

# Chapter 1

## The Human Organism



# Chapter 1 Outline

- 1.1 Anatomy and Physiology
- 1.2 Structural and functional organization of the human body
  - A. 11 Organ Systems
- 1.3 Characteristics of Life
- 1.4 Biomedical Research
- 1.5 Homeostasis
  - A. Negative feedback
  - B. Positive feedback
- 1.6 Terminology and the Body plan
  - A. Body Position
  - B. Directional terms
  - C. Body parts and regions
  - D. Planes
  - E. Body Cavities
  - F. Serous Membranes

# 1.1 Anatomy and Physiology

## Anatomy

- Scientific discipline that investigates body **structure** & examines the relationship between structure and function

## Physiology

- Scientific investigation of the processes or **functions** of living things.
- Goal:
  - Understand & predict body's responses to stimuli
  - Understand how the body maintains conditions with a narrow range of values in a constantly changing environment.

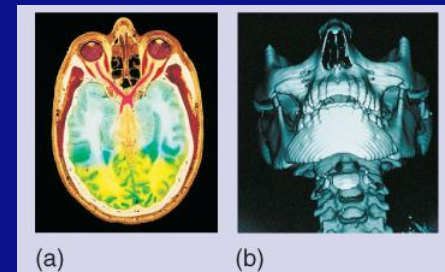
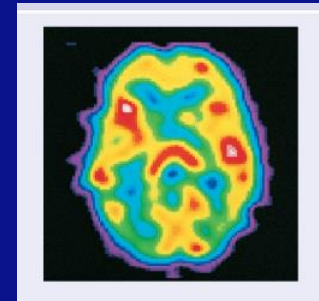
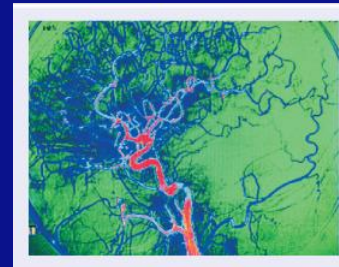
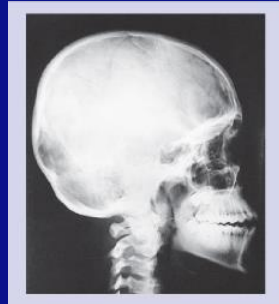
Study of the human body encompasses both because they are highly interwoven.

# Various types of study:

- Anatomy:
  - Developmental Anatomy
    - Embryology
  - Cytology
    - Histology
  - Gross Anatomy
    - Regional
    - Systemic
  - Surface Anatomy
  - Anatomical Anomalies
- Physiology:
  - Cell Physiology
  - Systemic Physiology
  - Neurophysiology
  - Cardiovascular physiology
  - Exercise physiology
  - ❖ Usually physiological study is systemic because functions occur in multiple places in the body.
  - Pathology

# Anatomical Imaging

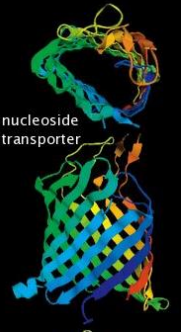
1. Radiograph
  2. Ultrasound
  3. Computed tomography
  4. Dynamic subtraction angiography
  5. Magnetic resonance imaging
  6. Positron emission tomography
- Table 1.1 Page 3



# 1.2 Struc & Fxnl Organization- Human Body

## 1. Chemical Level:

Involves interactions of atoms coming together to form more complex molecules.



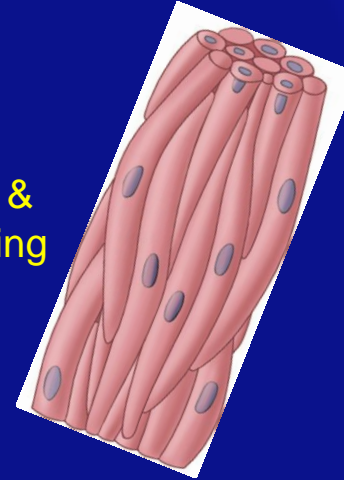
## 2. Cellular Level:

Basic structural & fxnal units of plants & animals



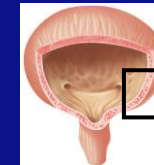
## 3. Tissue Level:

A group of similar cells & the materials surrounding them, this combination determines its fxn.

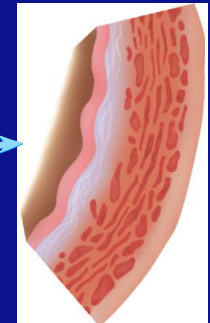


## 4. Organ Level:

Struc composed of 2 or more tissue types that perform 1 or more fxns.

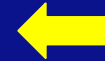


Urinary bladder



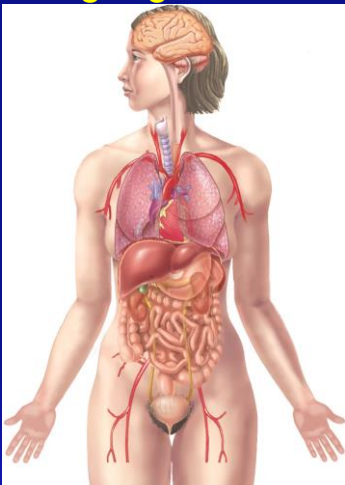
## 5. Organ System:

Group of organs that together perform a common fxn or set of fxns and are therefore seen as a unit.



## 6. Organism:

Any living thing considered as a whole with all 11 organ systems working together.

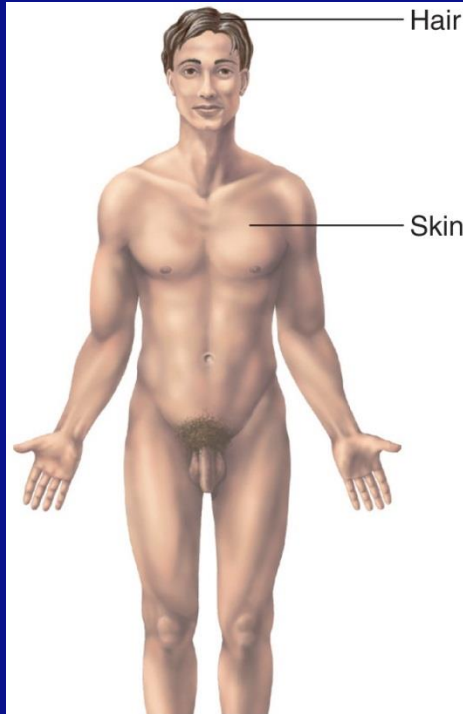


# The 11 Organ Systems

1. Integumentary System
2. Skeletal System
3. Muscular System
4. Lymphatic System
5. Respiratory System
6. Digestive System
7. Nervous System
8. Endocrine System
9. Cardiovascular System
10. Urinary System
11. Reproductive System

# Organ Systems of the Body

## Integumentary System



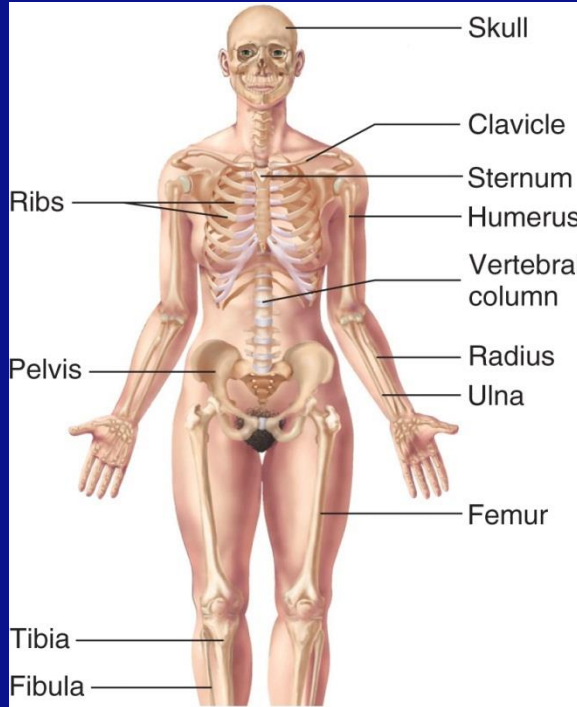
### Anatomy:

- Skin, hair, nails, & sweat glands

### Physiology:

- Provides protection
- Prevents water loss
- Helps produce vitamin D

## Skeletal System



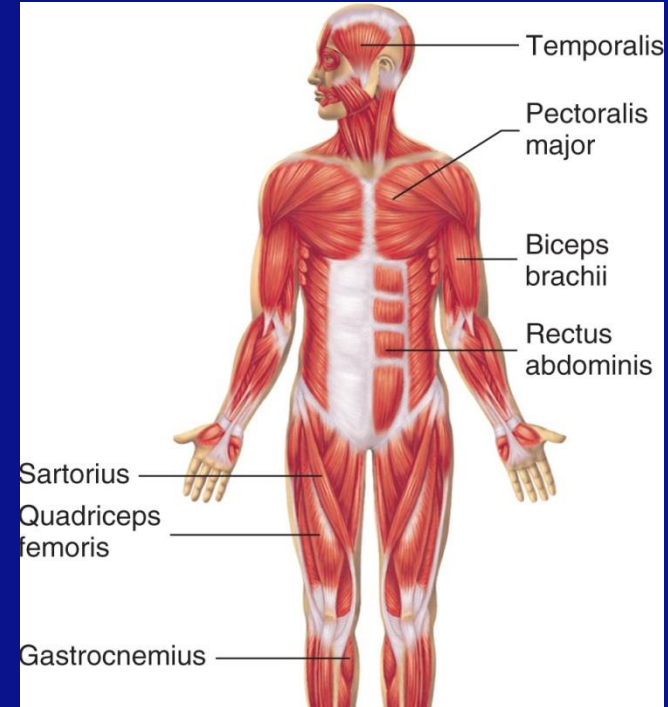
### Anatomy:

- Bones, ligaments, joints, & associated cartilages

### Physiology:

- Provides protection & support
- Allows body movements
- Produces blood cells
- Stores minerals and fats

## Muscular System



### Anatomy:

- Skeletal muscle & tendons

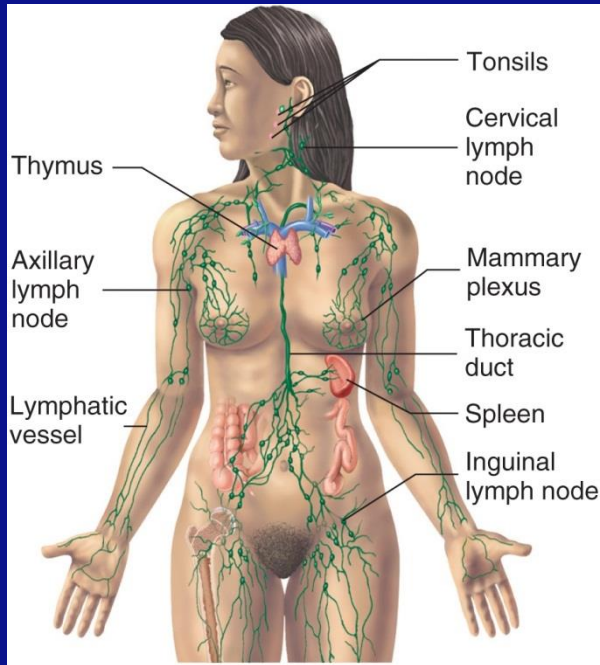
### Physiology:

- Produces body movements
- Maintains posture
- Produces body heat



# Organ Systems of the Body

## Lymphatic System



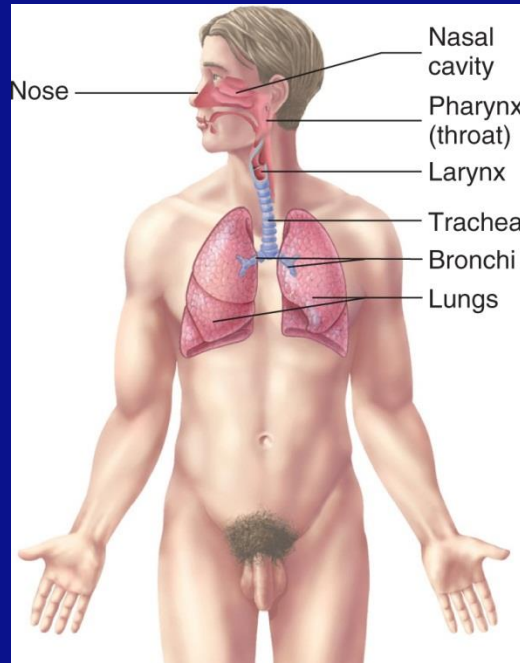
### Anatomy:

- Lymph nodes, lymphatic vessels, & other lymphatic organs

### Physiology:

- Maintains fluid balance
- Removes foreign substances from blood & lymph
- Combats disease
- Absorbs fat from digestive tract

## Respiratory System



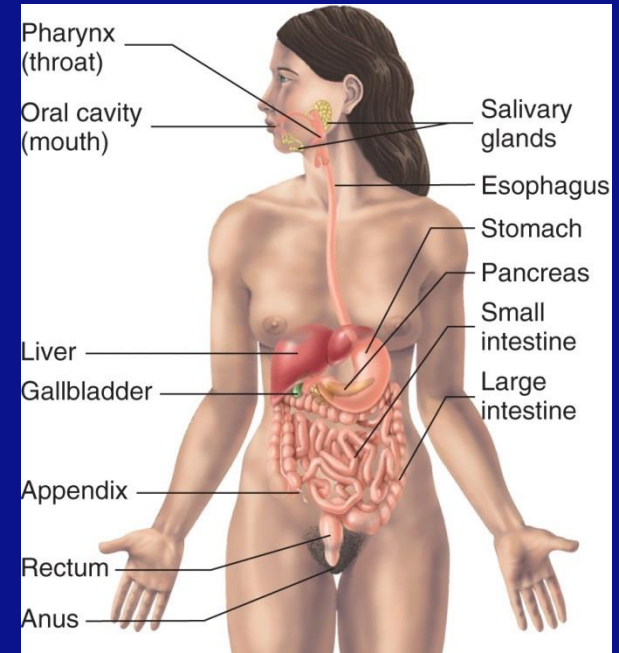
### Anatomy:

- Lungs & Respiratory passages

### Physiology:

- Exchange carbon dioxide for oxygen
- Regulates blood pH

## Digestive System



### Anatomy:

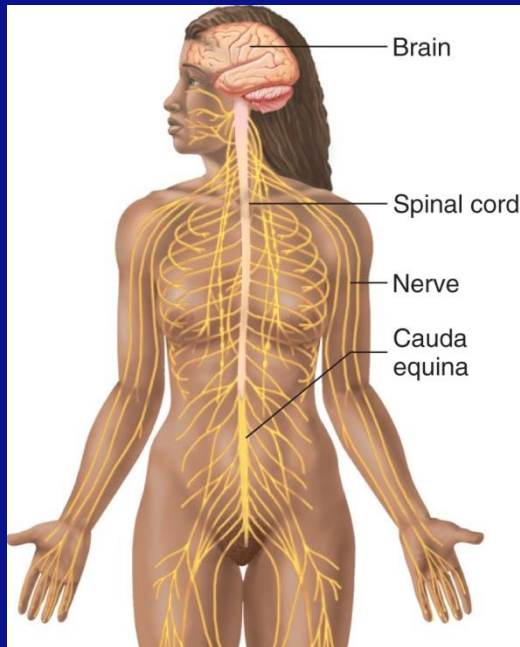
- Mouth, esophagus, stomach, intestines, & accessory organs

### Physiology:

- Mechanical & chemical digestion
- Absorbs nutrients
- Elimination of wastes

# Organ Systems of the Body

## Nervous System



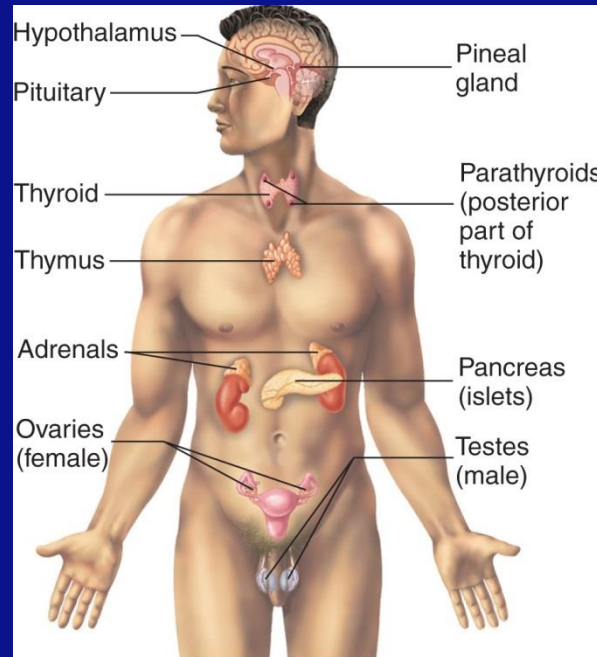
### Anatomy:

- Brain, spinal cord, nerves, & sensory receptors

### Physiology:

- Major regulatory system
- Detects sensations
- Controls
  - Movements
  - Physiological processes
  - Intellectual functions

## Endocrine System



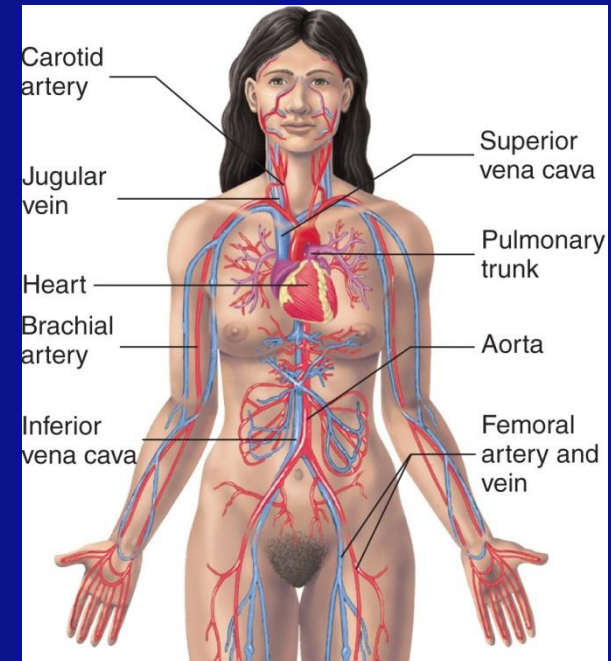
### Anatomy:

- Glands (ex/ adrenal gland)

### Physiology:

- Major regulatory system
- MANY fxns
- Influences
  - Growth
  - Metabolism
  - Reproduction

## Cardiovascular System



### Anatomy:

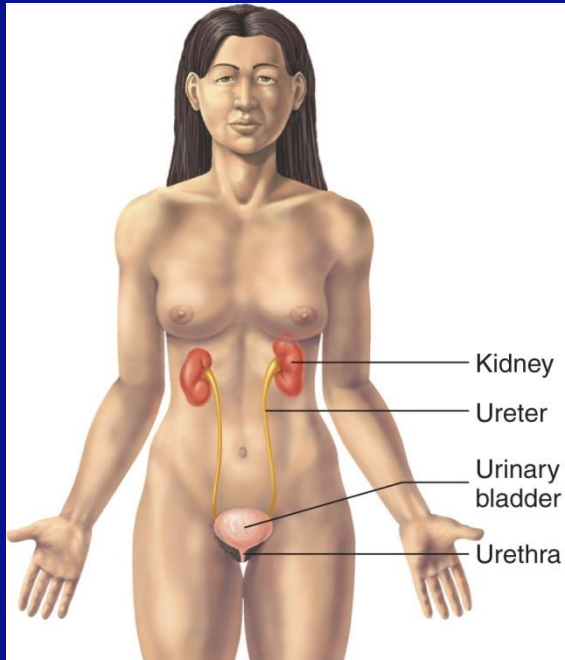
- Heart, blood vessels, & blood

### Physiology:

- Transports
  - Nutrients
  - Gases
  - Waste products
  - Hormones
- Plays a role in the immune response
- Plays a role in body temperature regulation

# Organ Systems of the Body

## Urinary System



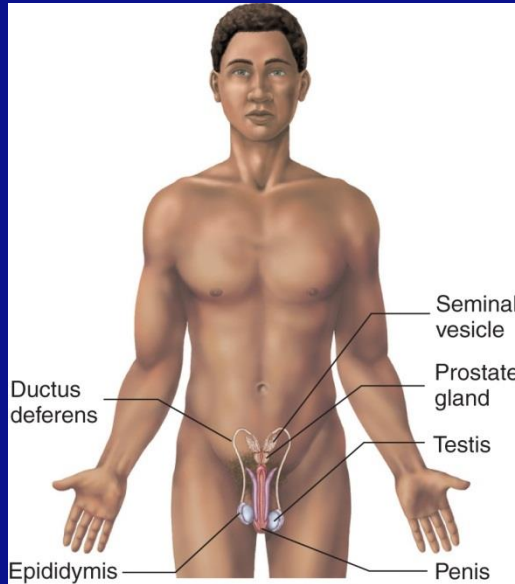
### Anatomy:

- Kidneys, Bladder, and Associated ducts

### Physiology:

- Removes waste from blood
- Regulates
  - Blood pH
  - Ion balance
  - Water balance

## Reproductive System



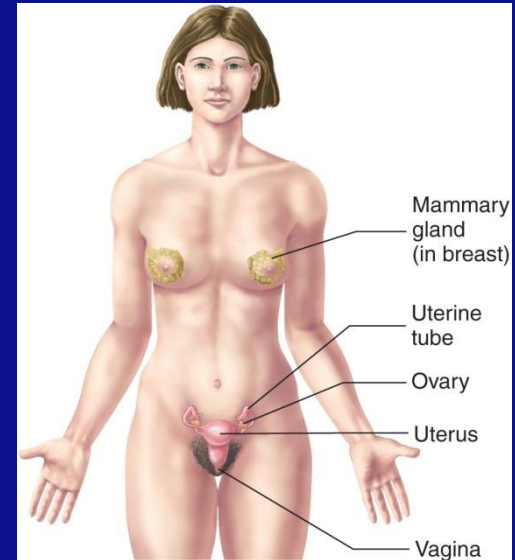
### MALE

### Anatomy:

- Testes, Penis, Ducts, & Accessory structures

### Physiology:

- Produces and transfers sperm to female
- Produces hormones that influence sexual functions & behaviors



### FEMALE

### Anatomy:

- Ovaries, Vagina, Uterus, Mammary glands, & associated structures

### Physiology:

- Produces oocytes
- Site of:
  - Fertilization
  - Fetal development
- Produces milk for newborn
- Produces hormones that influence sexual functions & behaviors

# 1.3 Characteristics of Life

## 1. Organization

- Condition in which the parts of an organism have specific relationships to each other and those parts interact to perform specific fxns

## 2. Metabolism

- All chemical reactions that take place in an organism

## 3. Responsiveness

- Organism's ability to detect changes ( $\Delta$ 's) in its internal or external environments and adjust to those  $\Delta$ 's

## 4. Growth

- Increase in the size or # of cells resulting in overall enlargement of all or part of an organism

## 5. Development

- Changes an organism undergoes through time beginning with fertilization and ending with death

## 6. Reproduction

- Production of new cells or new organisms

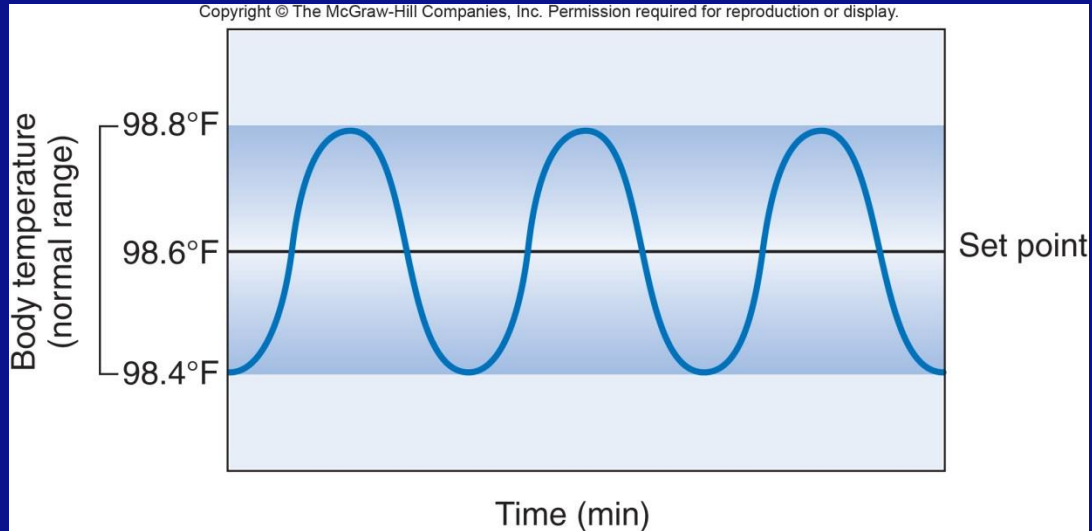
# 1.4 Biomedical Research

- Although we use alternative methods for understanding the functions of the body (for example animal or cell studies), and these have lead to ground breaking advances in technology and health care, some things require human subjects of study. Although these methods are helpful they are not exacting, such that misinformation can occur.

# 1.5 Homeostasis

- The existence & maintenance of a relatively constant environment in the human body that is *suitable to support life.*

- Set-point= perfection
- Normal range= we can live with

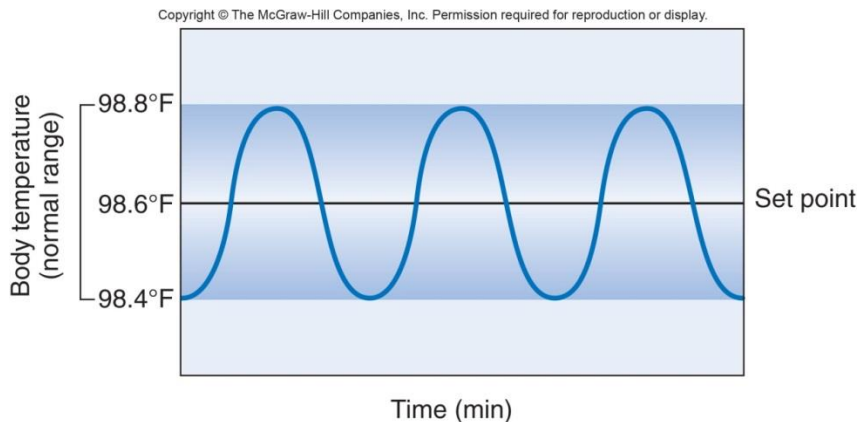


# 1.5 Homeostasis:

2 systems are used to maintain this balance

## 1. Negative Feedback

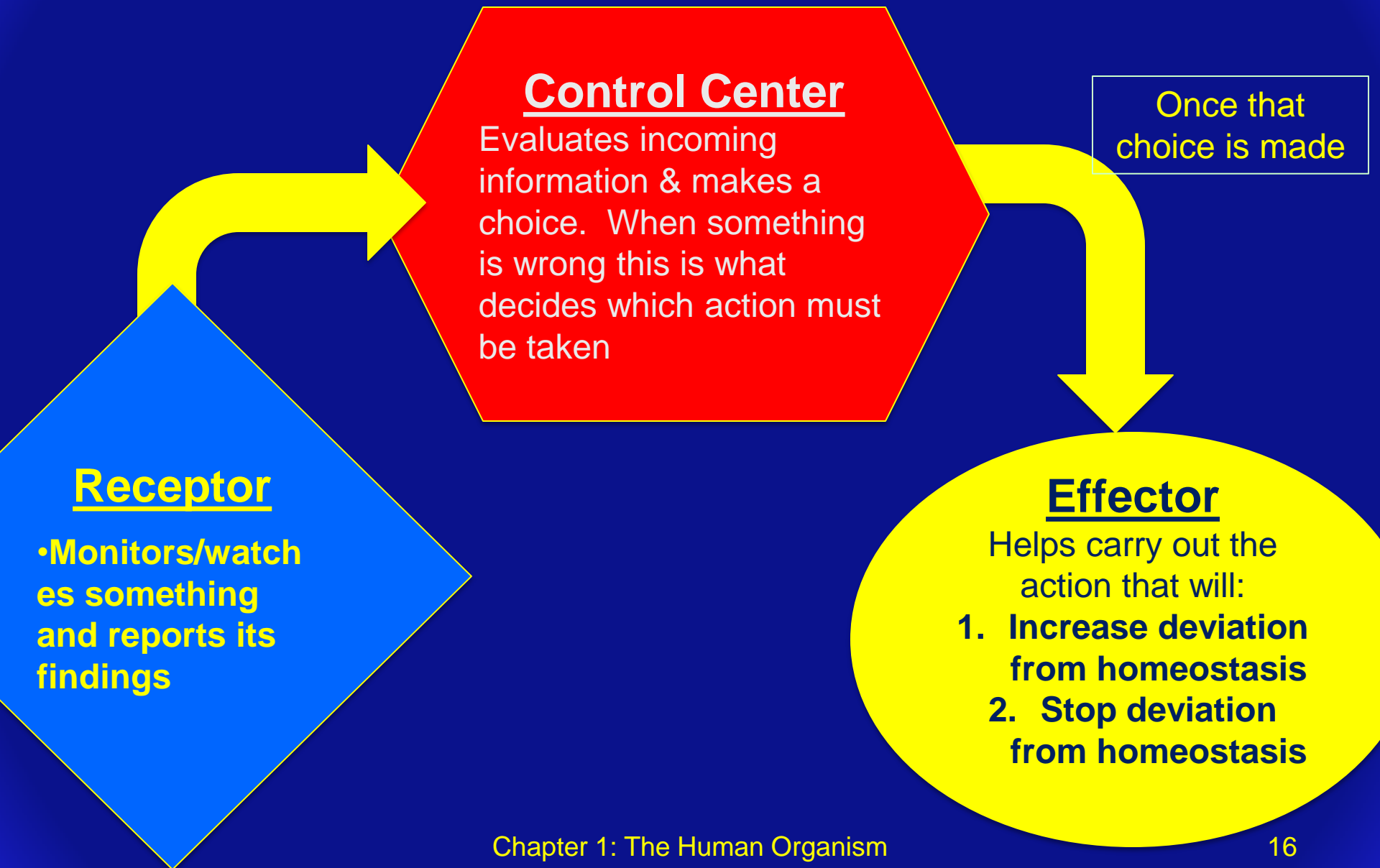
- Primary (1<sup>o</sup>) fxn → maintain homeostasis and decrease any deviations from the norm.



## 2. Positive Feedback

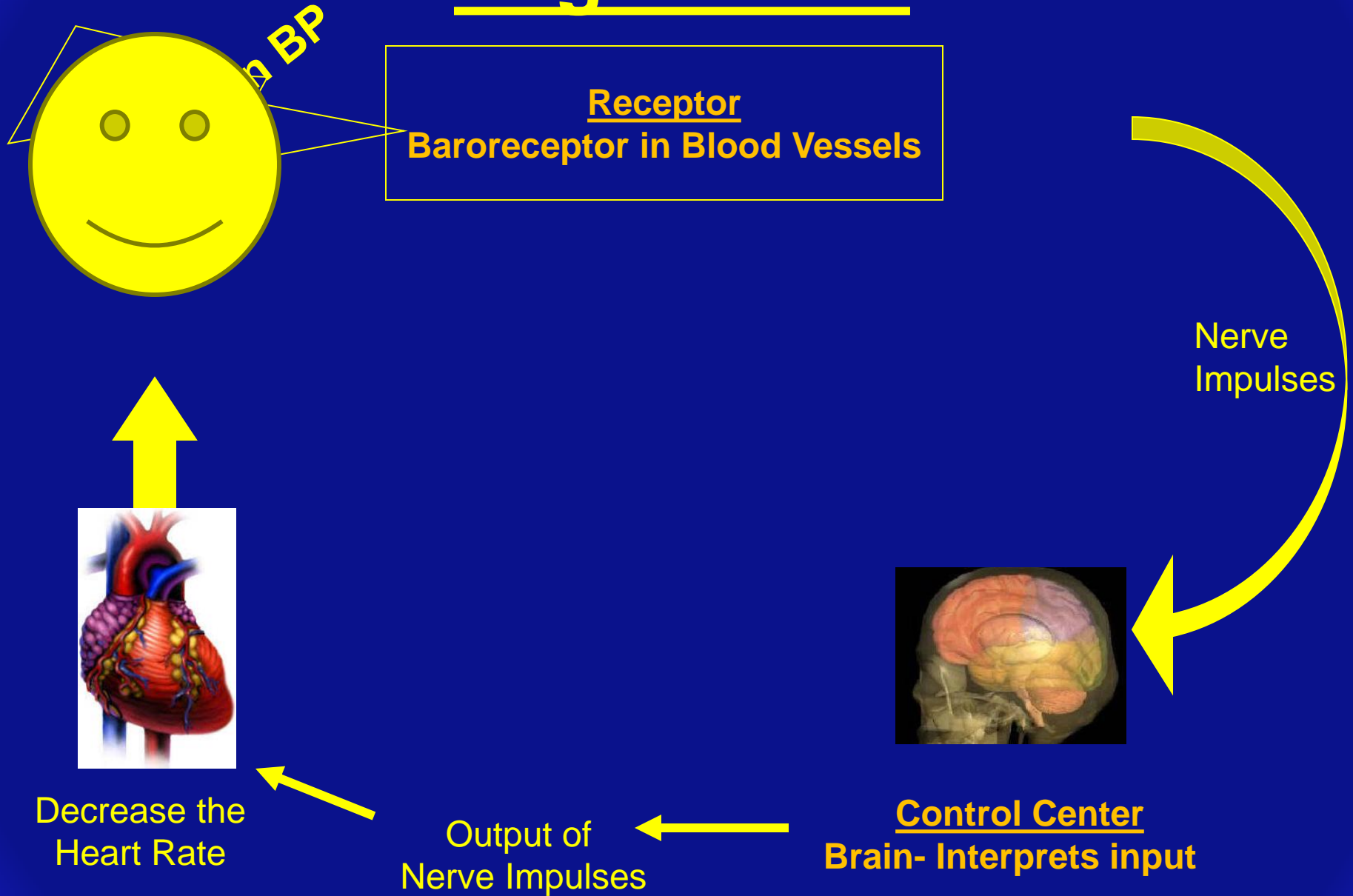
- 1<sup>o</sup> fxn → increase deviations from norm.
- Few in the body
- MOST are harmful
  - Leads body away from homeostasis and in worst case into death
  - Abnormal = Blood Loss
  - Normal = Labor

# Parts of Feedback Systems



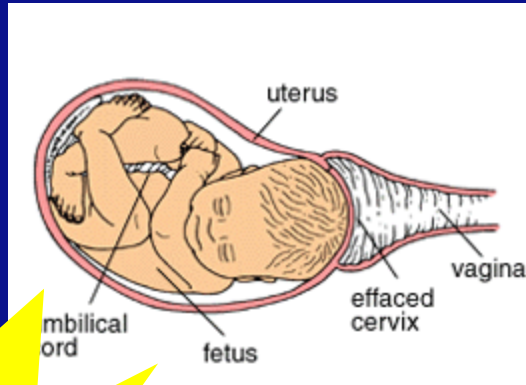


# Negative FB



# Positive FB

**Contractions**



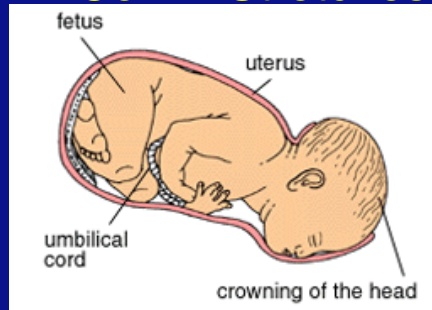
Receptors  
"Stretch Sensitive"



**\*Birth\***

No more stretching  
No more feedback

Effector: Uterus  
Contraction  
Cervix Stretches



Control Center  
Brain- Interprets input

Output  
Oxytocin

# Terminology and Body Plan

## 1. Anatomical Position

- Erect facing forward arms on the side with palms facing forward

## 2. Supine

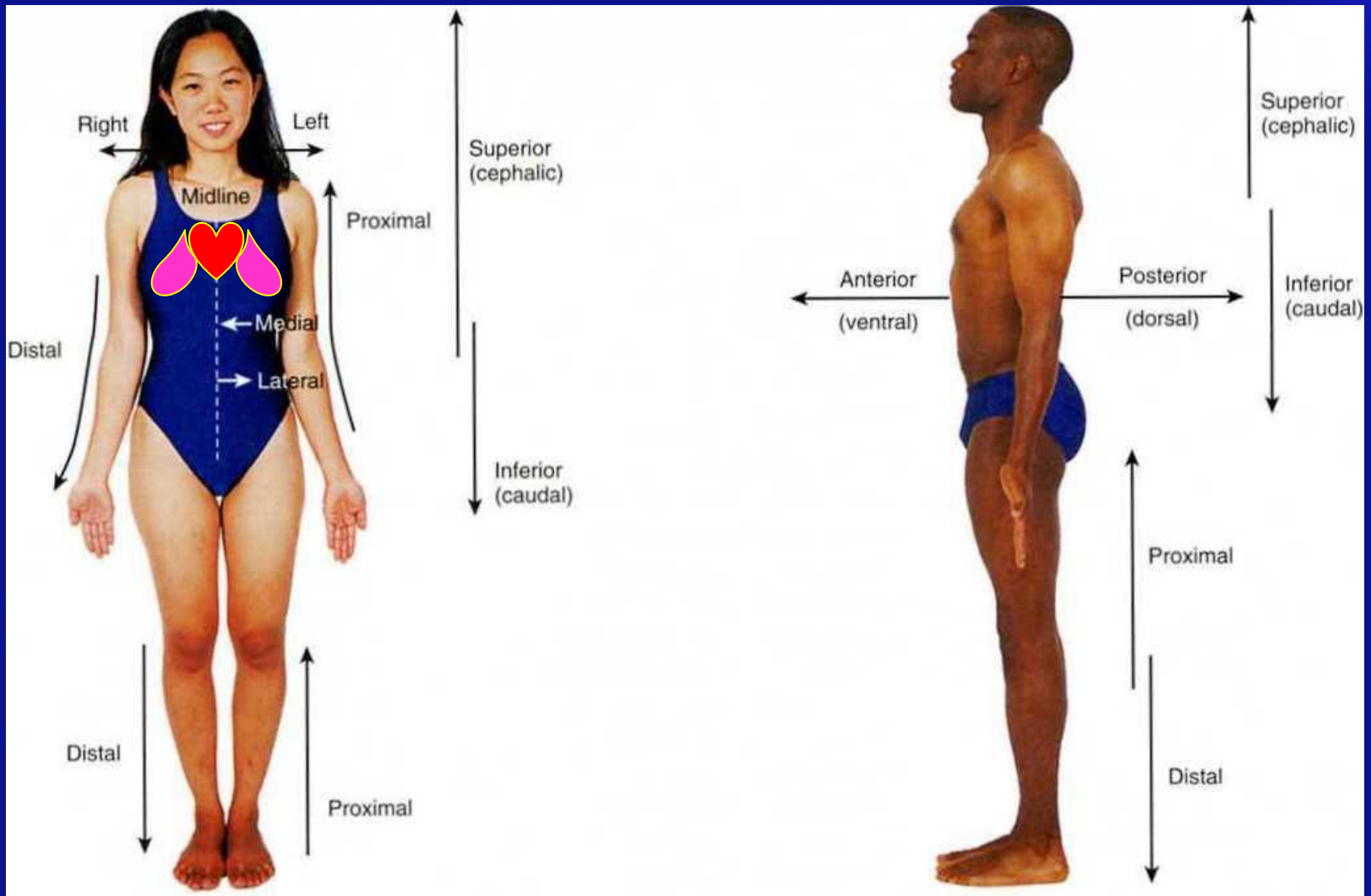
- Lying face up

## 3. Prone

- Lying face down

- Directional Terms
- Body parts and regions
  - Planes
  - Body Cavities
- Serous Membranes

# Directional Terms



- Medial
- Lateral

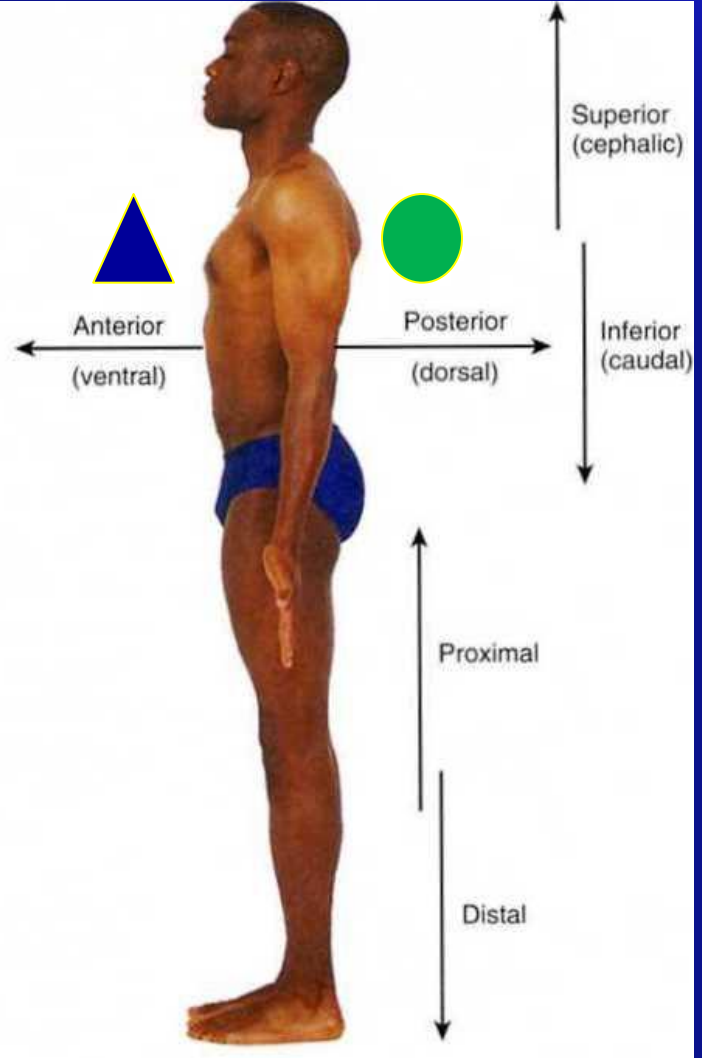
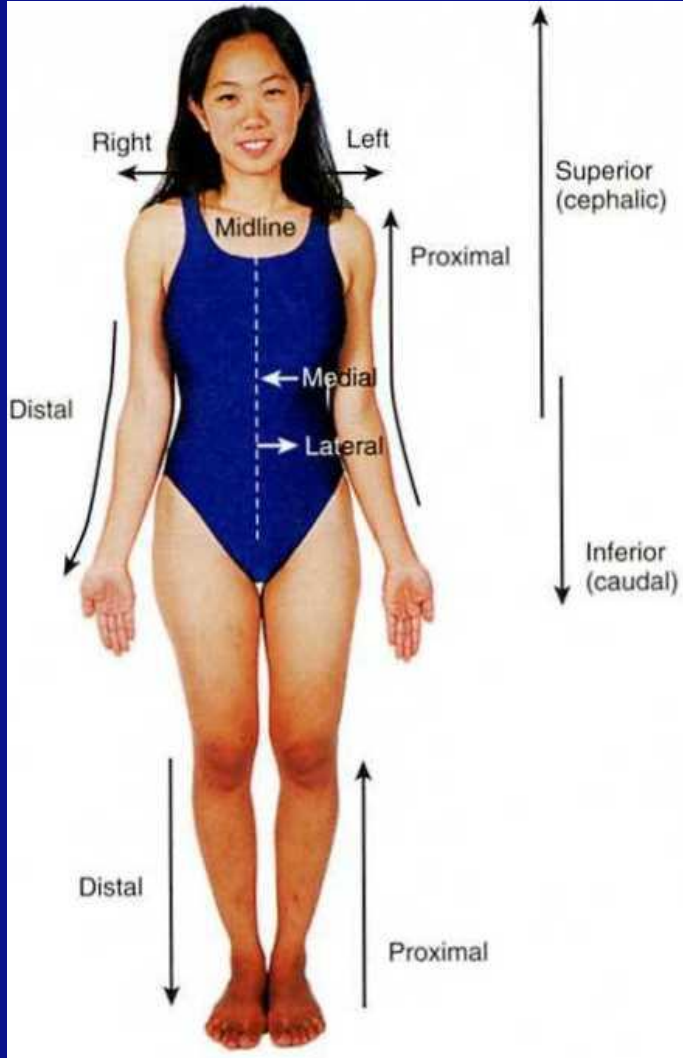
- Anterior (Ventral)
- Posterior (Dorsal)

- Superior (cephalic)
- Inferior (Caudal)

- Proximal
- Distal

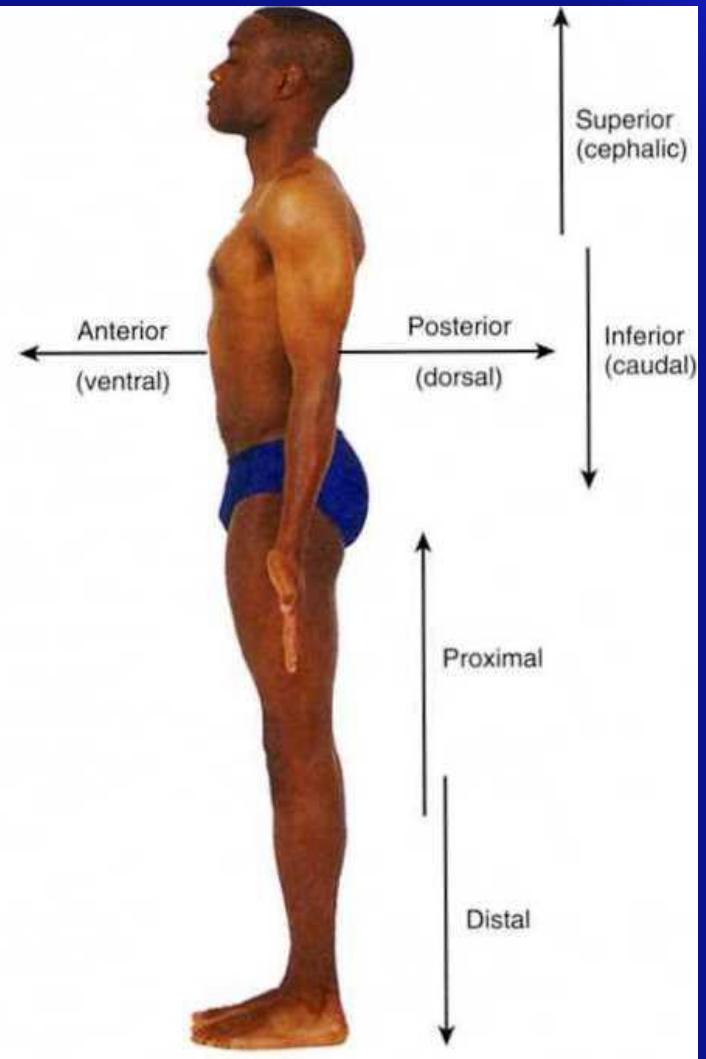
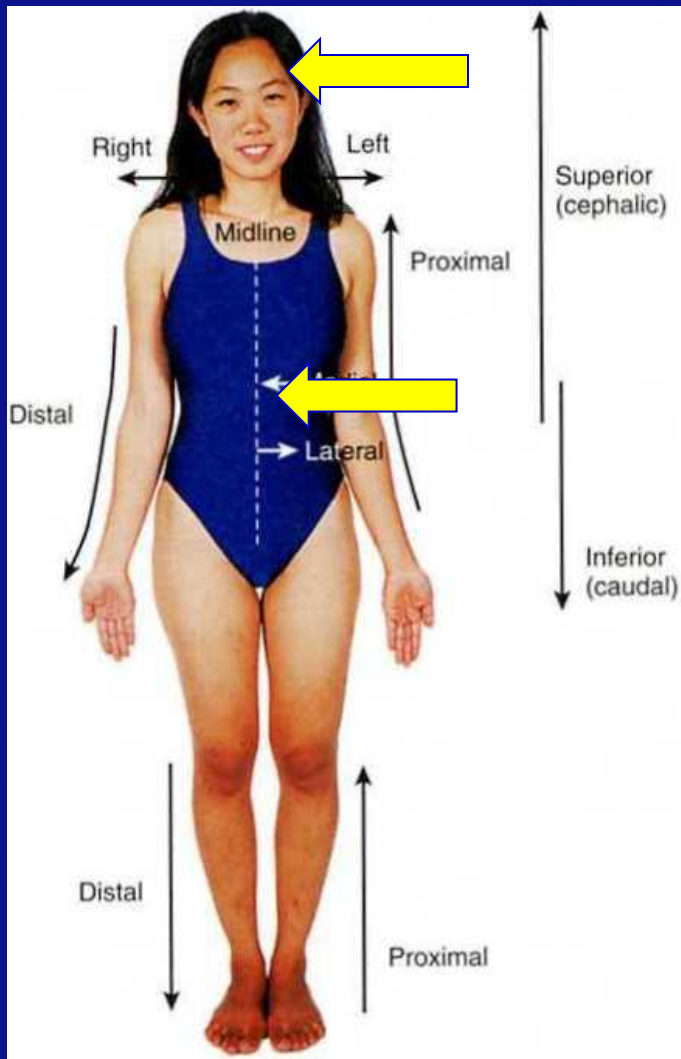
- Superficial
- Deep

# Directional Terms



- Medial
- Lateral
- Anterior (Ventral)
- Posterior (Dorsal)

# Directional Terms

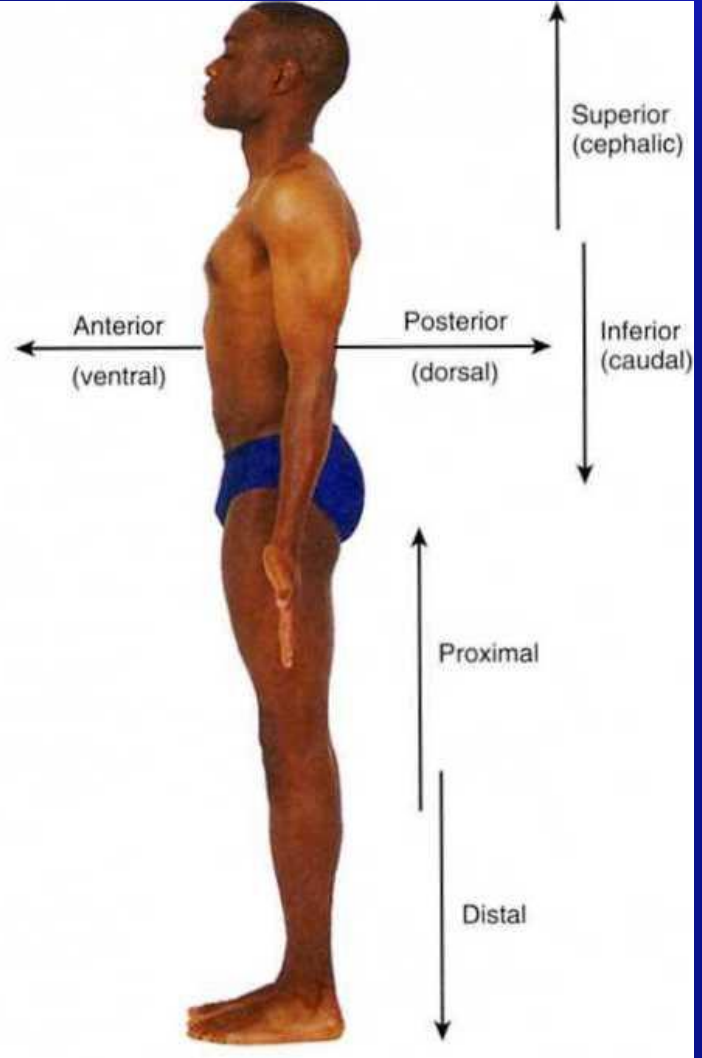
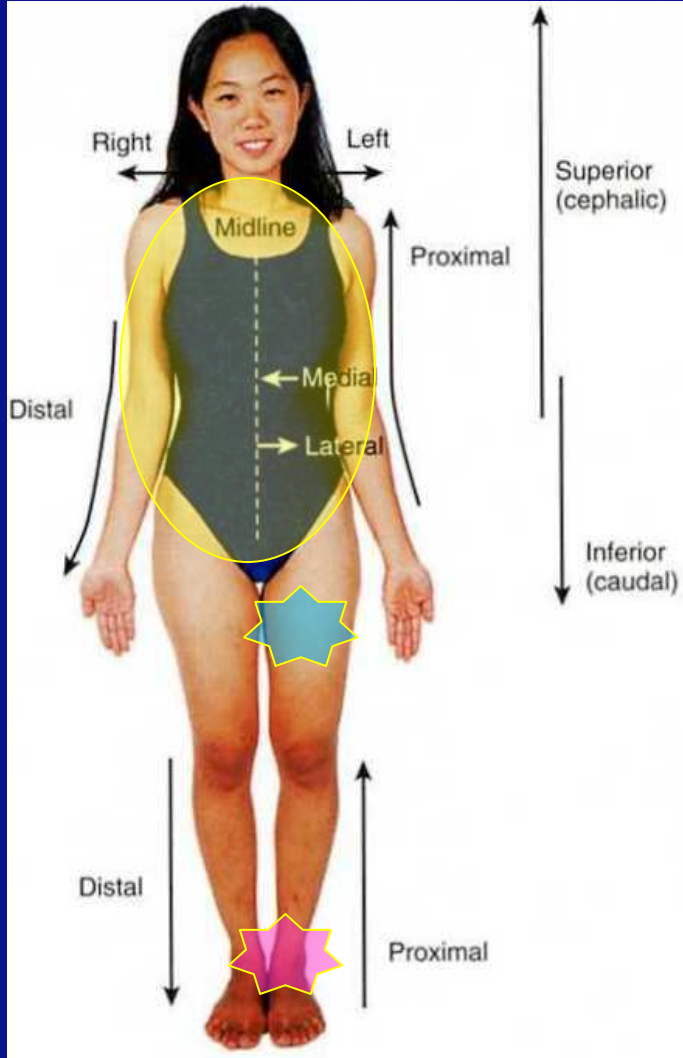


- Medial
- Lateral

- Anterior (Ventral)
- Posterior (Dorsal)

- Superior (cephalic)
- Inferior (Caudal)

# Directional Terms



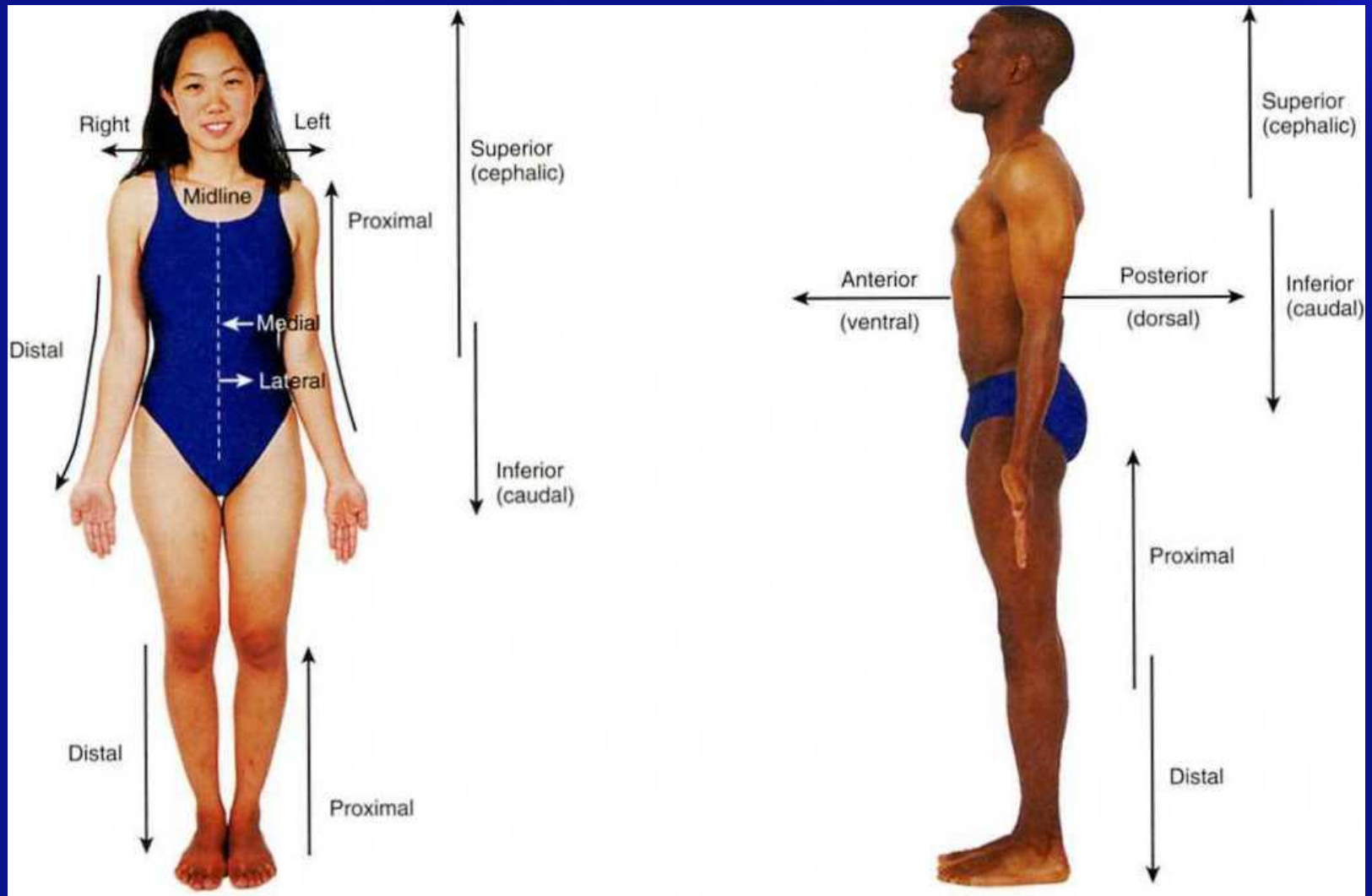
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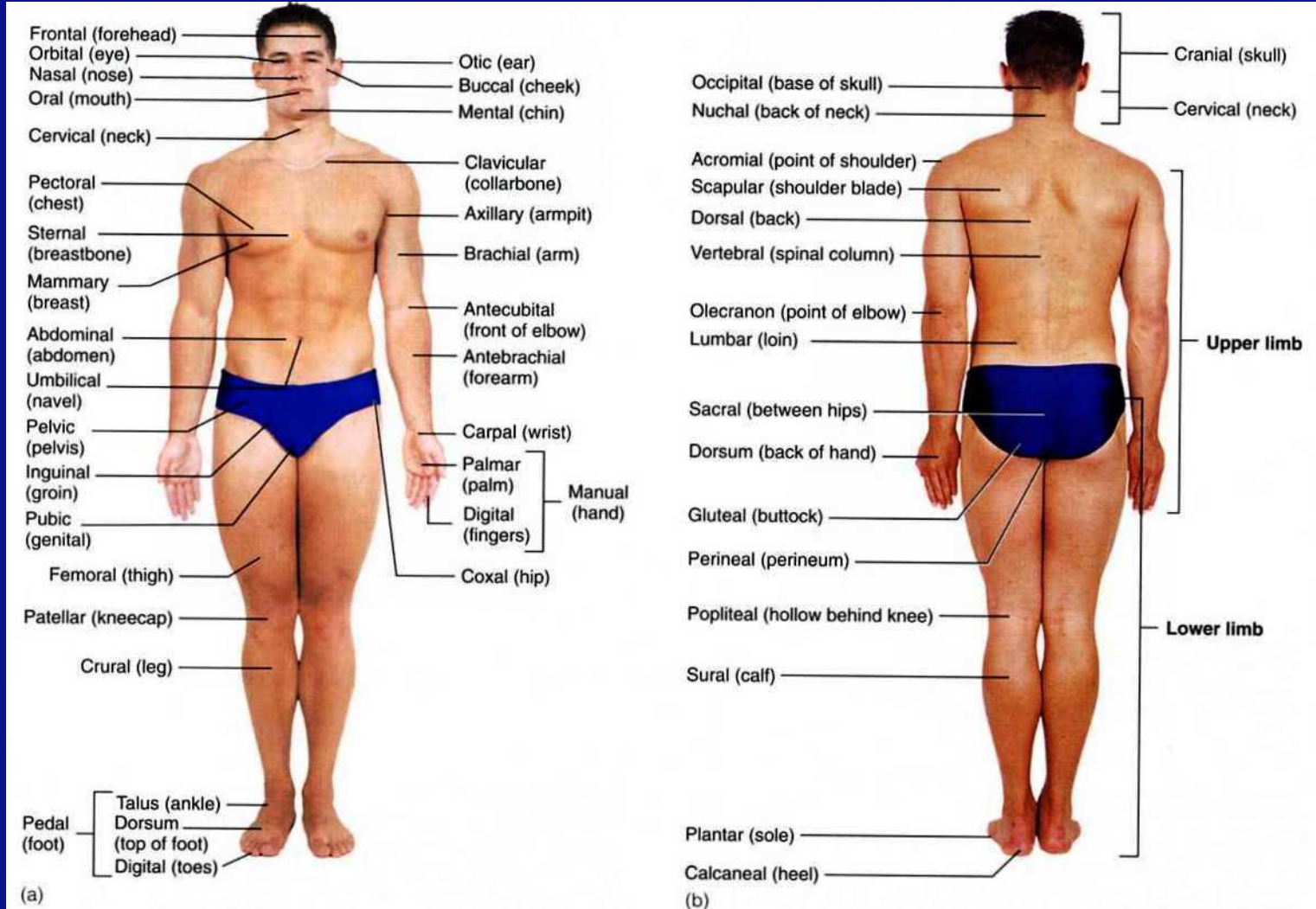
- Superior (cephalic)
- Inferior (Caudal)

- Proximal
- Distal

- Superficial
- Deep



# Body Parts

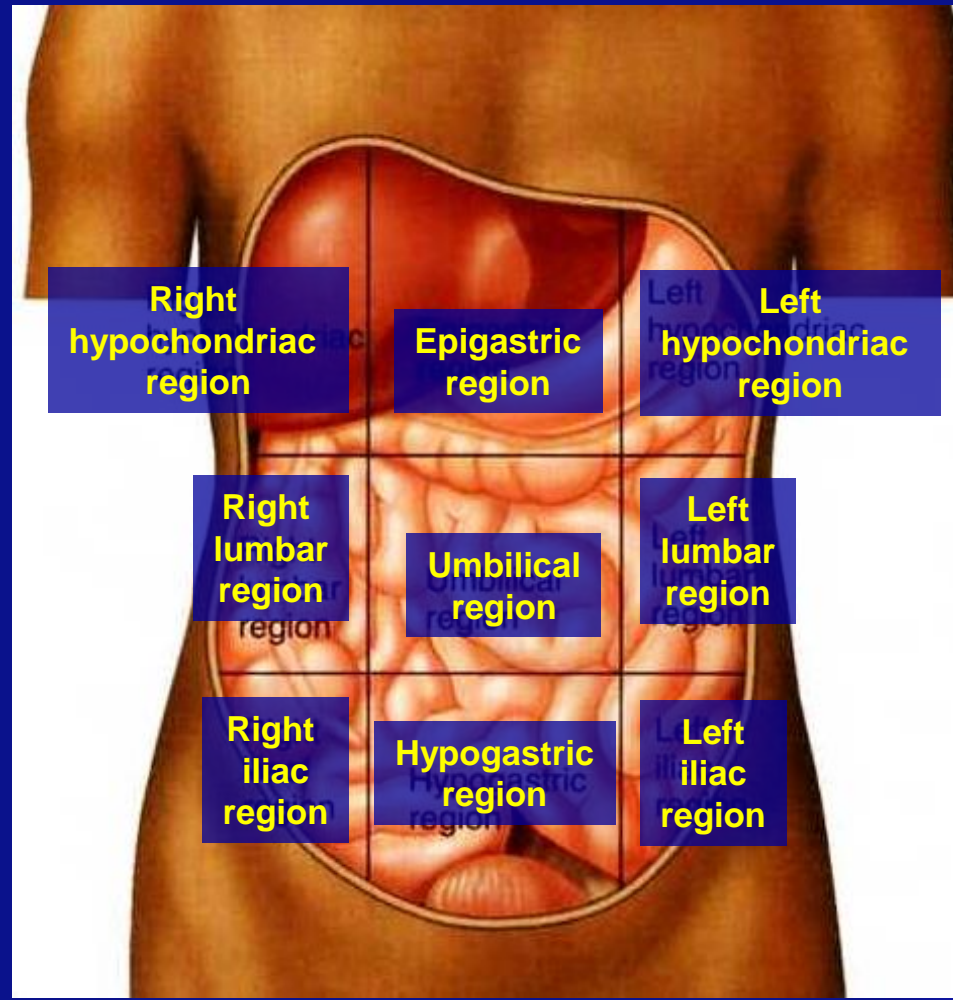
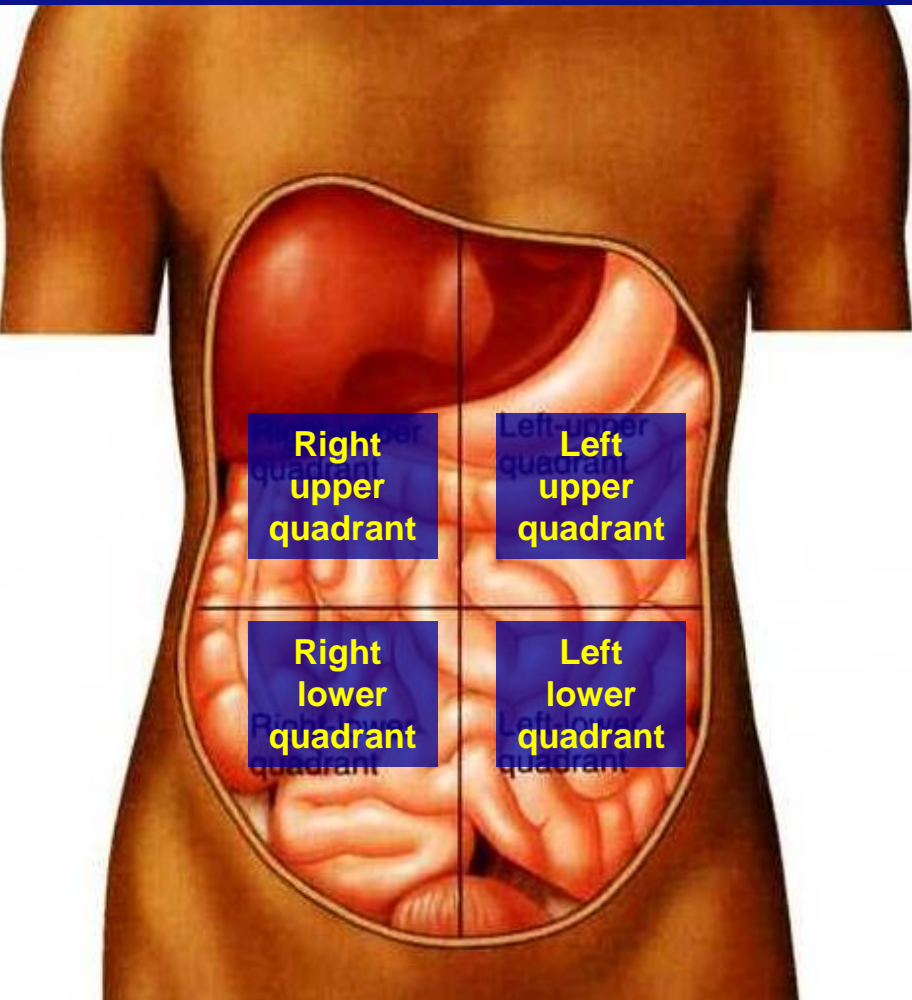


- Upper Limb
- Lower Limb
- Central Region
  - Head
  - Neck
  - Trunk

# Abdominal Regions

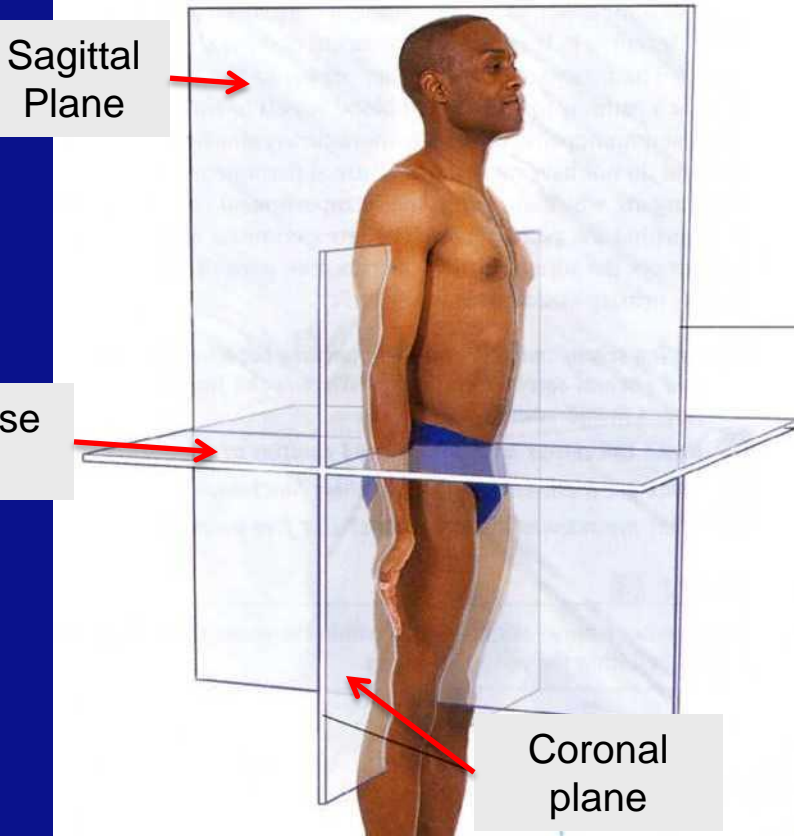
## 4 Quadrants

## 9 Regions



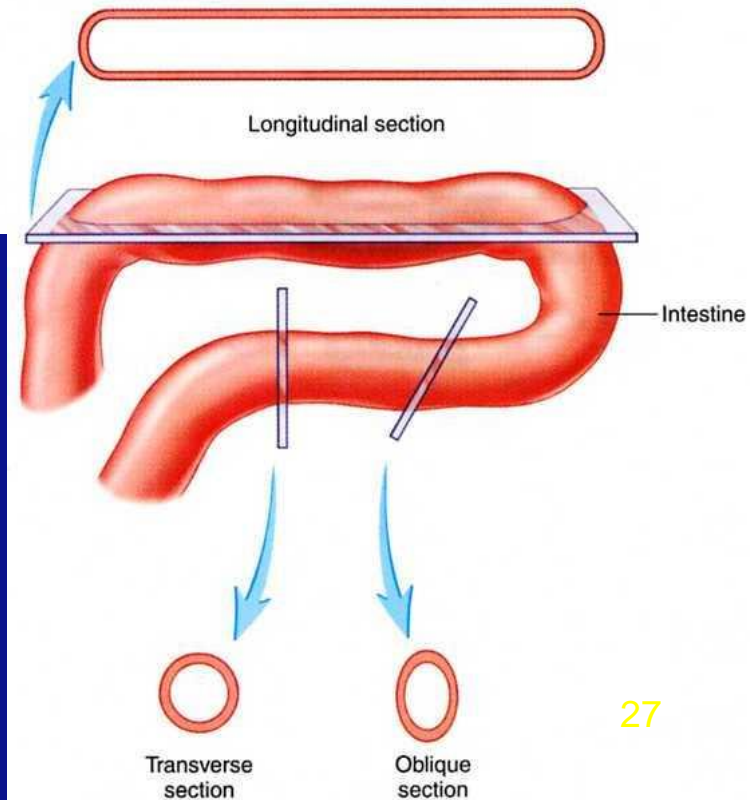
# Planes

# Sections of an organ

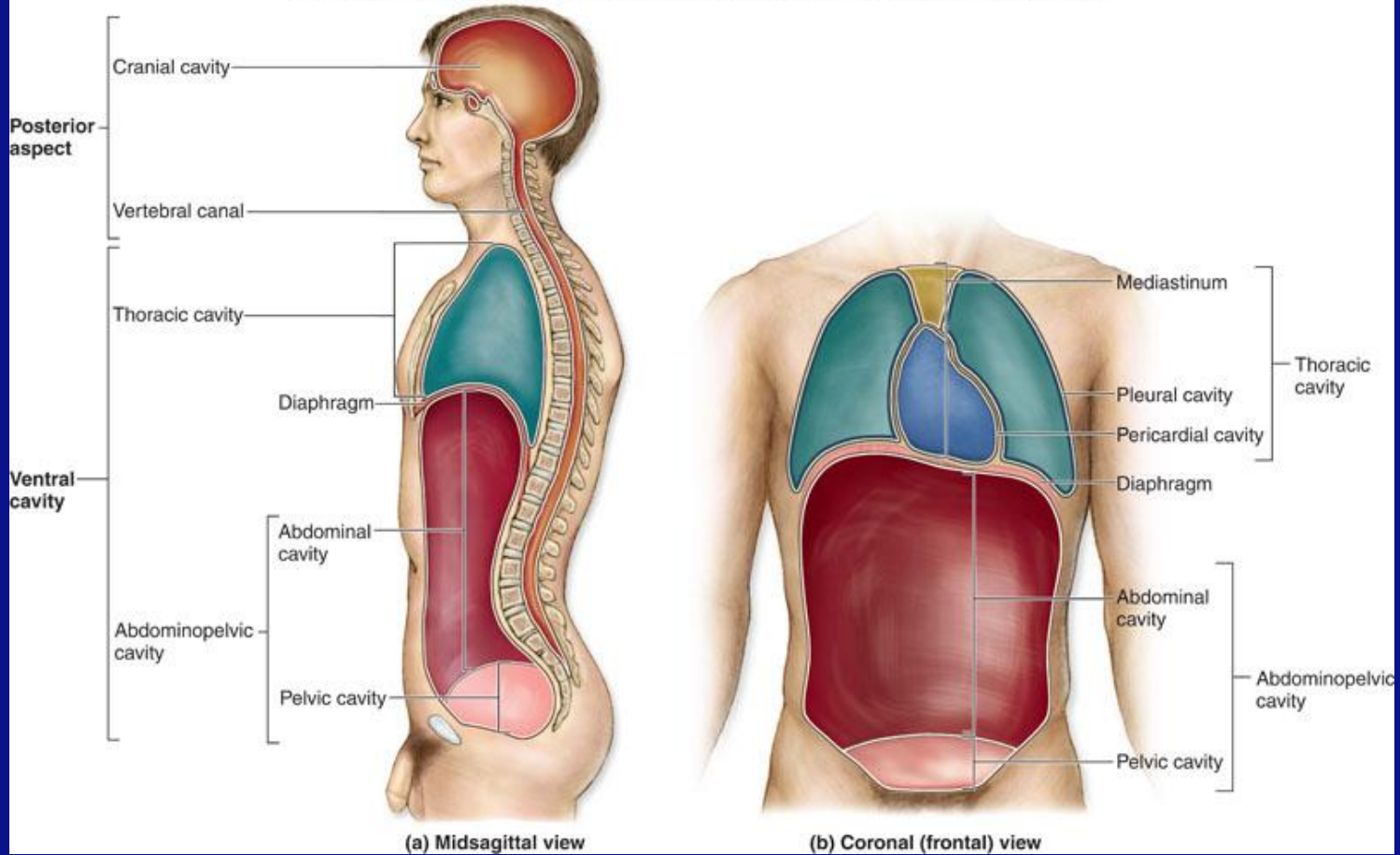


- Sagittal
  - Right and left halves
  - Meidan- perfect halves
- Coronal/ Frontal
  - Front and back halves
- Transverse/Horizontal
  - Top and bottom halves

- Longitudinal
  - Along it's long axis
- Cross Section
  - Right angle to it's long axis
- Oblique
  - Any angle along the long axis that isn't a right angle



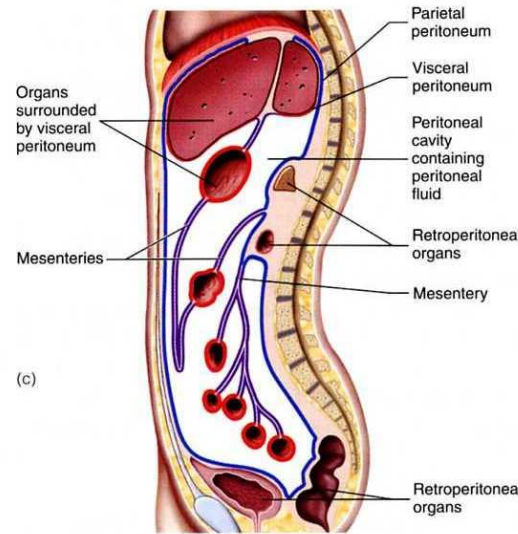
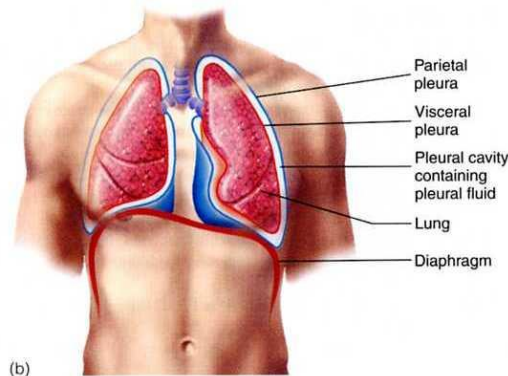
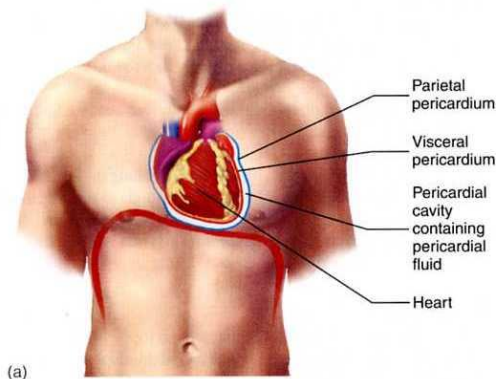
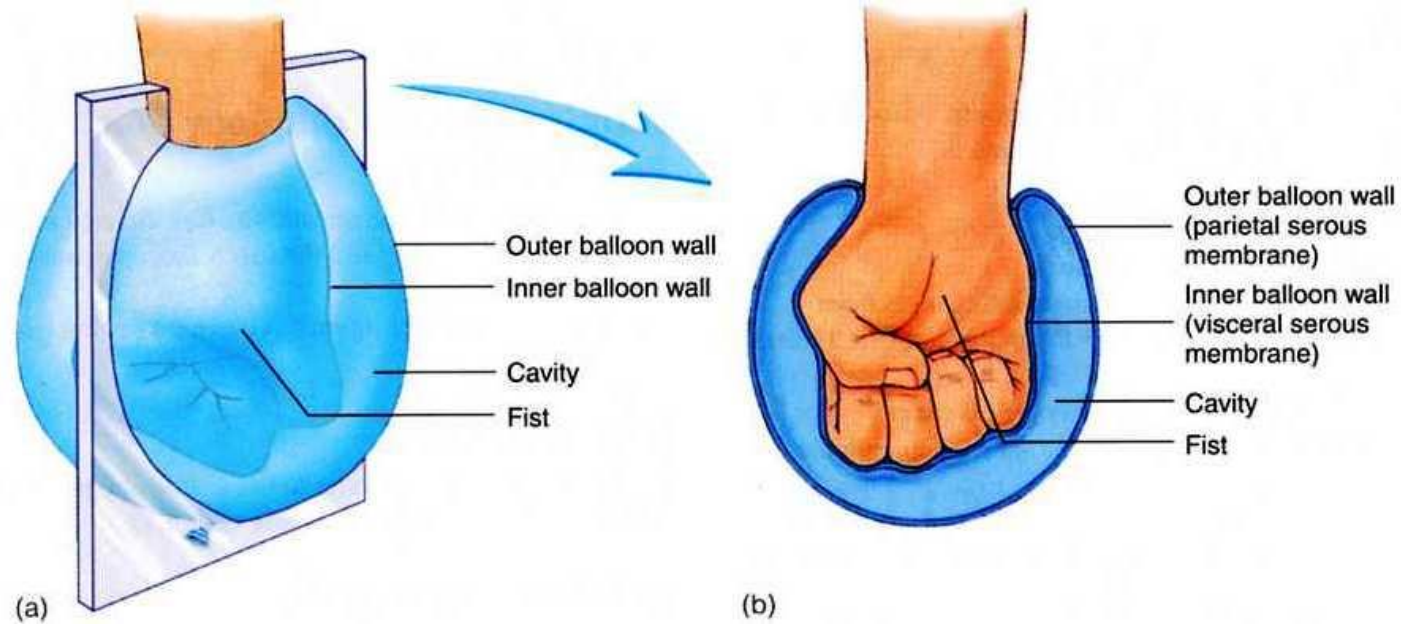
# Body Cavities



- **Ventral**
  - Thoracic
    - Mediastinum
    - Pericardial
    - Pleural
  - Abdominopelvic Cavity
    - Abdominal
    - Pelvic

- ❖ **Dorsal**
  - Cranial
  - Spinal

# Serous Membranes



**FIGURE 1.17** Location of Serous Membranes

(a) Frontal section showing the parietal pericardium (blue), visceral pericardium (red), and pericardial cavity. (b) Frontal section showing the parietal pleura (blue), visceral pleura (red), and pleural cavities. (c) Sagittal section through the abdominopelvic cavity showing the parietal peritoneum (blue), visceral peritoneum (red), peritoneal cavity, mesenteries (purple), and retroperitoneal organs.

## ❖ Serous Membranes

### ❖ Line the trunk's cavities

#### A. Parietal

- Lines the walls

#### B. Visceral

- Covers the Organ

➤ There is a fluid that is secreted between A and B that helps lubricate and protect organs from damage caused by friction