

INTRODUCTION

HUMAN ANATOMY

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Reading materials

- Marieb Human Anatomy 6th Edition
- Netter Human Atlas
- Grays Human Anatomy 3rd Edition
- Junqueira Histology Text book and Atlas 13 edition
- Clinical Oriented Anatomy 7th edition
- Snell Clinical Anatomy 9th Edition

INTRODUCTION

- The word **Anatomy** is derived from a Greek word: “**Anatome**”
 - **Ana** → apart, up
 - **Tome** → cutting
- = **Meaning cutting apart, divide or dissect.**
(**Dissection derived from the Latin word *dissecare***)
- The science that deals with the **structure** of the body

Definition Of Anatomy

Modern definition -The study of normal structures of the body and their relationship.

- Relationships revealed by dissection (cutting apart) & imaging techniques

Subdivision of Anatomy

- Microscopic Anatomy
- Macroscopic (Gross) Anatomy

Divisions Of Anatomy

1. Gross (macroscopic) Anatomy

- Study of Human body/its parts **without microscope**
 - It is studied by means of **dissection** of the body.
- **Regional or Topographic Anatomy**
 - Study of anatomy of certain **related parts or divisions** of body
 - **Systemic Anatomy**
 - Anatomy of the **systems** of the body
 - **Surface anatomy**
 - **Surface markings** of the body to understand internal anatomy through **visualization** and **palpation** (gentle touch)

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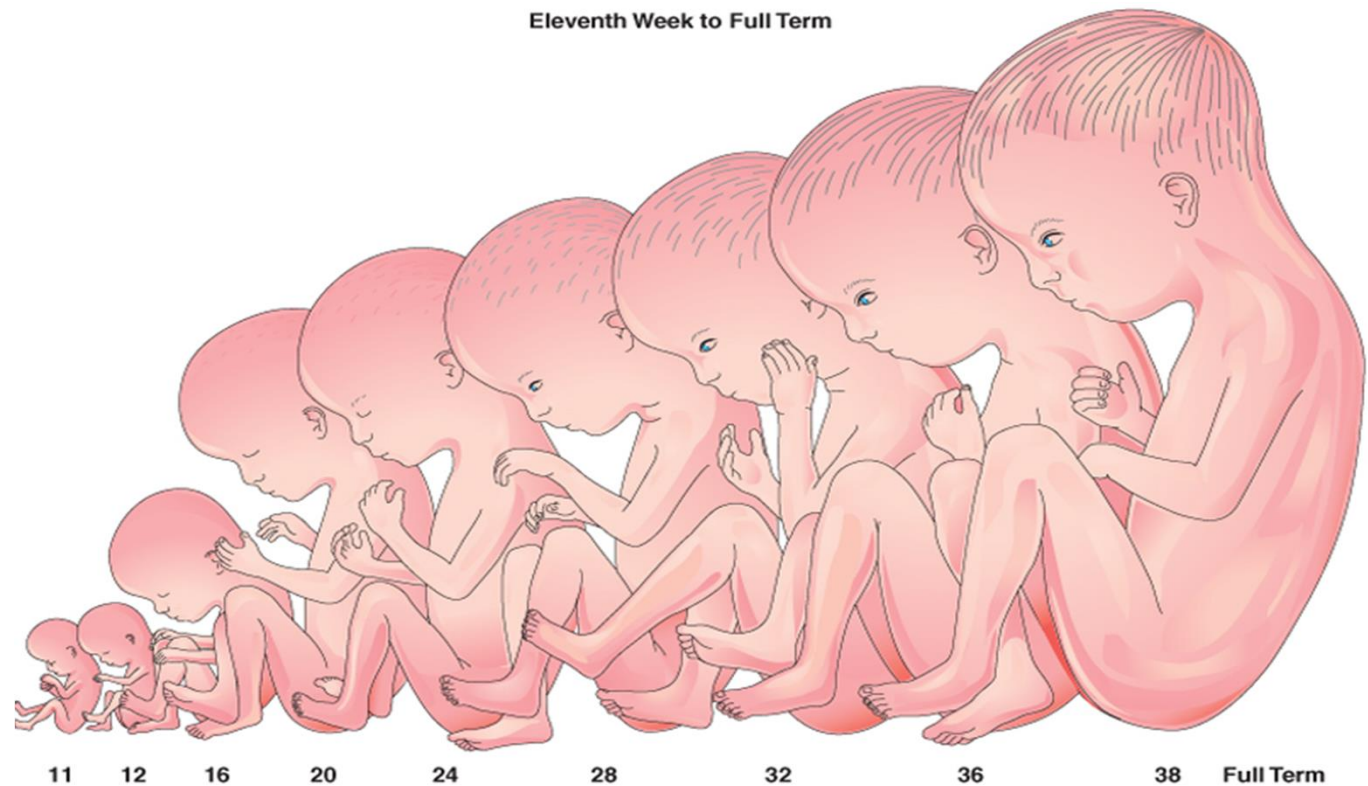
2. Microscopic Anatomy

- Study of cell , tissue and organs **using microscope**
- **Cytology** - study of cell
- **Histology** - study of tissue

Cont'

3. Developmental Anatomy

- Structural changes of an individual from fertilization to adulthood. Includes :
 - Embryology
 - Postnatal development



Cont'

4. Other divisions

Ultra structural Anatomy

- **Ultramicroscopic study of structures** too small to be seen with a light microscope.

Radiological Anatomy

- Study of body using **radiographs** (i.e. x-rays, CT Scan, MRI)
- They provides useful information about normal structures in living individuals, as affected by muscle tone, body fluids and pressures, and gravity;
- Diagnostic radiology reveals the effects of trauma, pathology, and aging on normal structures

Cont'

Pathological Anatomy

- **Gross and microscopic** study of organs and tissues removed for **biopsy** or during **Post-mortem exam.**
- Study of **structural changes caused by diseases.**

Surgical Anatomy

- Applied anatomy in reference to **surgical diagnosis and treatment.**

Physiological Anatomy

- Anatomy studied **in relation to function**

Approach To Study Anatomy

- The three main approaches to studying anatomy are:
 - ✓ Regional
 - ✓ Systemic, and
 - ✓ Clinical (applied)

Approach To Study Anatomy

1. Regional approach

- Method of studying the body's structure by focusing attention on a specific part (e.g., the head), region (the face), or subregion (the orbit);
- All the major parts may be further subdivided into regions and zones.
- Used mostly in **DR** & useful for physicians & surgeons

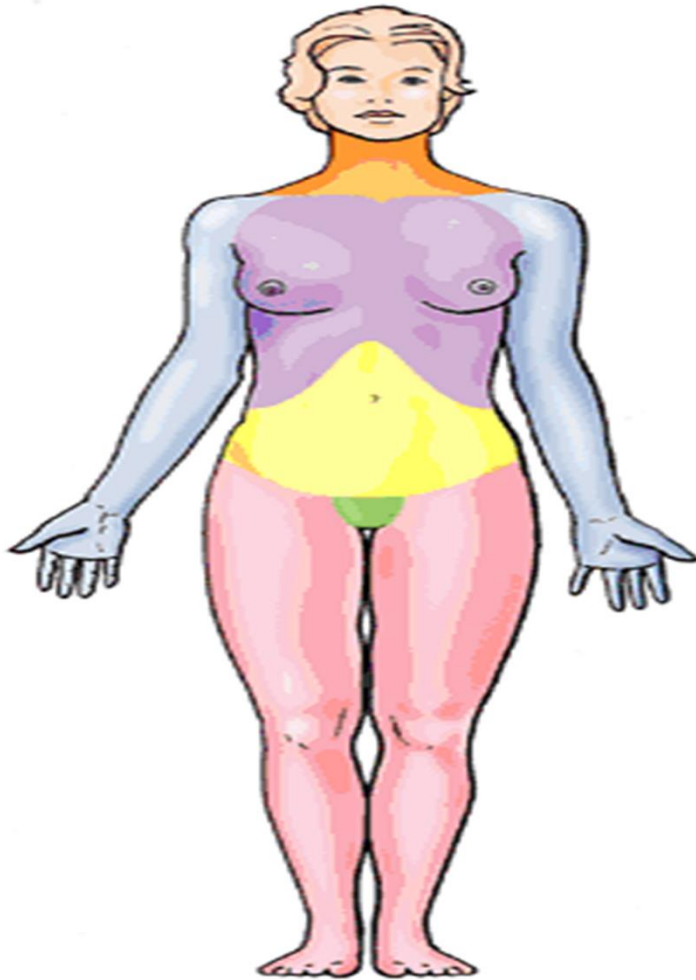
Key

Head
Neck

Thorax
Back

Abdomen
Pelvis/perineum

Lower limb
Upper limb



Anterior view



Posterior view

Cont'

2. Systemic approach

- Each **system** of the body is studied and followed throughout the entire body.
- For example, a study of the **cardiovascular system** looks at the heart and all of the blood vessels in the body.
- This approach continues for the whole body until every system is covered
(i.e. **the nervous system. the skeletal, muscular, gastrointestinal, respiratory, lymphatic e.t.c)**)

3. Clinical(Applied Anatomy)

- Emphasizes aspects of bodily structures and function important in the practice of medicine.
- It incorporates the regional and systemic approaches
- Clinical anatomy often involves inverting or reversing the thought process typically followed when studying regional or systemic anatomy
- For example, instead of thinking, “The action of this muscle”, clinical anatomy asks, “How would the absence of this muscle's activity be manifested?”

N.B Each of these approaches has benefits and deficiencies

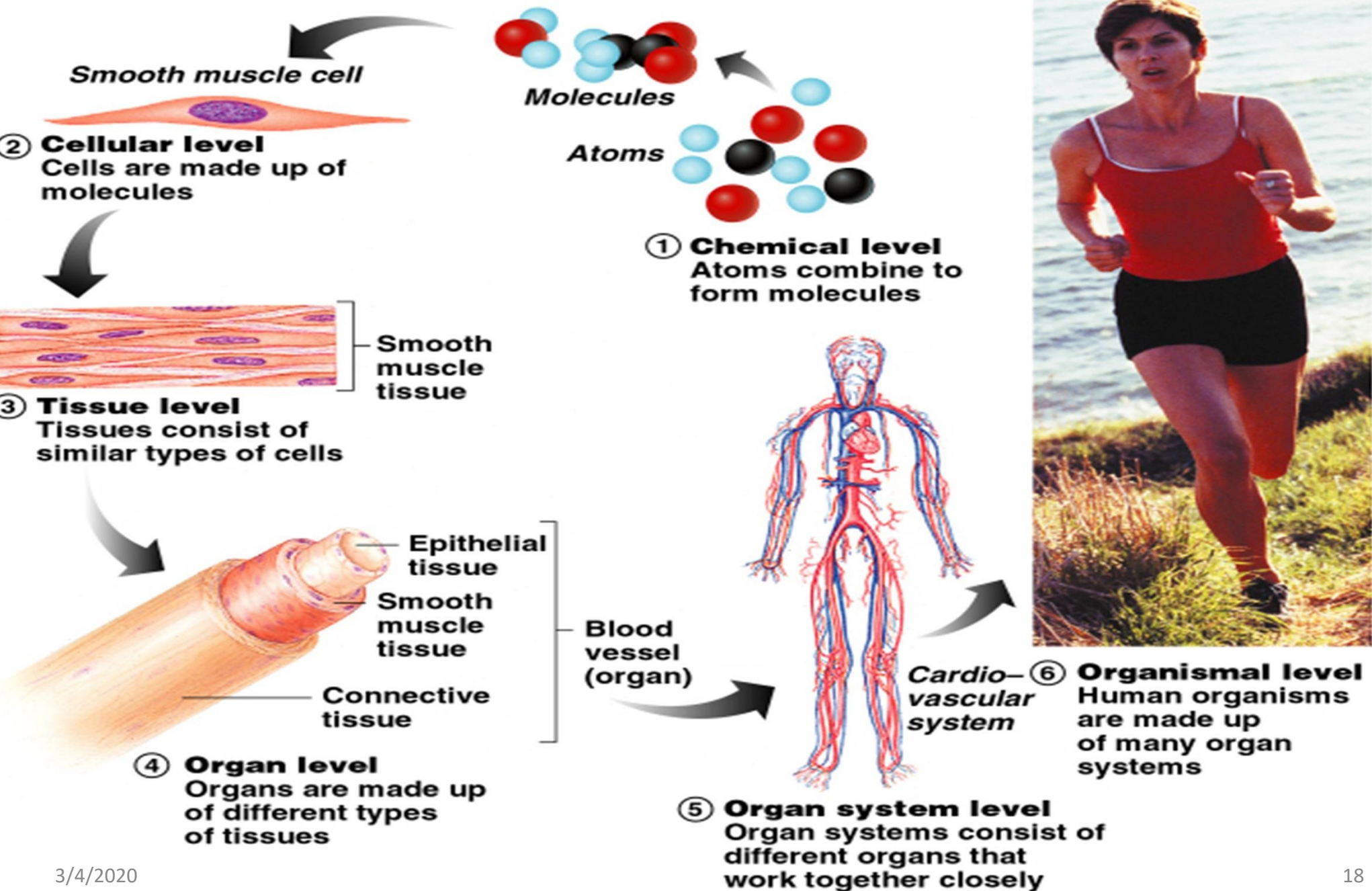
Levels of Structural Organization of Human Body

Levels of Organization

- **Chemical/Molecular** (simple)
- **Cell**
- **Tissue**
- **Organ**
- **Organ System**
- **Organism**



(complex)



Levels of Organization

- **Chemical/Molecular**

- Over a dozen different elements in the body
- Four of them make up 99 percent of the body
 - Hydrogen, oxygen, carbon, and nitrogen
- Major classes of compounds
 - Water
 - Carbohydrates
 - Proteins
 - Lipids

Levels of Organization

- **Cell**

- The smallest living unit in the body
 - Consists of organelles

- **Tissue**

- Groups of similar cells with a common function form **tissue**.
- Tissues are precise organizations of similar cells that perform **specialized functions**.
- four type of tissue:
 - epithelial, muscular, neural, and connective tissue

Levels of Organization

- **Organs**
 - Different tissue types that work together to perform **specific, complex functions** form an **organ**.
- **Organ Systems**
 - The organ system level consists of related organs that work together to coordinate activities and achieve a **common function**.
 - There are 11 organ systems in the human body.

Levels of Organization

- **Organism**
 - All body systems function **interdependently** in a single living human being, the organism.

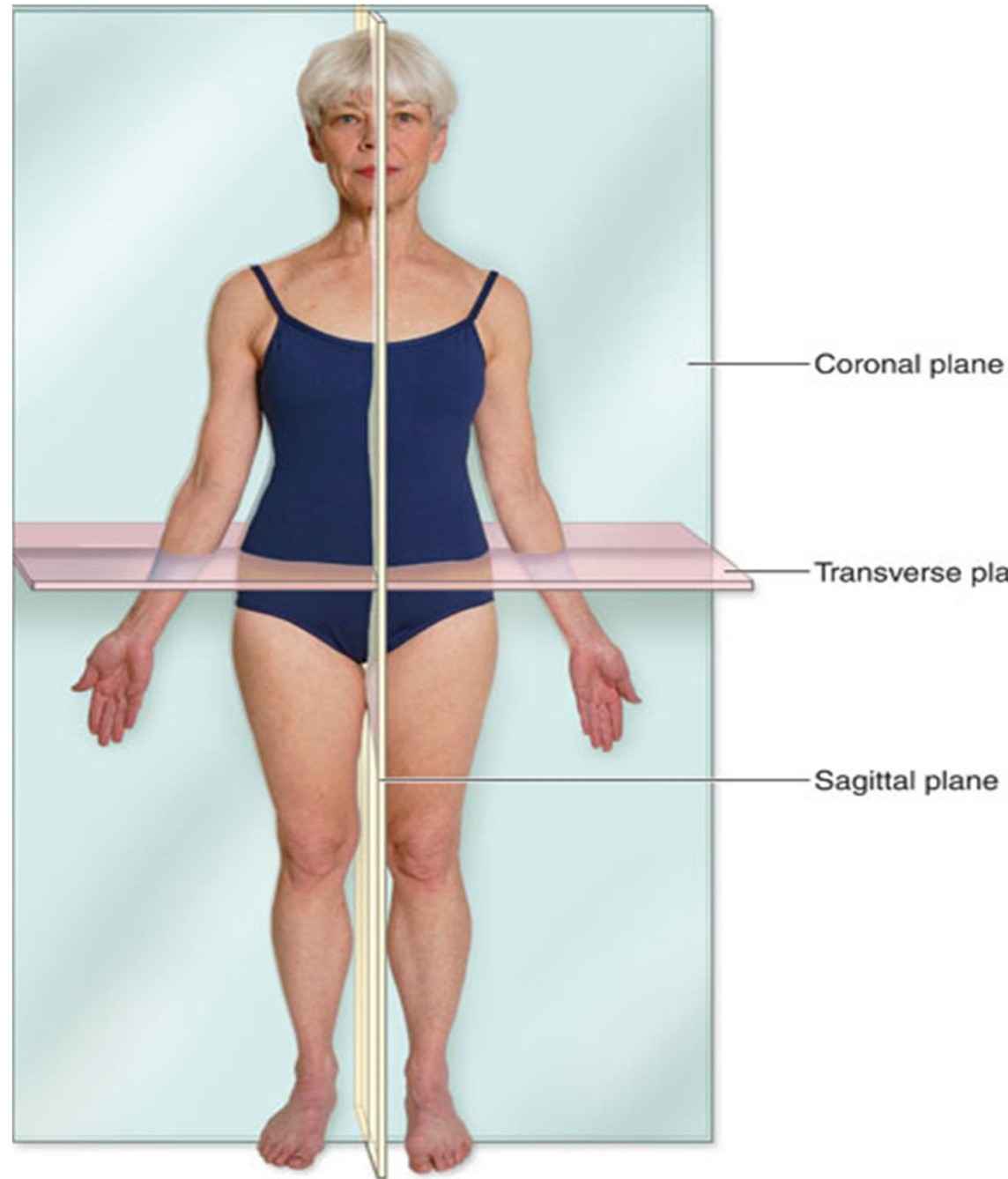
BASIC ANATOMICAL TERMINOLOGY

Anatomic Position

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

✓ By using this any part of the body can be related to any other part



Anatomic Position

The body is in the anatomical position when

- Standing upright with feet together
- The toes point forward
- Hands by the side and face looking forward
- The palms of the hands face forward
- The mouth is closed
- The eyes are 'open' and focused on something in the distance and
- The facial expression is neutral.



Anterior view



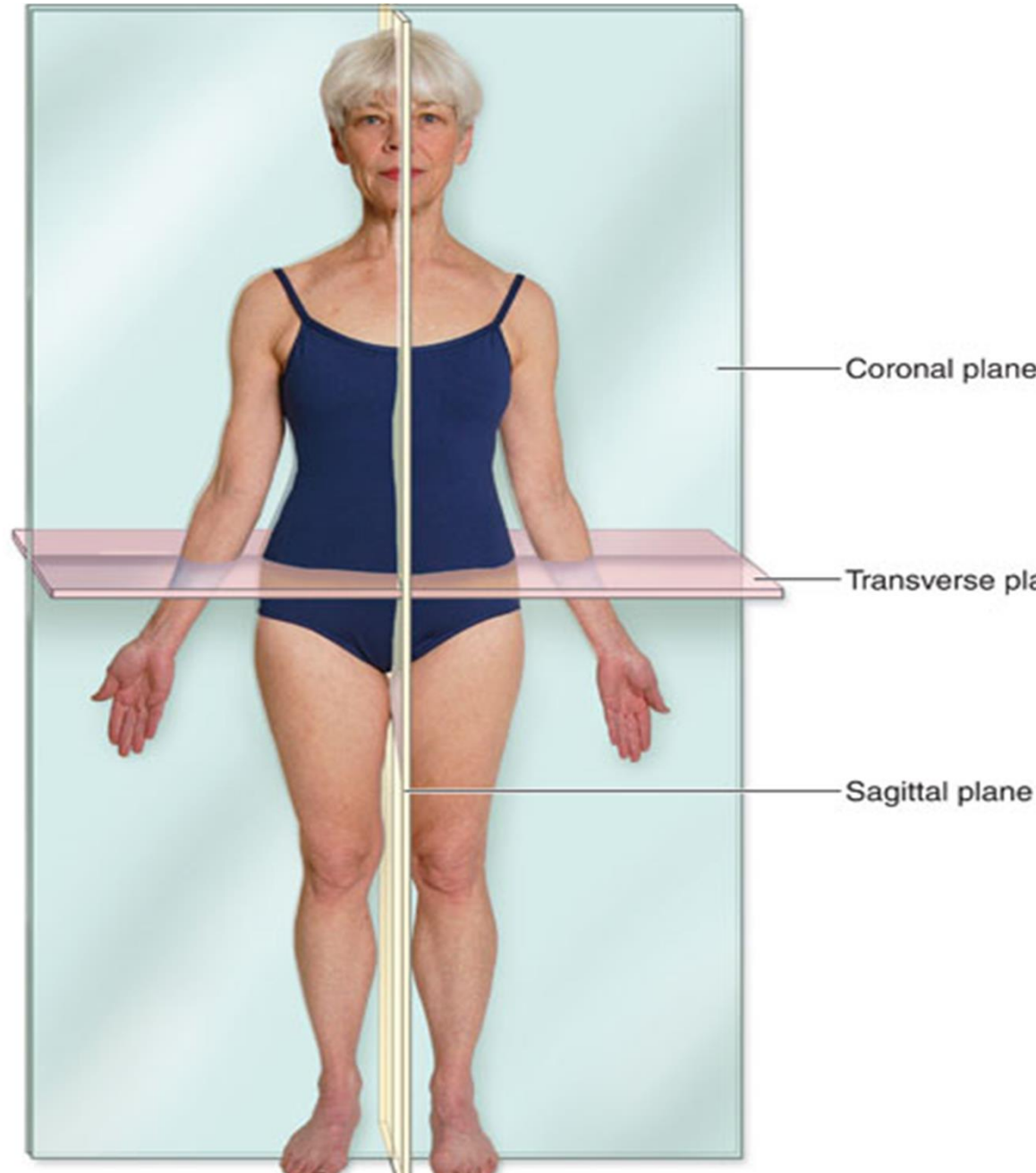
Posterior view

Anatomical Planes

A **plane** is an imaginary surface that slices the body into specific sections.

The three major anatomical planes of reference are

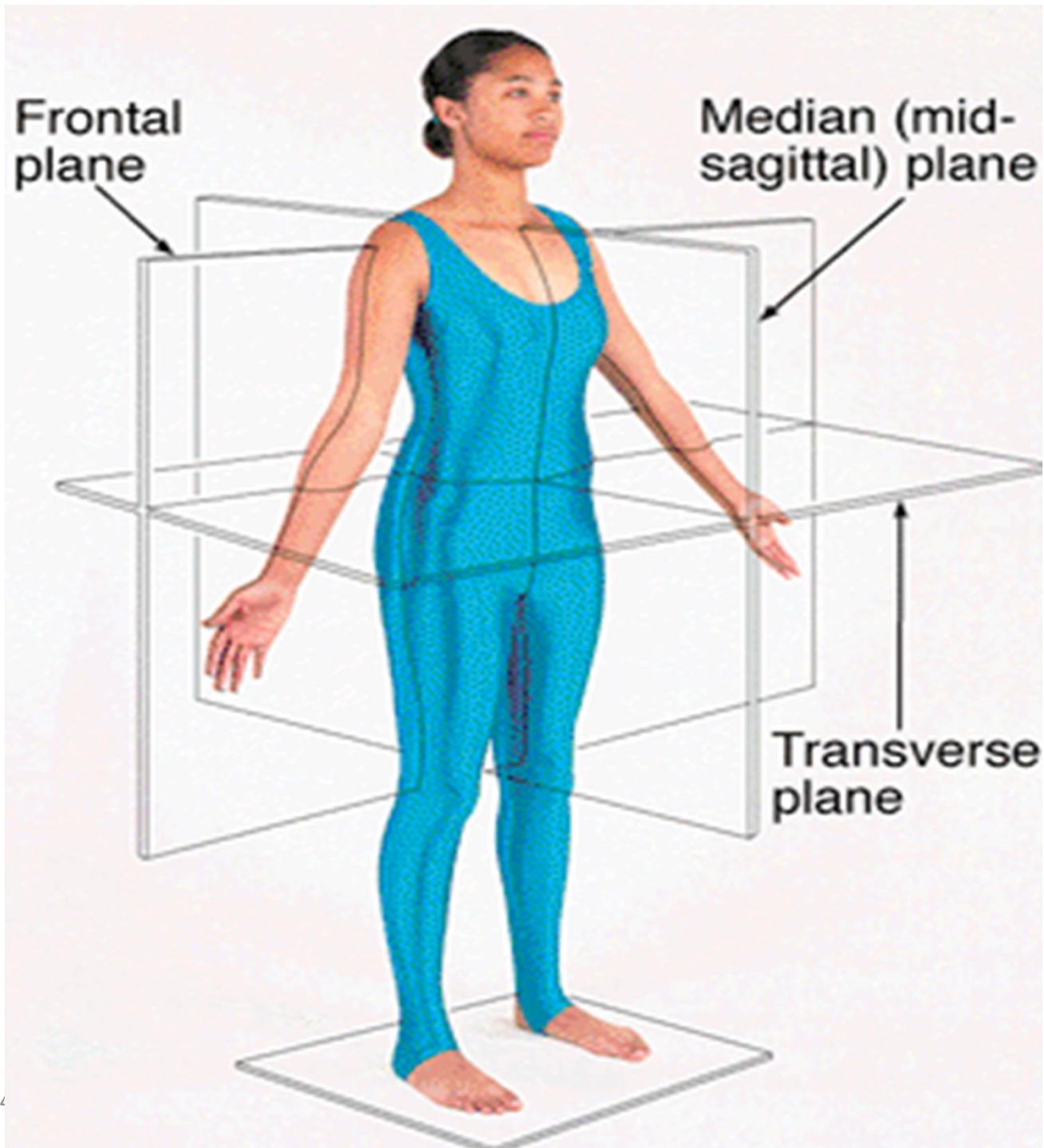
- **Coronal,**
- **Transverse, and**
- **Sagittal** planes.



Anatomical Planes

Sagittal Plane

- ✓ Divide the body into right and left parts
- ✓ Parallel to sagittal suture of skull
 - **Median sagittal (midsagittal, median plane or plane of symmetry) → divides the body into equal right & left sides**
 - **Parasagittal planes → planes parallel to it and divides the body (organ) into unequal right & left sides**



Anatomical Planes

Coronal (Frontal) Plane

- It divides the body longitudinally into anterior & posterior parts
- Situated in the direction of the coronal suture of the skull.

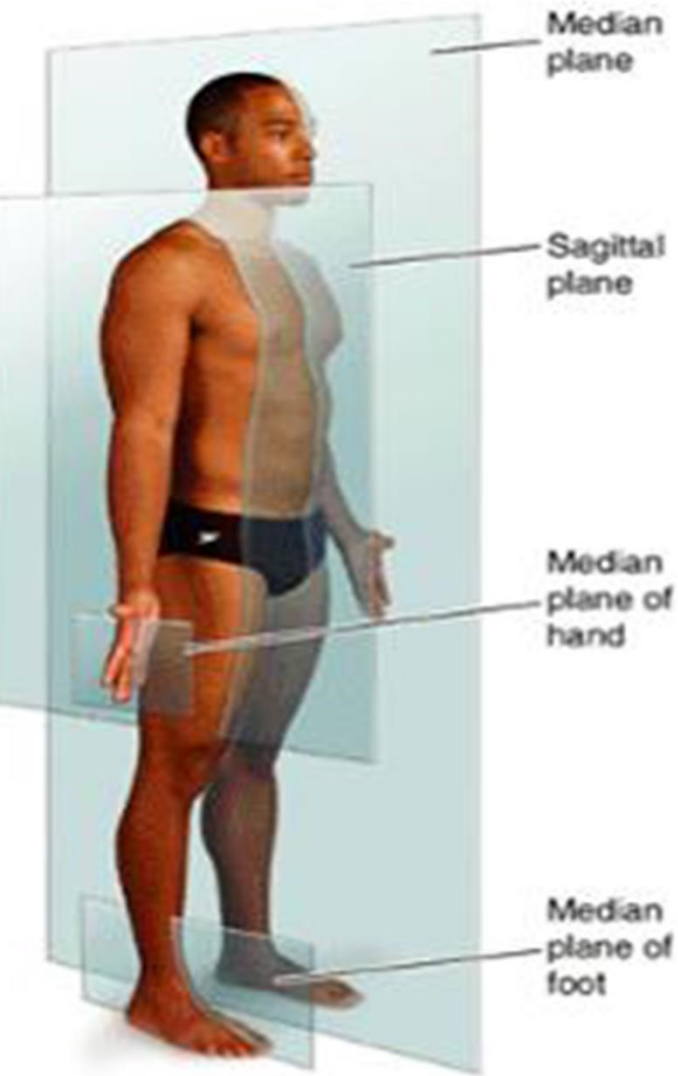
Horizontal Plane

- a transverse plane which runs horizontally at a right angle to the vertical plane
- It divides the body into upper & lower parts

Oblique Plane

- Passes through the body at an angle b/n transverse, sagittal or coronal plane

Anatomical Planes



Terms of Relationship and Comparison

- ▶ Various adjectives, arranged as pairs of opposites, describe the relationship of parts of the body in the anatomical position and compare the position of two structures relative to each other

Terms of Relationship and Comparison

- ▶ **Medial** is used to indicate that (in the anatomical position) a structure, such as the 5th digit of the hand (little finger), is nearer to the median plane of the body than the other digits
- ▶ **Lateral** stipulates that a structure, such as the 1st digit of the hand (thumb), is farther away from the median plane
- ▶ **External** and **internal** mean **farther** from and nearer to the center of an organ or cavity, respectively, **regardless of direction**.

Terms of Relationship and Comparison

- ▶ **Posterior** (dorsal) denotes the back surface of the body or nearer to the back
- ▶ **Anterior** (ventral) denotes the front surface of the body
- ▶ **Caudal** (L. cauda, tail) is a useful directional term that means toward the tail region, represented in humans by the coccyx, the small bone at the inferior (caudal) end of the vertebral column

Terms of Relationship and Comparison

- ▶ **Inferior** refers to a structure that is situated nearer the sole of the foot
- ▶ **Superior** refers to a structure that is nearer the vertex, the topmost point of the cranium
- ▶ Cranial relates to the cranium and is a useful directional term, meaning toward the head.

Terms of Relationship and Comparison

- ▶ **Proximal** and **distal** are used when contrasting positions nearer to or farther from the attachment of a limb or the central aspect of a linear structure, respectively

Terms of Relationship and Comparison

- ▶ **Dorsum** usually refers to the superior or posterior (back) surface of any part that protrudes anteriorly from the body, such as the dorsum of the tongue, nose, penis, or foot
- ▶ It is also used to describe the back of the hand.
- ▶ **The palm** refers to the flat of the hand, exclusive of the thumb and other fingers, and is the opposite of the dorsum of the hand

Terms of Laterality

- ▶ **Bilateral:** Paired structures having right and left members (e.g., the kidneys)
- ▶ **Unilateral:** those structures occurring on one side only (e.g., the spleen)
- ▶ **Ipsilateral** refers to something occurring on the same side of the body as another structure;
- ▶ **Contralateral:** means occurring on the opposite side of the body relative to another structure; the right hand is contralateral to the left hand

Terms of Movement

- ▶ Various terms describe movements of the limbs and other parts of the body
- ▶ While most movements occur at joints where two or more bones or cartilages articulate with one another

Terms of Movement

- ▶ **Flexion** indicates bending or decreasing the angle between the bones or parts of the body.
- ▶ **Dorsiflexion** describes flexion at the ankle joint, as occurs when walking uphill or lifting the toes off the ground.
- ▶ **Plantarflexion** turns the foot or toes toward the plantar surface (e.g., when standing on your toes)

Terms of Movement

- ▶ **Extension** indicates straightening or increasing the angle between the bones or parts of the body
- ▶ Extension usually occurs in a posterior direction, but extension of the knee joint occurs in an anterior direction
- ▶ Extension of a limb or part beyond the normal limit- **hyperextension** (overextension) can cause injury

Movements

Flexion

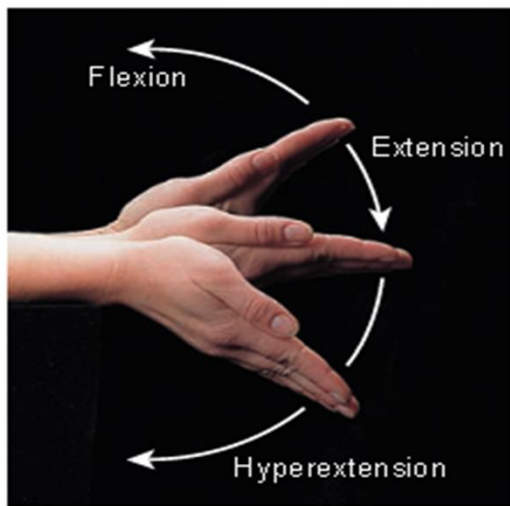
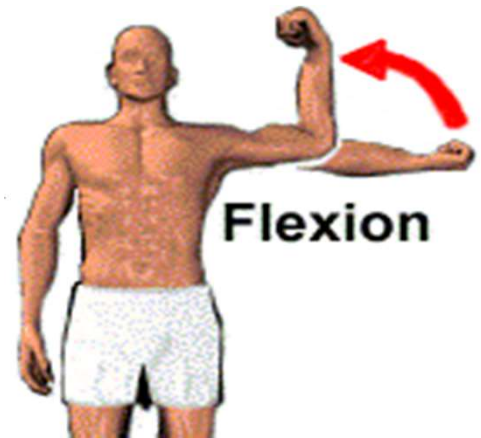
- Bending a joint or decreasing the angle between two bones

Extension

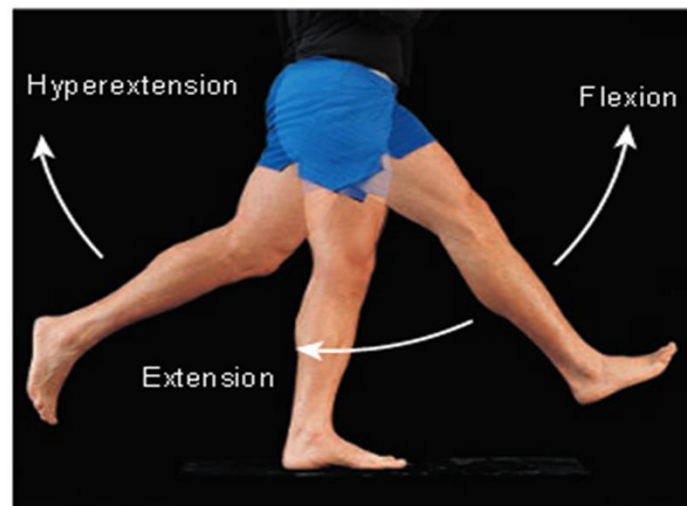
- Straightening a joint or increasing the angle between two bones

Hyperextension

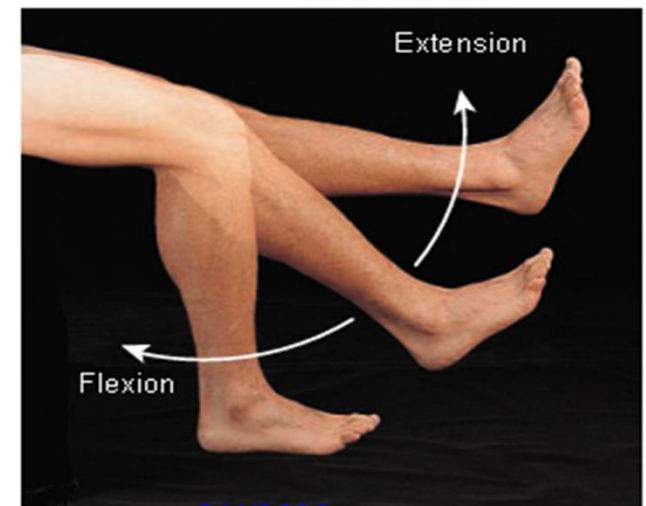
- Excessive extension of the parts at a joint beyond anatomical position



(d) Wrist joint



(e) Hip joint



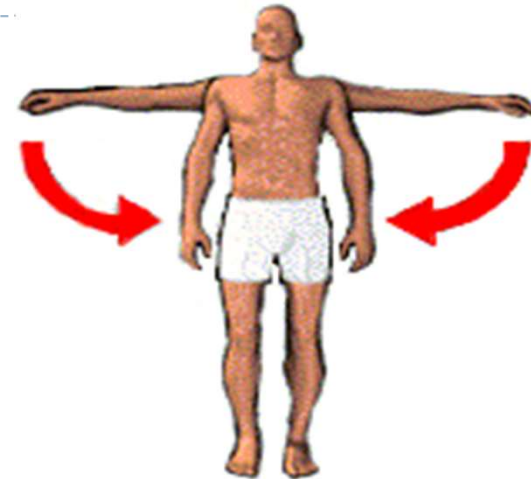
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(f) Knee joint

Movements

Adduction

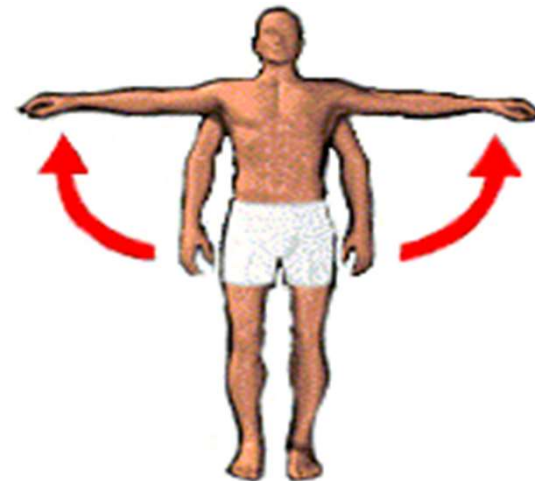
- ▶ Moving a body part towards the midline of the body



Adduction

Abduction

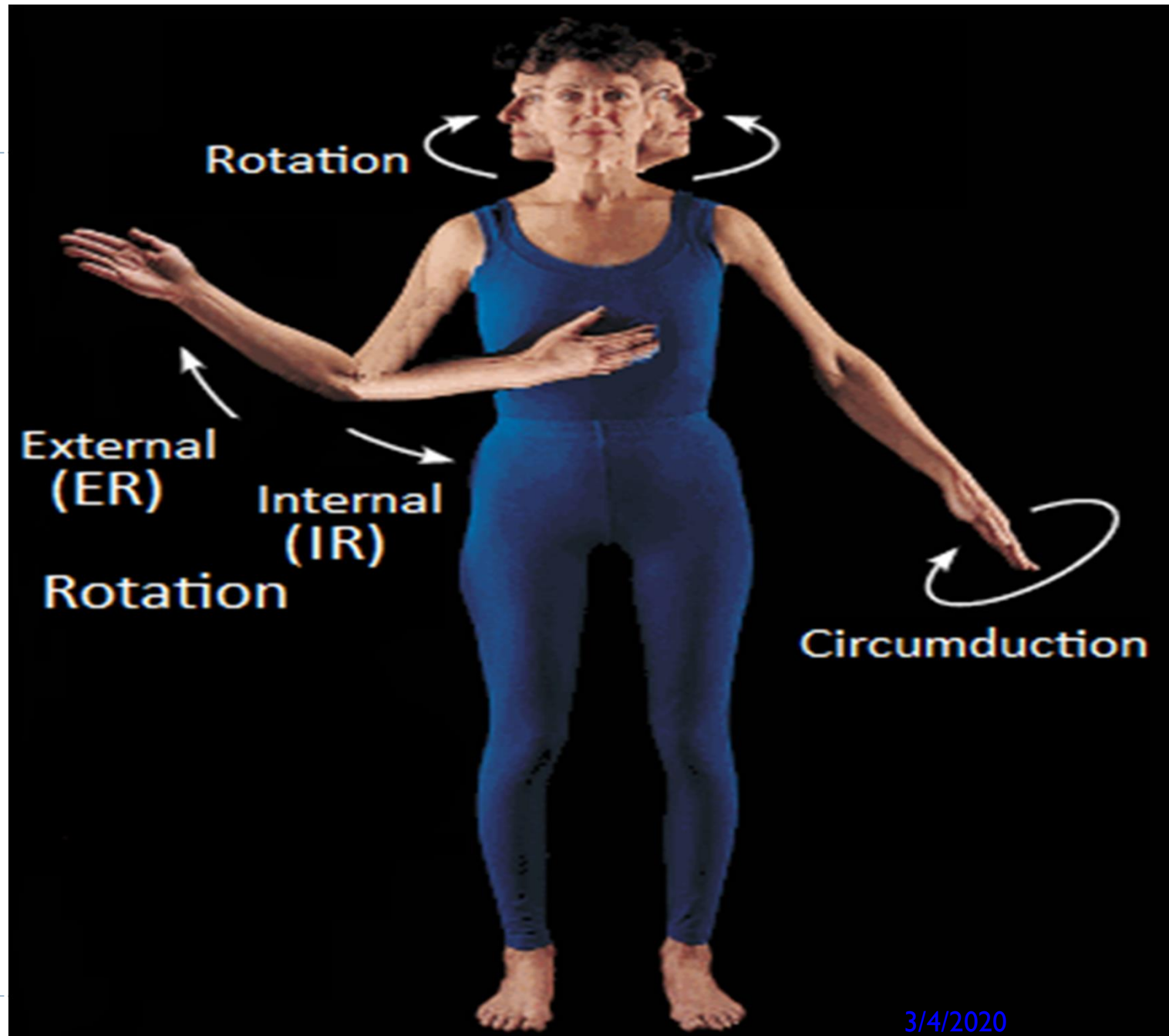
- ▶ Moving a body part away from the midline of the body



Abduction

Terms of Movement

- ▶ **Circumduction** is a circular movement that is a combination of flexion, extension, abduction, and adduction occurring in such a way that the distal end of the part moves in a circle
- ▶ Circumduction can occur at any joint at which all the above-mentioned movements are possible (e.g., the hip joint).



Terms of Movement

- ▶ **Rotation** involves turning or revolving a part of the body around its longitudinal axis, such as turning one's head to face sideways
- ▶ **Medial rotation** (internal rotation) brings the anterior surface of a limb closer to the median plane, whereas
- ▶ **Lateral rotation** (external rotation) takes the anterior surface away from the median plane

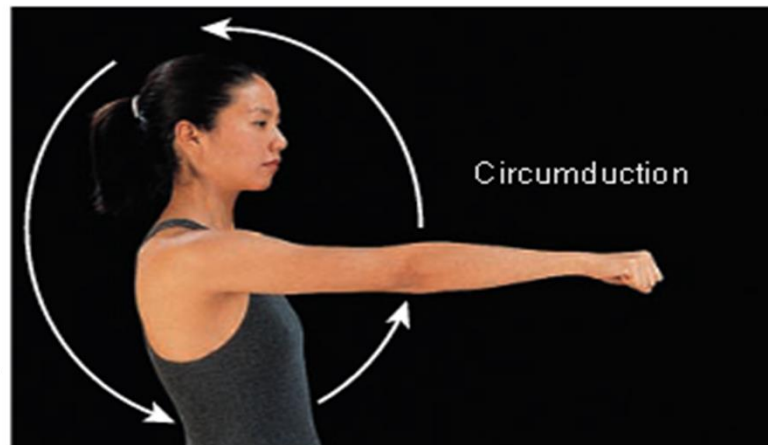
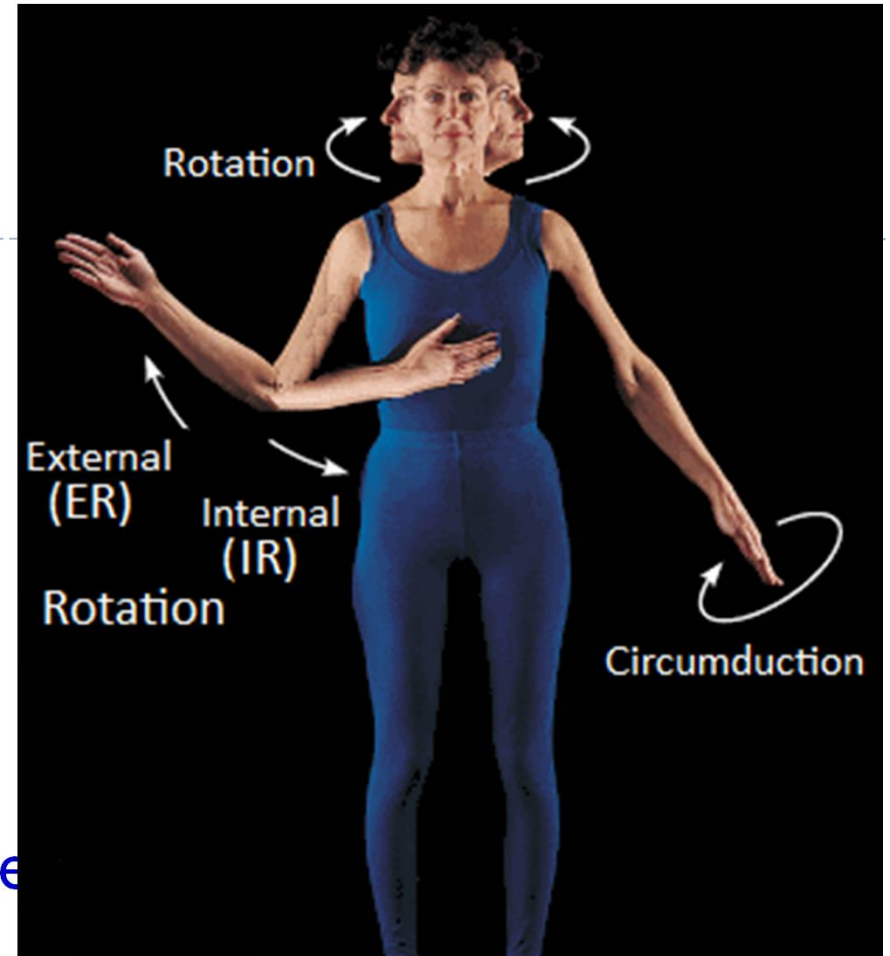
Movements

ROTATION

- ▶ Turning on a single axis

CIRCUMDUCTION

- ▶ circular motion at the hip or shoulder



Terms of Movement

- ▶ **Pronation** is the rotational movement of the forearm and hand so that the palm of the hand faces posteriorly and its dorsum faces anteriorly
- ▶ **Supination** is the rotational movement of the forearm and hand that swings the radius laterally around its longitudinal axis so that the dorsum of the hand faces posteriorly and the palm faces anteriorly .

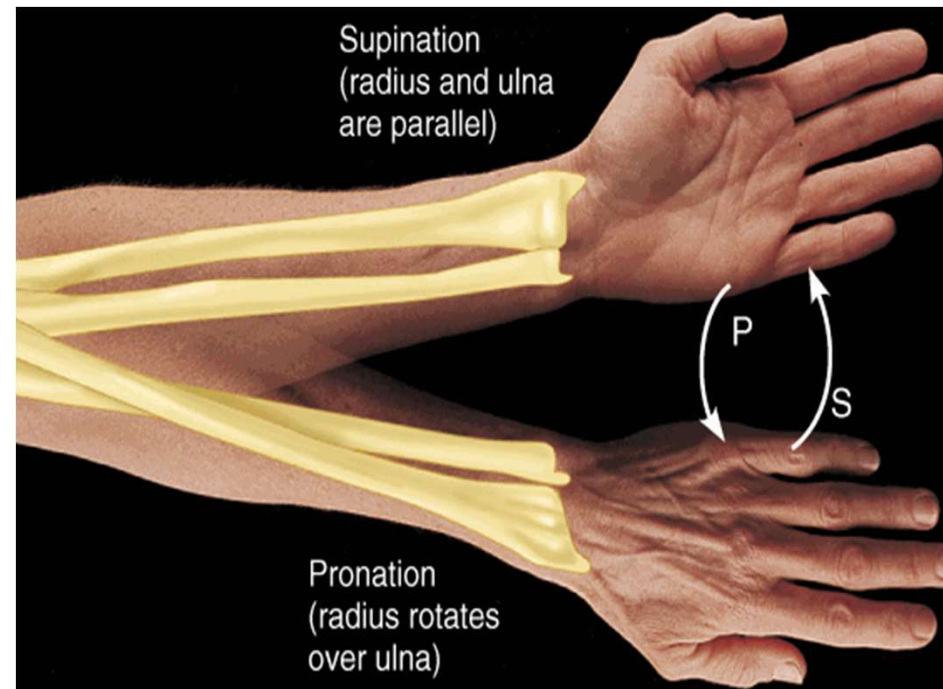
Movements

PRONATION

- Turning the arm or foot downward
- (palm or sole of the foot - down)
 - Prone

SUPINATION

- Turning the arm or foot upward
- (palm or sole of the foot - up)
 - Supine



Terms of Movement

- ▶ **Opposition** is the movement by which the pad of the 1st digit (thumb) is brought to another digit pad
- ▶ **Reposition** describes the movement of the 1st digit from the position of opposition back to its anatomical position.
- ▶ **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

Movements

RETRACTION

- Moving a part backward

PROTRACTION

- Moving a part forward

ELEVATION

- Raising a part

DEPRESSION

- Lowering a part



Terms of Movement

- ▶ **Eversion** moves the sole of the foot away from the median plane (turning the sole laterally)
- ▶ When the foot is fully everted it is also dorsiflexed
- ▶ **Inversion** moves the sole of the foot toward the median plane (facing the sole medially)



(e)

Intertarsal joints

(f)



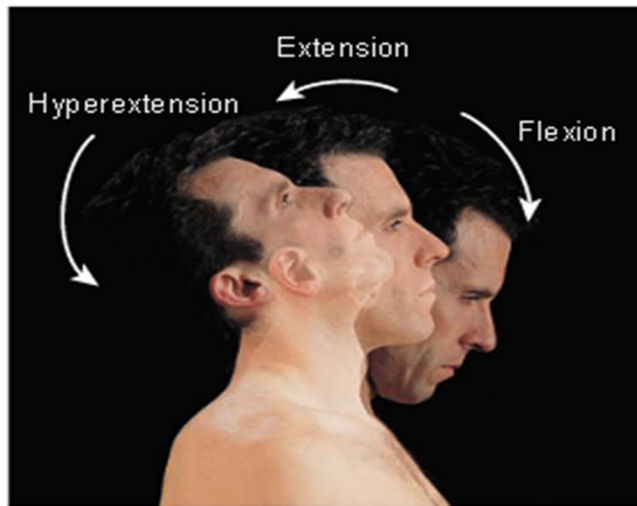
Terms of Movement

Dorsiflexion - **Bending** the foot in the direction of the dorsum (superior surface).

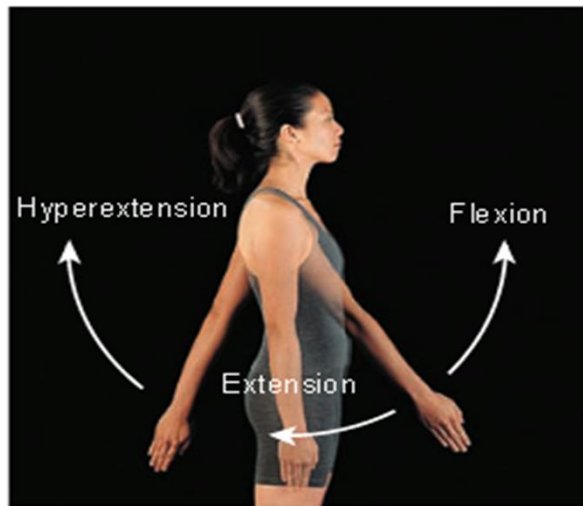
Plantar flexion - **Bending** the foot in the direction of the plantar surface (sole).



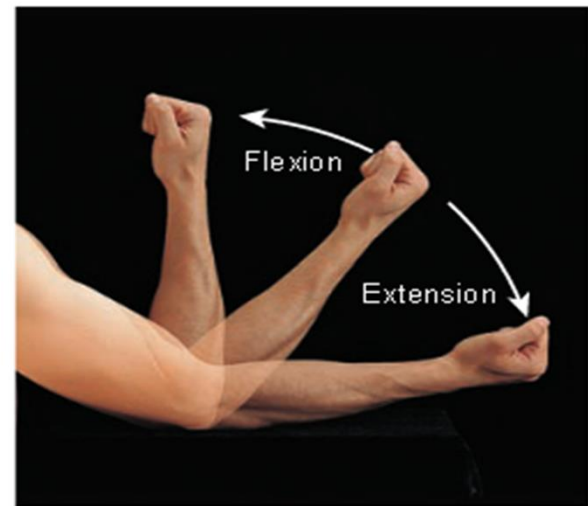
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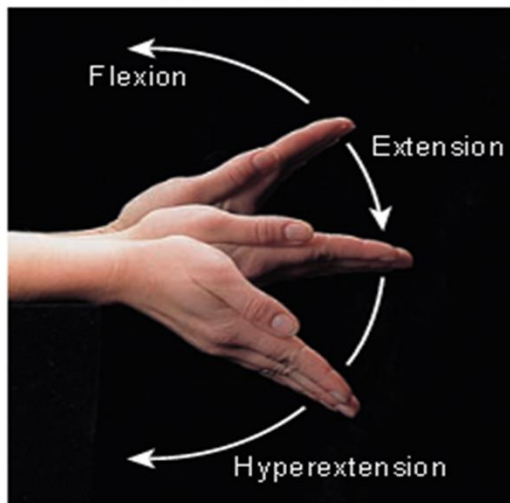
(a) Atlanto-occipital and cervical intervertebral joints



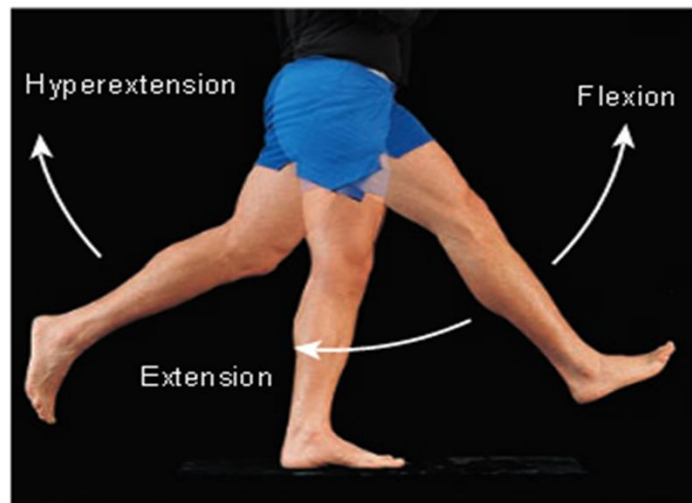
(b) Shoulder joint



(c) Elbow joint



(d) Wrist joint



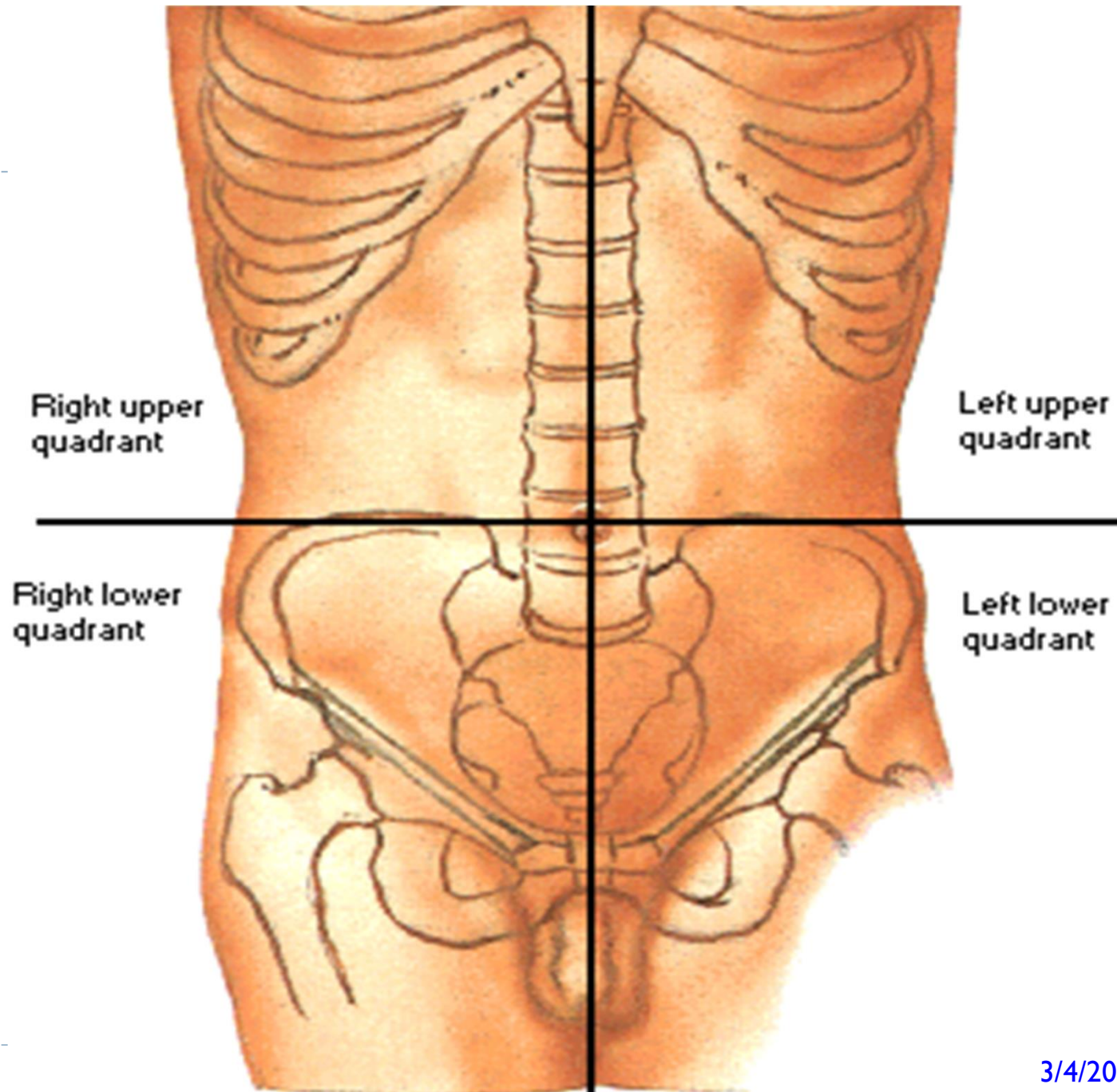
(e) Hip joint



(f) Knee joint

Subdivisions of abdominal cavity: quadrants

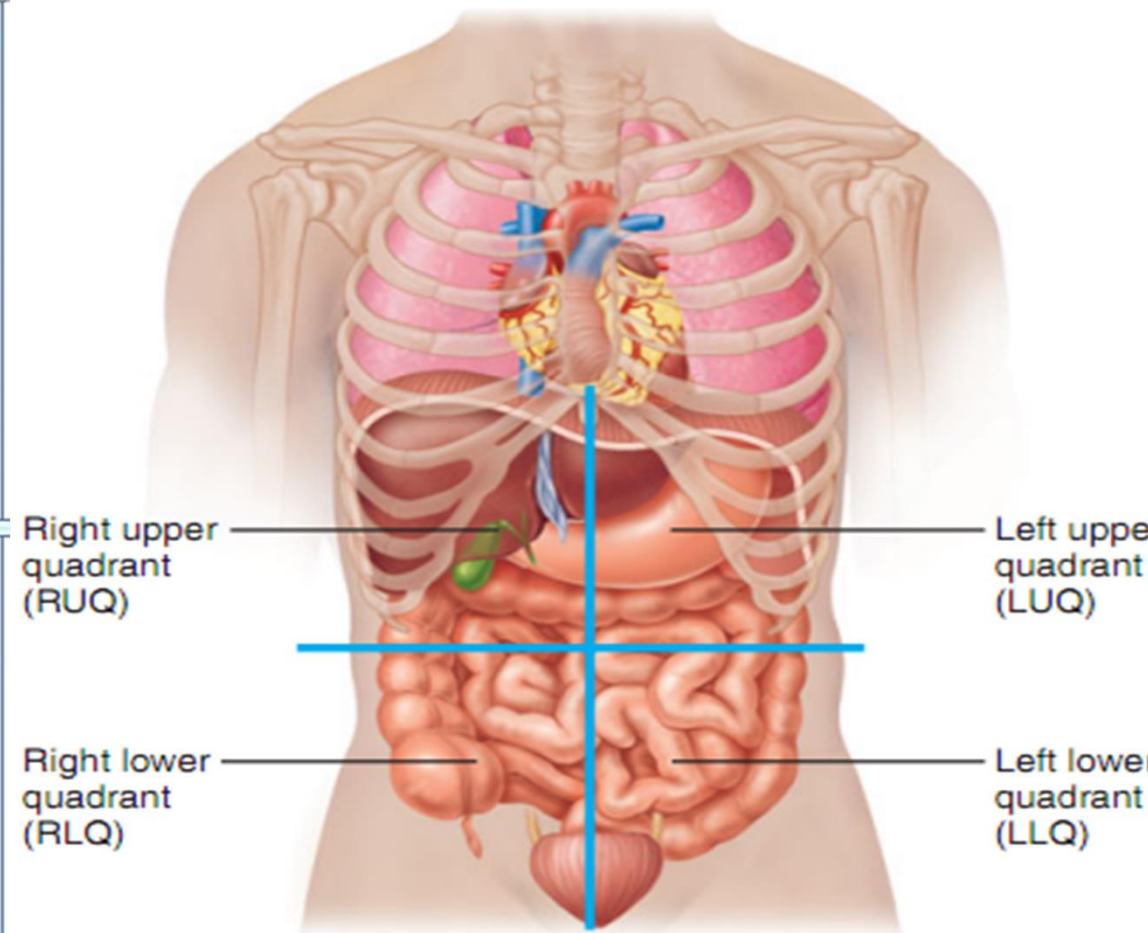
- ▶ For general clinical descriptions, clinicians use 4 quadrants defined by 2 planes
 - **Transumbilical plane**: passing through umbilicus and disc between L3 and L4 vertebrae
 - **Median plane**: longitudinal plane dividing the body into right and left halves



Quadrants of abdomen

Right upper quadrant (RUQ) Liver: right lobe Gallbladder Stomach: pylorus Duodenum: parts 1-3 Pancreas: head Right suprarenal gland Right kidney Right colic (hepatic) flexure Ascending colon: superior part Transverse colon: right half	Left upper quadrant (LUQ) Liver: left lobe Spleen Stomach Jejunum and proximal ileum Pancreas: body and tail Left kidney Left suprarenal gland Left colic (splenic) flexure Transverse colon: left half Descending colon: superior part
Right lower quadrant (RLQ) Cecum Vermiform appendix Most of ileum Ascending colon: inferior part Right ovary Right uterine tube Right ureter: abdominal part Right spermatic cord: abdominal part Uterus (if enlarged) Urinary bladder (if very full)	Left lower quadrant (LLQ) Sigmoid colon Descending colon: inferior part Left ovary Left uterine tube Left ureter: abdominal part Left spermatic cord: abdominal part Uterus (if enlarged) Urinary bladder (if very full)

Figure 1. Location of Abdominal Structures by Quadrants



(c) The four abdominopelvic quadrants

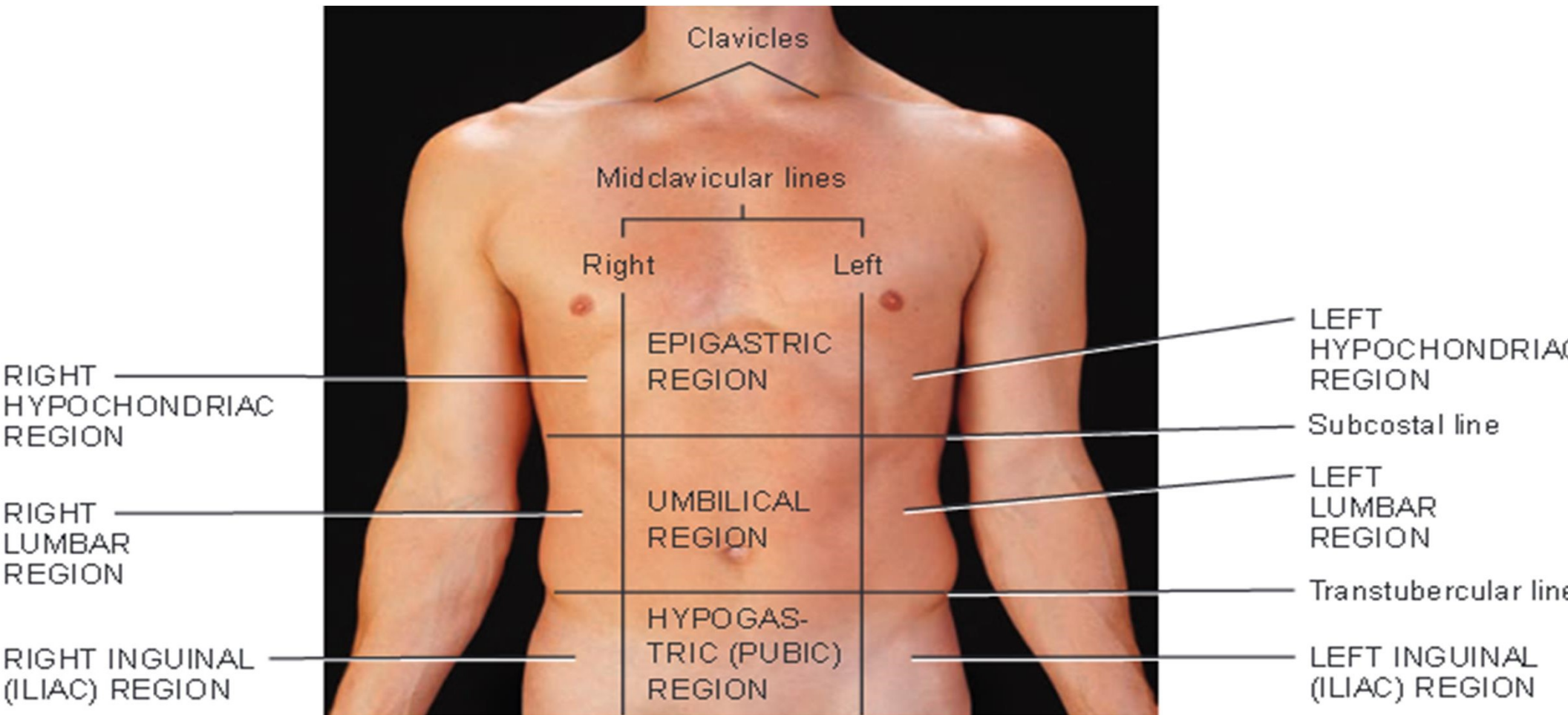
Subdivisions of abdominal cavity: regions

- ▶ Clinicians subdivide abdominal cavity into 9 regions to locate abdominal organs or pain sites

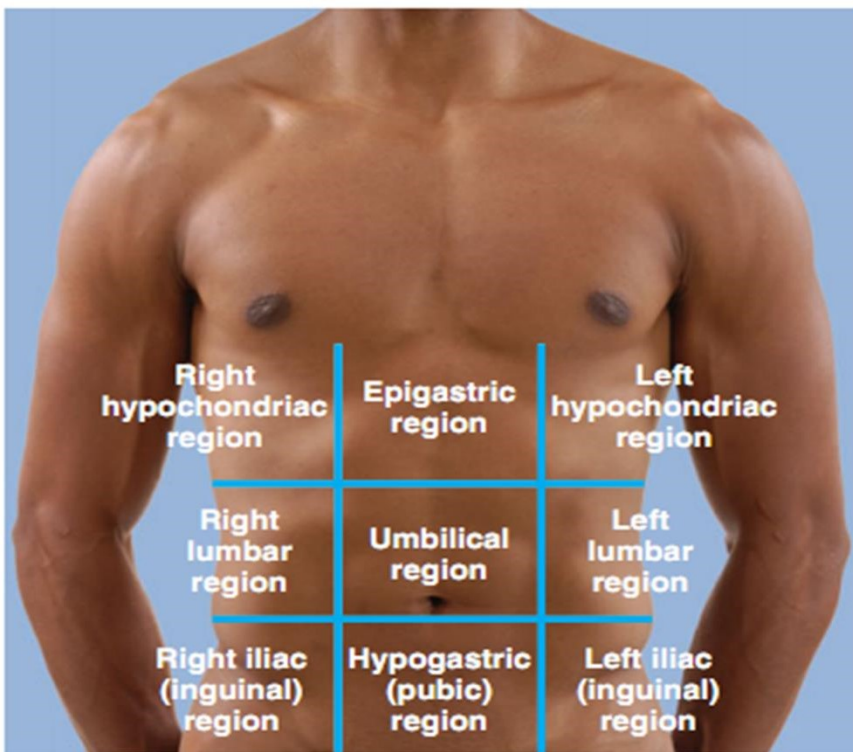
Delineated by 4 planes

- ▶ 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 (Rt &Lt)**: passing from midpoints of clavicles to mid inguinal points.

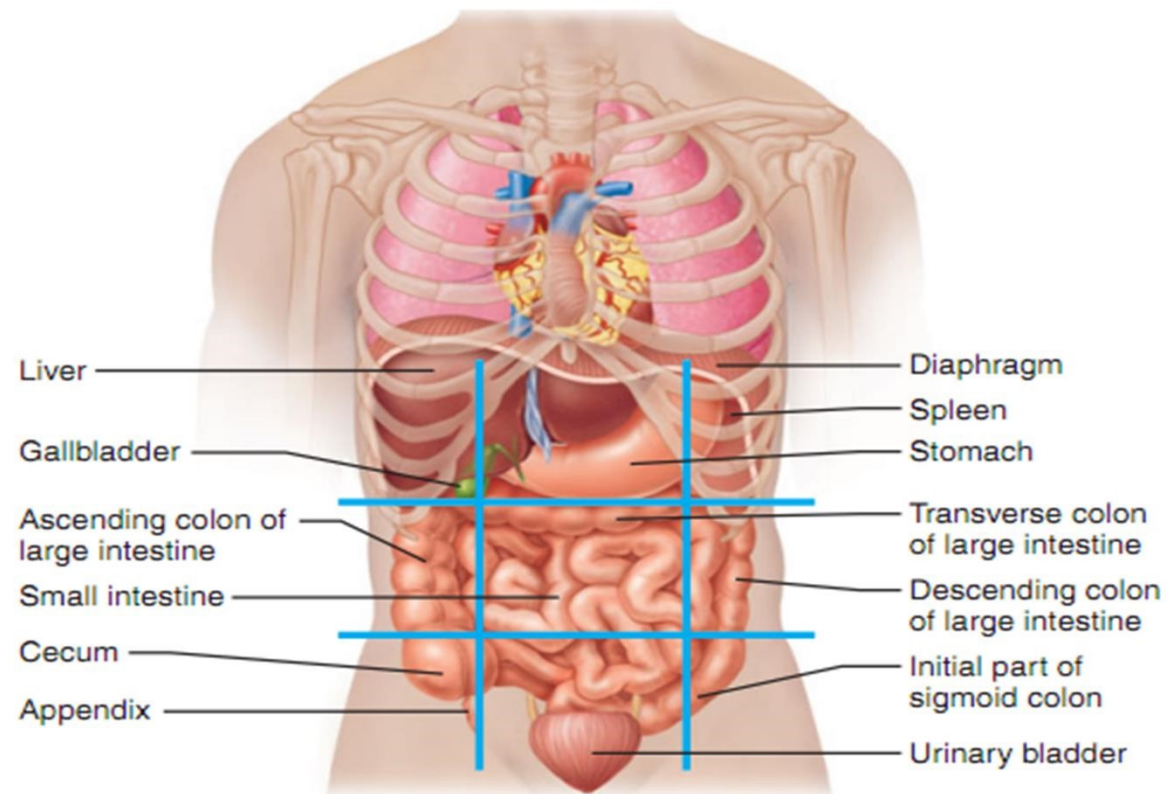
Regions of abdomen



(a) Anterior view showing abdominopelvic regions



(a) Nine regions delineated by four planes

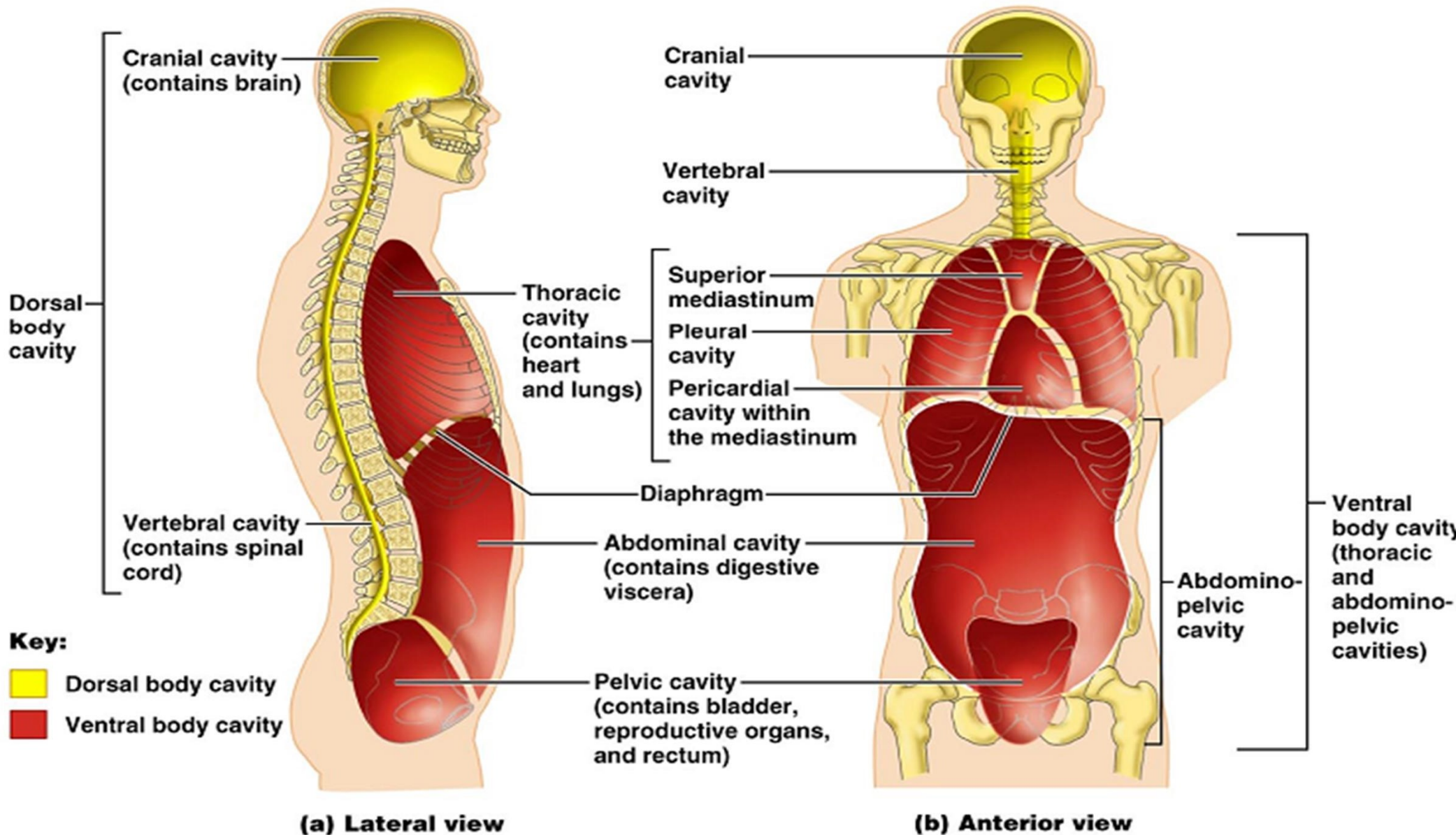


(b) Anterior view of the nine regions showing the superficial organs

Body Cavities

- Body cavities are spaces within the body that help protect, separate, and support internal organs.
- The various body cavities are separated from one another by bones, muscles, ligaments, and other structures.
- Two main categories of body cavity are:
 - Dorsal body cavities (cranial cavity & vertebral canal)
 - Ventral body cavities
- The ventral body cavity (coelom) is divided by the diaphragm muscle into 2 parts:
 1. A superior thoracic cavity
 2. Inferior abdominopelvic cavity (peritoneal cavity)

Body Cavities

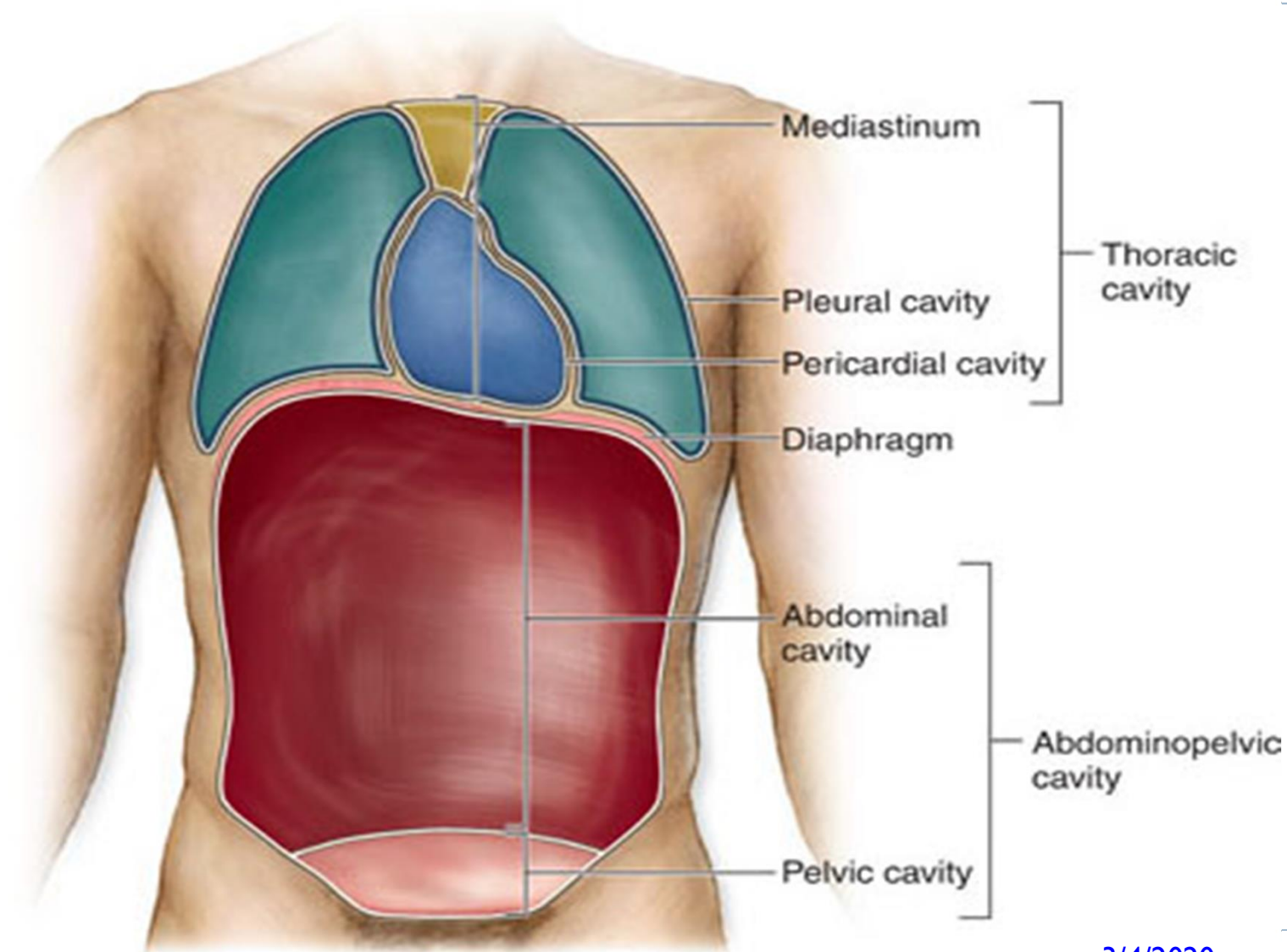


The ventral body cavity

The Thoracic Cavity

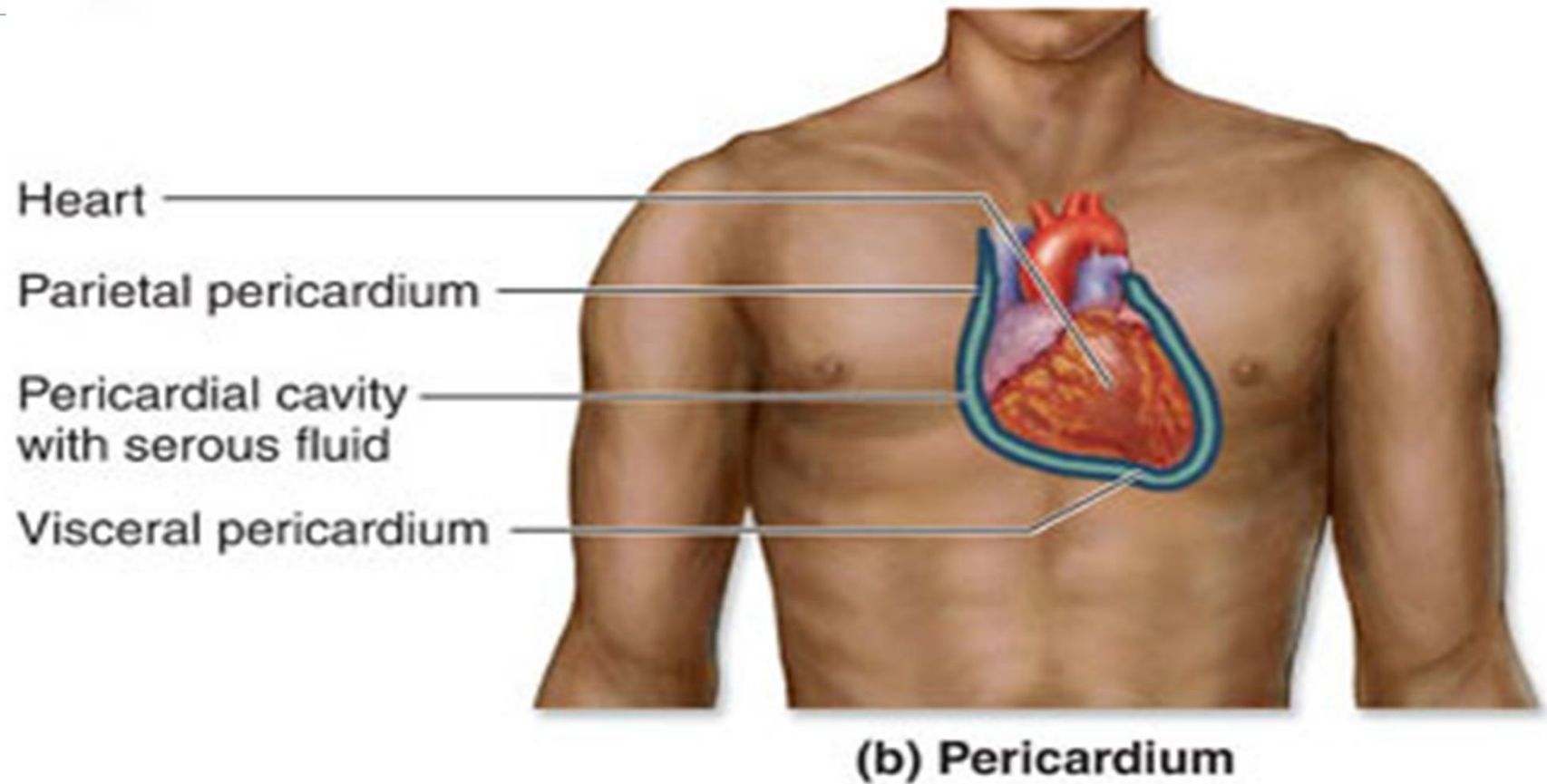
- ▶ The right and left sides of the thoracic cavity contain the lungs; they are lined by a **two-layered serous membrane** called the **pleura**.
 - ▶ The outer layer is the **parietal pleura**; it lines the internal surface of the thoracic wall
 - ▶ The inner layer is the **visceral pleura**; it covers the external surface of the lung
 - ▶ The narrow, moist, **potential space** between them is called the **pleural cavity**
- ▶ The **abdominopelvic cavity** consists of
 - ▶ an **abdominal cavity** and a **pelvic cavity**.

The ventral body cavity



(b) Coronal (frontal) view

Body Cavities

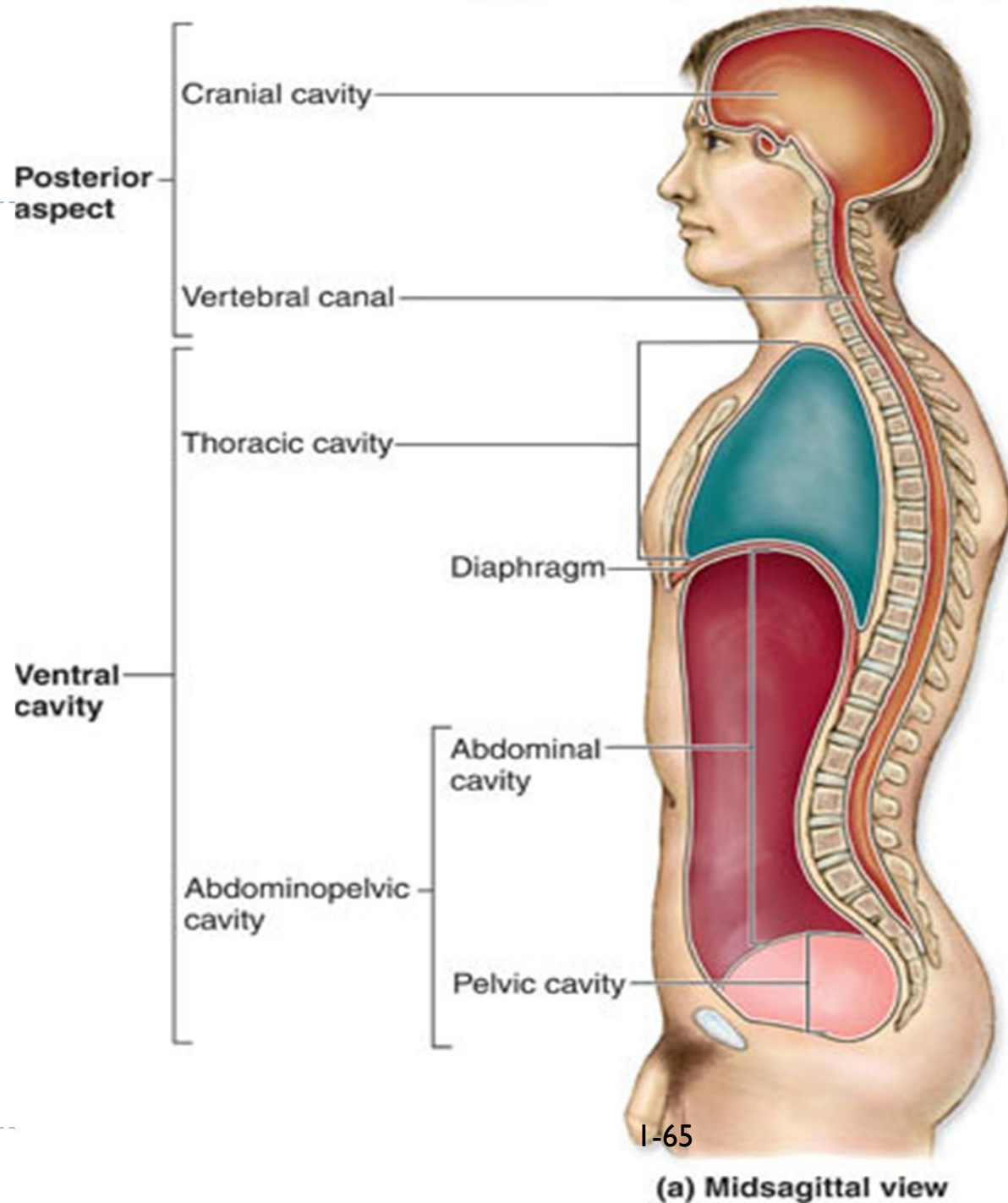


- ▶ Within the mediastinum, the heart is enclosed by a **two-layered** serous membrane called the **pericardium**.

Body Cavities

The posterior aspect of the body has two enclosed cavities

- ▶ A **cranial cavity** is formed by the cranium and houses the brain.
- ▶ A **vertebral canal** is formed by the individual bones of the vertebral column and contains the spinal cord.



QUESTIONS???

