# INTRODUCTION TO HUMAN ANATOMY

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**Course unit of ;**

**Anatomy, Histology and Embryology**

*WACHEMO UNIVERSITY*

# INTRODUCTION TO HUMAN ANATOMY

**ANATOMY**- is the study of the structure of the human body and the **relationships** among them.

- The **word anatomy** is derived from **Greek** (ana- **up**; -tome- process of **cutting**) and means "**to cut up**" or "to cut open." = to dissect

**Anatomy** is the setting (structure) in which the events (functions) of life occur.

- **Branches of anatomy**
  - **Gross anatomy**
  - **Microscopic anatomy**
    - Cytology
    - Histology
  - **Developmental anatomy**
    - Embryology
  - **Comparative anatomy**
  - **Surface anatomy**
  - **Radiological anatomy**
  - **Surgical anatomy**

# BRANCHES/SUBDIVISIONS OF ANATOMY

## Gross (macroscopic) anatomy

- Studies the human body parts (structures) that are visible without microscope (which deals with the body details which are seen by the naked eye)
- It is usually studied by means of **dissection** of the dead body (cadaver)

## Microscopic anatomy

is the study of structures that are so small they can be seen only with a microscope. Has sub-divisions

- **Cytology** =Studies cells of the body
- **Histology=** the study of tissues by the help of a microscope

## Developmental anatomy

- Studies structural changes of an individual throughout life span and the effects of aging.
- **Embryology** is the study of how body structures form and develop before birth.

# Developmental anatomy…

- geriatrics Branch o f medicine dealing with older individuals and their medical problems .
- gerontology Study of the process of aging and the various problems of older individuals .

# CONT'D…

**Surface anatomy**

- the study of shapes and markings (called land marks) on the surface of the body that reveal the underlying organs.

**Comparative anatomy**

- Comparative study of the structures with regard to homologous organs or parts

**Radiological anatomy**

- studies internal structures as visualized by X-ray images or specialized scanning procedures

*Surgical anatomy*

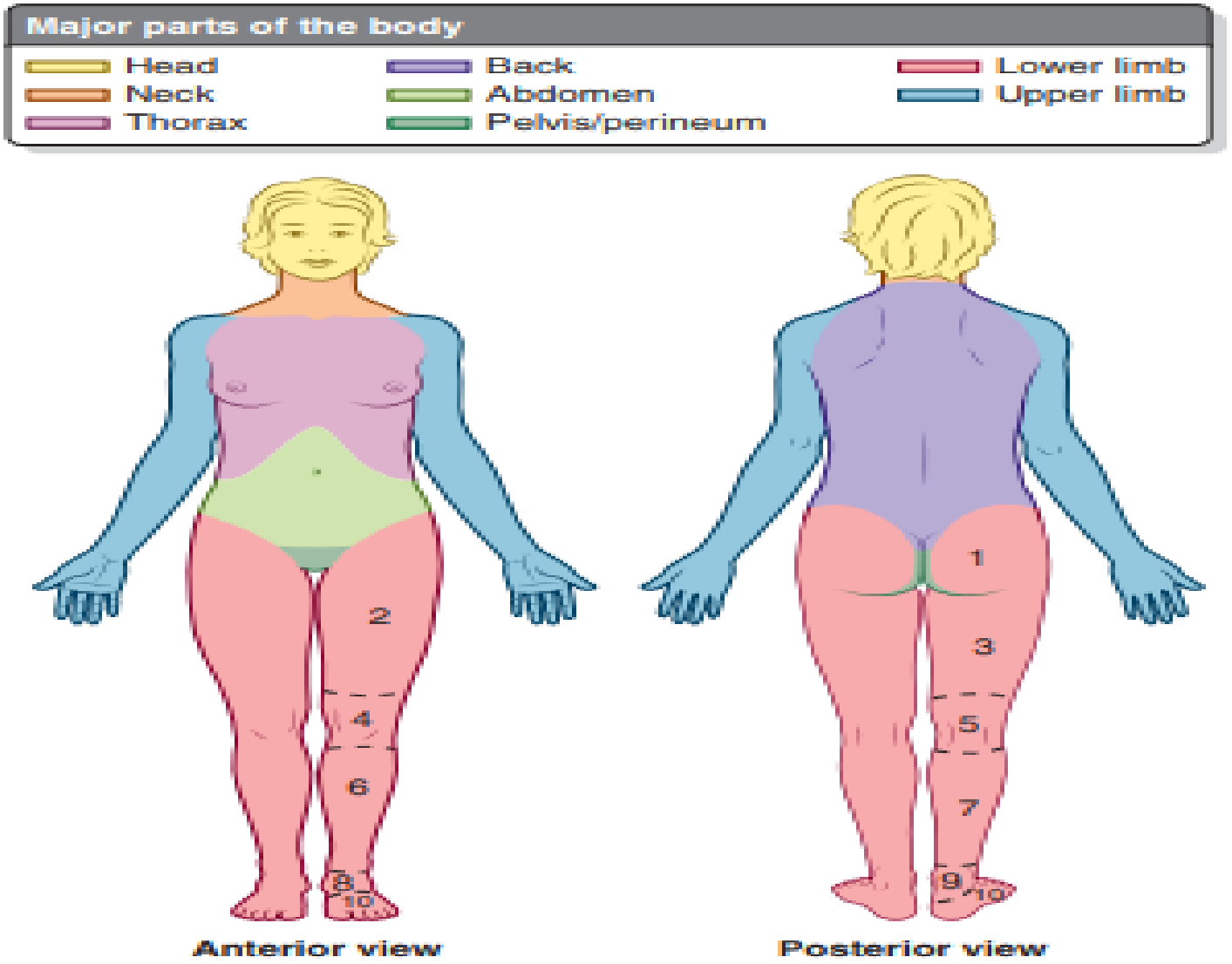
– is the study of anatomy in connection with surgical operations and surgical procedures (e.g. anatomy of surgical incisions, anatomy of surgical exposures…..).

Pathological anatomy deals with the structural changes in cells, tissues, and organs caused by disease. (Pathology is the study of disease.)

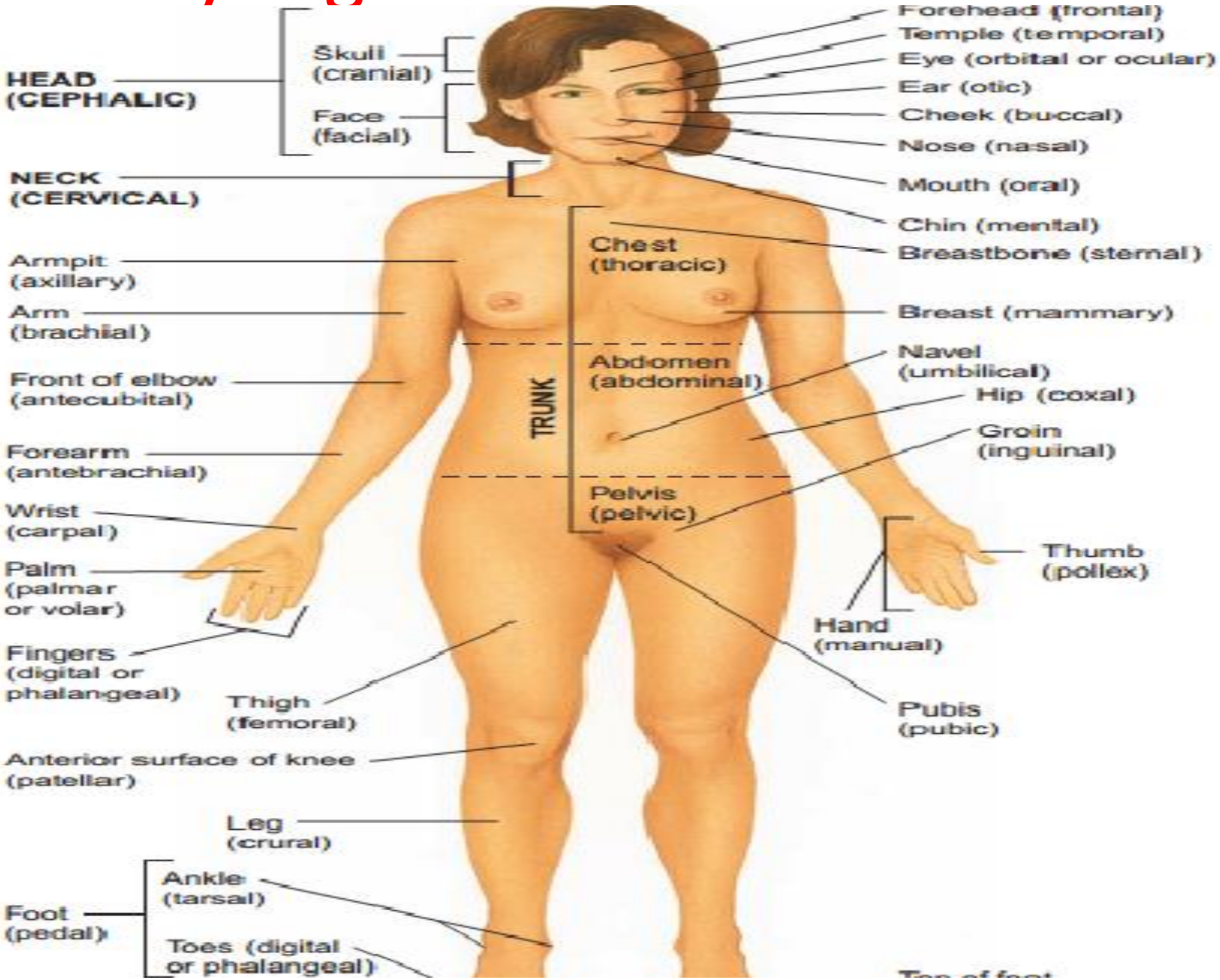
# Approaches to Studying Anatomy:

❖**Three** main **approaches** to study human gross anatomy: **regional**, **clinical** (**applied**) and **systemic.**

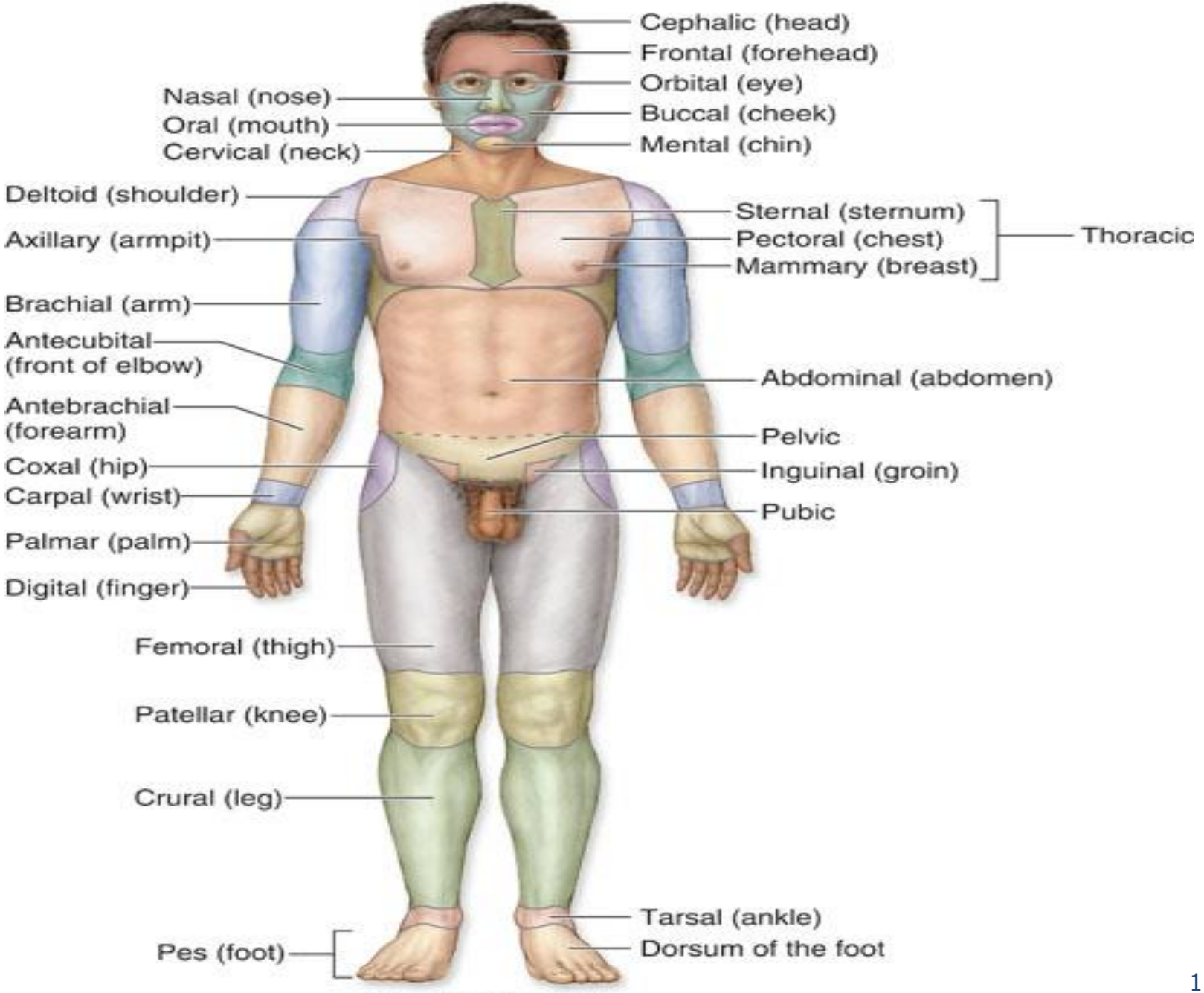
- **Regional anatomy (topographical anatomy)** is based on the organization of the body into **parts/ considers the** organization of the human body as major parts or segments
  - **Head, Neck**
  - **Trunk** (**thorax**, **abdomen**, **pelvis/perineum**, **back**)
  - Paired **upper** and **lower limbs**.


Major parts of the body
Head
Neck
Thorax
Back
Abdomen
Pelvis/perineum
Lower limb
Upper limb
1
2
3
4
5
6
7
8
9
10
Anterior view
Posterior view
Regions of lower limb
1 = Gluteal region
2 = Anterior thigh region
3 = Posterior thigh region
4 = Anterior knee region
5 = Posterior knee region
6 = Anterior leg region
7 = Posterior leg region
8 = Anterior talocrural (ankle) region
9 = Posterior talocrural region
10 = Foot region

# Body regions

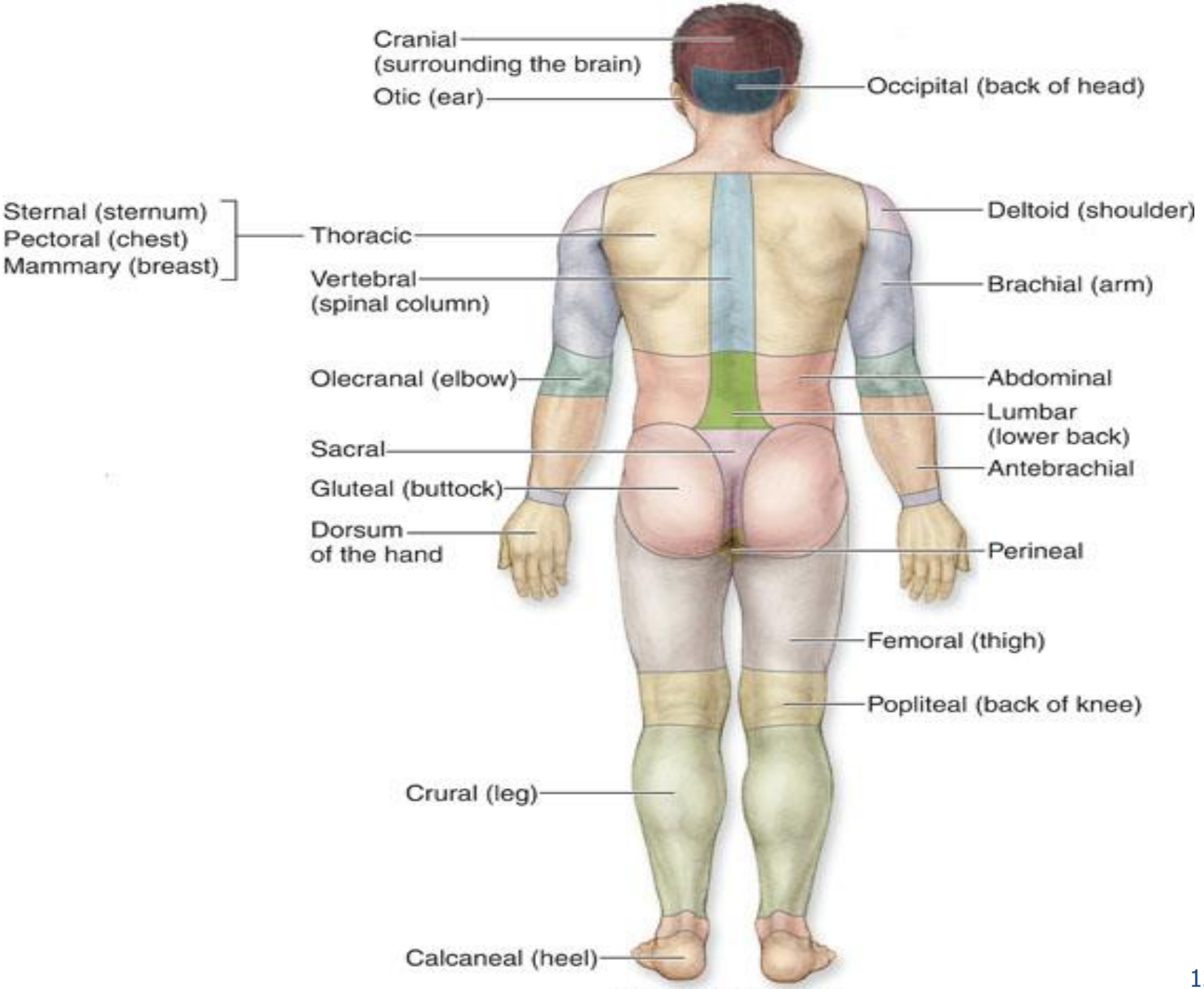


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(a) Anterior view

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(b) Posterior view

# Approaches to Studying Anatomy:

## 2. Clinical (applied) anatomy:

- Emphasizes **aspects** of the structure and **function** of the body important in the practice of **medicine**, **dentistry**, and **other health sciences**.

- It **deals both** the **regional** and the **systemic** approaches to studying anatomy and stresses **clinical application**.

# Approaches to Studying Anatomy:

3. **Systemic anatomy** is an approach to anatomical study organized by **organ systems** that work together to carry out **complex functions**:

1. **Integumentary system**
2. **Skeletal system**
3. **Articular system**
4. **Muscular system**
5. **Nervous system**.
6. **Endocrine system**
7. **Circulatory system**
8. **Digestive** or **alimentary system**
9. **Respiratory system**
10. **Urinary system**
11. **Reproductive system**

# Systemic anatomy…

- The integumentary system (dermatology)
- The skeletal system (osteology)
- The articular system (arthrology)
- The muscular system (myology)
- The nervous system (neurology)
- The circulatory system (angiology); The cardiovascular system (cardiology)
- The alimentary or digestive system (gastroenterology)
- The respiratory system (pulmonology)
- The urinary system (urology)
- The genital (reproductive) system (gynecology for
- females; andrology for males)
- The endocrine system (endocrinology)

# As summary

- Anatomy is the study of the structure of the human body.

♦ Regional anatomy considers the body as organized into segments or parts.

♦ Systemic anatomy sees the body as organized into organ systems.

♦ Surface anatomy provides information about structures that may be observed or palpated beneath the skin.

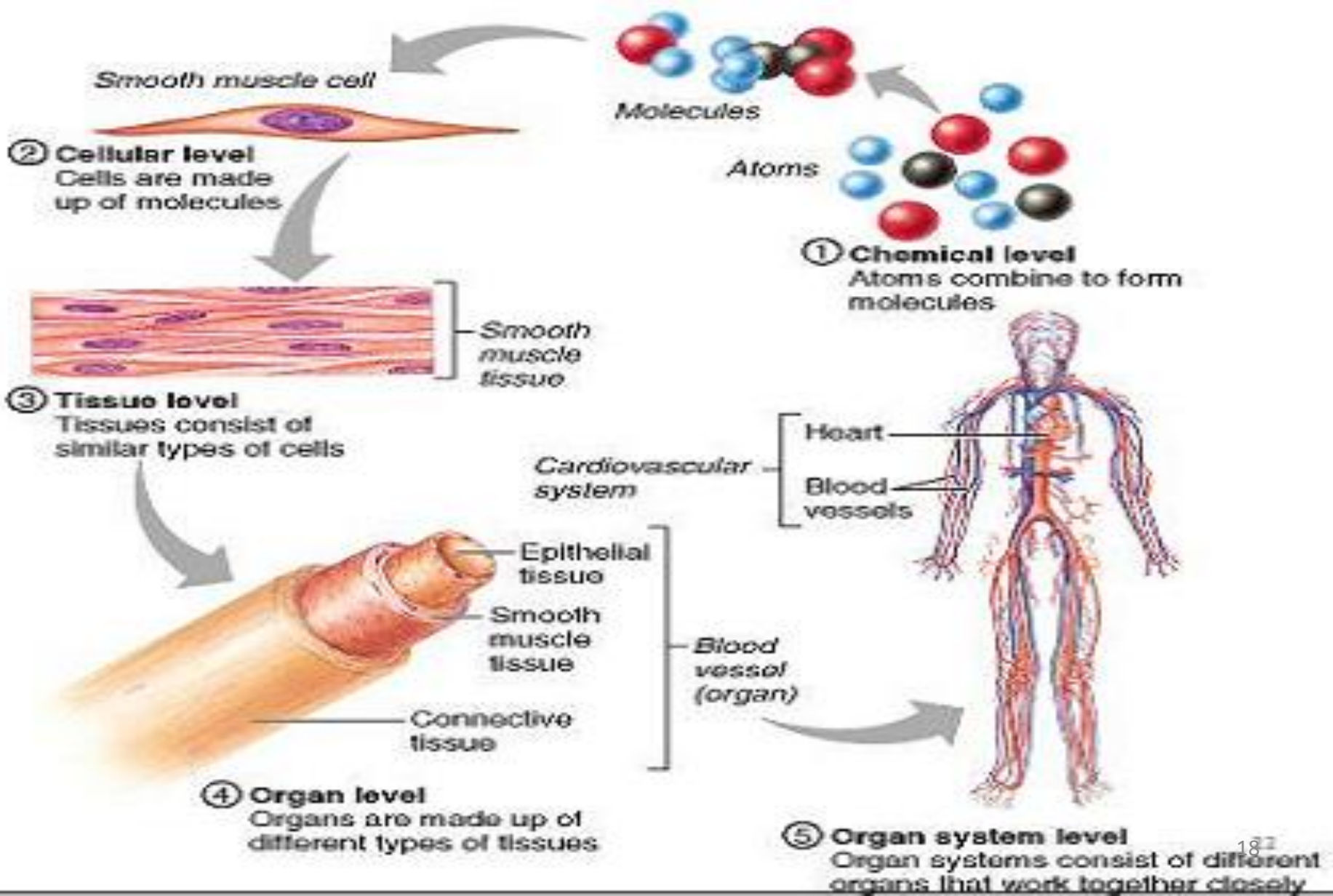
♦ Radiographic, sectional, and endoscopic anatomy allows appreciation of structures in living people, as they are affected by muscle tone, body fluids and pressures, and gravity.

♦ Clinical anatomy emphasizes application of anatomical knowledge to the practice of medicine.

- Levels of Structural Organization
  - **Chemical** Level: interaction of atoms
  - **Cell** Level: functional unit of life
  - **Tissue** Level: group of similar cells and the materials surrounding them
  - **Organ** Level: one or more tissues functioning together
  - **Organ System** Level: group of organs functioning together
  - **Organism** Level: any living thing.

# Levels of Structural Organization of Human Body

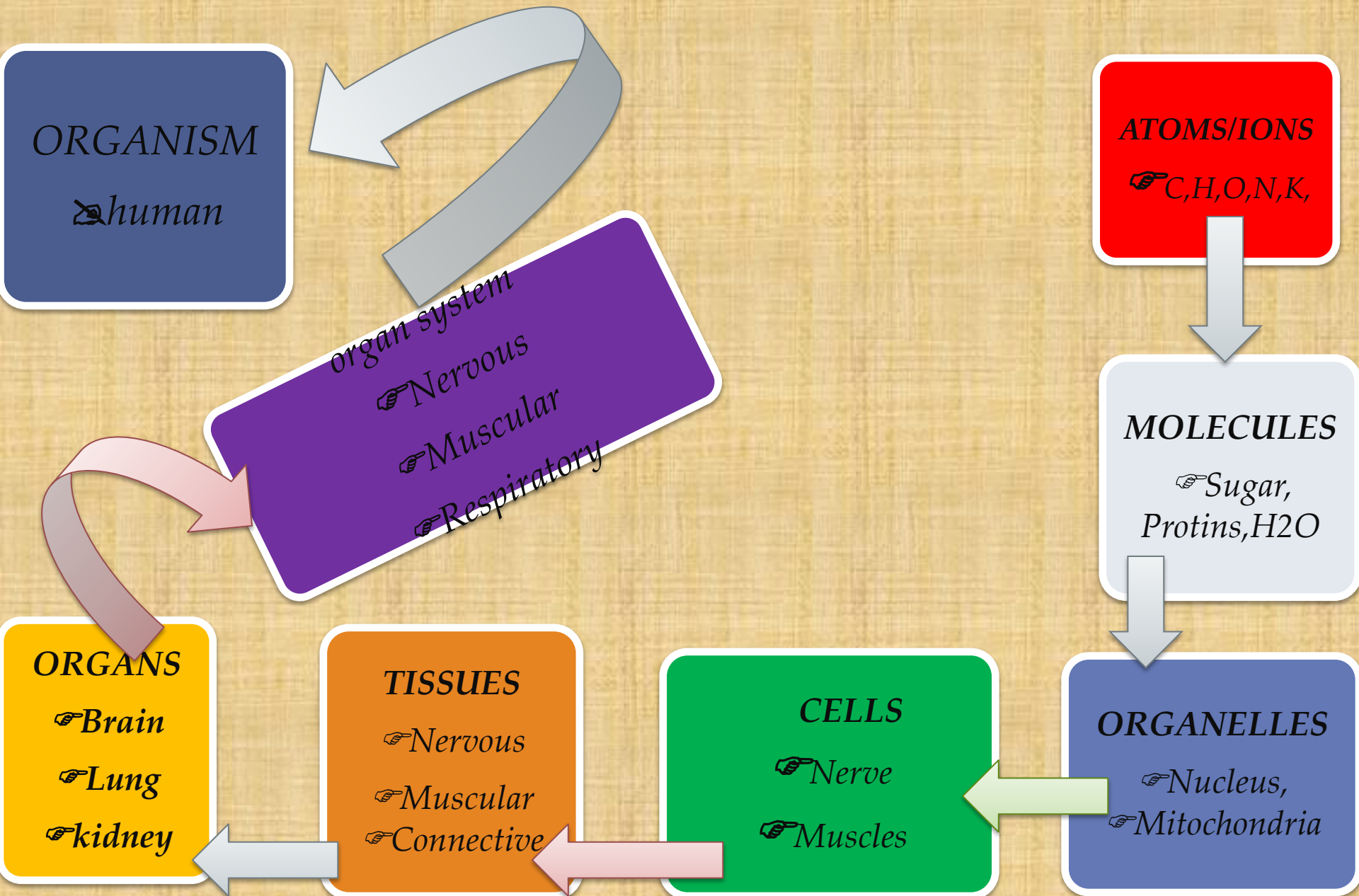
**Chemical level** to **Organism level**



- Chemical Level
  - Atoms and molecules essential for life
    - Atoms: C, H, O, N, Ca, K, Na
    - Molecules: proteins, carbohydrates, fats, vitamins, water
- Cellular Level
  - Cells are the basic structural and functional units of living organism
- Tissue Level
  - Consists of groups of similar cells that have a common function
  - 4 types: epithelium, muscle, connective and nervous tissues

- Organ Level
  - Organ is a structure that is composed of at least two tissue types which performs a specific function for the body
- System Level
  - System is composed of organs that cooperate with one another to perform a common function
- Organismic Level
  - Contains all systems functioning to make a living being

# LEVELS OF HUMAN BODY ORGANIZATION



# Anatomical Position

- is the **standard reference position of the body** used to describe the position & relations of various anatomical structures

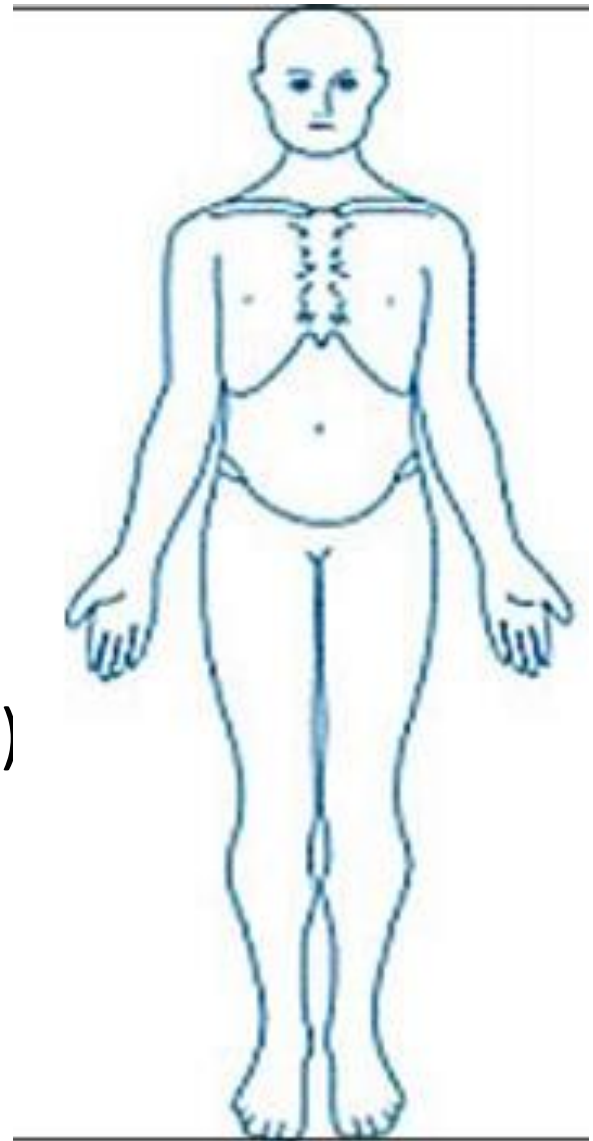
- All descriptions in human anatomy are expressed in relation to the anatomical position

# *ANATOMICAL POSITION*

- *All anatomical descriptions are expressed in relation to one standard anatomical position, ensuring that descriptions are not ambiguous.*
    - *The person were standing upright, regardless of the actual posture or position, with the:*
        - ➢ *Head, eyes, and toes=directed anteriorly (forward).*
        - ➢ *Arms=adjacent to the sides of the body with the palms facing anteriorly.*
        - ➢ *Lower limbs=close together with the feet parallel and the toes directed anteriorly.*
- *This anatomical position is adopted globally for anatomicomedical descriptions.*
- *By using this position and appropriate terminology, you can relate any part of the body precisely to any other part.*

# Anatomical Position…

- To be in Anatomical position, individuals (the body) should:
  - Stand erect
  - Eyes looking directly forward
  - Upper limb by the sides
  - Palms directed forward
  - Lower limbs lie parallel (together)
  - Feet directed anteriorly (the toes directed forward)



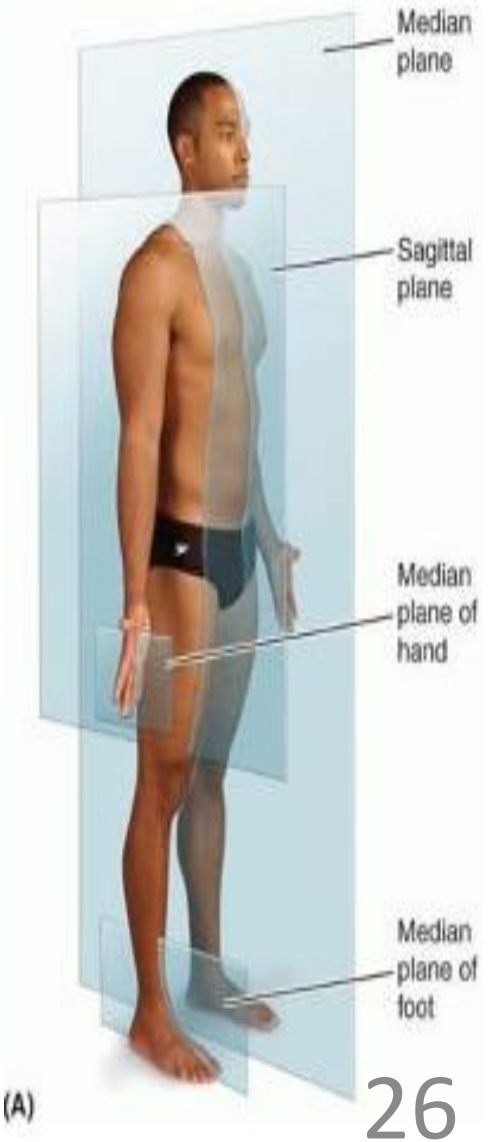
# Anatomical Terminology

- **Anatomical position** - refers to body position as if the person were standing upright with the:
  - **Head**, **eyes**, and **toes** directed **anteriorly** (forward).
  - **Arms** adjacent to the sides with the **palms** facing **anteriorly**, and
  - **Lower limbs** **close** together with the **feet** **parallel**.

- Standard reference position of the body

# Planes and Sections of the Body

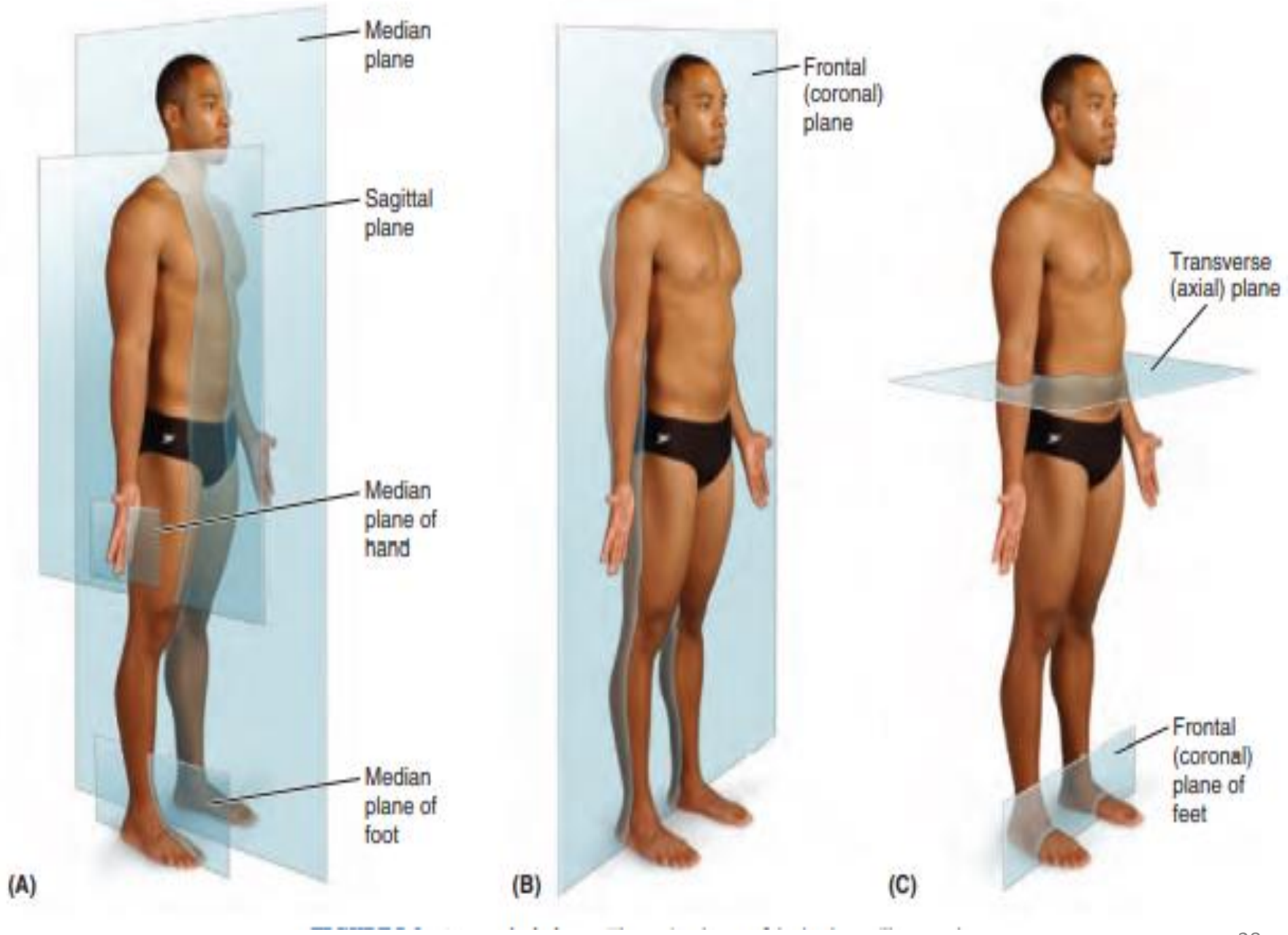
- **Median plane** is the **vertical plane** passing **longitudinally** through the **center of** the **body**, dividing it into **right** and **left halves**.
- **Sagittal planes** are vertical planes passing through the body **parallel** to the **median plane**.

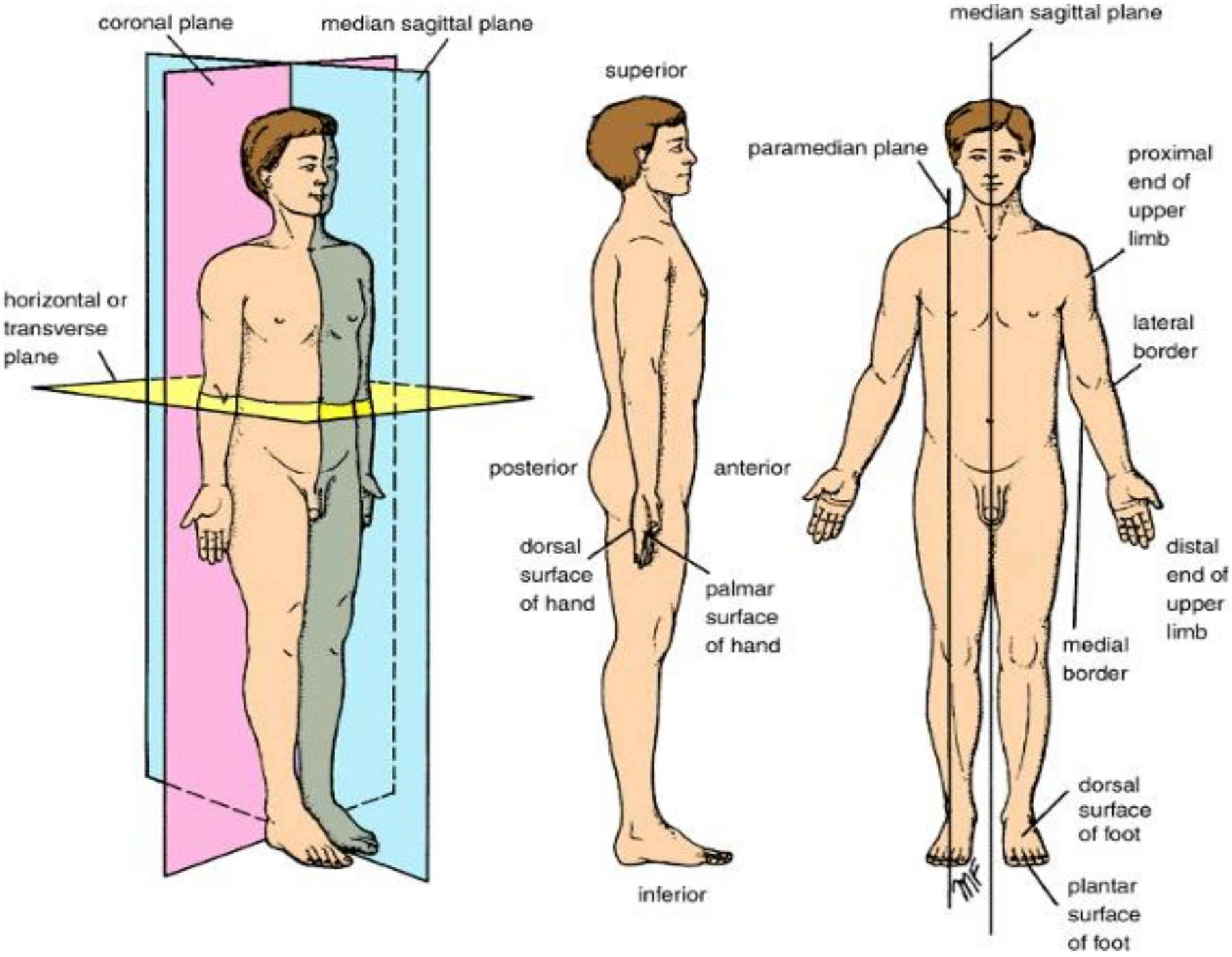


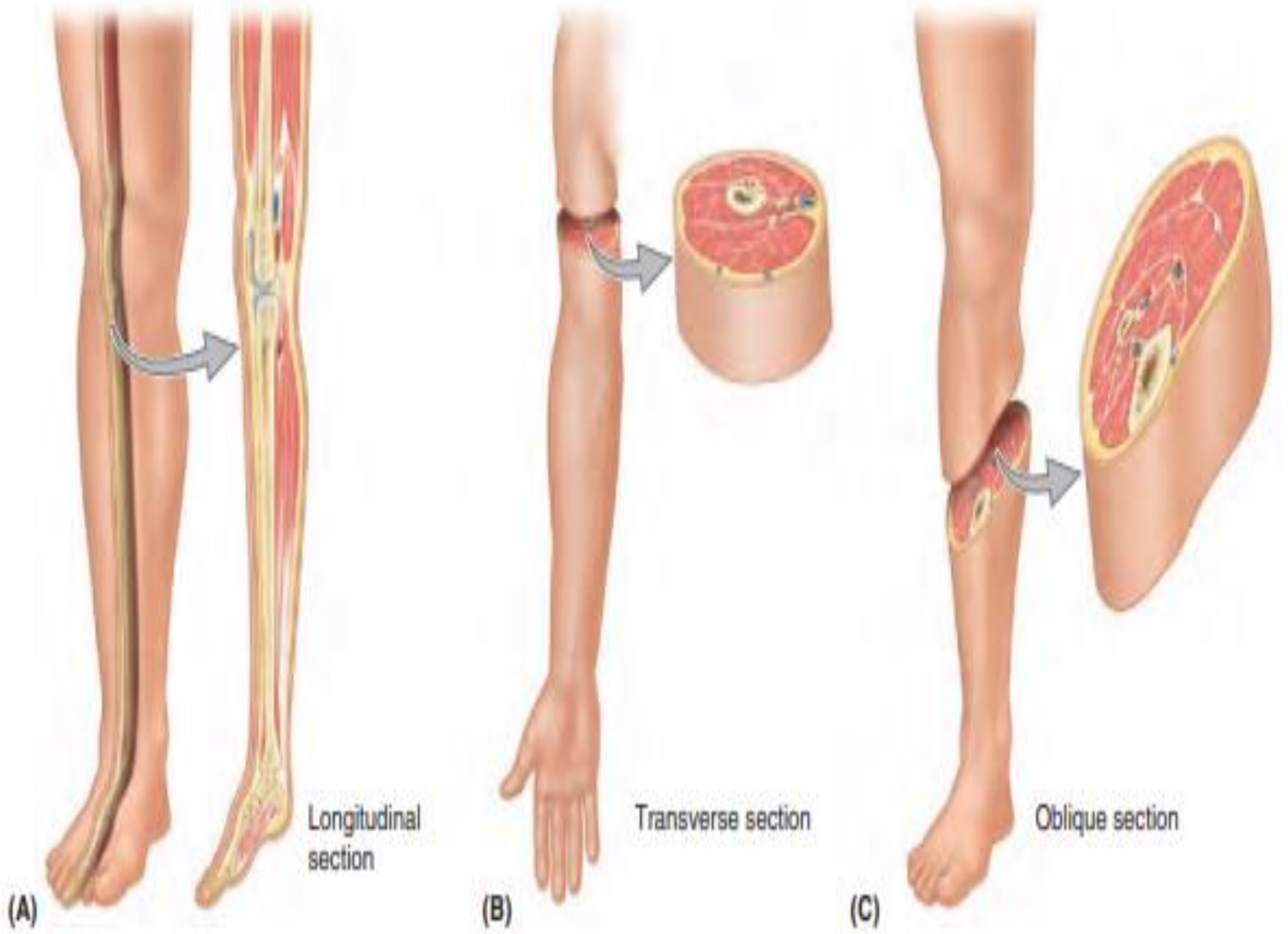
# Planes and Sections of the Body

- **Frontal (coronal) planes** are vertical planes passing through the body at **right angles** to the **median plane**
  - dividing it into **anterior** (front) and **posterior** (back) portions.
- **Transverse planes** are planes passing through the body at **right angles** to the **median** and **frontal** (**coronal**) planes.
  - A transverse plane divides the body into **superior** (upper) and **inferior** (lower) parts.




Median plane
Sagittal plane
Median plane of hand
Median plane of foot
(A)
Frontal (coronal) plane
(B)
Transverse (axial) plane
Frontal (coronal) plane of feet
(C)


coronal plane
median sagittal plane
horizontal or transverse plane
superior
posterior
anterior
dorsal surface of hand
palmar surface of hand
inferior
median sagittal plane
paramedian plane
proximal end of upper limb
lateral border
distal end of upper limb
medial border
dorsal surface of foot
plantar surface of foot

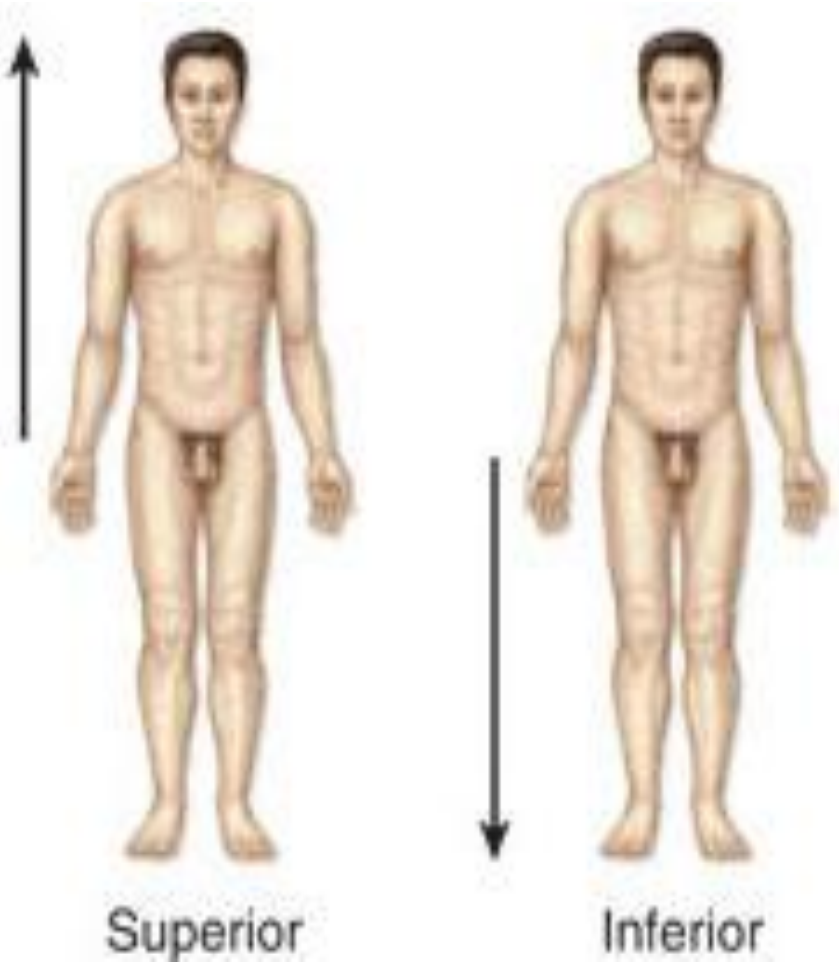

Longitudinal section
(A)
Transverse section
(B)
Oblique section
(C)

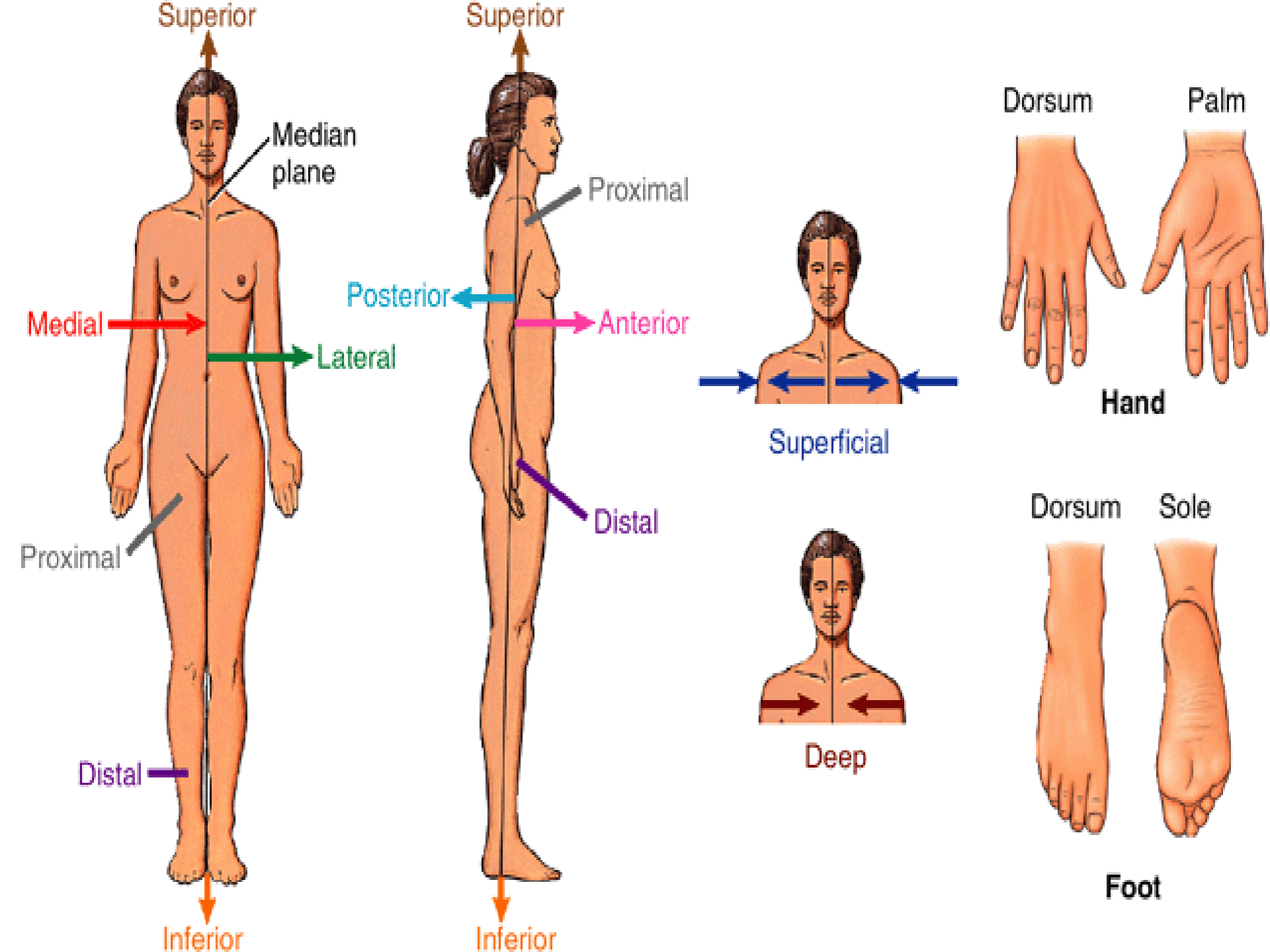
# Directional Terms

- **Superior** refers to a structure that is nearer the **vertex**, the top most point of the cranium.
- **Inferior** refers to a structure that is situated nearer the **sole** of the foot.
- **Cranial** relates to the **cranium** and is a useful directional term, meaning toward the **head** or cranium.
- **Caudal** means toward the **feet** or **tail** region, represented in humans by coccyx.

# Directional terms

- Superior (Cranial) : Toward the head or upper part of a structure or the body
- Inferior (Caudal) : Away from the head or toward the lower part of a structure or the body



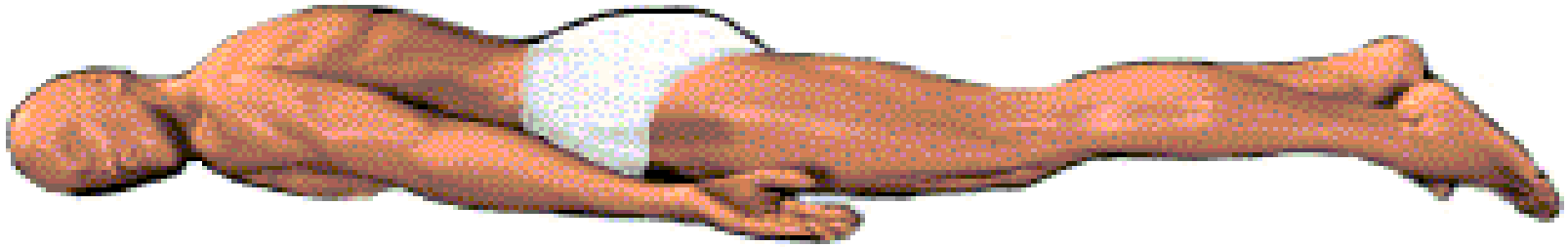

Superior
Median plane
Medial
Lateral
Proximal
Distal
Inferior
Superior
Proximal
Posterior
Anterior
Distal
Inferior
Superficial
Deep
Dorsum
Palm
Hand
Dorsum
Sole
Foot

**Supine position**: face up & palm down when lying on back (dorsal surface of the body)**.**

**Prone position:** face down & palm face up when lying on anterior (ventral) surface of body



Supine



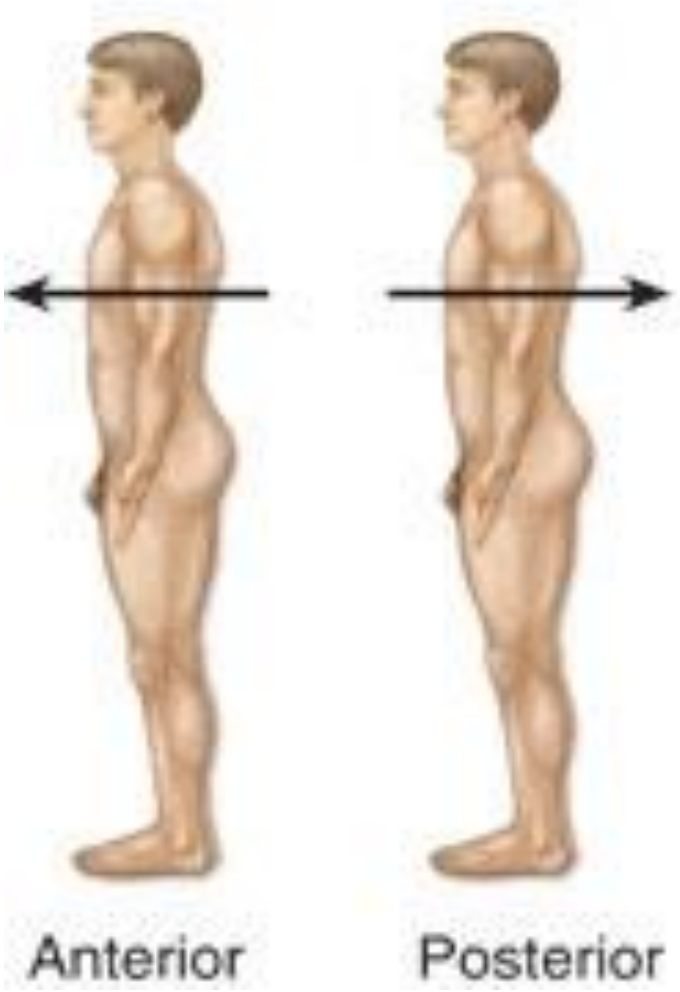
Prone

# Directional Terms

- **Posterior** (**dorsal**) denotes the **back** surface of the body or nearer to the back.
- **Anterior** **(ventral)** denotes the **front** surface of the body.
- **Medial** is used to indicate that a structure is nearer to the **median** plane of the body.
- **Lateral** indicates that a structure is **farther away** from the **median** plane.
  - For example, the **5th** digit of the hand (**little finger**) is medial to the other digits.
  - The **1st** digit of the hand (**thumb**) is lateral to the other digits.

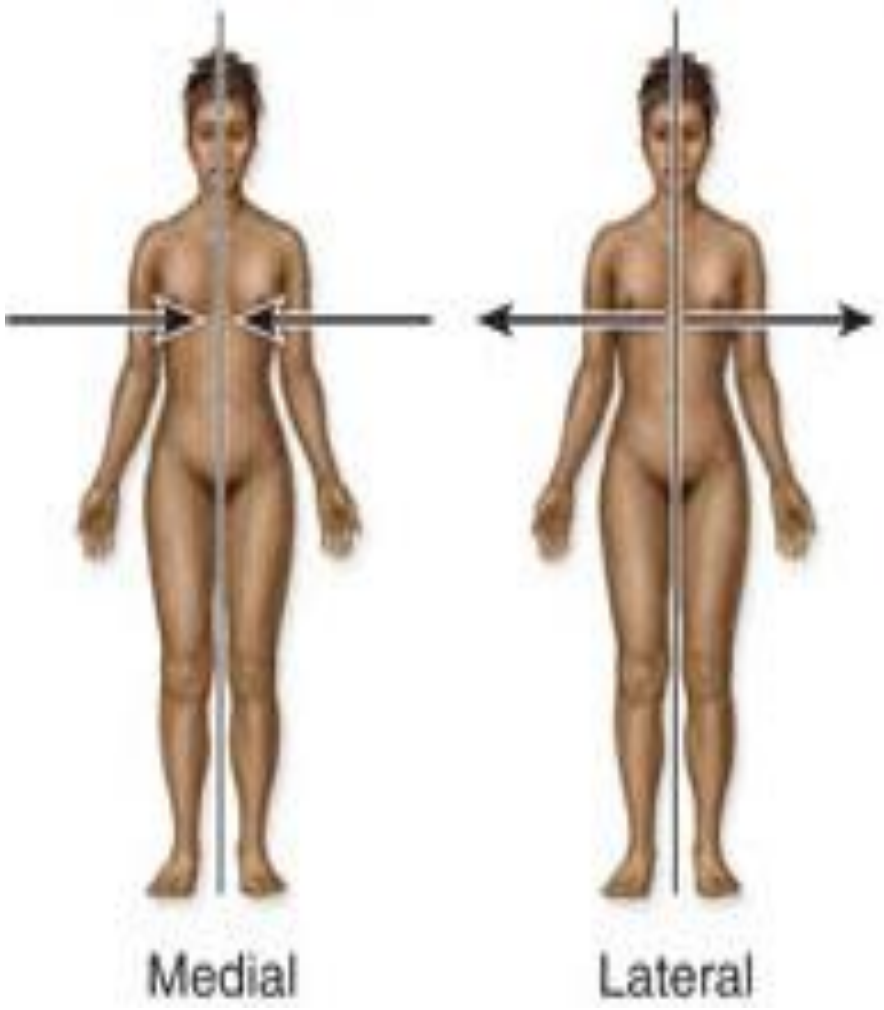
# Directional terms

- Anterior (ventral):
  Toward or at the front of the body
- Posterior (dorsal):
  Toward the back of the body; behind



# Directional terms

- Medial: Toward or at the midline of the body
- Lateral: Away from the midline of the body
- Intermediate: Between a more medial and a more lateral structure

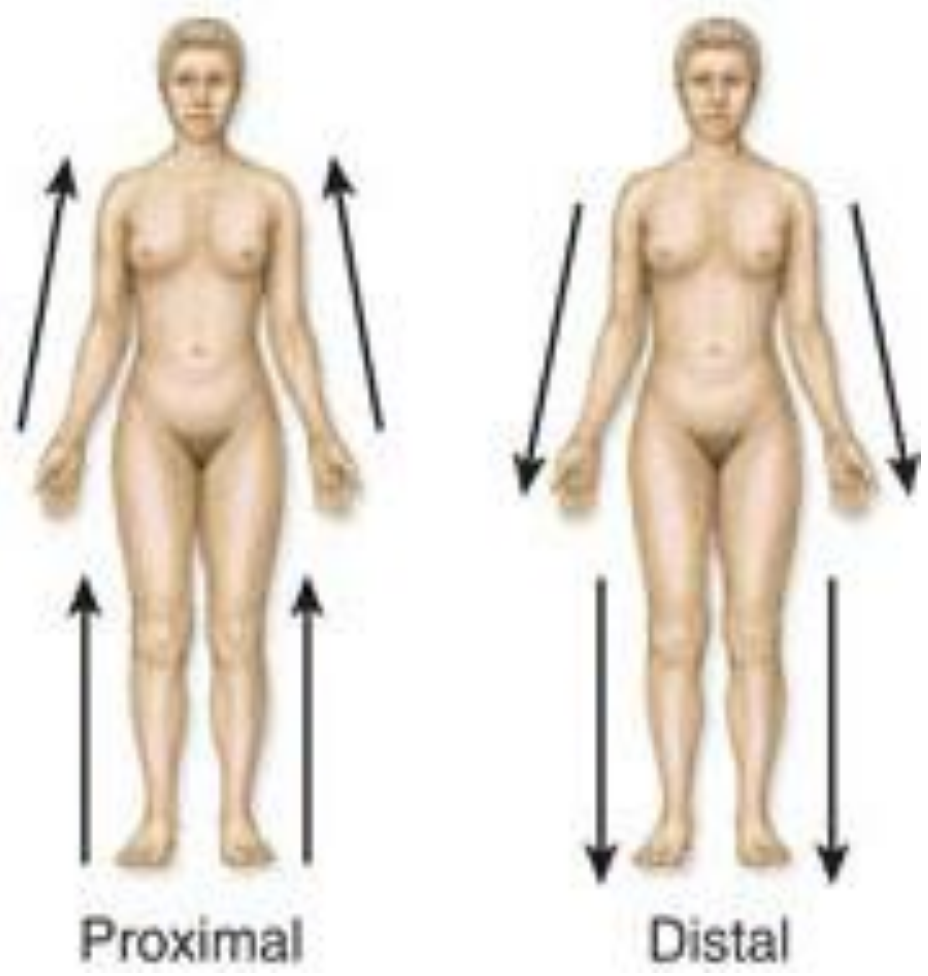


# Directional Terms

- **Proximal** means that a body part is **closer to the point** of **attachment** or closer to the trunk. The elbow is proximal to the hand.
- **Distal** means that a body part is **farther** from the **point** of **attachment** or farther from the **trunk** or torso. The hand is distal to the elbow.
- **Superficial** & **deep** describe the position of structures relative to the **surface** of the body or the relationship of one structure to another underlying or overlying structure.

# Directional terms

- Proximal: closer to the origin of the body part, or the point of attachment of a limb to the body trunk
- Distal: farther from the origin of a body part or the point of attachment of a limb to the body trunk



**Superficial**

Nearer to surface

The muscles of the arm are superficial to its bone (humerus).

**Intermediate**

Between a superficial and a deep structure

The biceps muscle is intermediate between the skin and the humerus.

**Deep**

Farther from surface

The humerus is deep to the arm muscles.



**Superior (cranial)**

Nearer to head

The heart is superior to the stomach.

**Hand**

Dorsal surface (dorsum)

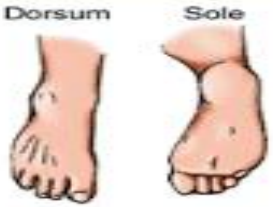
Palmar surface (palm)

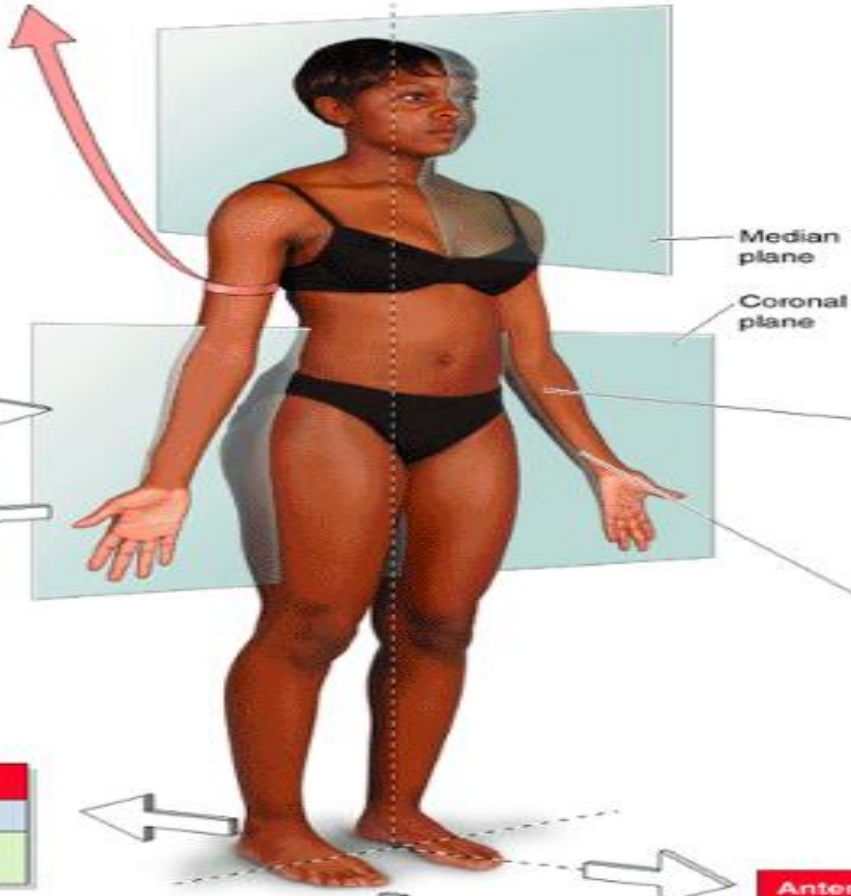



**Foot**

Dorsal surface (dorsum)

Plantar surface (sole)




**Medial**

Nearer to median plane

The 5th digit (little finger) is on the medial side of the hand.

**Lateral**

Farther from median plane

The 1st digit (thumb) is on the lateral side of the hand.

**Proximal**

Nearer to trunk or point of origin (e.g., of a limb)

The elbow is proximal to the wrist, and the proximal part of an artery is its beginning.

**Distal**

Farther from trunk or point of origin (e.g., of a limb)

The wrist is distal to the elbow, and the distal part of the upper limb is the hand.

**Posterior (dorsal)**

Nearer to back

The heel is posterior to the toes.

**Anterior (ventral)**

Nearer to front

The toes are anterior to the ankle.

**Inferior (caudal)**

Nearer to feet

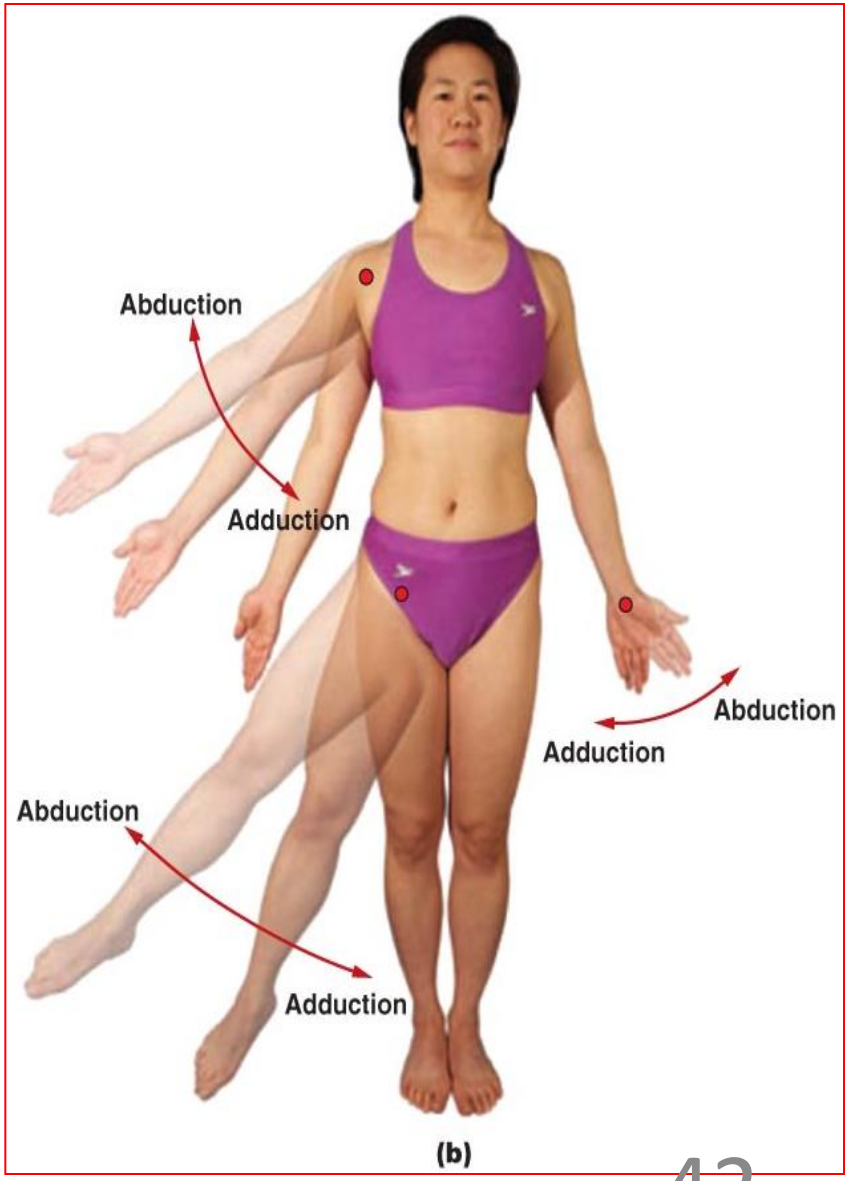
The stomach is inferior to the heart.

# Terms of Laterality

- **Bilateral- paired** structures having **right** and **left** members (e.g., kidneys, lungs)
- **Unilateral** those occurring on **one side only** (e.g., the spleen).
- **Ipsilateral -** Something occurring on the **same side** of body as another structure.
  - E.g., the right thumb and right great toe are ipsilateral.
- **Contralateral** means occurring on the **opposite** side of the body **relative** to **another structure**.

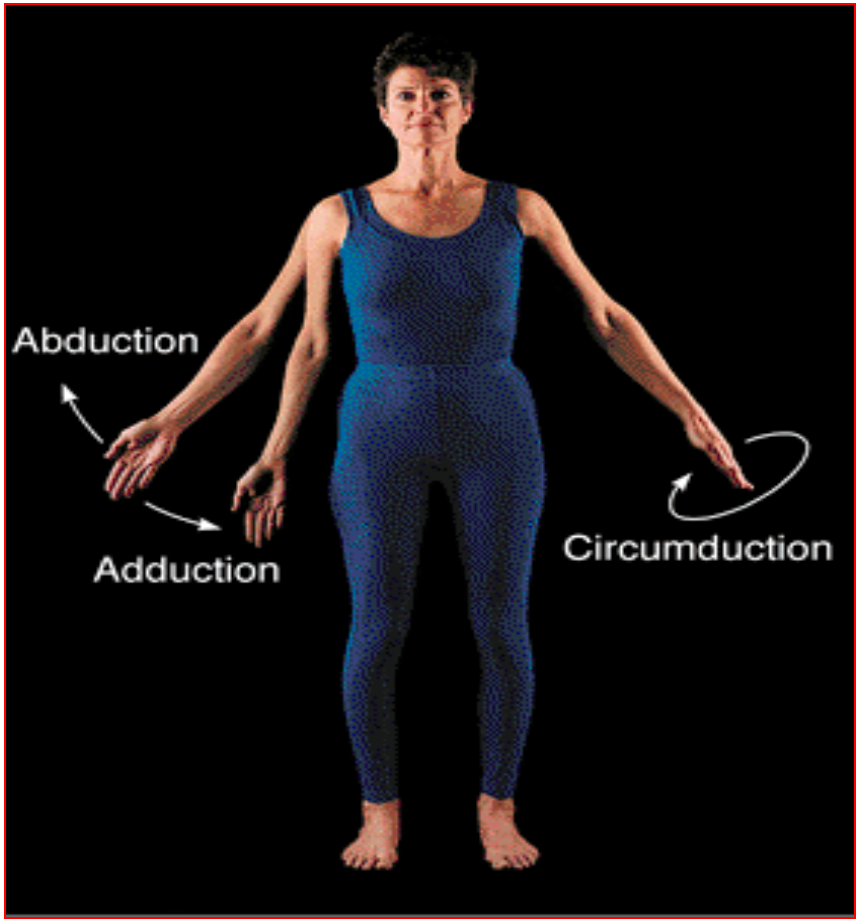
# Terms of Movement

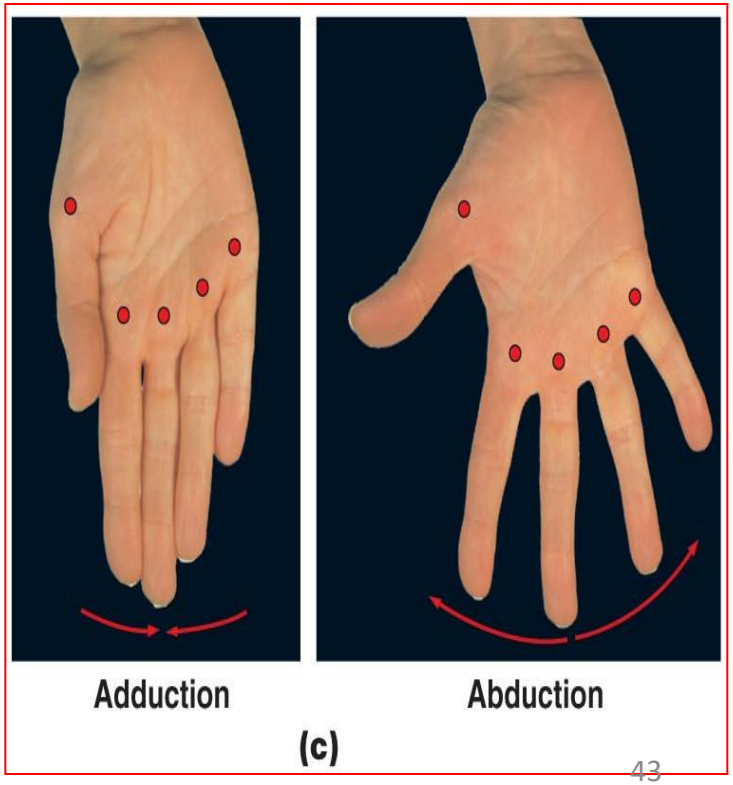
- **Abduction** means moving **away** from the **median** plane.
- **Adduction** means moving **toward** median plane.
  - **Abduction** of the digits means spreading them apart.
  - **Adduction** of the digits is bringing the spread fingers or toes together.



# Terms of Movement

- **Circumduction:**
  - **Circular** motion

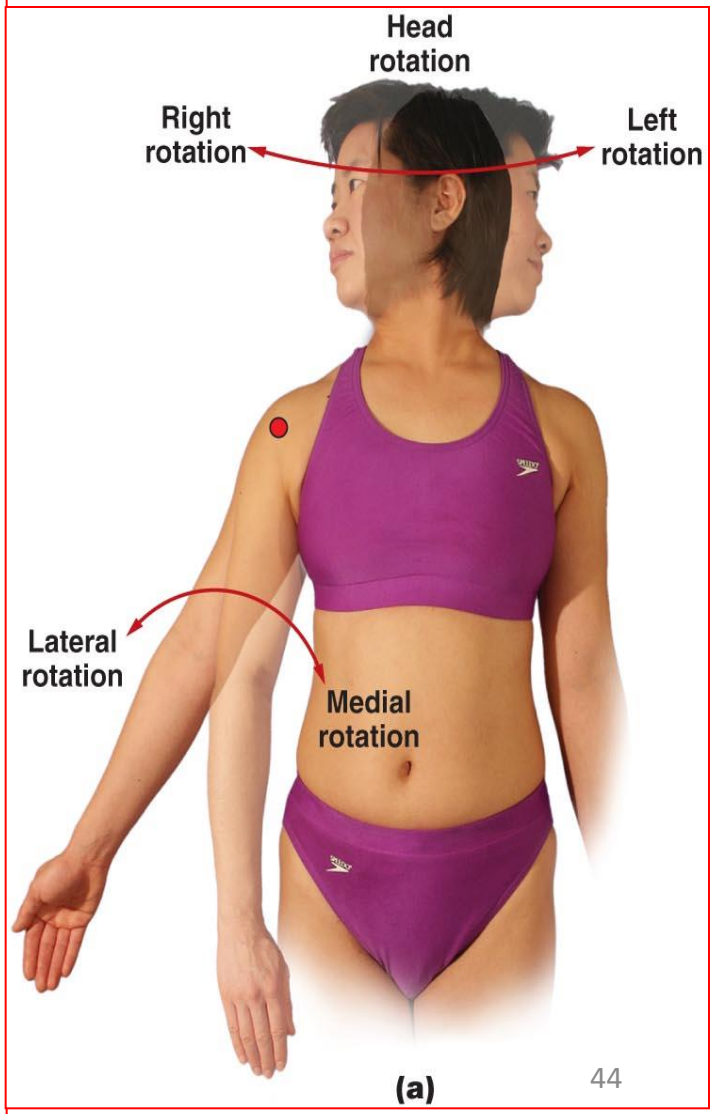


# Terms of Movement

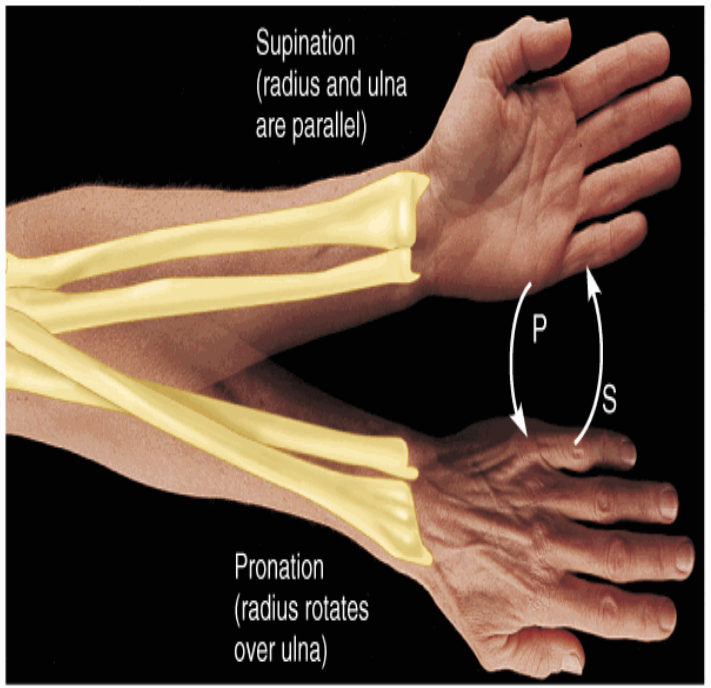
## ❖Rotation

- Direction of rotation from anatomical position
- Relative to longitudinal axis of the body
- **Left** or **right** rotation
- **Medial rotation (*inward rotation*):**
  - **Turning anterior surface medially**
- **Lateral rotation (*outward rotation*):**
  - **Turning anterior surface laterally**



# Terms of Movement

- **Pronation** is a **medial rotation** of **forearm** and **hand** so that the **palm** faces **posteriorly**.
- **Supination** is a **lateral** rotation of the forearm and hand so that the **palm** faces **anteriorly**, as in the anatomical position.

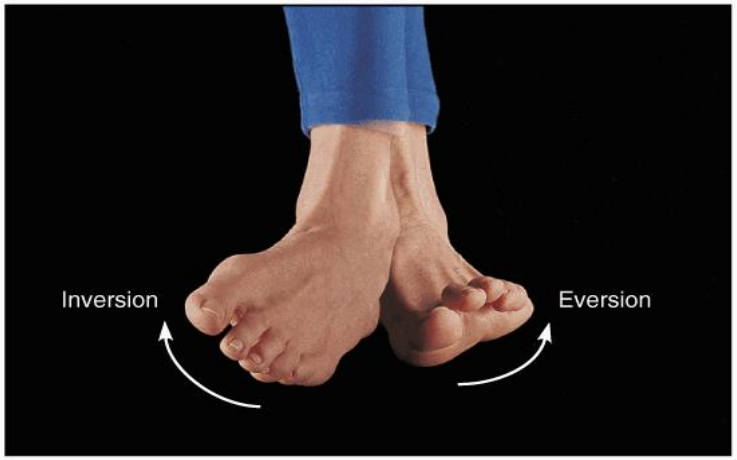



(a) Supination (S) and pronation (P)

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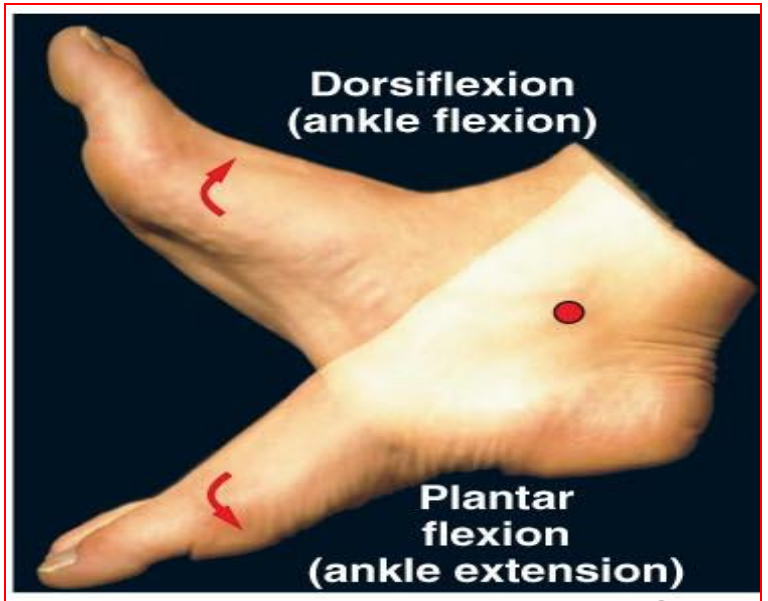
# Terms of Movement

- **Inversion:**
  - Twists sole of foot **medially**
- **Eversion:**
  - Twists sole of foot **laterally**
- **Dorsiflexion:**
  - **Flexion** at ankle (lifting toes)
- **Plantarflexion:**
  - **Extension** at **ankle** (pointing toes)




(b) Inversion and eversion

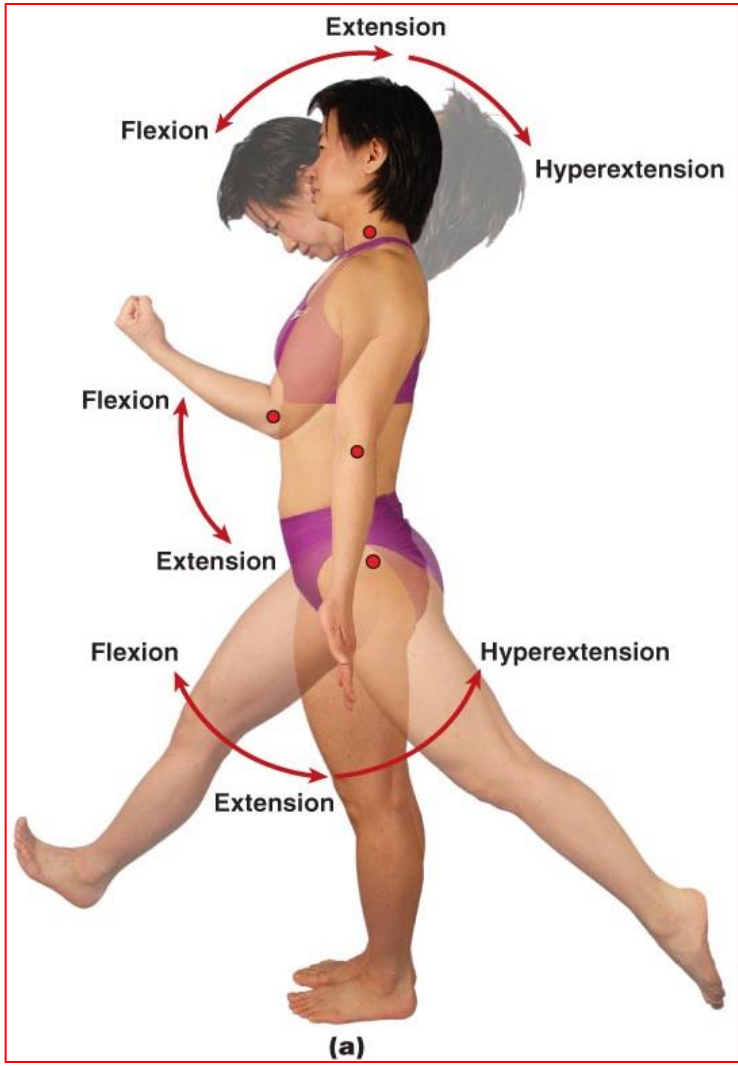
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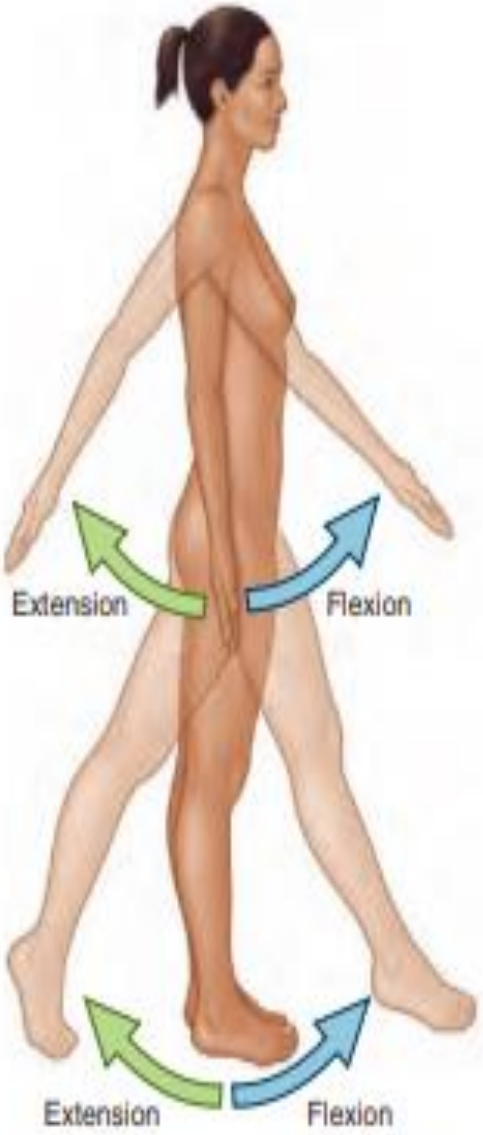


# Terms of Movement

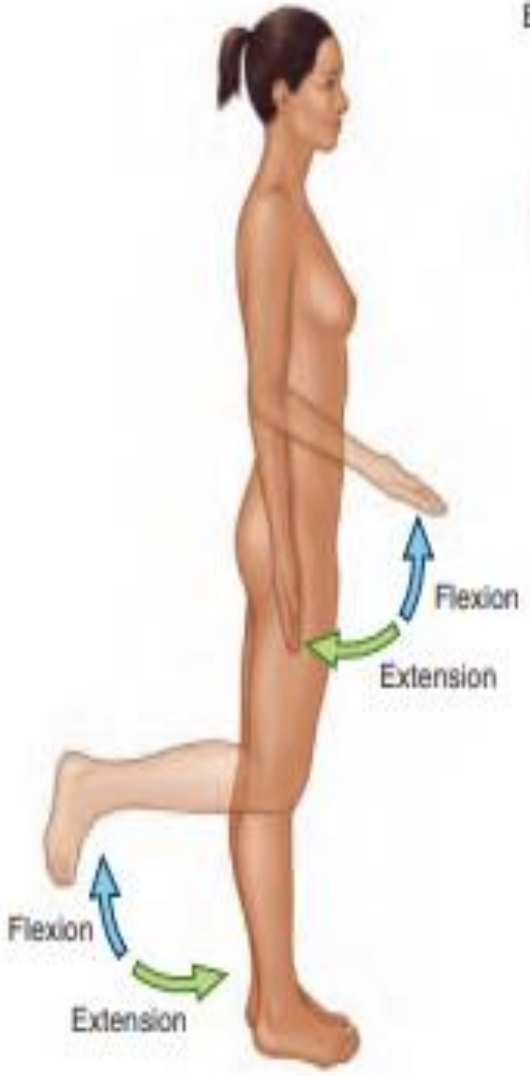
- **Flexion** indicates **bending** or **decreasing** the **angle** b/n the bones or parts of the body.

- **Extension** indicates **straightening** or **increasing** the **angle** b/n the bones or parts of the body.





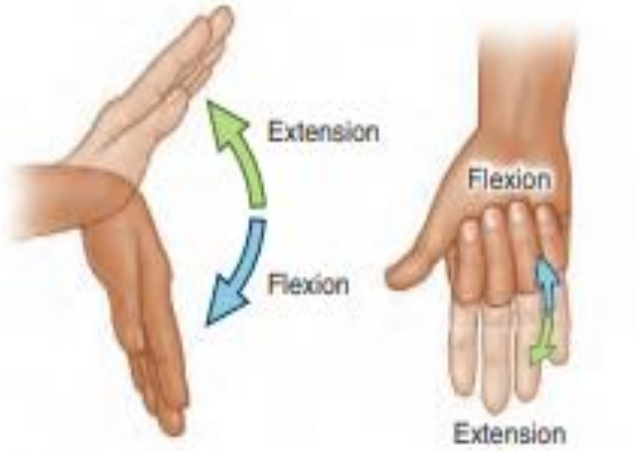

(A) Flexion and extension of upper limb at shoulder joint and lower limb at hip joint




Flexion and extension of forearm at elbow joint and of leg at knee joint

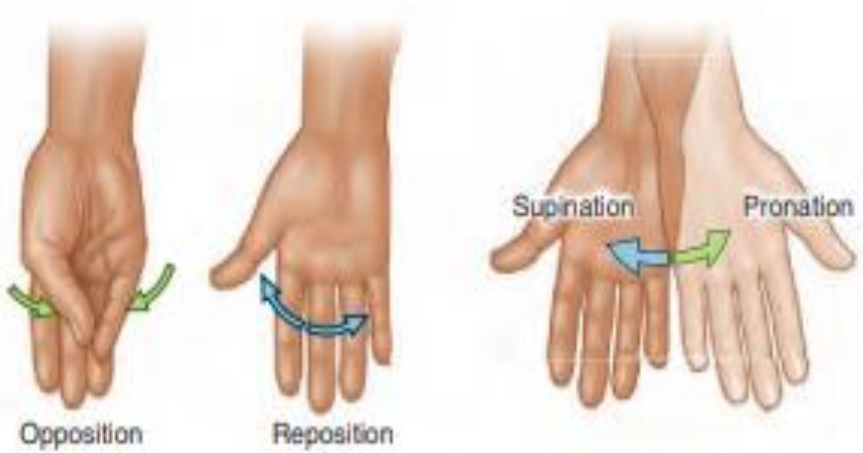



Flexion and extension of vertebral column at intervertebral joints




(B) Flexion and extension of hand at wrist joint

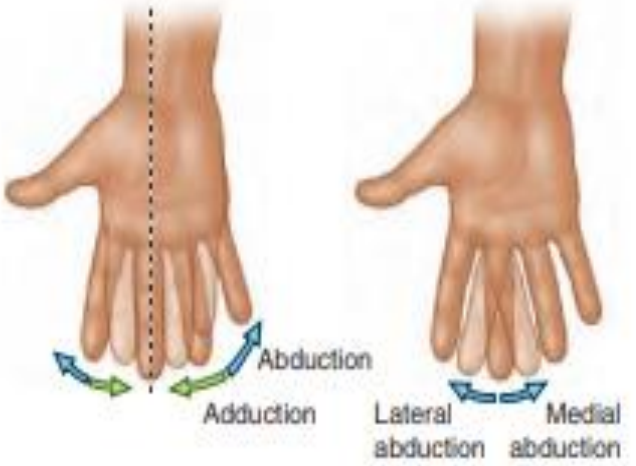
Flexion and extension of digits (fingers) at metacarpophalangeal and interphalangeal joints




(C) Opposition and reposition of thumb and little finger at carpometacarpal joint of thumb combined with flexion at metacarpophalangeal joints




(D) Pronation and supination of forearm at radio-lnar joints




(E) Abduction and adduction of 2nd, 4th, and 5th digits at metacarpo-phalangeal joints

Abduction of 3rd digit at metacarpophalangeal joint




(F) The thumb is rotated 90° relative to other structures. Abduction and adduction at metacarpophalangeal joint occurs in a sagittal plane; flexion and extension at metacarpophalangeal and interphalangeal joints occurs in frontal planes, opposite to these movements at all other joints.

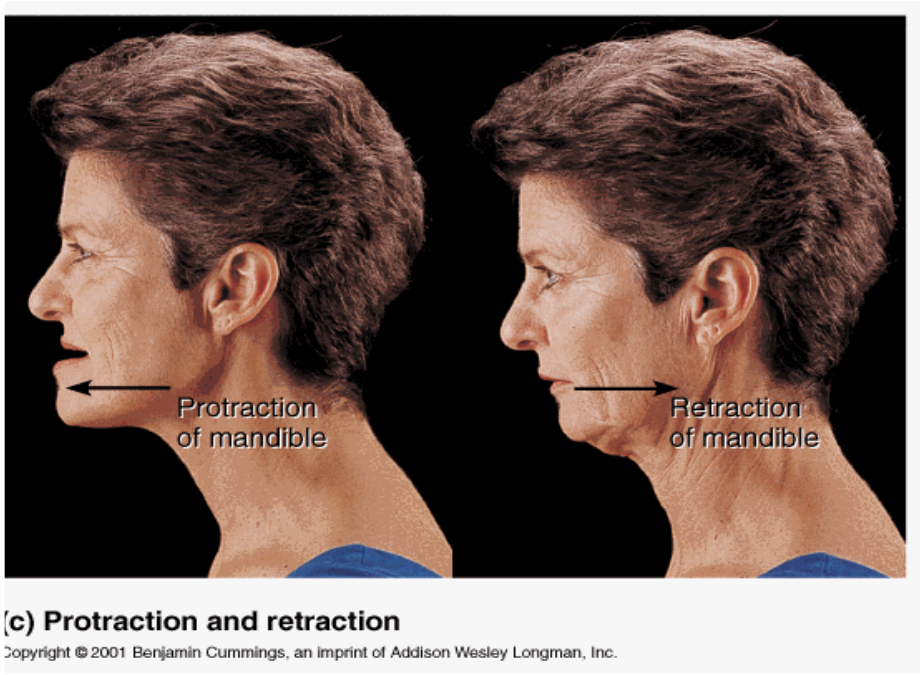
# Terms of Movement

❖**Protraction:**

– Moves anteriorly

– In the horizontal plane

(pushing forward)




(c) Protraction and retraction

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❖**Retraction:**

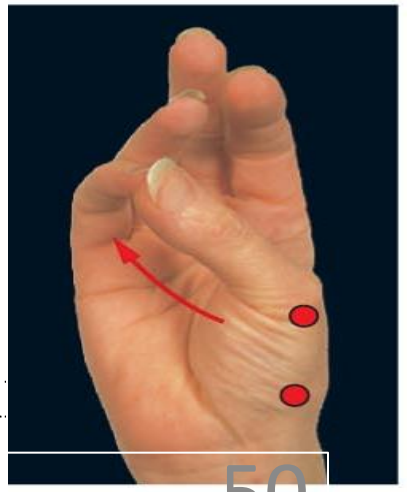
– Opposite of protraction

– Moving posteriorly (pulling back)

❖ **Opposition:**

➢ **Thumb** movement toward fingers or pal

(grasping)

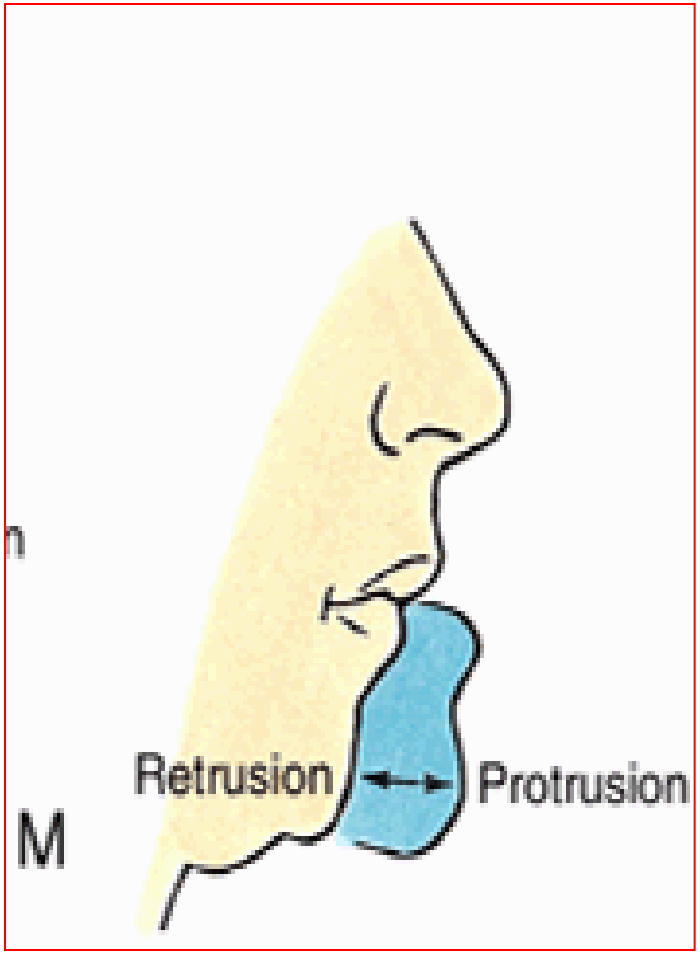


Opposition

# Terms of Movement

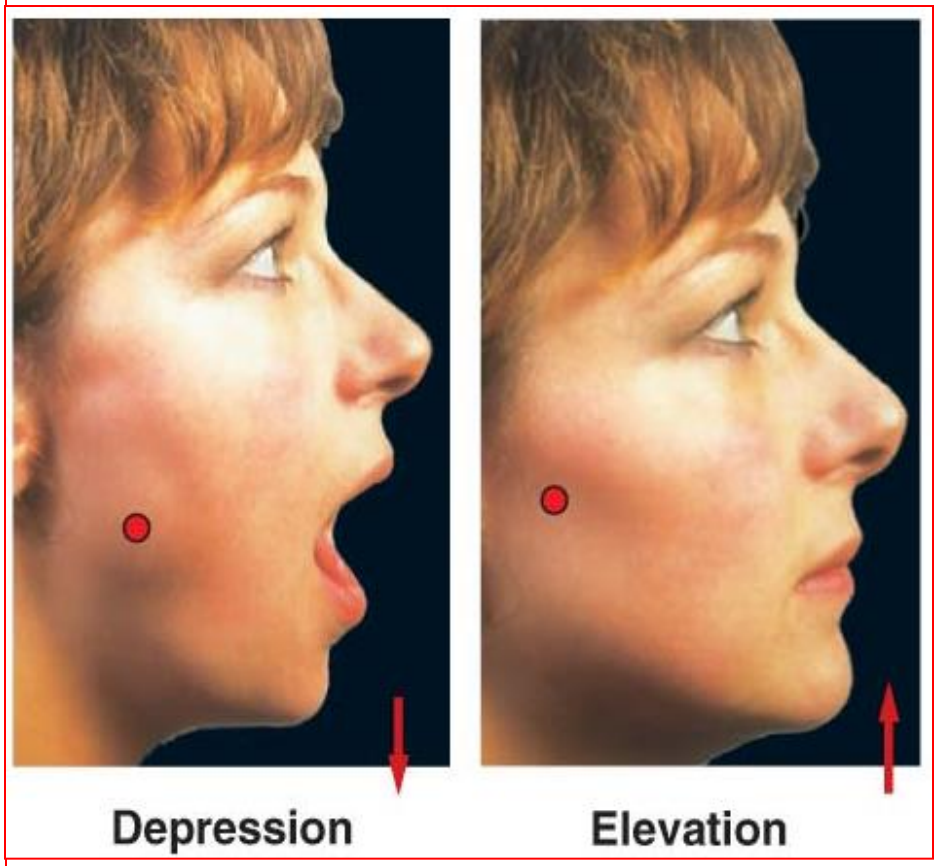
- **Protrusion** is a movement **anteriorly** (forward) as in protruding the **mandible** (chin), **lips**, or **tongue**.

- **Retrusion** is a movement **posteriorly** (backward), as in retruding the **mandible**, **lips**, or **tongue**.



# Terms of Movement

- **Elevation:**
  - Moves in **superior** direction (**up**)
- **Depression:**
  - Moves in **inferior** direction (**down**)

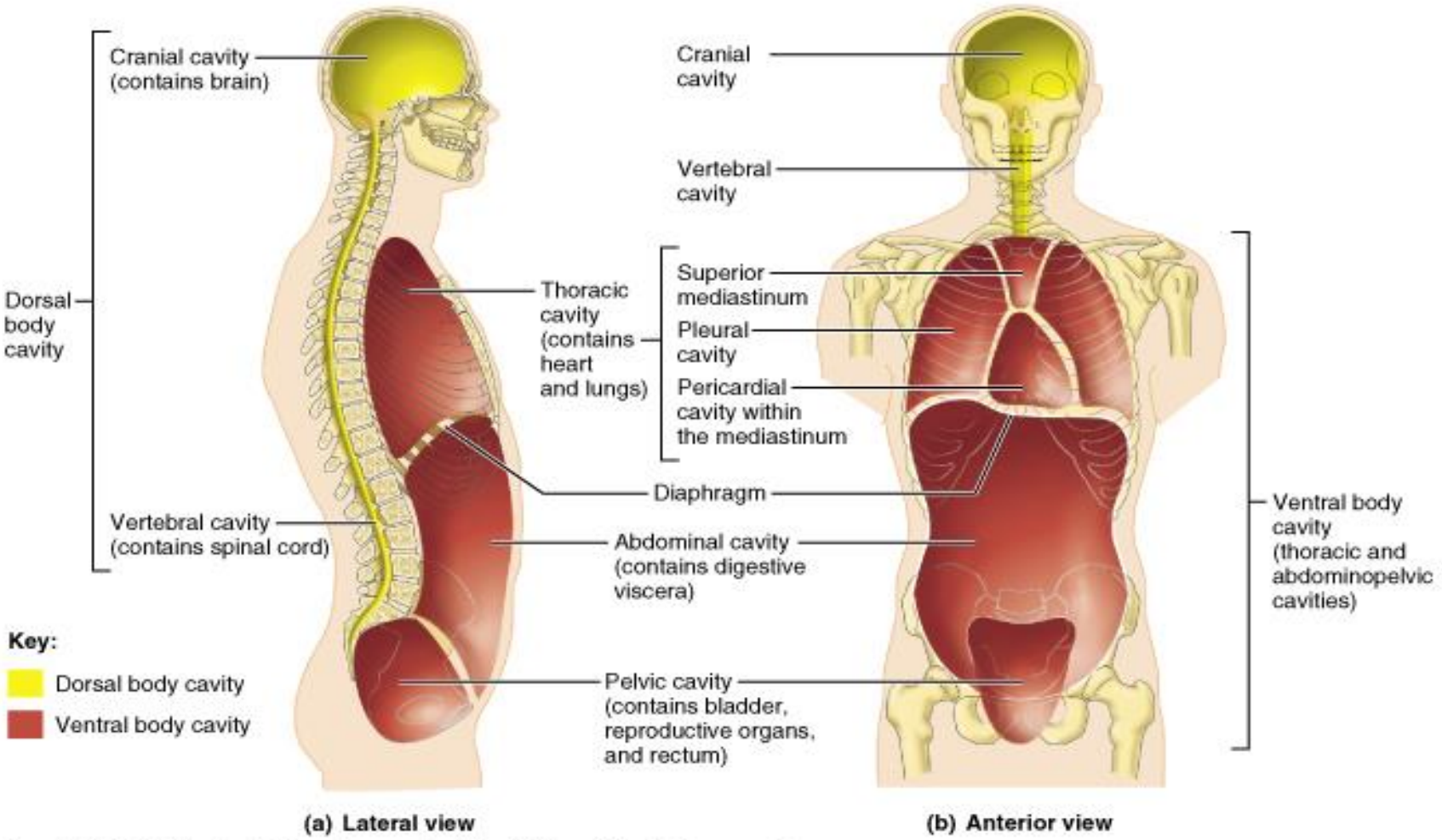


# Body cavities

- **Dorsal cavity** protects the **nervous** system, and is divided into **two** subdivisions
  1. **Cranial cavity** is within the **skull** and encases the **brain**
  2. **Vertebral cavity** runs within the **vertebral** column and encases **spinal cord**
- **Ventral cavity** houses the internal organs (**viscera**), and is divided into **two** subdivisions: - ***Thoracic*** and ***Abdominopelvic cavity***.

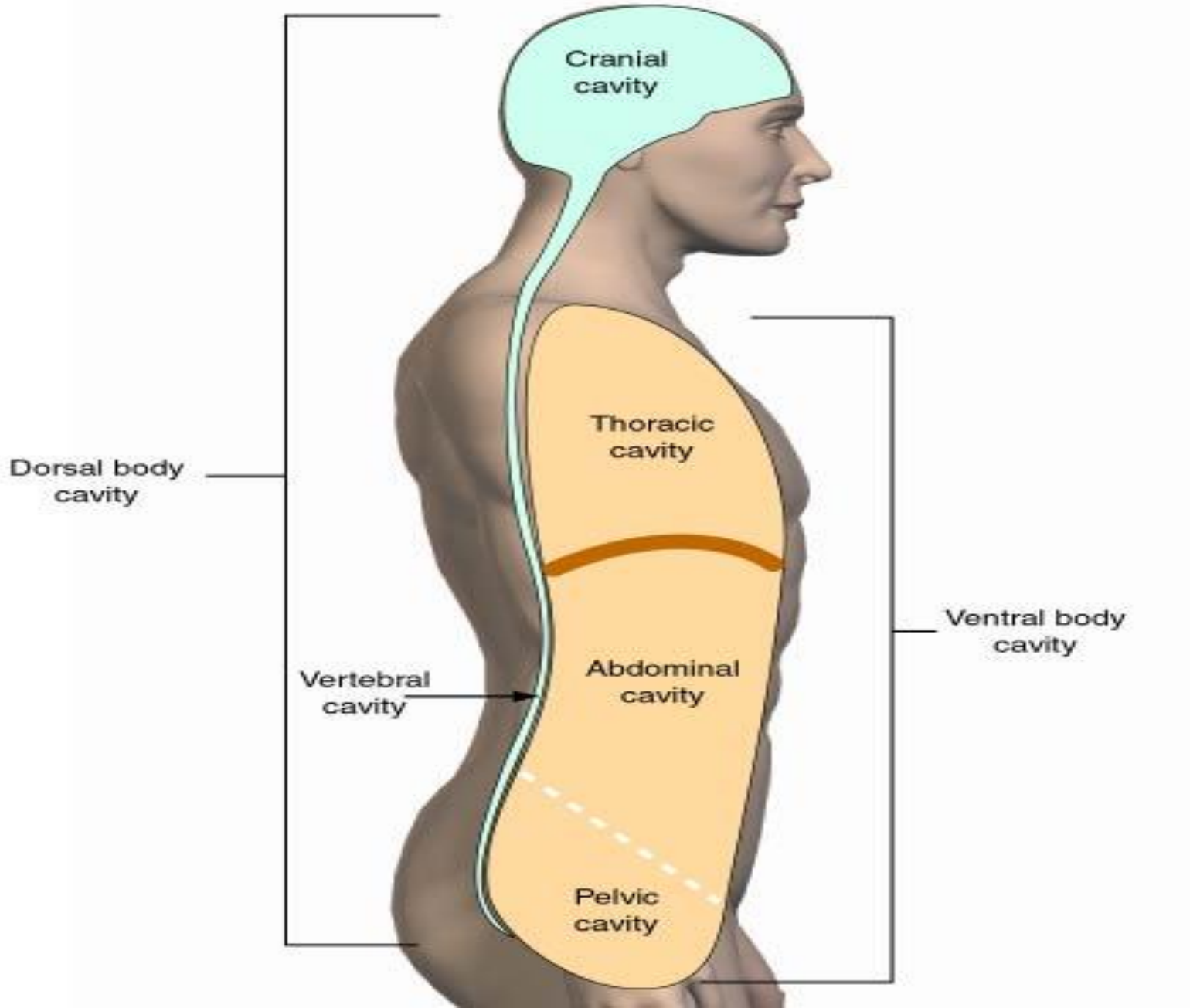
# Body Cavities

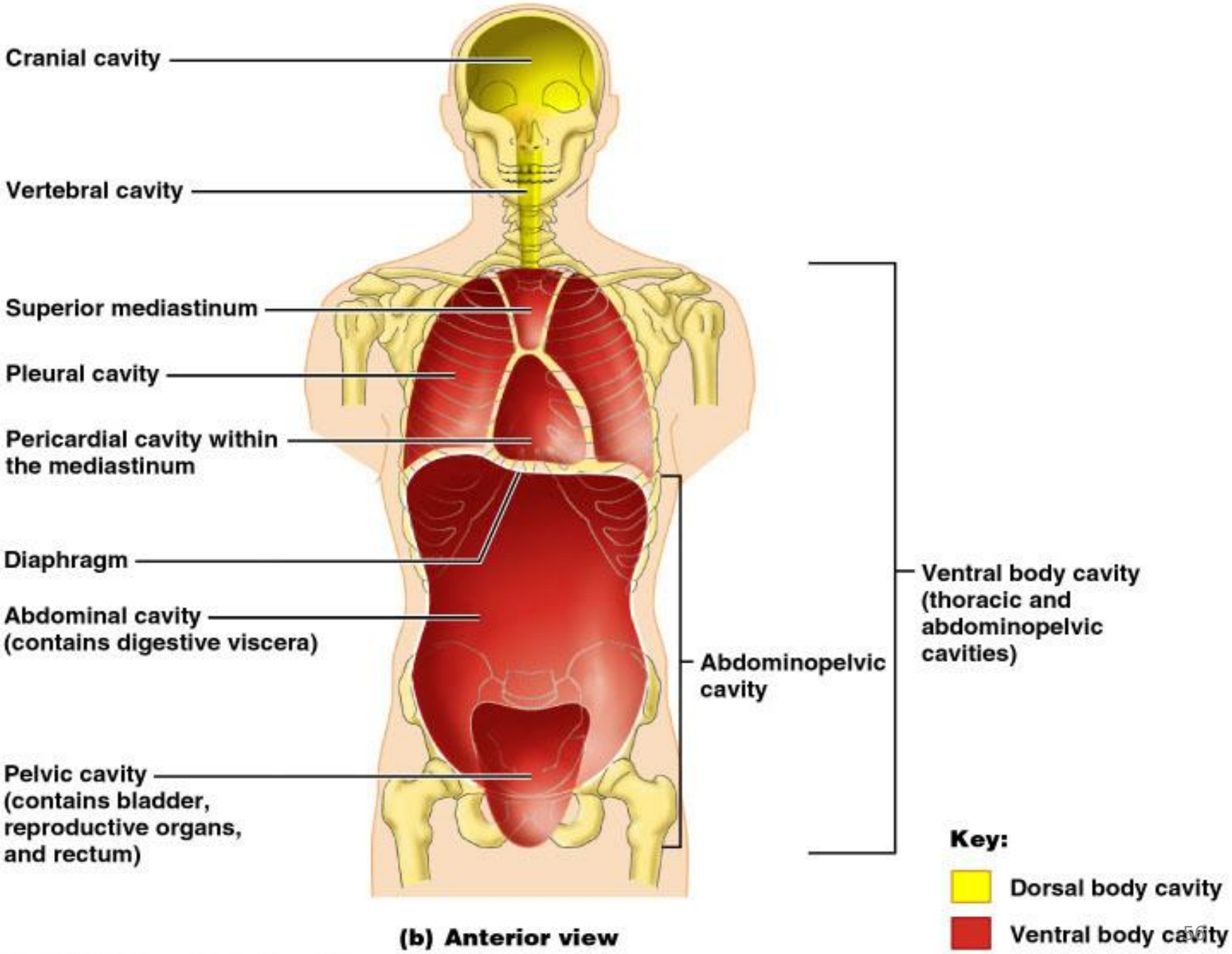
## 2 main: dorsal and ventral




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# Dorsal and Ventral Body Cavities




Cranial cavity
Vertebral cavity
Superior mediastinum
Pleural cavity
Pericardial cavity within the mediastinum
Diaphragm
Abdominal cavity (contains digestive viscera)
Pelvic cavity (contains bladder, reproductive organs, and rectum)
Abdominopelvic cavity
Ventral body cavity (thoracic and abdominopelvic cavities)
Key:
Dorsal body cavity
Ventral body cavity
(b) Anterior view

# Body cavities….

- **Thoracic cavity** is subdivided into **pleural** cavities, the **mediastinum**, and the **pericardial** cavity

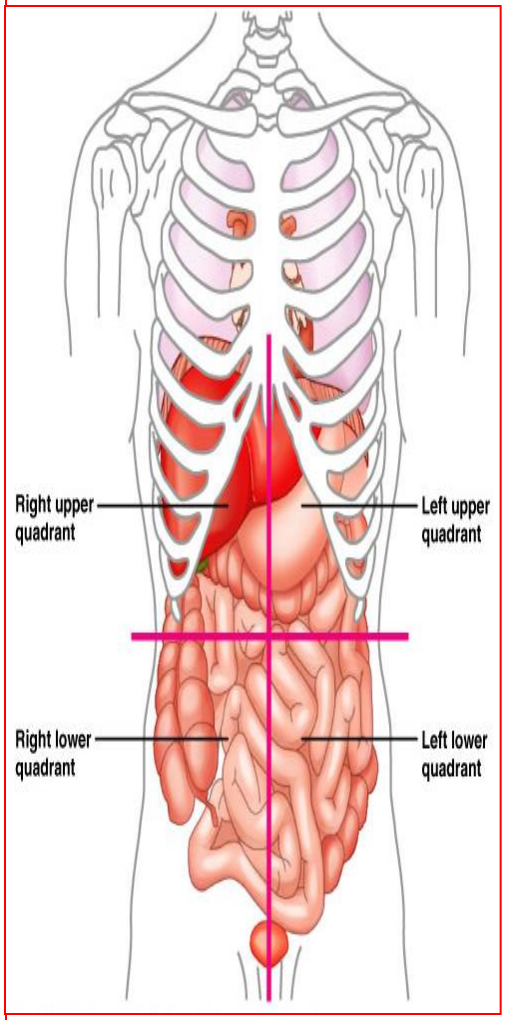
1. **Pleural cavities** – each houses a **lung.**
2. **Mediastinum** – **contains** the **pericardial cavity**, and surrounds the remaining thoracic organs.
3. **Pericardial cavity** – encloses the **heart.**

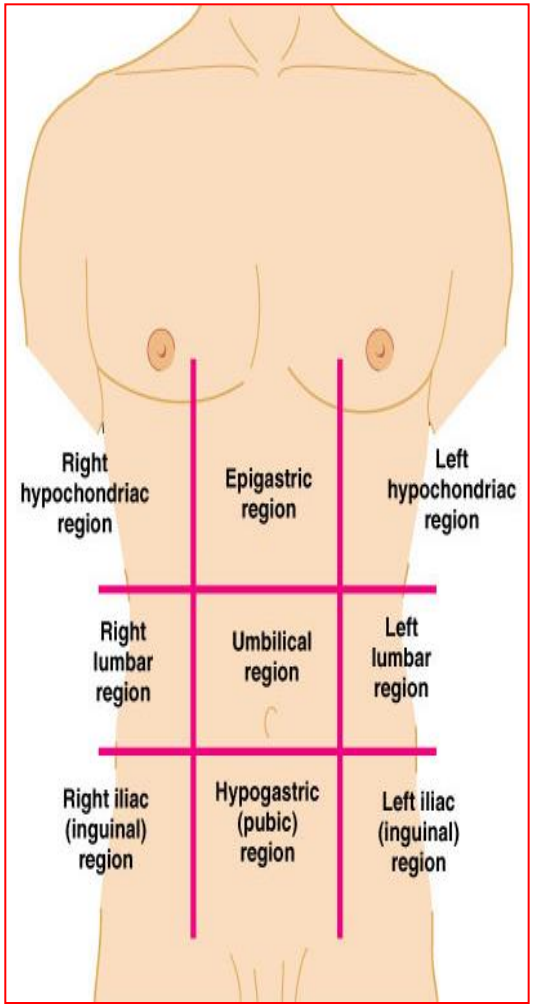
# Body Cavities….

- **Abdominopelvic** cavity is composed of **two** subdivisions
  - **Abdominal cavity** – contains stomach, intestines, spleen, liver, & other organs.
  - **Pelvic cavity** – lies within the pelvis and contains bladder, reproductive organs, and rectum.
- **Ventral Body Cavity Membranes**
  - **Parietal membrane - lines internal** body **walls**
  - **Visceral membrane - covers** the **internal organs**
- **Serous fluid**-separates the **two** membranes
  - used for **lubrication**

# Divisions of Abdominopelvic Cavity

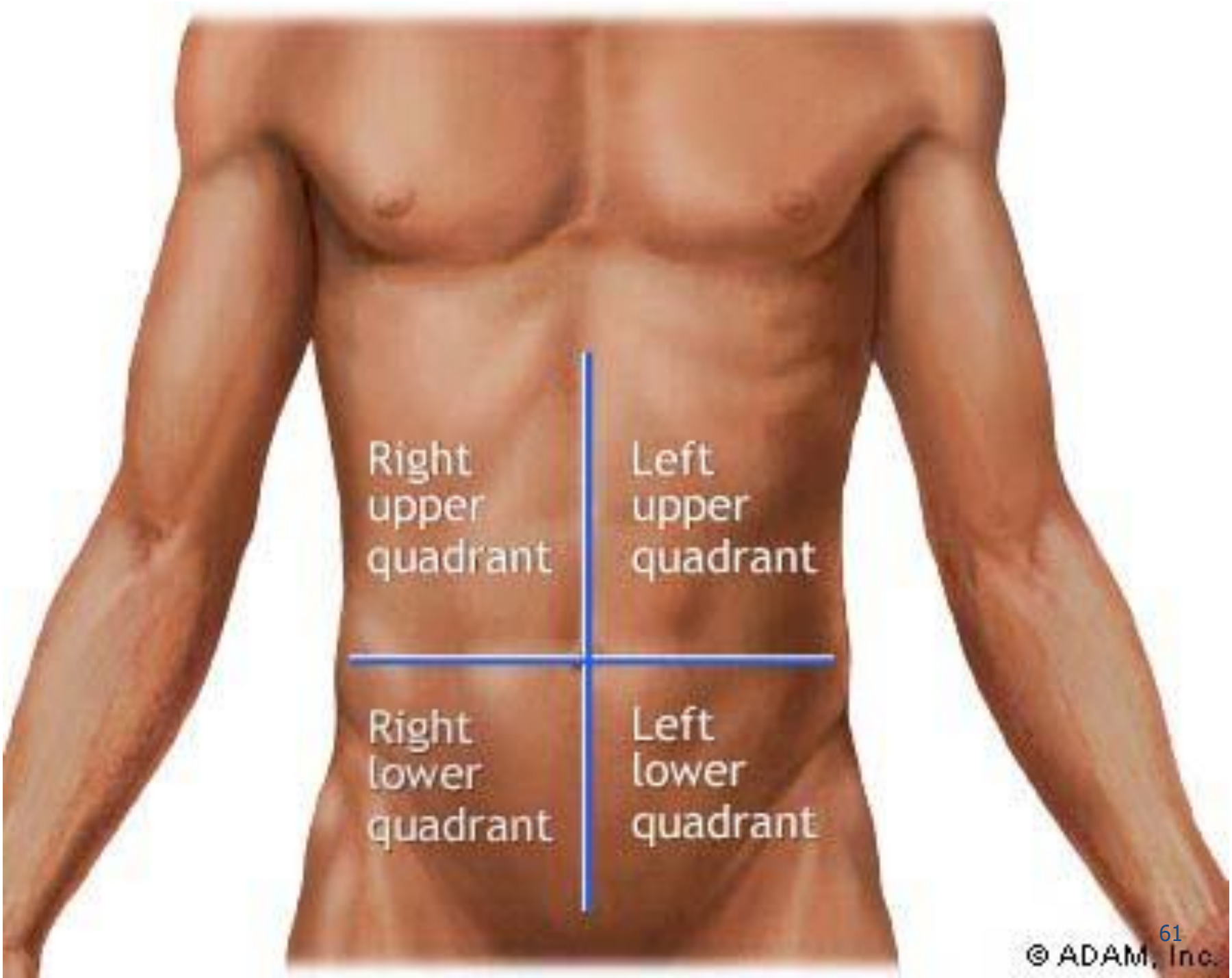
- Used to describe the **location** of abdominal **organs** and the **pain** associated with abdominal problems.
- The **two schemes** most often used are:
  1. **Four-quadrant pattern**
  2. **Nine-region organizational description**



# Subdivisions of abdominal cavity: quadrants

- For general clinical descriptions, clinicians use 4 quadrants defined by 2 planes
  - Transumbilical plane: passing through umbilicus and disc between L3 and L4 vertebrae
  - Median plane: longitudinal plane dividing the body into right and left halves

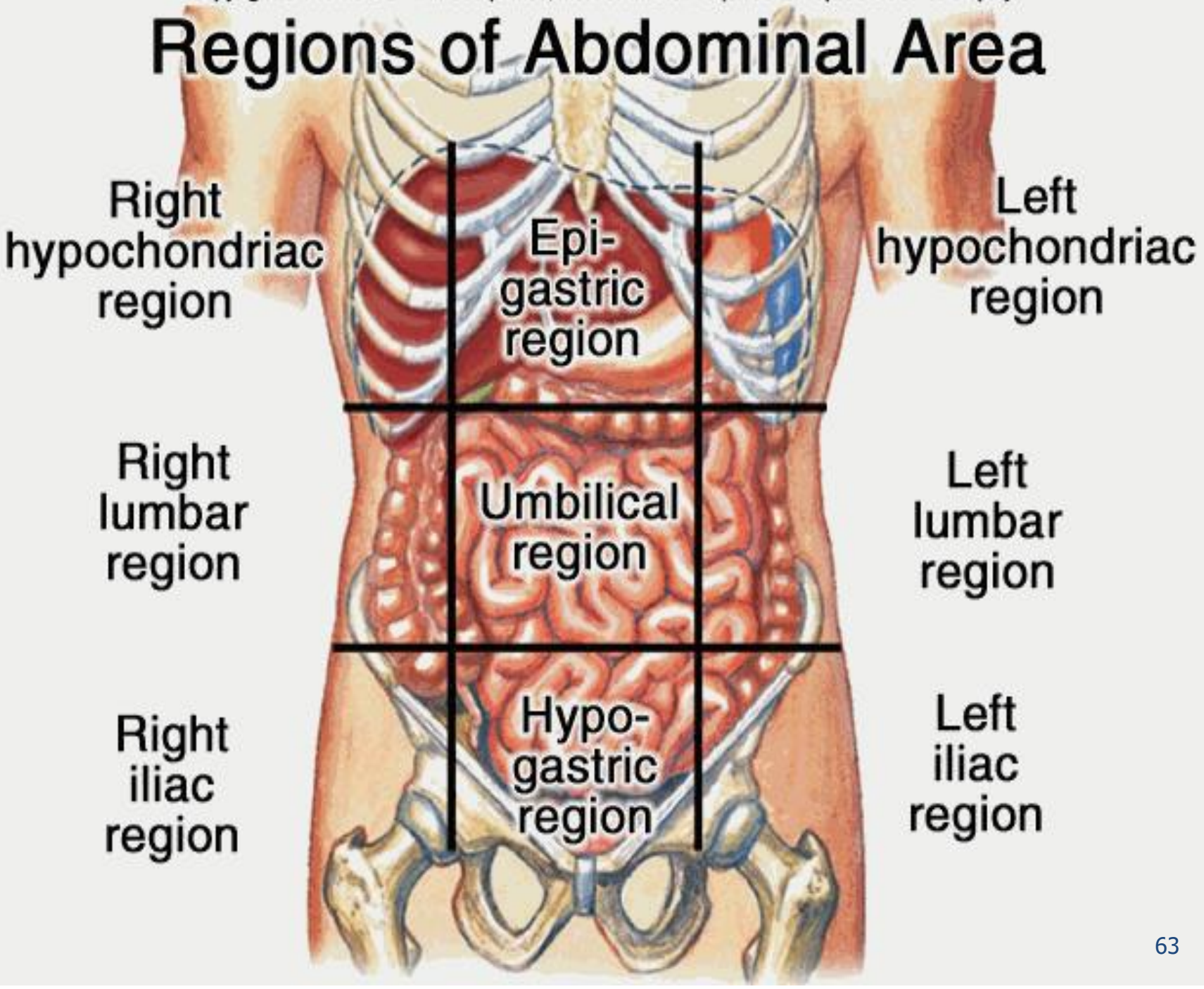

Right upper quadrant
Left upper quadrant
Right lower quadrant
Left lower quadrant
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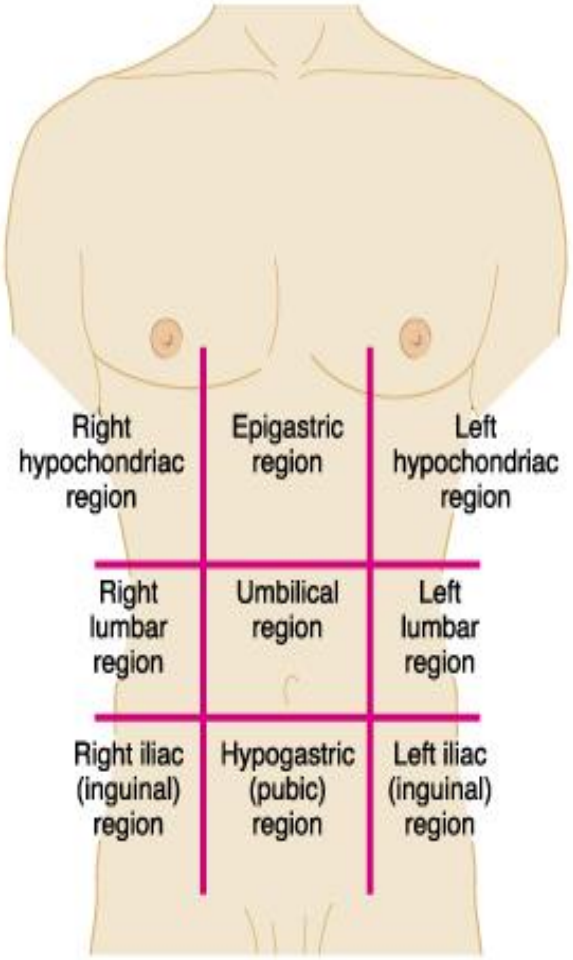
# Subdivisions of abdominal cavity: regions

- Clinicians subdivide abdominal cavity into 9 regions to locate abdominal organs or pain sites
- Delineated by 4 planes
- Two horizontal
  - Subcostal plane: passing through inferior border of 10th costal cartilage
  - Transtubercular plane: passing through iliac tubercles and body of L5 vertebra
- Two vertical
  - Midclavicular planes: passing from midpoints of clavicles to midinguinal points

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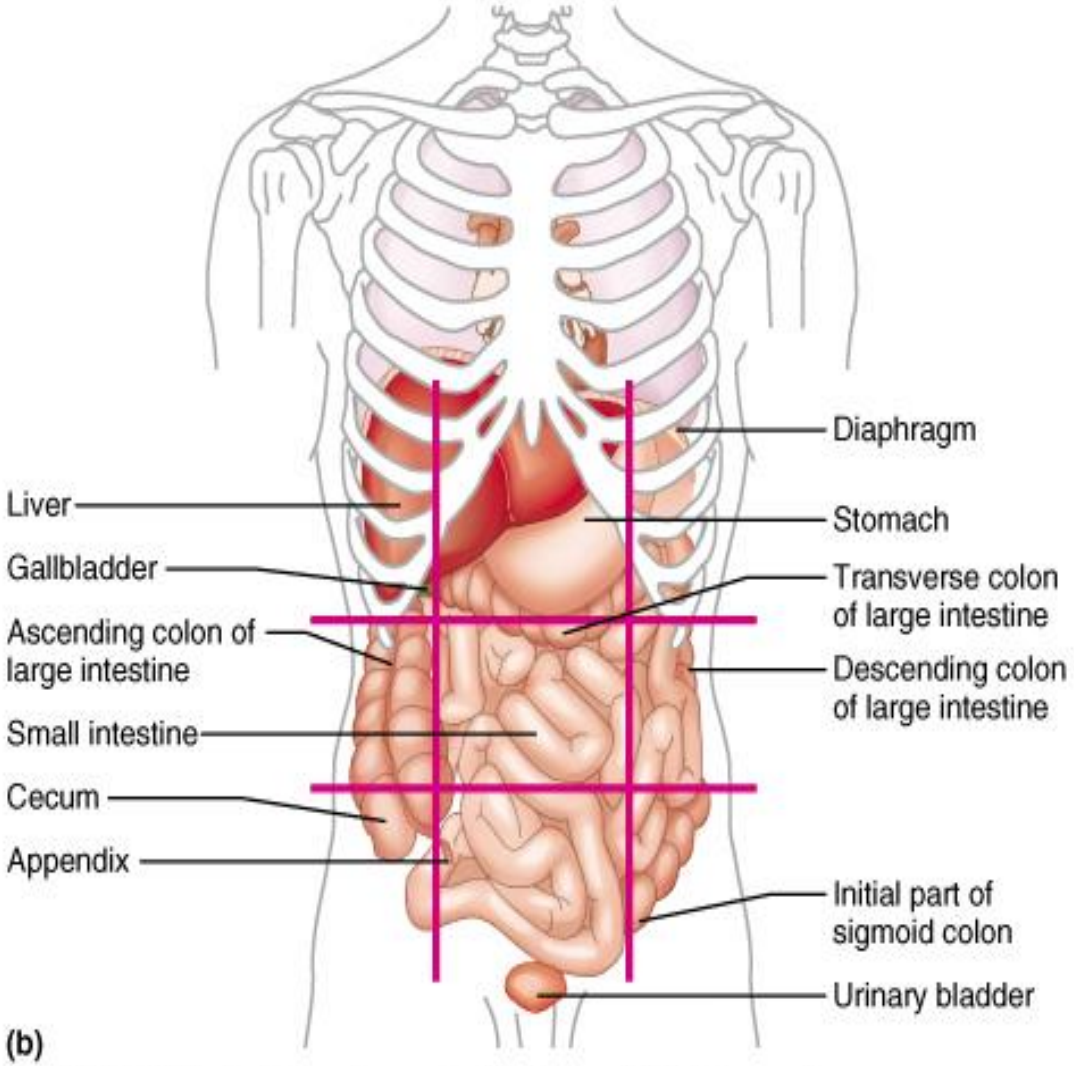
# Regions of Abdominal Area






(a)

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(b)

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**MEMBRANES -**flat sheets of pliable tissue that cover or line the body or a parts of the body.

A. MUCOUS MEMBRANE (MUCOSA)-lines a body cavity that opens directly to the outside (digestive, respiratory etc.)

**Functions:**

- Protection-tight junctions between cells prevent leakage and is hard for microbes to penetrate
- Secrete mucus, which keeps the membrane moist and provides lubrication
- Cells secretes digestive enzymes and are the site of absorption of digested micronutrients.

B. SEROUS MEMBRANES (serosa)-lines a body cavity that does not open directly to the outside and covers organs in the cavity

- Cover both the walls of internal cavities (parietal layer) and the visceral organs themselves (visceral layer), and b/n the two layers is the **cavity**

- Serous membrane secrete a watery lubricant in to the cavity that reduces friction, allowing organs to expand and contract freely.

Serous membranes include:

1. **Pleura** is the serous membrane enclosing the lung
   a. Parietal pleura lines wall of the cavity
   b. Visceral pleura covers organs surface
2. **Peritoneum** is the serous membrane of the abdominal cavity
   a. Parietal peritoneum lines the abdominal wall internally
   b. Visceral peritoneum covers abdominal organs
3. **Pericardium** is the membrane that covers the heart

**C. SYNOVIAL MEMBRANES** -line the cavities of freely movable joints. They secrete synovial fluid which lubricates the joint and nourished the cartilage.

Synovial membranes also forms:

**Bursa** -cushioning fluid filled sacs outside but near the joint (b/n tendons, b/n tendons & bones or joints)

**Tendon sheaths-** envelope tendons as they cross joints so as to ease movement

**D. CUTANEOUS MEMBRANE-** outer limiting membrane of the body, which is the **skin**




# THANK YOU !!!