

# Hole's Human Anatomy and Physiology

## Chapter 1

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# Chapter 1

## Introduction to Human Anatomy and Physiology

# Levels of Organization

**Subatomic Particles** – electrons, protons, neutrons

**Atom** – hydrogen atom, lithium atom

**Molecule** – water molecule, glucose molecule

**Macromolecule** – protein molecule, DNA molecule

**Organelle** – mitochondrion, Golgi apparatus, nucleus

**Cell** – muscle cell, nerve cell

**Tissue** – simple squamous epithelium, loose connective tissue

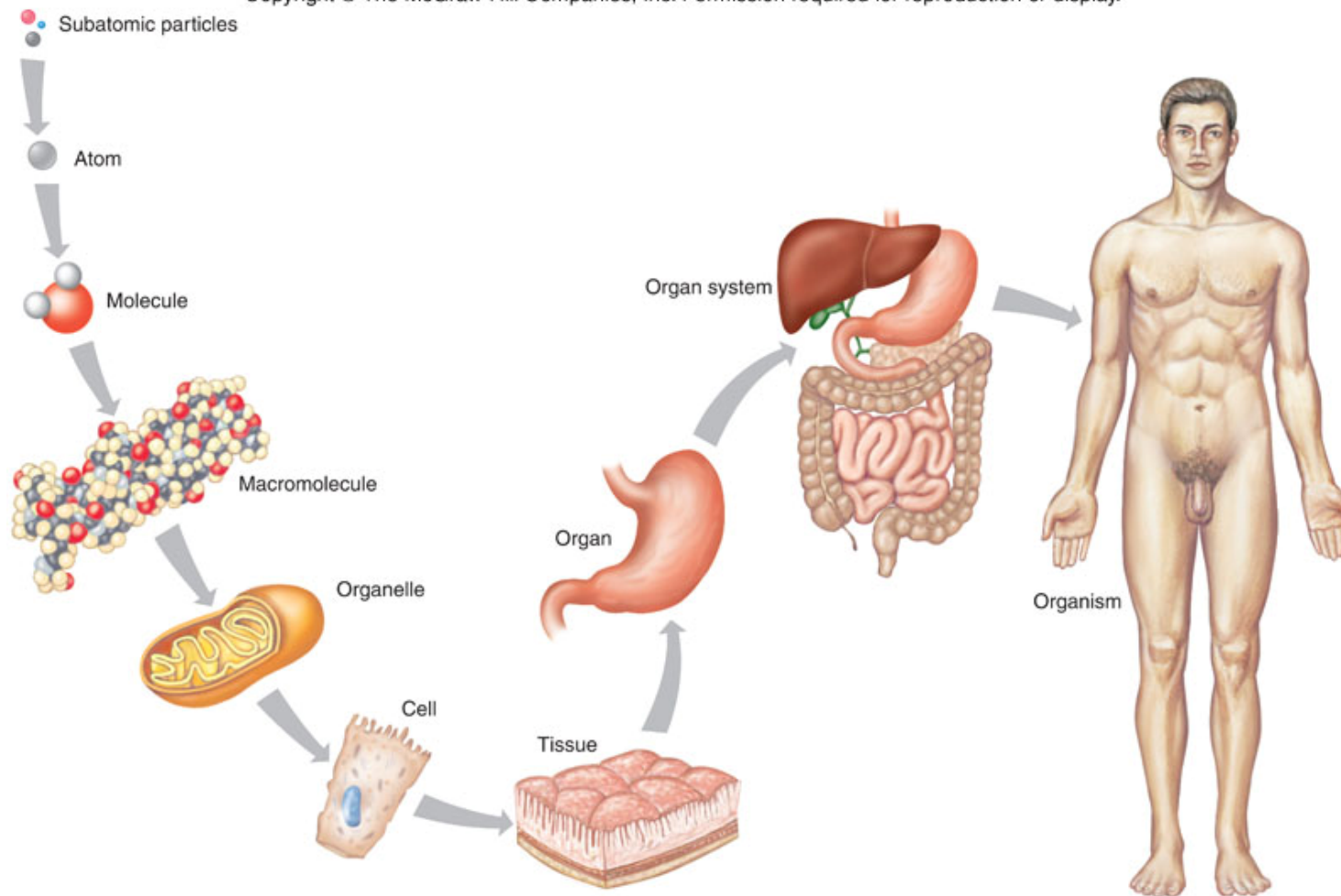
**Organ** – skin, femur, heart, kidney

**Organ System** – skeletal system, digestive system

**Organism** - human

# Levels of Organization

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# **Anatomy and Physiology**

**Anatomy** – study of structure  
(Greek – “a cutting up”)

**Physiology** – study of function  
(Greek – “relationship to nature”)

**Structure is always related to function**

# Clinical Application

## Medical Imaging

- **Noninvasive procedures**
- **Provide images of soft internal structures**

### **Ultrasonography**

- **Use of high-frequency sound waves**
- **Relatively quick and inexpensive**

### **Magnetic Resonance Imaging**

- **Requires injection of dye**
- **Produces computerized images from different angles**

# Characteristics of Life

**Movement** – change in position; motion

**Responsiveness** – reaction to a change

**Growth** – increase in body size; no change in shape

**Reproduction** – production of new organisms and new cells

**Respiration** – obtaining oxygen; removing carbon dioxide; releasing energy from foods

# Characteristics of Life

**Digestion** – breakdown of food substances into simpler forms

**Absorption** – passage of substances through membranes and into body fluids

**Circulation** – movement of substances in body fluids

**Assimilation** – changing of absorbed substances into chemically different forms

**Excretion** – removal of wastes produced by metabolic reactions



# Requirements of Organisms

**Life depends on five environmental factors**

- **water**
- **food**
- **oxygen**
- **heat**
- **pressure**

# Requirements of Organisms

## Water

- most abundant substance in body
- required for metabolic processes
- required for transport of substances
- regulates body temperature

## Food

- provides necessary nutrients
- supplies energy
- supplies raw materials

# Requirements of Organisms

## Oxygen (Gas)

- one-fifth of air
- used to release energy from nutrients

## Heat

- form of energy
- partly controls rate of metabolic reactions

## Pressure

- application of force on an object
- atmospheric pressure – important for breathing
- hydrostatic pressure – keeps blood flowing

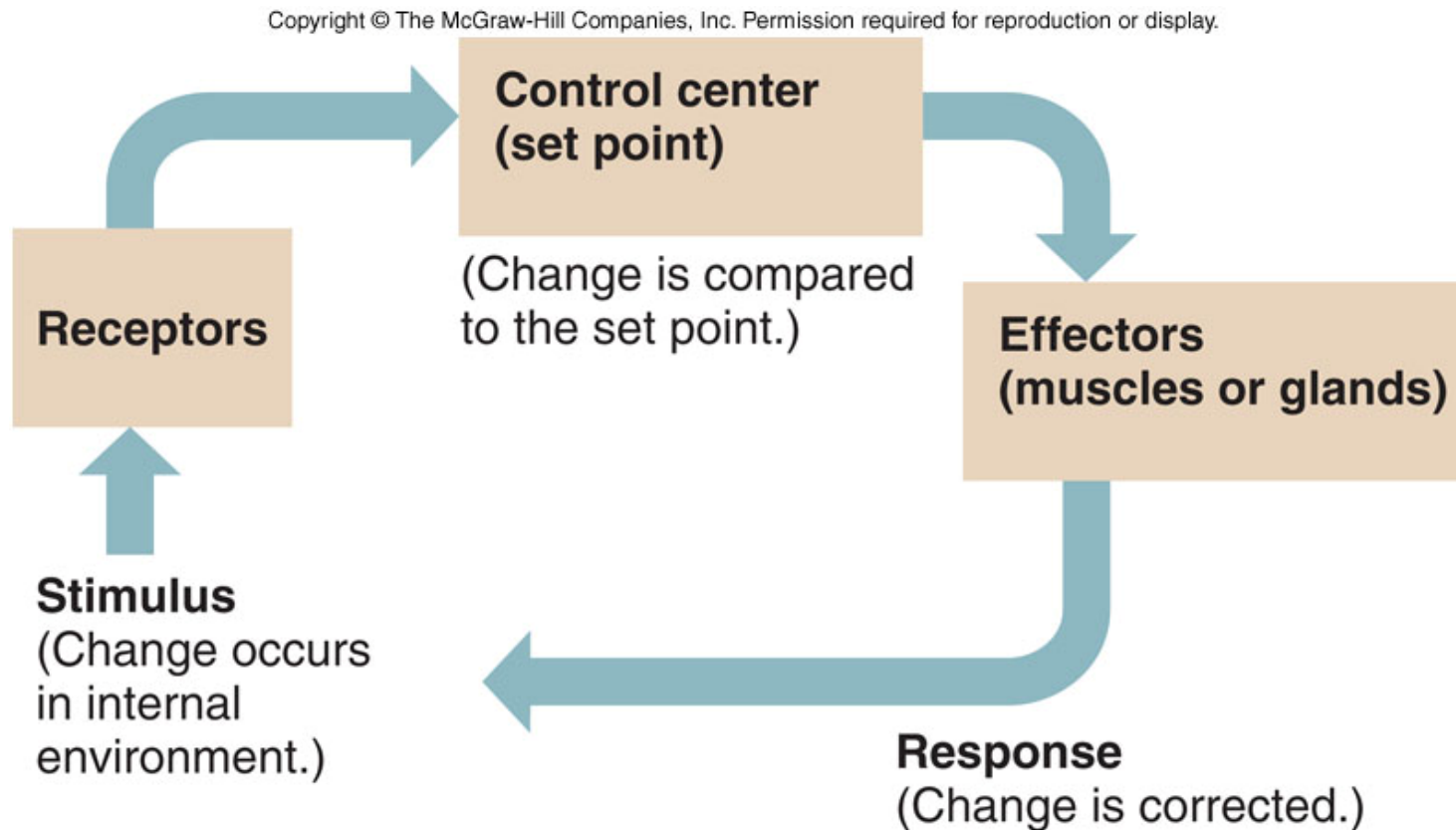
# Homeostasis

**Body's maintenance of a stable internal environment**

**Homeostatic Mechanisms** – monitor aspects of the internal environment and corrects any changes

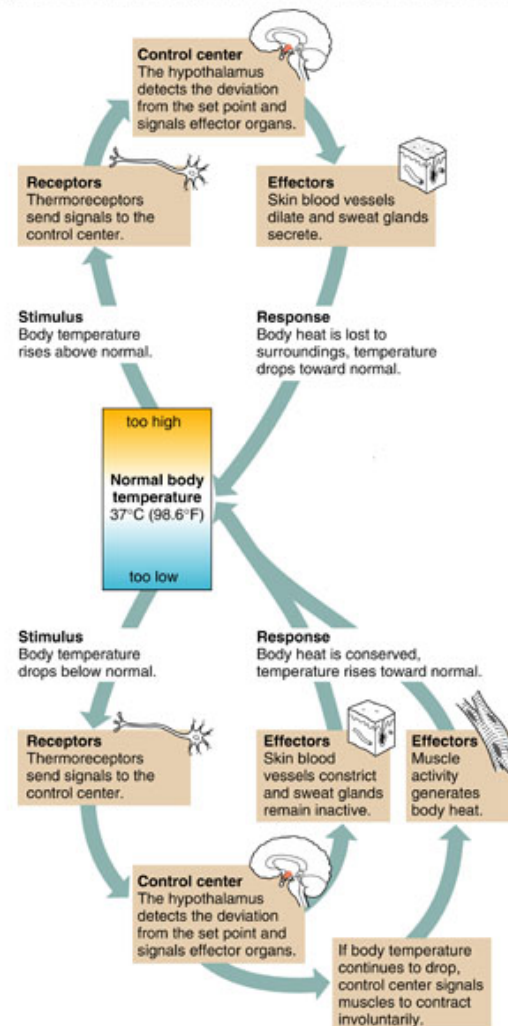
- **Receptors** - provide information about stimuli
- **Control center** - tells what a particular value should be (includes a set point)
- **Effectors** - elicit responses that change conditions in the internal environment

# Homeostatic Mechanisms



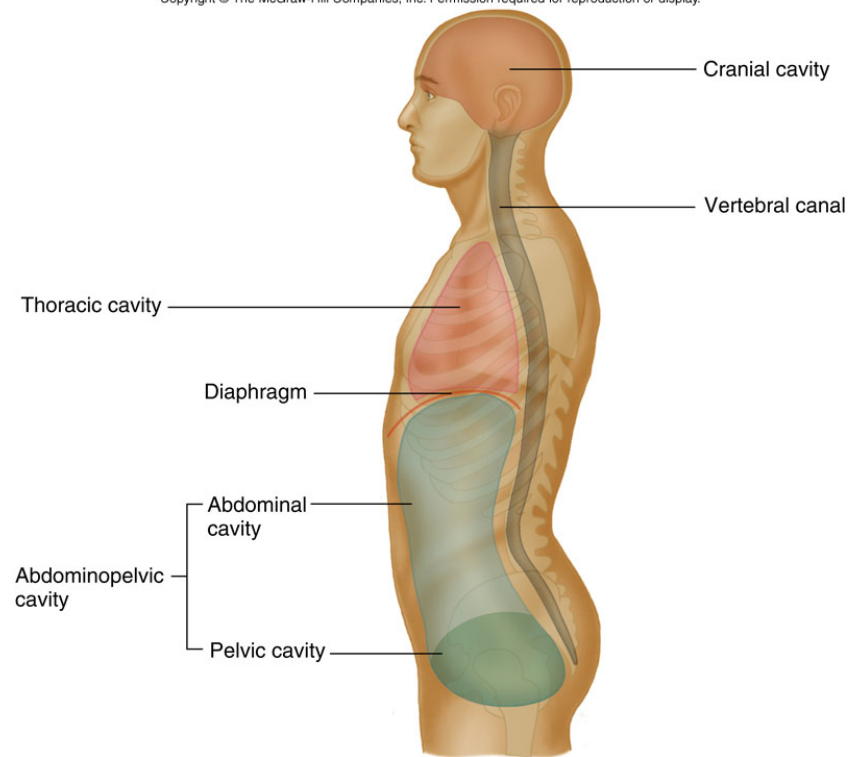
# Homeostatic Mechanisms

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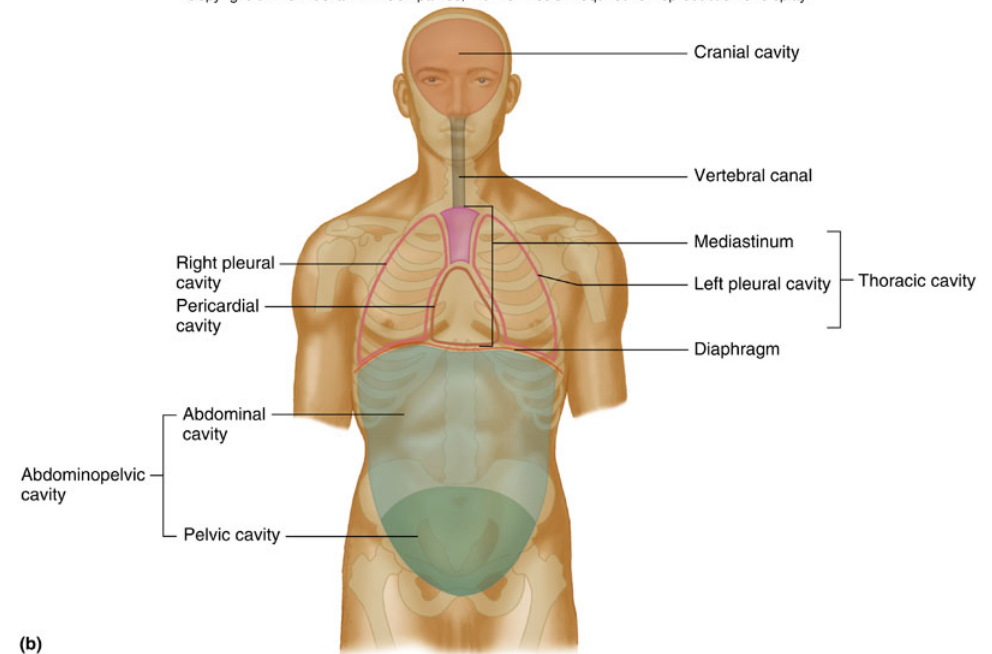
# Body Cavities

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(a)

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(b)

# Thoracic & Abdominal Membranes

**Visceral layer** – covers an organ

**Parietal layer** – lines a cavity or body wall

## Thoracic Membranes

- Visceral pleura
- Parietal pleura
- Visceral pericardium
- Parietal pericardium

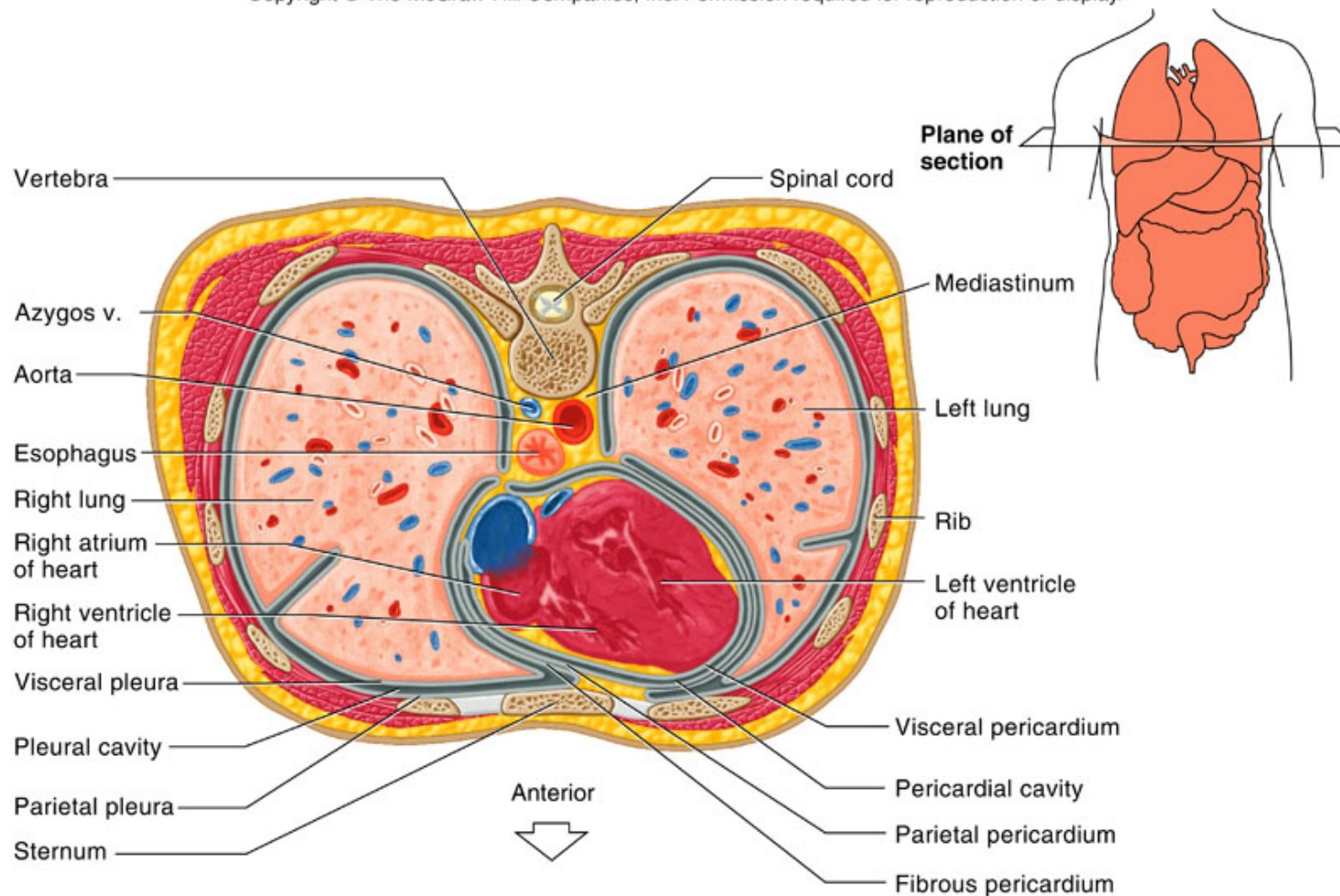
## Abdominopelvic Membranes

- Parietal peritoneum
- Visceral peritoneum



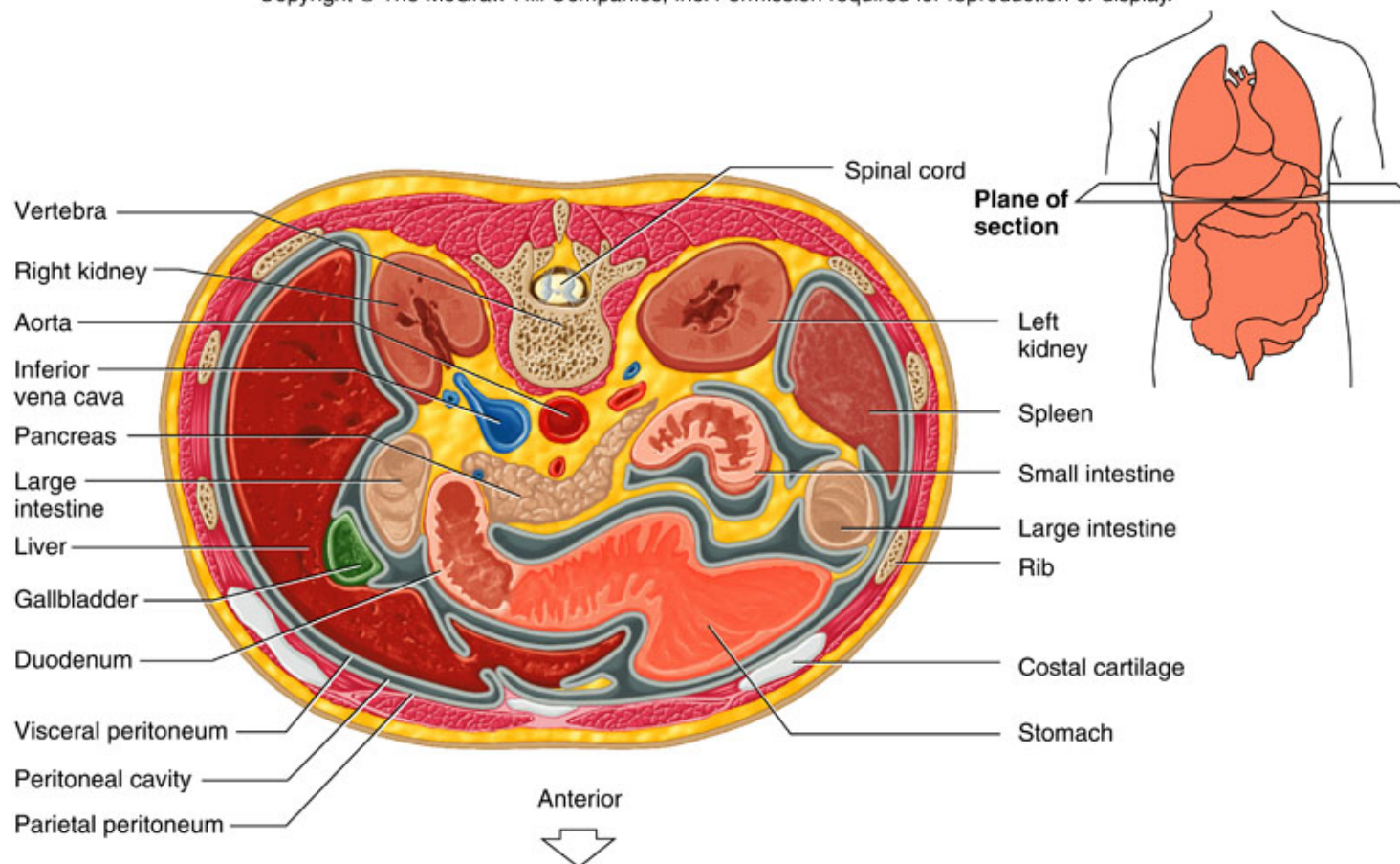
# Serous Membranes

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# Serous Membranes

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# Organ Systems

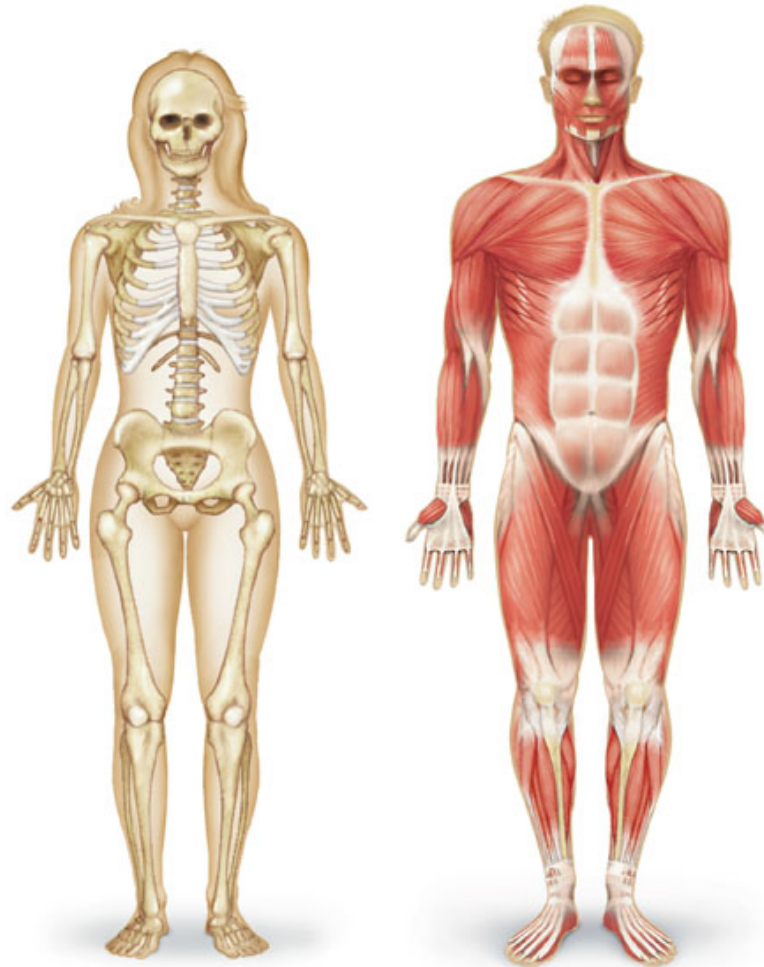
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Integumentary system

# Organ Systems

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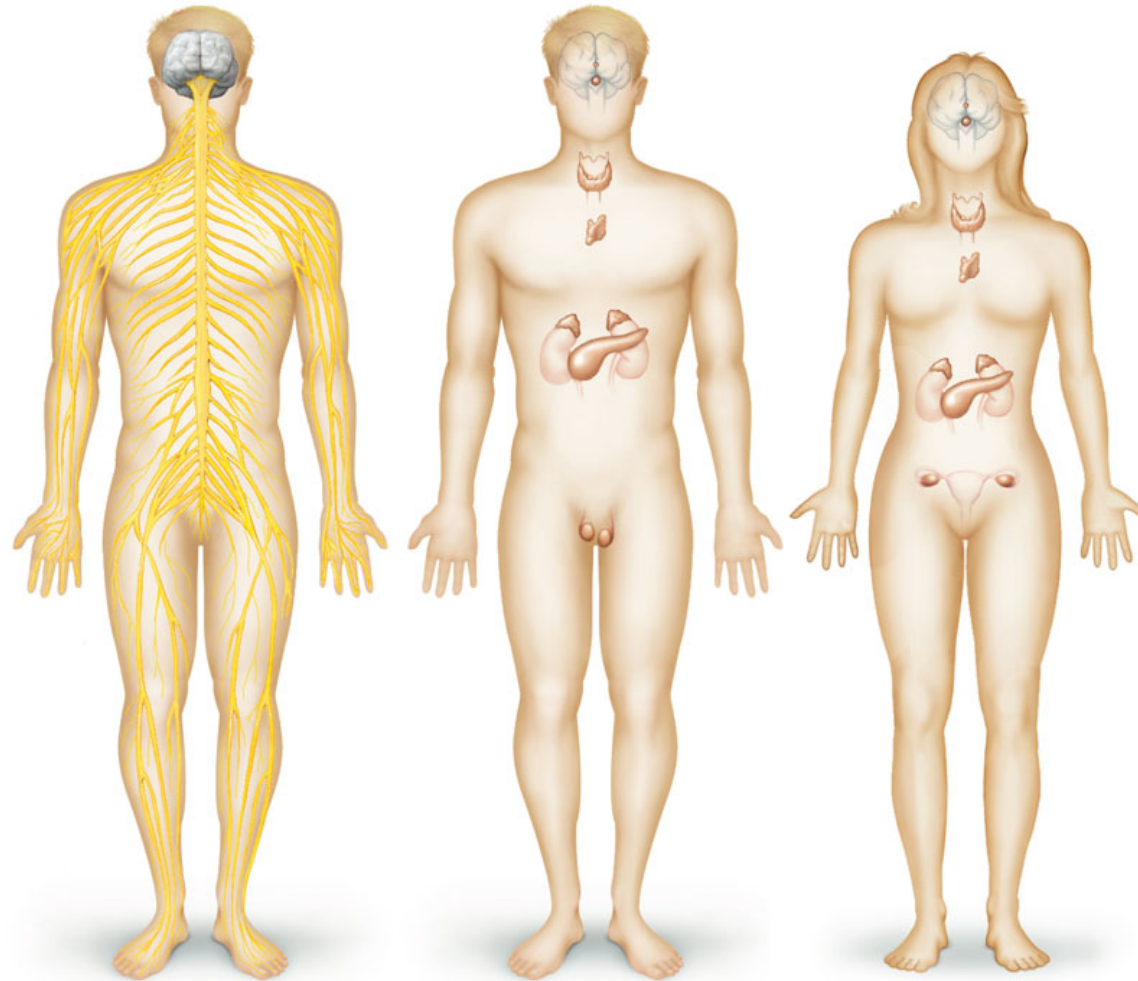


Skeletal system

Muscular system

# Organ Systems

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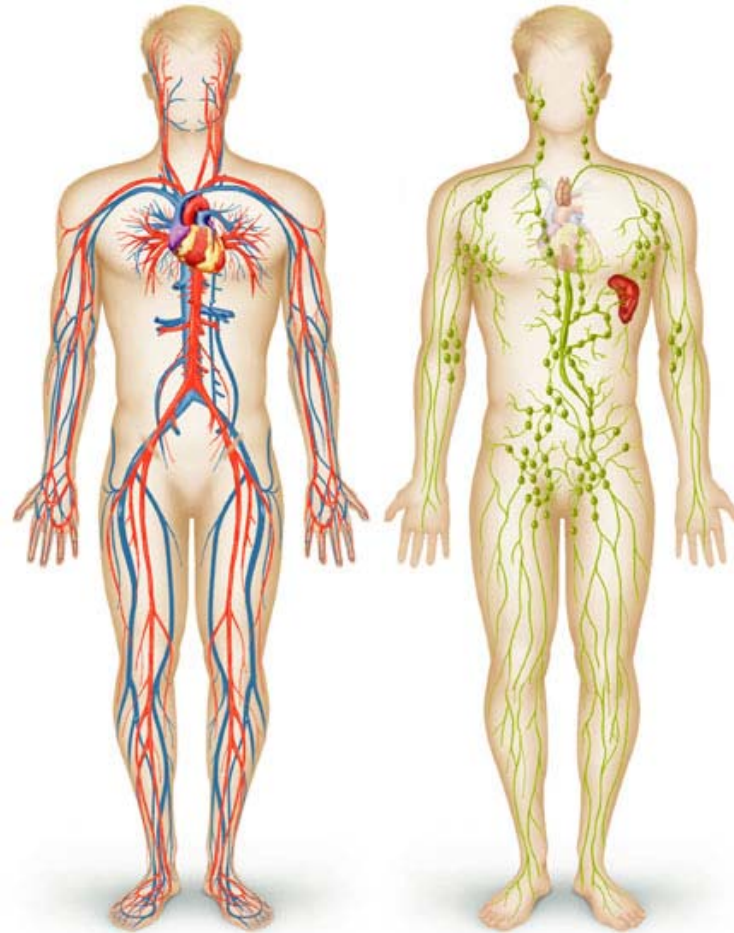
Nervous system

Endocrine system



# Organ Systems

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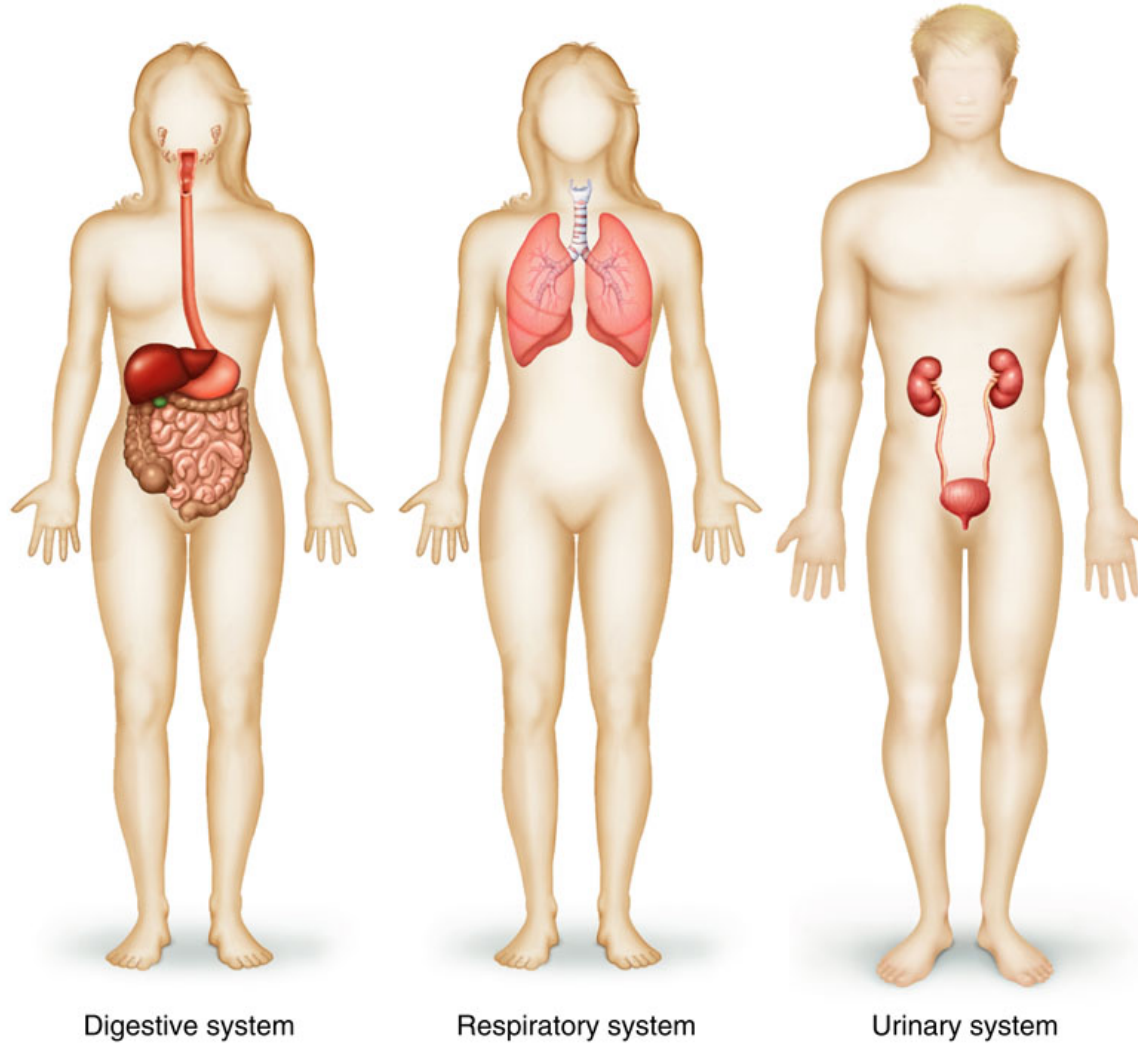


Cardiovascular system

Lymphatic system

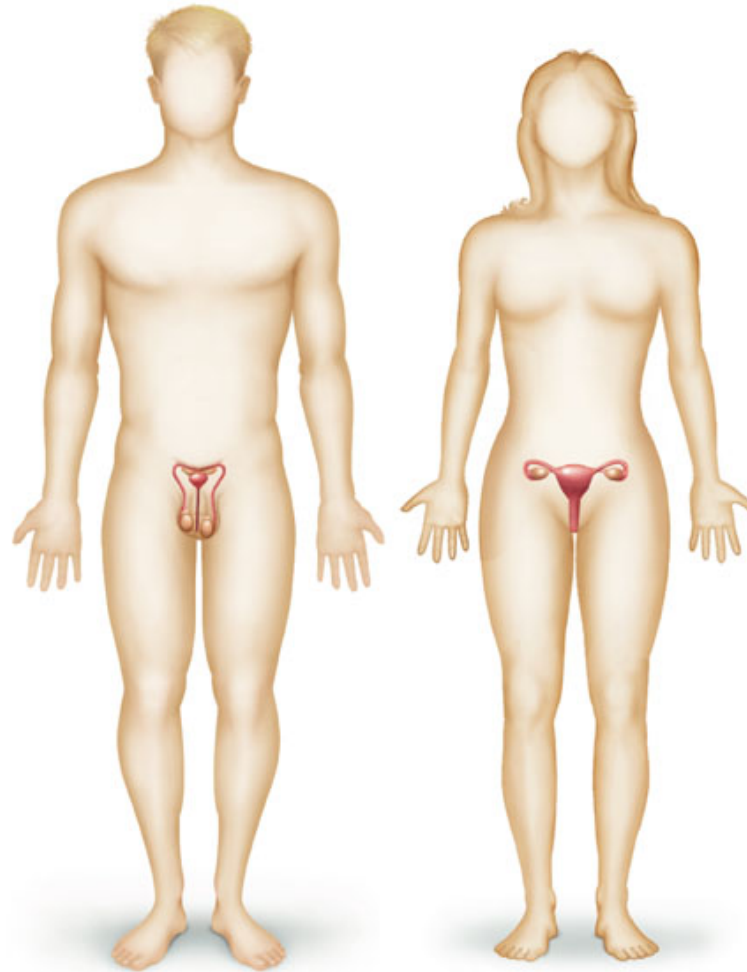
# Organ Systems

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# Organ Systems

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Male reproductive system

Female reproductive system



# Anatomical Terminology

**Anatomical Position** – standing erect, facing forward, upper limbs at the sides, palms facing forward

## **Terms of Relative Position**

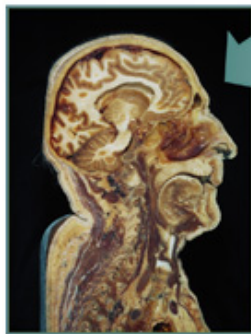
- **Superior versus Inferior**
- **Anterior versus Posterior**
- **Medial versus Lateral**
- **Ipsilateral versus Contralateral**
- **Proximal versus Distal**
- **Superficial versus Peripheral**
- **Deep**

# Body Sections

- **Sagittal / Midsagittal or Median / Parasagittal**
- **Transverse or Horizontal**
- **Coronal or Frontal**
- **Cross section, Oblique, Longitudinal**

# Body Sections

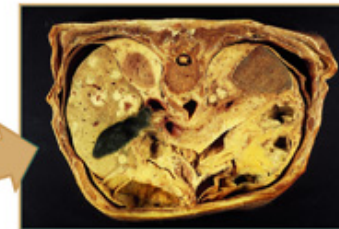
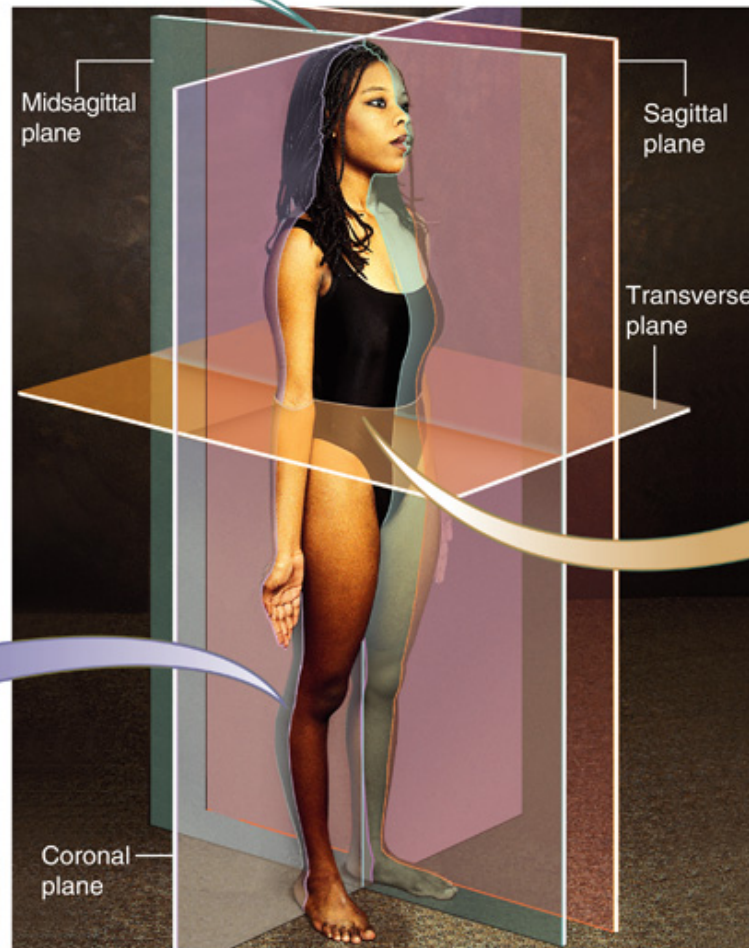
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A section along the midsagittal plane (median plane)



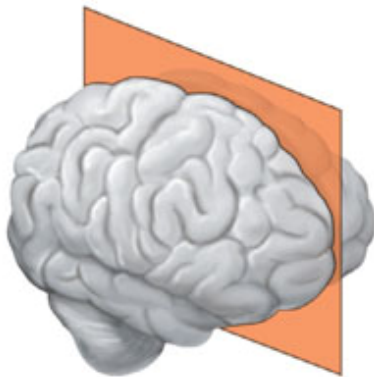
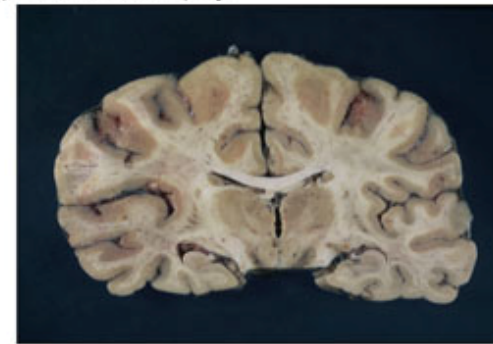
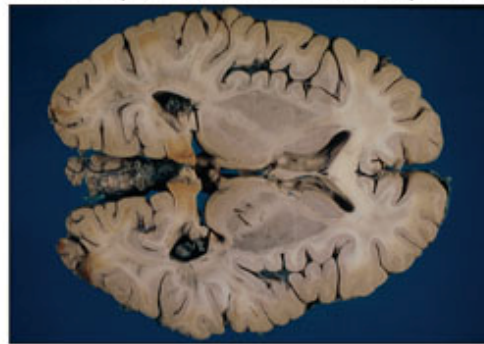
A section along a coronal plane (frontal plane)



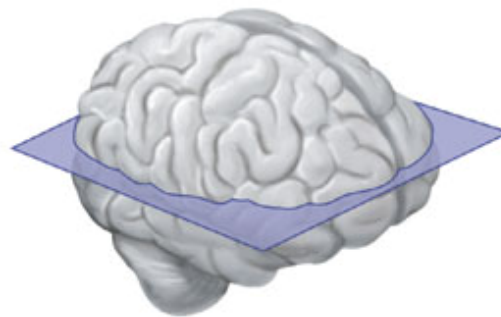
A section along a transverse plane (horizontal plane)

# Body Sections

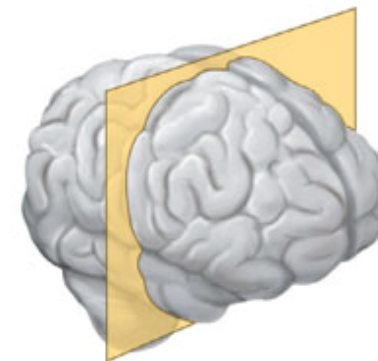
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(a)



(b)



(c)

# Body Sections

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(a)



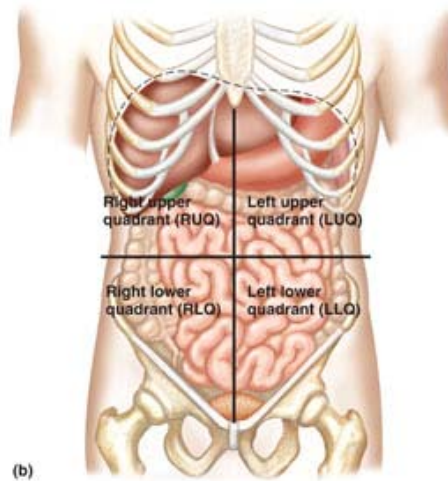
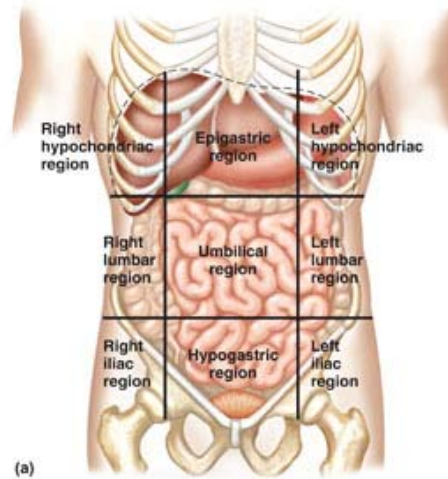
(b)



(c)

# Abdominal Subdivisions

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# Body Regions

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