Introduction To Human Anatomy

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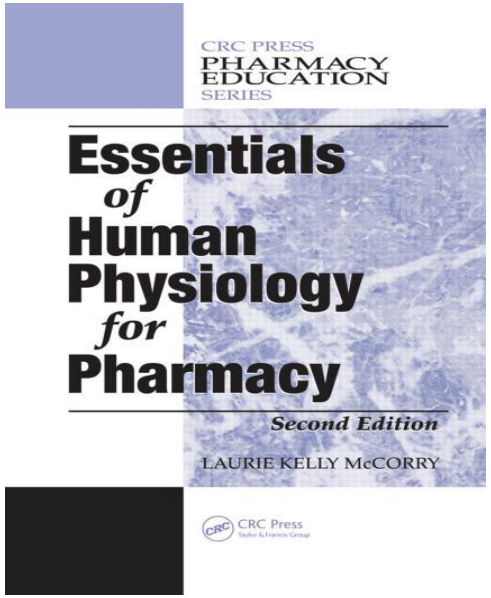
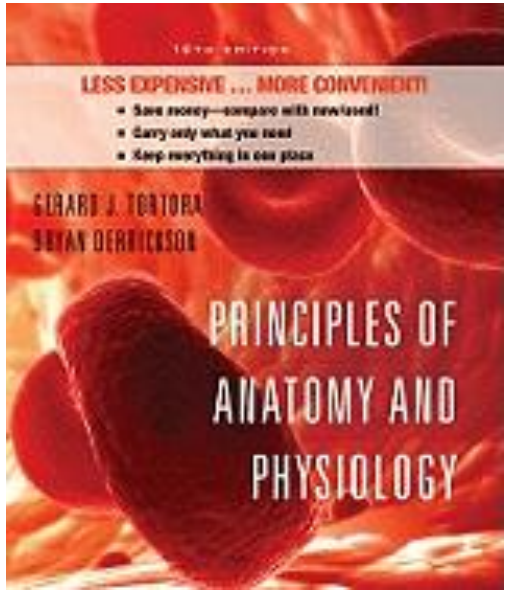
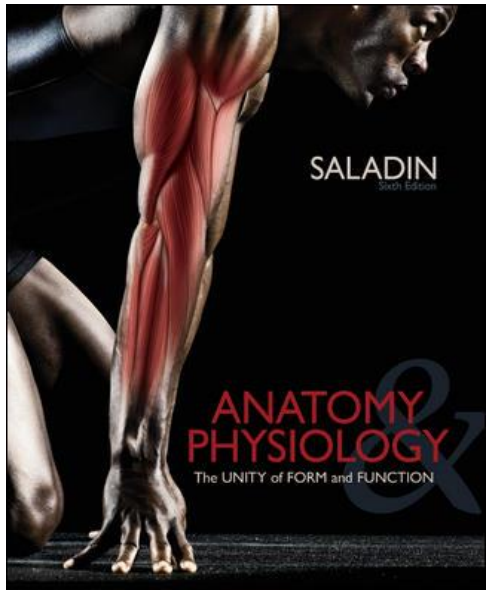
Learning Outcomes Of The Course

- Identify, describe and Illustrate the gross anatomical structures of tissues and body organs. (Draw, Label, Name, List, Describe: focus on anatomy).
  - + Correlate body structures with functions. (focus on anatomy & physiology).
  - + Explain the basic concepts and principles underlying the physiological processes of the human body systems. (focus on physiology).
  - + Understand the interrelationships between different organ systems and their relevance to drug delivery and therapeutic interventions. (focus on pharmacy).
- Teaching methods:
  - Lecture, practical, problem based learning, and interactive discussions.

Other Useful Textbooks



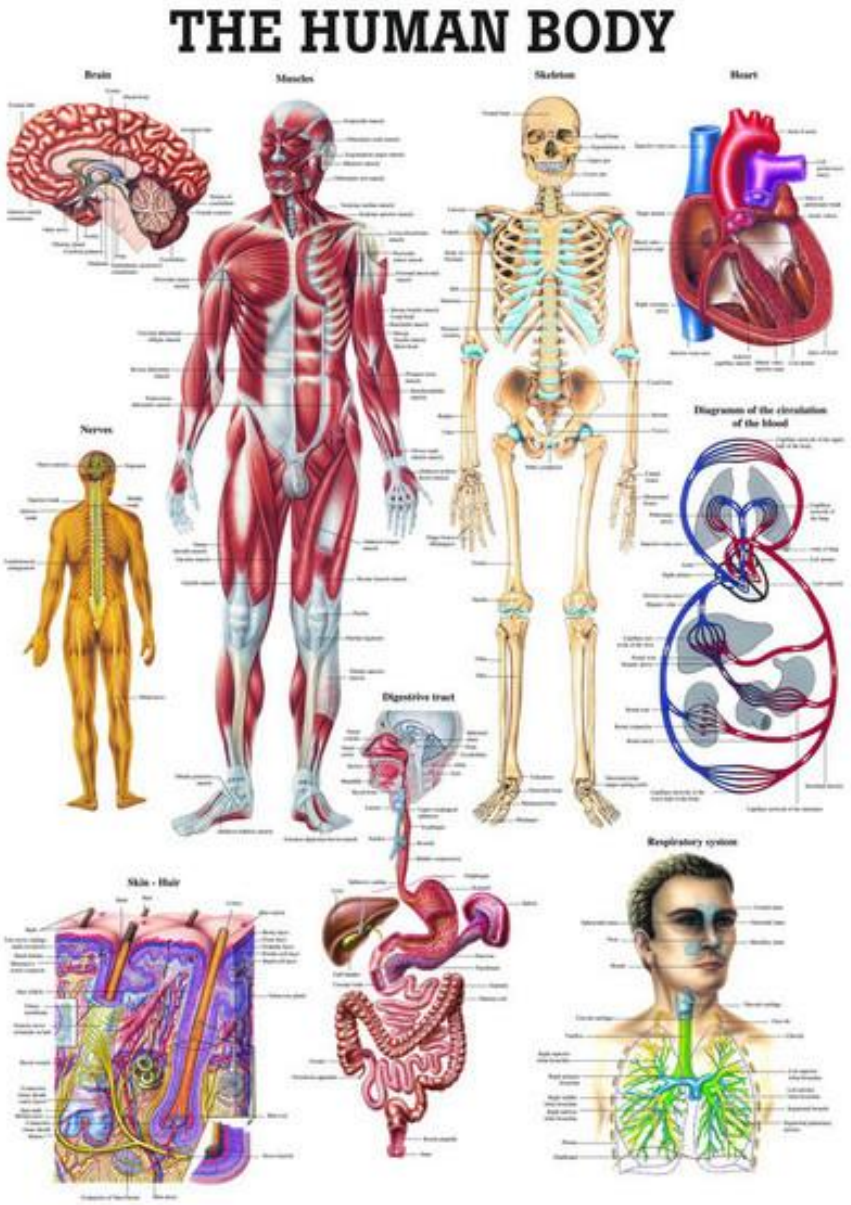




Reference Textbook: Clinical Anatomy by Regions (Richard S. Snell, 8th Edition, 2010).

Introduction To Human Anatomy

- Definitions
- Key concepts
- Subdivisions of Anatomy



Learning Objectives Lecture 1

- Define anatomy and describe the subdivisions of anatomy.
- Verbally describe or demonstrate the anatomical position.
- Use proper anatomical terminology to describe body directions, surfaces, and body planes.
- Locate the major body cavities, and list the chief organs in each cavity.

Definitions

Anatomy

- In greek "tome" means "to cut open" or "dissection"
- Describes the **structures** of the body:
  - What they are made of.
  - Where are they located.
  - Associated structures.

Physiology

- Is the study of:
  - **Functions** of anatomical structures, both individual and cooperative.
  - Considers the operation of specific organ systems.
    - Renal – kidney function.
    - Cardiovascular – operation of the heart and blood vessels.

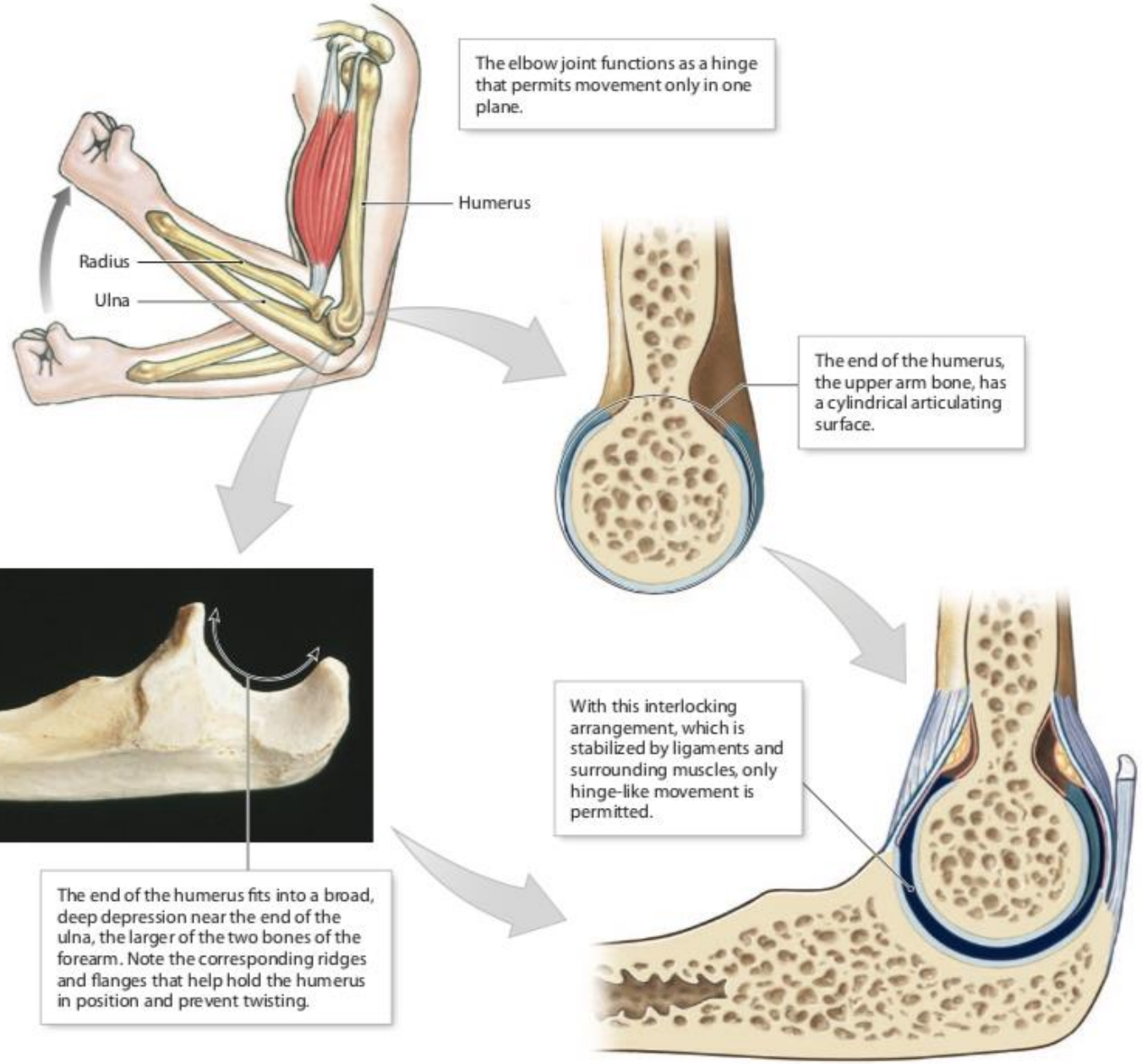
Anatomy Defined

- Anatomy is the study of the structures or body parts and the relationships among structures.

Key Concept

- Structure (anatomy) and function (physiology) are intimately related.
  - Principle of complementarity says that **structure** and **function** are complementary.
    - Function always reflects structure.
    - What a structure can do depends on its specific form.
  - All physiological **functions** are performed by specific anatomical **structures.**
  - Key to learning anatomy is understanding function.
    - Ex:

1 This relationship is easily understood at the gross anatomical level. You are well aware that your elbow joint functions like a hinge. It lets your forearm move toward or away from your shoulder, but it does not allow twisting at the joint. These functional limits are imposed by the internal structure of the joint.



Subdivisions of Anatomy: Gross Anatomy

- Anatomy
  - **Gross anatomy**, or macroscopic anatomy, examines large, visible structures.
    - ***Surface anatomy***: exterior features.
    - ***Regional anatomy***: body areas (ex: head and neck).
    - ***Systemic anatomy***: groups of organs working together (ex: digestive system).
    - ***Developmental anatomy***: from conception to death (fetus----birth----adult).
    - ***Clinical anatomy***: medical specialties.

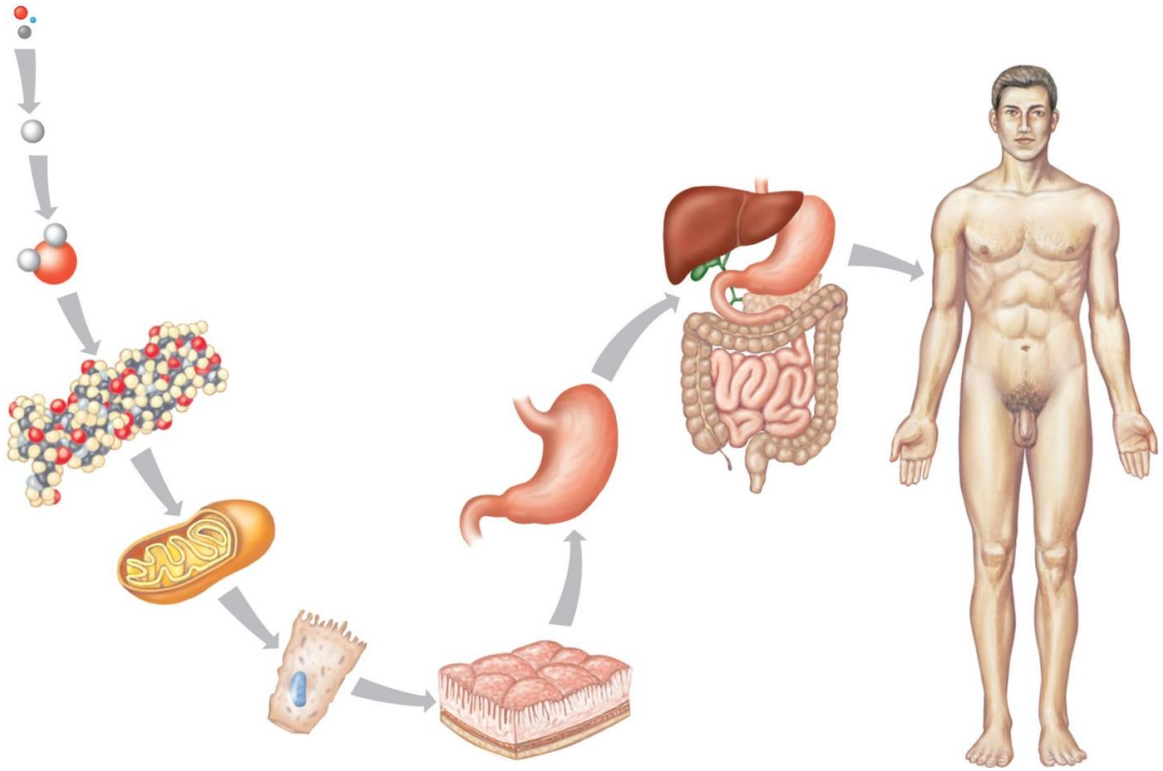
Subdivisions of Anatomy: Microscopic Anatomy

- Anatomy
  - **Microscopic anatomy** examines cells and molecules.
    - ***Cytology***: study of cells and their structures.
    - ***Histology***: study of tissues and their structures.

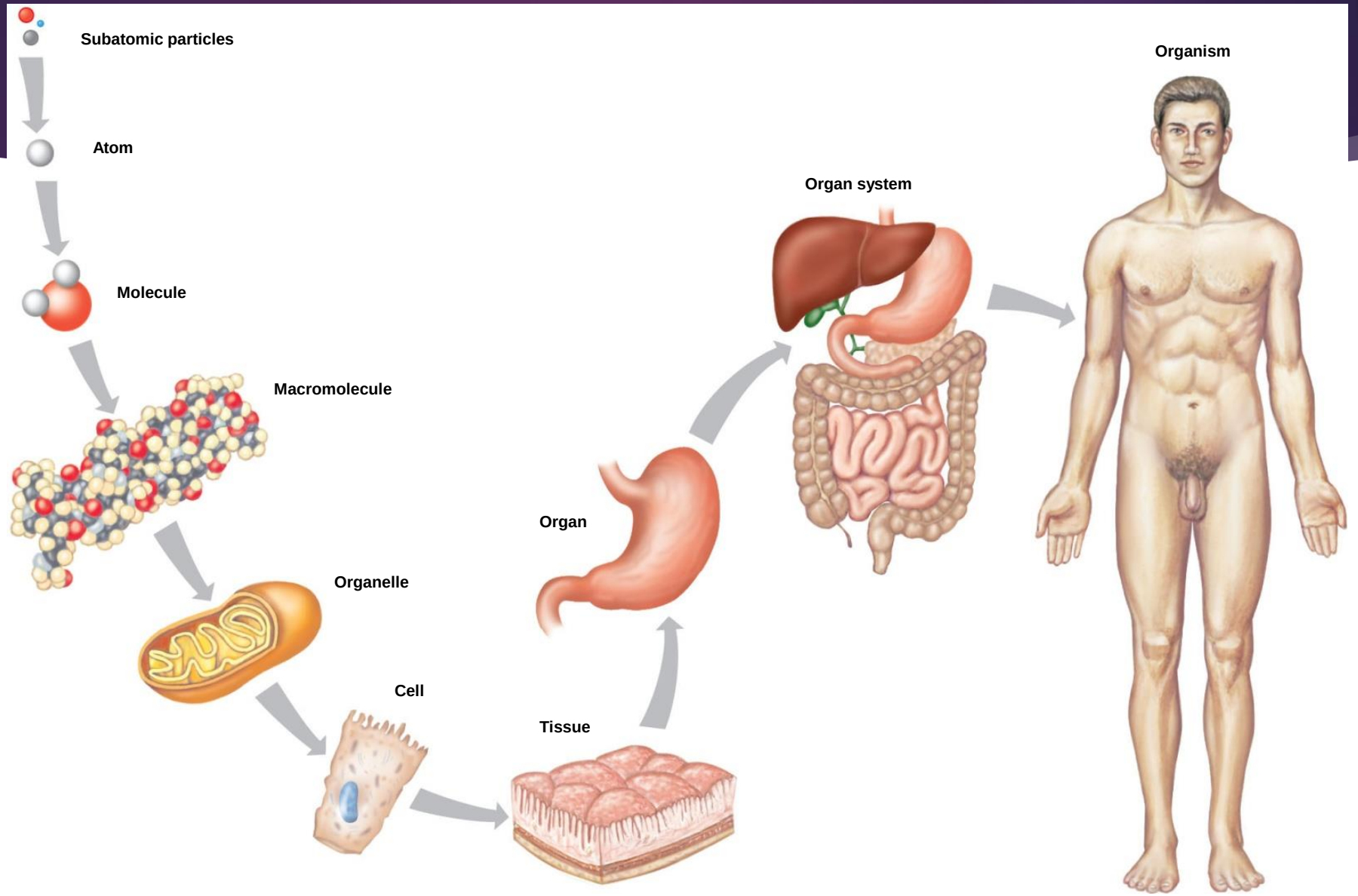
Subdivisions of Anatomy

1. Gross anatomy (macroscopic):
2. Microscopic anatomy: requires the use of a microscope.
3. Regional anatomy: (ex: Head and Neck).
4. Systemic anatomy: (ex: digestive system).
5. Radiographic anatomy: using X-Rays.
6. Cytology: Microscopic study of the cells.
7. Histology: Microscopic study of the tissues.
8. Embryological anatomy: Study of prenatal development.
9. Pathological anatomy: Study of structural changes associated with disease.

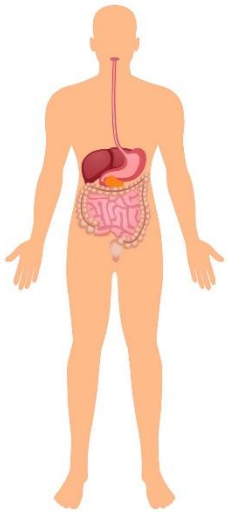
Level of Organization (In Human Body)



Levels of Organization

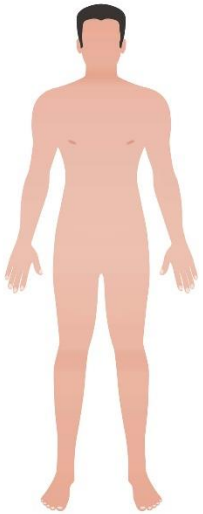


HUMAN BODY ORGAN SYSTEMS

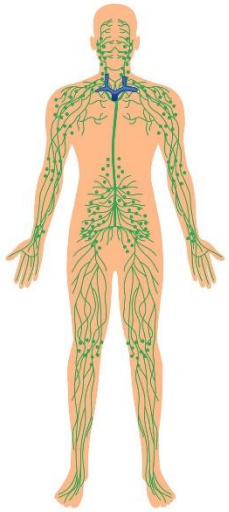


Digestive System

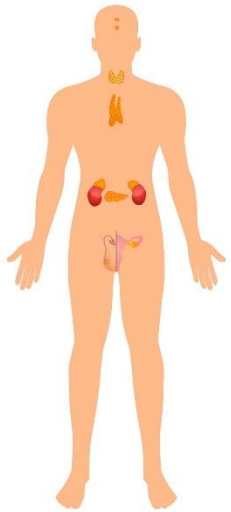
Muscular System



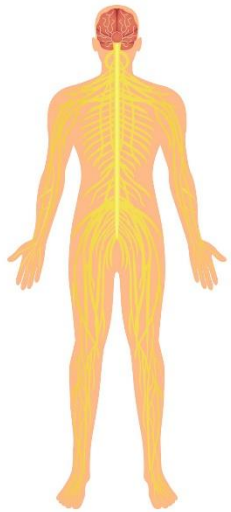
Integumentary System



Lymphatic System

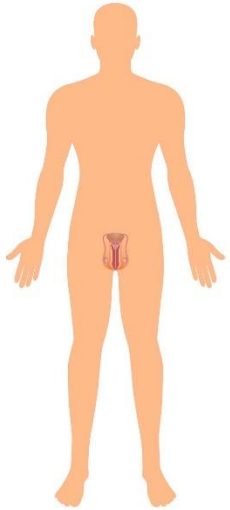


Endocrine System

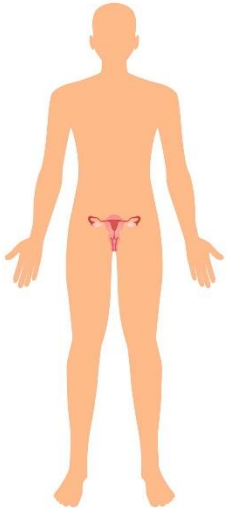


Nervous System

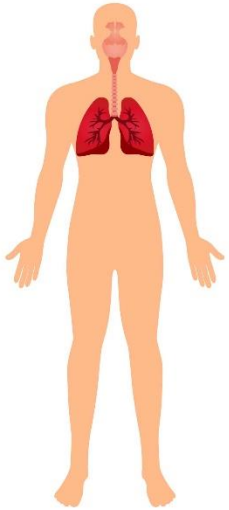
Skeletal system



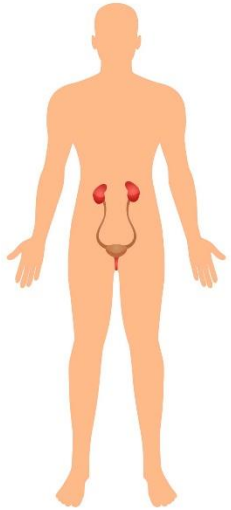
Male Reproductive System



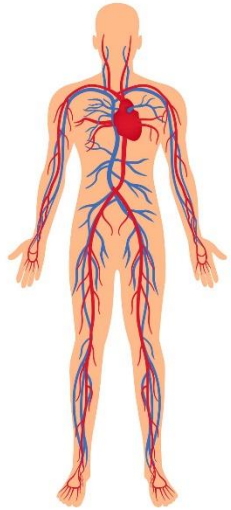
Female Reproductive System



Respiratory system

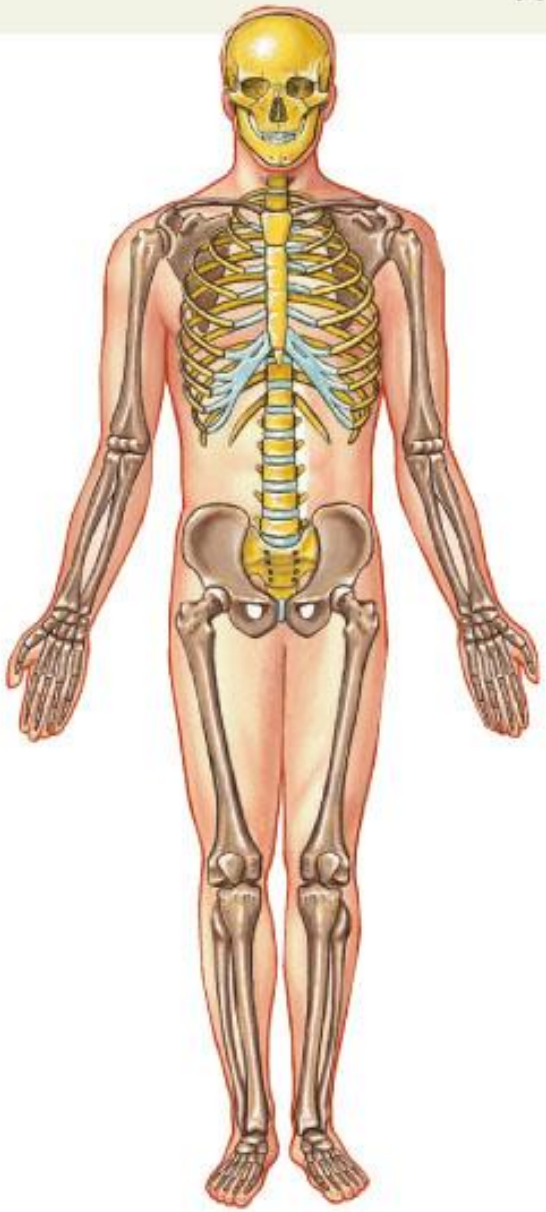


Urinary System



Circulatory system

THE SKELETAL SYSTEM



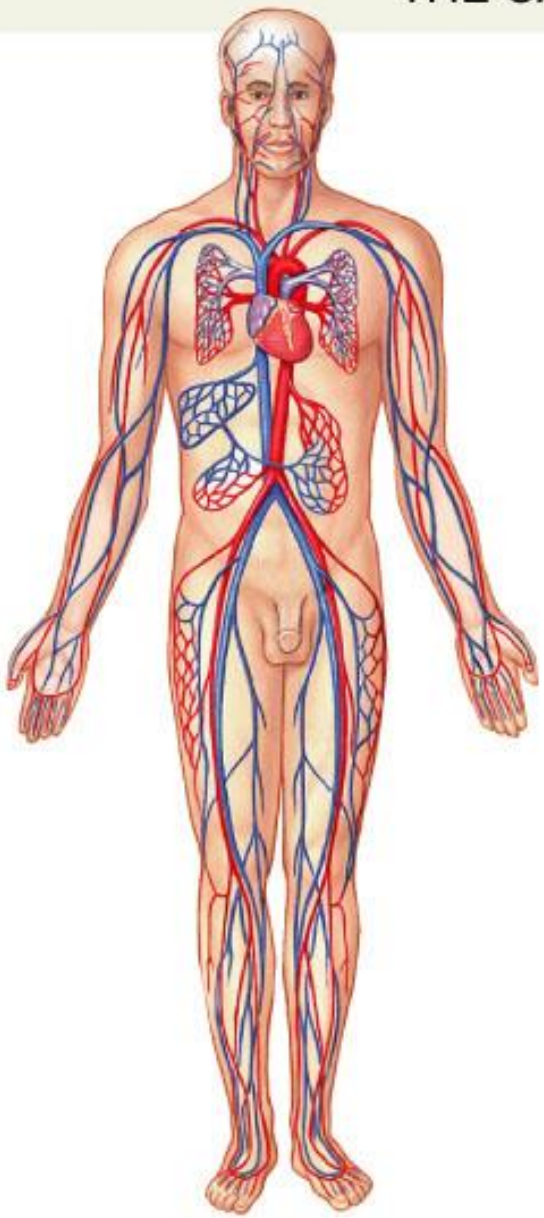
Major Organs:

- Bones
- Cartilages
- Associated ligaments
- Bone marrow

Functions:

- Provides support and protection for other tissues
- Stores calcium and other minerals
- Forms blood cells

THE CARDIOVASCULAR SYSTEM



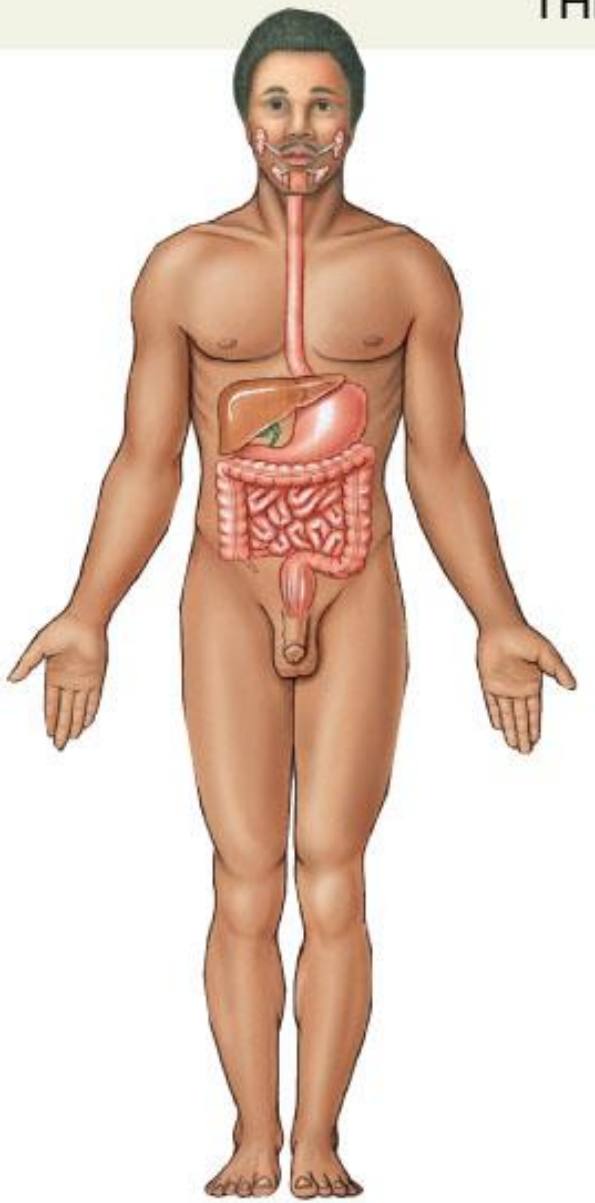
Major Organs:

- Heart
- Blood
- Blood vessels

Functions:

- Distributes blood cells, water, and dissolved materials, including nutrients, waste products, oxygen, and carbon dioxide
- Distributes heat and assists in control of body temperature

THE DIGESTIVE SYSTEM



Major Organs:

- Teeth
- Tongue
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine
- Liver
- Gallbladder
- Pancreas

Functions:

- Processes and digests food
- Absorbs and conserves water
- Absorbs nutrients (ions, water, and the breakdown products of dietary sugars, proteins, and fats)
- Stores energy reserves

Anatomical Terminology

The Language of Anatomy:

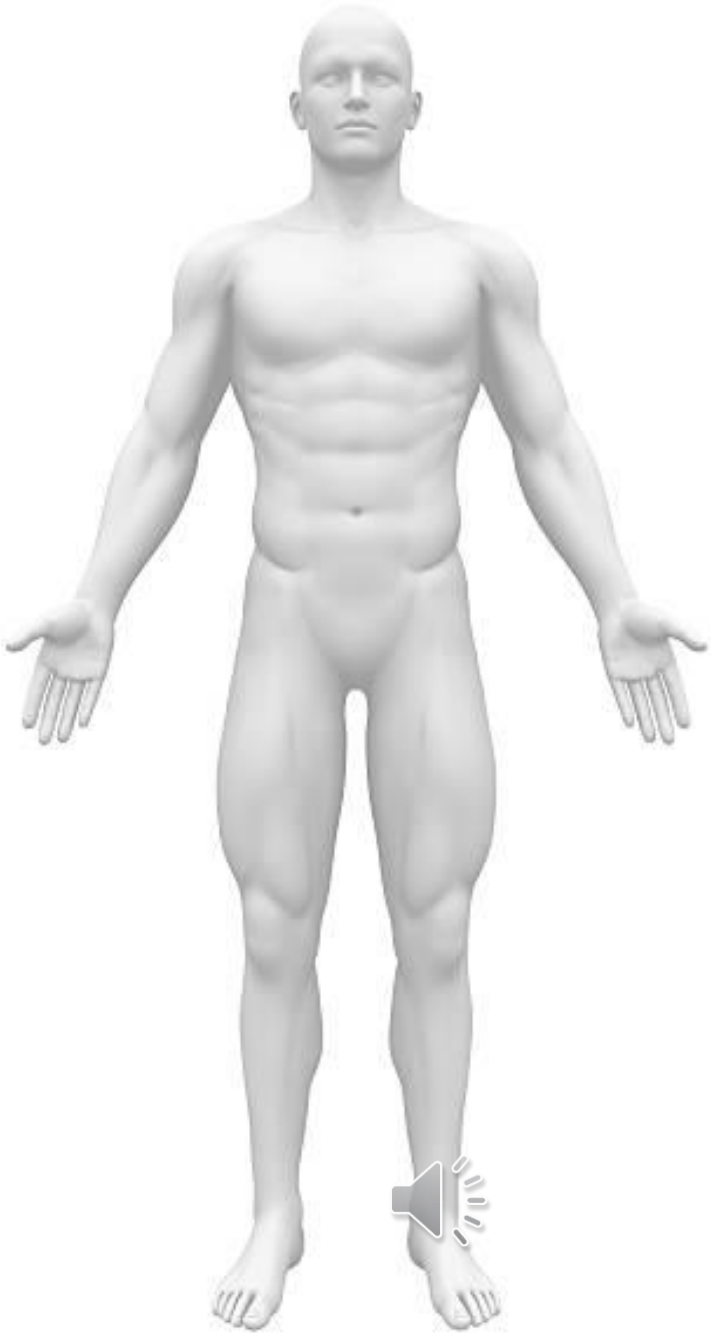
- Anatomical Position
- Directional Terms
- Regional Terms
- Body Planes and Sections
- Body Cavities

2 Why is it important to learn these terms? We need common anatomical terms to communicate effectively in a medical setting. For example, stating that a patient has a "bump on the back" does not give very precise information about its location. So, anatomists created maps of the body, naming superficial anatomical structures and identifying regional landmarks to help locate the exact point of that "bump on the back."

Anatomical Position

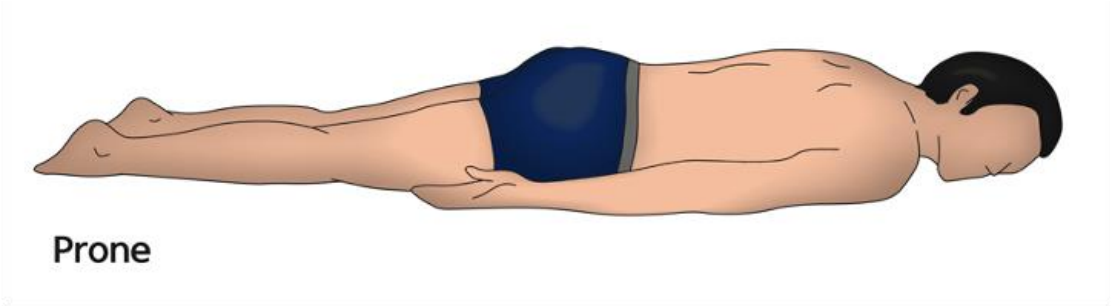
- The **Anatomical Position** is a standardized method of observing or imaging the body that allows precise and consistent anatomical **references**.
- When in the anatomical position, the subject stands erect facing the observer, the upper extremities are placed at the sides, the palms of the hands are turned forward, and the feet are flat on the floor.

In order to describe the **Anatomical Position** a person has to **stand erect, face forward, with upper limbs at the sides, palms showed forward and thumbs point away from the body.**

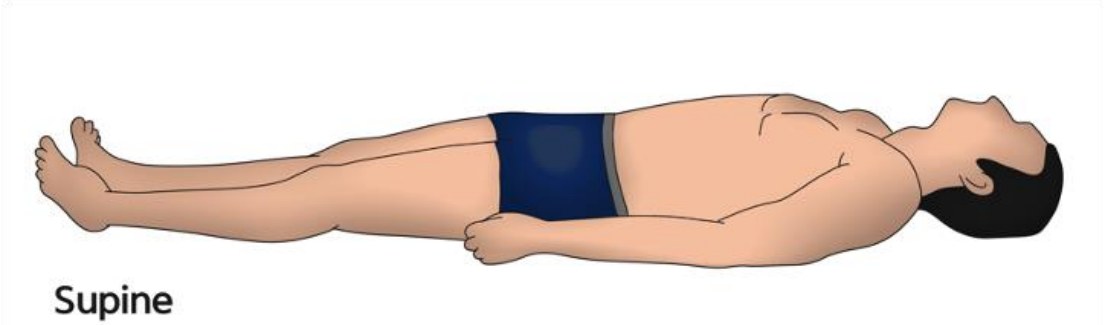


Reclining Position

- If the body is lying face down, it is in the **prone position.**

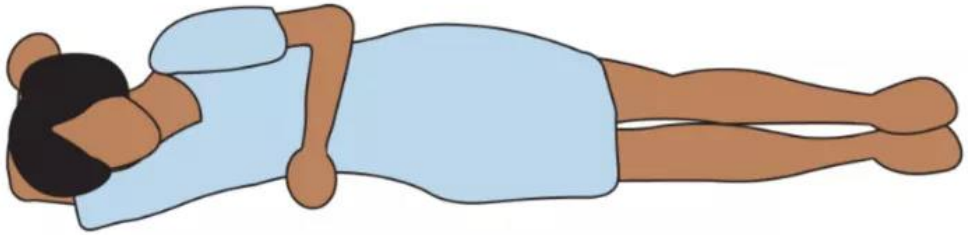


- If the body is lying face up, it is in the **supine position.**

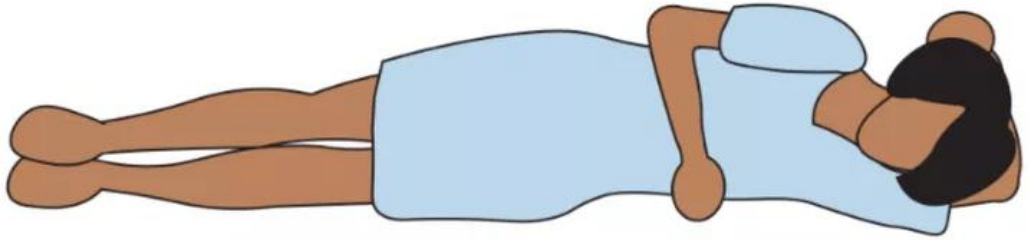


Other Positions

- **Right lateral recumbent**: Horizontal position with the right side oriented down.



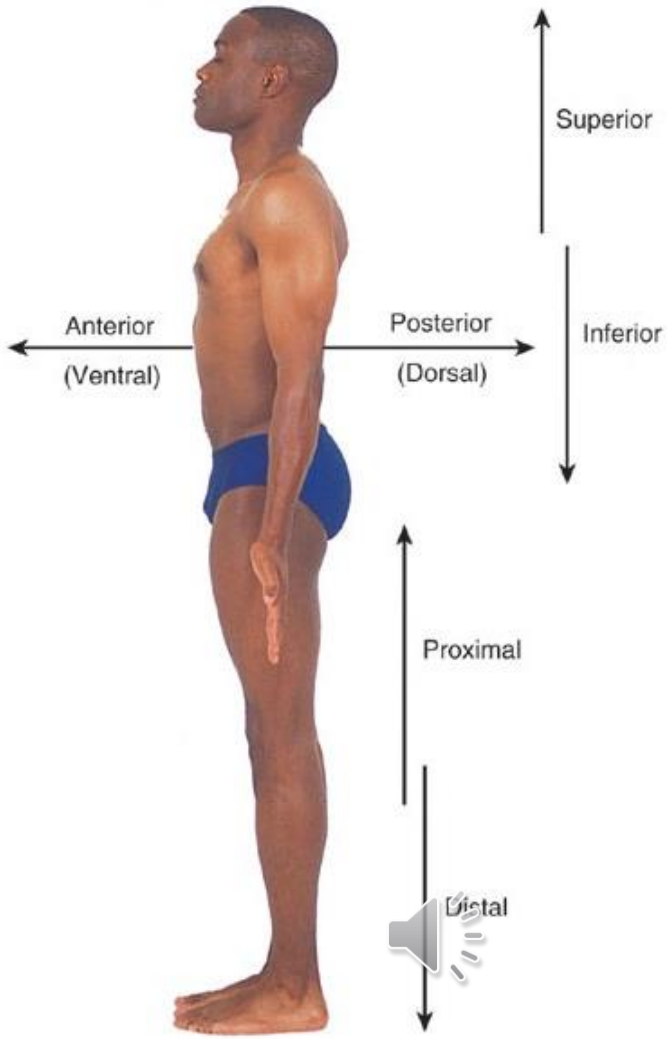
- **Left lateral recumbent**: Horizontal position with the left side oriented down.



The word "lateral" means "to the side," while "recumbent" means "lying down."

Orientation and Directional Terms

- Directional terms are used to precisely locate one part of the body relative to another and to reduce the length of explanations.



Anatomical Terminology: Directional Terminologies

Relative Position:

Referring up and down

1. **Superior** = above **Inferior** = below
2. **Cranial** = towards the head **Caudal** = towards the tail

Referring front and back

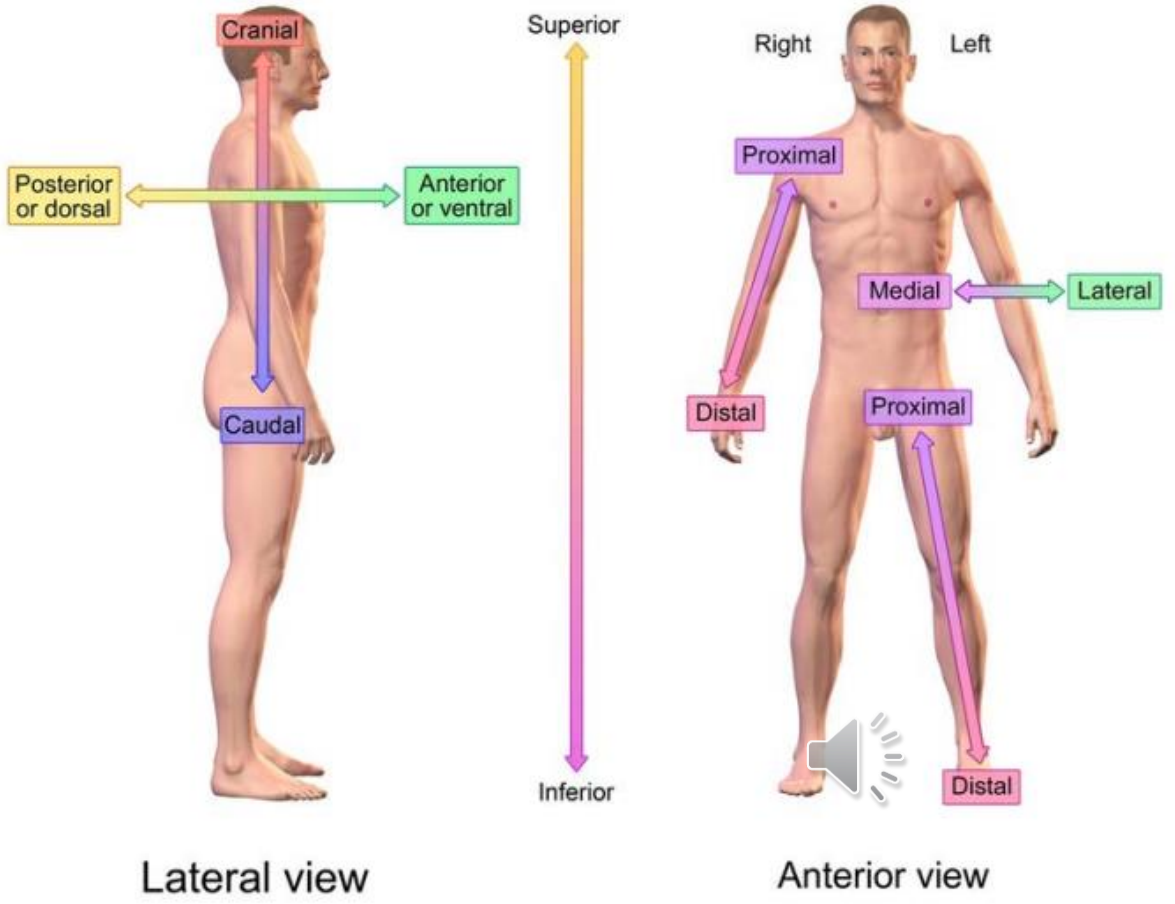
1. **Anterior** = front **Posterior** = back
2. **Ventral** = front **Dorsal** = back

Referring side and center

1. **Medial** = center **Lateral** = side

Referring to other directional terms

1. **Superficial** = surface **Deep** = internal
2. **Proximal** = closer to trunk **Distal** = farther from trunk
3. **Ipsilateral** = same side **Contralateral** = other side

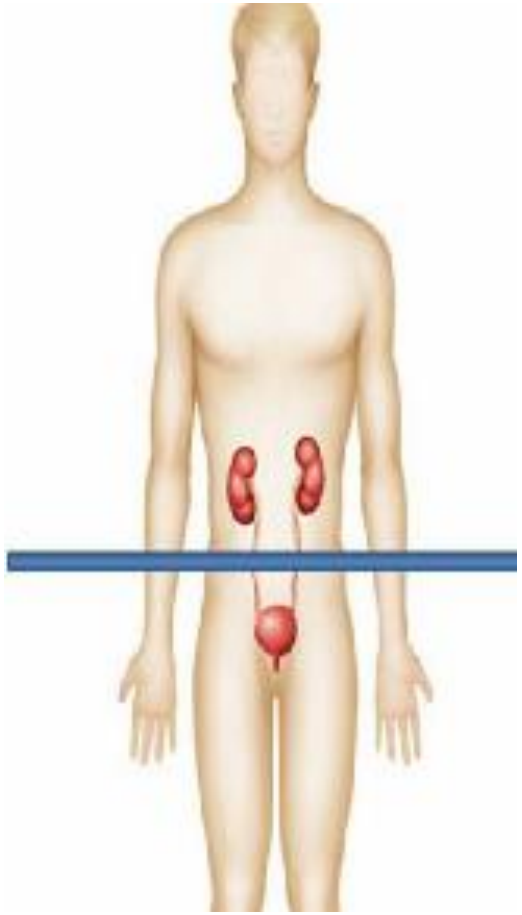


Lateral view

Anterior view

Directional Terms

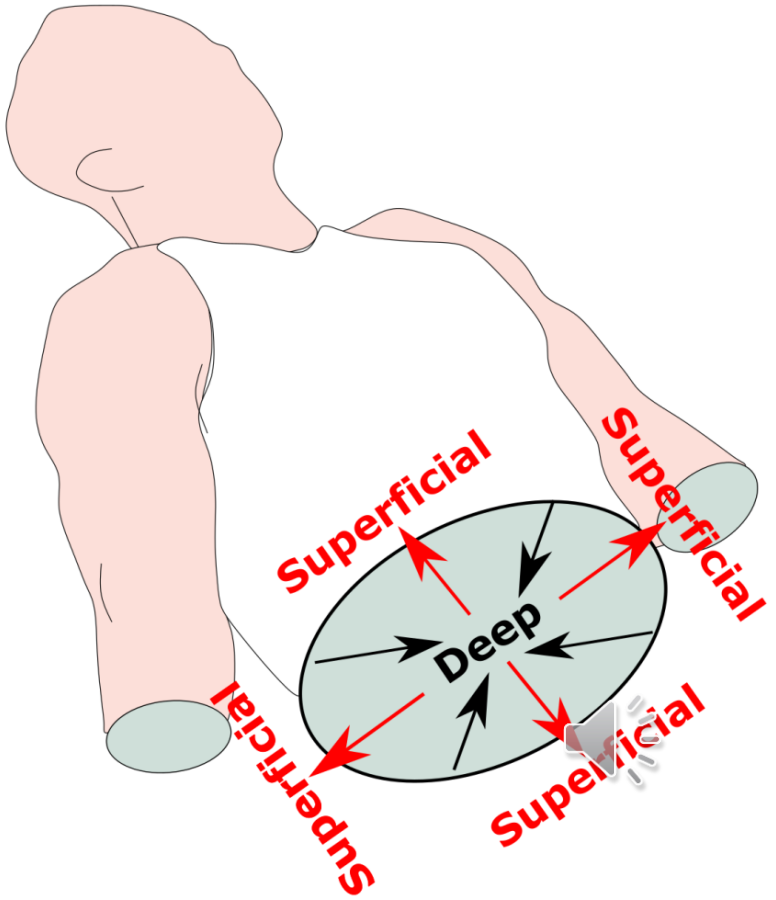
- **Superior:** Top. Part that is above another part; closer to the head.
  Ex: The kidneys are superior to the bladder.



- **Inferior:** Bottom. Part that is below another part; toward the feet.
  Ex: The bladder is inferior to the kidneys.

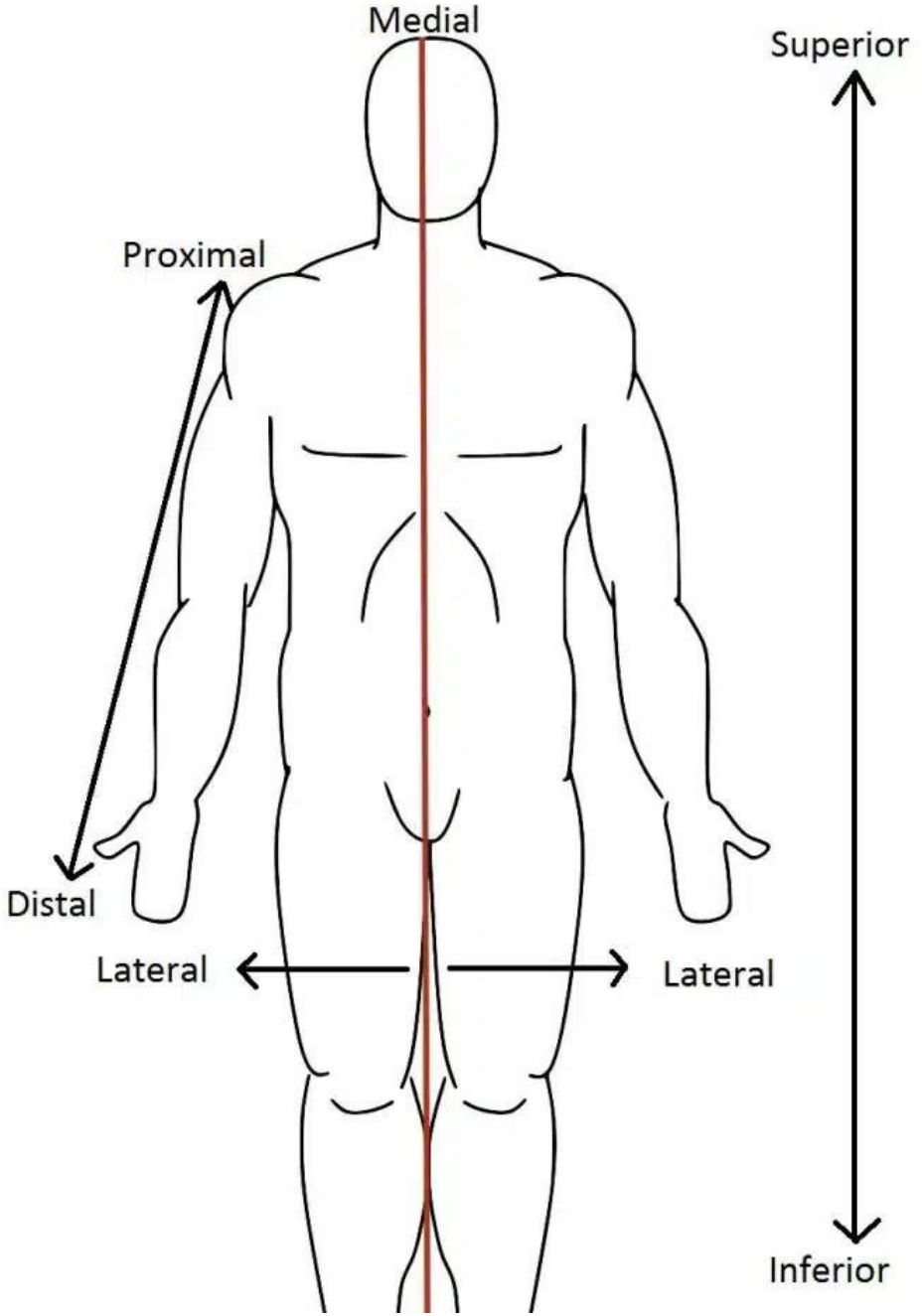
Directional Terms

- **Superficial** (external): toward or at the body surface.
  - Ex: the skin is **superficial** to the muscles.
- **Deep** (internal): away from the body surface.
  - Ex: the heart is **deep** to the rib cage.

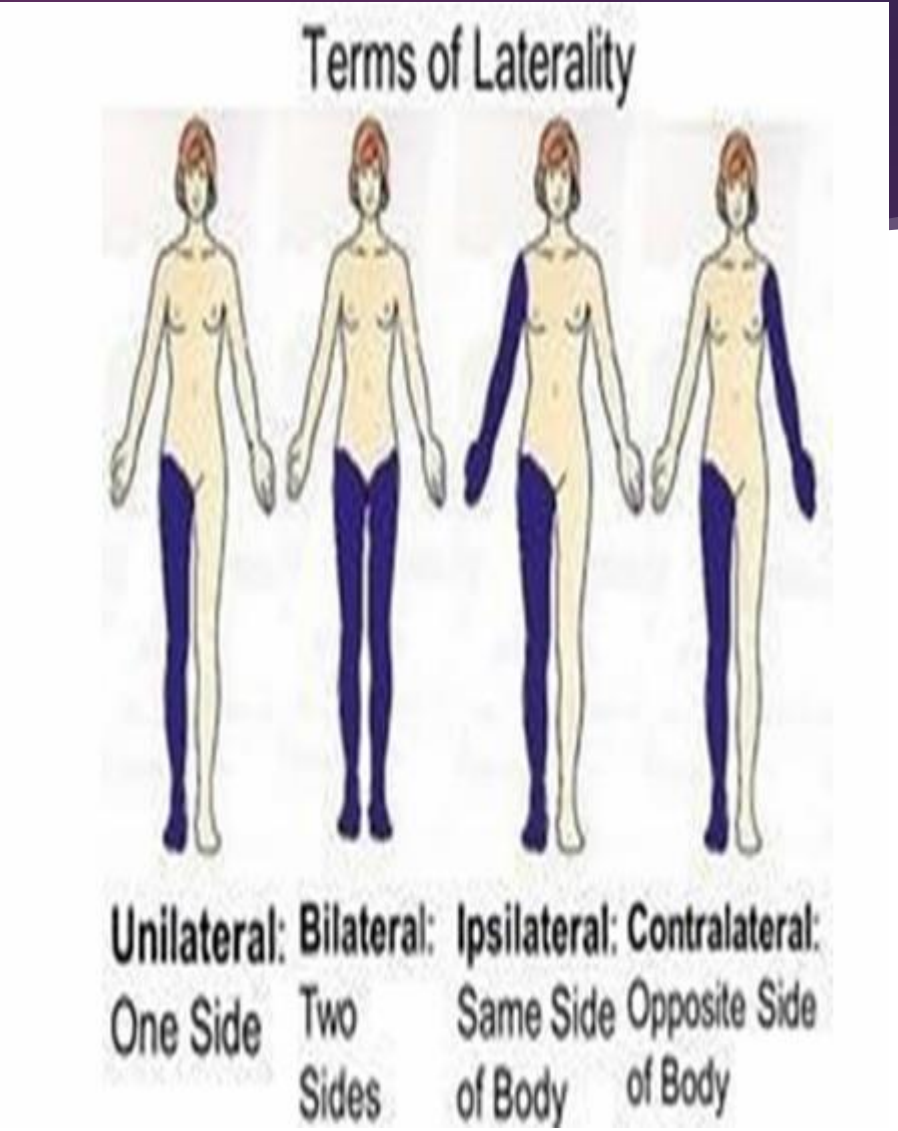


Directional Terms

- **Medial:** toward midline.
  - Ex: The nose is **medial** to the ears.
- **Lateral:** away from midline.
  - Ex: The eye is **lateral** to the nose.
- **Proximal:** near origin/torso.
  - Ex: The arm is **proximal** to the hand.
- **Distal:** away from origin.
  - Ex: The wrist joint is **distal** to the elbow joint.



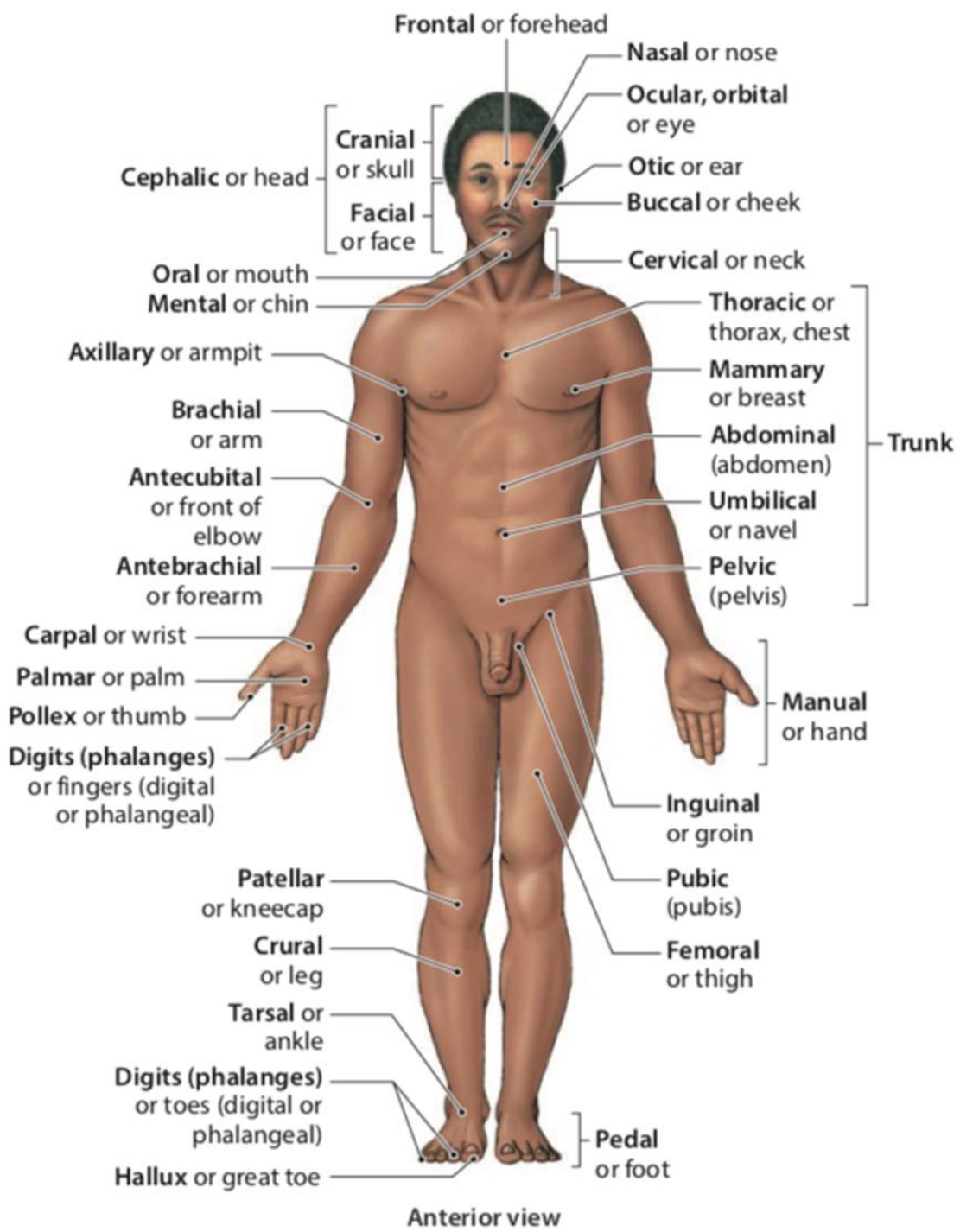
Directional Terms

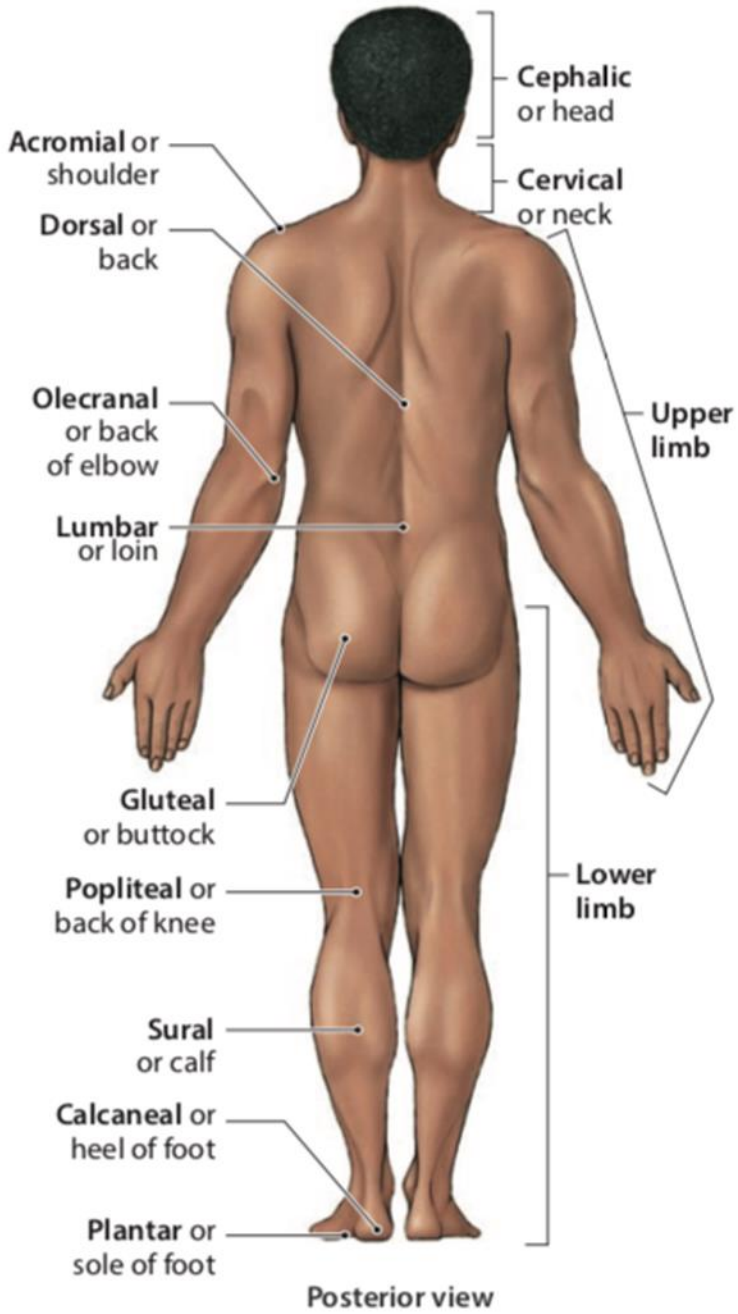


Regional Terms

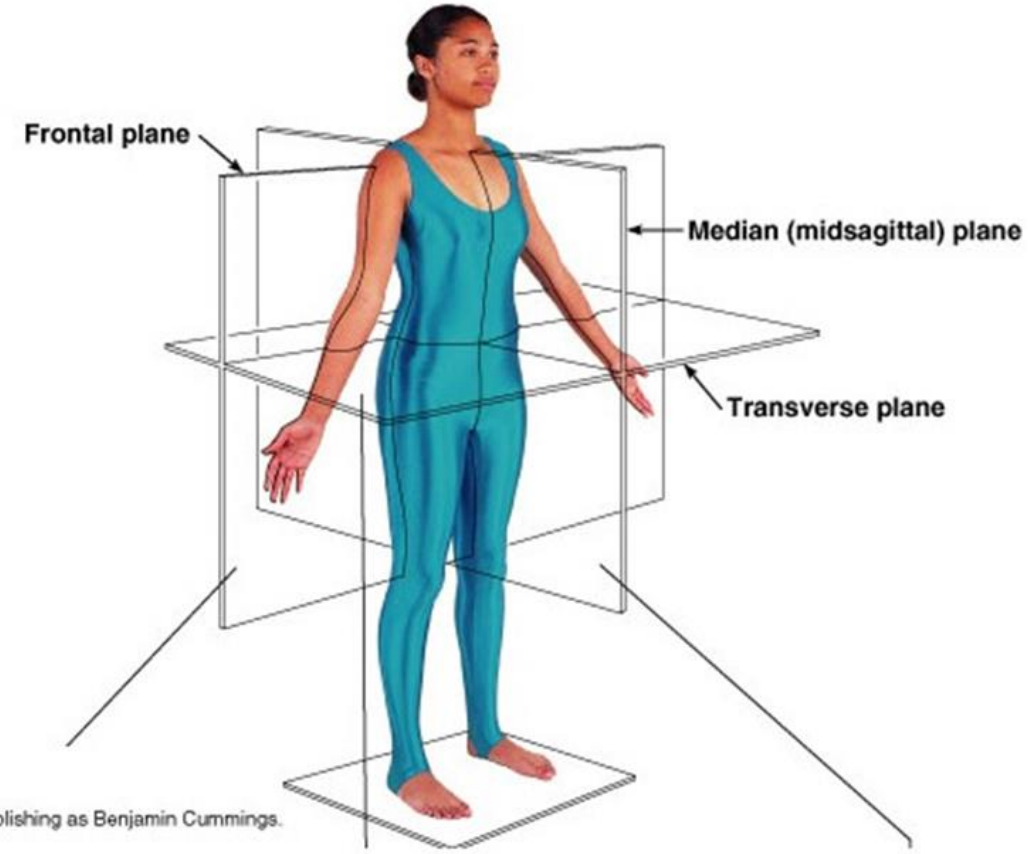
- Are names given to specific regions of the body for reference. Ex:

1. Cephalic (head)
2. Cranial (skull)
3. Thoracic (chest)
4. Brachial(arm)
5. Patellar (knee)
6. Gluteal (buttock)



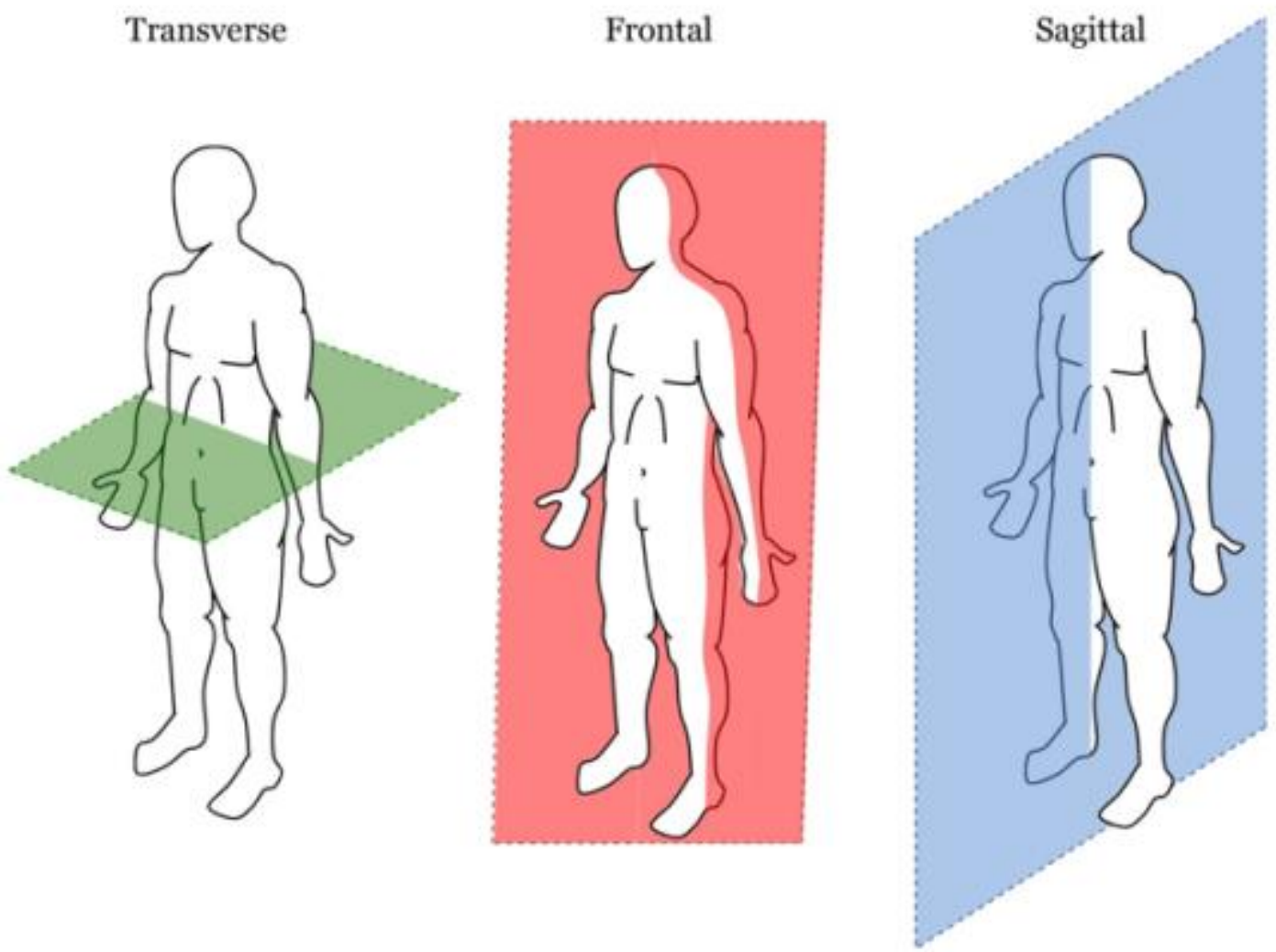


Body Planes and Body Sections



Dissection Planes

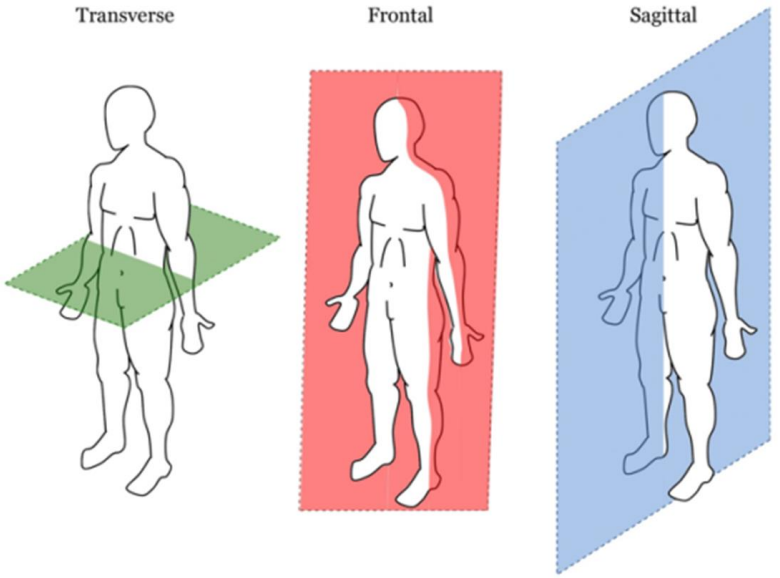
- Planes are imaginary flat surfaces that are used to divide the body or organs into definite areas.



Dissection Planes

Body Planes:

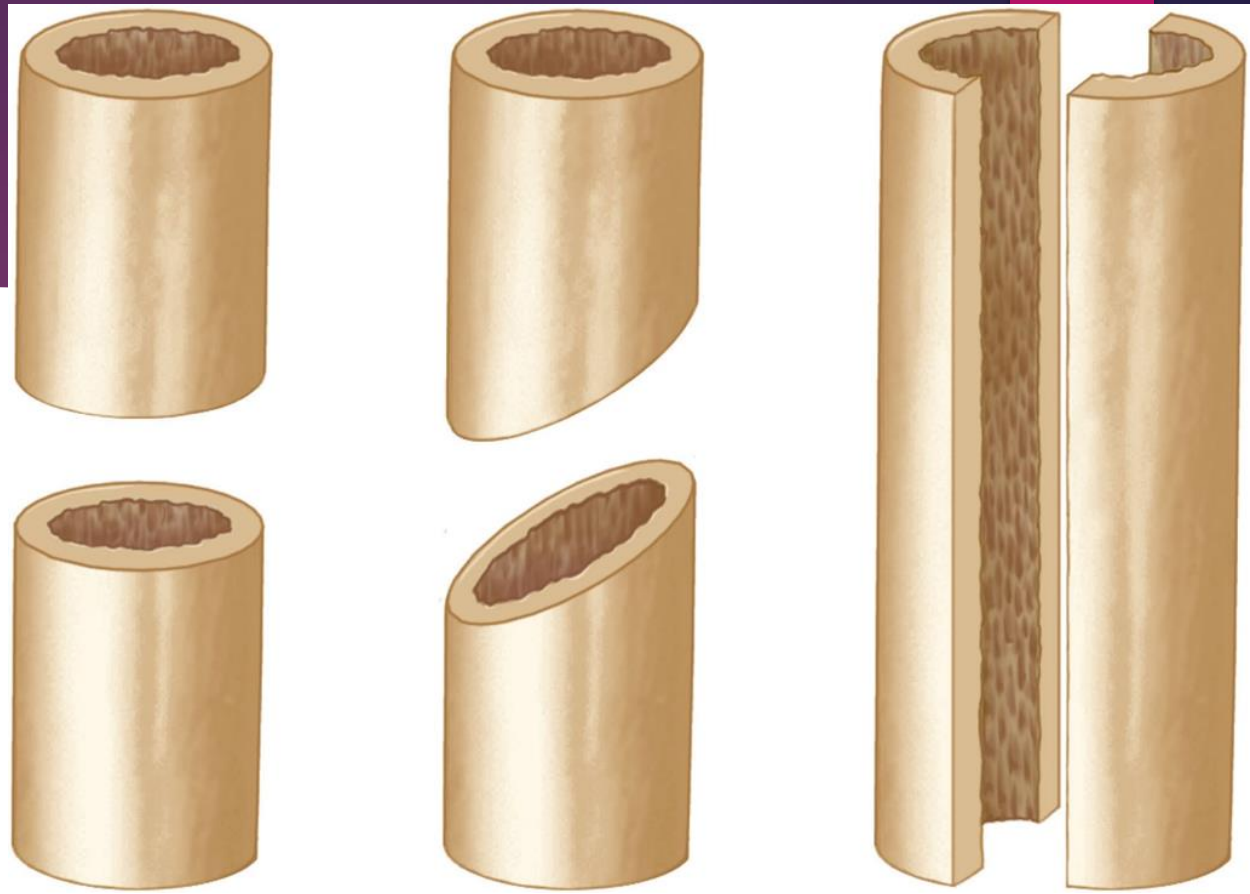
- **Sagittal plane**: divides the body into right and left portions.
- **Midsagittal plane** (medial) = equal right and left portions.
- **Transverse plane:** (cross-sectional or horizontal): divides the body into superior and inferior portions.
- **Coronal plane**: divides the body into anterior and posterior portions.



Dissection Sections

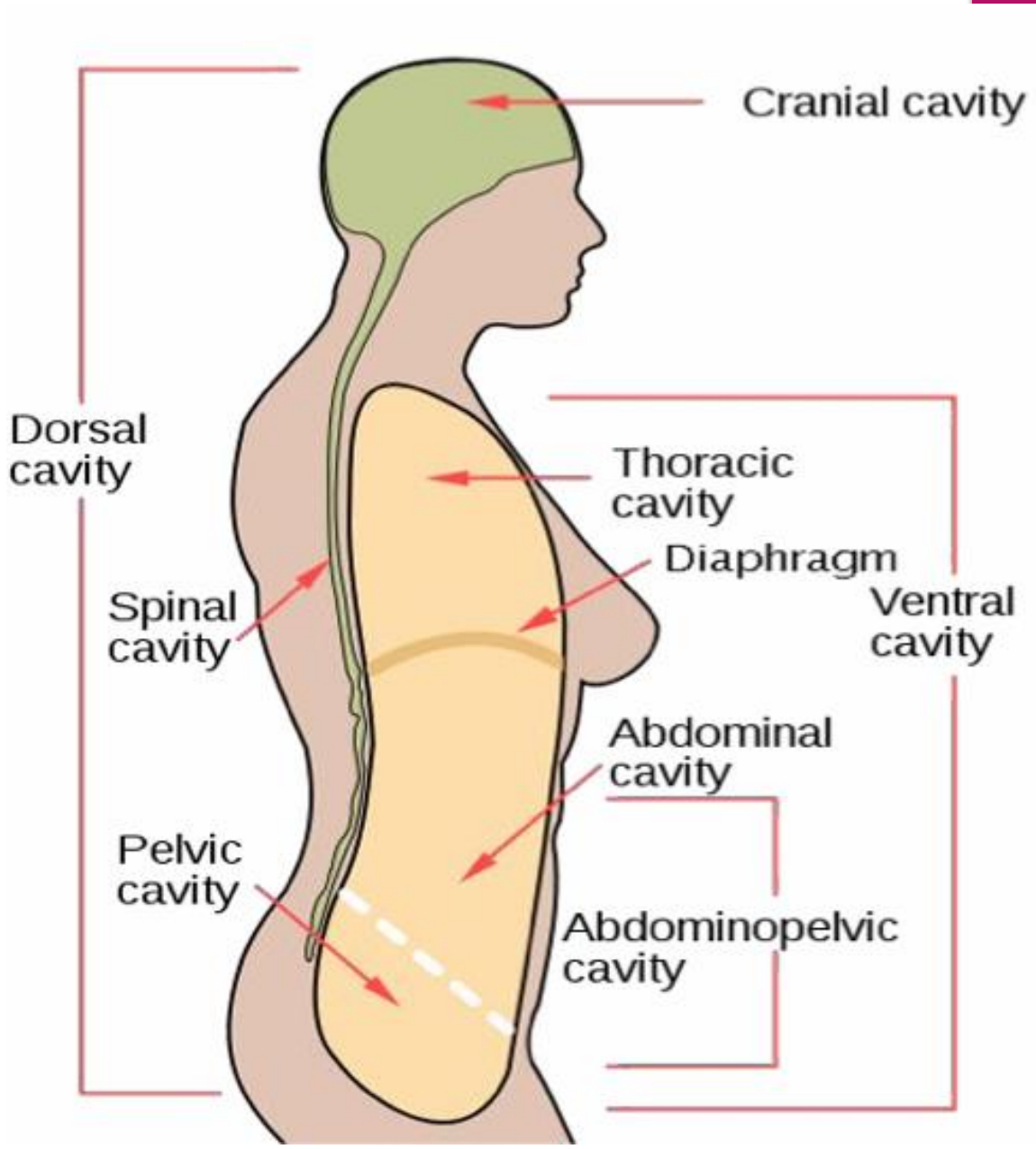
Body Sections:

- **Cross-section/cut**: cut at 90 degrees to long axis of the object.
- **Oblique section/cut**: cut at an angle across an object.
- **Longitudinal section/cut**: cut with the long axis of an object.



Ex: section of a blood vessel

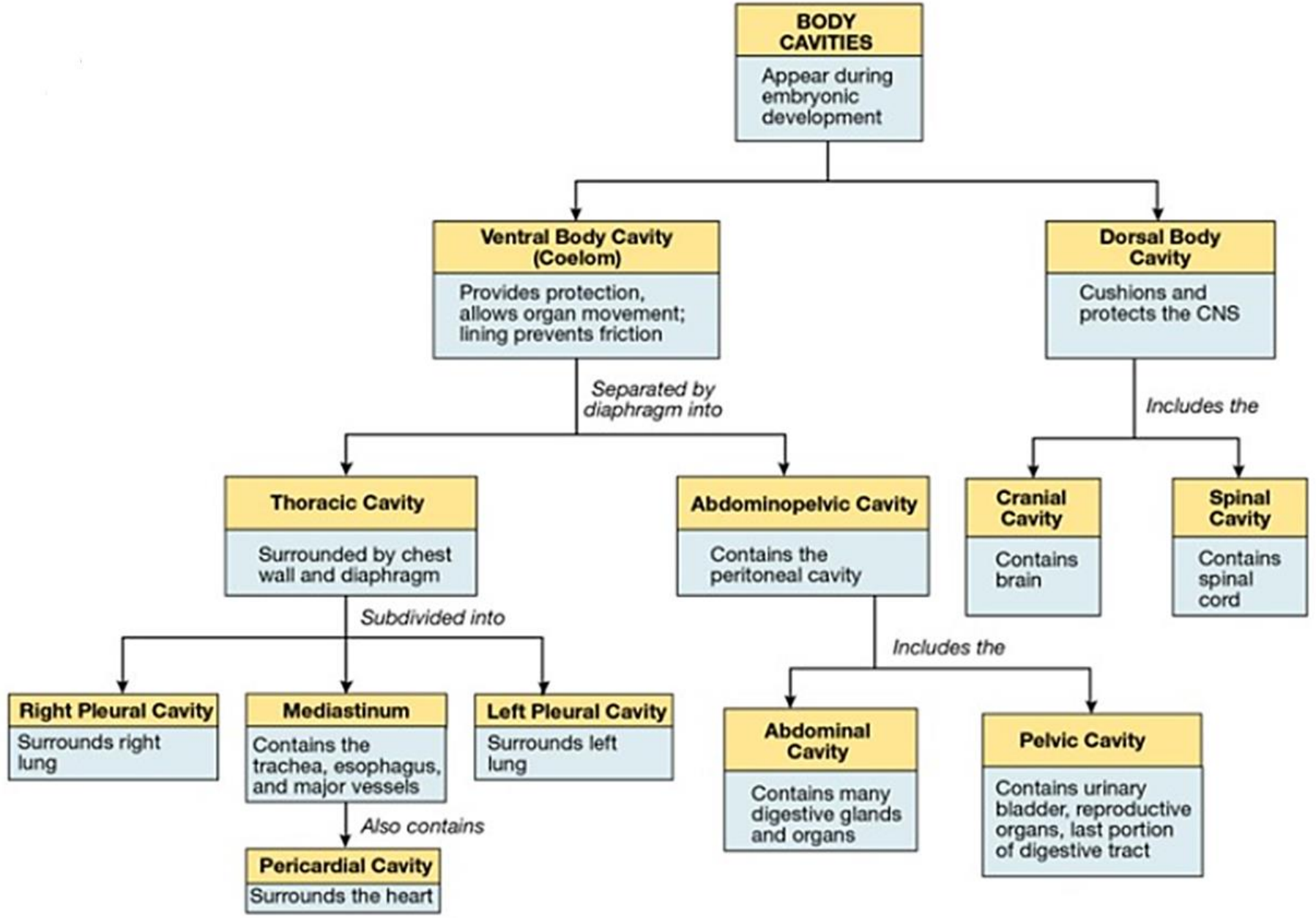
Body Cavities



Body Cavities

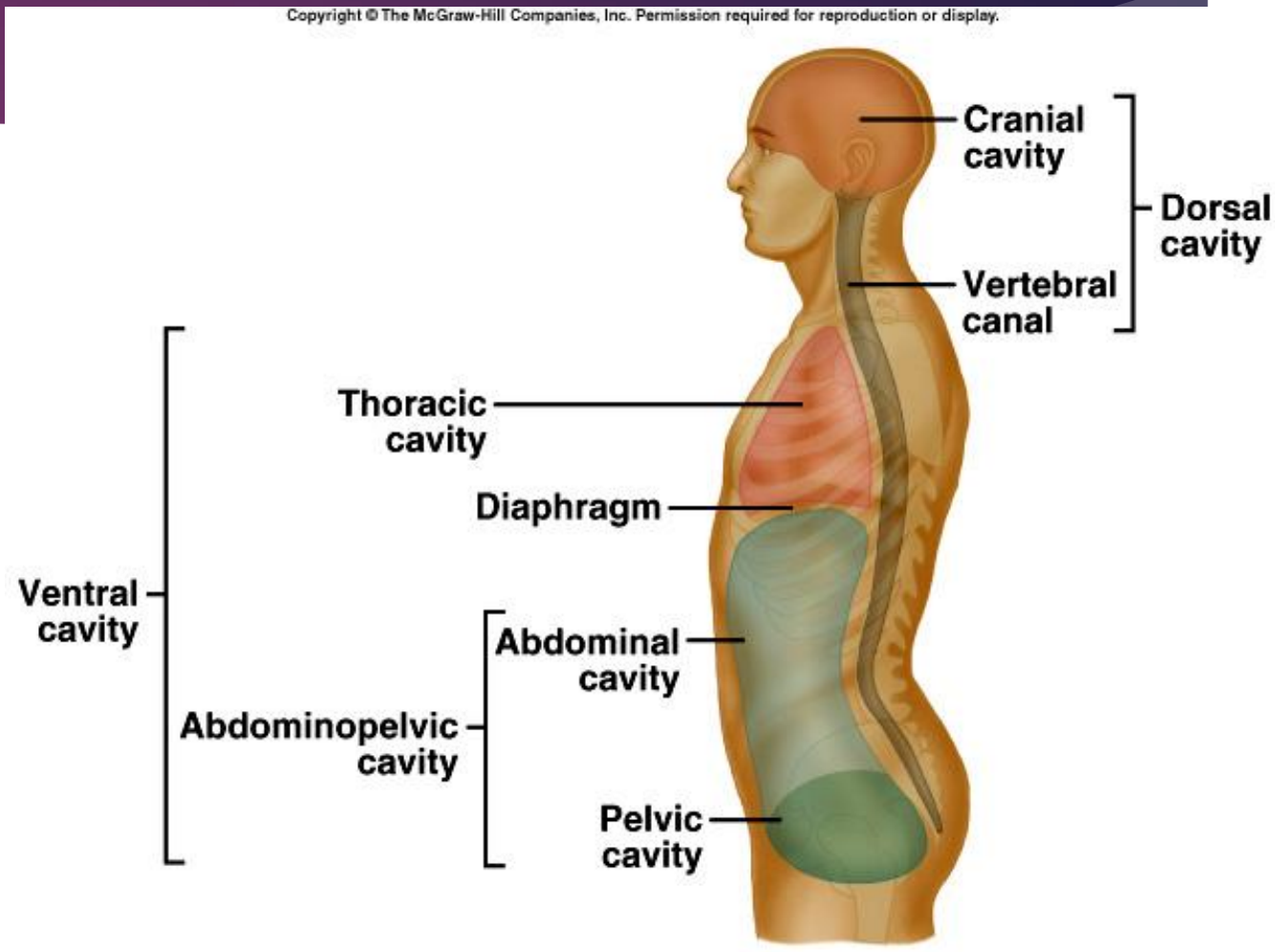
- Body cavities are internal chambers (hollow area) holding vital organs.
  - Cavities protect vital organs.
    - Ex: the brain is protected in the cranial cavity.
  - Cavities allow organs to change in shape and size.
    - Ex: the pleural cavity allows the lungs to expand during inspiration.
- **Two major body cavities:**
  - **Dorsal body cavity** (at the back) includes the cranial cavity and the spinal cavity.
  - **Ventral body cavity** (in front) includes the thoracic cavity and the abdominopelvic cavity.

Body Cavities



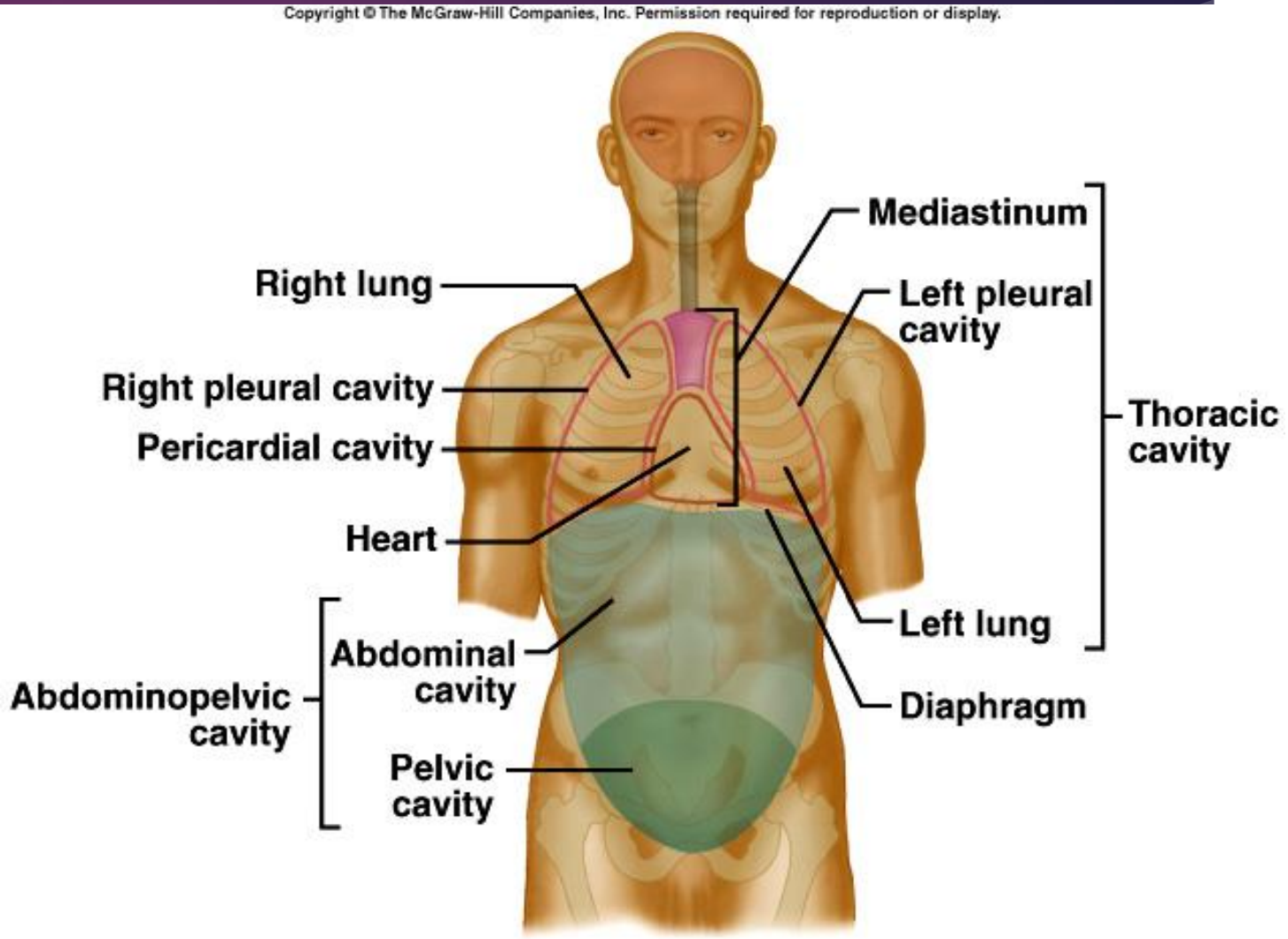
Dorsal Body Cavity

- **Cranial Cavity:**
  - Formed by the cranial bones.
  - Contains the brain.
- **Vertebral (Spinal) Canal:**
  - Formed by the bones of the vertebral column.
  - Contains the spinal cord.
- **Protective Tissue:**
  - Three layers of protective tissue, called **meninges**, line the dorsal body cavity.



Ventral Body Cavity

- The ventral body cavity is subdivided by the **diaphragm** into an upper **thoracic cavity** and a lower **abdominopelvic cavity**.



Thoracic Cavity

- The **thoracic cavity** contains the heart and lungs.
- The thoracic cavity is subdivided into:
  - **Left and right pleural cavities** (each pleural cavity contains one lung) lined by the visceral and parietal pleura).
  - The **mediastinum** contains the pericardium (**pericardial cavity**), another serous membrane that surrounds the heart and great vessels.

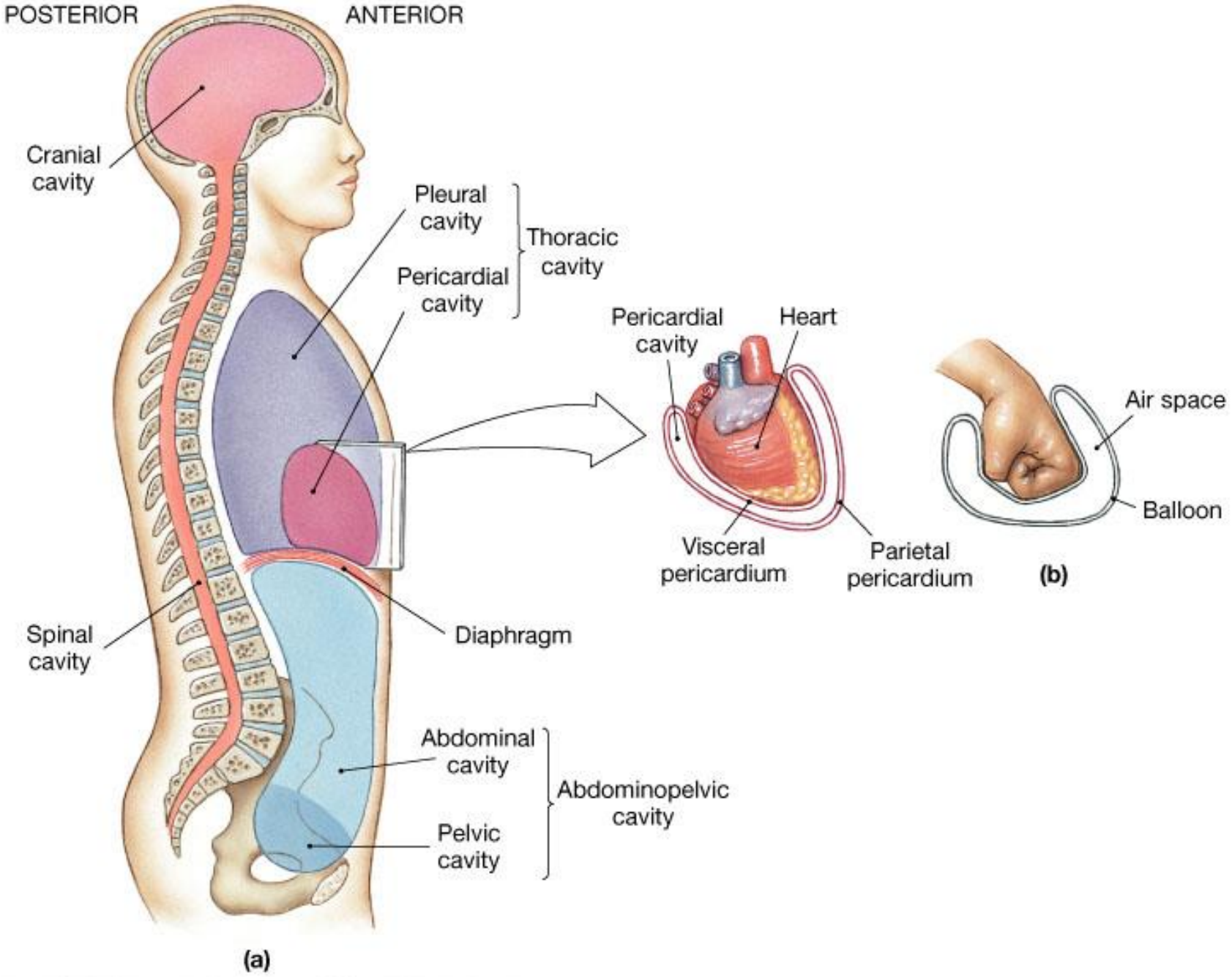
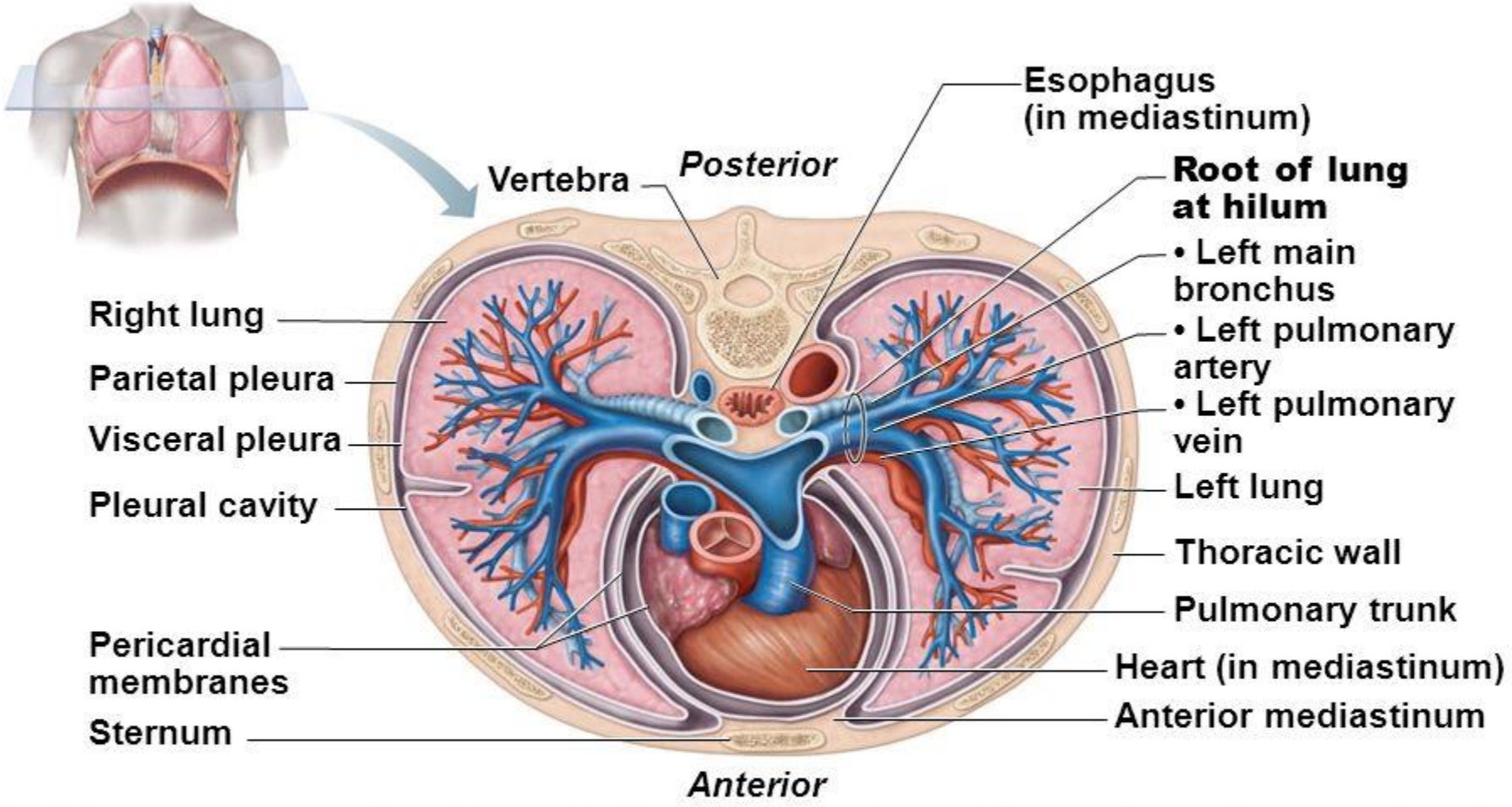

POSTERIOR
ANTERIOR
Cranial cavity
Pleural cavity
Pericardial cavity
Thoracic cavity
Spinal cavity
Diaphragm
Abdominal cavity
Pelvic cavity
Abdominopelvic cavity
(a)
Pericardial cavity
Heart
Visceral pericardium
Parietal pericardium
Air space
Balloon
(b)

Figure 22.10c Anatomical relationships of organs in the thoracic cavity.



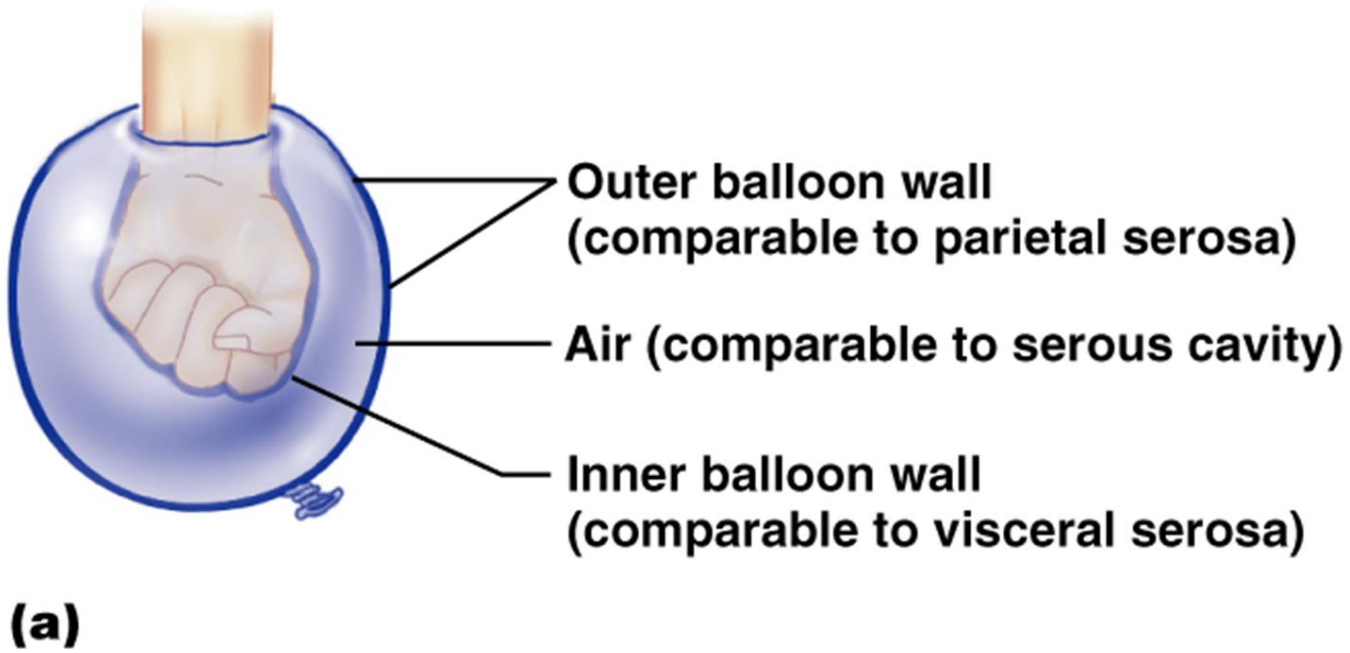
(c) Transverse section through the thorax, viewed from above. Lungs, pleural membranes, and major organs in the mediastinum are shown.

Abdominopelvic Cavity

- The abdominopelvic cavity is lined by the peritoneum and is divided into:
  - The superior **abdominal cavity** extends from the diaphragm to the superior margins of the pelvis.
    - Liver, stomach, spleen and most of the large intestine.
  - The inferior **pelvic cavity** is bordered by the pelvis, with a floor of muscle.
    - Urinary bladder, reproductive organs, and the final portion of the large intestine.

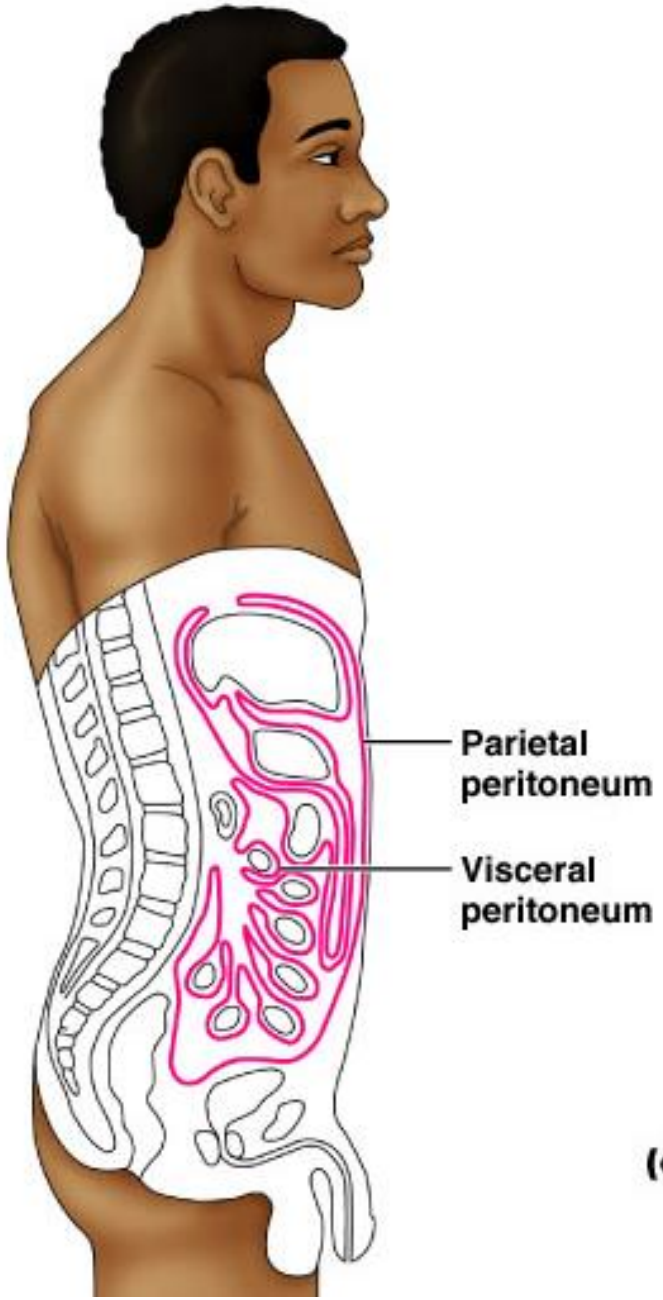
Body Cavity Membranes

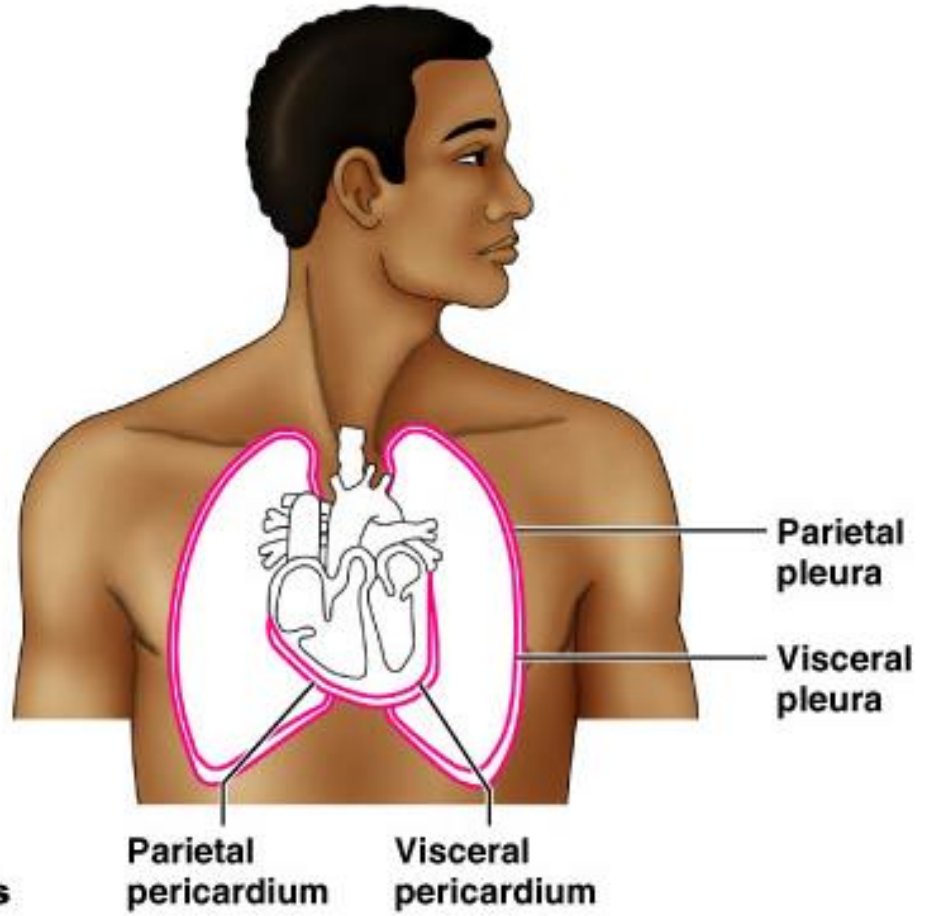
- Called serous membranes or serosa.
  - **Parietal serosa** lines internal body walls (example: parietal pleural).
  - **Visceral serosa** covers the internal organs.
  - Serous fluid separates the serosae (serous cavity).



Serous Fluid and Membranes

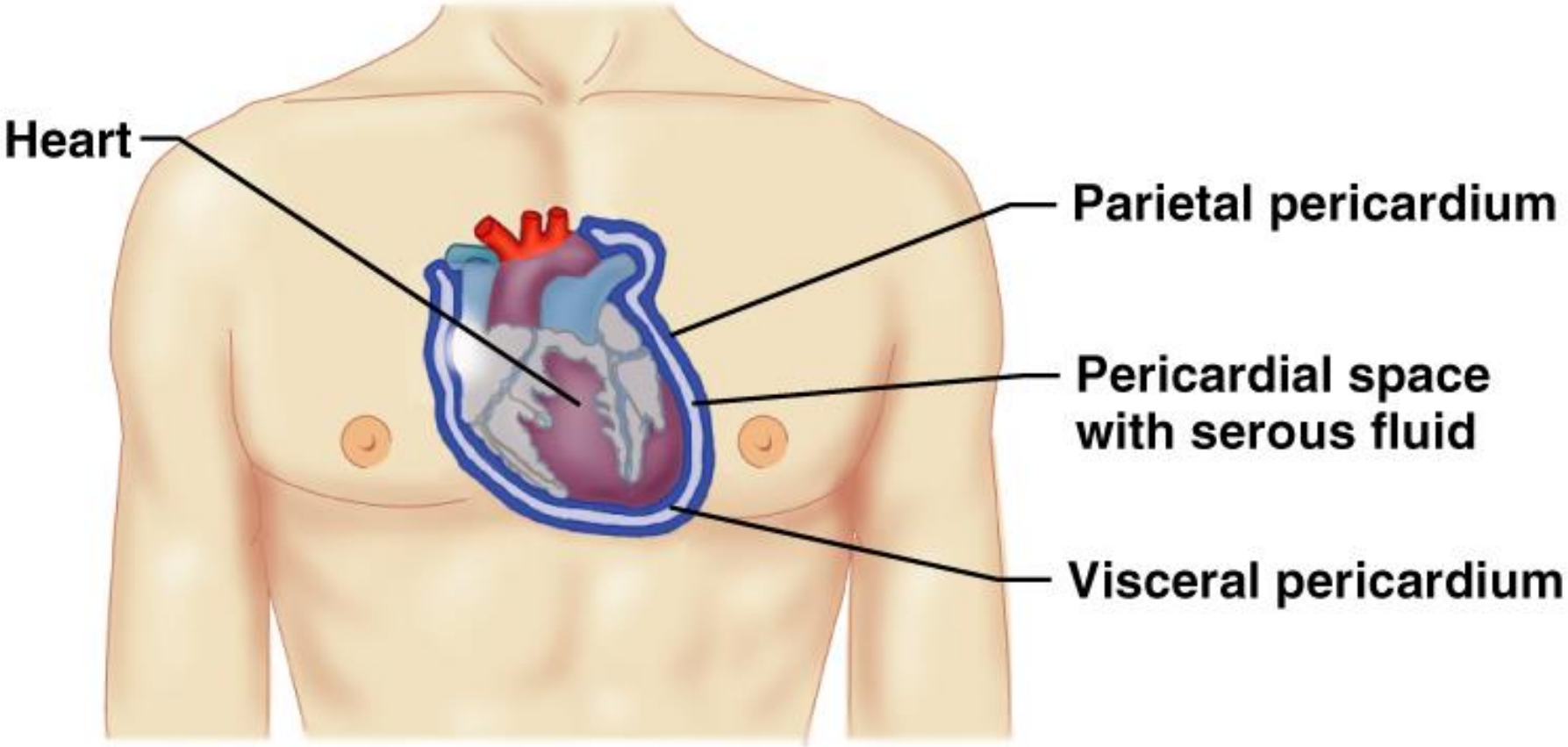
- Serous fluid between the two layers of serous membranes reduces friction and allows the viscera (internal organs) to slide somewhat during movements.
- **Serous Membranes Include:**
  - **Pleura:** Surrounds the lungs.
  - **Pericardium:** Surrounds the heart.
  - **Peritoneum:** Lines the abdominal cavity and covers abdominal organs.



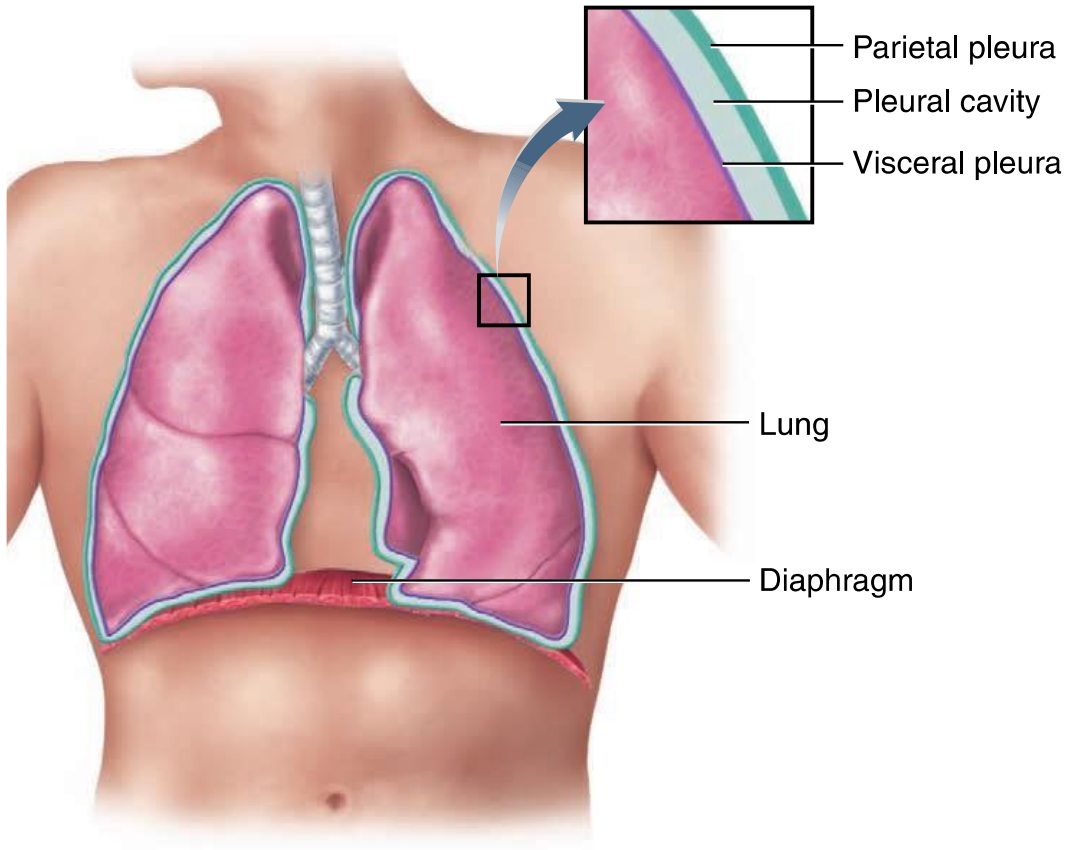


(c) Serous membranes

Heart Serosae



Pleural Serosae



(b) Pleurae

Thank You