell types cooperate to perform a common function make up a tissue
 - Consists of cells and surrounding extracellular matrix
- **Organ level:** consists of two or more tissue types combined to form a structure/organ
 - Has a recognisable shape and performs a specialised task
 - E.g. heart and lungs
- **Organ system level:** consists of two or more organs that together carry out a broad bodily function
 - E.g. cardiovascular system and digestive system
- **Organism level:** organ systems function together to make up the working human body.

Direction Terms:

- **Anatomical position:** common frame of reference from which all body parts and regions are described.
- **Directional terms:** describes relative location of body parts and markings
 - **Anterior:** towards the front
 - **Posterior:** towards the back
 - **Superior:** towards the head
 - **Inferior:** towards the tail
 - **Proximal:** closer to the point of origin (the trunk)
 - **Distal:** farther away from the point of origin (the trunk)
 - Used when talking about arms and legs
 - **Medial:** closer to the midline of the body
 - **Lateral:** farther away from the midline
 - **Superficial:** closer to the surface
 - **Deep:** further below the surface

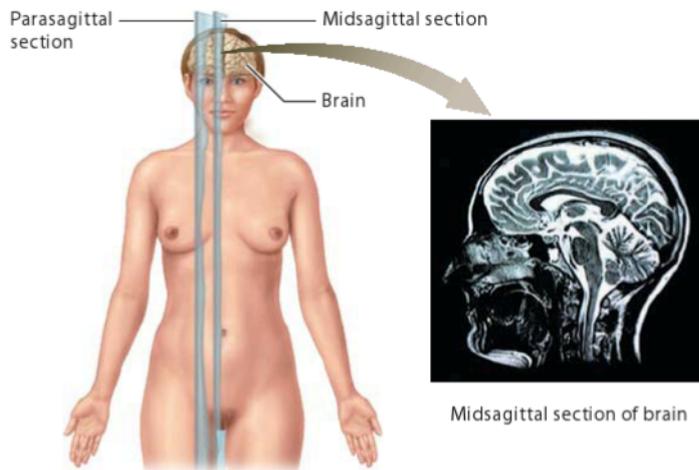


Regional Terms:

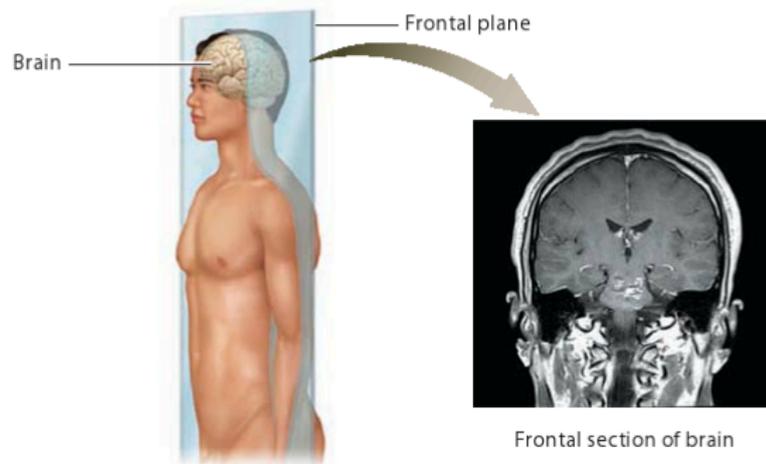
- **Axial region:** includes the head, neck and trunk
- **Appendicular region:** includes upper and lower limbs

Planes of Section:

- **Sagittal plane** divides body or body part into right and left sections.
 - **Midsagittal plane (median plane):** divides the body into **equal** left and right sections
 - **Parasagittal plane** divides body into **unequal** right and left sections

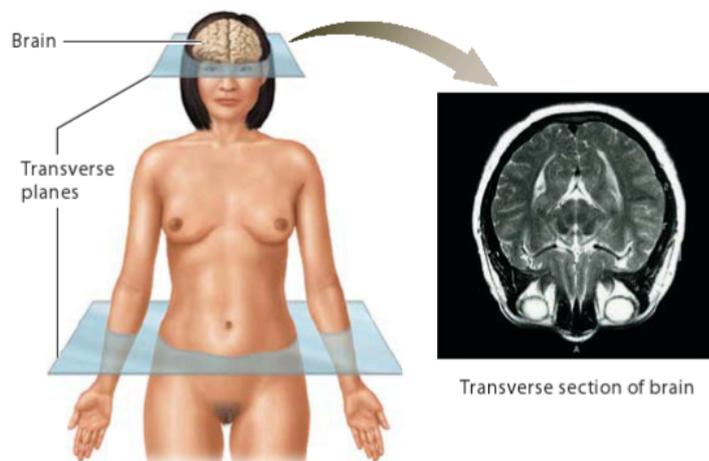


- **Frontal plane** divides body into **anterior and posterior** sections (front and back)



(b) Frontal plane

- **Transverse plane (horizontal plane)** divides the body into **superior and inferior** sections or proximal and distal sections when describing structures of appendicular regions (top and bottom)

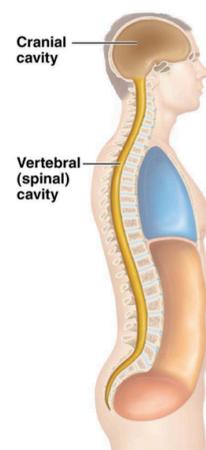


(c) Transverse plane

- **Oblique plane** taken at an angle and is not standardised

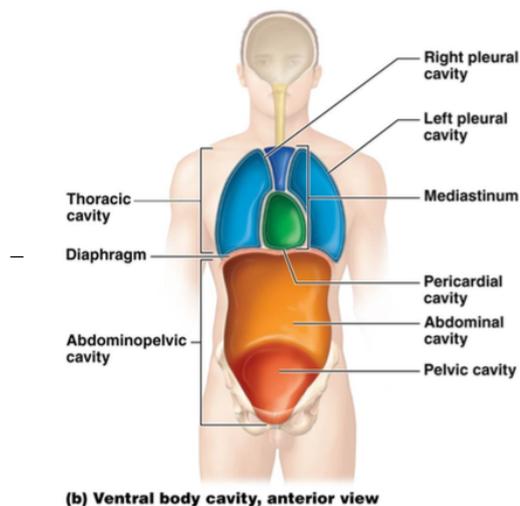
Body Cavities:

- **Cavity:** any fluid-filled space within body
- Cavities protect internal organs and allow them to move and expand as necessary to perform their functions
- **Dorsal cavity:** largely located on the posterior side of the body
 - **Cranial cavity** - within the skull and protects the brain
 - **Vertebral cavity** - within the vertebral column
 - Lined with protective layers called meninges
 - Filled with cerebrospinal fluid

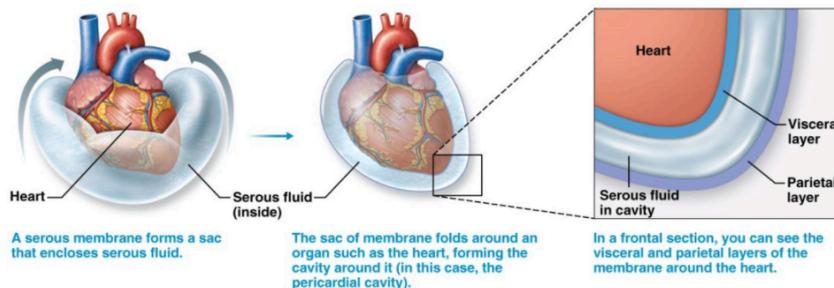


(a) Dorsal body cavity, lateral view

- **Ventral cavity:** Separated into two divisions by the diaphragm
 - Lined with serous membranes
 - **Thoracic cavity** - is superior (above) the diaphragm
 - **Pleural cavities** - surround either the left or right lung - the two cavities allow it to be separated
 - **Mediastinum** - between the pleural cavities; houses the heart, trachea and oesophagus.
 - Not located within a serous membrane
 - Houses the great vessels
 - **Pericardial cavity** - within the mediastinum - surrounds the heart
 - **Abdominopelvic cavity** - is inferior (below) the diaphragm
 - **Abdominal cavity** - spans from the diaphragm to the pelvis
 - **Pelvic cavity** - within the pelvis
 - **Peritoneal cavity** - abdominal sub-cavity found within serous membrane



- **Serous membranes:**
 - Thin sheets of tissue that form certain cavities found in the ventral cavity - surrounding the heart, lungs and many abdominal organs
 - Appear to be two membranes when sectioned
 - Actually consists of a single, continuous layer of tissue - folds over itself to create a double layered structure
 - Within the cavity between the two layers is a thin layer of serous fluid
 - **Serous fluid** - acts a lubricant between membrane layers and prevents friction caused by movement of organs
 - Visceral layer - contact with the underlying organ
 - Parietal layer - attached to surrounding structures



- There are three main serous body cavities:
 - **Pleural membranes** - covering the lungs
 - **Pericardial membranes** - covering the heart
 - **Peritoneal membranes** - covering most of the gastrointestinal tract

Core Principles in Anatomy and Physiology:

- **Homeostasis** - maintenance of internal environment
 - Homeostatic imbalances - disturbances in homeostasis can lead to disease or death if uncorrected.
 - To prevent imbalance, most variables are **controlled (regulated)**. To keep them within a narrow range close to a normal value.
 - Body temperature, blood pressure, heart rate etc.
- **Feedback Loops** - positive and negative feedback loops are two mechanisms vital to the maintenance of homeostasis:
 - **Positive feedback loops:** less common than negative feedback loops
 - Effector activity **increases** and reinforces the **initial stimulus**
 - Shuts off when conditions return to the normal range
 - E.g. blood clotting and contractions during labour
 - **Negative feedback loops:** oppose initial change in a regulated variable, **reduce output**
- **Relationship between structure and function** - form of a structure is always such that it best suits its functions
 - Form follows function - applies to each level of organisation
- **Gradients:** present any time one area has more of something than another area, where the two are connected.
 - Gradients drive many physiological processes (respiration, nutrient exchange, etc.)
 - **Temperature gradient** - when there is a temperature difference between two connected regions, e.g. liver
 - **Concentration gradient** - where there is a concentration difference between two connected regions, e.g. concentration of salts
 - **Pressure gradient** - where there is a pressure difference between two connected regions
- **Cell to cell communication:** required to coordinate body functions
 - Cells coordination ensures homeostasis of the entire organism is maintained
 - **Chemical messengers or electrical signals** - one cell triggers a response from another cell

The Body's Survival Needs:

- **Food (nutrients)**
- **Oxygen** - required for chemical reactions to release energy
- **Water** - necessary for chemical reactions
- **Temperature** - increases lead to protein denaturation and enzyme dysfunction
- **Air pressure** - less pressure = less oxygen