The HUMAN BODY

Concepts of
ANATOMY
and
PHYSIOLOGY

ANATOMY

- The scientific study of structures and the relationship of structures to each other.
- FORM
- Other terms include shape, structure, and appearance.

PHYSIOLOGY

- The scientific study of the functioning of specific body parts and systems.
- FUNCTION

Characteristics of Life

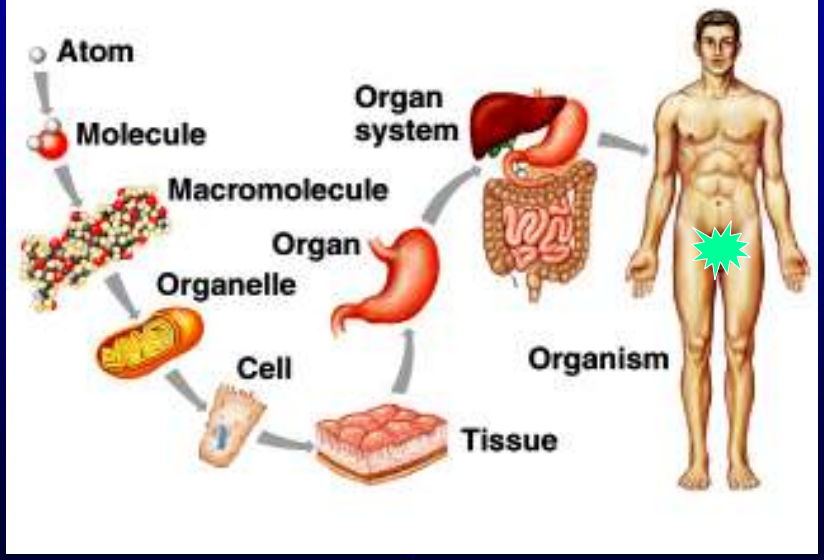
Fundamental characteristics of life are traits shared by all organisms.

1. Metabolism (cell respiration)
2. Homeostasis (reaction to internal or external change)
3. Growth (increase in size without change in shape)
4. Reproduction (new organisms or new cells)
5. Evolution (ability to adapt and change over time)
6. Cell Structure (made of one or more cells)
7. Digestion (breakdown of food into simpler forms)
8. Absorption (nutrient intake)
9. Circulation (movement within body fluids)
10. Death (all things eventually die)

Levels of Organization

- Chemical Level
- Cellular Level
- Tissue Level
- Organ Level
- System Level
- Organism Level

- **Levels of Organization:**



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Chemical Level

- All chemical substances essential for maintaining life – atoms-compounds-molecules.
- Major Elements
  - C - carbon
  - H - hydrogen
  - O - oxygen
  - N - nitrogen

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Cellular Level

- The cell is the basic unit of structure and function.
- Each cell has a unique structure and function.
  - Muscle cells
  - Nerve cells
  - Blood cells
  - Cartilage cells

Tissue Level

- Collection of similar cells grouped together to perform a specific function.
- Usually derived from a common embryonic origin.
- Four Major Tissue Types
  - Epithelial Tissue
  - Connective Tissue
  - Nervous Tissue
  - Muscular Tissue

Organ Level

- Structures composed of two or more different tissues.
- Have specific functions.
- Usually have recognizable shapes
  - Heart
  - Brain
  - Kidney
  - Liver

System Level

- An association of organs that have a common function.
  - Digestive System
  - Cardiovascular System
  - Nervous System
  - Lymphatic System

Organ Systems

Integumentary system

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Organ Systems

Skeletal system | Muscular system

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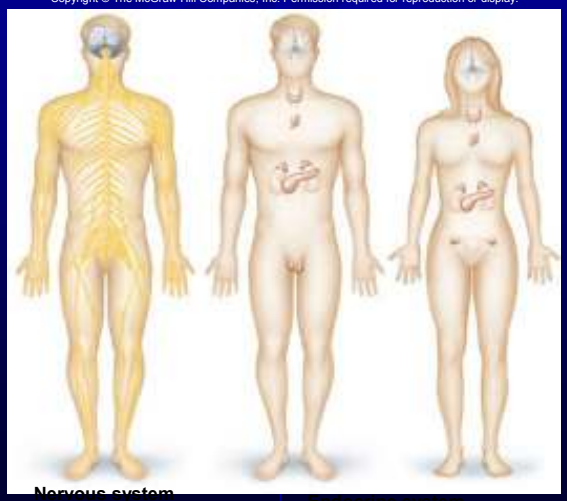
Organ Systems



Nervous system | Endocrine system

Organ Systems

Cardiovascular system | Lymphatic system

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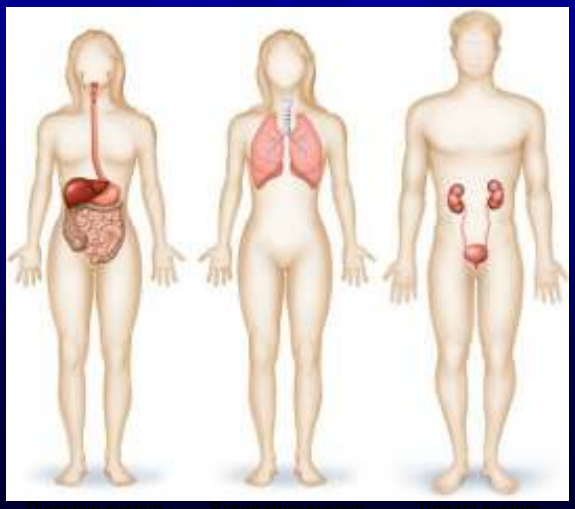
Organ Systems



Digestive system Respiratory system Urinary system

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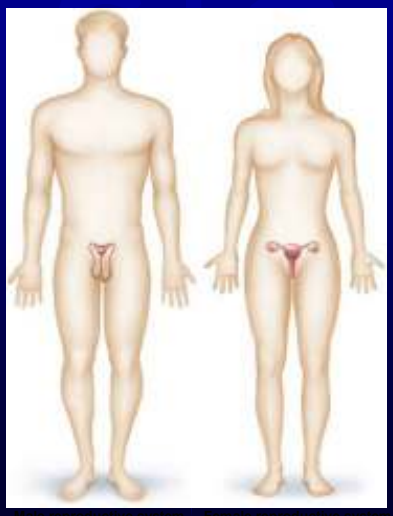
Organ Systems



Male reproductive system Female reproductive system

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Organism Level

All body systems are functioning with one another as a living individual.

Metabolism

The sum total of all chemical processes that occur in the body.

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Anabolism

Using energy to synthesize or manufacture new tissue or molecules.

Catabolism

The breakdown of tissues or chemical structures to produce or generate energy.

Position Descriptors

- Superior (Cranial)
- Inferior (Caudal)
- Anterior (Ventral)
- Posterior (Dorsal)
- Medial
- Lateral
- Proximal
- Distal

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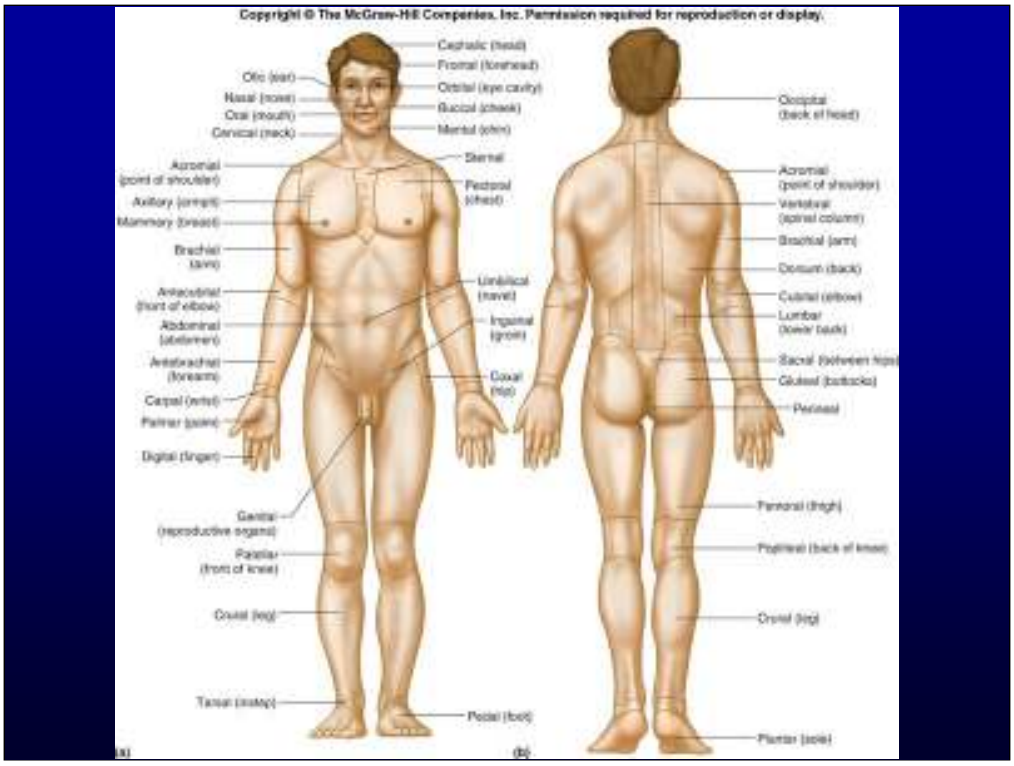
Movement Descriptors

- flexion
- extension
- hyperextension
- abduction
- adduction
- plantar flexion
- dorsiflexion
- circumduction
- supination (LR)
- pronation (MR)
- inversion
- eversion
- elevation
- depression
- protraction
- retraction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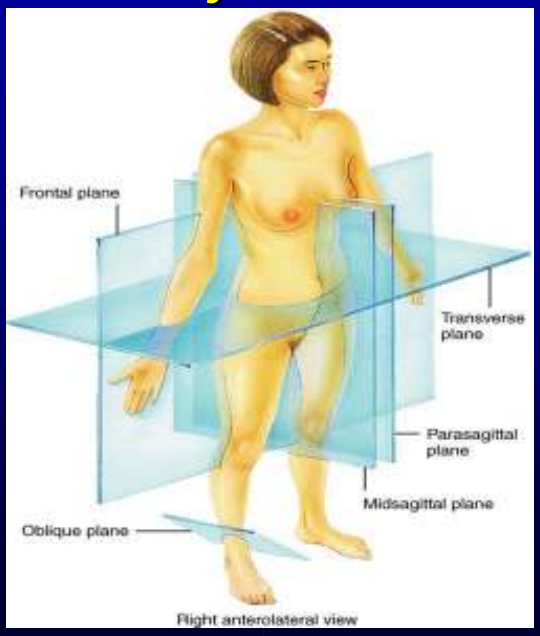
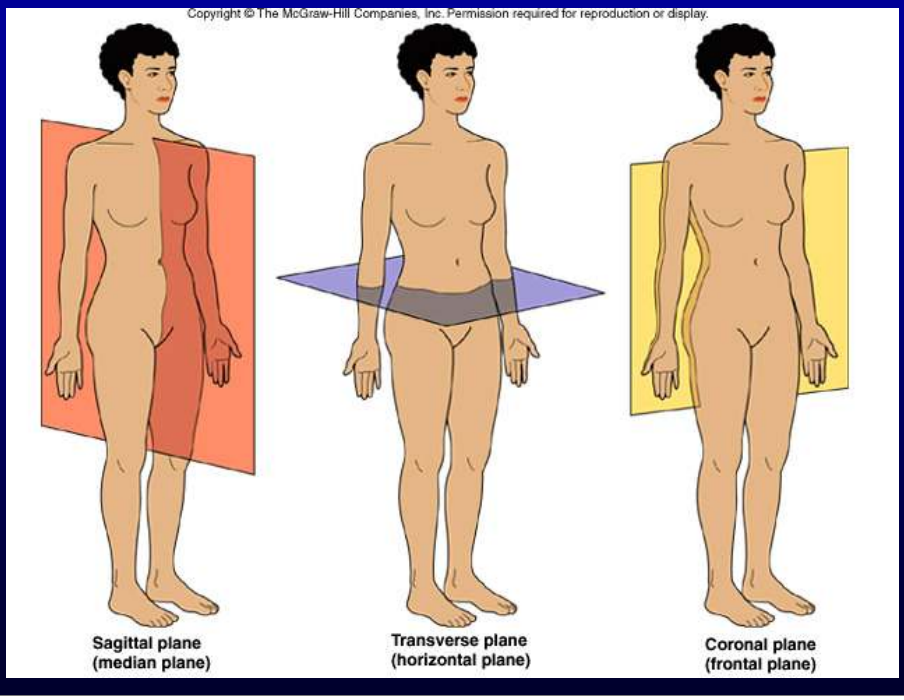
Cephalic (head)
Frontal (forehead)
Otic (ear)
Orbital (eye cavity)
Nasal (nose)
Buccal (cheek)
Oral (mouth)
Mental (chin)
Cervical (neck)
Sternal
Acromial (point of shoulder)
Pectoral (chest)
Axillary (armpit)
Mammary (breast)
Brachial (arm)
Umbilical (navel)
Antecubital (front of elbow)
Inguinal (groin)
Abdominal (abdomen)
Antebrachial (forearm)
Coxal (hip)
Carpal (wrist)
Palmar (palm)
Digital (finger)
Genital (reproductive organs)
Patellar (front of knee)
Crural (leg)
Tarsal (ankle)
Pedal (foot)
(a)
Occipital (back of head)
Acromial (point of shoulder)
Vertebral (spinal column)
Brachial (arm)
Dorsum (back)
Cubital (elbow)
Lumbar (lower back)
Sacral (between hips)
Gluteal (buttocks)
Perineal
Femoral (thigh)
Popliteal (back of knee)
Crural (leg)
Plantar (sole)
(b)

Planes

Fixed lines of reference along which the body or organ is often divided to facilitate viewing.

Body Planes


Frontal plane
Transverse plane
Parasagittal plane
Midsagittal plane
Oblique plane
Right anterolateral view



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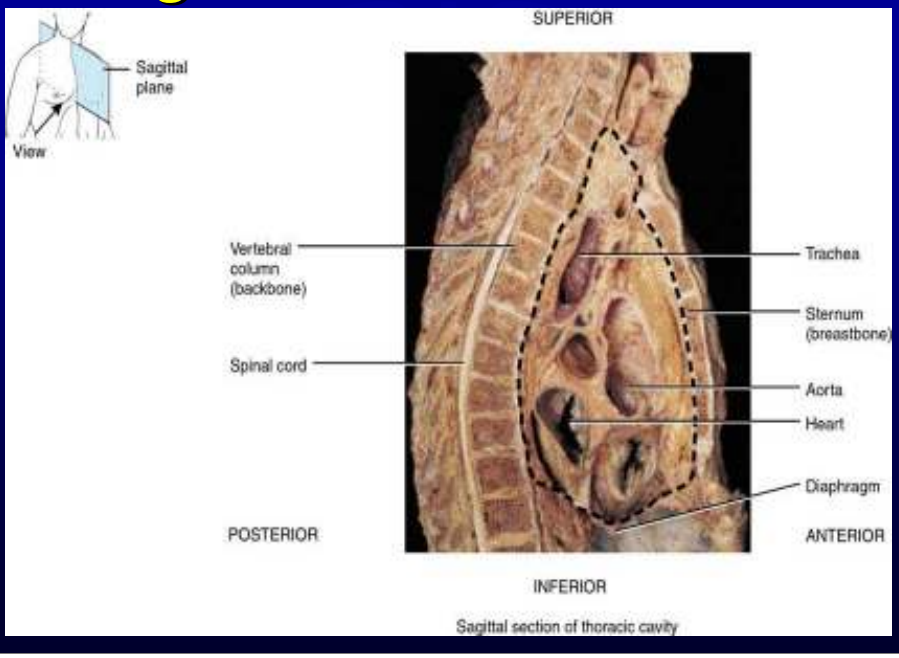
Sagittal Plane

A vertical plane which divides the body or structure into right and left sections.

Sagittal Section of Thorax



Sagittal section of thoracic cavity

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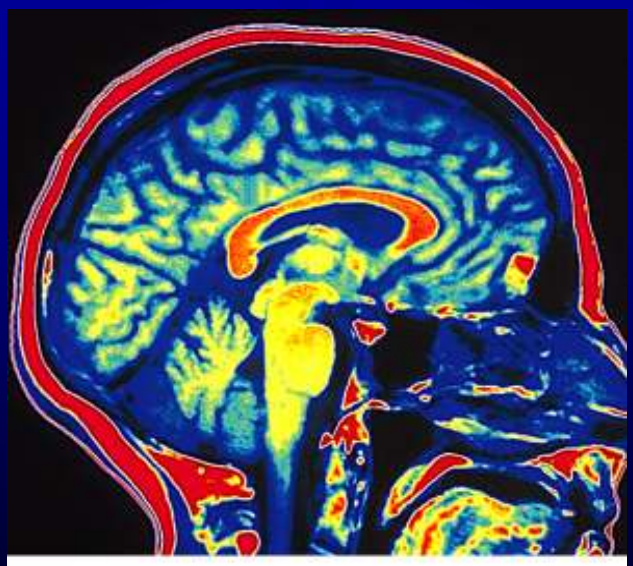
MRI of Brain



Sagittal section of brain

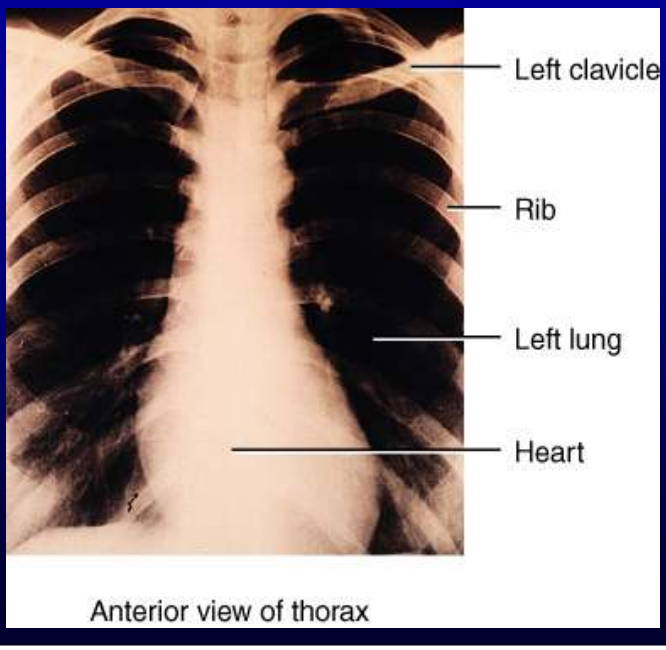
Mid-Sagittal Plane

A vertical plane which divides a body or structure into equal right and left halves.

Frontal (Coronal) Plane

A vertical plane which divides a body or structure into anterior and posterior sections

X-Ray: Frontal View



Anterior view of thorax

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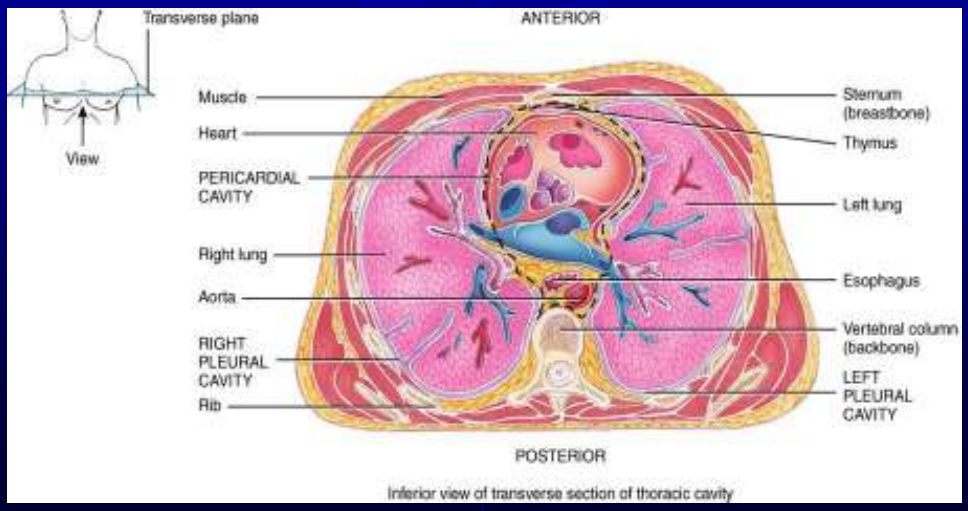
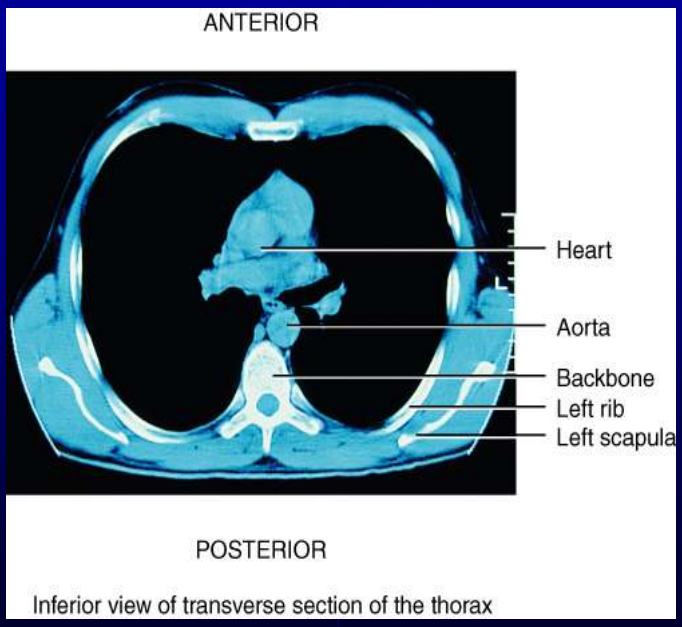
Transverse (Horizontal) Plane

A horizontal plane which divides a body or structure into superior and inferior sections.

Transverse Plane (Cross Section)

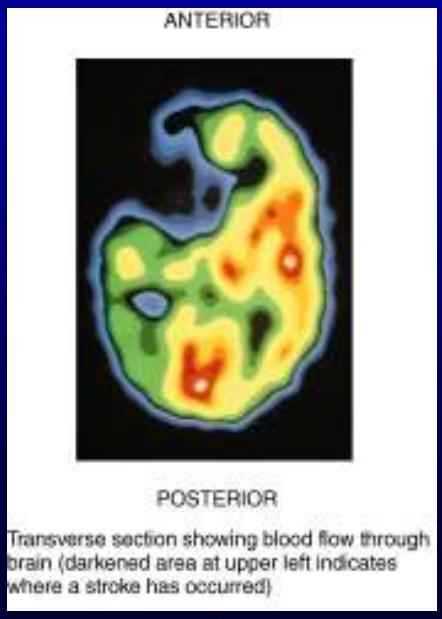


Chest CT Scan



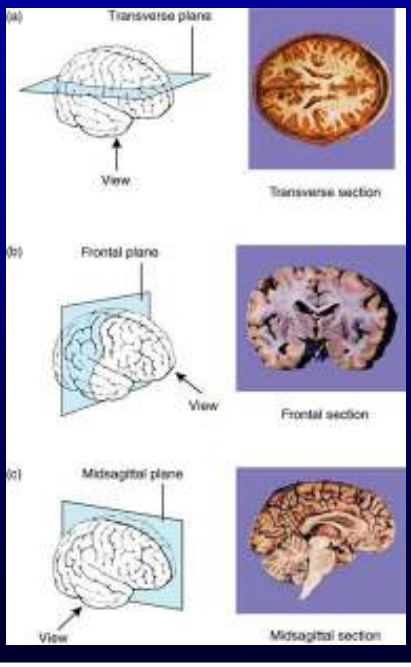
Inferior view of transverse section of the thorax

Brain MRI



Transverse section showing blood flow through brain (darkened area at upper left indicates where a stroke has occurred)

Planes - Overview



BODY CAVITIES

Spaces within the body that contain the internal organs.

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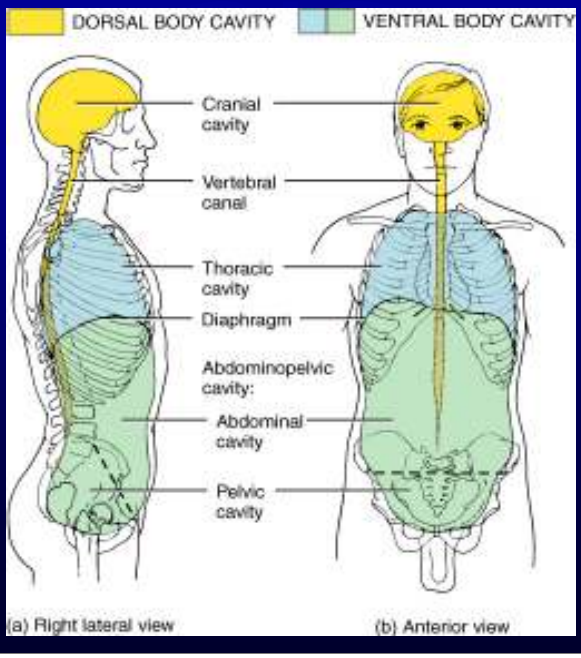
Dorsal Body Cavity

- Cranial Cavity
  - Contains the brain
- Spinal (Vertebral) Cavity
  - Bony cavity formed by the vertebrae of the spine that contains and protects the spinal cord.

Ventral Body Cavity

- Thoracic Cavity
  - Pleural cavities (2)
  - Mediastinum
  - Pericardial cavity
- Abdominopelvic Cavity
  - Abdominal cavity
  - Pelvic cavity

Body Cavities



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Abdominopelvic Quadrants

- The abdominopelvic cavity can be functionally divided into quadrants.
- Used by clinical personnel to describe the location of abdominopelvic pain, tumors, and other abnormalities.

Abdominopelvic Quadrants

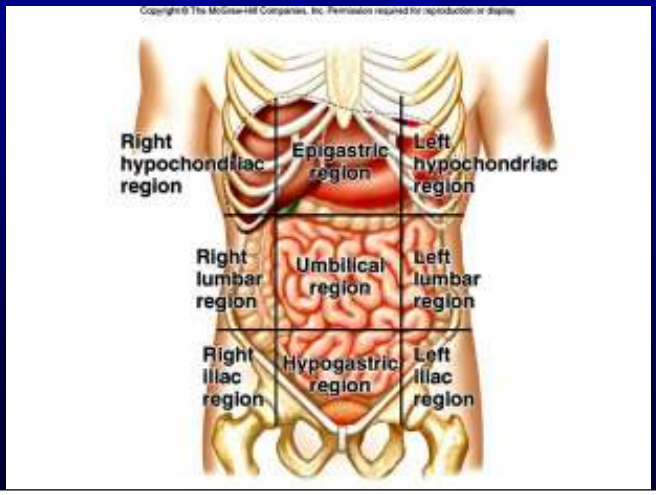
- Used mostly in the medical and clinical disciplines.
- Functionally divides the abdominopelvic cavity into four quadrants
  - RUQ - Right Upper Quadrant
  - LUQ - Left Upper Quadrant
  - RLQ - Right Lower Quadrant
  - LLQ - Left Lower Quadrant

Quadrants and Organs

- RUQ – liver, gallbladder, right kidney
- LUQ – stomach, spleen, pancreas, left kidney
- RLQ – appendix, right ovary
- LLQ – left ovary

- **Body Regions**

1. **The abdominal area can be divided into nine regions.**
2. **Terms used to refer to various body regions are depicted in Fig. 1.15.**



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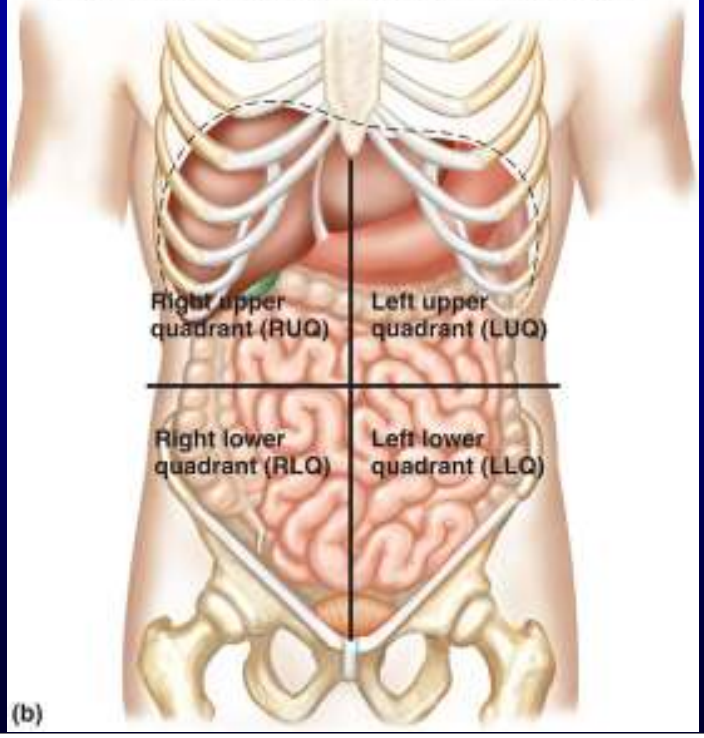

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Homeostasis

The ability of the body to maintain a constant internal environment within prescribed physiological limits.

Parameters Maintained in Homeostasis

- gas concentrations
- temperature
- pressure
- pH (acidity)
- nutrients
- water

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STRESS

- Any factor which disrupts homeostasis.
- Any stimulus which creates an imbalance in the body's internal environment
- Anything that causes stress - Stressor
  - Physical
  - Emotional
  - Metabolic
  - Environmental

External Stressors

- Heat
- Cold
- Noise
- Light
- Exercise

Internal Stressors

- Pain
- Tumors
- High blood pressure
- Chemical imbalances
- Unpleasant thoughts

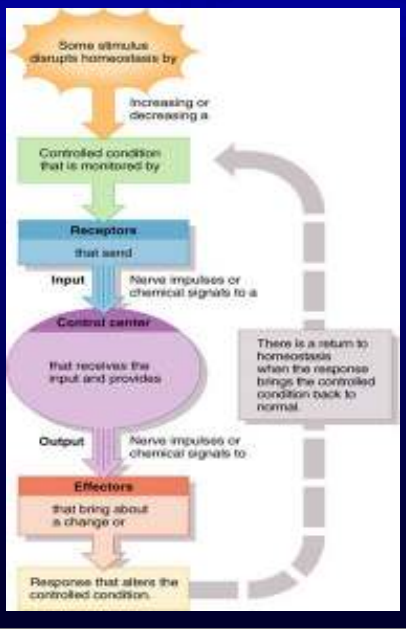
Feedback Mechanisms

Any circular situation in which information about something is monitored and sent to a control center

Components of a Feedback Mechanism

- Control Center
  - An area that receives information about a monitored condition and determines an appropriate response.
- Receptor
  - An area or structure that monitors a controlled condition.
- Effector
  - Structure that produces a response or changes a controlled condition.

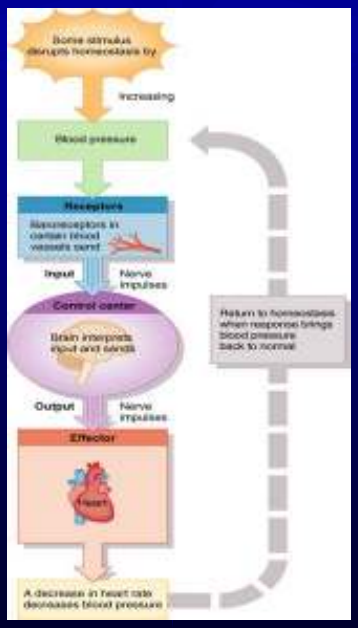
Feedback Mechanisms



Types of Feedback Mechanisms

- Negative Feedback Mechanisms (Inhibitory)
  - The response counteracts the input.
  - The most common feedback mechanism.
  - Examples:
    - blood pressure
    - blood sugar regulation
    - cardiac output
    - temperature regulation
- Positive Feedback Mechanisms (Stimulatory)
  - The response is intensified by the input.
  - Example: Breastfeeding by an infant, childbirth, and blood clotting.

Negative Feedback System



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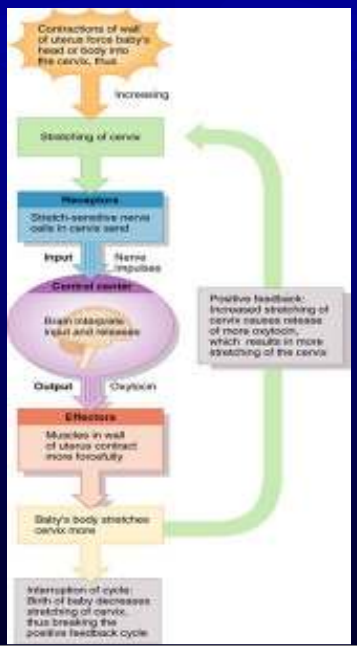
Positive Feedback System



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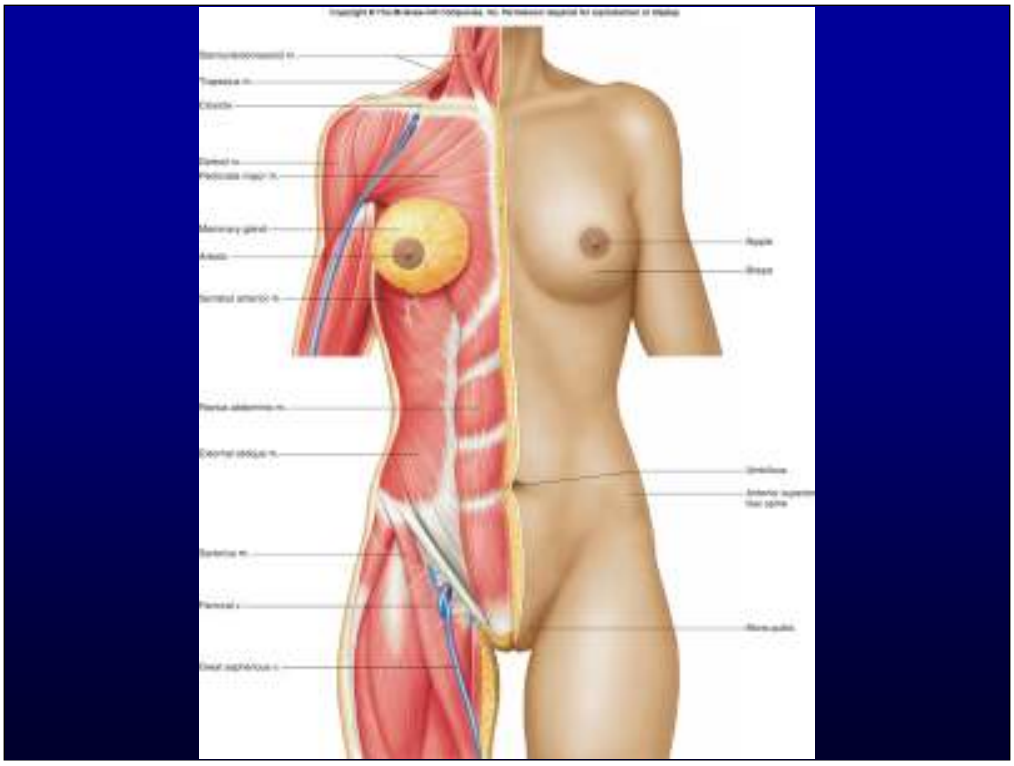
Medical and Applied Sciences

- Cardiology
- Cytology
- Dermatology
- Epidemiology
- Gastroenterology
- Gerontology
- Gynecology
- Hematology
- Histology
- Pharmacology
- Podiatry
- Psychiatry
- Immunology
- Neonatology
- Neurology
- Obstetrics
- Oncology
- Ophthalmology
- Orthopedics
- Otolaryngology
- Pathology
- Pediatrics
- Toxicology
- Urology
- Radiology



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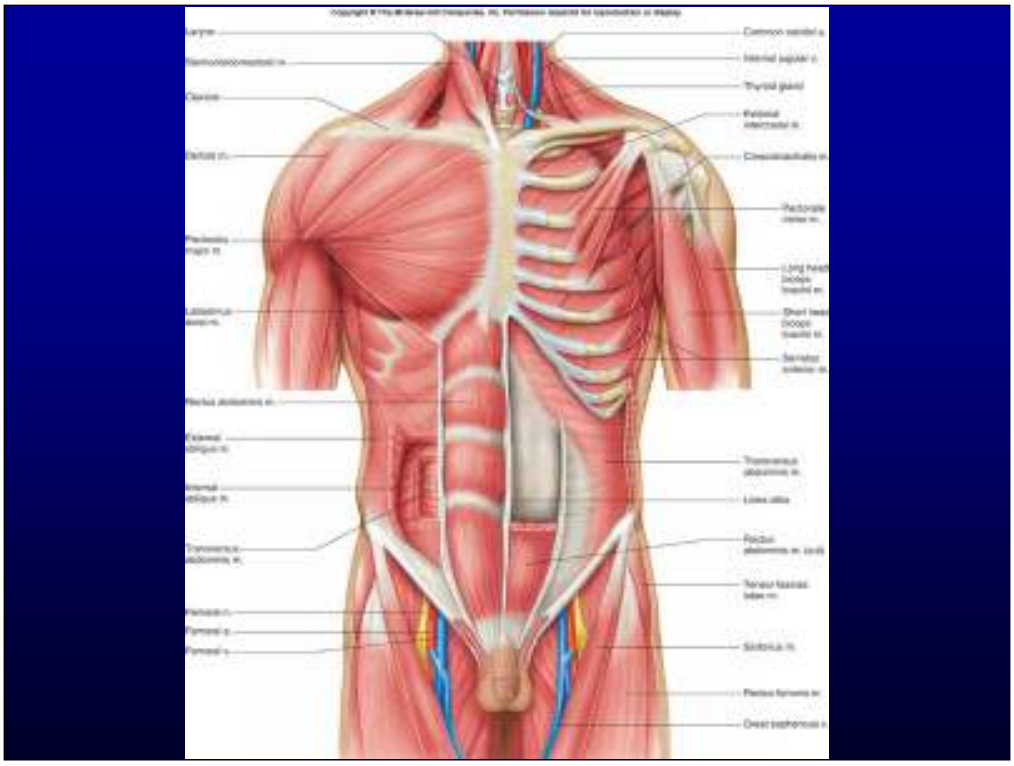
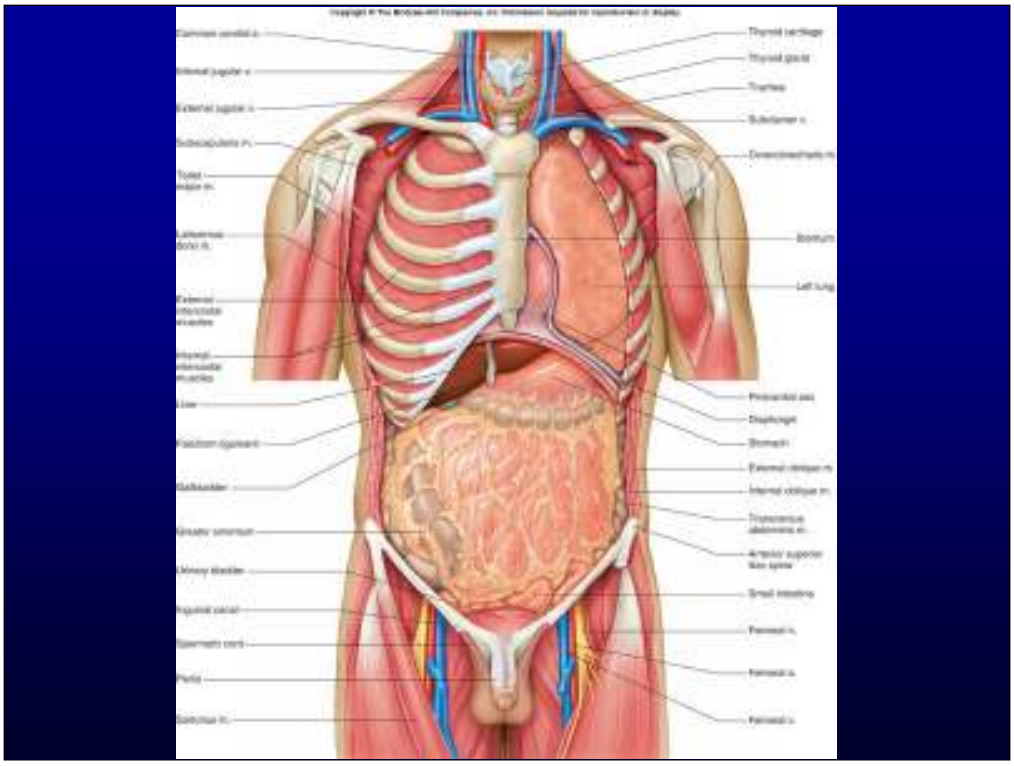
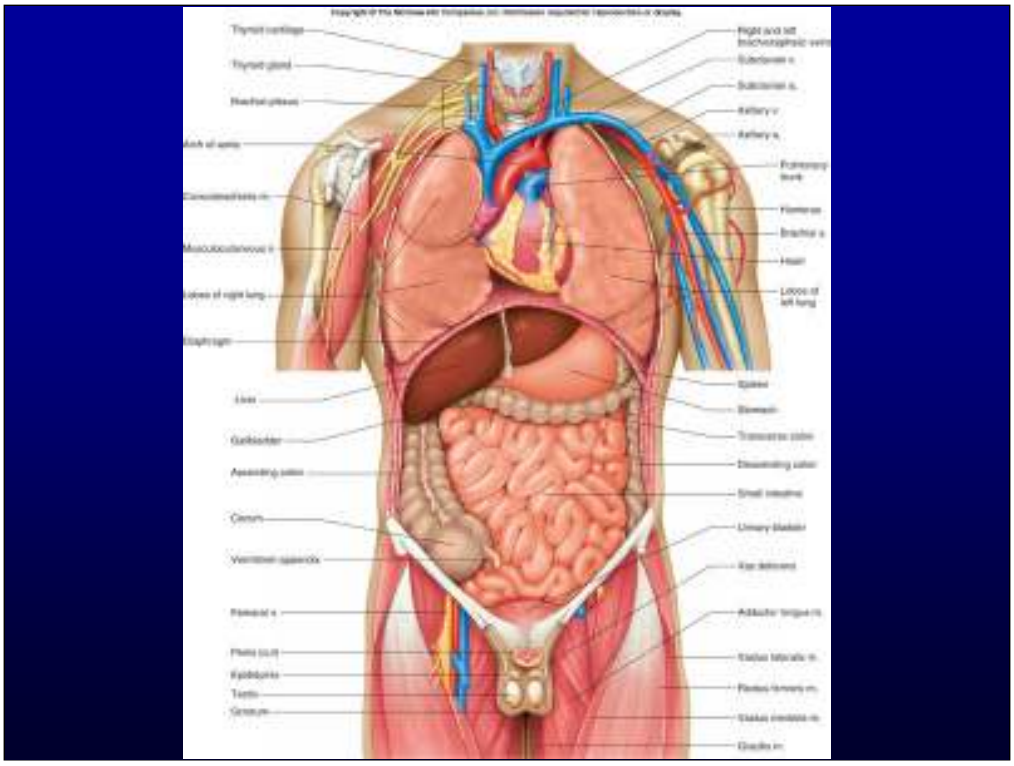



Thyroid cartilage
Thyroid gland
Trachea
Subclavian v.
Coracobrachialis m.
Brachial a.
Left lung
Pericardial sac
Diaphragm
Stomach
External oblique m.
Internal oblique m.
Transversus abdominis m.
Anterior superior iliac spine
Small intestine
Femoral n.
Femoral a.
Femoral v.


Thyroid cartilage
Thyroid gland
Brachial plexus
Arch of aorta
Musculocutaneous n.
Lobes of right lung
Diaphragm
Liver
Gallbladder
Ascending colon
Cecum
Vermiform appendix
Femoral a.
Penis (cut)
Epididymis
Testis
Scrotum
Right and left brachiocephalic veins
Subclavian v.
Subclavian a.
Axillary v.
Axillary a.
Pulmonary trunk
Humerus
Brachial a.
Heart
Lobes of left lung
Spleen
Stomach
Transverse colon
Descending colon
Small intestine
Urinary bladder
Rectus abdominis
Adductor longus m.
Vastus lateralis m.
Pectineus m.
Vastus medialis m.
Gracilis m.

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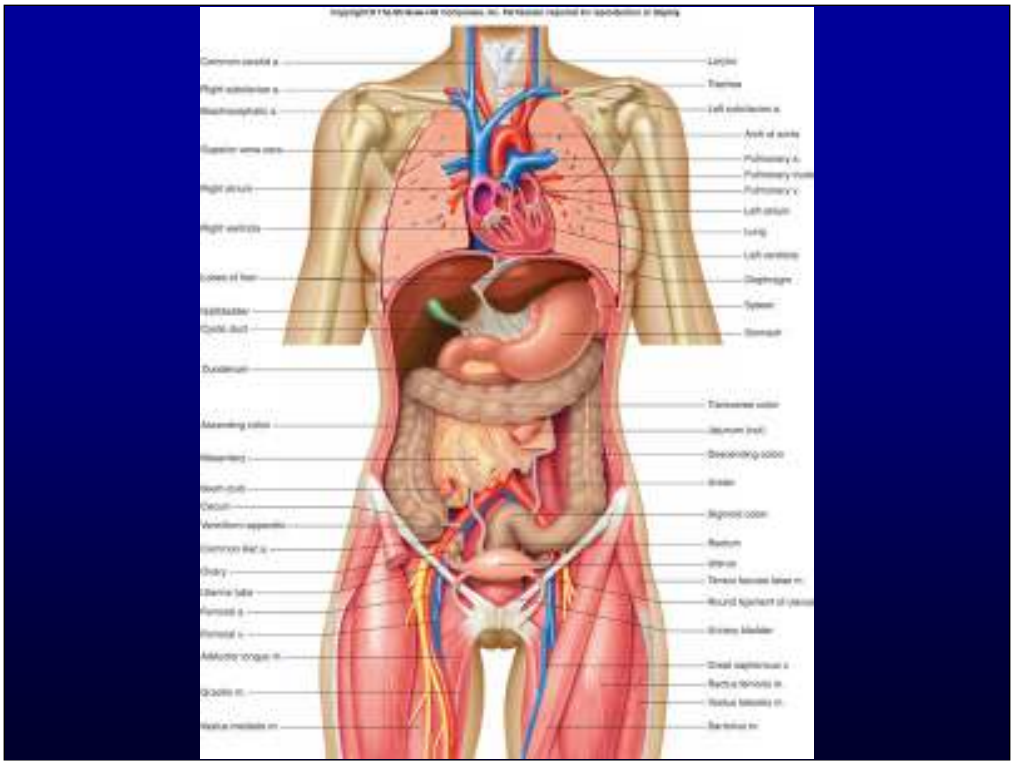

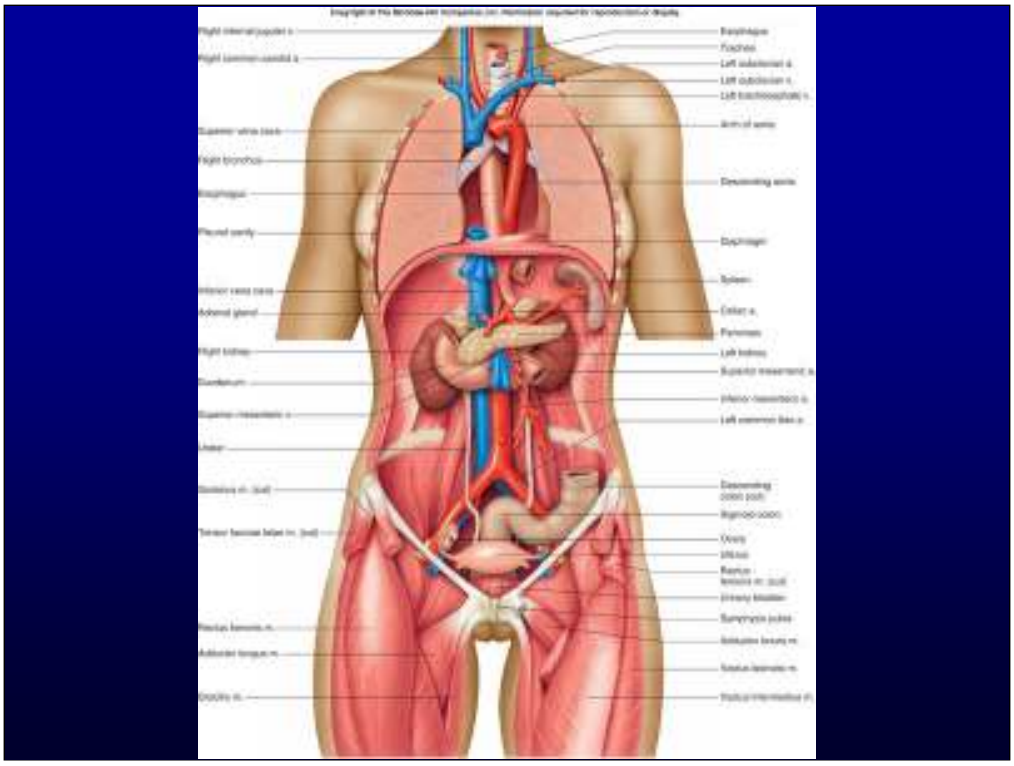

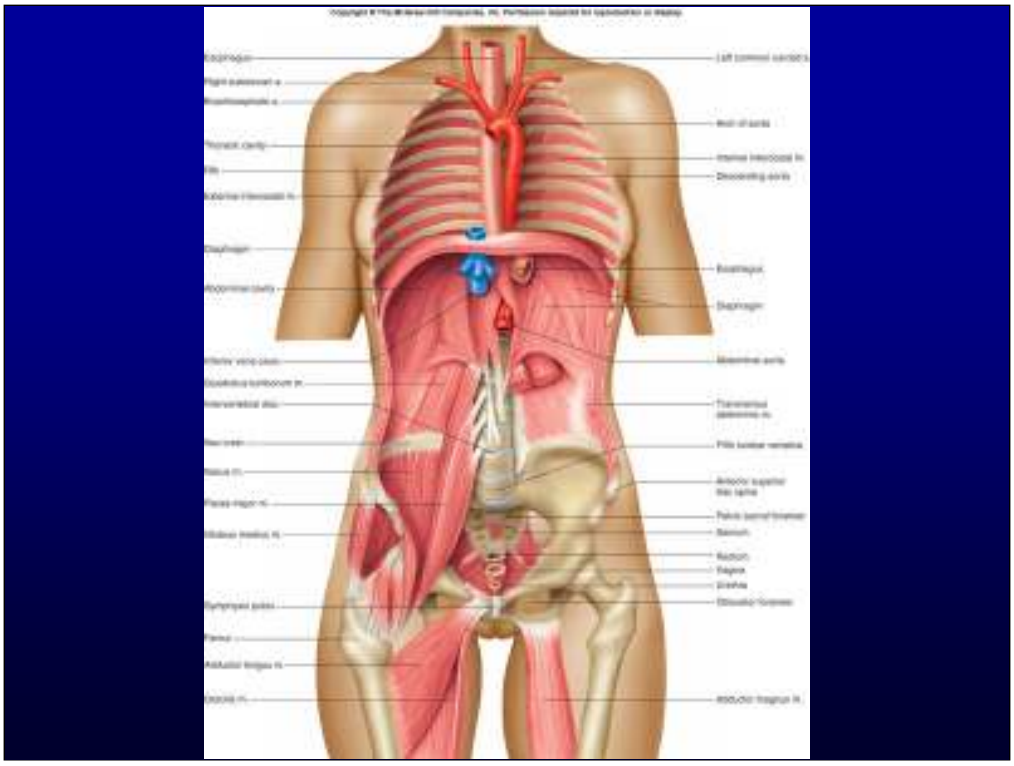

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