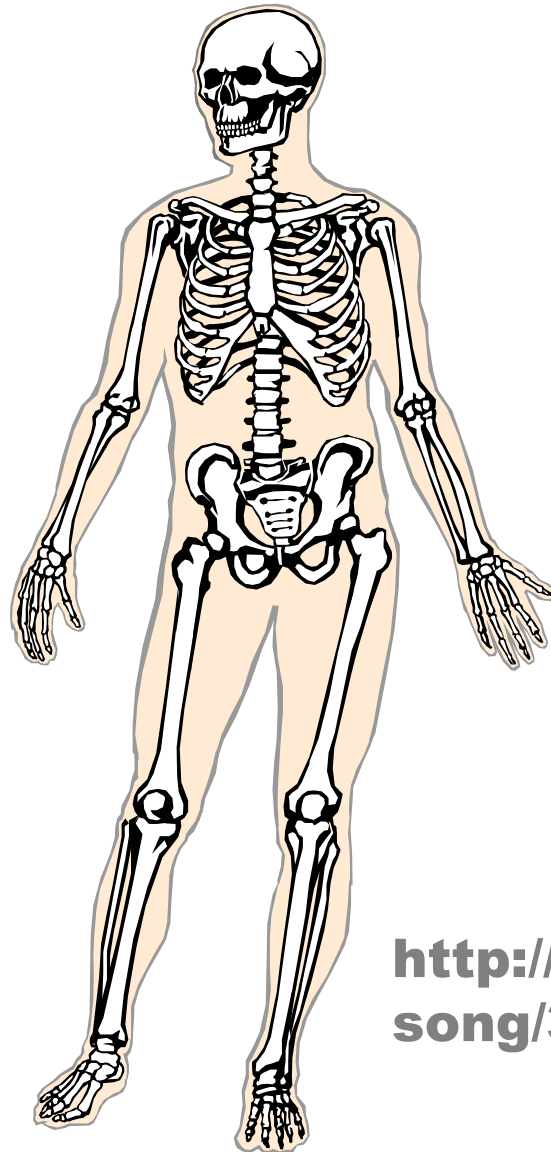


Body Structure



<http://people.eku.edu/ritchison/301notes1.htm>

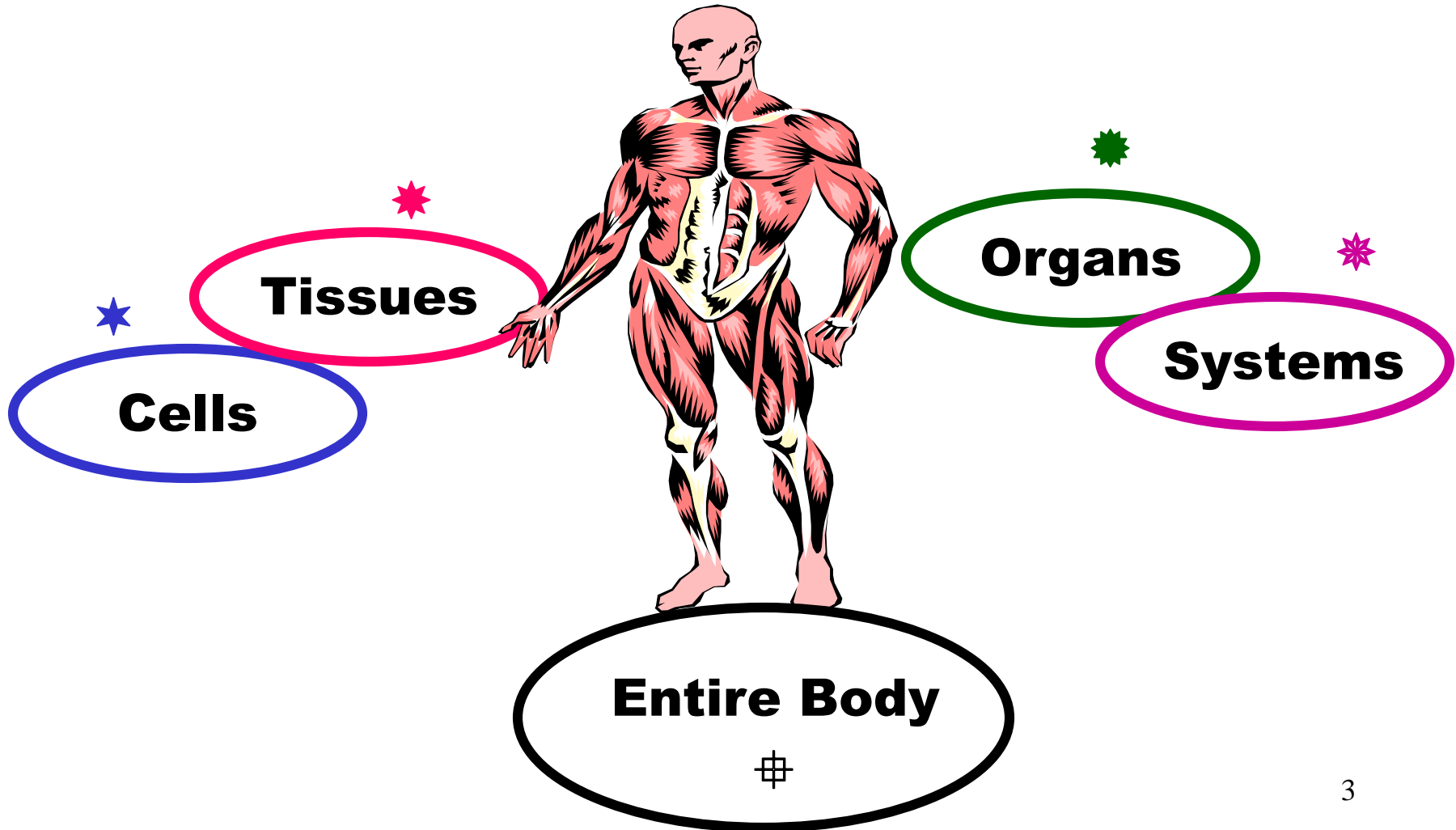
Objectives

After studying this chapter, you will be able to:

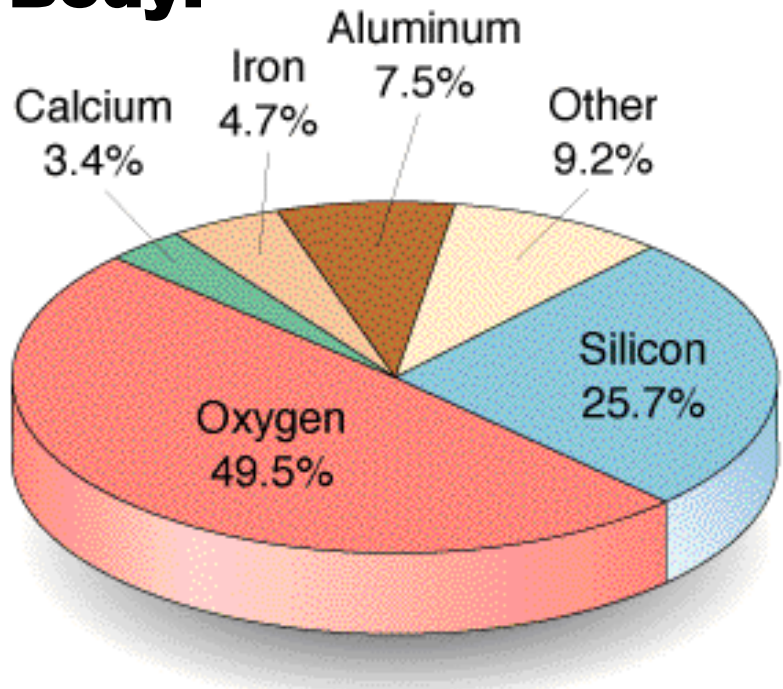
- **Define the elements of human body structure**
- **Describe the planes of the body**
- **Locate the body cavities and list organs that are contained within each cavity**
- **Recognize the combining forms that relate elements and systems of the body**

Body Structure and Organization

The body is organized from its smallest element, the cell, to the collection of systems.

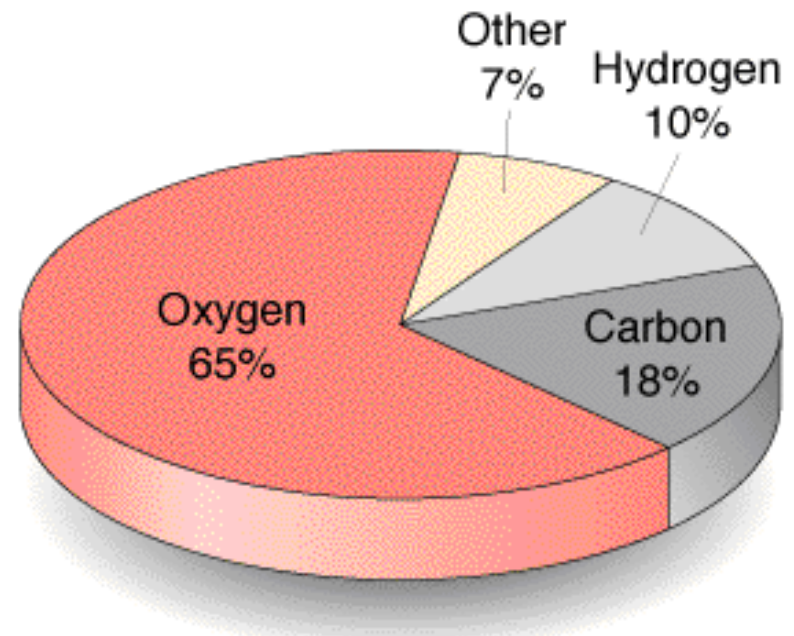


Here are the elemental abundances, BY MASS, in the earths crust and in the Human Body:



Earth's crust

(a)

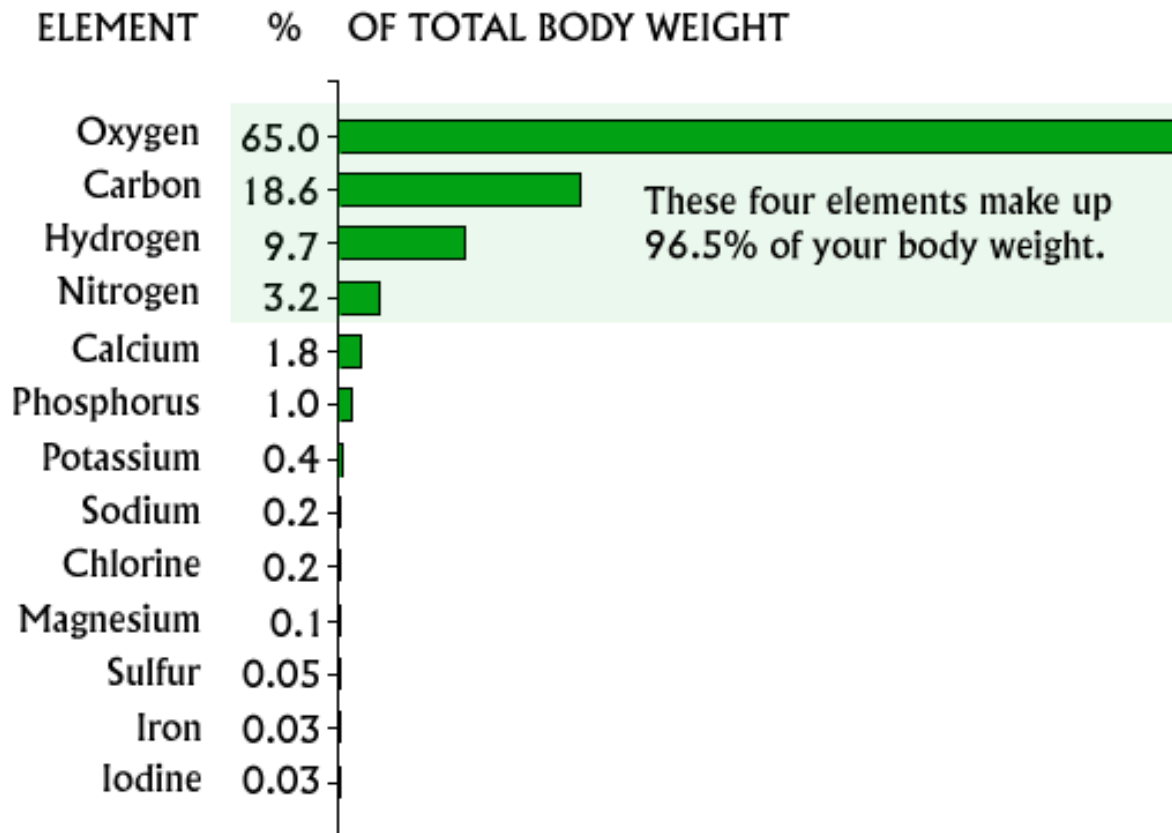


Human body








(b)

Elements Found in the Human Body

- Of the elements found in the human body, four of them make up the largest percentage of our body weight (96.5%).
- The four elements are oxygen, hydrogen, carbon, nitrogen.



Body Structure and Organization

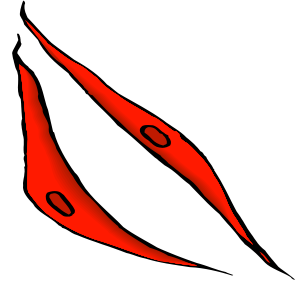
Level of Organization	Explanation	Example
 Atomic Level	Atoms are defined as the smallest unit of an element that still maintains the property of that element.	Carbon, Hydrogen, Oxygen
 Molecular Level	Atoms combine to form molecules which can have entirely different properties than the atoms they contain.	Water, DNA, Carbohydrates
 Cellular Level	Cells are the smallest unit of life. Cells are enclosed by a membrane or cell wall and in multicellular organisms often perform specific functions.	Muscle cell, Skin cell, Neuron
 Tissue Level	Tissues are groups of cells with similar functions	Muscle, Epithelial, Connective
 Organ Level	Organs are two or more types of tissues that work together to complete a specific task.	Heart, Liver, Stomach
 Organ System Level	An organ system is group of organs that carries out more generalized set of functions.	Digestive System, Circulatory System
 Organismal Level	An organism has several organ systems that function together.	Human

Body Structure and Organization

Cells

- Vary in size, shape, and function.
- Need food, water, and oxygen to live and function.
- Contain three basic structures:

- **Cell Membrane**- outer covering of the cell.
- **Nucleus**- central portion of each cell responsible for directing cell activities.
- **Cytoplasm**- substance surrounding the nucleus and is responsible for reproduction and movement.



Muscle cell



Bone Cell

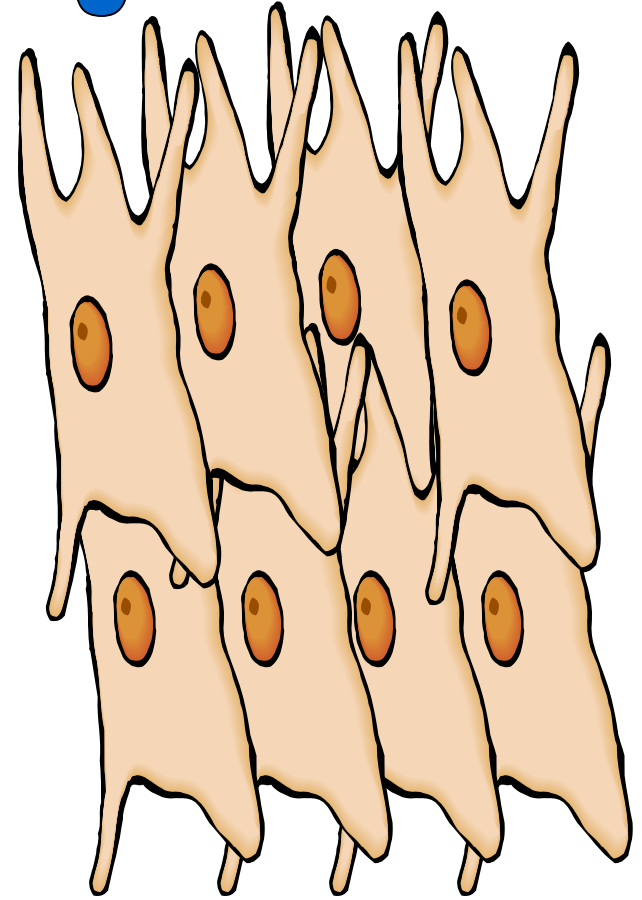
Body Structure and Organization

Tissues

Groups of cells that work together to perform the same task are called *tissues*.

Types of Tissues

- **Connective tissue**
- **Epithelial tissue**
- **Muscle tissue**
- **Nervous Tissue**



Connective Tissue

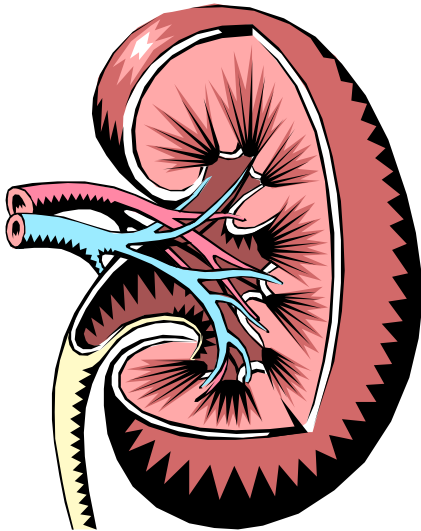
Body Structure and Organization

Organs

Groups of tissues that work together to perform a specific function are called *organs*.

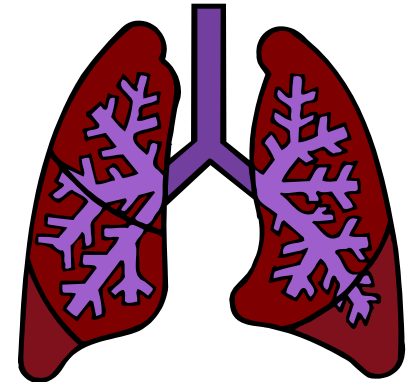
Organ Examples:

kidney



brain

lungs



Body Structure and Organization

Systems

Groups of organs that work together to perform one of the body's major functions are called ***systems***.

Integumentary System

Consists of:

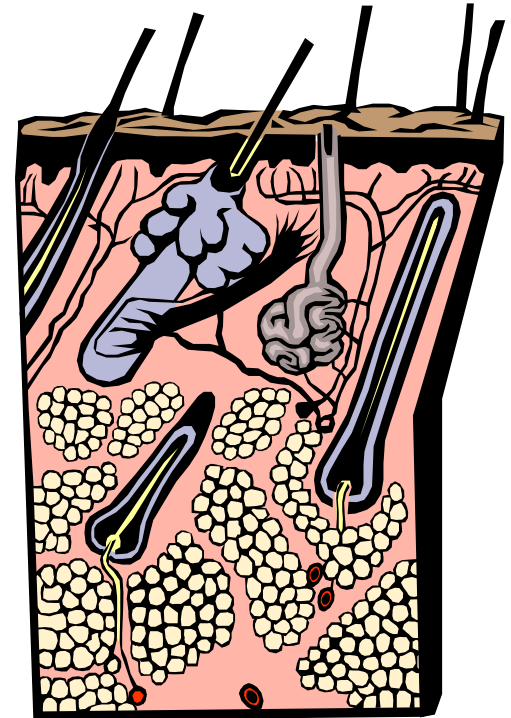
Skin

Hair

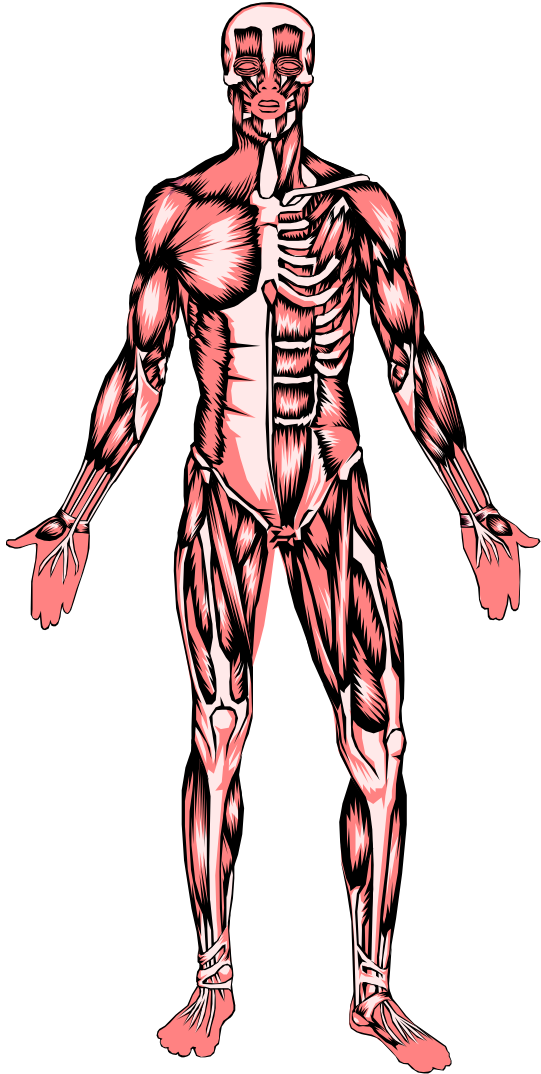
Nails

Sweat glands

Oil glands



Body Structure and Organization



Musculoskeletal System

Supports the body, protects organs and provides body movement.

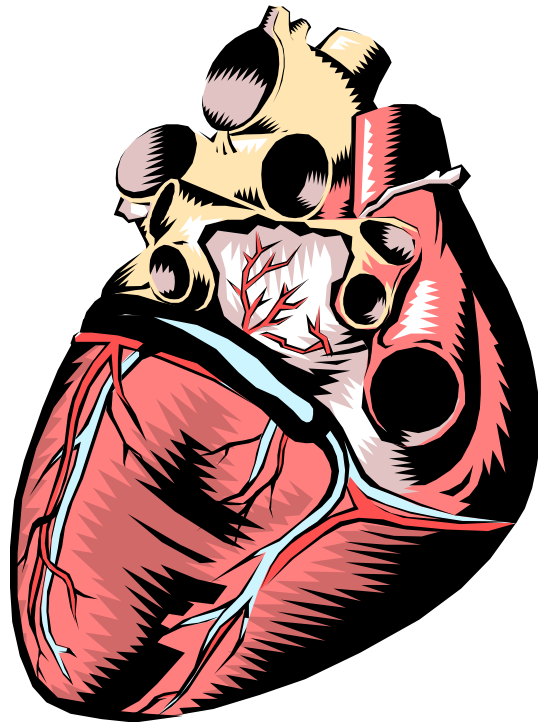
Consists of:

- **Muscles**
- **Bones**
- **Cartilage**

Body Structure and Organization

Cardiovascular System

Pumps and transports blood throughout the body. Blood carries nutrients and removes waste from the tissues.



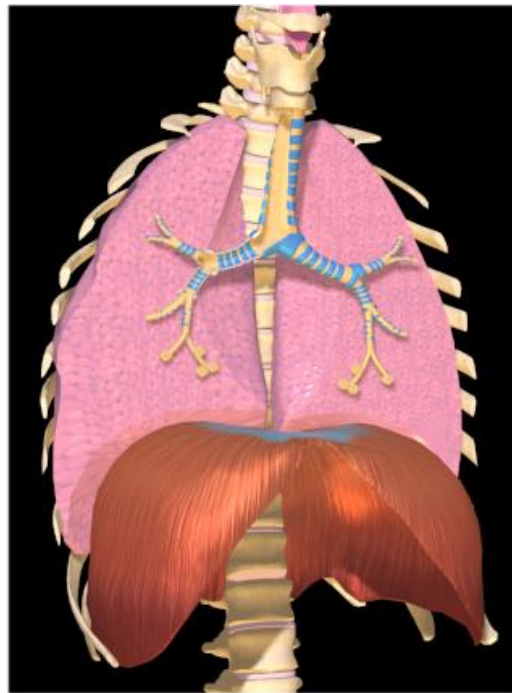
Consists of:

- **Heart**
- **Blood Vessels**

Body Structure and Organization

Respiratory System

- Performs respiration

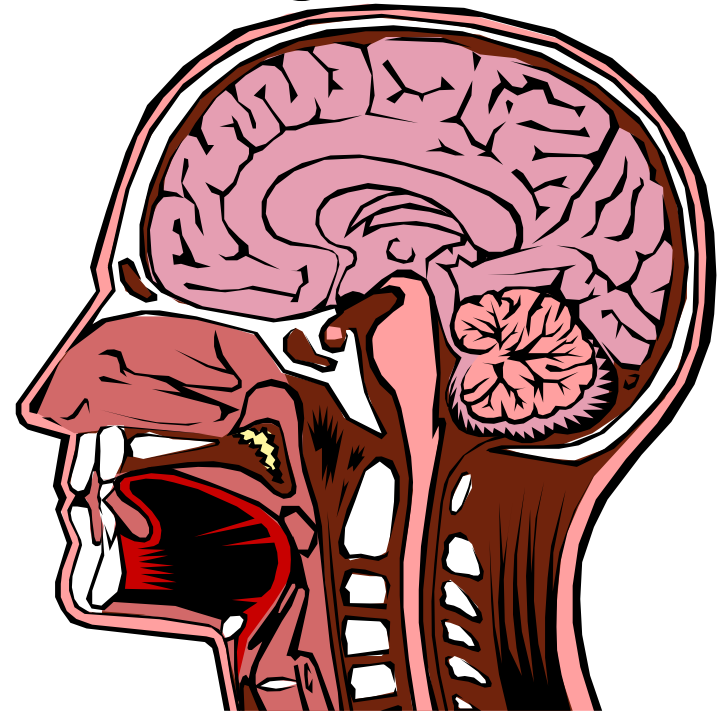


Consists of the lungs and the airways

Body Structure and Organization

Nervous System

Regulates most of the body's activities and sends and receives messages from sensory organs.



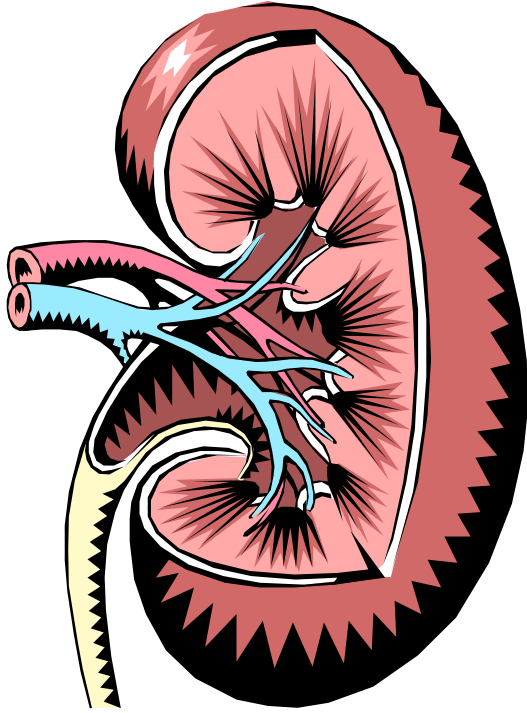
Consists of :

Brain

Peripheral Nerves

Spinal Cord

Body Structure and Organization



Urinary System

- Eliminates metabolic waste
- Helps to maintain acid-base and water-salt balance
- Helps regulate blood pressure

Consists of:

Kidneys

Bladder

Ureters

Urethra

Body Structure and Organization

Reproductive System

Controls reproduction and heredity.

Male Structures

- **testes**
- **penis**
- **prostate gland**
- **vas deferens**
- **seminal vesicles**

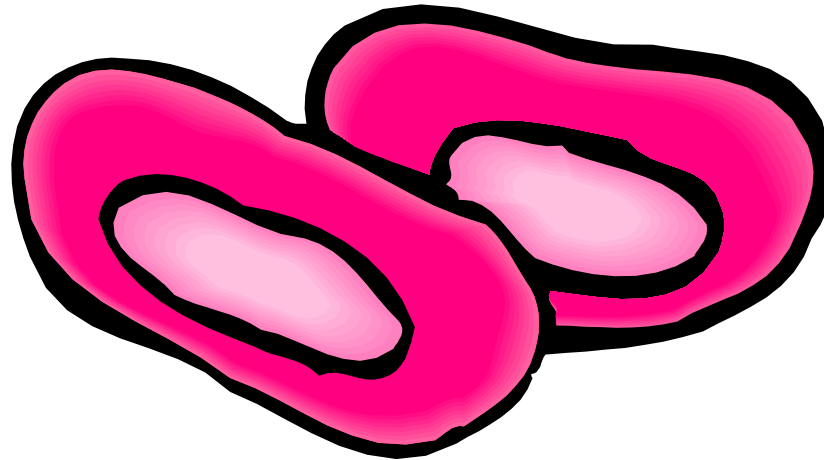
Female Structures

- **ovaries**
- **vagina**
- **uterine tubes**
- **uterus**
- **mammary glands**

Body Structure and Organization

Blood System

Blood transports nutrients and waste to and from body tissues.



Red Blood Cell

Body Structure and Organization

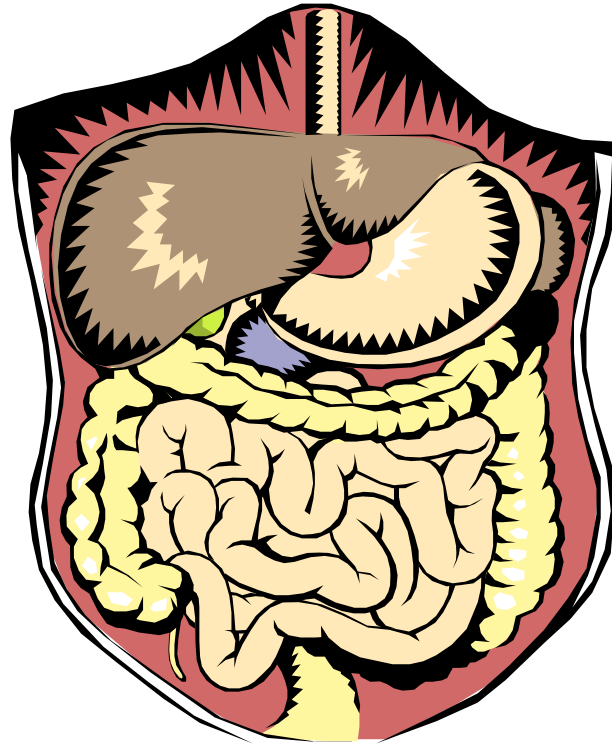
Lymphatic and Immune System

Consists of:

- **Lymph**
- **Lymphatic Vessels**
- **Lymphatic Glands**
- **Nonspecific Defenses of the Immune System**

Body Structure and Organization

Digestive System

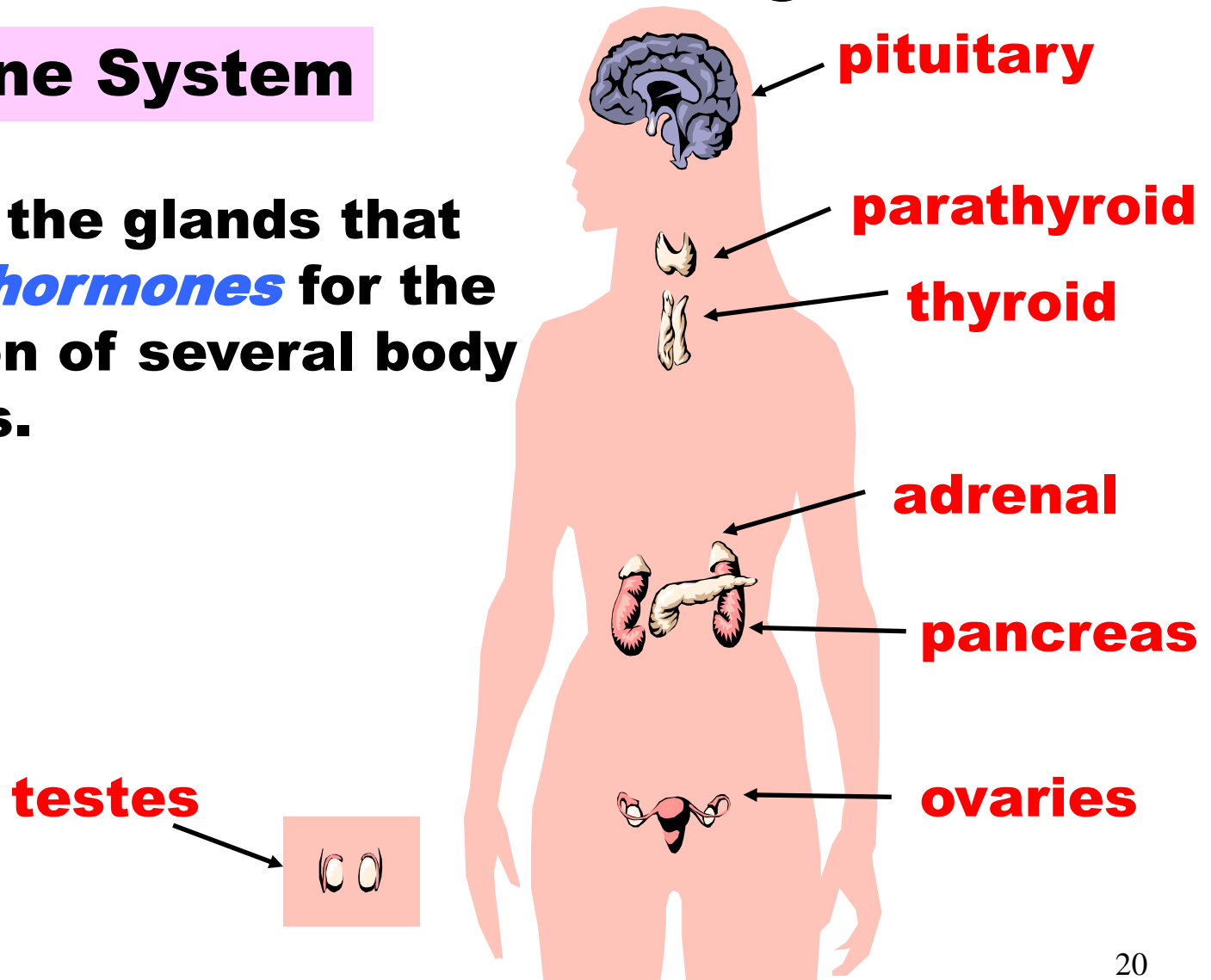


Includes all organs of digestion and excretion of waste.

Body Structure and Organization

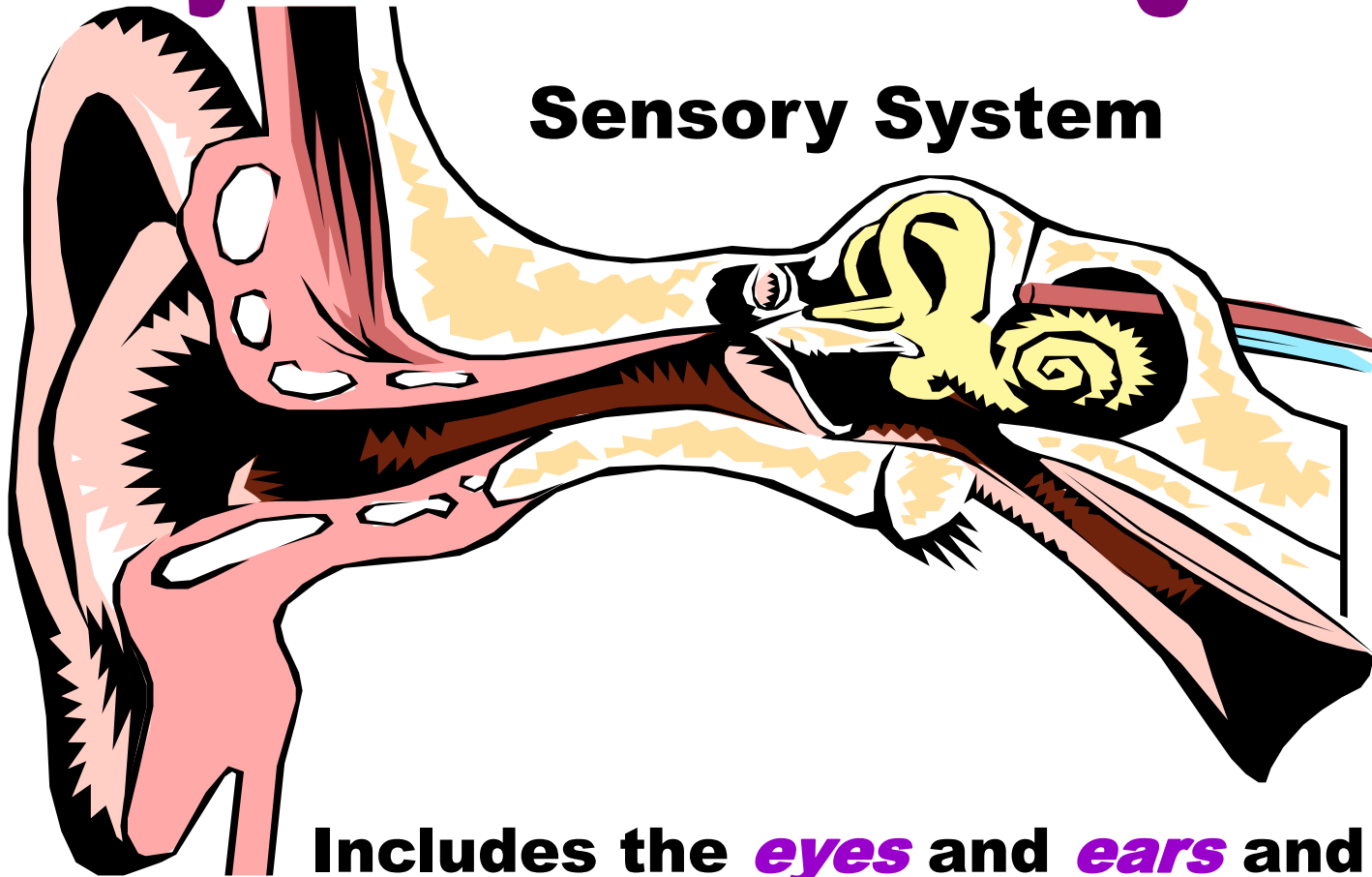
Endocrine System

Includes the glands that secrete *hormones* for the regulation of several body activities.



Body Structure and Organization

Sensory System



Includes the *eyes* and *ears* and those other parts of other systems involved in the reactions of the other five *senses*.

Body Structure and Organization

Body Cavities

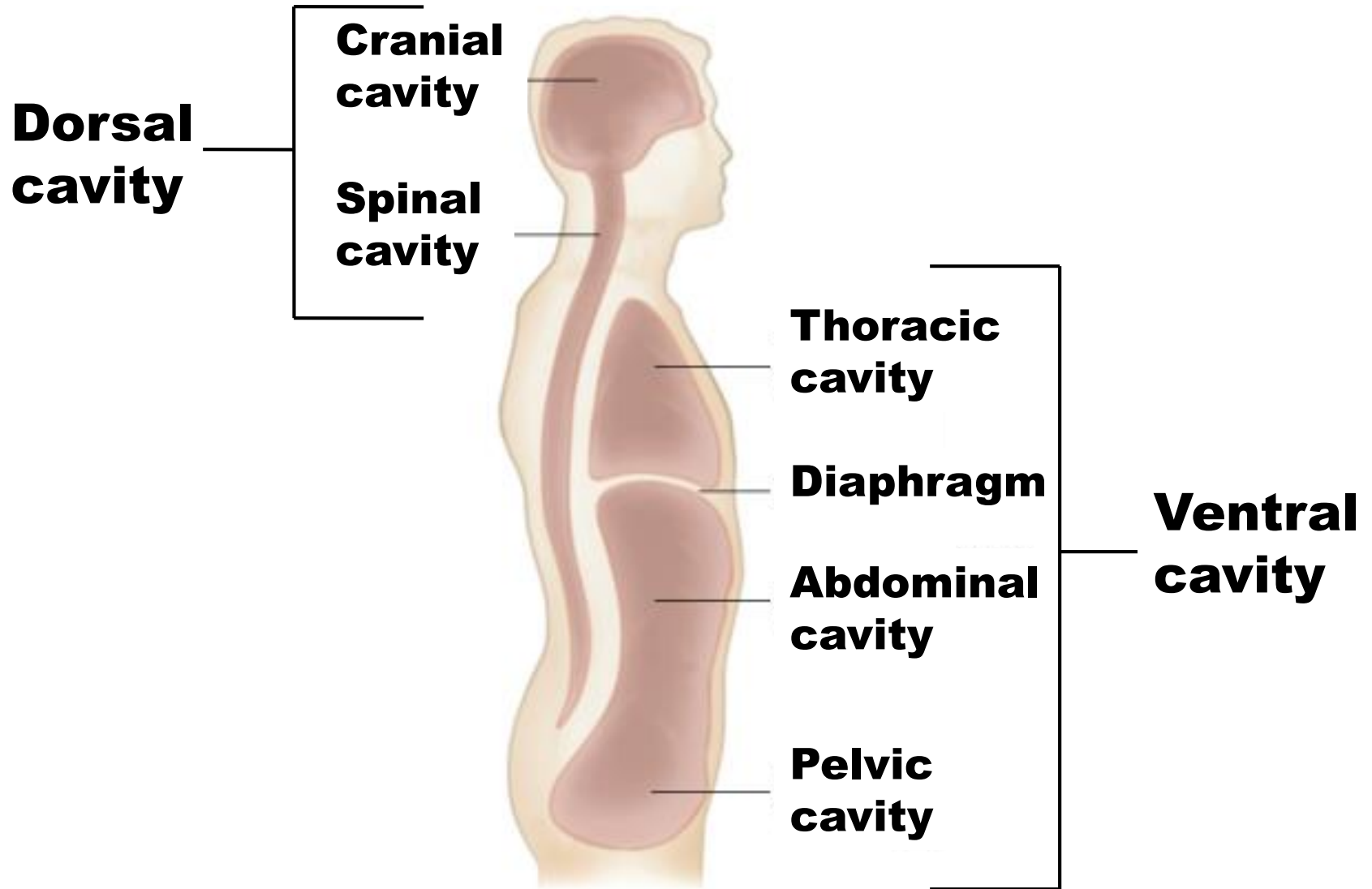
Dorsal (back side of the body)

- Consists of the ***cranial*** cavity and ***spinal*** cavity

Ventral (front side of the body)

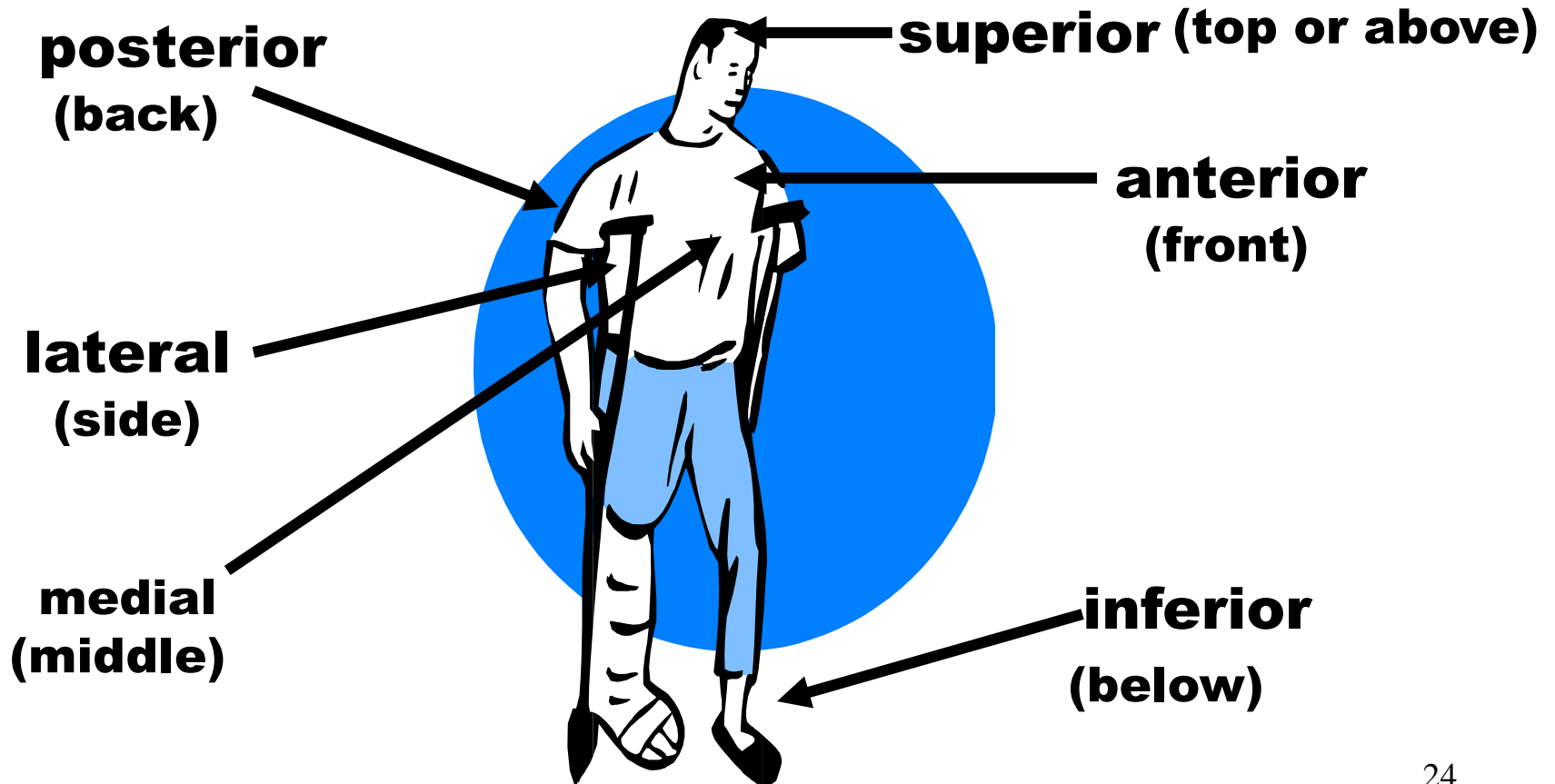
- Separated by ***diaphragm*** into the ***thoracic*** cavity and ***abdominal*** cavity
- Lower portion of the abdominal cavity is called the ***pelvic*** cavity

Body Structure and Organization



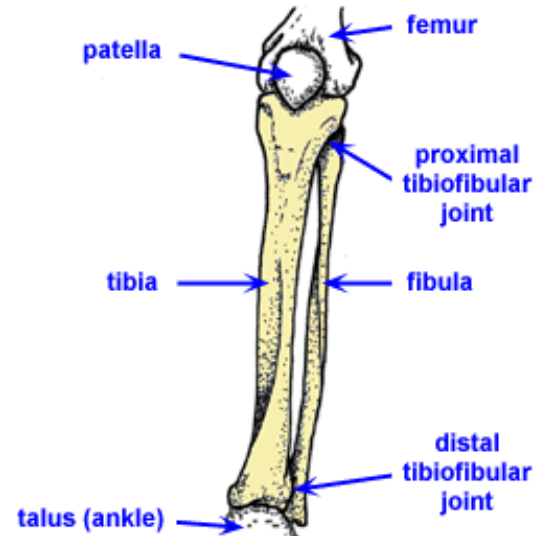
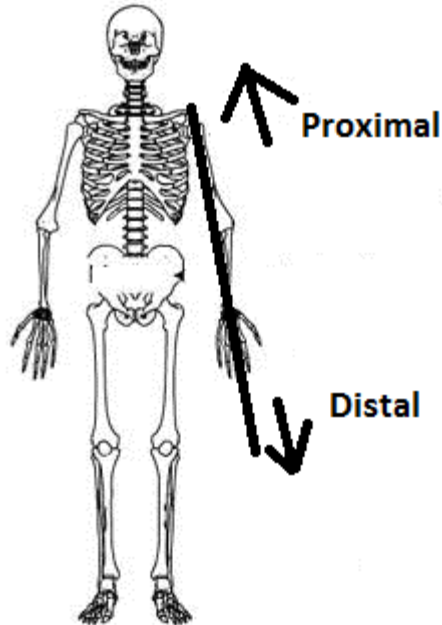
Directional Terms, Planes, and Regions

Directional terms describe a portion or position of the body.

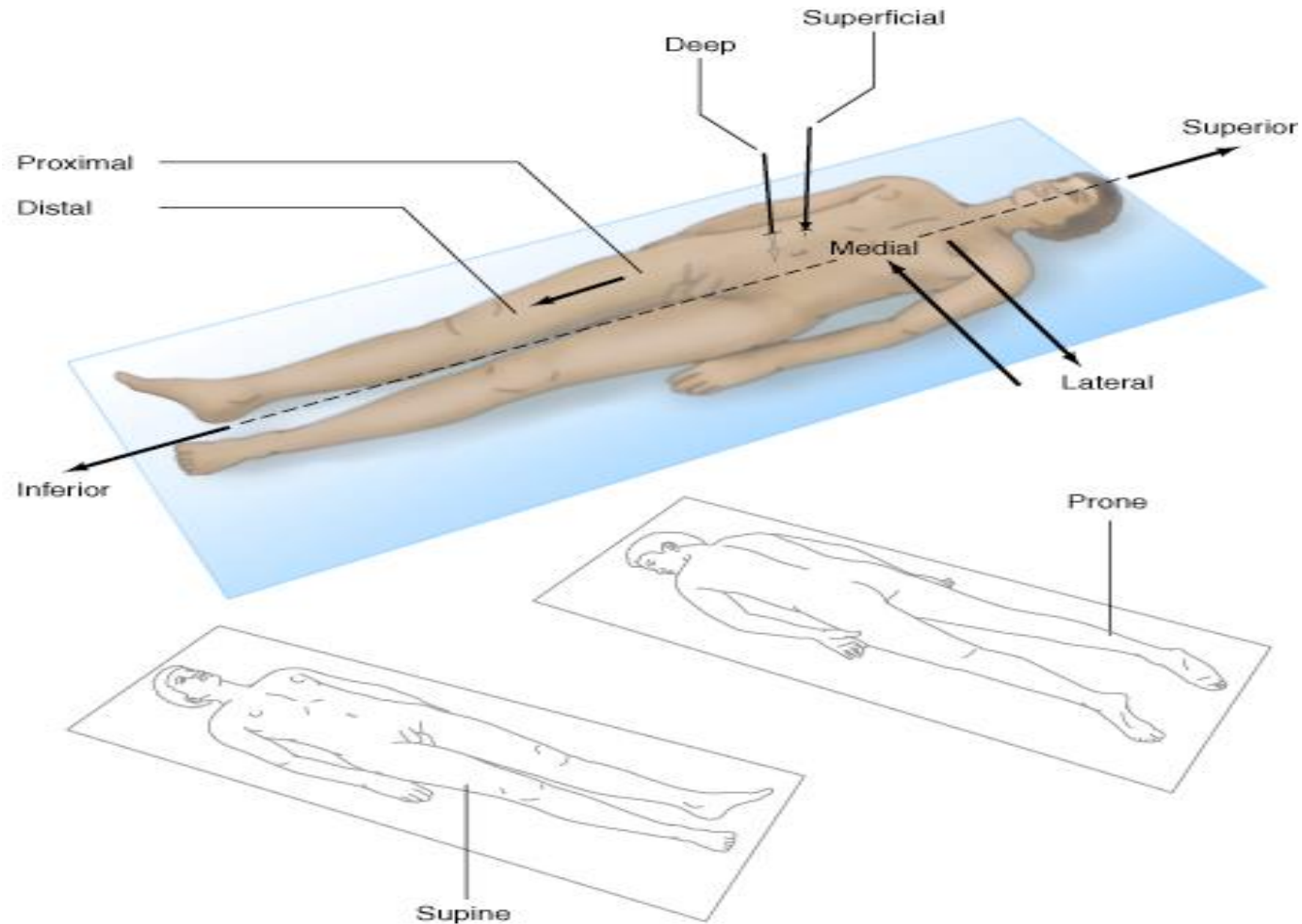


〈표 2-1〉 방향 용어

약어	의미	용례
가까운쪽(proximal)	가까운 지점	손목은 손가락보다 몸쪽에 있다.
먼쪽(distal)	멀리 떨어져 있는 지점	어깨는 손가락보다 먼쪽에 있다.
바깥(external)	겉 부분	제세동기는 가슴의 바깥면에 사용한다.
속(internal)	안쪽	사고로 인해 속부분이 상해를 입는다.
얕은(superficial)	몸의 표면	칼로 인해 얕은 부분이 다쳤다.
깊은(deep)	몸의 표면보다 훨씬 아래	전기톱에 의해서 환자는 깊은 상처를 입었다.
중심(central)	몸의 중심부위	환자는 가슴 중심에 통증이 있다.
말초(peripheral)	주변부위, 변두리	발의 말초가 부어 있다.



Directional Terms, Planes, and Regions

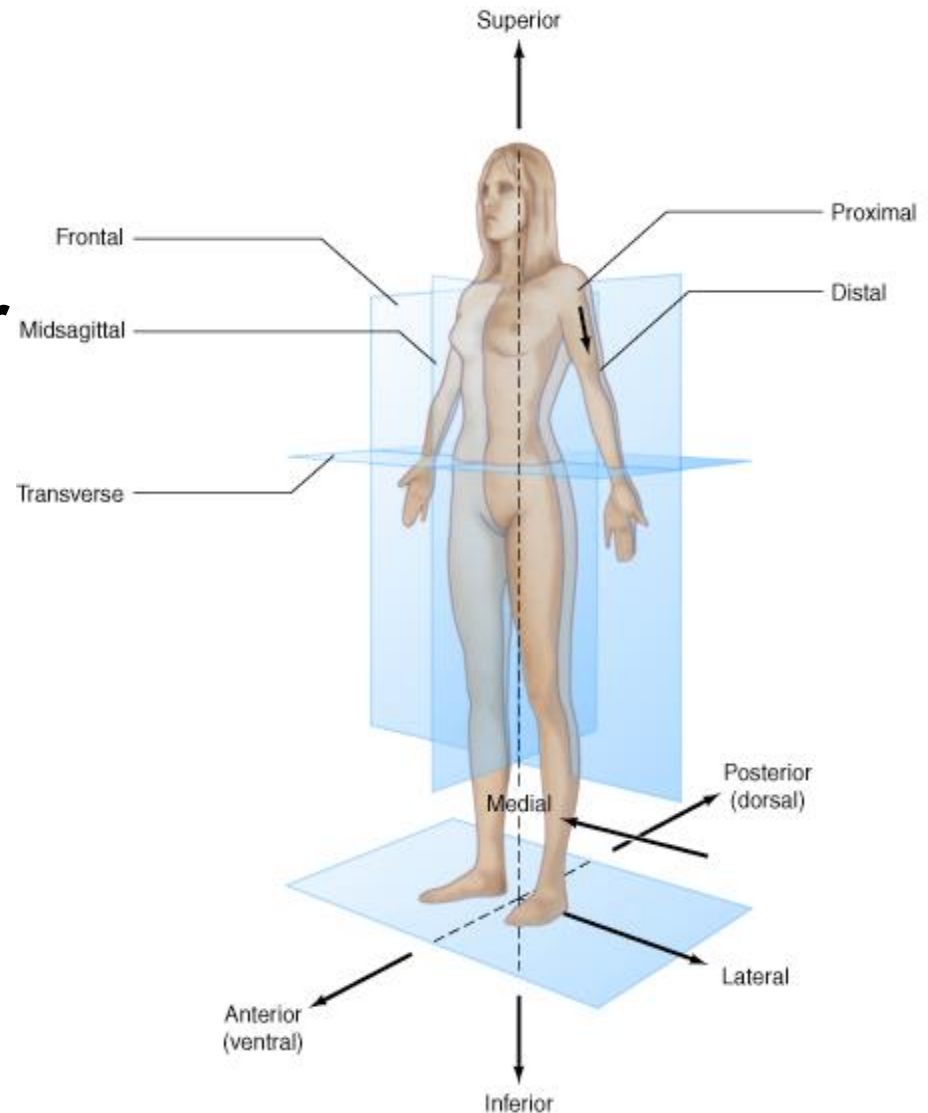


For examination purposes, patients are either lying face up (***supine***) or face down (***prone***).

Directional Terms, Planes, and Regions

Planes of the Body

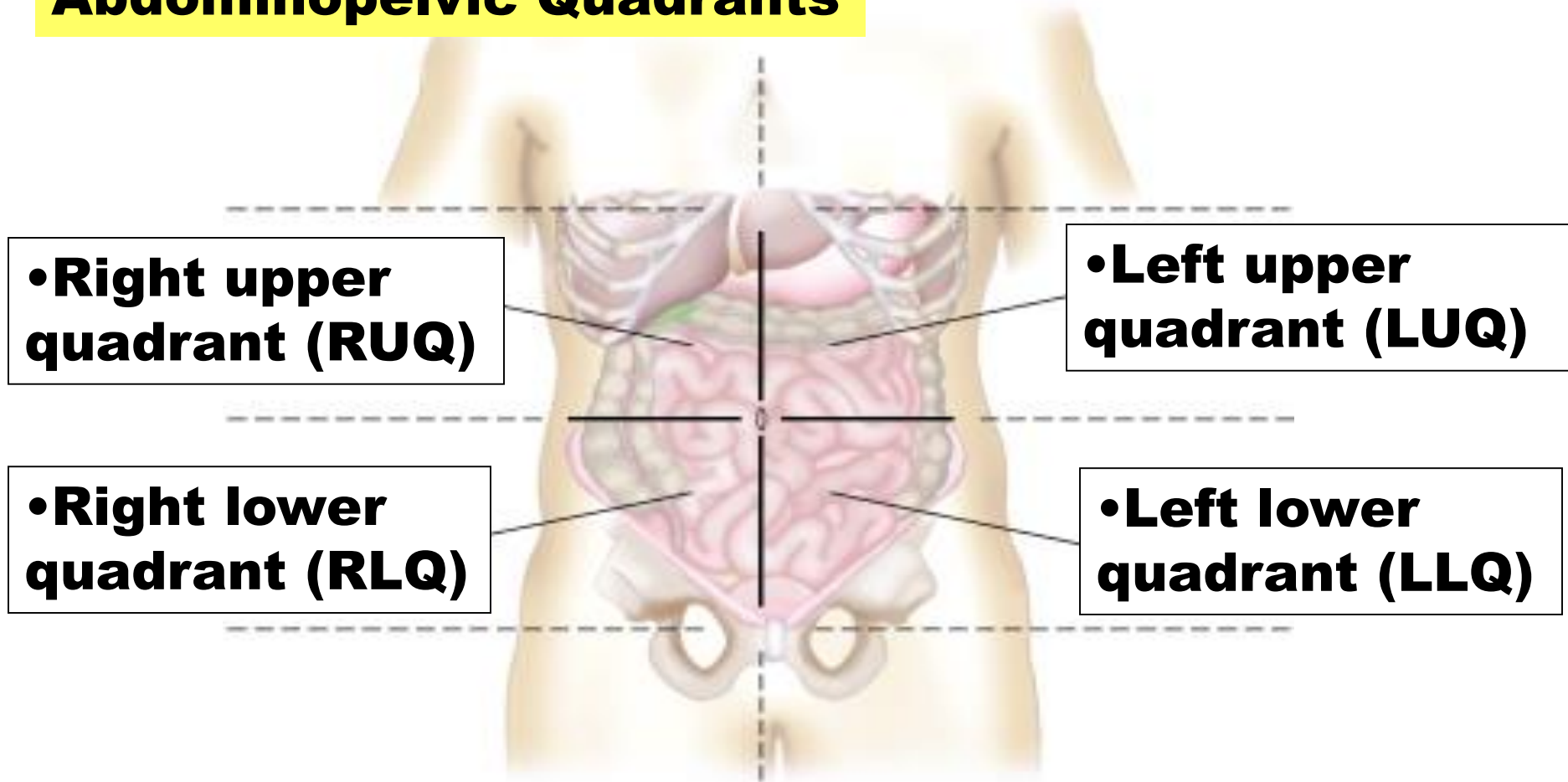
- ***Frontal*** divides the body into anterior and posterior positions.
- ***Sagittal*** is the lateral position.
- ***Medial*** or ***midsagittal*** divides the body into right and left halves.
- ***Transverse*** divides the body into upper and lower sections.



Directional Terms, Planes, and Regions

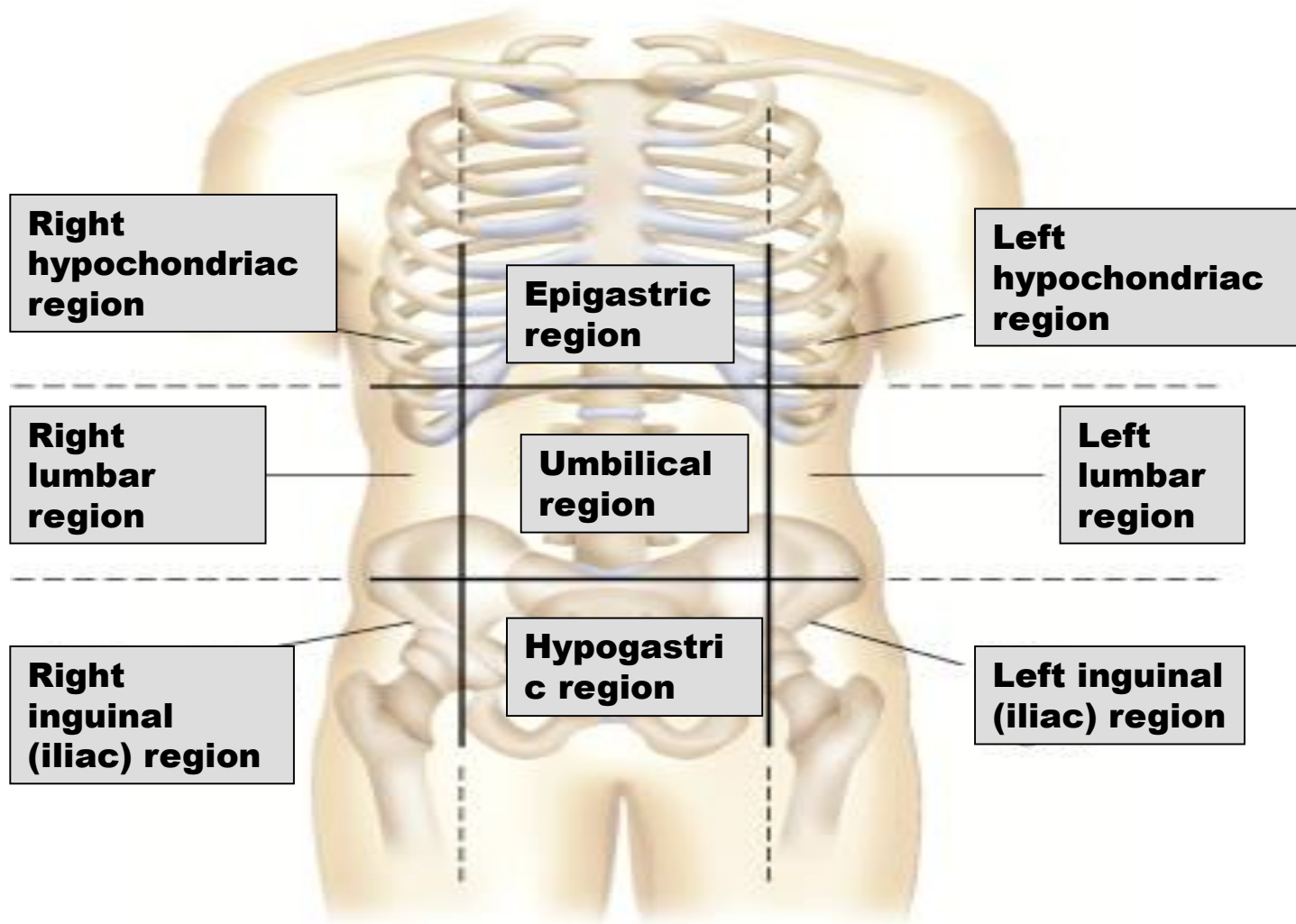
Quadrants of the Body

Abdominopelvic Quadrants



Directional Terms, Planes, and Regions

Regions of the Body



Combining Forms

Combining Form

Meaning

•acetabul(o)	→	cup-shaped hip socket
•aden(o)	→	gland
•adip(o)	→	fat
•alveol(o)	→	air sac, alveolus
•angi(o)	→	vessel
•arthr(o)	→	joint; articulation
•aur(i)	→	ear

Combining Forms

Combining Form

Meaning

• blephar(o)	●—————●	eyelid
• brachi(o)	●—————●	arm
• bucc(o)	●—————●	cheek
• calcane(o)	●—————●	heel bone
• celi(o)	●—————●	abdomen
• cephal(o)	●—————●	head
• cheil(o)	●—————●	lip

Combining Forms

Combining Form

Meaning

•chir(o)



hand

•chol(e)



bile

•dactyl(o)



fingers, toes

•dent(i)



tooth

•encephal(o)



brain

•enter(o)



intestines

•gingiv(o)



gum

Combining Forms

Combining Form

Meaning

•gloss(o) → tongue

•gnath(o) → jaw

•hidr(o) → sweat

•ile(o) → ileum

•ili(o) → ilium

•labi(o) → lip

•lapar(o) → abdominal wall

Combining Forms

Combining Form

Meaning

•lip(o) →

fat

•my(o) →

muscle

•ocul(o) →

eye

•odont(o) →

tooth

•onych(o) →

nail

•oo →

egg

•oophor(o) →

ovary

Combining Forms

Combining Form

Meaning

- **orchi(o), orchid(o)** → **testis**
- **ot(o)** → **ear**
- **ped(o), pedi** → **foot; child**
- **phleb(o)** → **vein**
- **pil(o)** → **hair**
- **pod(o)** → **foot**
- **proct(o)** → **anus**

Combining Forms

Combining Form

•psych(o), psyche →

•rachi(o) →

•rhin(o) →

•somat(o) →

•trachel(o) →

•trich(o), trichi →

•vesic(o) →

Meaning

mind

spine

nose

body

neck

hair

bladder

Homeostasis; stability, balance or equilibrium

homeo = same; stasis = standing

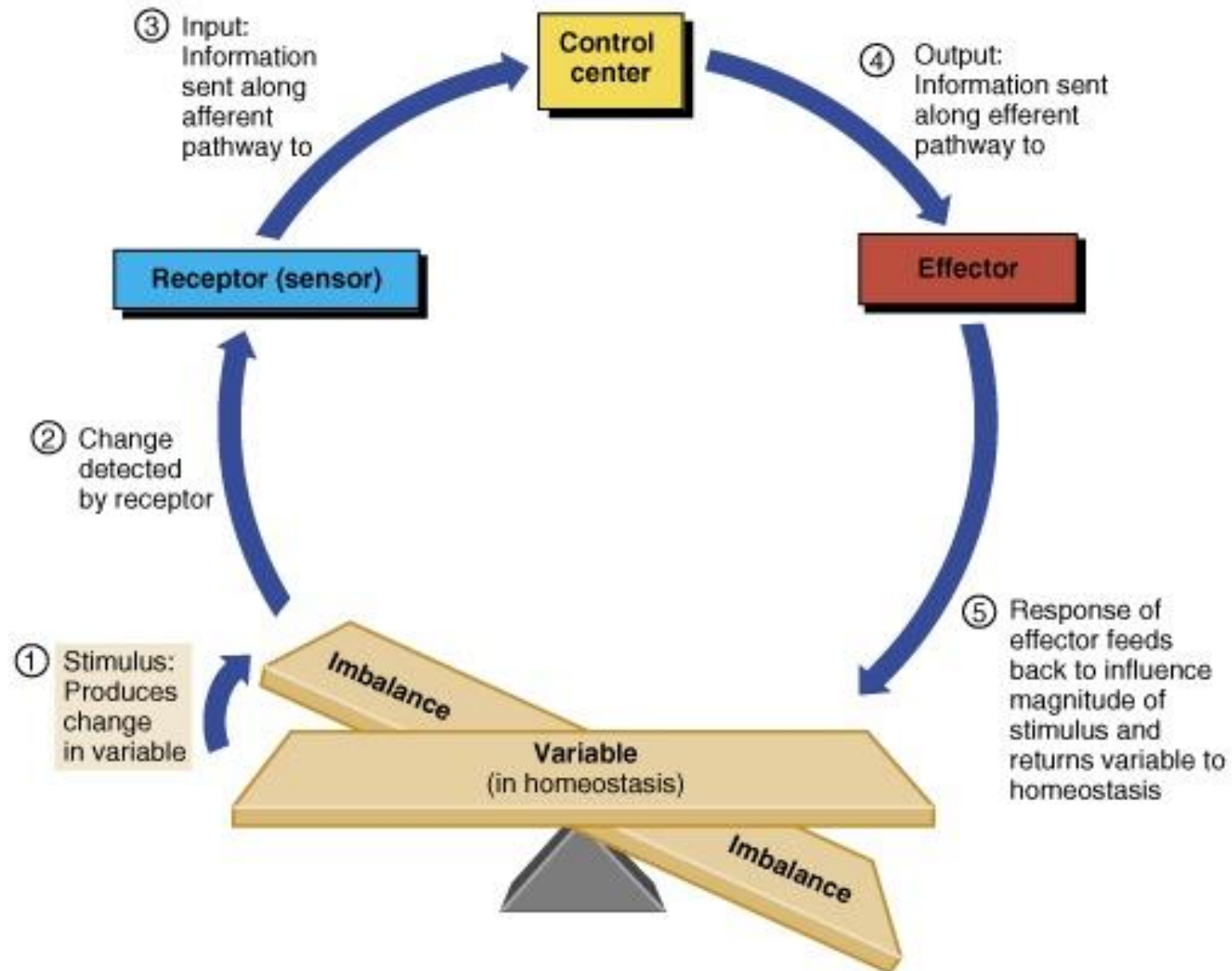
Homeostasis = relative constancy of the internal fluid environment

- **It is the body's attempt to maintain a constant internal environment.**
- **Maintaining a stable internal environment requires constant monitoring and adjustments as conditions change.**
- **This adjusting of physiological systems within the body is called *homeostatic regulation*.**

항상성(Homeostasis)

1. 인간의 내부환경 : 세포 밖의 세포외액 (ECF)
2. 내부환경을 외부환경의 변동으로부터 보호
3. 내부환경의 변화에 대응하여 즉시 정상상태로 되돌리려는 작용
4. 내부환경의 물리 화학적 상태를 일정하게 유지하려는 인체 활동

항상성(homeostasis)



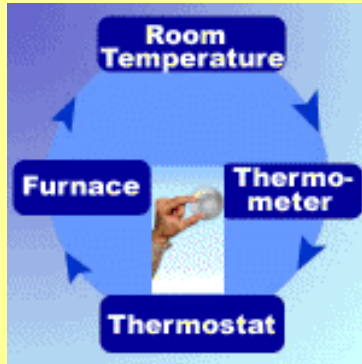
항상성(homeostasis)

Fishbowl Model

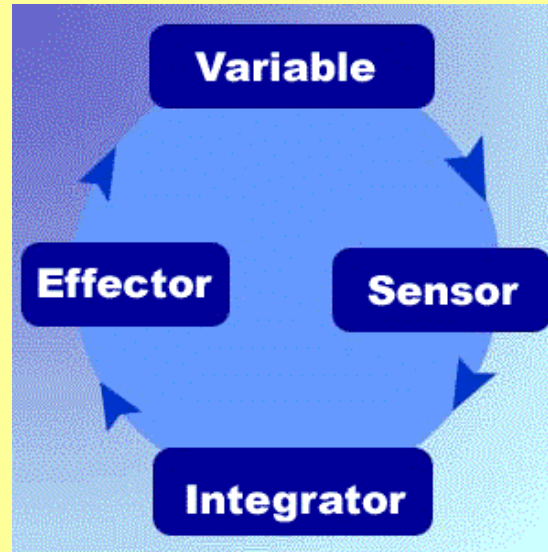


Fishbowl	Human Body	Function
Water	Body fluid	Internal environment
Glass bowl	Skin	Barrier (internal vs. external)
Fish	Cells	Stay alive
Air pump	Lungs	Keep O ₂ level constant (high)
Filter	Kidneys	Keep nitrogen wastes constant (low)
Heater	Muscles	Keep temperature constant (high)
Feeder	Digestive system	Keep nutrient levels constant (high)
Everything working together		Relatively constant conditions

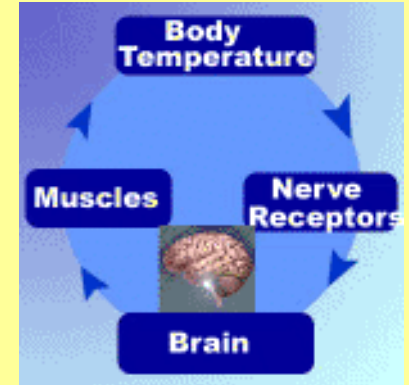
Engineered control system (thermostat) model



Engineered Room Control



Feedback Loop



Human Body Thermoregulation

Room Temperature	Variable The characteristic that is controlled	Body temperature
Thermometer	Sensor Detects the value of the variable	Nerve receptors
Thermostat	Integrator Compares the actual value of the variable to a pre-determined setpoint value	Brain (hypothalamus)
Furnace	Effector Instrument that has an effect on (changes) the variable	Muscles (shivering)

Apply Your Knowledge

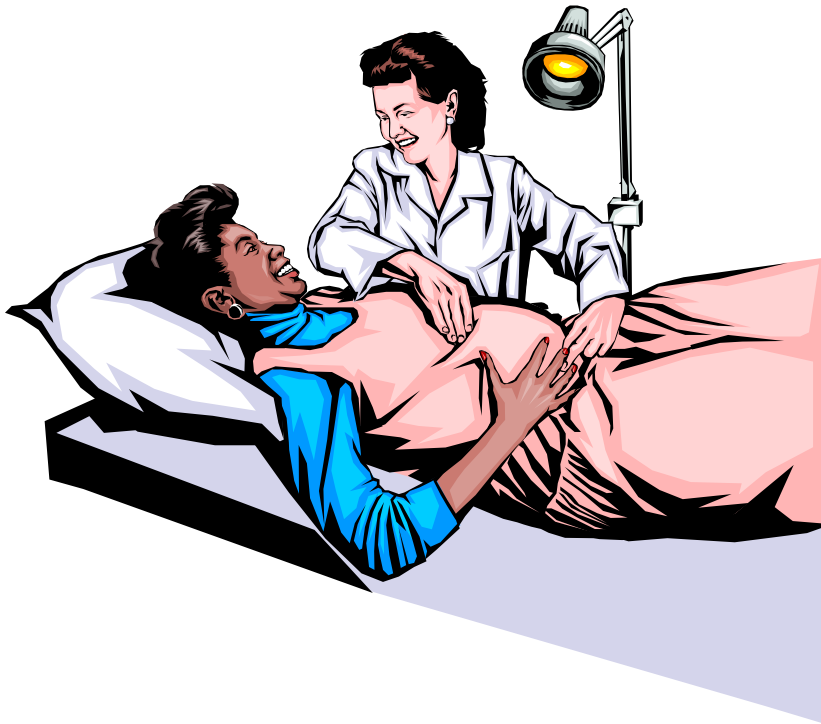
Koretta complains of abdominal pain. The emergency room physician suspects that she may have appendicitis.

In which of the following quadrants is the appendix located?

- A. RUQ**
- B. RLQ**
- C. LUQ**
- D. LLQ**

Answer: B. RLQ

Apply Your Knowledge



This patient is being examined. Which of the following positions is she in?

- A. Prone**
- B. Supine**

Answer: B. Supine

Apply Your Knowledge

Complete the following statements by adding the correct directional terms.

The hands are _____ **distal to the elbows.**

The nose is _____ **medial to the face.**

The stomach is _____ **inferior to the heart and _____ **superior** to the intestines.**

Apply Your Knowledge

What are the *opposites* for the following directional terms?

Answers

- **deep** → **superficial**
- **posterior** → **anterior**
- **inferior** → **superior**
- **supine** → **prone**
- **lateral** → **medial**