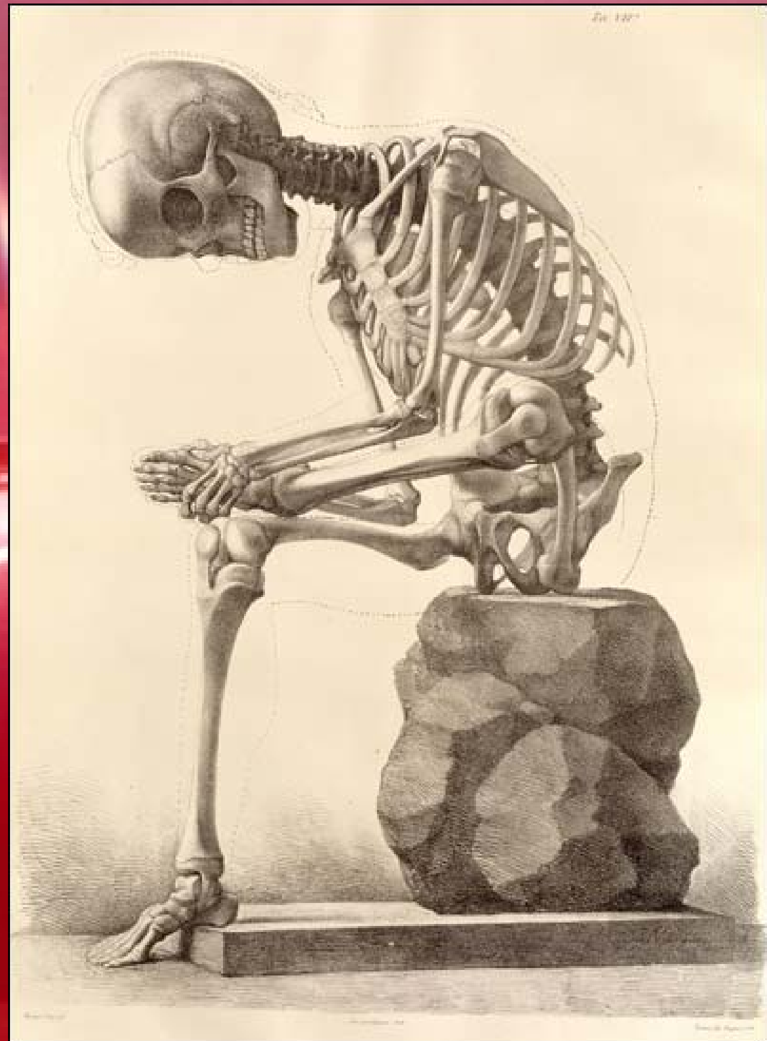
Introduction in human anatomy



Anatomy

- Definition - anatome = up (ana) + cutting (tome)
- Disciplines of anatomy
  - Macroscopic
  - Microscopic
  - Developmental
  - Neuroanatomy
- Approach to study of gross anatomy

Upper extremity	Back
Head and neck	Thorax
Abdomen	Pelvis and perineum
Lower extremity	

Basis for Terminology

- Terms informative
- Nomina anatomica
- Use of eponyms

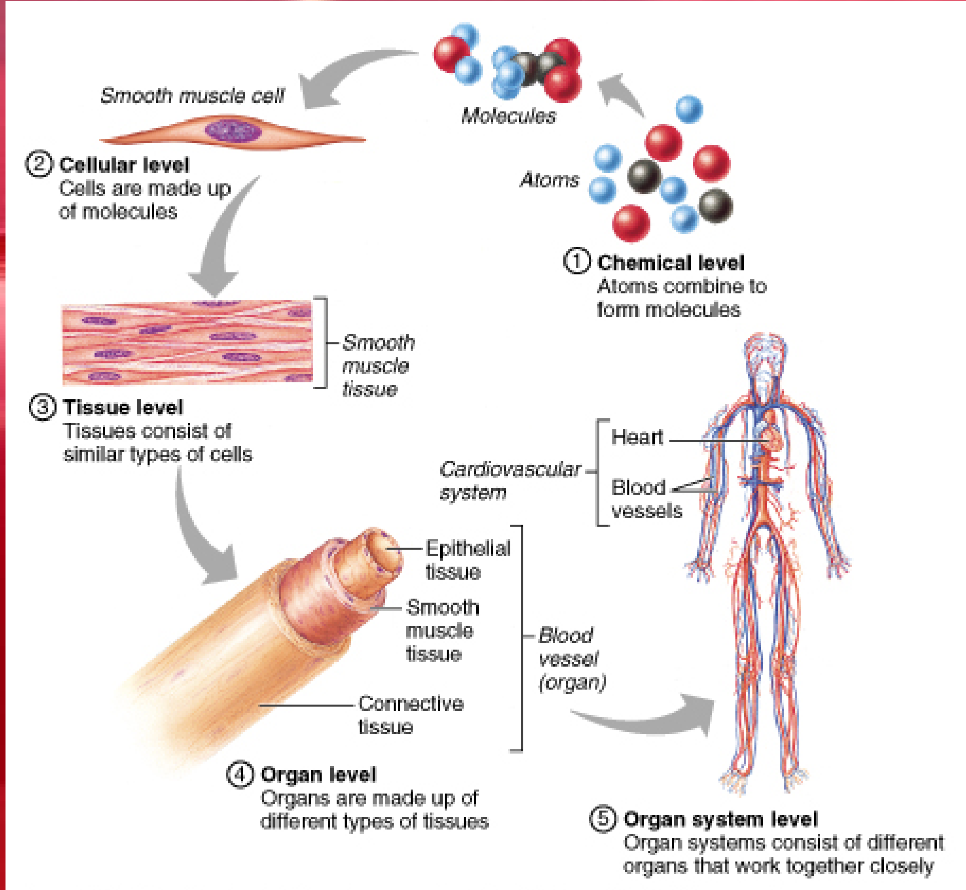
Use correct terminology on exams; avoid nonspecific, general terms, like “front,” “up,” and “behind.”

Disciplines of Anatomy

- Gross Anatomy: structures studied with the naked eye.
  - Systematic anatomy: organized by systems, e.g., digestive, nervous, endocrine, etc.
  - Regional anatomy: study of all structures in an area of the body, e.g., upper extremity bones, muscles, blood vessels, etc.
- Microscopic anatomy (histology)
- Cell biology
- Developmental anatomy (embryology)
- Pathological anatomy
- Radiologic anatomy (x-ray, CT, MRI)
- Other areas? (surgery)

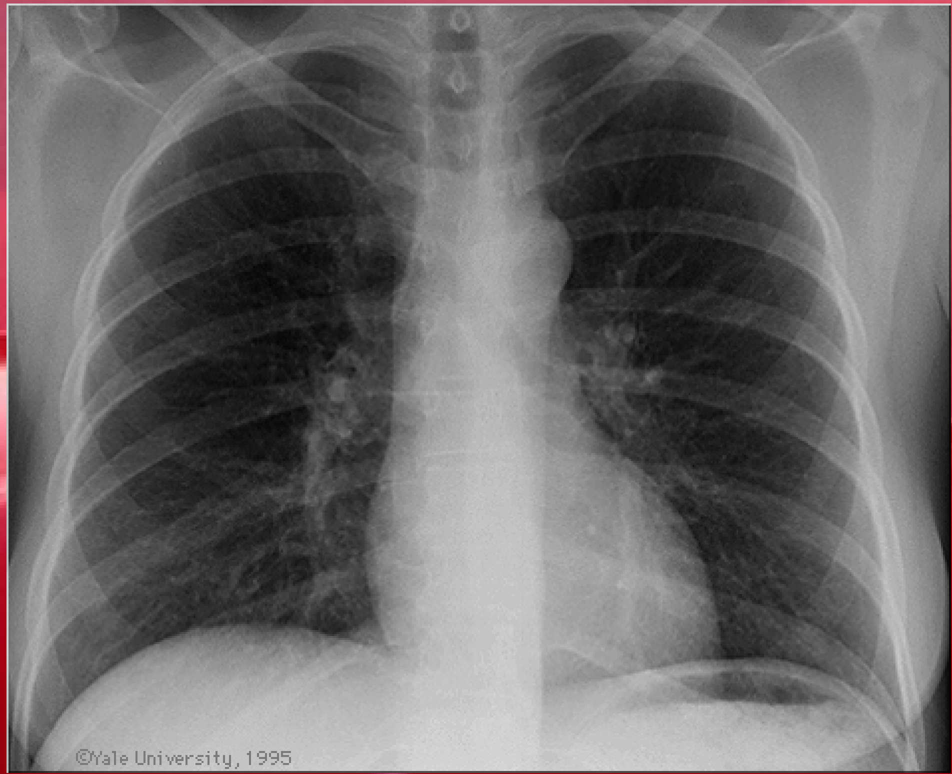
Levels of Structural Organization

- Biochemical (atoms, molecules)
- Cellular
- Tissue
- Organ
- Organ system
- Organism



Medical Imaging Techniques

- X-rays
- CT Scan
- PET
- Ultrasound imaging
- MRI
- Anatomy is important!

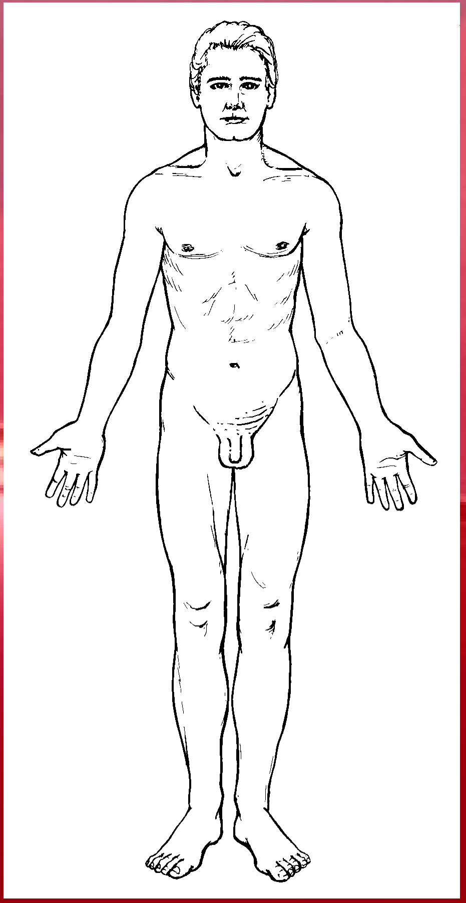


Anatomical Planes

- Median = vertical, front to back in midline
- Frontal (coronal) = vertical, perpendicular to median
- Horizontal (transverse) = parallel to floor, perpendicular to median, coronal
- Sagittal = vertical, parallel to median
- Midsagittal (R-L)
- Parasagittal (unequal R-L)

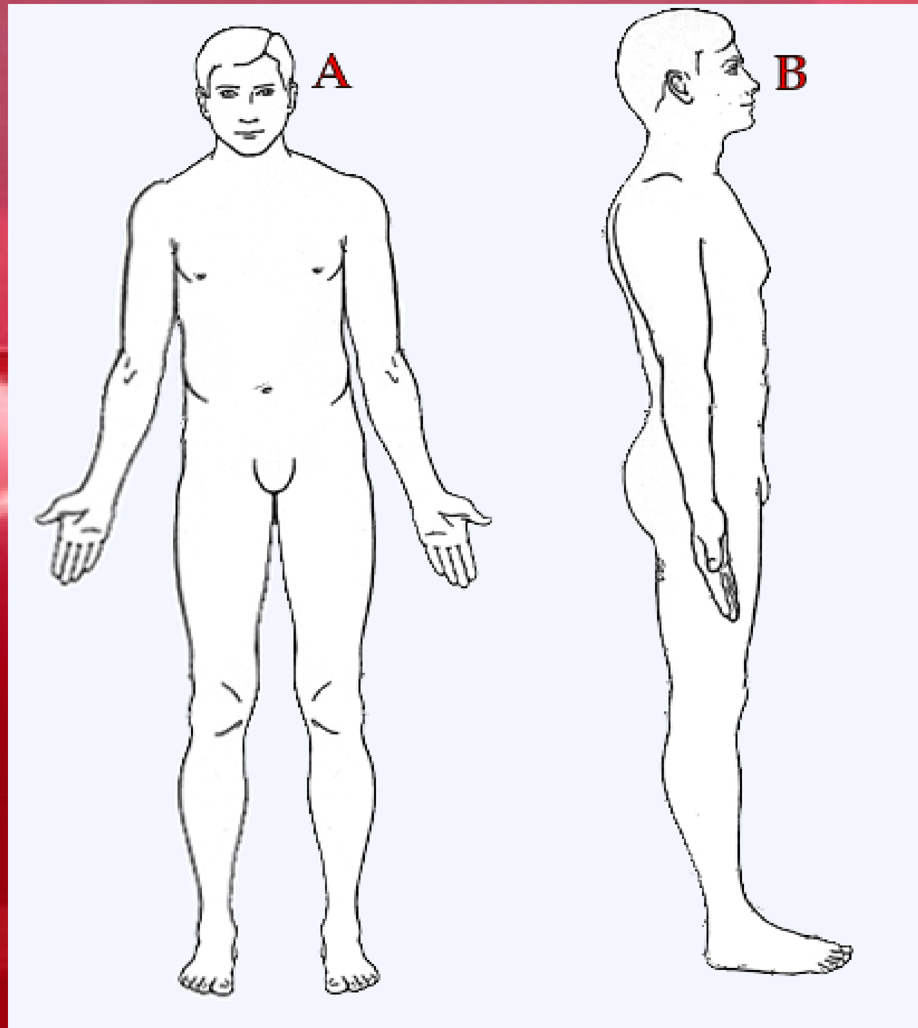
Reference positions

- *Anatomical position*
  - most widely used & accurate for all aspects of the body
  - standing in an upright posture, facing straight ahead, feet parallel and close, & palms facing forward
- *Fundamental position*
  - is essentially same as anatomical position except arms are at the sides & palms facing the body



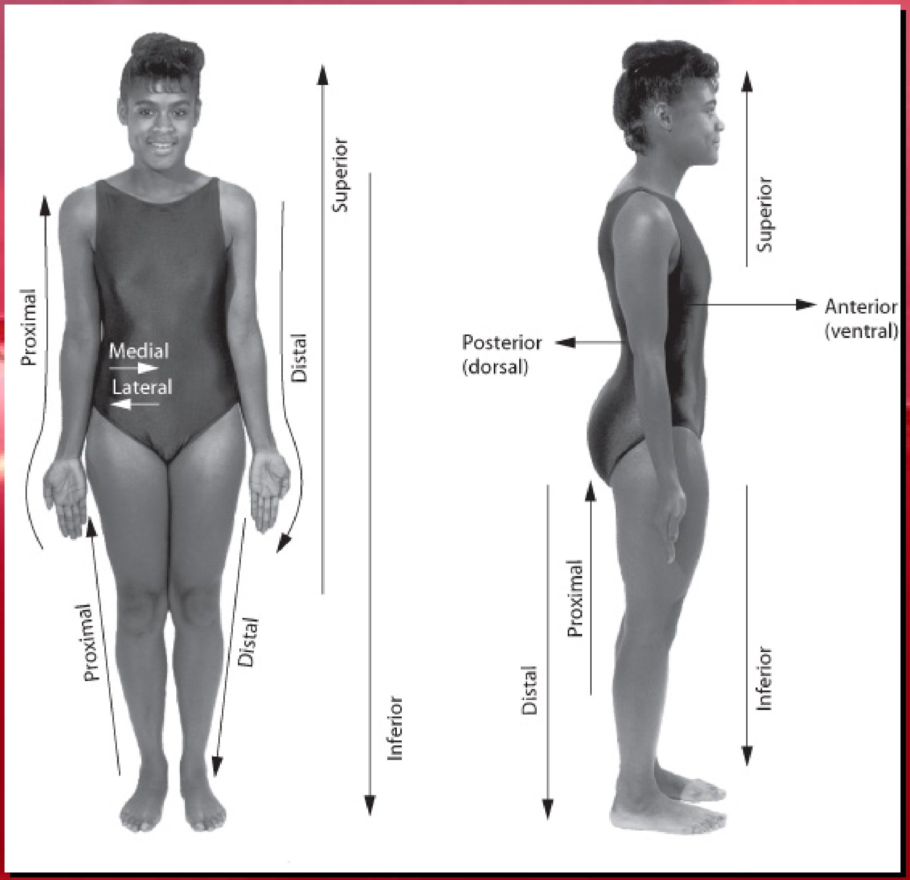
Anatomical Position

- Body erect
- Head, eyes, toes directed forward
- Limbs at sides of body
- Palms directed forward



Anatomical directional terminology

- Anterior
  - in front or in the front part
- Anteroinferior
  - in front & below
- Anterosuperior
  - in front & above
- Posterior
  - behind, in back, or in the rear
- Posteroinferior
  - behind & below; in back & below
- Posterolateral
  - behind & to one side, specifically to the outside

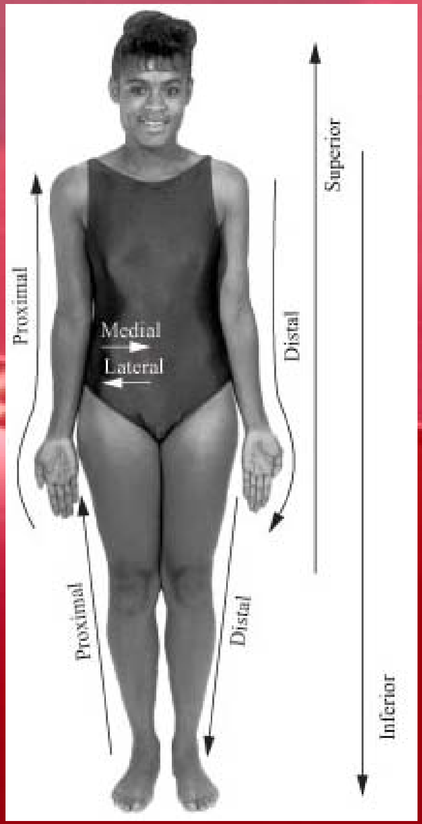


Anatomical directional terminology

- Contralateral
  - pertaining or relating to the opposite side
- Ipsilateral
  - on the same side
- Bilateral
  - relating to the right and left sides of the body or of a body structure such as the right & left extremities

Anatomical directional terminology

- Inferior (infra)
  - below in relation to another structure; caudal
- Superior (supra)
  - above in relation to another structure; higher, cephalic
- Distal
  - situated away from the center or midline of the body, or away from the point of origin
- Proximal
  - nearest the trunk or the point of origin
- Lateral
  - on or to the side; outside, farther from the median or midsagittal plane
- Medial
  - relating to the middle or center; nearer to the medial or midsagittal plane
- Median
  - Relating to the middle or center; nearer to the median or midsagittal plane



From Van De Graaff KM: *Human anatomy*, ed 6, New York, 2002, McGraw-Hill

Anatomical directional terminology

- Caudal
  - below in relation to another structure; inferior
- Cephalic
  - above in relation to another structure; higher, superior
- Deep
  - beneath or below the surface; used to describe relative depth or location of muscles or tissue
- Superficial
  - near the surface; used to describe relative depth or location of muscles or tissue

Anatomical directional terminology

- Prone
  - the body lying face downward; stomach lying
- Supine
  - lying on the back; face upward position of the body
- Dorsal
  - relating to the back; being or located near, on, or toward the back, posterior part, or upper surface of
- Ventral
  - relating to the belly or abdomen, on or toward the front, anterior part of
- Volar
  - relating to palm of the hand or sole of the foot
- Plantar
  - relating to the sole or undersurface of the foot

Directional Terms

- *Toward the upper part*
  - *Superior Cephalic*
- *Toward the lower part*
  - *Inferior Caudal*
- *Front*
  - *Ventral Anterior*
- *Back*
  - *Dorsal Posterior*

Directional Terms

- *Front Down*
  - *Prone*
- *Toward Midline*
  - *Medial*
- *Away from Midline*
  - *Lateral*
    - *Same-Ipsilateral*
    - *Opposite-Contralateral*
- *Between*
  - *Intermediate*
- *Near*
  - *Proximal*

Directional Terms

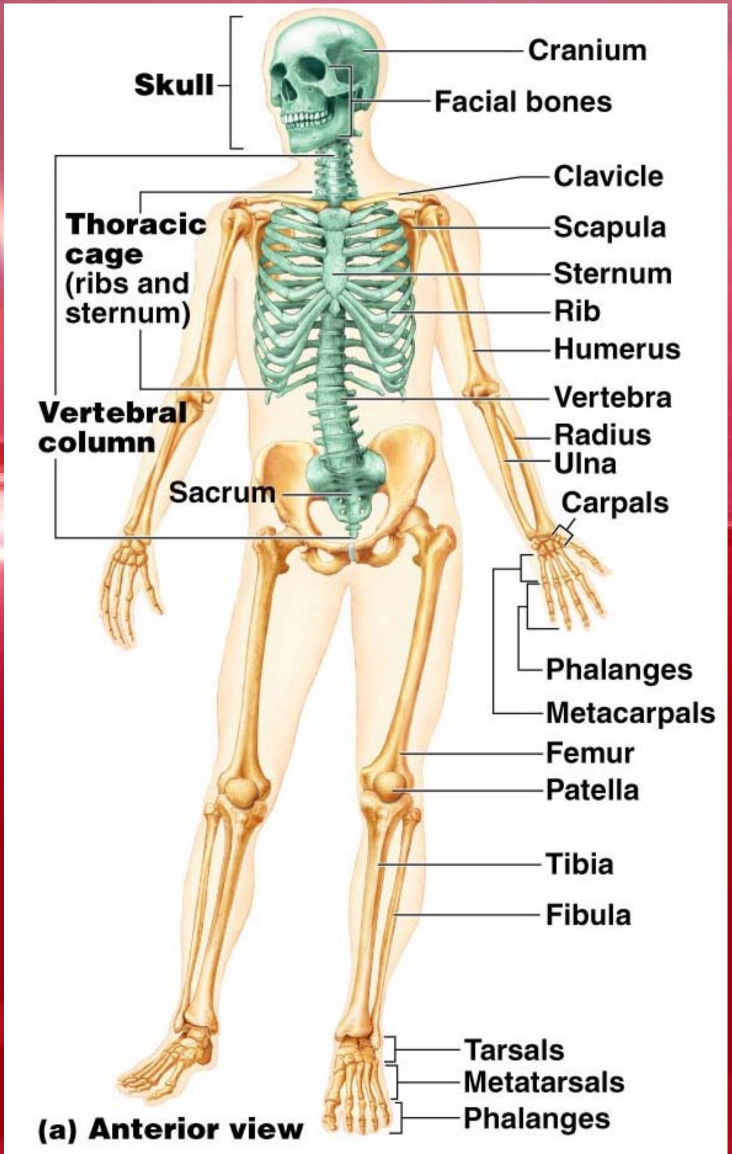
- *Far*
  - *Distal*
- *On the Surface*
  - *Superficial*
- *On the Inside*
  - *Deep*
- *On the Wall of the Body Cavity*
  - *Parietal*
- *On an Organ*
  - *Visceral*

The Skeleton

- Consists of
  - Bones, cartilage, joints, and ligaments
- Composed of 206 named bones grouped into two divisions
  - Axial skeleton (80 bones)
  - Appendicular skeleton (126 bones)

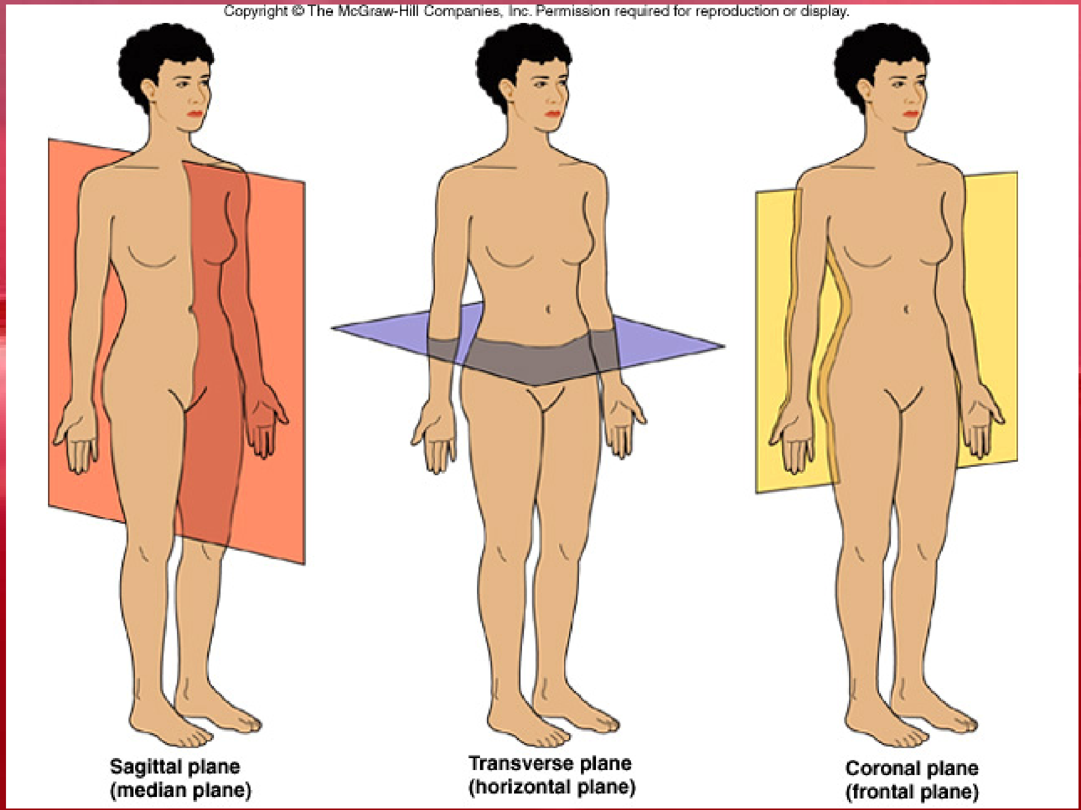
The Axial Skeleton

- Formed from 80 named bones
- Consists of skull, vertebral column, and bony thorax

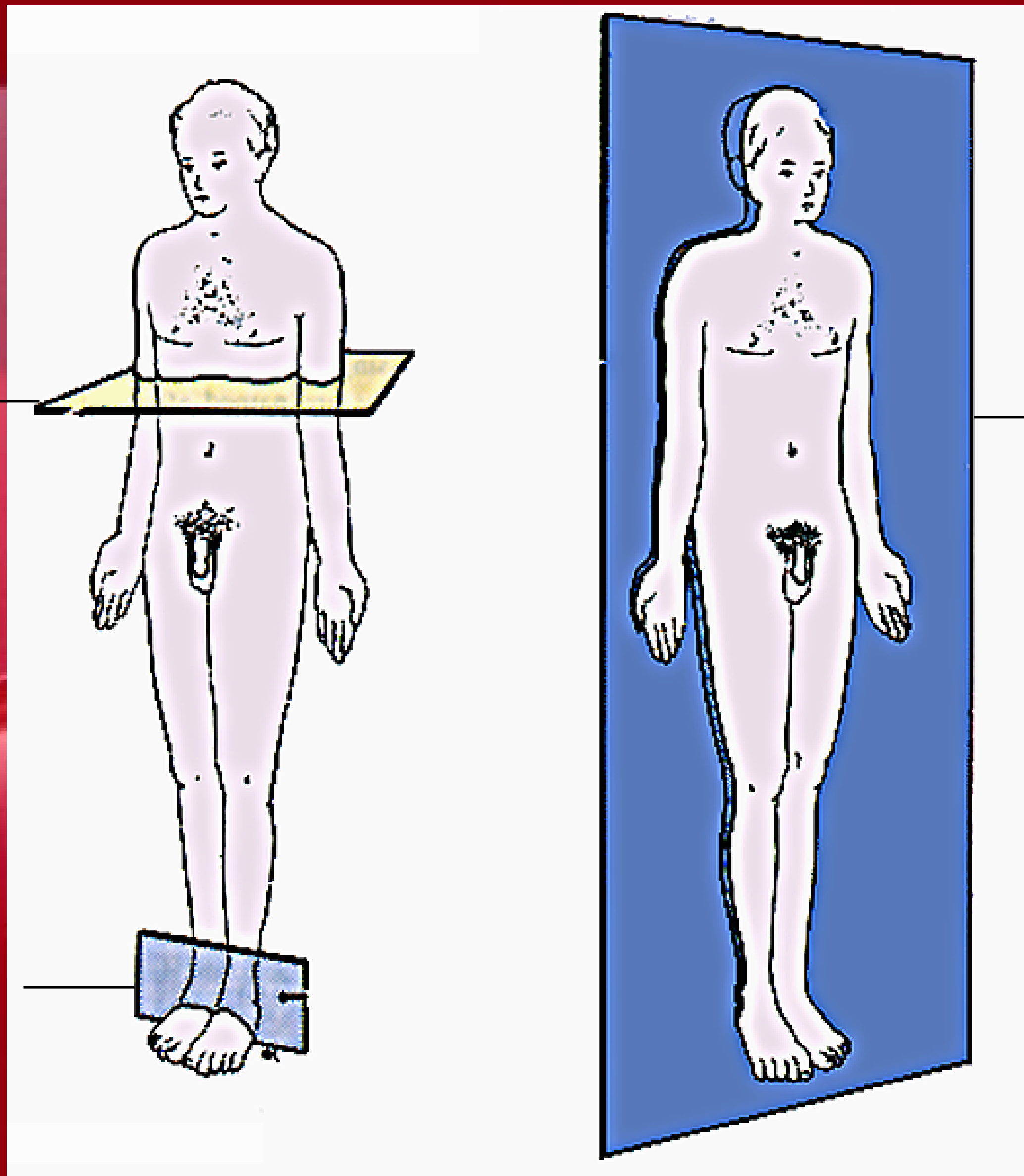


Planes and Sections

- A plane is an imaginary flat surface that passes through the body.
- A section is one of the 2 surfaces (pieces) that results when the body is cut by a plane passing through it.

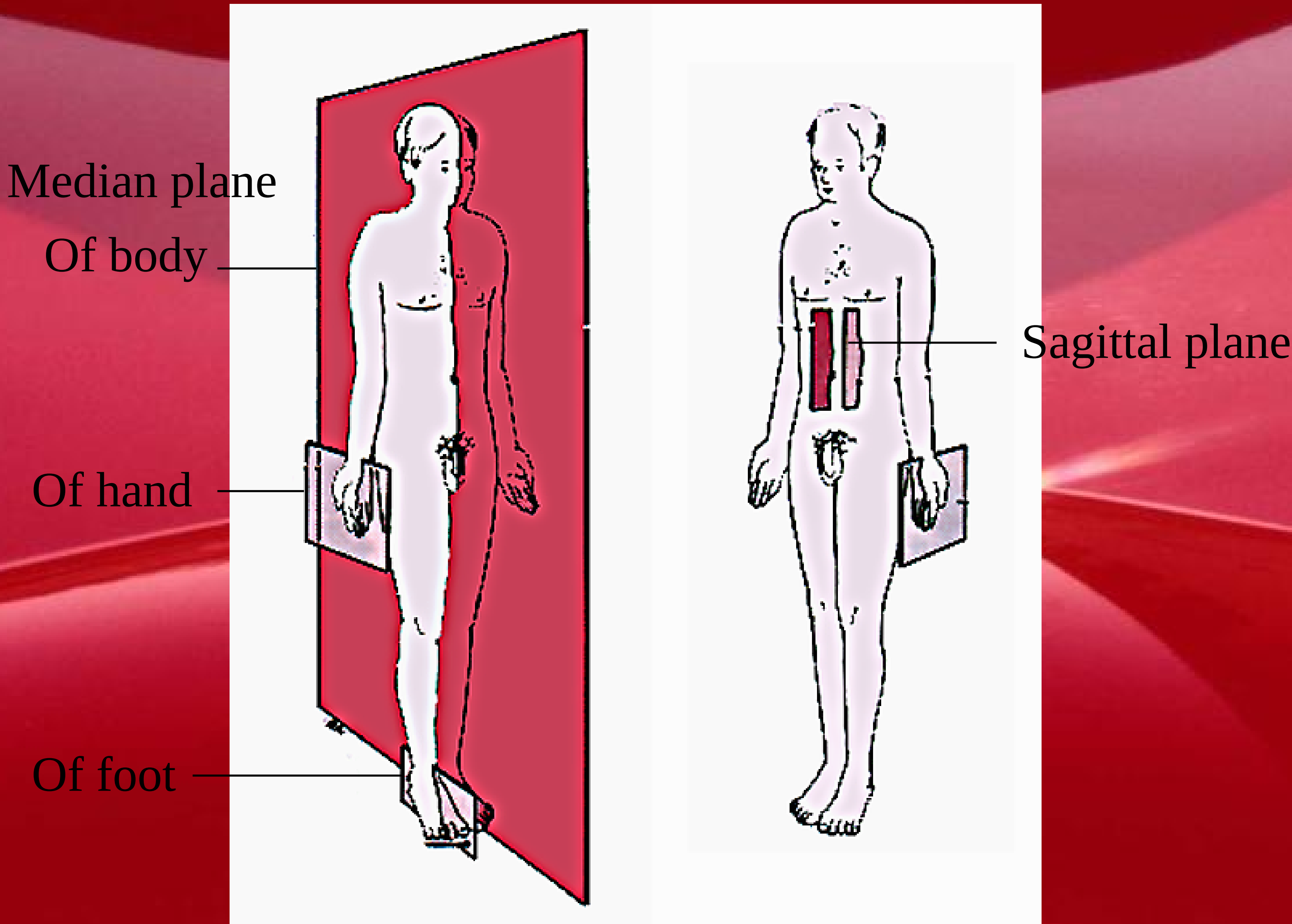


Transverse plane



Coronal plane

Coronal plane


Median plane
Of body
Of hand
Of foot
Sagittal plane

Sagittal Plane

- Sagittal plane
  - divides the body or an organ into left and right sides
- Midsagittal plane
  - produces equal halves
- Parasagittal plane
  - produces unequal halves

Other Planes and Sections

- Frontal or coronal plane
  - divides the body or an organ into front (anterior) and back (posterior) portions
- Transverse(cross-sectional) or horizontal plane
  - divides the body or an organ into upper (superior) or lower (inferior) portions
- Oblique plane
  - some combination of 2 other planes

Planes and Sections of the Brain

(3-D anatomical relationships revealed)

- Horizontal Plane
- Frontal Plane
- Midsagittal Plane

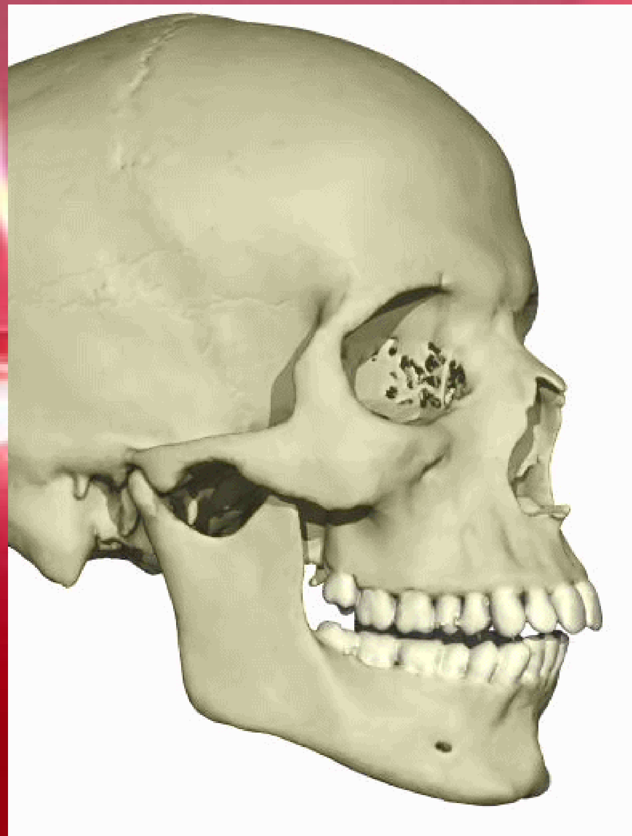
- Superior
  - **towards the head**
  - **The eyes are superior to the mouth.**
- Inferior
  - **away from the head**
  - **The stomach is inferior to the heart.**

- Dorsal or Posterior
  - **at the back of the body**
  - **The brain is posterior to the forehead.**
- Ventral or Anterior
  - **at the front of the body**
  - **The sternum is anterior to the heart.**

- Medial
  - **nearer to the midline of the body**
  - **The heart lies medial to the lungs.**
- Lateral
  - **farther from the midline of the body**
  - **The thumb is on the lateral side of the hand.**
- Proximal
  - nearer to the attachment of the limb to the trunk
  - The knee is proximal to the ankle.
- Distal
  - farther from the attachment of the limb to the trunk
  - The wrist is distal to the elbow.

Head-Cephalic

- *Skull Cranial*
  - *Forehead--Frontal*
  - *Roof--- Parietal*
  - *Side---Temporal*
  - *Back--- Occipital*



Head-Cephalic

- *Face Facial*
  - *Eye---Ocular, orbital*
  - *Nose---Rhino, nasal*
  - *Ear---Otic*
  - *Mouth---Oral*
  - *Cheek----Buccal*
  - *Chin---Mental*

Neck-Cervical

Area between shoulder and base of skull.

Includes 7 neck vertebrae.

“C” collar used for whiplash.

Trunk

- *Front Ventral Anterior*
  - *Chest---Thoracic, pectoral*
  - *Collar Bone---Clavicular*
  - *Shoulder---Acromial*
  - *Breast bone---Sternal*
  - *Belly---Abdominal*
  - *Navel---Umbilical*
  - *Pelvis---Pelvic*
  - *Pubis---Pubic*

- *Back Dorsal Posterior*
  - *Backbone---Vertebral*
  - *Loin---Lumbar*
  - *Tail Bone---Sacral, Coccygeal*

Arm-Upper Extremity

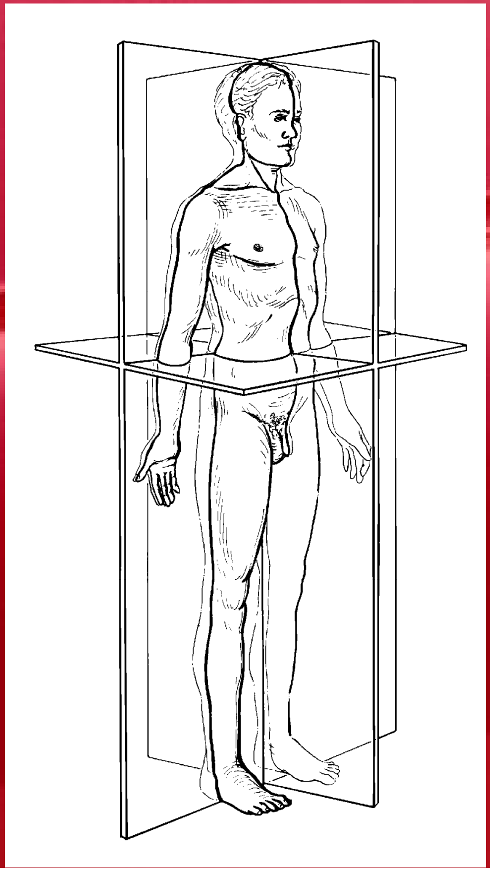
- *Armpit--- Axillary*
- *Upper Arm---Brachial*
- *Forearm---Antebrachial*
- *Wrist---Carpal*
- *Hand---Manual*
- *Palm---Metacarpal,volar*
- *Front of Elbow---Antecubital*
- *Back of Elbow---Cubital Olecranal*
- *Back of hand---Dorsal*
- *Finger---Digital,Phalangeal*
- *Thumb---Pollex*

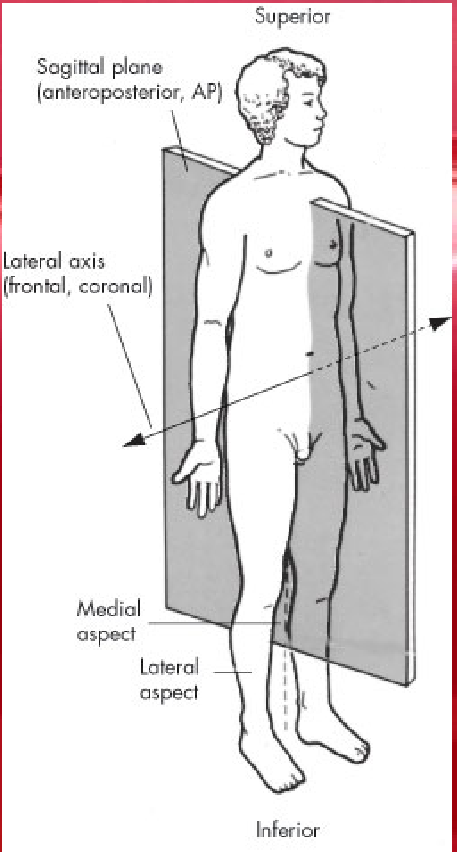
Leg-Lower Extremity

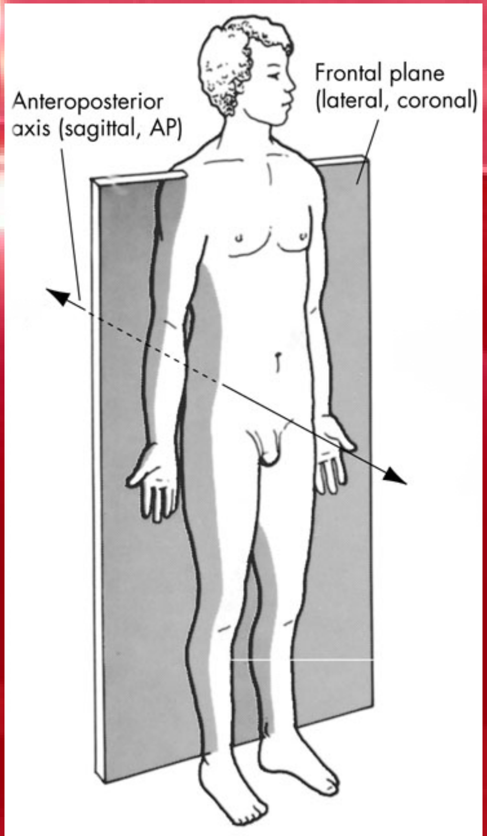
- *Hip---Coxal*
- *Buttock---Gluteal*
- *Thigh---Femoral*
- *Knee cap---Patellar*
- *Back of Knee---Popliteal*
- *Shin---Crural*
- *Calf---Sural*
- *Ankle---Tarsal*
- *Heel---Calcaneal*
- *Foot------Pedal, metatarsal*
- *Top of Foot---Dorsal*
- *Sole of Foot---Plantar*
- *Toe---Digital,Phalangeal*
- *Great Toe---Hallux*

Cardinal planes of motion

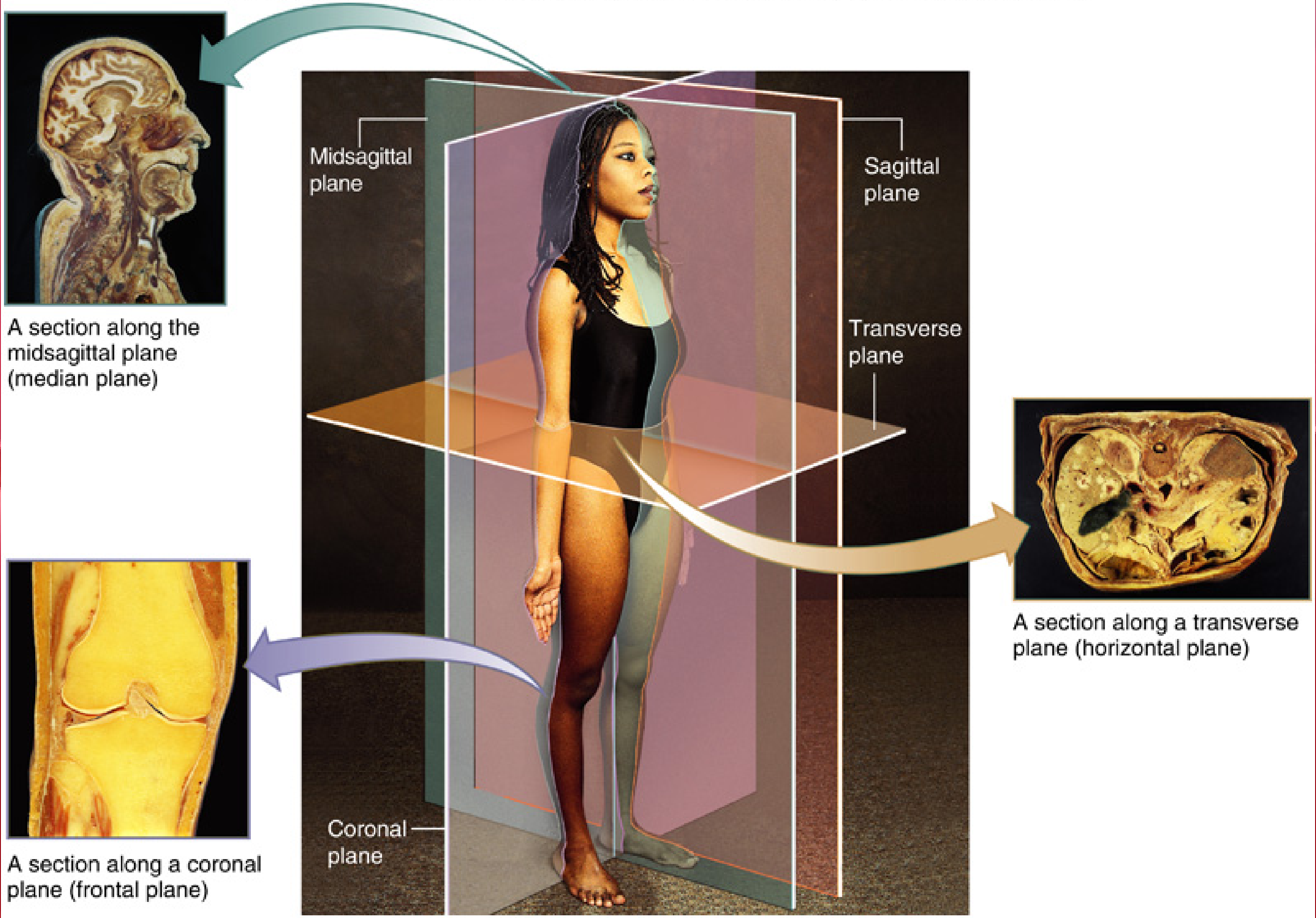
- 3 basic or traditional
  - in relation to the body, not in relation to the earth
- Anteroposterior or Sagittal Plane
- Lateral or Frontal Plane
- Transverse or Horizontal Plane



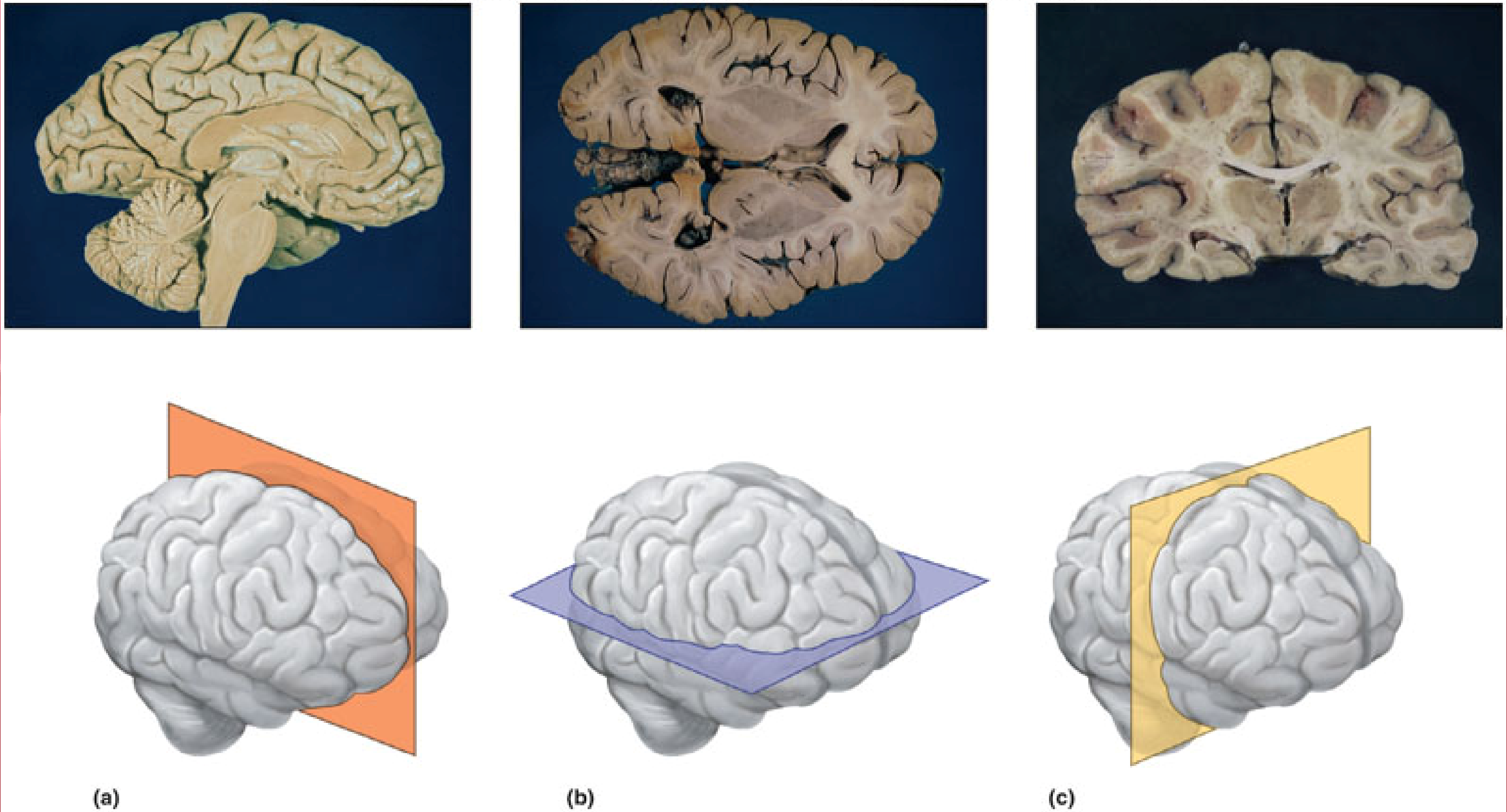




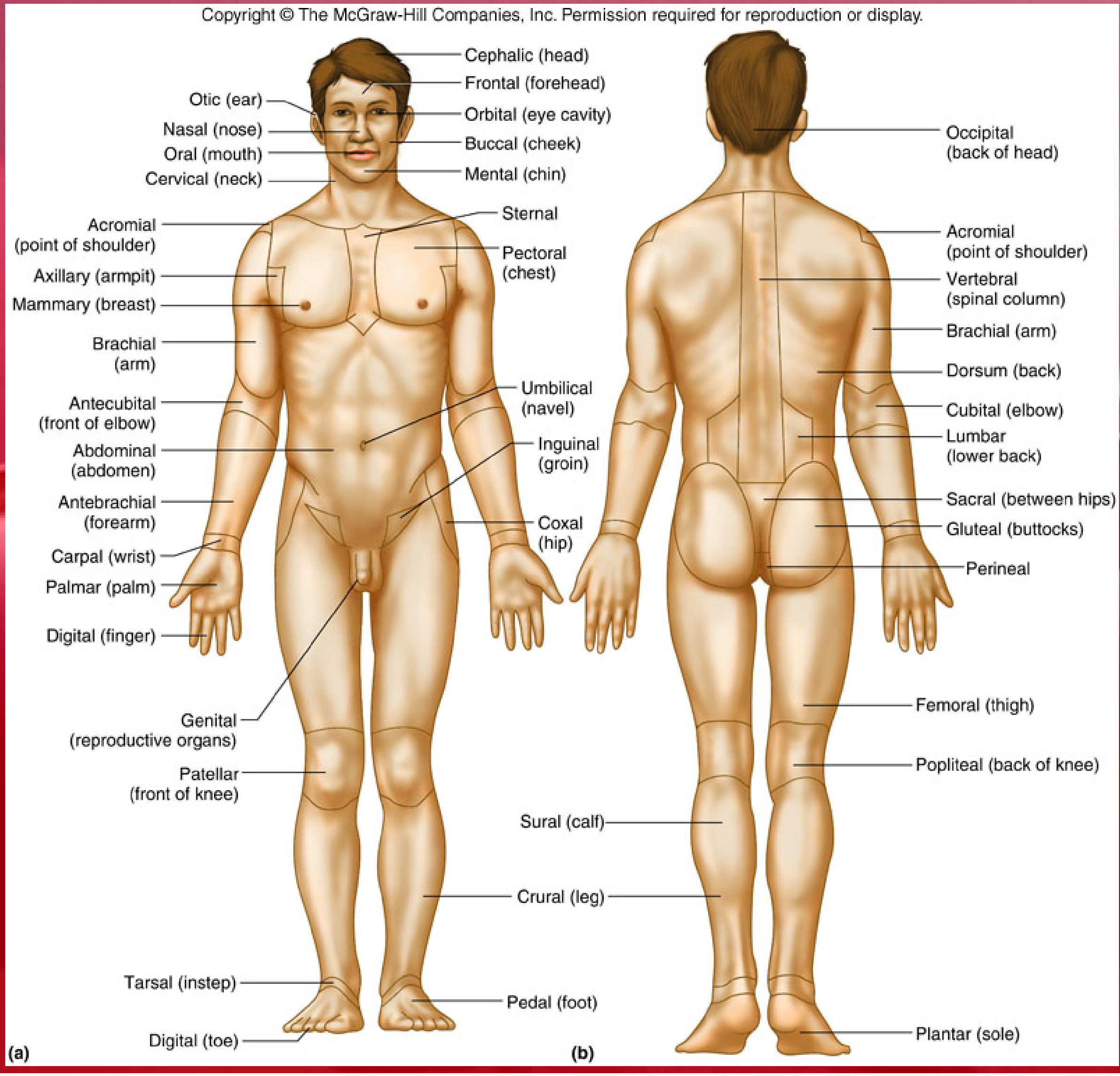
Body Sections



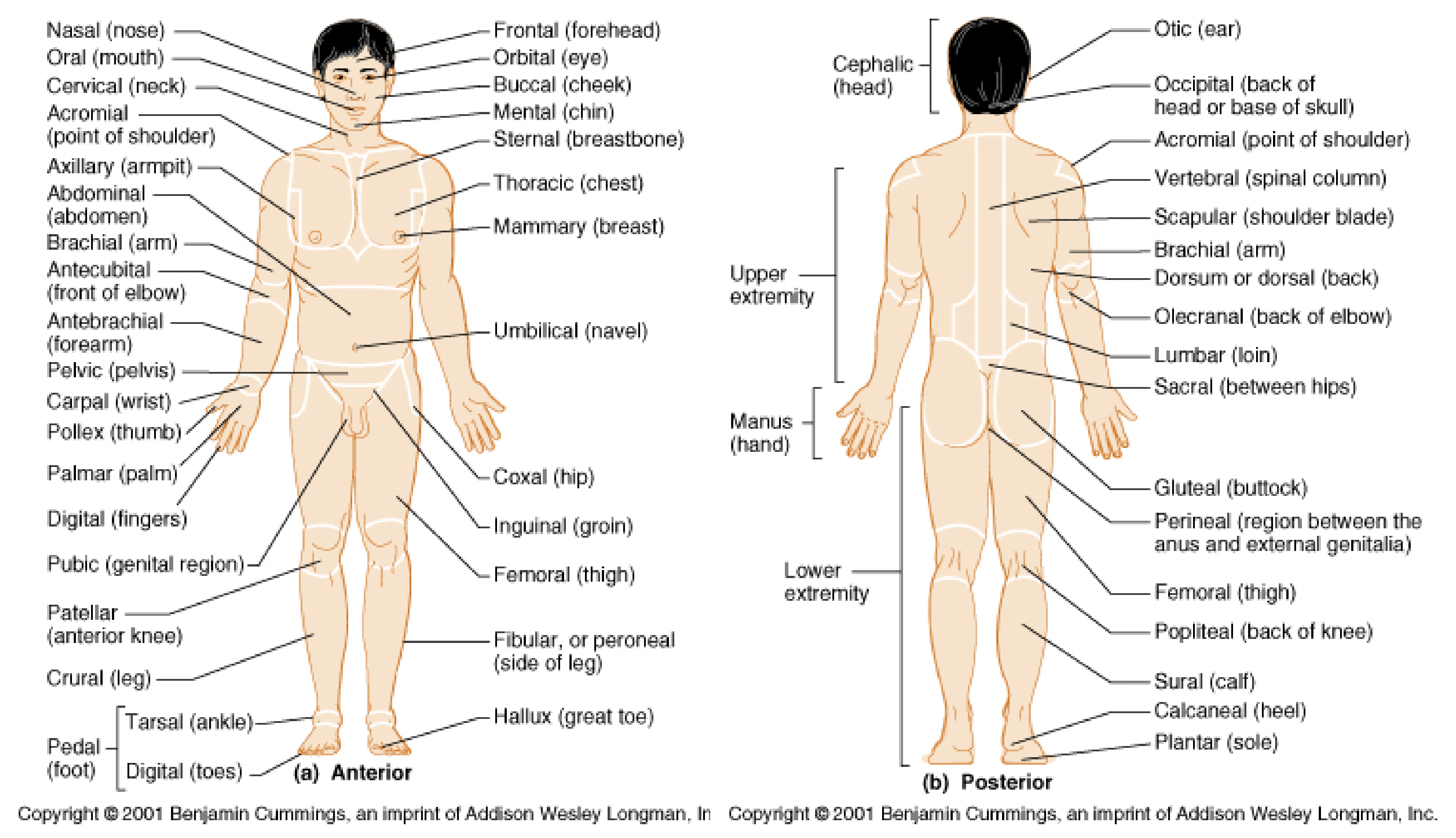
Body Sections



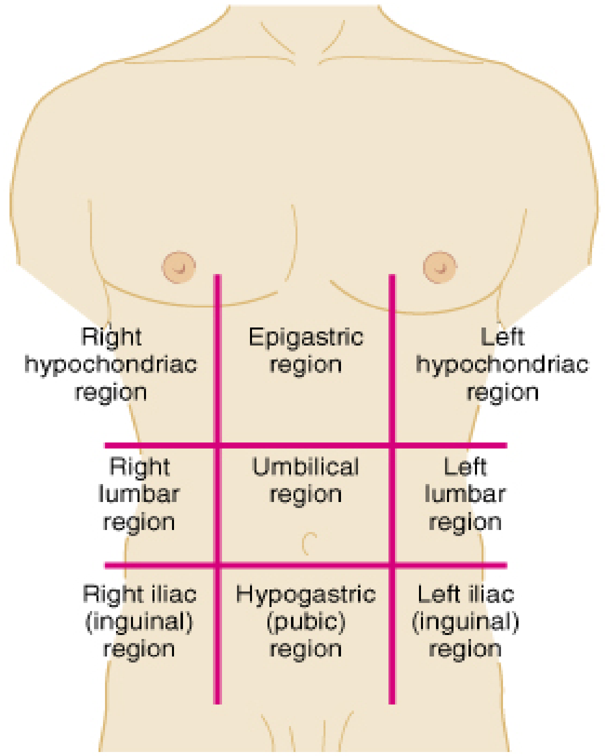
Body Regions



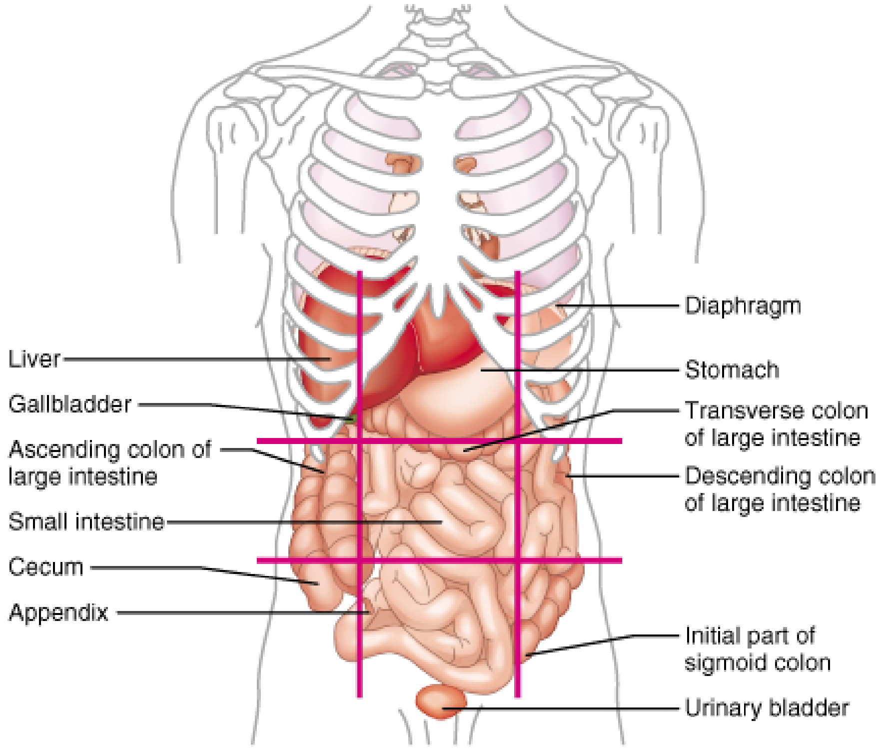
Regional Terms Used for Places



Abdominopelvic Regions



(a)

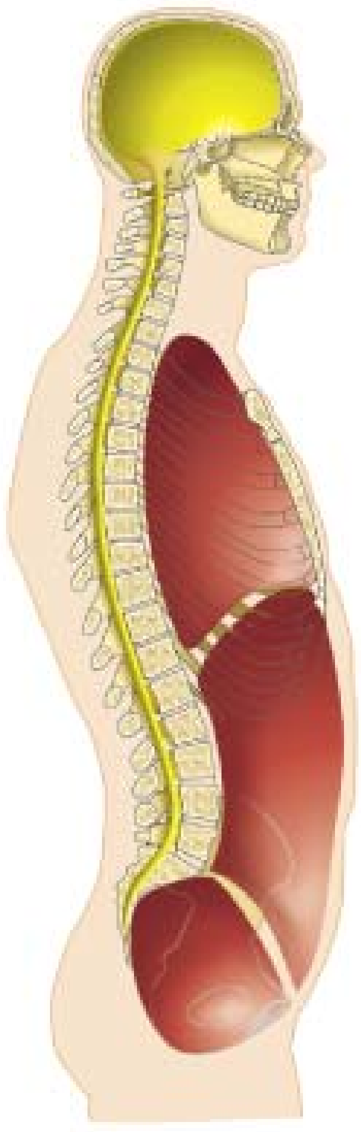


(b)

Body Cavities

- Dorsal body cavity
  – Cranial & vertebral/spinal cavity
- Ventral body cavity
  – Thoracic & abdominopelvic cavity

1.8a



(a) Lateral view

Dorsal Body Cavity

- Near dorsal surface of body
- 2 subdivisions
  - – cranial cavity
    - holds the brain
    - formed by skull
  - – vertebral or spinal canal
    - contains the spinal cord
    - formed by vertebral column
- Meninges line dorsal body cavity

Ventral Body Cavity

- Near ventral surface of body
- 2 subdivisions
  - thoracic cavity above diaphragm
  - abdominopelvic cavity below diaphragm
- Diaphragm = large, dome-shaped muscle
- Organs called viscera
- Organs covered with serous membrane

Abdominopelvic Cavity

- Inferior portion of ventral body cavity below diaphragm
- Encircled by abdominal wall, bones & muscles of pelvis

Thoracic Cavity

- Encircled by ribs, sternum, vertebral column and muscle
- Divided into 2 pleural cavities by mediastinum
- Mediastinum contains all thoracic organs except lungs

Mediastinum

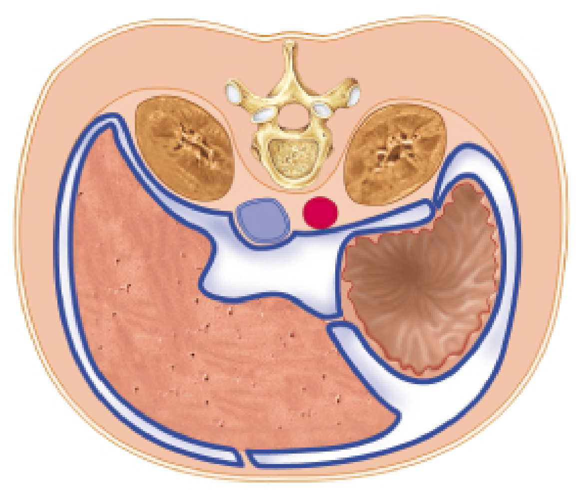
- Midline wall of tissue that contains heart and great vessels, esophagus, trachea and thymus.

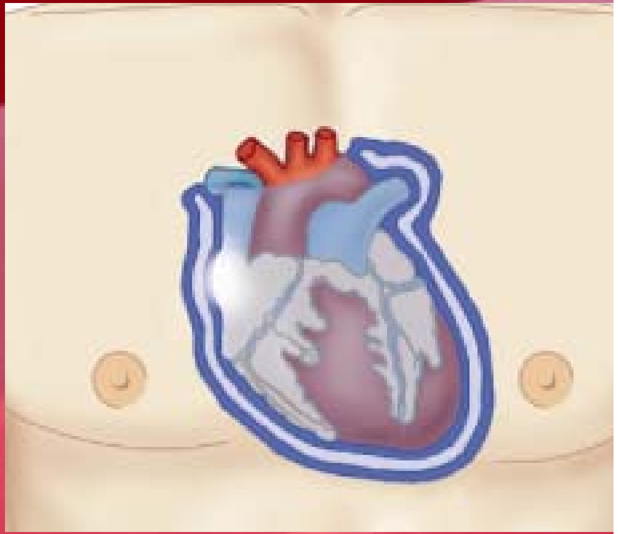
Serous Cavities

- Thorax & Abdomen
- Closed to outside
- Double walled sac (serous membrane)
  - Pleural cavity
  - pericardium
  - peritoneum
- Parietal serosa
- Visceral serosa
- Serous fluid/cavity

Serous Cavities

- Double walled sac
  - – Pleural cavity
  - – pericardium
  - – peritoneum
- Parietal serosa
- Visceral serosa
- Serous fluid
- (1.9bcd) [name views and planes]





Serous Membranes

- Thin slippery membrane lines body cavities not open to the outside
  - parietal layer lines walls of cavities
  - visceral layer covers viscera within the cavities
- Serous fluid reduces friction

Pleural & Pericardial Cavities

- Visceral pleura clings to surface of lungs --- Parietal pleura lines chest wall
- Visceral pericardium covers heart --- Parietal pericardium lines pericardial sac

Peritoneum

- Visceral peritoneum --- serous membrane that covers the abdominal viscera
- Parietal peritoneum --- serous membrane that lines the abdominal wall

Mucous Membranes

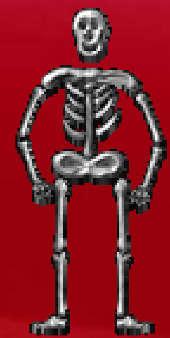
Lines body cavities open to the outside

- Respiratory system
- Digestive system
- Urinary system
- Reproductive system

The Body Systems

- *The Skeletal System*
  - *The basic framework of the body is a system of over 200 bones*

    with their joints, collectively known as the skeleton.
  - *Protects and supports body organs.*
  - *Provides a framework the muscles use to cause movement.*
  - *Blood cells are formed within bones.*
  - *Stores minerals.*



The Body Systems

- *The Muscular System*
  - *Body movements are due to the action of the muscles which are*

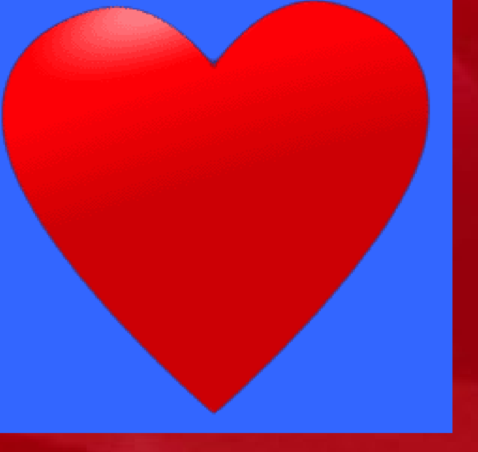
    attached to the bones. Other types of muscles are present in the

    walls of such organs as the intestine and the heart.
  - *Allows manipulation of the environment, locomotion and facial*

    expression.
  - *Maintains posture.*
  - *Produces heat.*

The Body Systems

- *The Circulatory System*
  - *The heart, blood vessels, lymph vessels and lymph nodes all make up the system whereby blood is pumped to all the body tissues, bringing with it food, oxygen and other substances, and carrying away waste materials.*
  - *Blood vessels transport blood, which carries oxygen, carbon dioxide, nutrients, wastes, etc.*
  - *The heart pumps blood.*



The Body Systems

- *The Digestive System*
  - *This system comprises all organs which have to do with taking in food and converting the useful parts of it into substances that the body cells can use. Examples of these organs are the mouth, the teeth, and the alimentary tract (esophagus, stomach, intestine, and accessory organs such as the liver and the pancreas).*
  - *Breaks down food into absorbable units that enter the blood for distribution to body cells.*
  - *Indigestible foodstuffs are eliminated as feces.*

The Body Systems

- *The Respiratory System*
  - *This includes the lungs and the passages leading to and from them. The purpose of this system is to take in air, and from it extract oxygen which is then dissolved in the blood and conveyed to all the tissues. A waste product of the cells, carbon dioxide, is taken by the blood to the lungs, whence it is expelled to the outside air.*
  - *Keeps blood constantly supplied with oxygen and removes carbon dioxide.*
  - *The gaseous changes occur through the walls of the air sacs of the lungs.*

The Body Systems

- *The Integumentary System*
  - *The word "integument" (in-teg'u-ment) means "skin." The skin is considered by some authorities to be a separate body system. It includes the hair, nails, sweat and oil glands, and other related structures.*
  - *Forms the external body covering.*
  - *Protects deeper tissues from injury.*
  - *Synthesis vitamin D.*
  - *Site of cutaneous (pain, pressure, etc.) receptors, and sweat and oil glands.*

The Body Systems

- *The Urinary System*
  - *This is also called the excretory system. Its main components are*

    the kidneys, the ureters, the bladder and the urethra. Its purpose is

    to filter out and rid the body of certain waste products taken by the

    blood from the cells. (Note that other waste products are removed

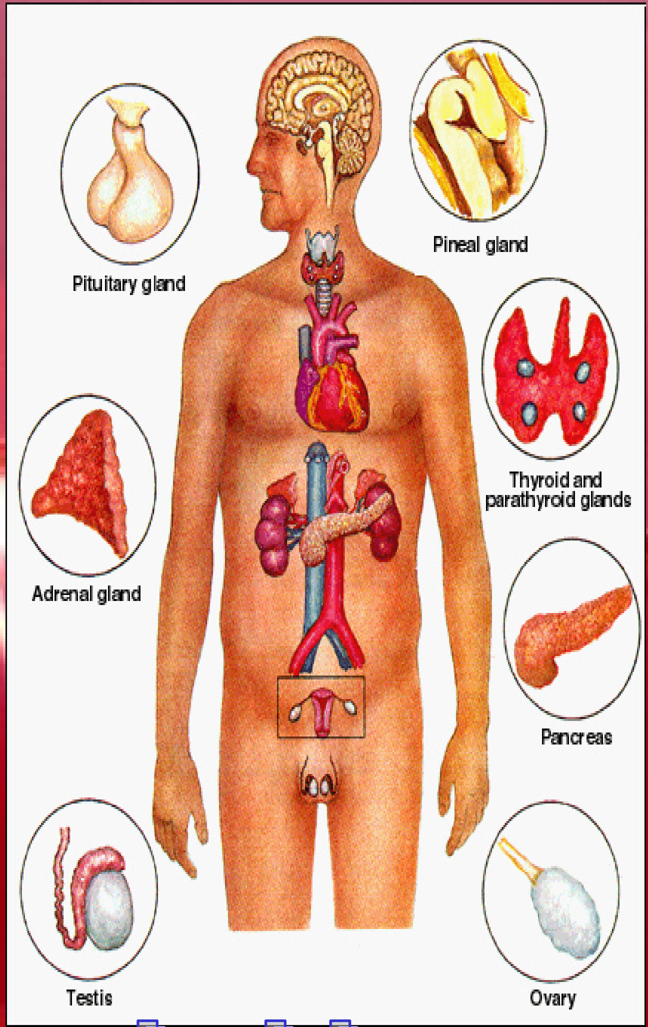
    via the digestive and respiratory systems).
  - *Eliminates nitrogenous waste from the body.*
  - *Regulates water, electrolyte and acid-base balance of the blood.*

The Body Systems

- *The Nervous System*
  - *The brain, the spinal cord and the nerves all make up this very complex system by which all parts of the body are controlled and coordinated. The organs of special sense (such as the eyes, ears, taste buds, and organs of smell), sometimes classed as a separate **sensory system**, together with the sense of tough, receive stimuli from the outside world, which are then converted into impulses that are transmitted to the brain. The brain determines to a great extent the body's responses to messages from without and within, and in it occur such higher functions as memory and reasoning.*
  - ***Fast-acting control system of the body.***
  - ***Responds to internal and external changes by activating appropriate muscles and glands.***

The Body Systems

- *The Endocrine System*
  - *A few scattered organs known as endocrine glands produce special substances called hormones, which regulate such body functions as growth, food utilization within the cells, and reproduction. Examples of endocrine glands are the thyroid and pituitary glands.*
  - *Glands secrete hormones that regulate processes such as growth, reproduction and nutrient use (metabolism) by body cells.*



The Body Systems

- *The Reproductive System*
  - *This system includes the external sex organs and all related inner structures which are concerned with the production of new individuals.*
  - *Overall function is production of offspring.*
  - *Testes produce sperm and male sex hormone; ducts and glands aid in delivery of sperm to the female reproductive tract.*
  - *Ovaries produce eggs and female sex hormone; remaining structures serve as sites for fertilization and development of fetus.*
  - *Mammary glands of female breasts produce milk to nourish the newborn.*