



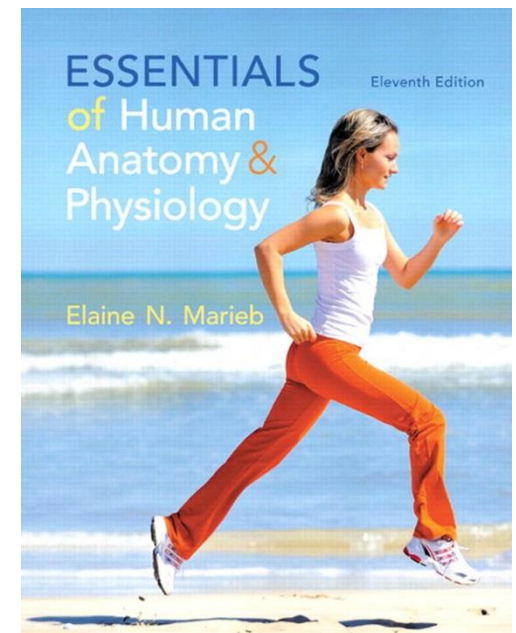
Human Anatomy and Physiology

CLS 224

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Lecture 1:

The Human Body (an orientation)

1. An overview of anatomy and physiology.
2. Levels of structural organization.
3. Homeostasis.
4. The language of anatomy.

1. An overview of anatomy and physiology

Objectives:

- Define anatomy and physiology.
- Explain how anatomy and physiology are related.

1. An overview of anatomy and physiology

•**Anatomy:** *the term **anatomy** is derived from the Greek words; to cut (tomy) apart (ana).*

It is the study of the body shape & structure and its parts relationships to one another.

❖ **Gross Anatomy:**

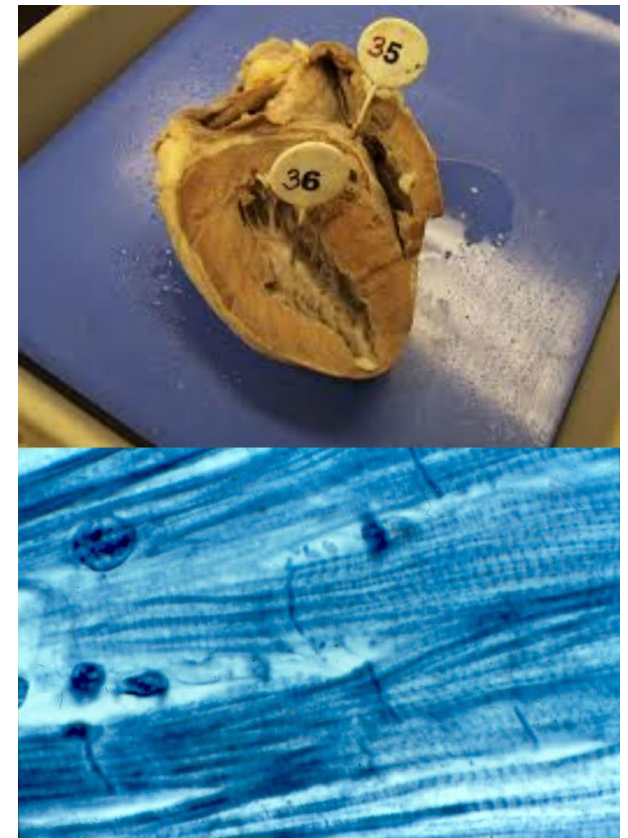
Studying large, easily observed structures (e.g. heart, bones)

❖ **Microscopic Anatomy:**

The study of body structures that can only be viewed with a microscope. (e.g. Cells and tissues)

•**Physiology:** *(physio= nature; ology= the study of)*

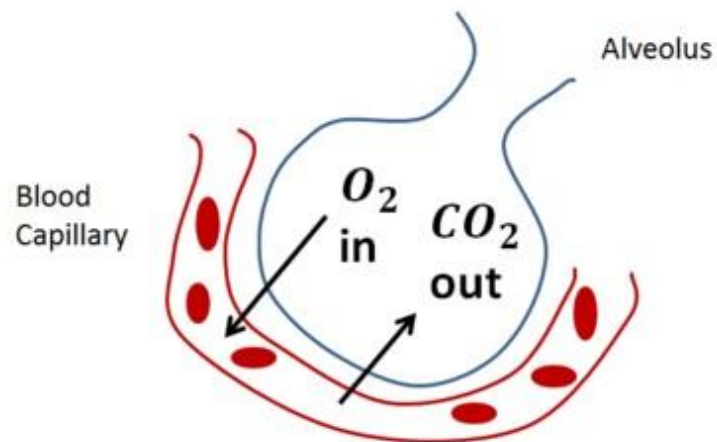
Is the Study of how the body and its parts work and function.



- **The Relationship between anatomy and physiology:**

Topics of anatomy and physiology are always related.
Anatomy determines physiology.

The physiology, or function, of a particular body part is dependent upon its structure.



Lungs do not have muscles but have thin air sacs that allows gas exchange.

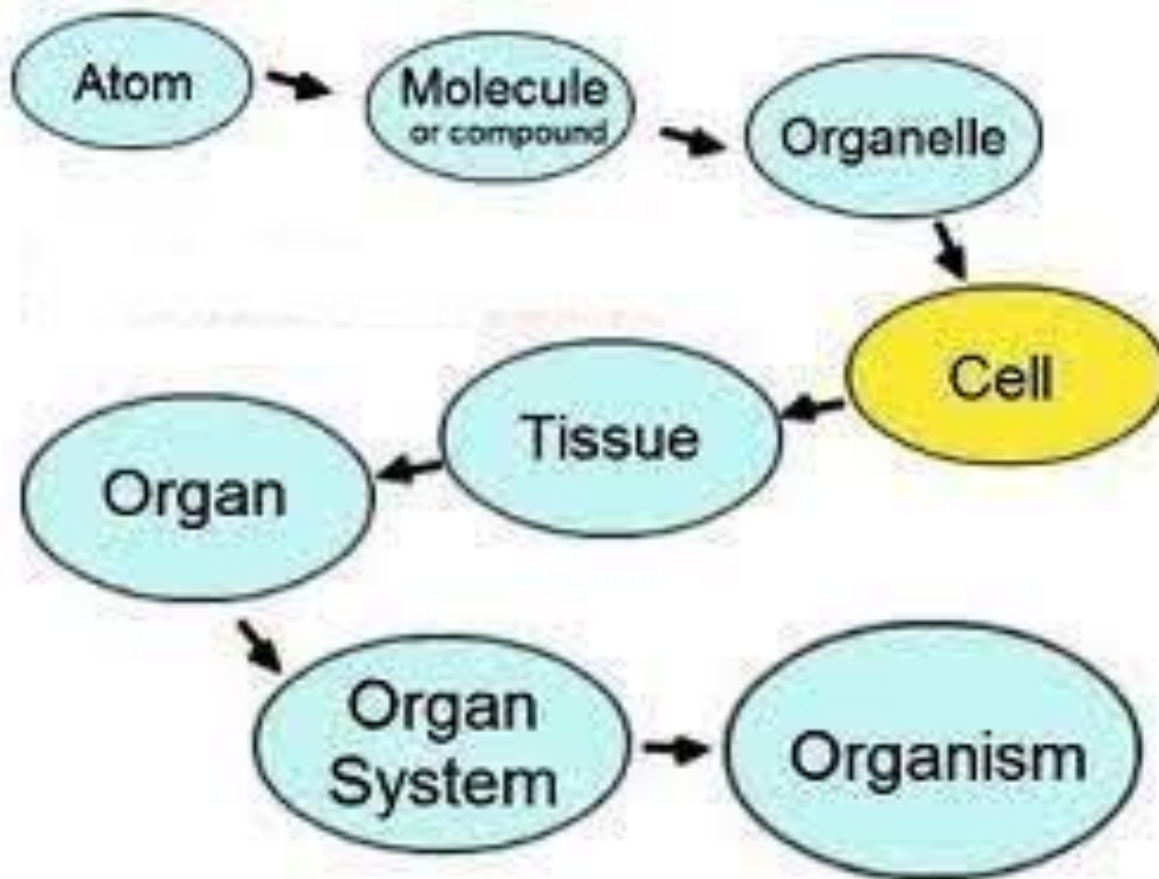
2. Levels of structural organization

Objectives:

- Name the levels of structural organizations that make up the human body and explain how they are related.
- Name the body system, and briefly state the major functions of each system.
- Name the organs that the body system is composed of and identify them on a diagram.

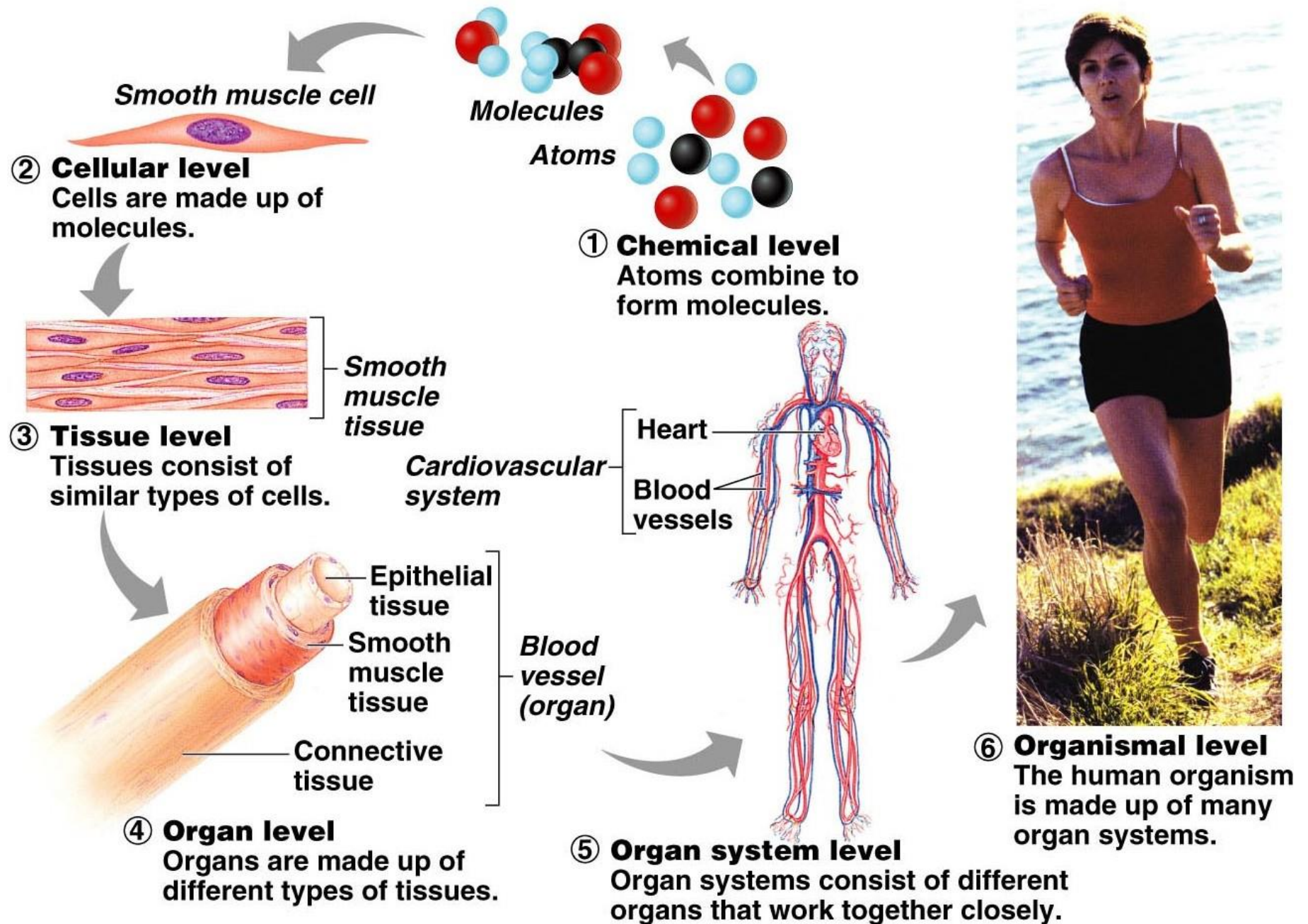
2. Levels of structural organization

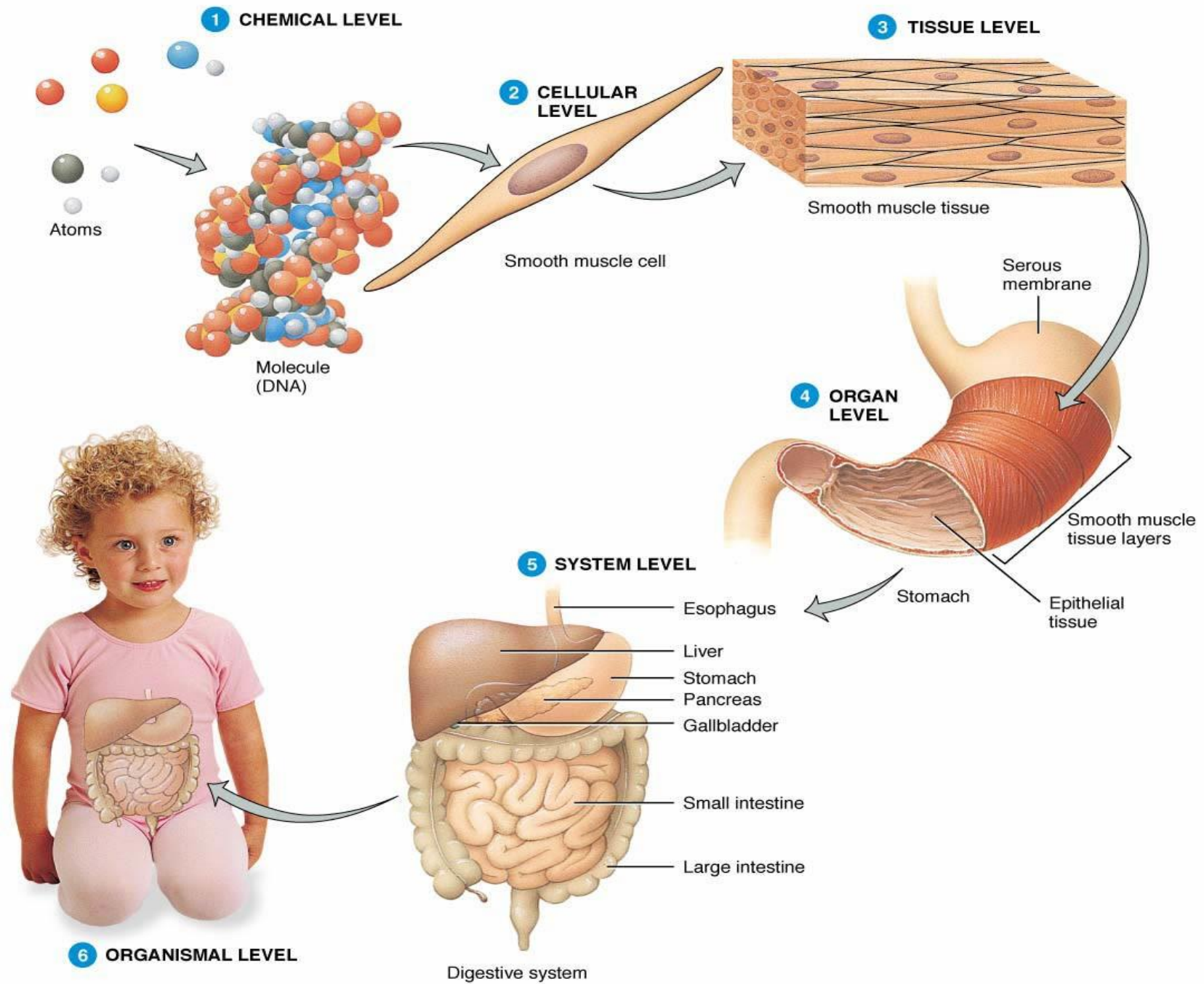
• From atoms to organism



Cells vary in functions, but all cells;

- uses O₂, CHO, fat and proteins to release energy.
- Almost all cells have the ability to reproduce and replace damaged cells.





•Organ System overview

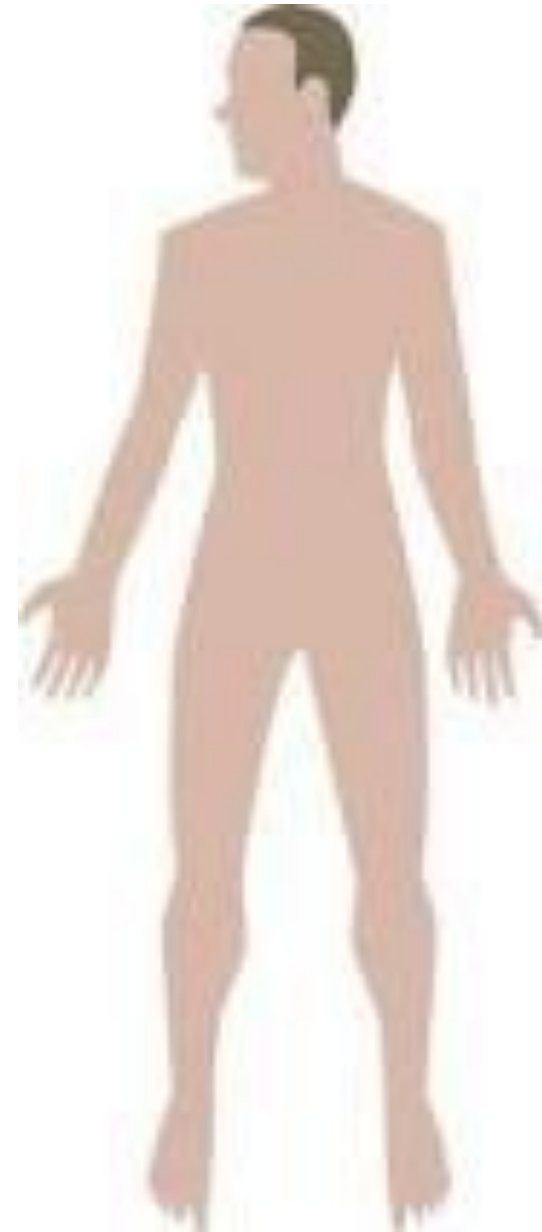
1. Integumentary System:

Organ

–Skin.

Function

- Protects and cushions deeper tissues.
- Excretes salts and urea (perspiration).
- Sensation.
- Regulate body temperature.
- Synthesize vitamin D.



2. Skeletal System:

Organ

-Bones, Cartilages, ligaments, joints.

Function

- Supports and protects body organs.
- Provides a framework the muscles use to cause movement.
- Blood formation (Hematopoiesis).
- Store minerals.



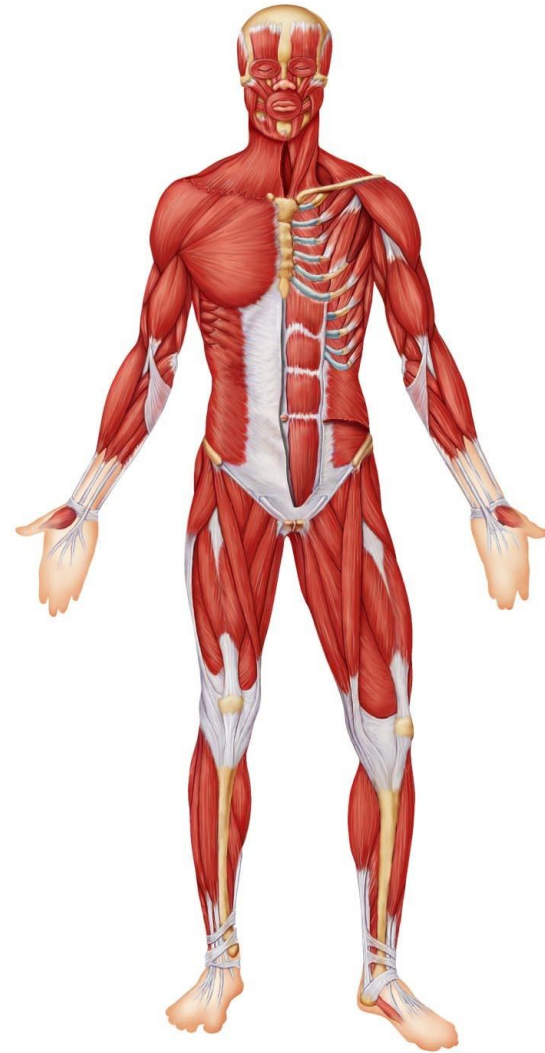
3. Muscular System:

Organ

-Skeletal muscles.

Function

- Only one function (to contract) Causing movement to occur.
- Maintenance of posture.
- Facial expression.
- Production of body heat.



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4. Nervous System:

Organ

-Brain, spinal cord, nerves and sensory receptors.

Function

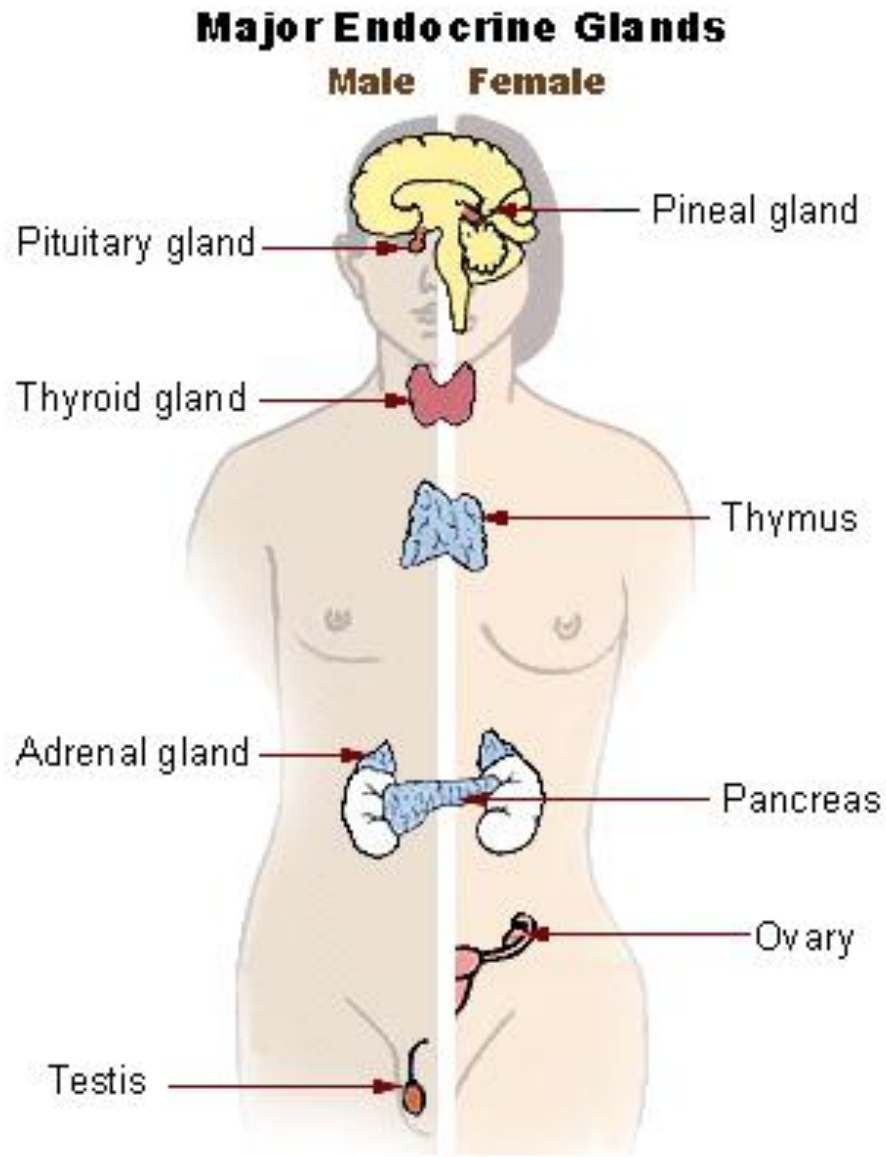
-Fast-acting control system of the body.

using sensory receptors to detect stimulus from the environment> sending signals to the central nervous system> processing the information to determine an appropriate response> sending output signals to muscles or glands to activate the response

- Responsible "higher functions" such as thought and reasoning.



5- The endocrine system



Organ

- Pituitary, thyroid, parathyroid, adrenal, thymus, pancreas, pineal, ovaries, testes.

Function

-Gland produces hormones that regulates :

Growth

Reproduction

Metabolism..ect

-Slower- acting control system

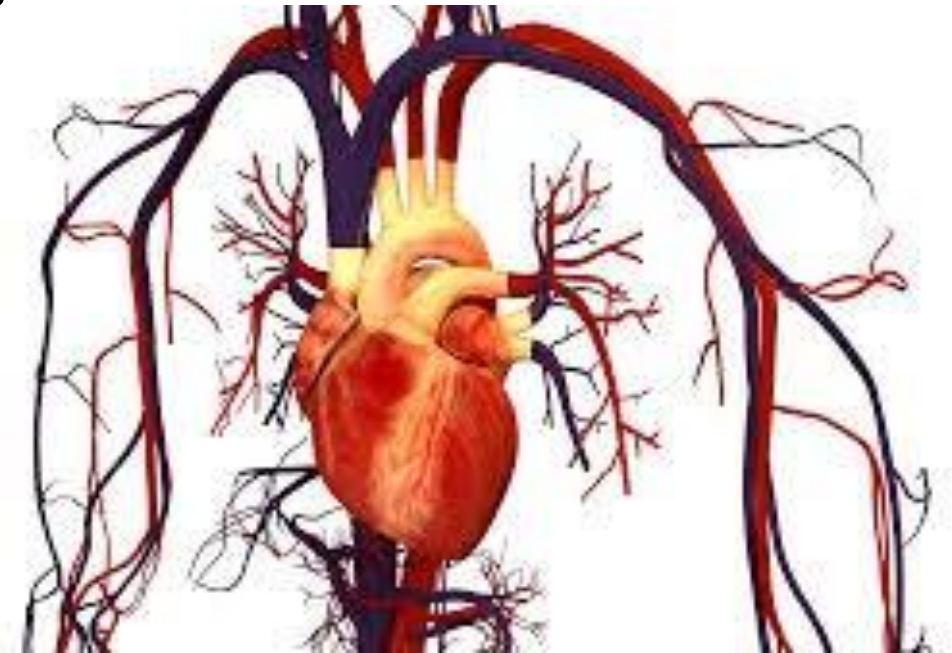
6. Cardiovascular System:

Organs

- Heart and blood vessels.

Functions

- BV: Transportation of materials (O₂, nutrients, hormones etc) to and from the cells using blood.
- Heart: pumps blood.



7. Lymphatic System:

Organ

- Lymphatic vessels, lymph nodes, spleen, tonsils.

Function

- Complements circulatory system by returning leaked fluid (interstitial fluid) back to blood vessels.
- It absorbs and transports fatty acids from the digestive system.
- House cells involved in immunity.



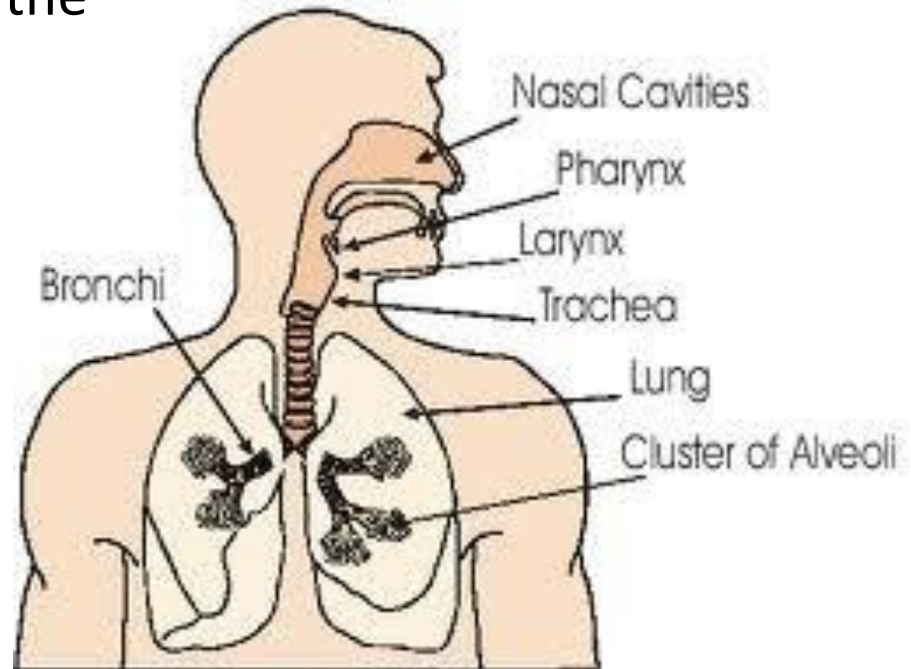
8. Respiratory System:

Organ

- nasal cavity, Pharynx, larynx, trachea, bronchi and lungs.

Function

- Carries out gas exchange through the air sacs of the lungs.
- Keeps blood supplied with O₂
- CO₂ removal.
- source of vocalization.



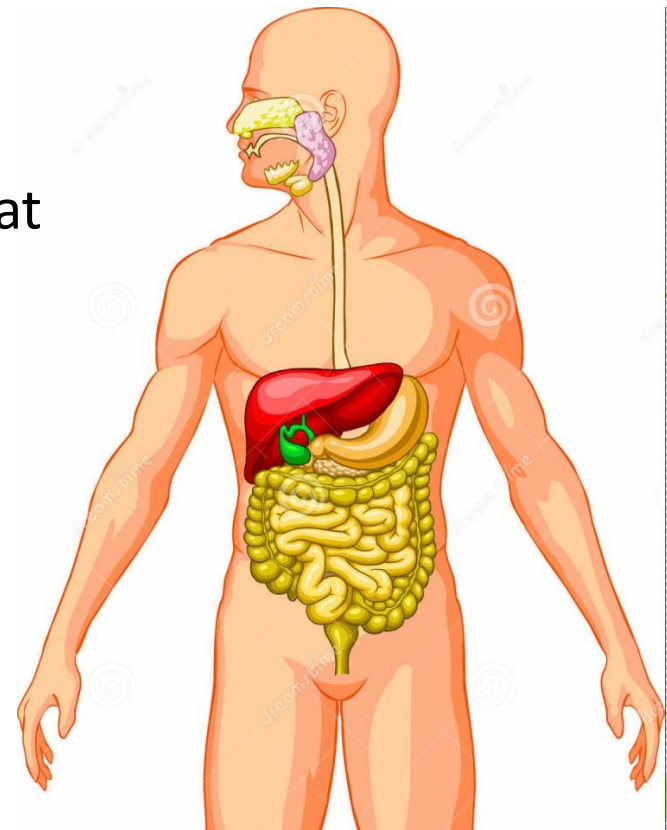
9. Digestive System:

Organ

-Oral cavity, esophagus, stomach, small intestine, large intestine, rectum, anus. (liver, pancreas and salivary glands)

Function

- Break down food into absorbable units that enter the blood.
- Reabsorb water.
- Eliminates undigested food as feces.



10. Urinary System

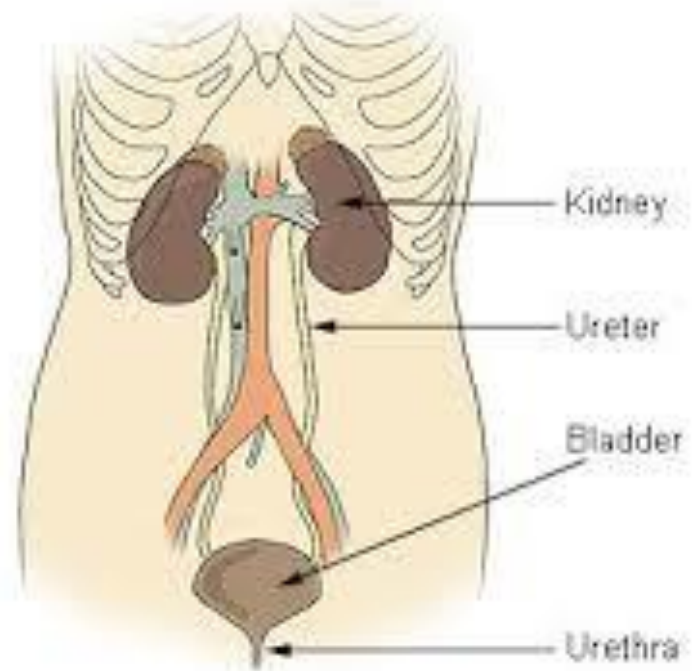
Organ

- kidney, ureter, urinary bladder, urethra.

Function

- Eliminates nitrogenous waste from the body (urea & uric acid).
- maintain water and electrolyte balance.
- Regulate the acid-base balance of the blood.

Components of the Urinary System



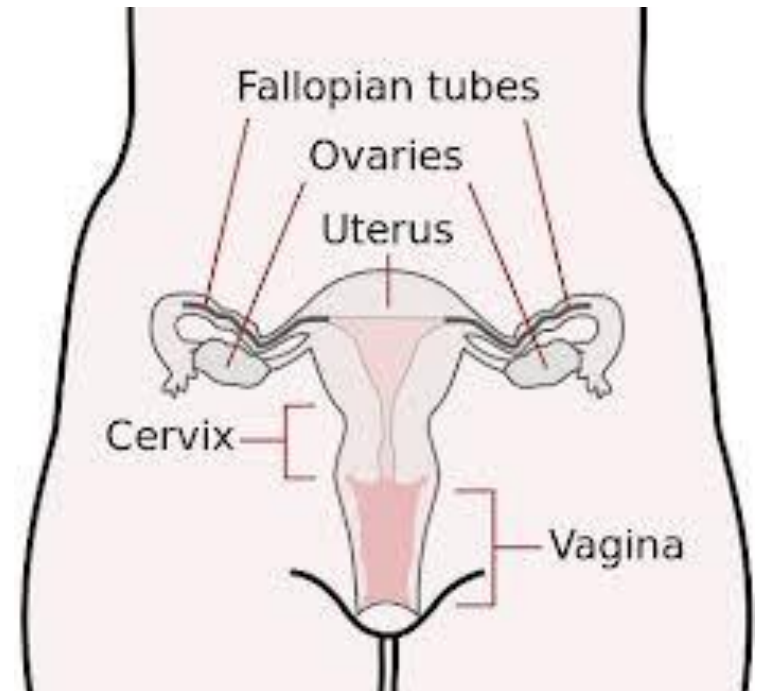
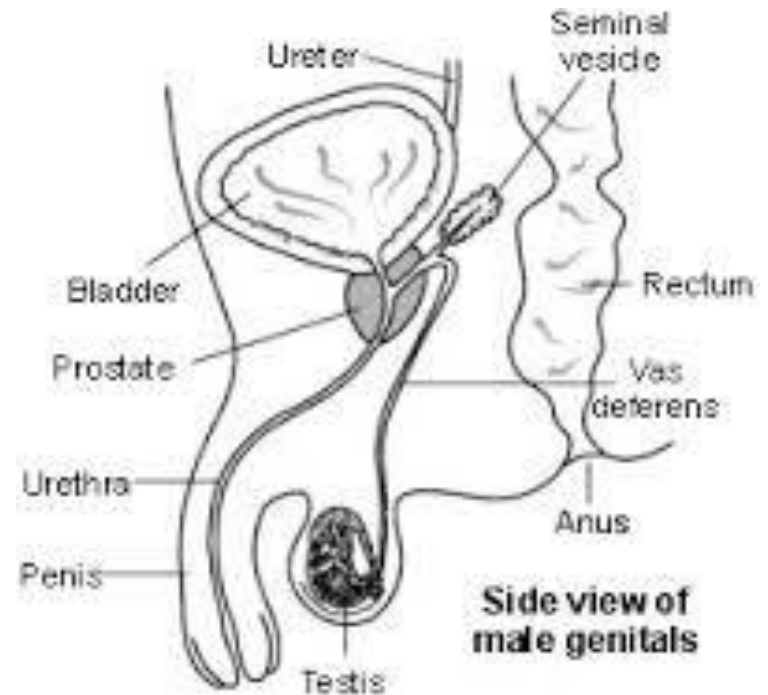
11. Reproductive System:

Organs

- Male: Seminal vesicles, prostate, penis, vas deferens, testes, scrotum.
- Female: ovary, uterus, vagina, fallopian tubes, mammary glands.

Functions

- Primary function for both sexes is to produce offspring,
- Male testes produces sperm and male sex hormones.
- Female ovary produce eggs & female sex hormones. Uterus hosts the fetus.



3. Homeostasis

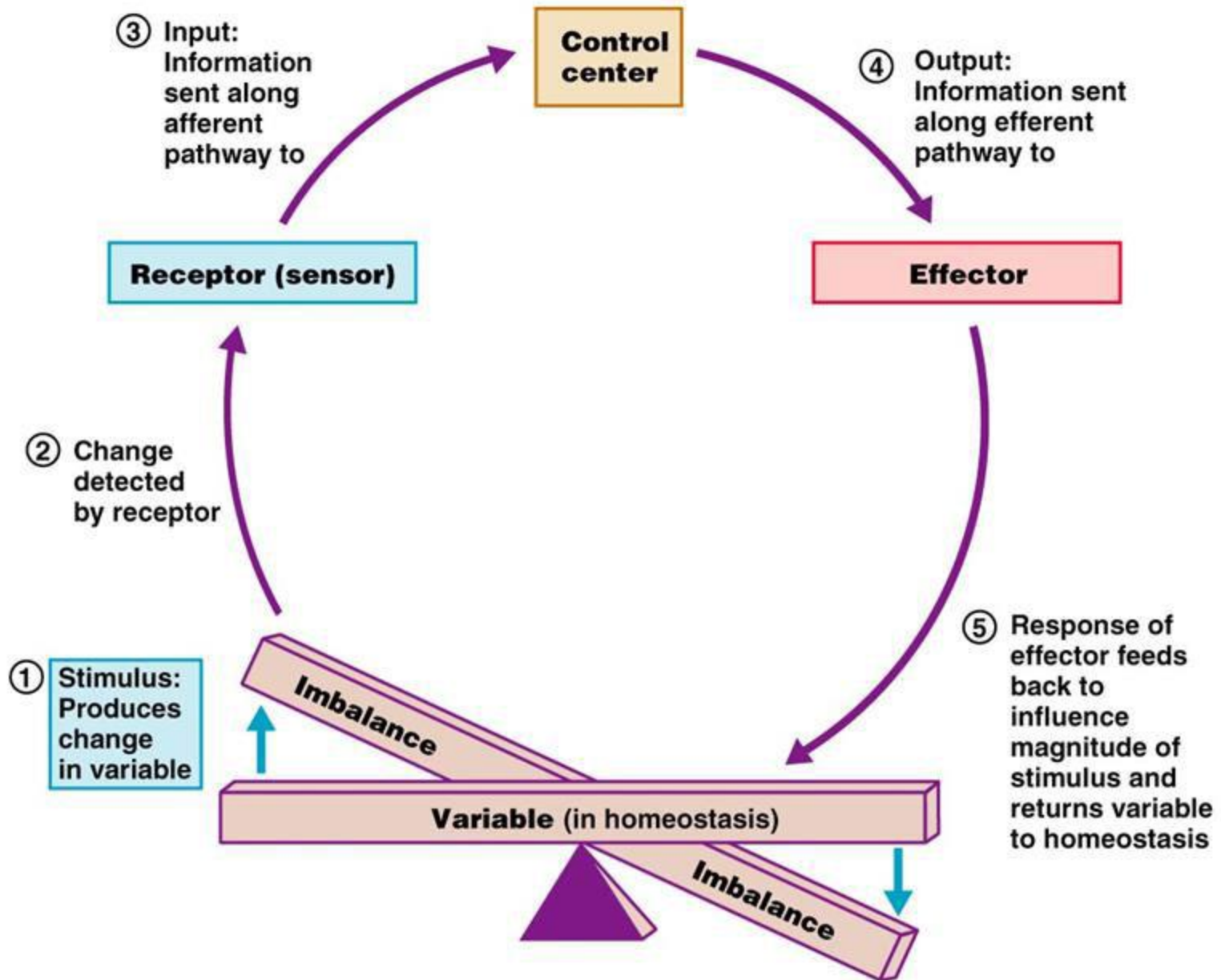
Objectives:

- Define homeostasis, and its importance.
- Define negative\Positive feedback, and describe its role in homeostasis and body function.

Homeostasis

Homeo= the same; stasis= standing still

- Describes multiple mechanisms that maintains the body's stable internal conditions.
- Dynamic state of equilibrium or balance in which internal conditions change and vary but always within internal conditions change and vary but always within relatively narrow limits.
- These mechanisms ensures that the body temperature, waste levels, pH, glucose, water content, O₂ and hormone levels are at stable rate.
- Homeostatic condition is changed by a disruptor or stimulus.
- E.g.
 - When a person runs outside> body heat is generated> temperature rises> balance of internal temperature is disturbed.



Homeostasis

All homeostatic control mechanisms have at least three components:

1- ***receptor***

Sensor that monitors and responds to changes in the environment, they detect any disruption (*stimuli*).

2- ***control center***

System that receives information from the receptors and analyzes information to bring back the static range.

3- ***effector***

provides the means for the control center's response (output) to the stimulus. The results of the response then feed back to influence the stimulus, either by depressing it (negative feedback), so that the whole control mechanism is shut off; or by enhancing it (positive feedback), so that the reaction continues at an even faster rate.

control mechanisms

negative feedback mechanisms,

- Common in the body
- In such systems, the net effect of the response to the stimulus is to shut off the original stimulus or reduce its intensity (response is opposite to the stimulus).
- Effect result in homeostasis.
- E.g.
 - Blood pressure regulation.
 - O₂, Co₂ levels.
 - Heart rate.

Positive feedback mechanisms,

- are rare in the body because they tend to increase the original disturbance (stimulus) and to push the variable farther from its original value.
- effect does not result in homeostasis.
- these mechanisms control are dangerous thus infrequent.
- events that occur explosively and do not require continuous adjustments.
- E.g.
 - Blood clotting and the birth of a baby are the most familiar examples of positive feedback mechanisms.

e.g.

Glucose concentration in the bloodstream

The body uses glucose as a source of energy, but too much or too little glucose in the bloodstream can cause serious complications. The body uses hormones to regulate glucose concentration. Insulin reduces glucose concentration, while cortisol and glucagon increase glucose concentration.

Homeostatic imbalance

An inability to maintain homeostasis, it may lead to disease or death.

- For example, Without iodine, functional hormones can't be made and is our source of our diet. Without it you can develop goiters which is an enlargement of the thyroid gland.
- Another example is diabetes mellitus, a condition that results from either the over-production or, in some cases, the hyper-activity, of the hormone insulin. When no homeostatic imbalance is present, the body is able to regulate its blood sugar levels efficiently.

4.The language of anatomy

Objectives:

- Verbally describe the anatomical Positions.
- Use proper anatomical terminology to describe body directions, surfaces and planes.
- Name the major body cavities and list the chief organs in each cavity.

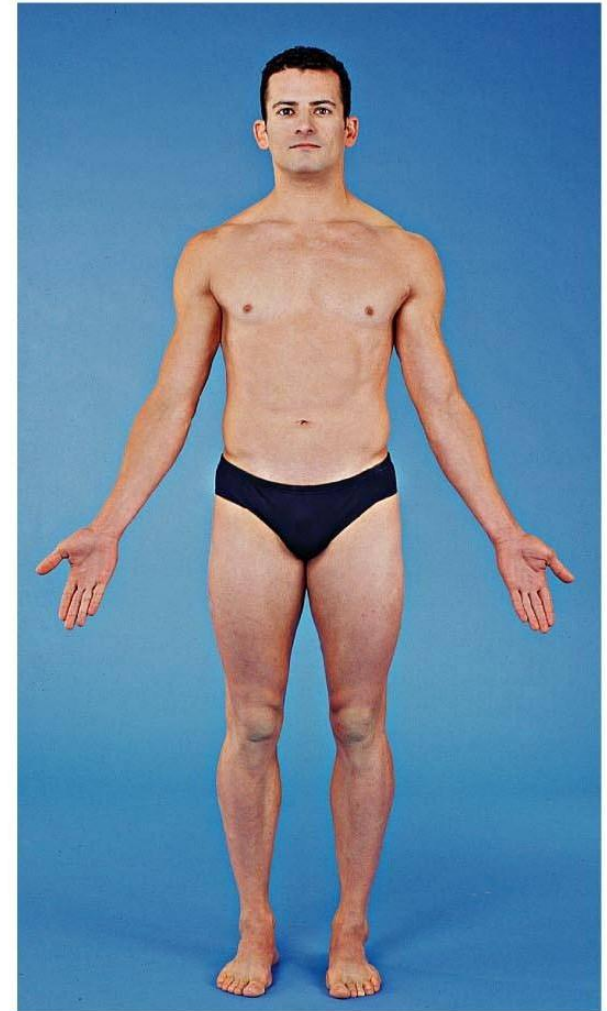
4. The language of anatomy

- **Anatomical position:**

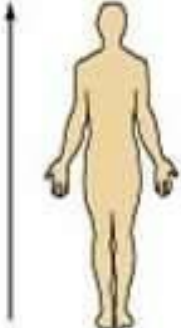
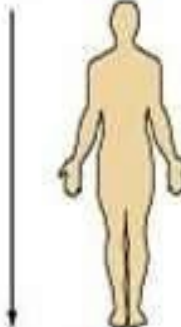
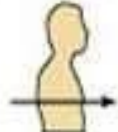
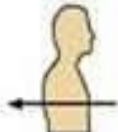
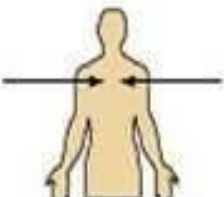
The body is erect,

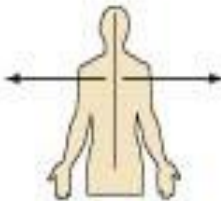
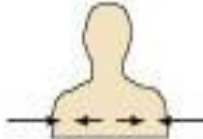


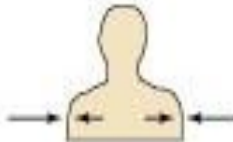
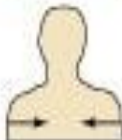
Feet are parallel,

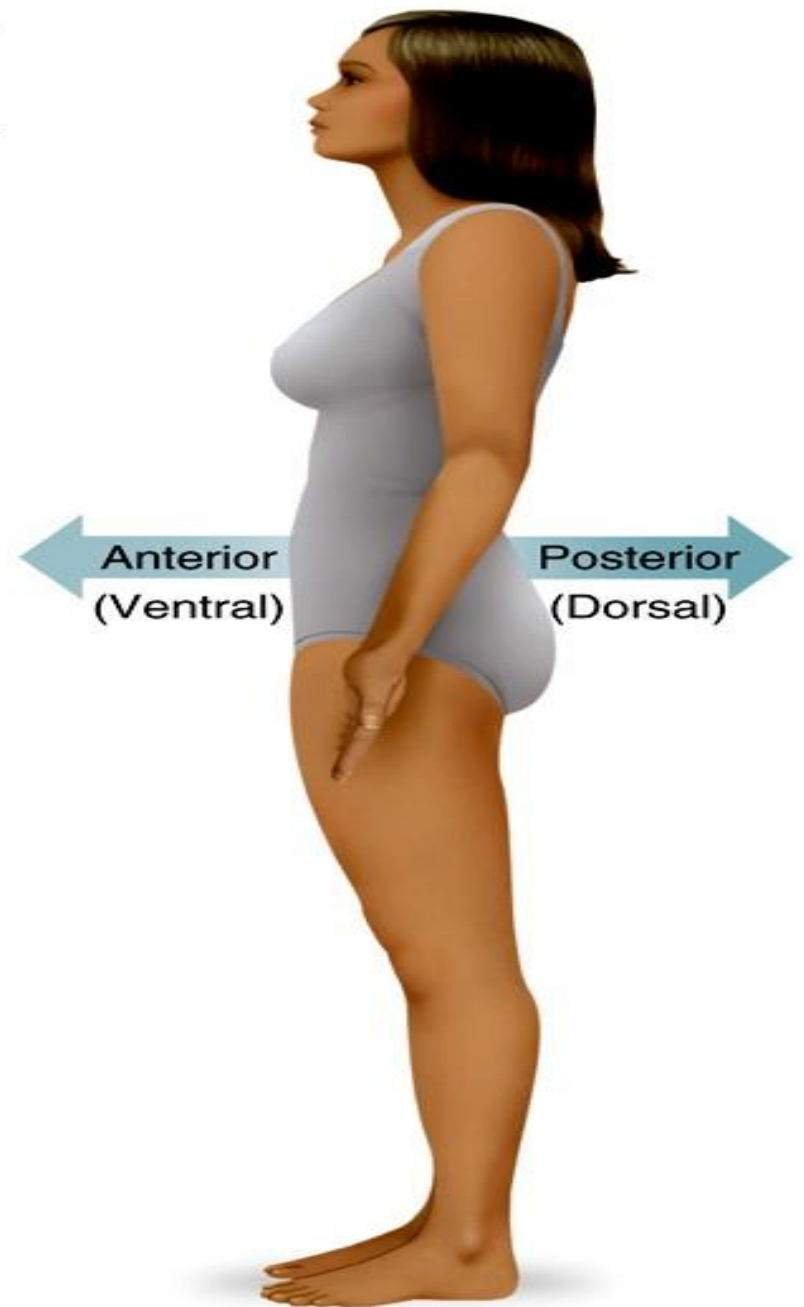
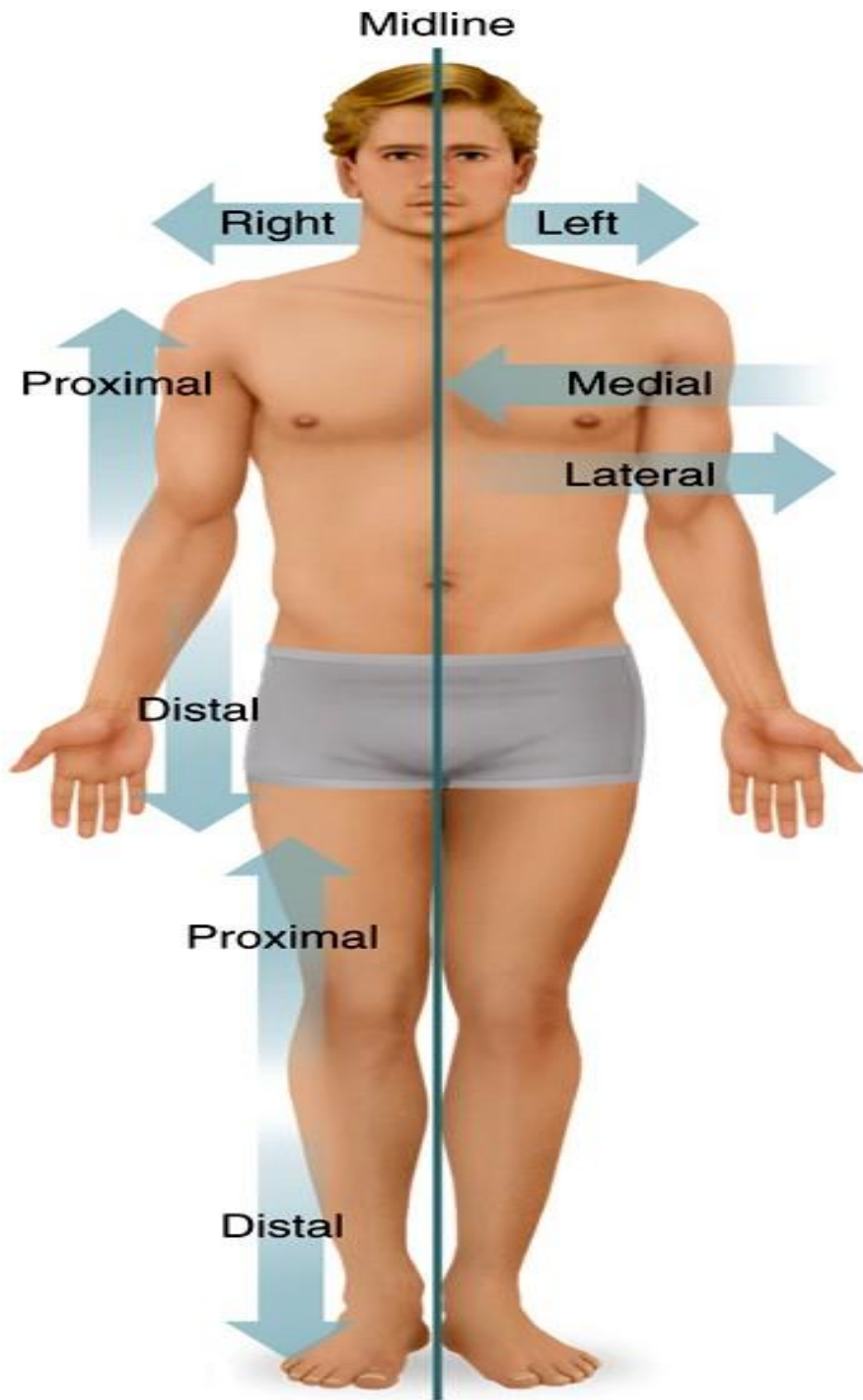
Arms hanging at the sides with palms facing forward.



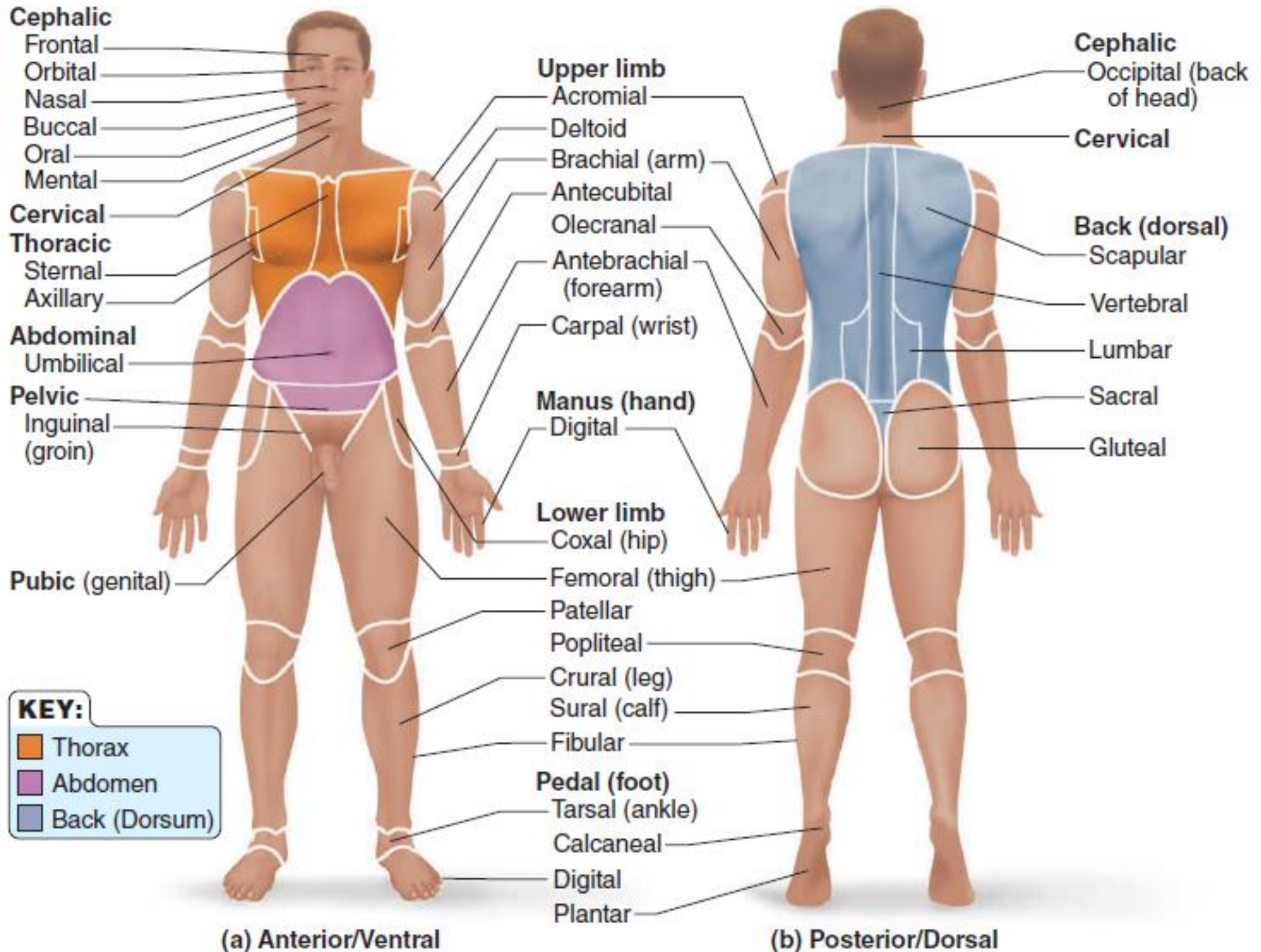
•Directional terms

Term	Definition	Illustration	Example
Superior (cranial or cephalad)	Toward the head end or upper part of a structure or the body; above		The forehead is superior to the nose.
Inferior (caudal)	Away from the head end or toward the lower part of a structure or the body; below		The navel is inferior to the breastbone.
Anterior (ventral)*	Toward or at the front of the body; in front of		The breastbone is anterior to the spine.
Posterior (dorsal)*	Toward or at the backside of the body; behind		The heart is posterior to the breastbone.
Medial	Toward or at the midline of the body; on the inner side of		The heart is medial to the arm.

Term	Definition	Illustration	Example
Lateral	Away from the midline of the body; on the outer side of		The arms are lateral to the chest.
Intermediate	Between a more medial and a more lateral structure		The armpit is intermediate between the breastbone and shoulder.
Proximal	Close to the origin of the body part or the point of attachment of a limb to the body trunk		The elbow is proximal to the wrist (meaning that the elbow is closer to the shoulder or attachment point of the arm than the wrist is).
Distal	Farther from the origin of a body part or the point of attachment of a limb to the body trunk		The knee is distal to the thigh.
Superficial	Toward or at the body surface		The skin is superficial to the skeleton.
Deep	Away from the body surface; more internal		The lungs are deep to the rib cage.



Regional Terms:

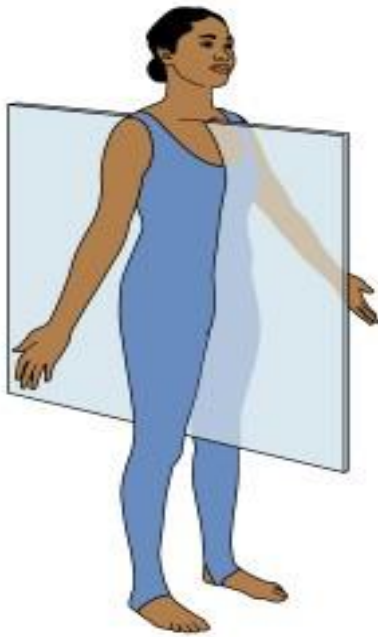


Body planes and sections

Body planes are imaginary lines used to divide the body into sections.

There are three types of planes:

- 1) **Sagittal (midsagittal or, medial)** – divides the body into right and left parts
- 2) **Frontal or coronal** – divides the body into anterior and posterior parts.
- 3) **Transverse or cross section** – divides the body into superior and inferior parts.



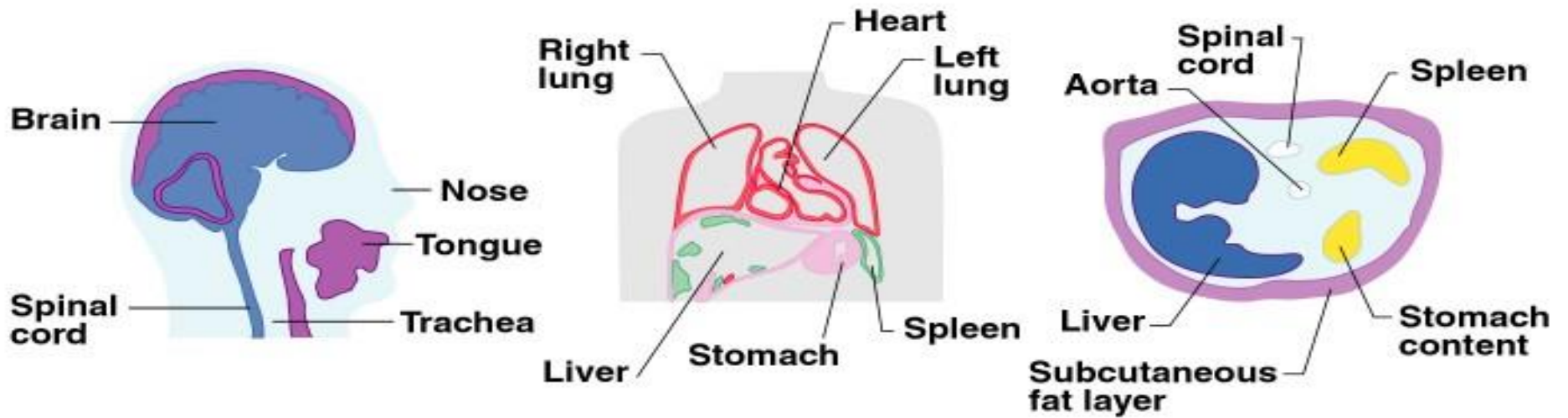
(a) Median (midsagittal)



(b) Frontal (coronal) plane

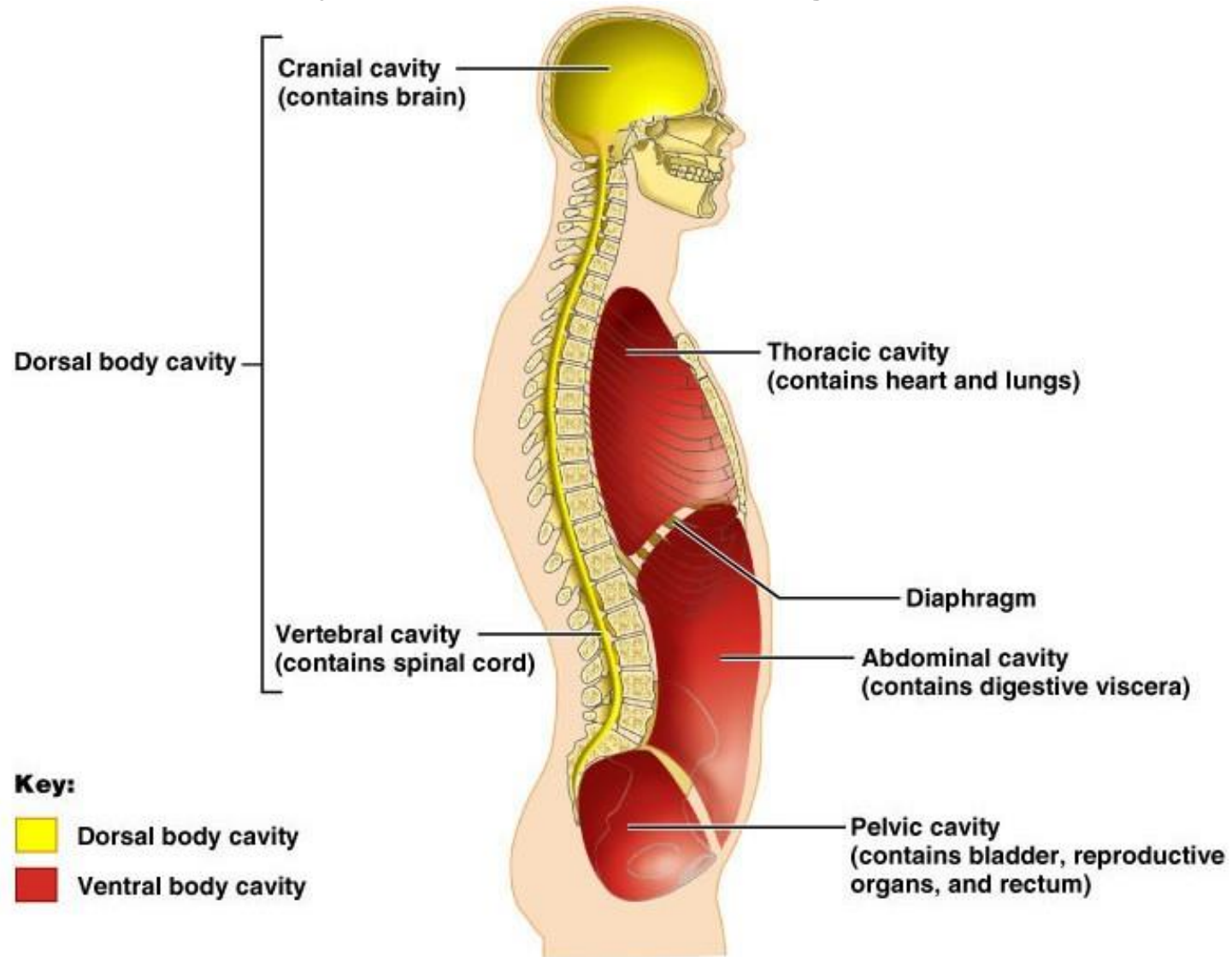


(c) Transverse plane



•Body Cavities:

Spaces within the body which contain vital organs.



(a) Lateral view

❖ **Dorsal cavity** protects the nervous system, and has two subdivisions which are continuous with each other:

1-Cranial cavity: The space within the skull.

2-Spinal cavity: The space that runs within the vertebral column and encases the spinal cord.

❖ **Ventral cavity** houses the visceral organs, and is divided into two subdivisions: -

1-Thoracic cavity: encloses the heart and lungs.

2-Abdominopelvic cavity: It is composed of two subdivisions:

a) Abdominal cavity – contains the stomach, intestines, liver, and other organs.

b) Pelvic cavity – lies within the pelvis and contains the bladder, reproductive organs, and rectum.

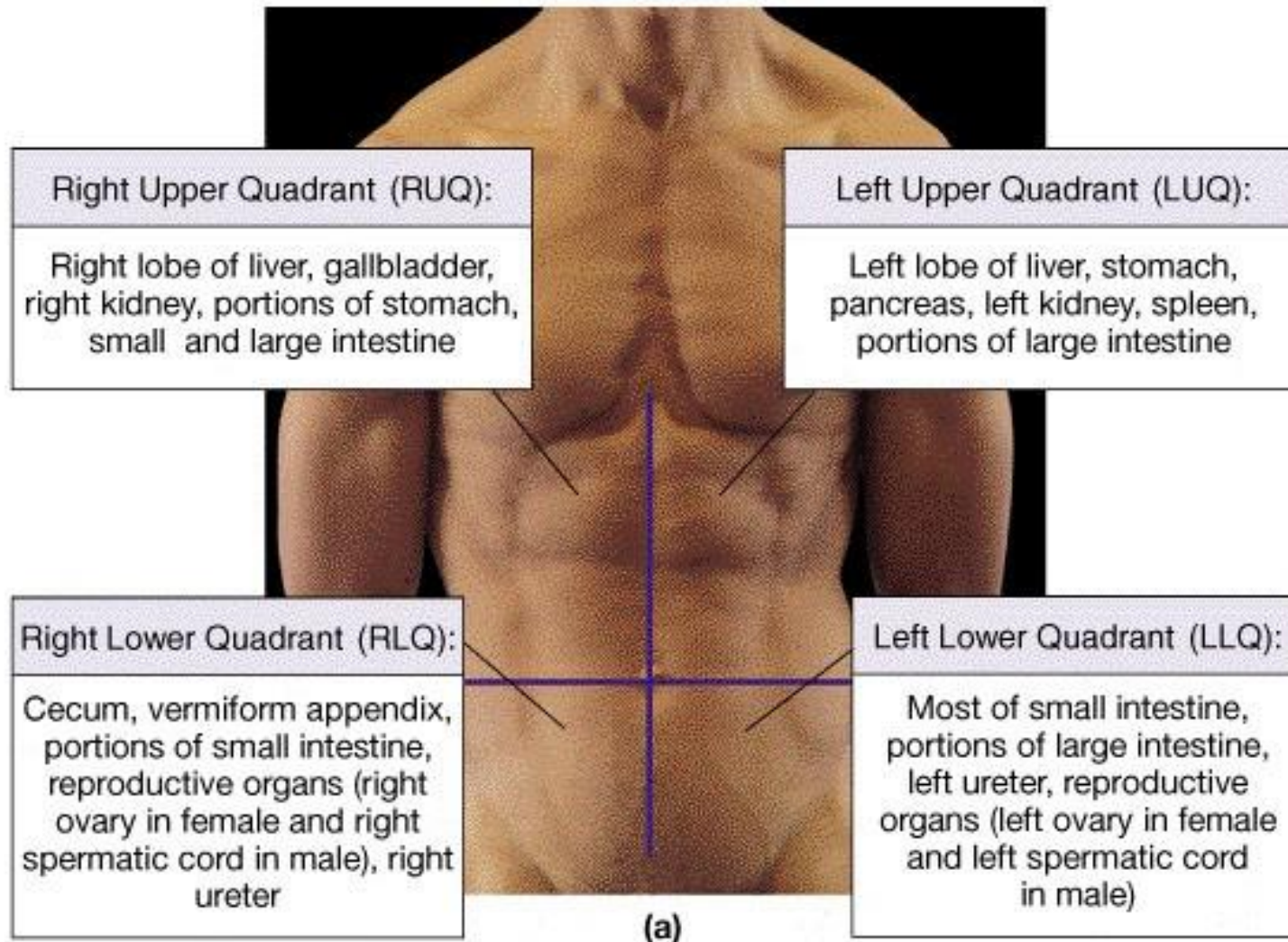
abdominopelvic cavity is separated from the superior thoracic cavity by the dome-shaped diaphragm.

Abdominopelvic Regions and Quadrants

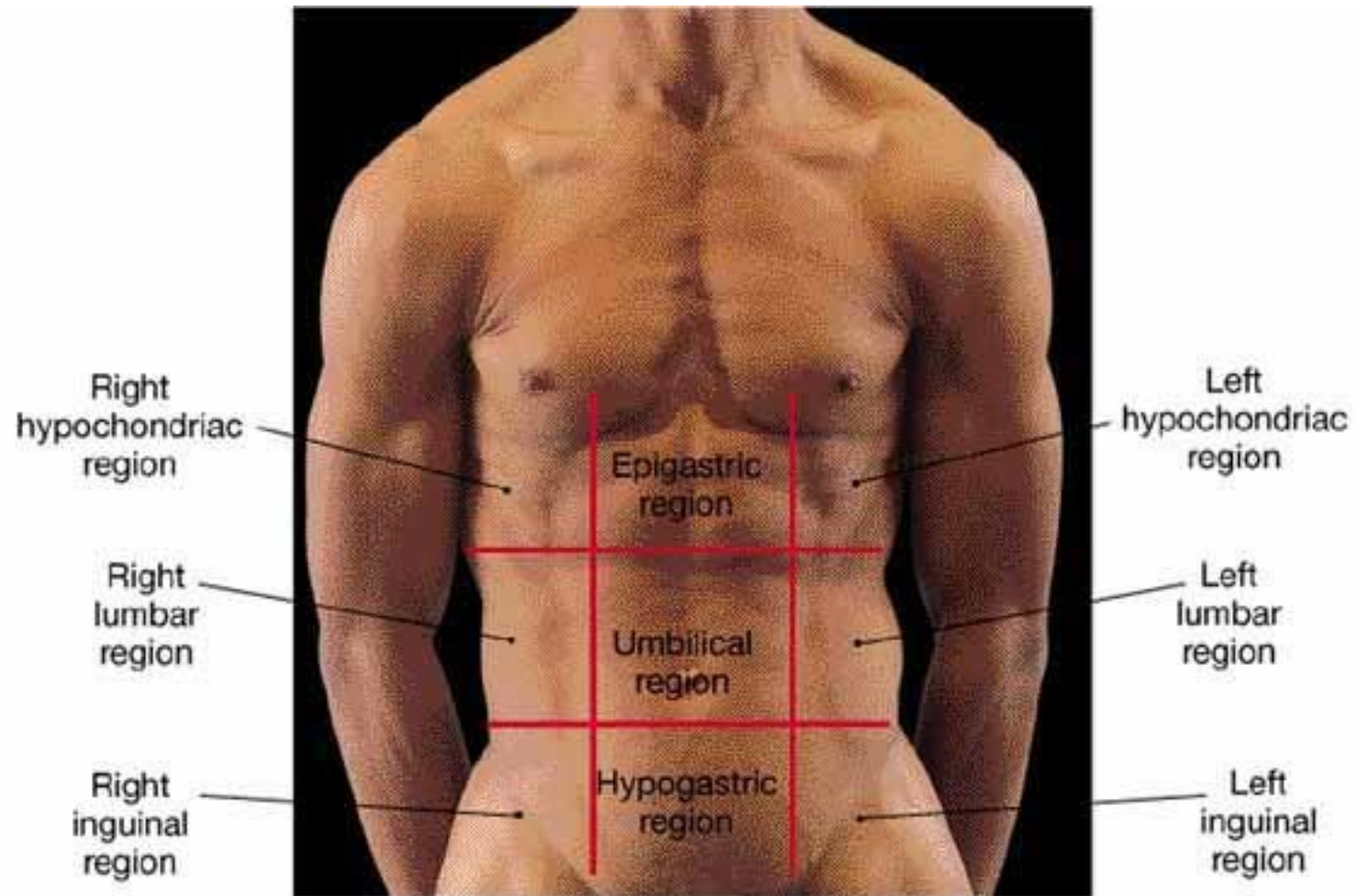
Anatomists divide the body cavity into smaller regions

- **Abdominopelvic quadrants** – divides abdomen into four quadrants.
- **Abdominopelvic regions** – divides abdomen into nine regions.

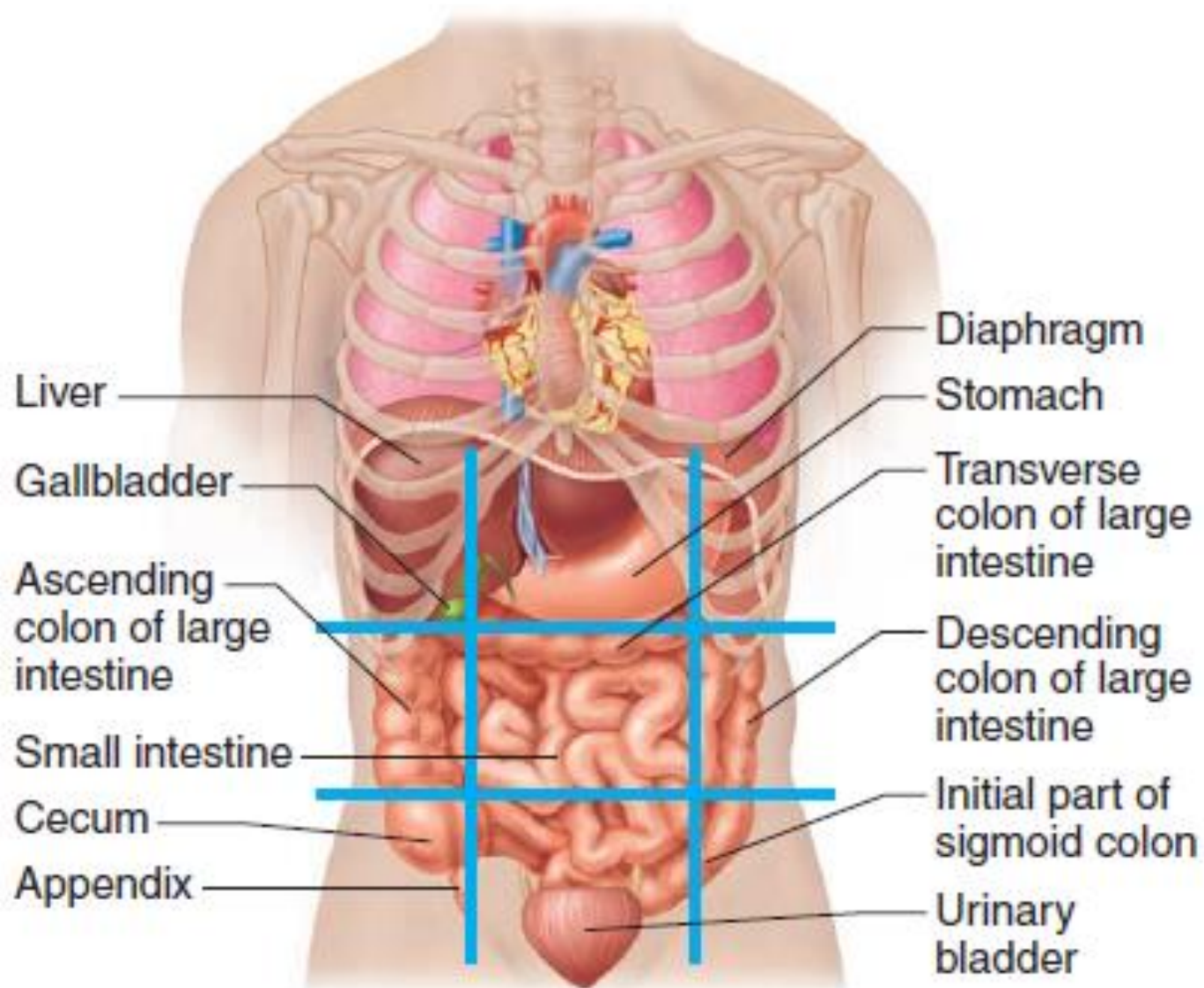
Abdominopelvic Quadrants



Abdominopelvic Regions



(b)



Other Body Cavities

In addition to the large closed body cavities, there are several smaller ones mostly in the head region

Oral and digestive cavities

The oral cavity, commonly called the mouth, contains the teeth and tongue. This cavity is part of and continuous with the cavity of the digestive organs, which opens to the exterior at the anus.

Nasal cavity

Located within and posterior to the nose, the nasal cavity is part of the respiratory system passageways.

Orbital cavities

The orbital cavities (orbits) in the skull house the eyes and present them in an anterior position.

Middle ear cavities

The middle ear cavities carved into the skull lie just medial to the eardrums.

These cavities contain tiny bones that transmit sound vibrations to the hearing receptors in the inner ears.

Medical terms

Roots

- Cardi/o = heart
- Gastr/o = stomach
- Hepat/o = liver
- Hemat/o = blood
- Dermat/o = skin
- aden/o = gland
- bucc/o = cheek

Suffix

- -logy = study of
- -logist = specialist
- -gram = record
- -ac = related to
- -itis = inflammation
- -ectomy: Removal of an anatomical structure.

- -tomy = to cut into
- -itis: Inflammation.
- -algia: Pain
- -megaly: Enlarged
- -pathy = Disease
- -osis = Condition

Prefix

- Brady = slow
- Tachy = fast
- Endo = within
- Epi = above
- hyper- = excessive
- hypo- = deficient

Word Analysis

CARDIOLOGY

- CARDI/O/LOGY
 - Study of the heart

- Splenomegaly

CARDIOLOGIST

- CARDI/O/LOGIST
 - Specialist in the heart

- Gastritis

HEMATOLOGIST

- HEMAT/O/LOGIST
 - Specialist in blood

Word Analysis

- E.g.

- TACHYCARDIA

- prefix

- Tachy = fast

- Root

- Cardi/o = heart

- Suffix

- -ia = condition / disease

Common definitions

- Pathology: The science of the causes and effects of diseases.
- Diagnosis: The identification of an illness by examining the symptoms.
- Prognosis: The forecast of the probable outcome or course of a disease.
- Acute: sudden.
- Chronic: gradual.
- Idiopathic: without a known cause.
- Infection: illness usually caused by a microorganism.
- Pathogen: organism that causes a disease.
- Asymptomatic: Without symptoms.
- Benign: A condition or abnormal growth that is treatable and not life-threatening. Opposite of malignant.
- Biopsy: removal of a portion of tissue for further examination for diagnostic purposes.

Colors

- Leuk/o
- Melan/o
- Erythr/o
- Cyan/o
- Chlor/o
- Xanth/o



- ☐ White
- ☐ Black (dark pigment)
- ☐ Red
- ☐ Blue
- ☐ Green
- ☐ Yellow

e.g.: Erythr/o/derma

Independent reading

Maintaining life (life functions & survival needs).....pages 7,8 and 9