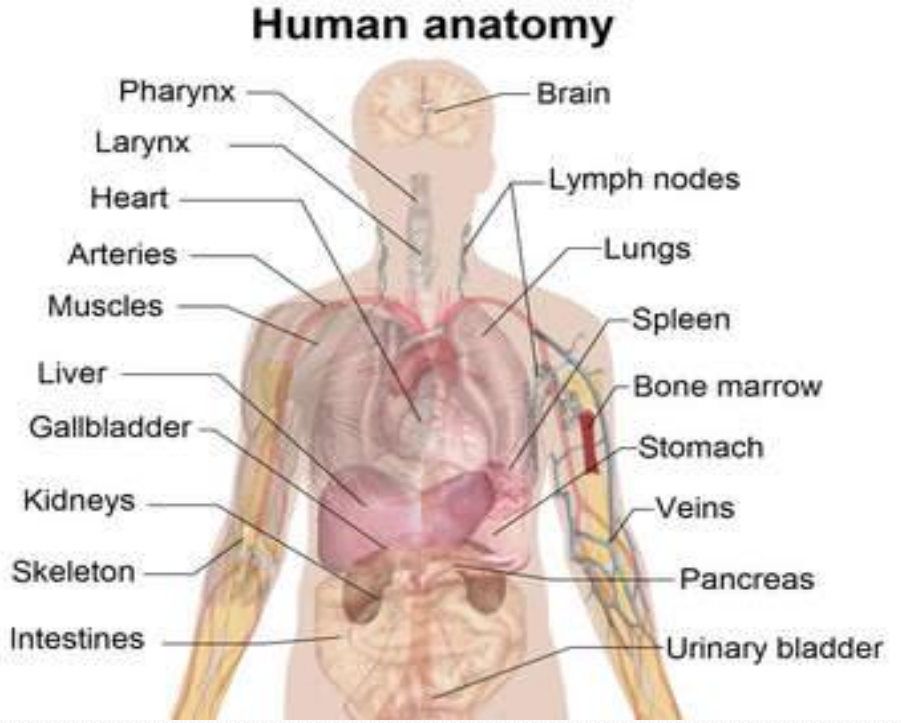
Introduction to Human Anatomy & Physiology

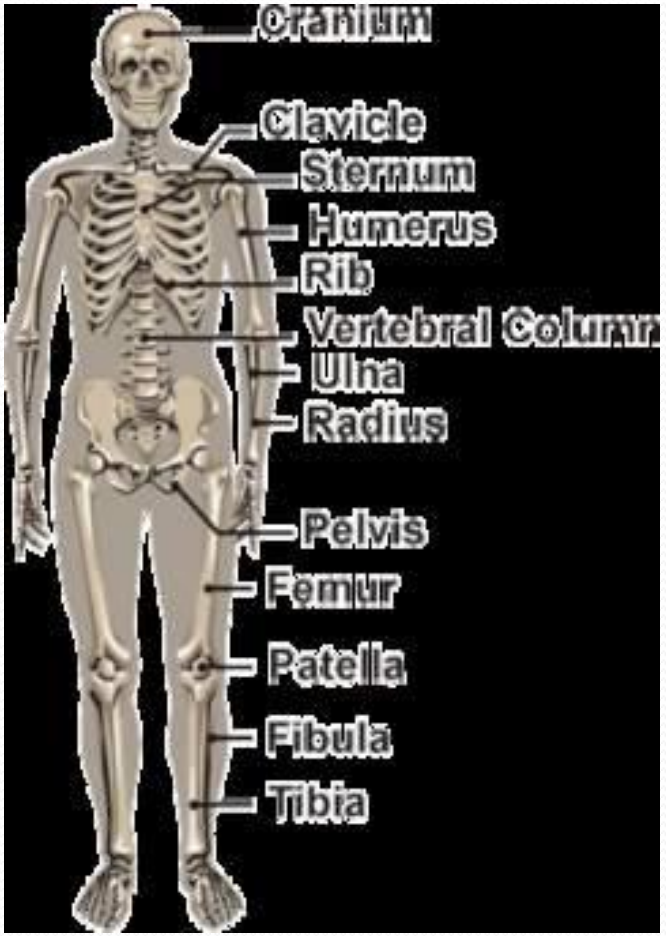
BPH, First semester

Pokhara University

Introduction

- **Anatomy** is the branch of biology concerned with the study of the structure of organisms and their parts. It is concerned with the shape, size, position, structure, blood supply and innervation of different organs.



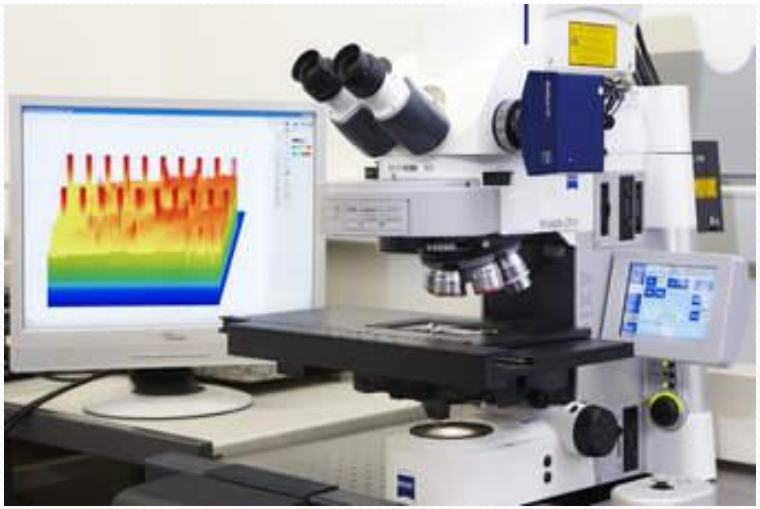


Intro….

- Anatomy is divided into : macroscopic /gross anatomy: the examination of an animal's body parts using unaided eyesight (naked eye)

  microscopic anatomy: involves the use of optical instruments (microscope) in the study of the tissues of various structures, known as histology and also in the study of cells.

- Studied through dissection of cadavers and medical imaging technique like X-ray, USG (video x-ray), CT scan, MRI.



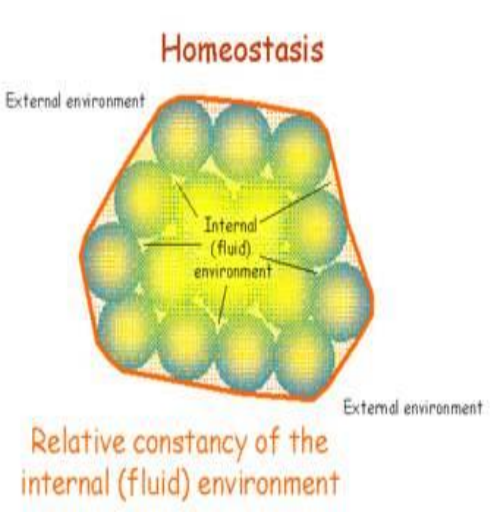
Intro….

- **Physiology** is the branch of biology that deals with the scientific study of the normal function in living organism.
- Divided into various sub branches like: animal physiology (including that of humans), plant physiology, cellular physiology, microbial physiology, bacterial physiology, and viral physiology.
- In medicine, a **physiologic** state is one occurring at normal body function.
- Physiologic state is different at different stage such as childhood, youth, old age, pregnancy, lactation, during rest & exercise, different environmental temperature, pressure.

Why to study Anatomy and physiology?

As a basis of medicine:

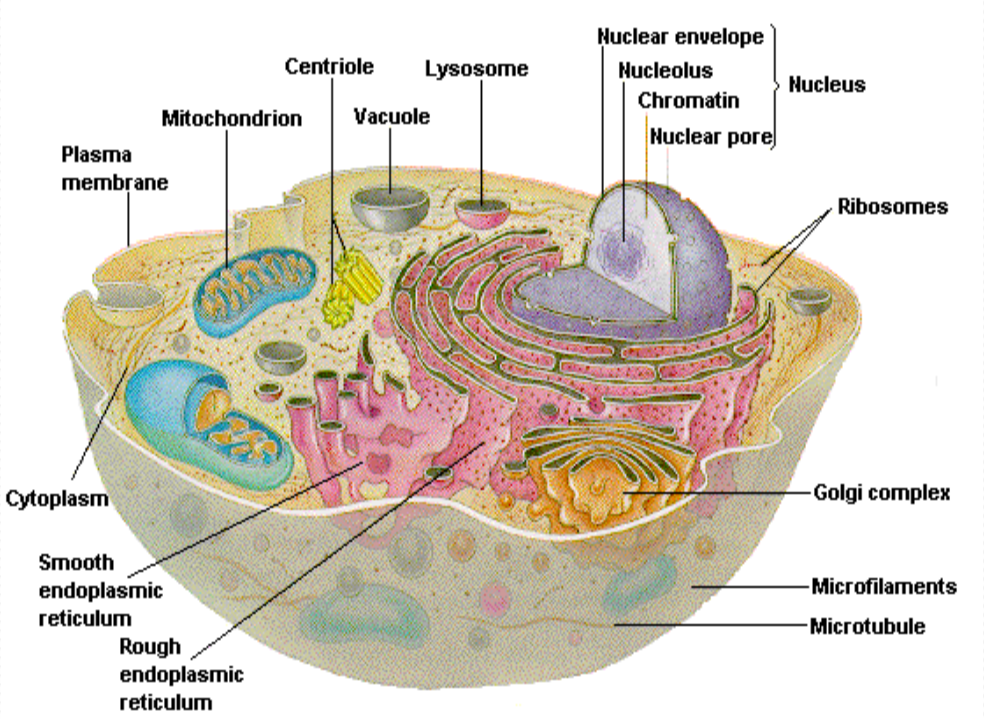
Trillions of cells bathed by a fluid (internal or immediate environment) of right composition at appropriate pH, temperature and osmolarity.

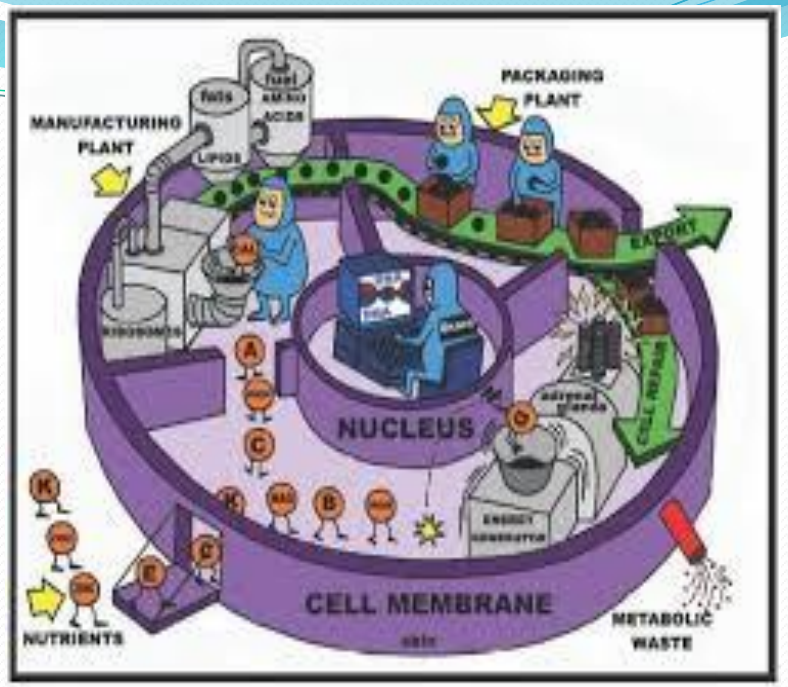


- Coordinated and cooperative activity of all parts of body to maintain the relative constancy of internal environment is called Homeostasis (Homoios: similar, Stasis: position).

- Threat to homeostasis is the **disease**, hence health care workers like nurses, doctors, laboratory/ radiology technologists, pharmacist should have the knowledge of homeostatic mechanism through reading with Anatomy and physiology.

Cell


Nuclear envelope
Nucleolus
Chromatin
Nuclear pore
Nucleus
Centriole
Lysosome
Mitochondrion
Vacuole
Plasma membrane
Ribosomes
Cytoplasm
Golgi complex
Smooth endoplasmic reticulum
Microfilaments
Microtubule
Rough endoplasmic reticulum


MANUFACTURING PLANT
PACKAGING PLANT
NUCLEUS
CELL MEMBRANE
NUTRIENTS
METABOLIC WASTE

- The human body has 50 to 100 trillion of these tiny building blocks

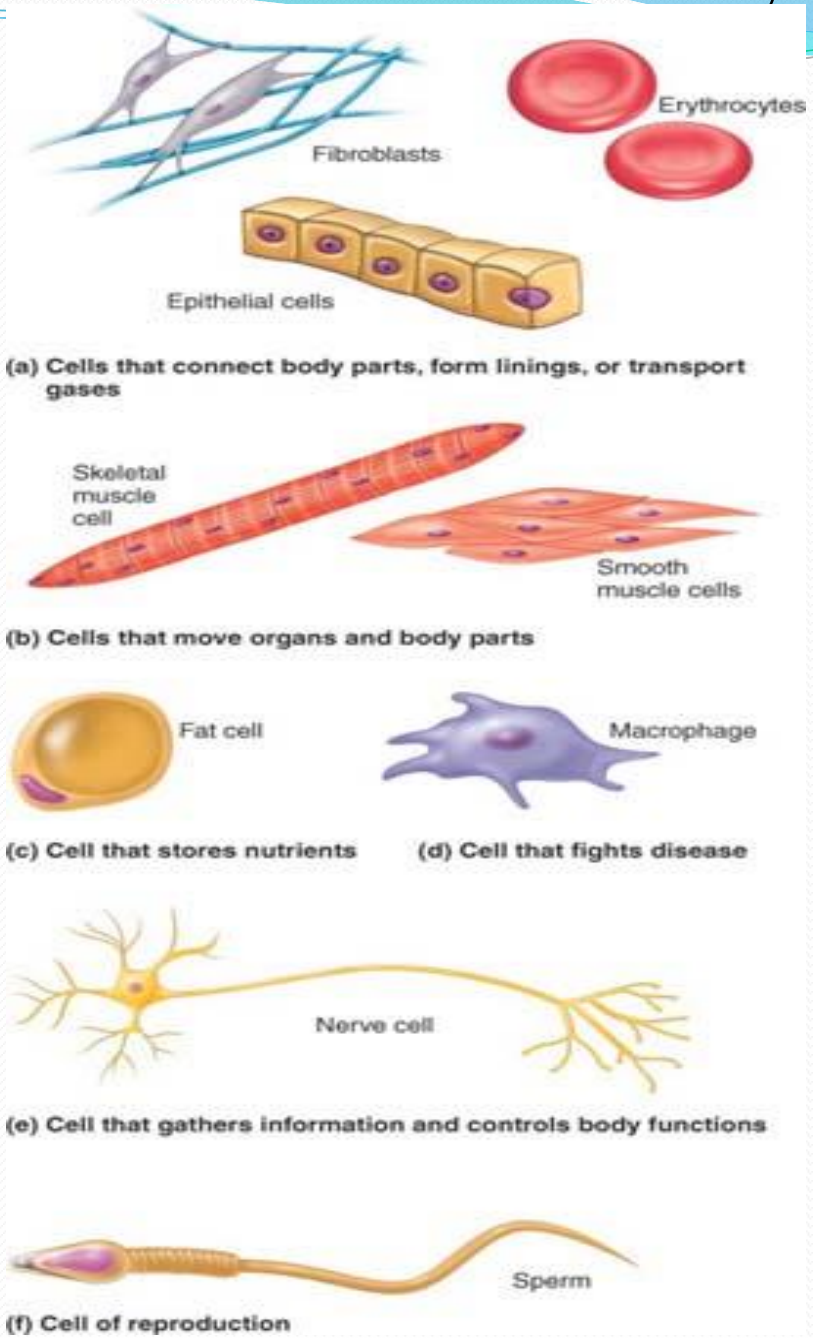
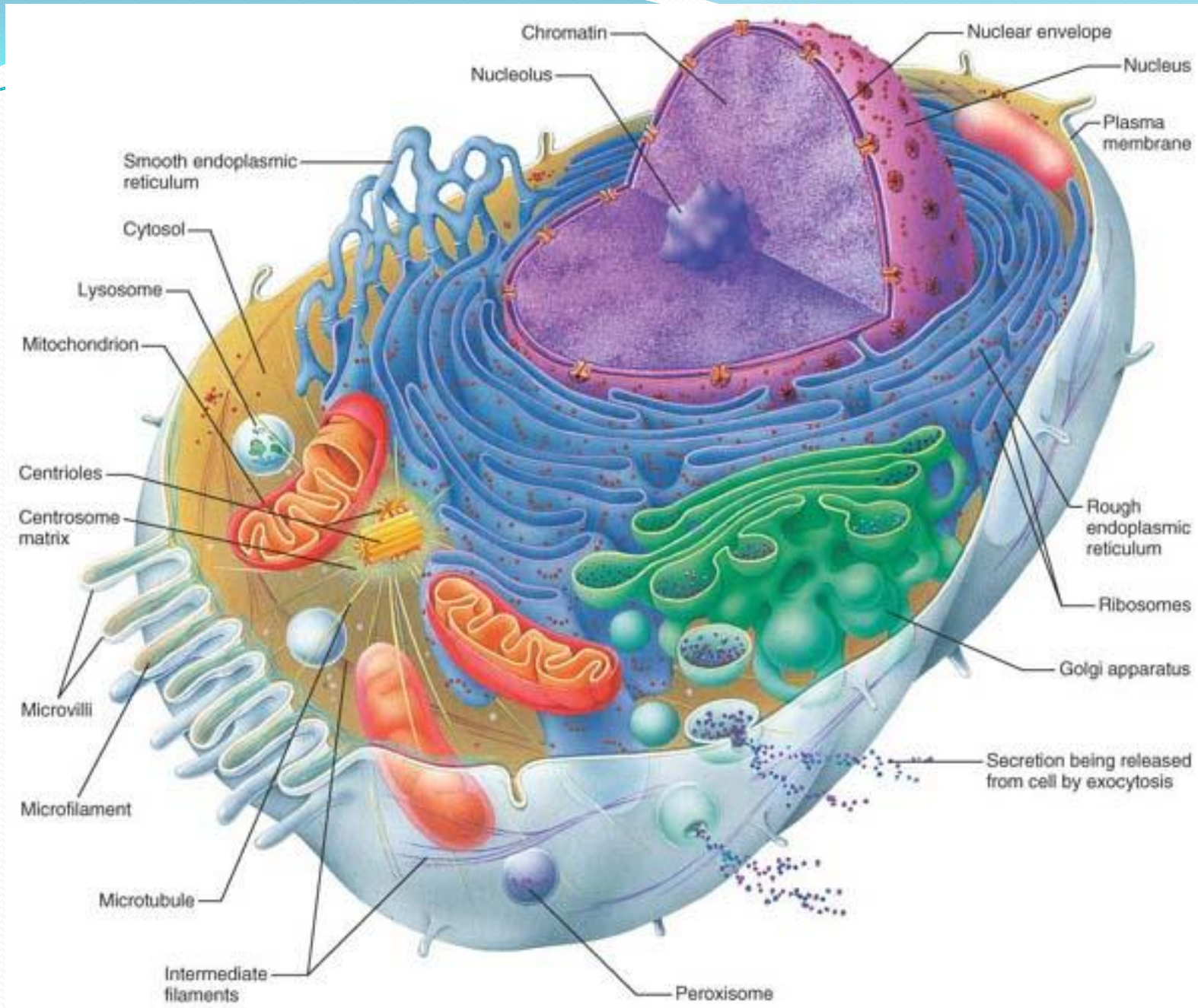
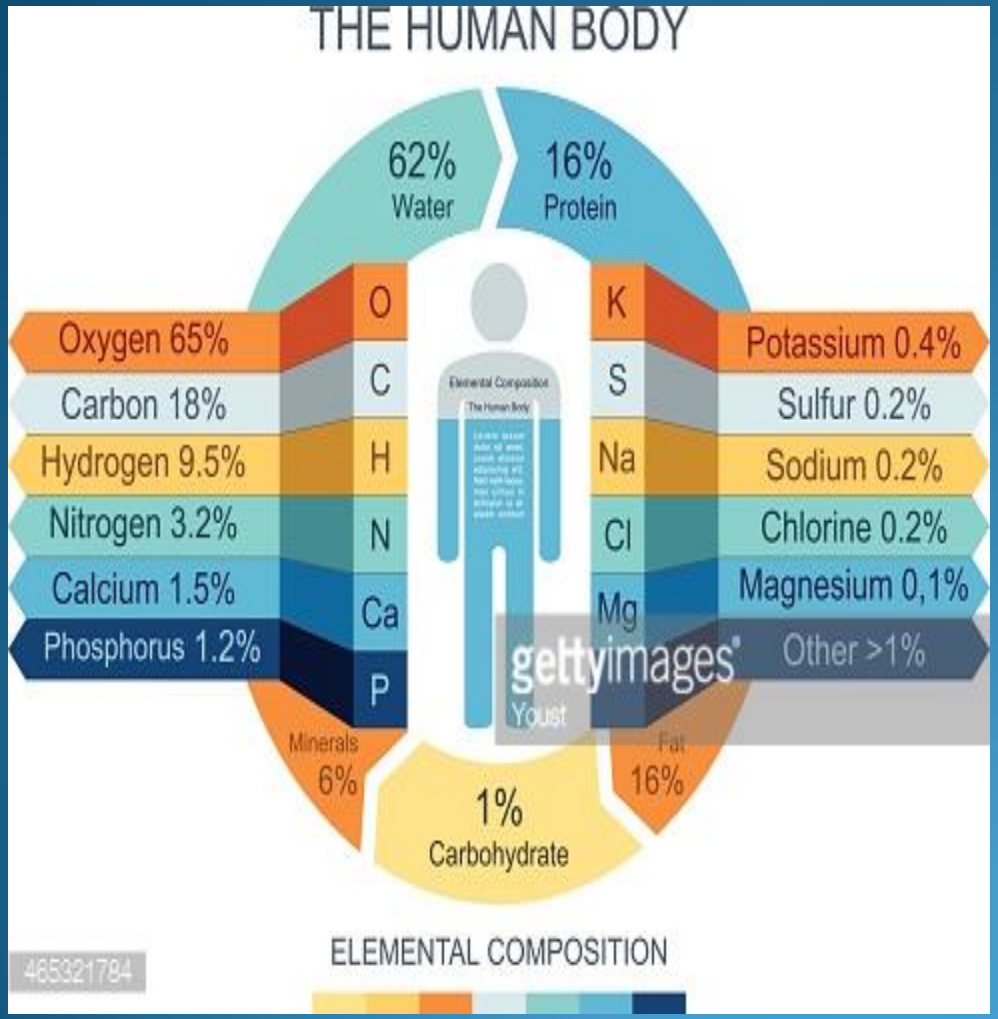
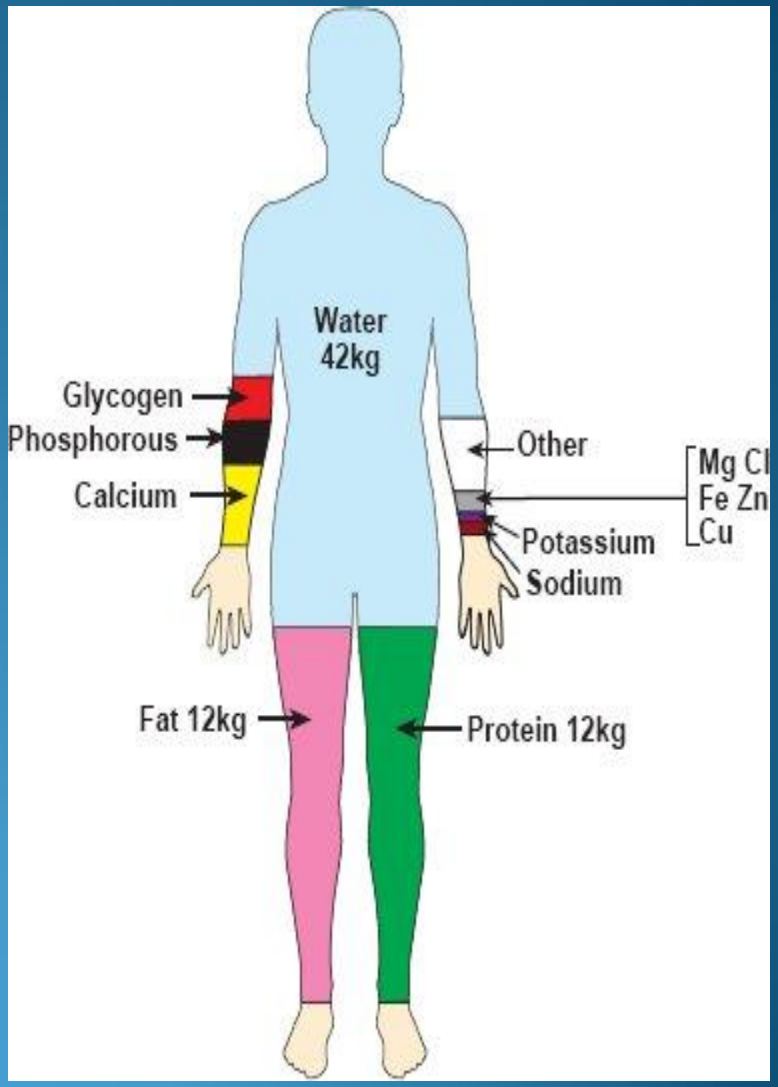


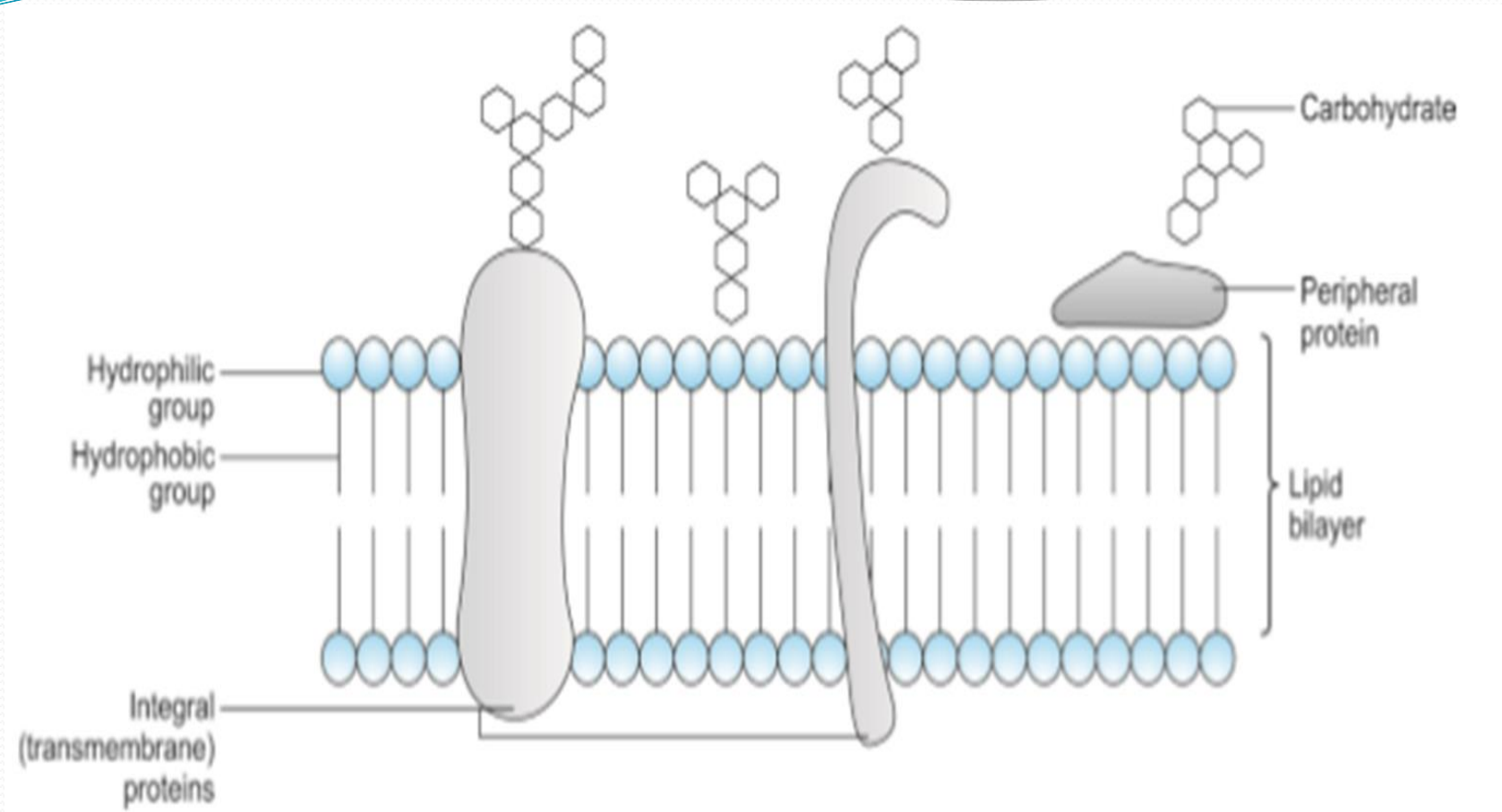
Fig. Cell diversity


Chromatin
Nuclear envelope
Nucleolus
Nucleus
Plasma membrane
Smooth endoplasmic reticulum
Cytosol
Lysosome
Mitochondrion
Centrioles
Centrosome matrix
Rough endoplasmic reticulum
Ribosomes
Golgi apparatus
Microvilli
Secretion being released from cell by exocytosis
Microfilament
Microtubule
Intermediate filaments
Peroxisome

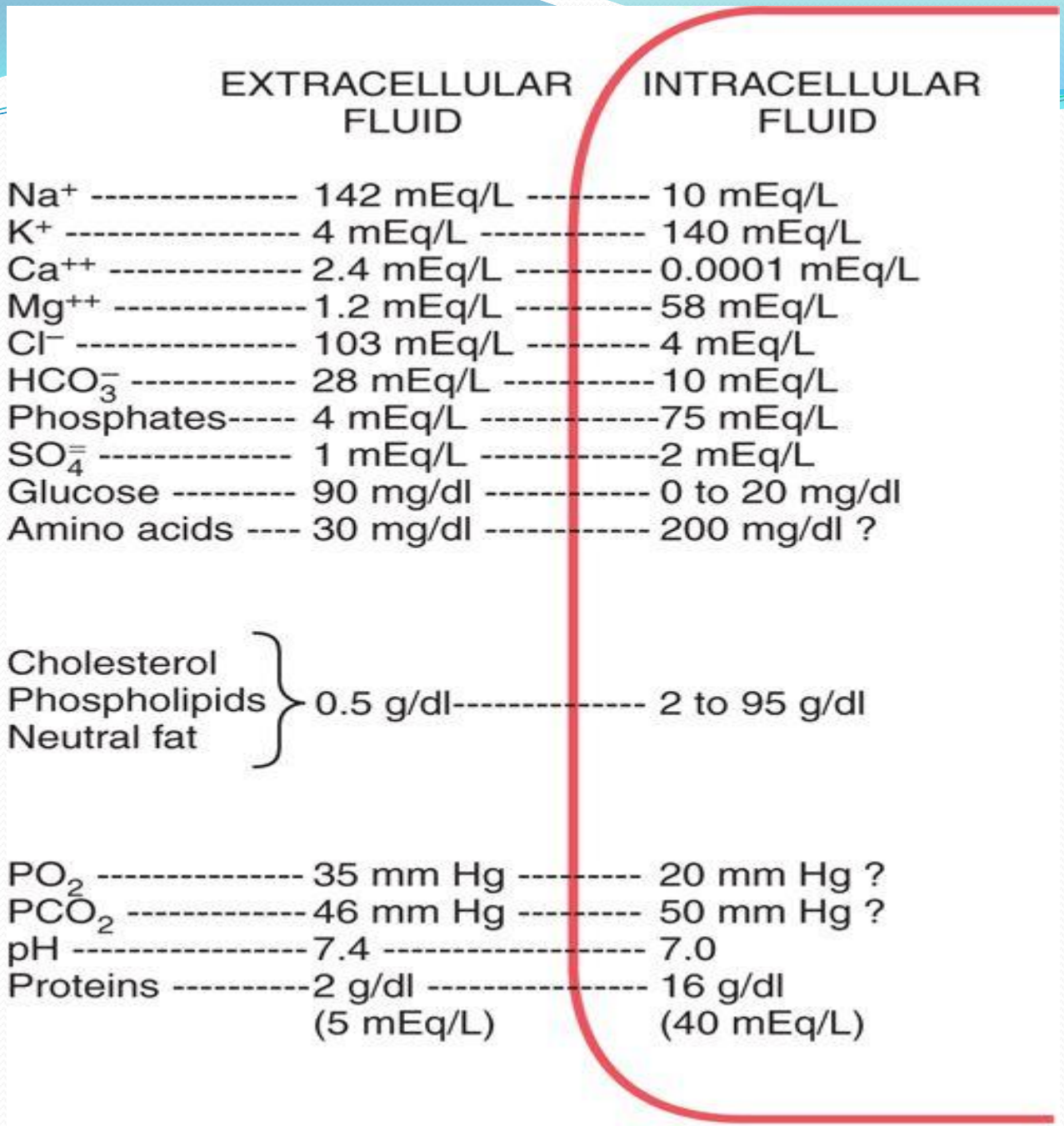
Constituents of cell







2: Diagrammatic representation of the fluid mosaic model of the cell membrane. Note the lipid bilayer, the integral proteins



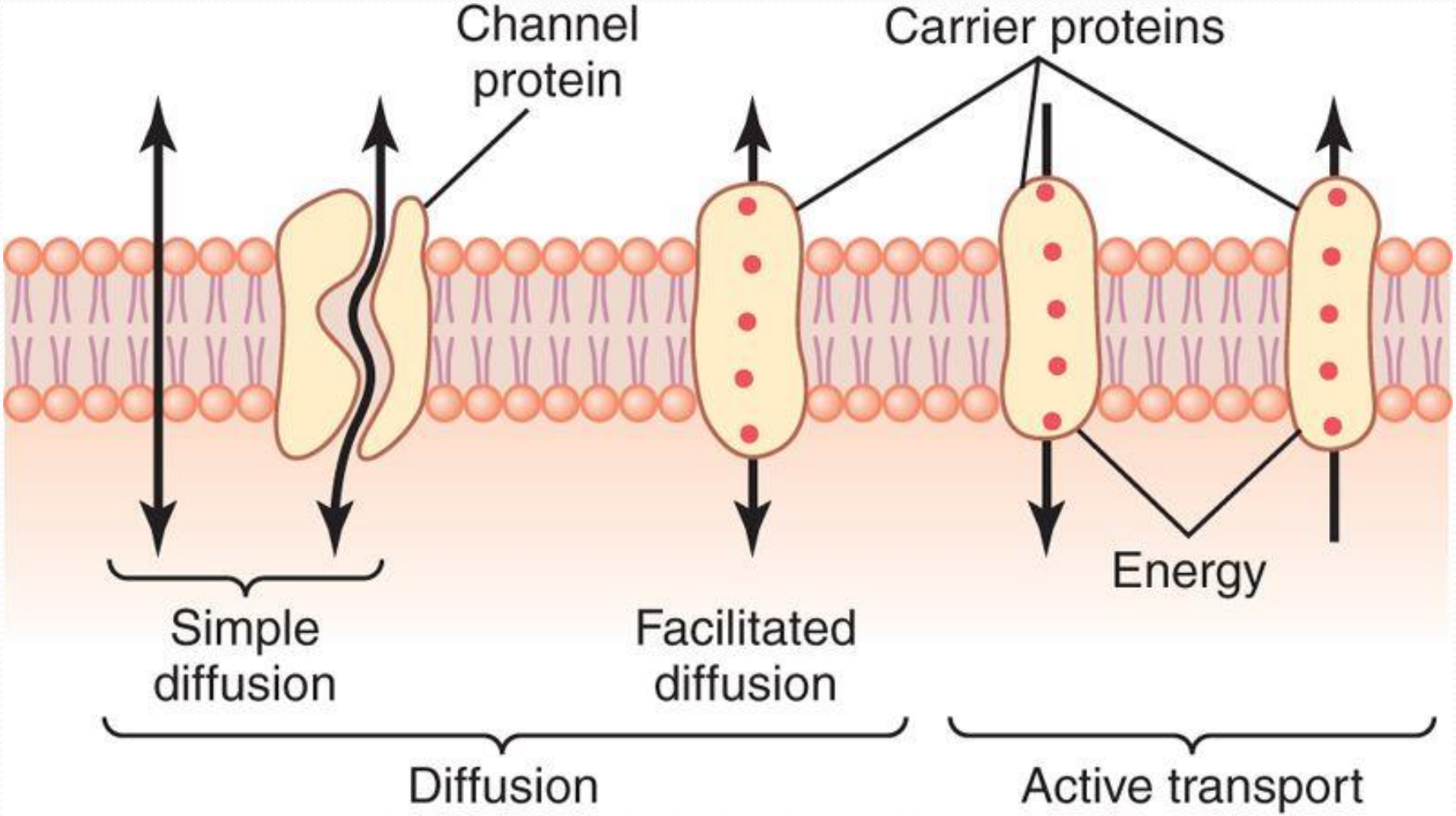
Hall: Guyton and Hall Textbook of Medical Physiology, 12th Edition

Types of transport across cell membrane

- Transport across cell membranes may be governed only by physical processes, the membrane acting like any non-living semipermeable structure. In such cases the transport is called passive.
- Or, the transport may involve expenditure of biologically produced energy ATP. In such cases the transport is called active.

PASSIVE TRANSPORT:

- Passive transport across the cell membrane **depends on physical factors such as concentration gradient, electrical gradient and pressure gradient.**
- In addition, it depends on the **permeability of the membrane**.
- **Permeability of the cell membrane** to a substance depends on its **molecular size, lipid solubility, and whether a special protein (called carrier) is available** to shuttle the substance across the membrane.

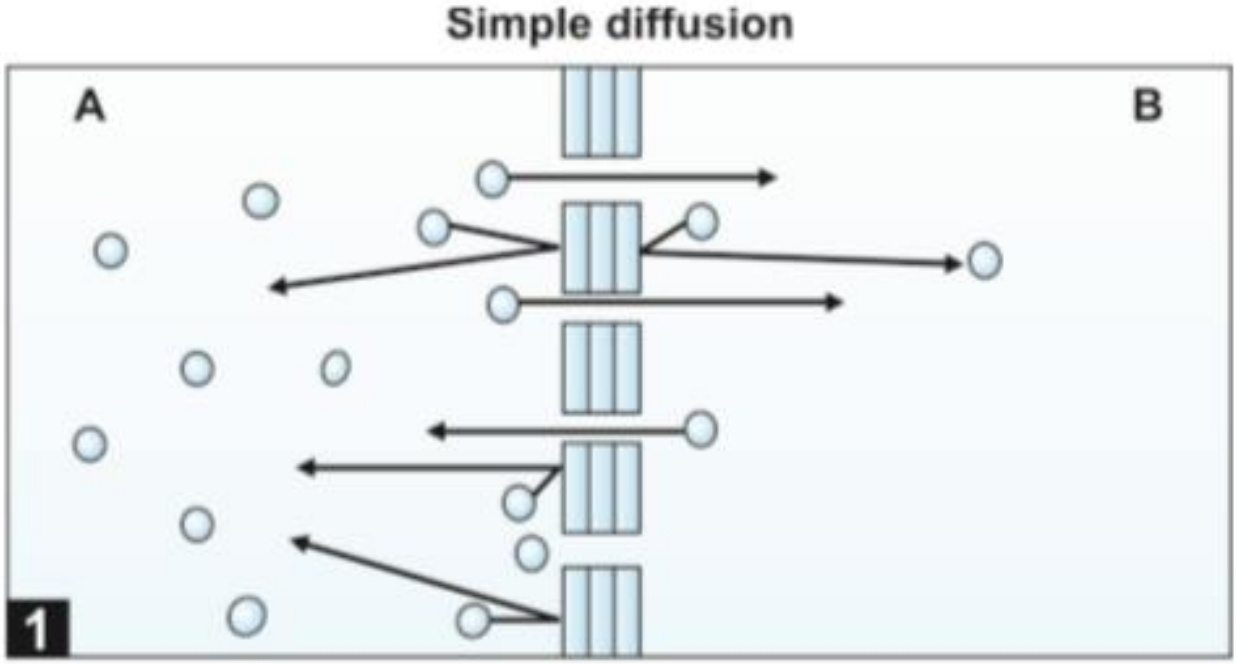


- **Small molecules or ions** are **transported faster** because they can pass through ‘pores’ in the cell membrane.
- **Lipid soluble substances** are transported **faster** because such substances can ‘dissolve’ in the lipid bilayer of the cell membrane and cross it.
- **The major processes by which passive transport is accomplished** are :
  a. **Simple diffusion,**
  b. **Facilitated diffusion and**
  c. **Osmosis**.

a. **Simple diffusion**

If the substance is present on both sides of the membrane, the **frequency of collisions is higher on the side on which the substance is present in a higher concentration**. Higher the frequency of collisions, greater is the probability of particles striking a pore through which they can pass to the other side of the membrane. Or, **in case of lipid soluble substances, higher the concentration, greater is the probability of the particles striking the membrane and ‘dissolving’ in it** and passing to the other side.

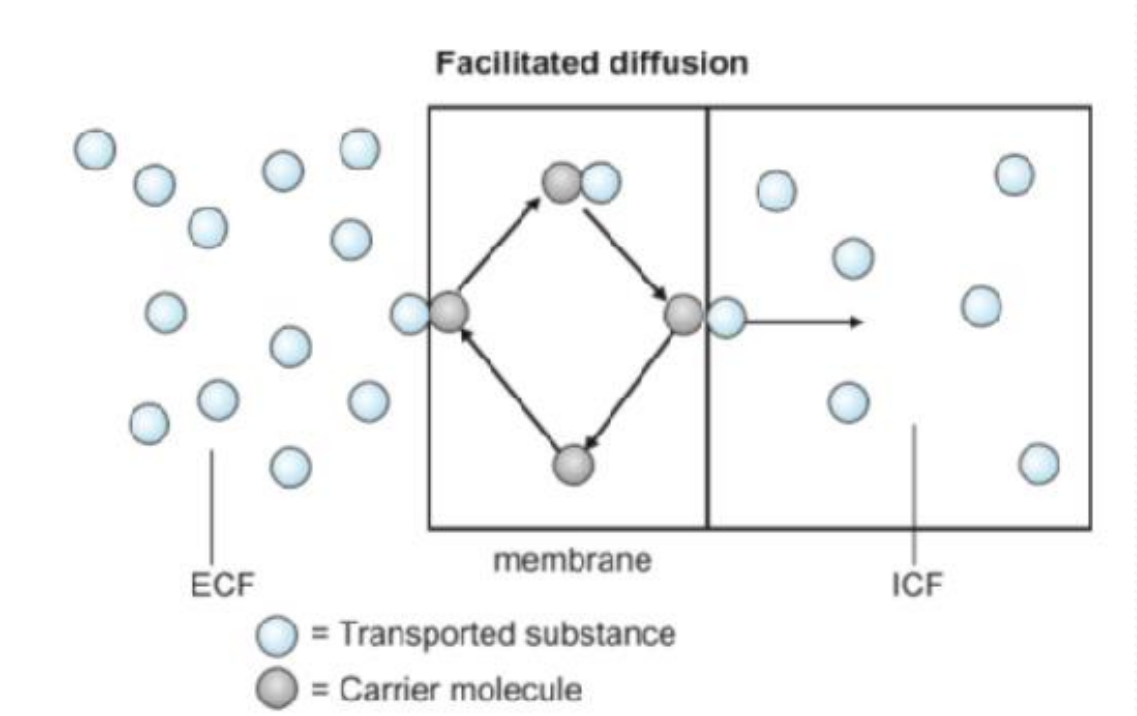
- Hence substances **diffuse from the side on which they are present in a higher concentration** to one on which the concentration is lower.



- The concentration of the solute is **higher on side A than on side B.** Hence random molecular motion results in transport from A to B at a rate higher than that from B to A. Thus the **net transport is from A to B**.

b. **Facilitated Diffusion**

- Transport by diffusion may be made **faster**, and the **limitation of molecular size overcome**, if a **suitable carrier is available** in the cell membrane.
- The carrier helps incorporate **even a water soluble substance** in the membrane. Since the carrier merely facilitates diffusion, the process is called facilitated diffusion



3. Osmosis

- Osmosis is a **special instance of diffusion**. Suppose a **selectively permeable membrane** (often erroneously called a semi-permeable membrane) separates two compartments.
- The membrane **allows water to pass through but not a solute**. On side A is water, and on side B is the solute dissolved in water. The membrane is permeable only to water, and the concentration of water is higher on side A.
- Hence water diffuses from A to B,

but in this type of situations water
is said to be transported by osmosis.

- The net flow of the solvent stops wh

the excess hydrostatic pressure on side
B just counterbalances the osmotic
pull exerted by the solute.

a and b, hydrostatic pressure in
compartment A;

c and d, hydrostatic pressure in compartment B, OP, osmotic pressure.

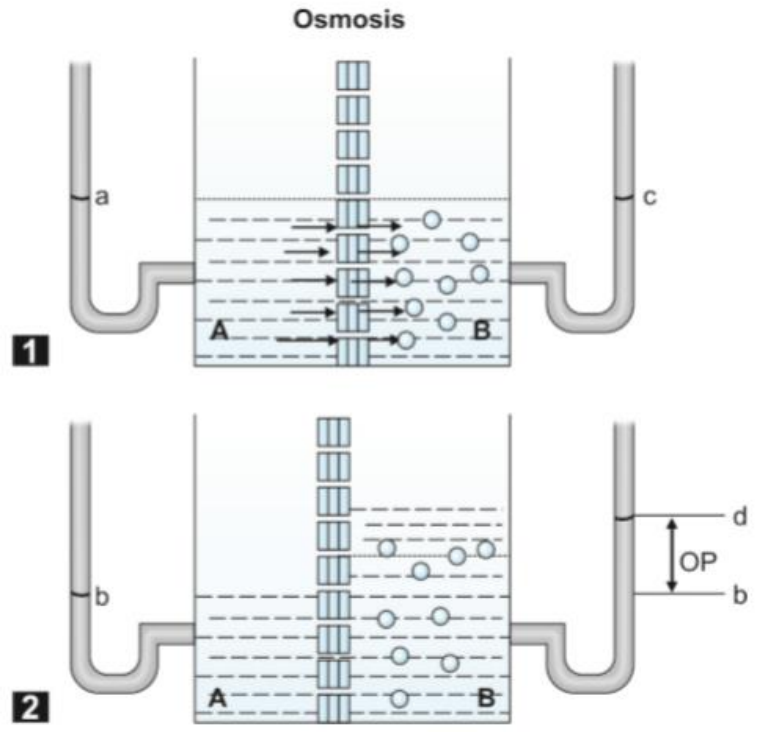
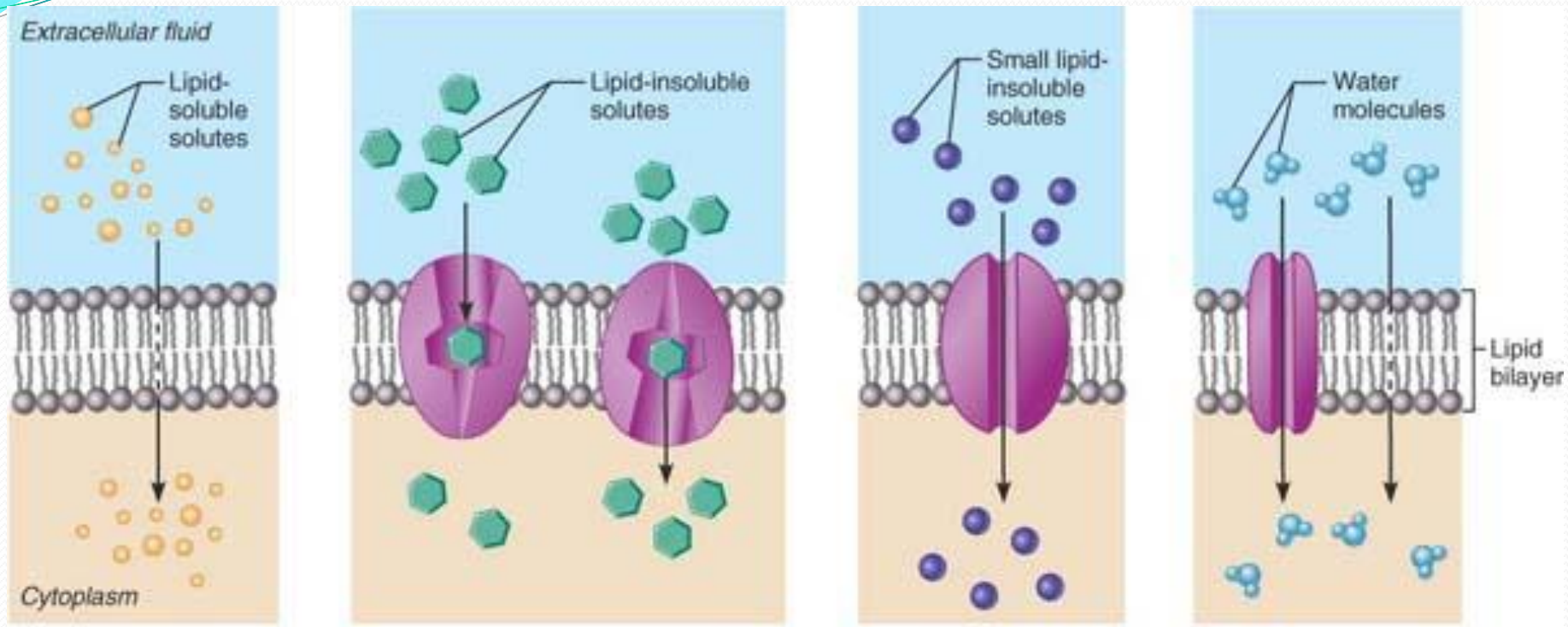


TABLE 3.1 Passive Membrane Transport Processes

PROCESS	ENERGY SOURCE	DESCRIPTION	EXAMPLES
DIFFUSION			
Simple diffusion	Kinetic energy	Net movement of particles (ions, molecules, etc.) from an area of their higher concentration to an area of their lower concentration, that is, along their concentration gradient	Movement of fats, oxygen, carbon dioxide through the lipid portion of the membrane
Facilitated diffusion	Kinetic energy	Same as simple diffusion, but the diffusing substance is attached to a lipid-soluble membrane carrier protein or moves through a membrane channel	Movement of glucose and some ions into cells
Osmosis	Kinetic energy	Simple diffusion of water through a selectively permeable membrane	Movement of water into and out of cells directly through the lipid phase of the membrane or via membrane pores (aquaporins)
FILTRATION			
	Hydrostatic pressure	Movement of water and solutes through a semipermeable membrane (either through the plasma membrane or between cells) from a region of higher hydrostatic pressure to a region of lower hydrostatic pressure, that is, along a pressure gradient	Movement of water, nutrients, and gases through a capillary wall; formation of kidney filtrate



(a) **Simple diffusion** directly through the phospholipid bilayer

(b) **Carrier-mediated facilitated diffusion** via protein carrier specific for one chemical; binding of substrate causes shape change in transport protein

(c) **Channel-mediated facilitated diffusion** through a channel protein; mostly ions selected on basis of size and charge

(d) **Osmosis**, diffusion through a specific channel protein (aquaporin) or through the lipid bilayer

Active transport

- Like carrier-mediated facilitated diffusion, **requires carrier proteins** that combine specifically and reversibly with the transported substances.
- However, facilitated diffusion always honors concentration gradients because its driving force is kinetic energy.
- In contrast, the active transporters or **solute pumps** move solutes, most importantly ions (such as **Na^+, K^+, and Ca^{2+}), "uphill" against a concentration gradient**.
- To do this work, cells must expend the energy of ATP. There are two types of active transport distinguished according to their source of energy.
- In **primary active transport**, the energy to do work comes directly from hydrolysis of ATP.
- In **secondary active transport**, transport is driven indirectly by energy stored in ionic gradients created by operation of primary active transport pumps.).

- **Secondary active transport** systems are all **coupled systems;** that is, they **move more than one substance at a time**.
- If the **two transported substances** are moved in **the same direction**, the system is a **symport system** (sym = same).
- If the transported substances "**wave to each other**" as they cross the membrane in **opposite directions**, the system is an **antiport system** (anti = opposite, against)

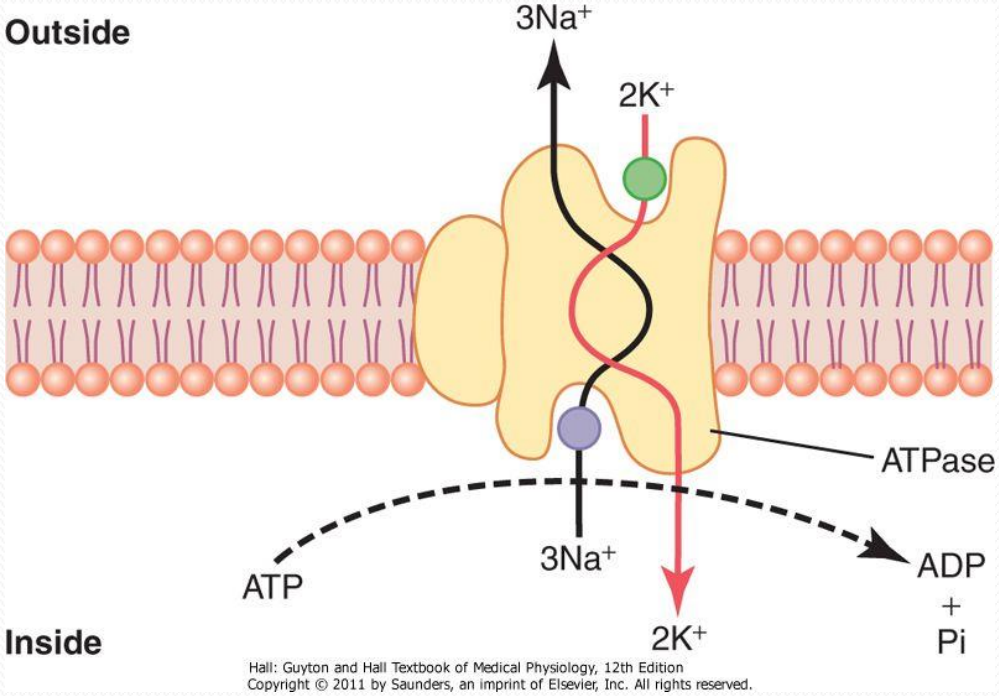


Fig. Primary active transport, Sodium/potassium pump

Na^+/K^+ pump: a primary active pump

- **The *carrier protein*** is a complex of **two separate globular proteins**: a larger one called the **α subunit,** with a molecular weight of about 100,000, and a **smaller one called the β subunit**, with a molecular weight of about 55,000.
- Although the function of the smaller protein is not known (except that it might anchor the protein complex in the lipid membrane), the **larger protein has three specific features that are important for the functioning of the pump**:
  - It has **three *receptor sites for binding sodium ions*** on the portion of the protein that protrudes to the inside of the cell.
  - It has **two *receptor sites for potassium ions* on the outside**.
  - The inside portion of this protein **near the sodium binding sites has ATPase activity.**

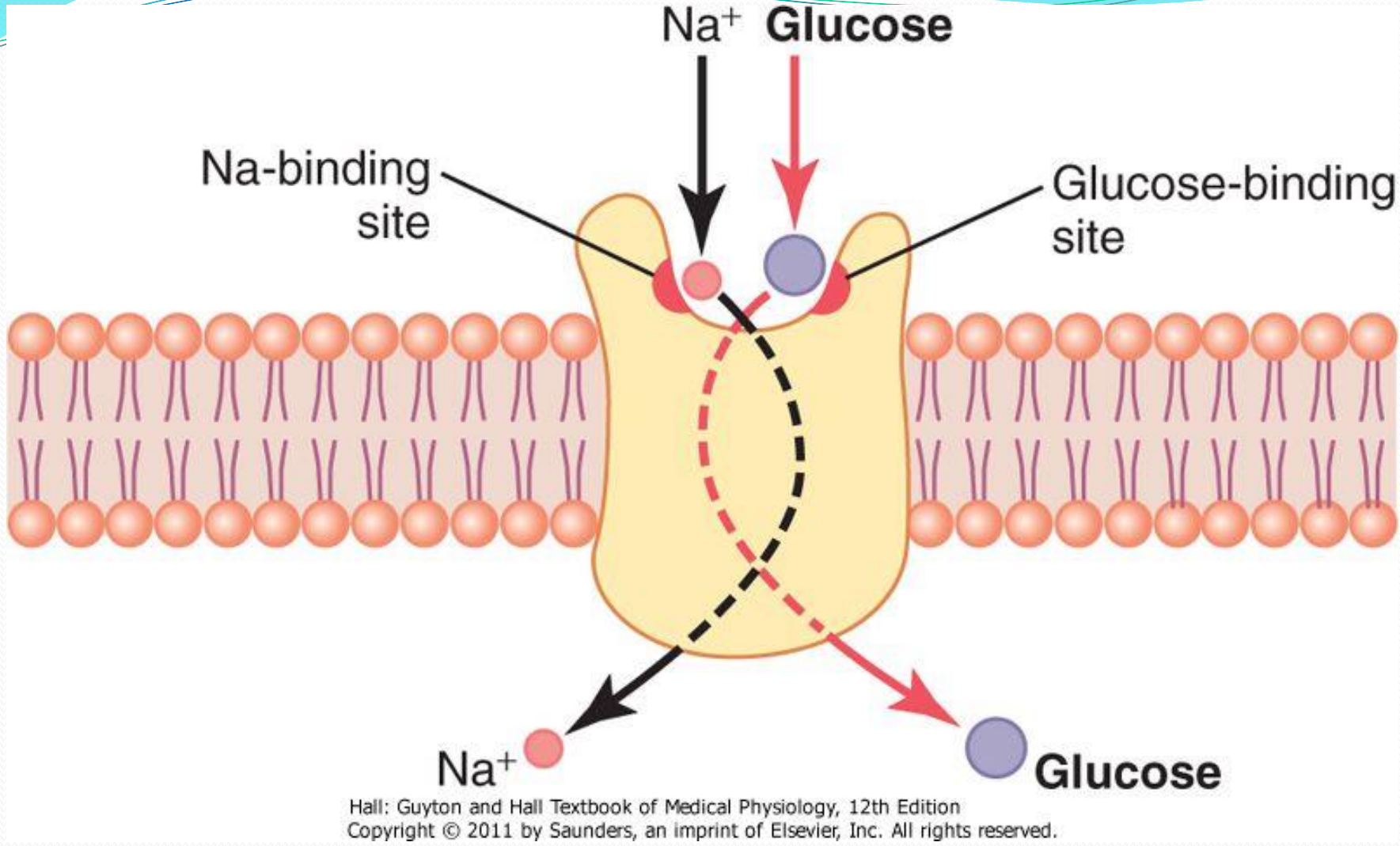


Fig. Postulated mechanism for **sodium co-transport of glucose**

SECONDARY ACTIVE TRANSPORT

TABLE 3.2 Active Membrane Transport Processes

PROCESS	ENERGY SOURCE	DESCRIPTION	EXAMPLES
ACTIVE TRANSPORT			
Primary active transport	ATP	Transport of substances against a concentration (or electrochemical) gradient; across the plasma membrane by a solute pump; directly uses energy of ATP hydrolysis	Ions (Na^+, K^+, H^+, Ca^{2+}, and others)
Secondary active transport	Ion concentration gradient maintained with ATP	Cotransport (coupled transport) of two solutes across the membrane; energy is supplied by the ion gradient created by a primary active solute pump (indirectly); symporters move the transported substances in the same direction; antiporters move transported substances in opposite directions across the membrane	Movement of polar or charged solutes, e.g., amino acids (into cell by symporters); Ca^{2+}, H^+ (out of cells via antiporters)

For some cells, such as electrically active nerve cells, **60 to 70 percent of the cells' energy requirement m**ay be devoted to **pumping Na^+ out of the cell and K^+ into the cell.**

The **Na^+-K^+ Pump Is Important For Controlling Cell Volume**

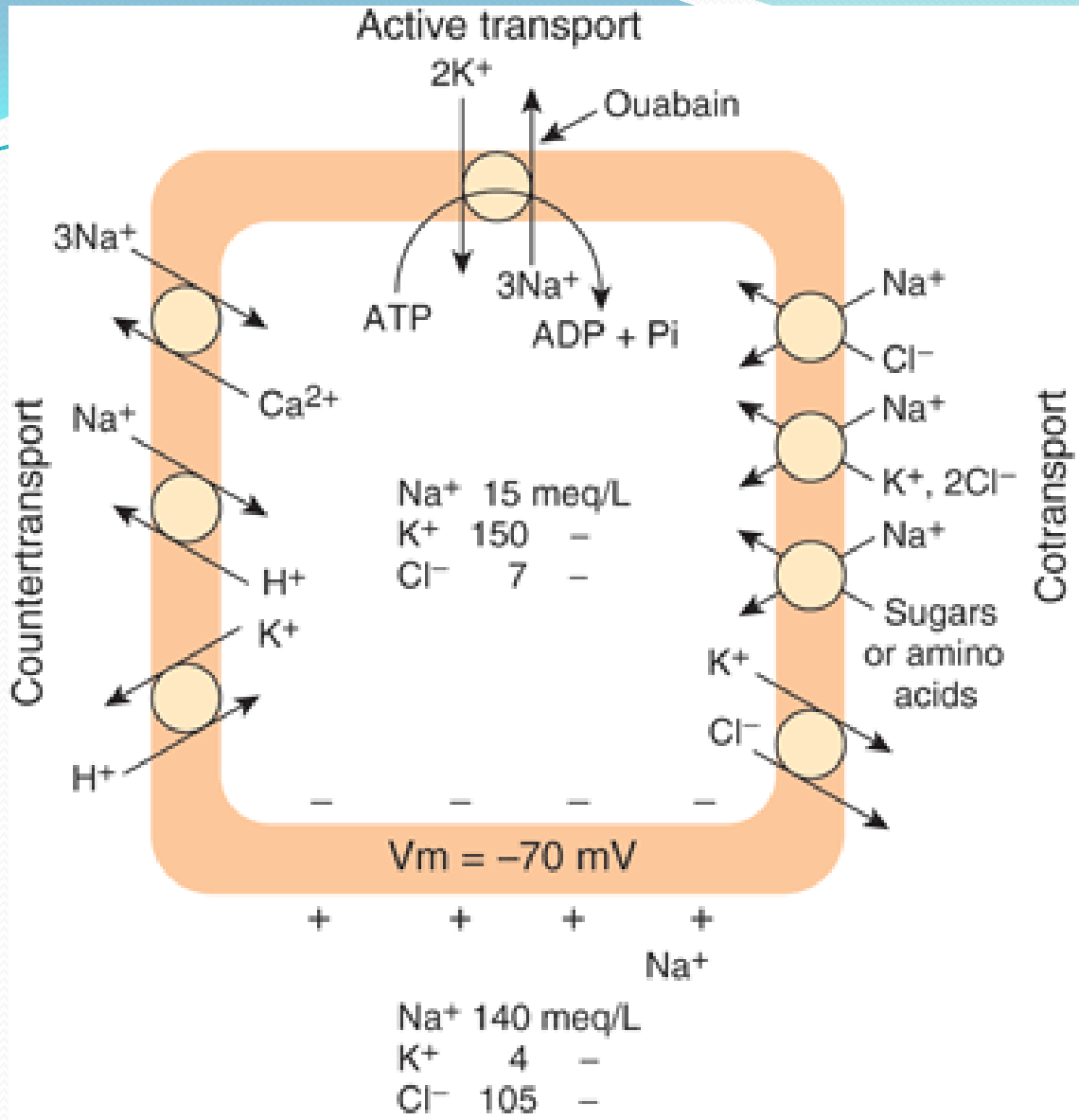
At two places in the body, **primary active transport of hydrogen ions is important:**

(1) In the **gastric glands of the stomach H^+/K^+ ATPase** for the release of hydrogen in stomach during **HCl production**.

(2) In the **late distal tubules and cortical collecting ducts of the kidneys for ion releasing (H^+) in urine.**

Two **primary active transport of calcium pumps; muscle contraction**

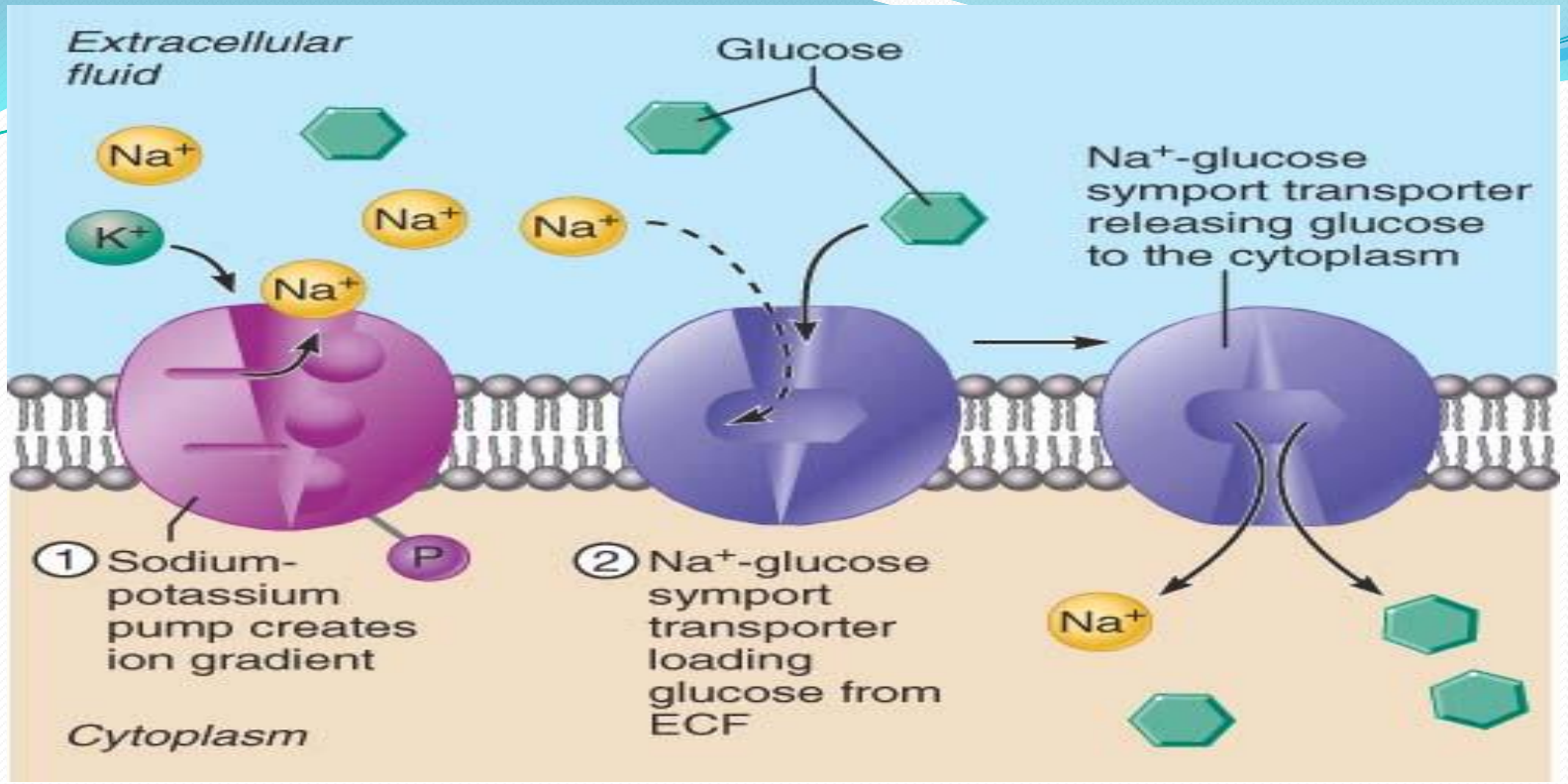
1. One is in the **cell membrane and pumps calcium to the outside of the cell.**
2. The other pumps **calcium ions into one or more of the intracellular vesicular organelles** of the cell, such as the **sarcoplasmic reticulum** of muscle cells and the **mitochondria** in all cells.



Source: Barrett KE, Barman SM, Boitano S, Brooks H: *Ganong's Review of Medical Physiology, 23rd Edition*: http://www.accessmedicine.com

Secondary active transport.

- A single ATP-powered pump, such as the **Na^+-K^+ pump, ca++ pump, H+/K+ pump can indirectly drive the secondary active transport of several other solutes.**
- By moving sodium across the plasma membrane against its concentration gradient, **the pump stores energy (in the ion gradient).**
- Then**, just as water pumped uphill can do work as it flows back down (turn a turbine or water wheel),** a substance pumped across a membrane can **do work as it leaks back, propelled downhill along its concentration gradient.**
- Thus, **as sodium moves back into the cell with the help of a carrier protein (facilitated diffusion), other substances are "dragged along" or cotransported by a common carrier protein**



Secondary active transport.

1.The ATP-driven **Na^+-K^+ pump stores energy by creating a steep concentration gradient for Na^+** entry into the cell.

2. As Na^+ diffuses back across the membrane through a membrane cotransporter protein, it **drives glucose against its concentration gradient into the cell**. (ECF = extracellular fluid)

Human Anatomy:

It is defined in various ways :-

a) **It is concerned with the consideration of Various structures which make up the human body.**

b) **In the restricted sense , the anatomy deals with the parts , which from the fully developed individual and can be demonstrated to the naked eye by various methods of dissection.**

c) Its is defined as an important scientific discipline which is concerned with the investigation of biological structure by :

i) Dissection ;

ii) Microdissection ;

iii) Light microscopy ;

iv)Electron microscopy ;

v) Radiology ;

Regional anatomy :

It deals with anatomy of various structures as they lie in relationship with one another in different region of the body . It is valuable for surgeons.

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Surface anatomy:

It deals with the study and identification of various structures in the living person by methods of inspection and palpation It helps to enhance the knowledge acquired through dissection of the cadaver by either of line of study, Regional or systematic. It is helpful both in health and disease and is daily used in medical practice.

Radiological Anatomy

It deals with the study of structure of human body with the aid of X-Rays. It helps to investigate the anatomical facts which cannot be understood by any other method. It is very useful both in health and disease and is in current use in modern medical practice.

Embryology

It is the study of various changes in the developing organism from the fertilization of ovum up to the birth of the baby.

Cytology

It is the study of the cells by various biological methods. The cell is defined as the structural unit of a multicellular organism like man.

Histology

It is the study of various tissues by various scientific method (microscopy ; histochemistry ; radio autography ; etc.). A tissue may be defined as a combination of various cells performing a certain function.

Applied / Clinical Anatomy

It is the direct application of facts of human anatomy to medicine and surgery. The students are advised to lay the stress on applied aspects while they are studying gross anatomy in dissection hall.

Systemic Anatomy

The description of several systems of organs separately and in logical order comes under the head of systematic anatomy. The several parts of each system not only show a certain similarity of structure but are also associated in specialized functions.

Basic organization of the body

A collection of cells of similar morphology performing a specific function is termed tissue.

There are four basic tissues:

i) Epithelium

ii) Connective tissue

iii) Muscle tissue

iv) Nervous tissue

Organs and systems

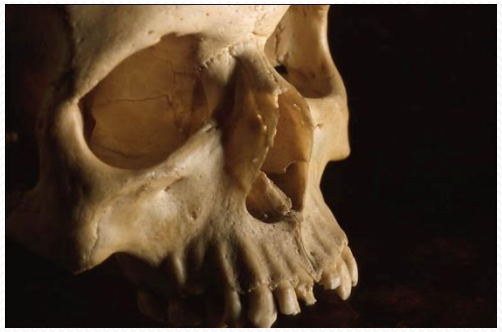
An association of different tissues which perform certain function is called Organ e.g., bone, muscle, heart, stomach and urinary bladder.

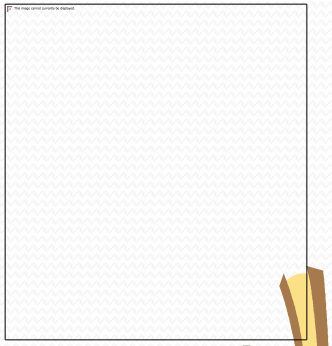
A group of organs working harmoniously to discharge a specific function forms a system.

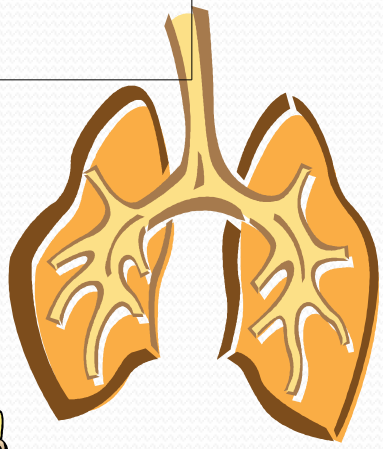
The following systems are formed in the human body.

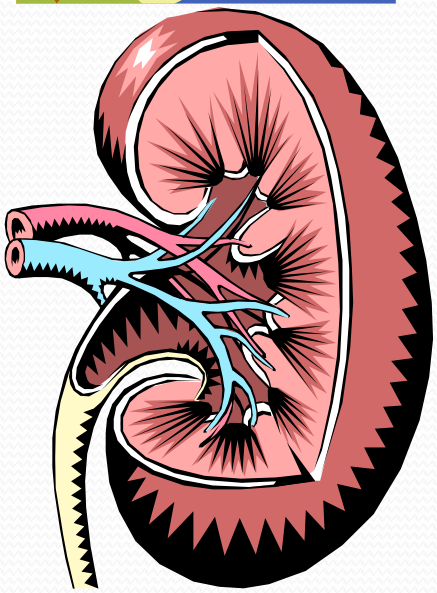
Body Systems

- Integumentary
- Skeletal
- Circulatory
- Digestive
- Respiratory
- Urinary
- Reproductive
- Nervous
- Muscular
- Endocrine
- Lymphatic









Anatomical Positions

- For humans: standing erect facing forward, with head level and eyes facing forward, feet flat on the floor and directed forward, and arms are at the sides of the body with palms turned forward.

Anatomical Position

Anatomical Position
The person is standing up straight
The palms face anteriorly
The knees, elbow, and neck are straight (not bent)
The toes point anteriorly, but the fingers point inferiorly

Left and Right: yours or the patient's?

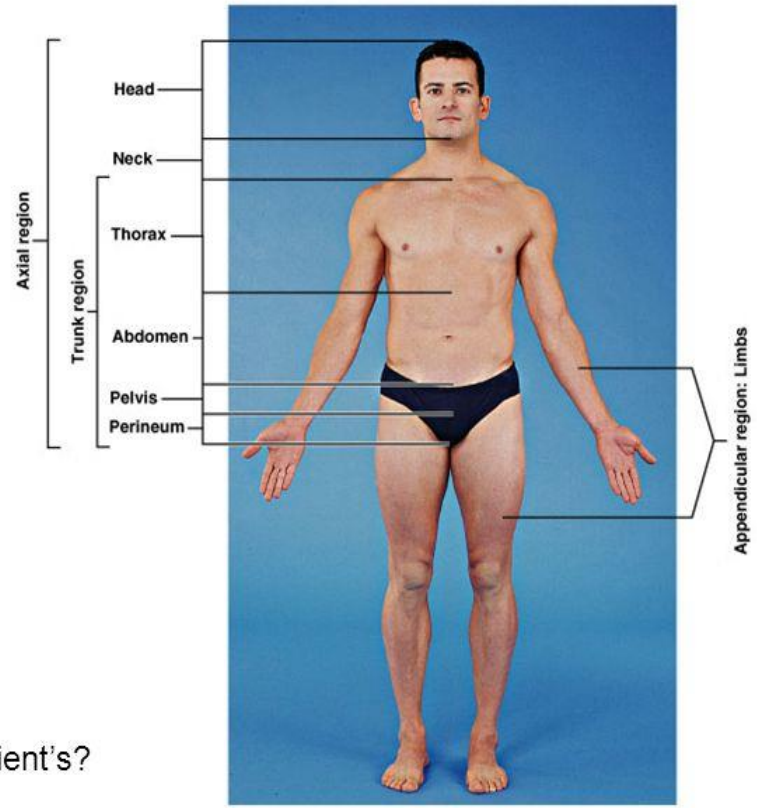
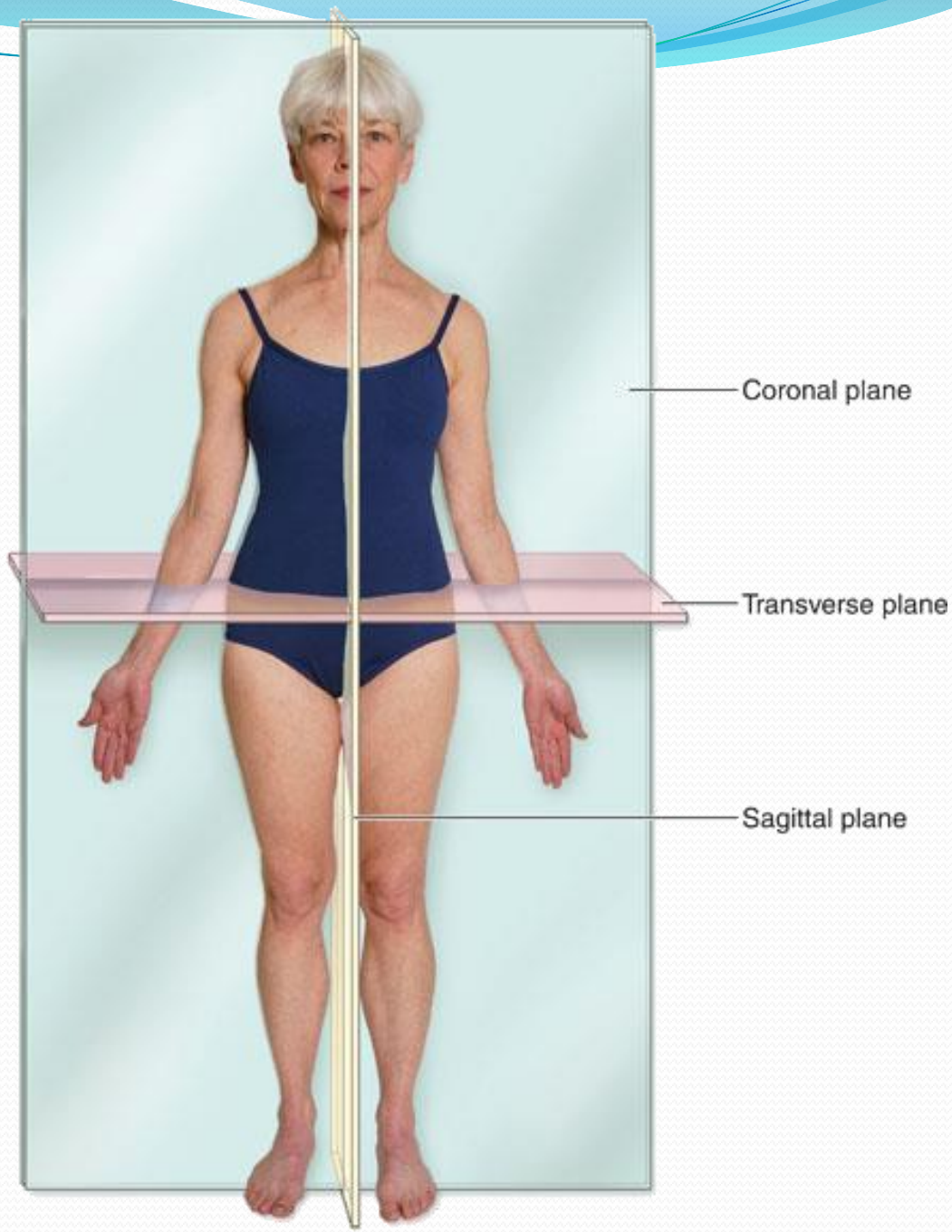


Figure 1.3

Anatomical Terminologies

- Anatomic position is a specific body position in which an individual stands upright with the feet parallel and flat on the floor.
- The head is level, and the eyes look forward toward the observer.
- The arms are at either side of the body with the palms facing forward and the thumbs pointing away from the body.

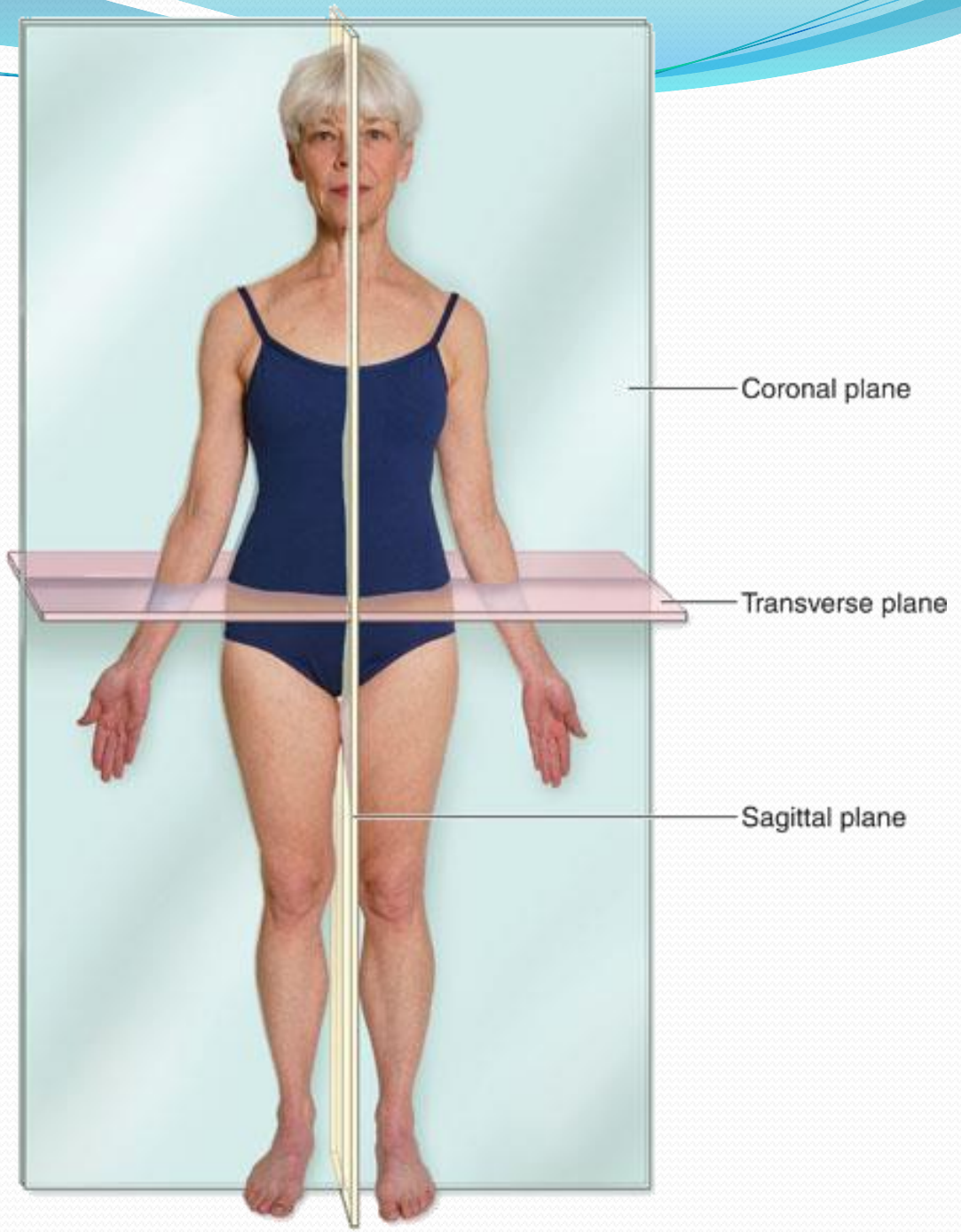


Anatomical Terminology

- A plane is an imaginary surface that slices the body into specific sections.
- The three major anatomic planes of reference are the coronal, transverse, and sagittal planes.

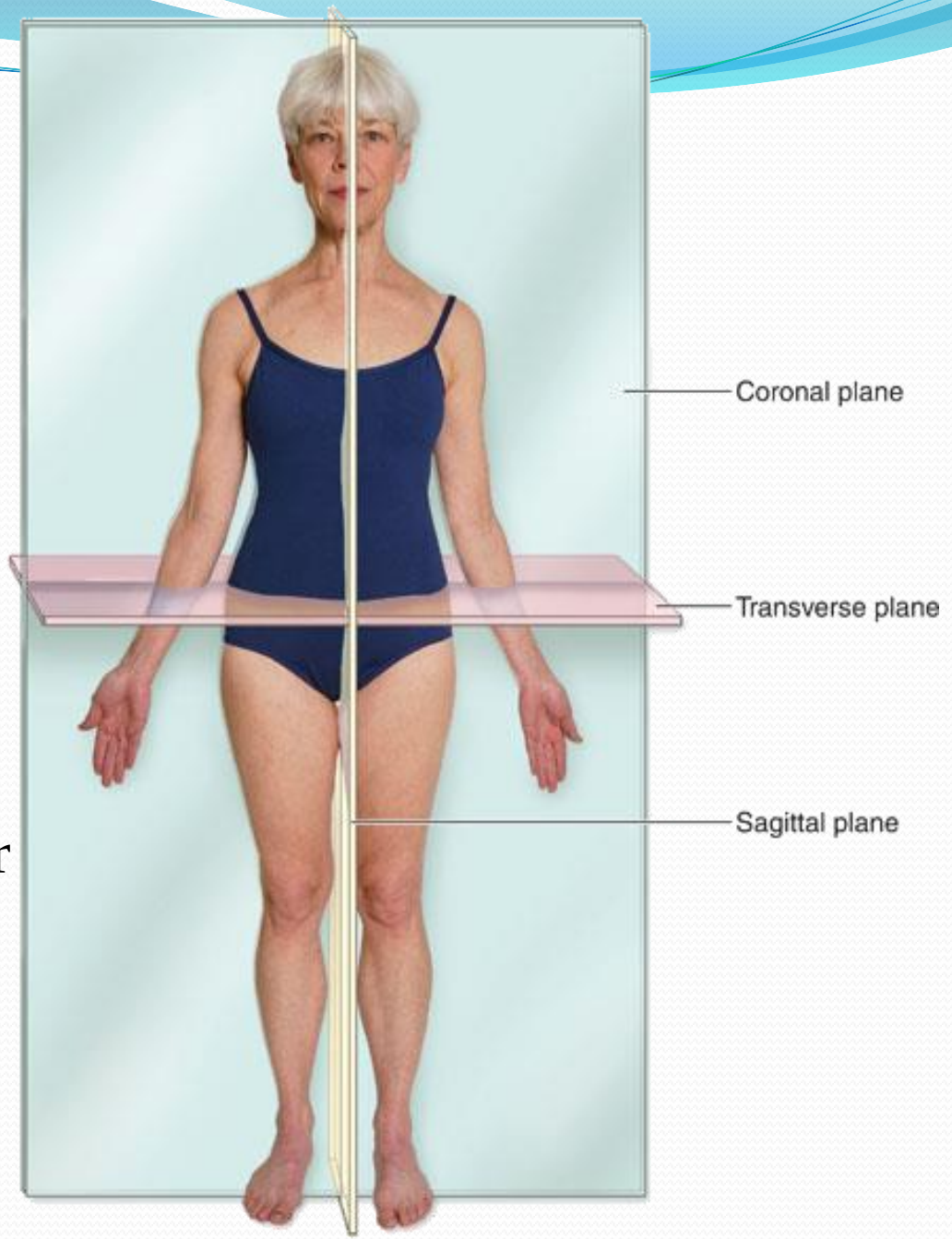
Sections and Planes

A coronal plane, also called a frontal plane, is a vertical plane that divides the body into anterior (front) and posterior (back) parts.



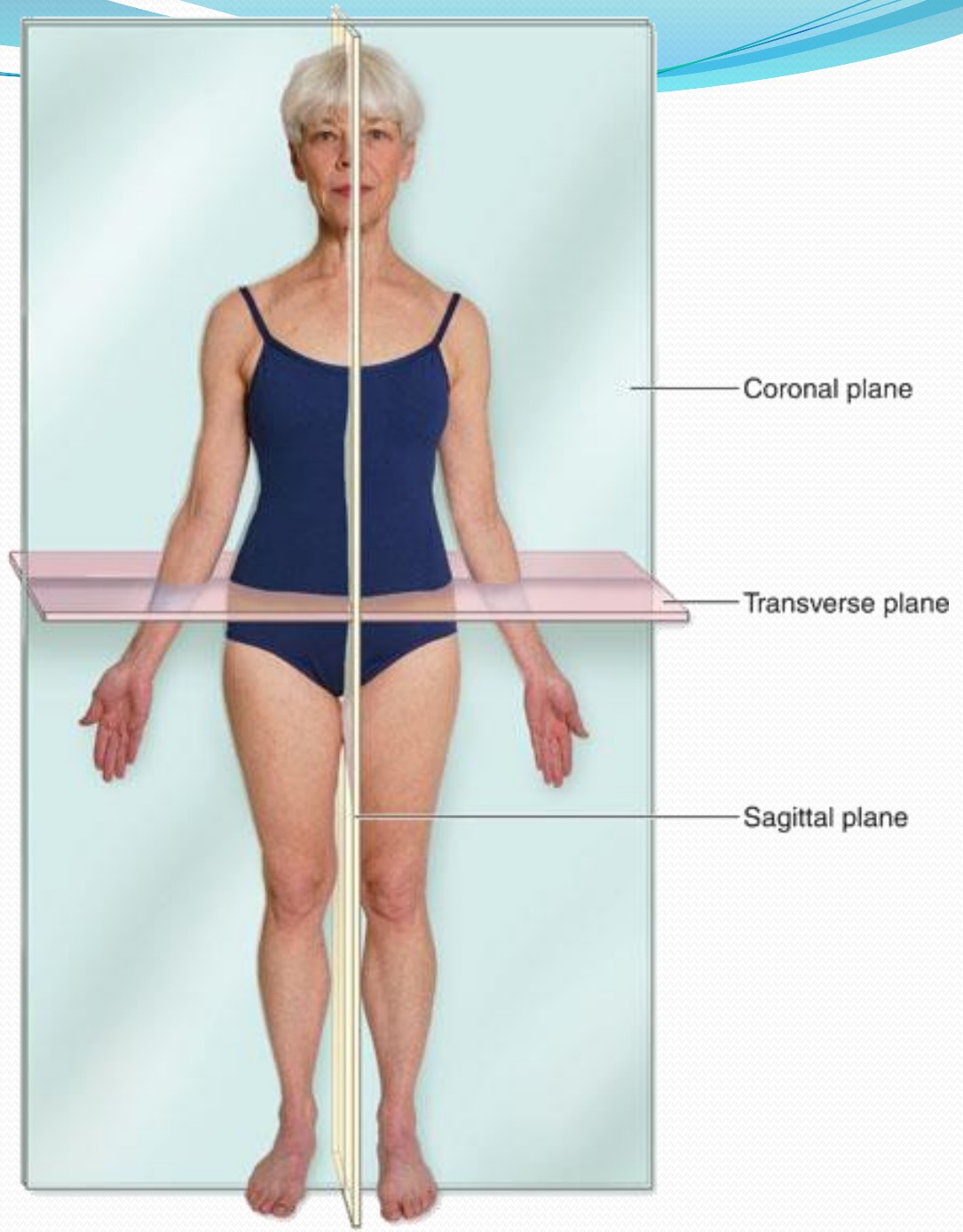
Sections and Planes

- A transverse plane, also called a cross-sectional plane or horizontal plane, cuts perpendicularly along the long axis of the body or organ separating it into both superior (upper) and inferior (lower) parts.



Sections and Planes

- A sagittal plane or median plane, extends through the body or organ vertically and divides the structure into right and left halves.



Sections and Planes

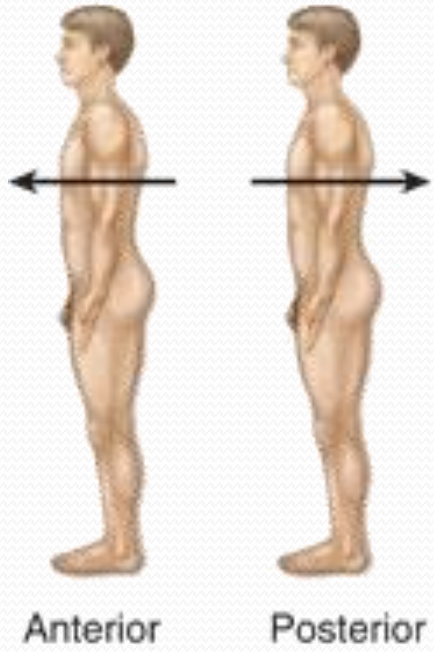
- A sagittal plane in the body midline is a midsagittal plane.
- A plane that is parallel to the midsagittal plane, but either to the left or the right of it, is termed a parasagittal (or sagittal) plane.
- A minor plane, called the oblique plane, passes through the specimen at an angle.

Directional Terms of the Body

- Directional terms are precise and brief, and for most of them there is a correlative term that means just the opposite.

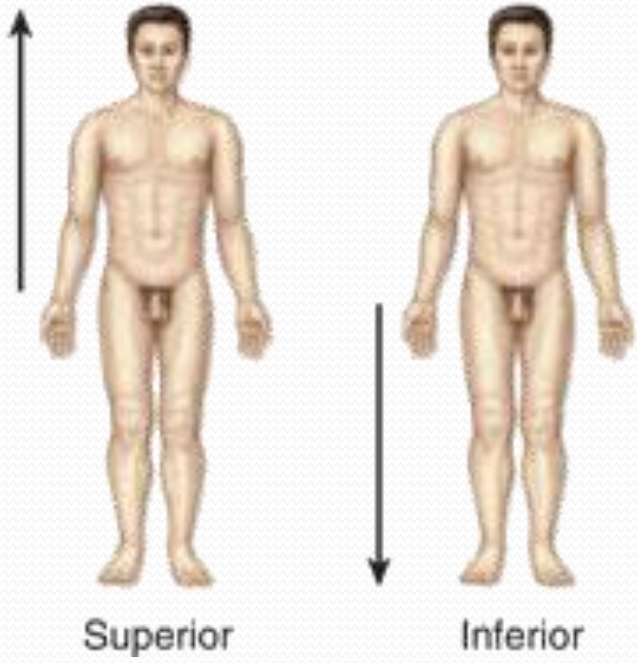
Relative and Directional Terms of the Body

- Relative to front (belly side) or back (back side) of the body :
  - **Anterior** = In front of; toward the front surface
  - **Posterior** = In back of; toward the back surface
  - **Dorsal** =At the back side of the human body
  - **Ventral** = At the belly side of the human body



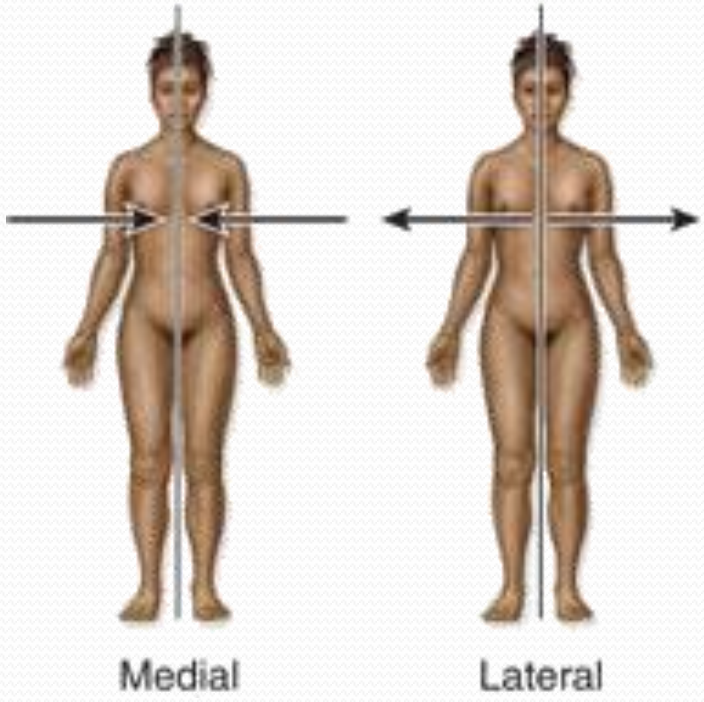
Relative and Directional Terms of the Body

- Relative to the head or tail of the body:
  - **Superior** = Toward the head or above
  - **Inferior** = Toward feet not head
  - **Caudal** = At the rear or tail end
  - **Cranial** = At the head end



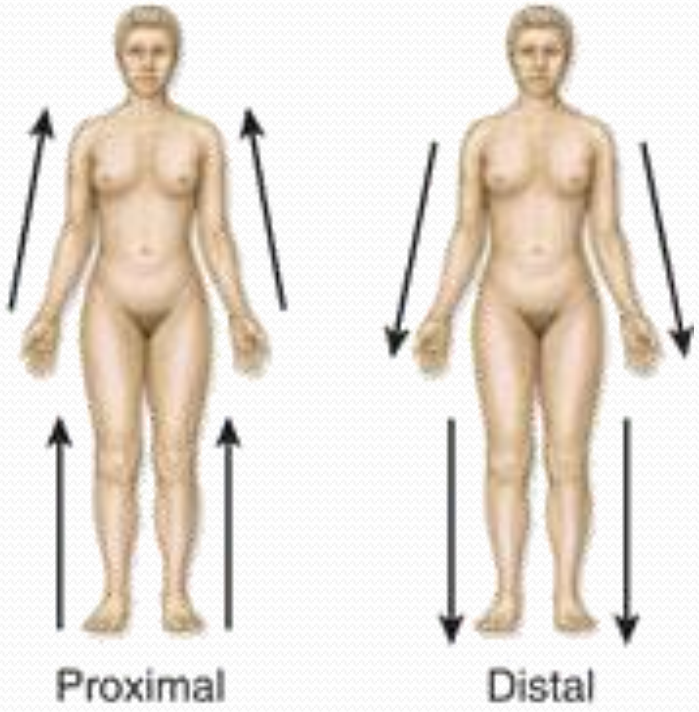
Relative and Directional Terms of the Body

- Relative to the midline or center of the body:
  - **Medial** = Toward the midline of the body
  - **Lateral** = Away from the midline of the body
  - **Deep** = On the inside, underneath another structure
  - **Superficial** = On the outside



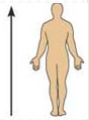
Relative and Directional Terms of the Body

- Relative to point of attachment of the appendage:
  - **Proximal** = Closest to point of attachment to trunk
  - **Distal** = Furthest from point of attachment to trunk

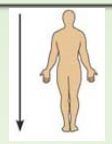


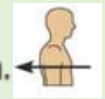
Directional terms

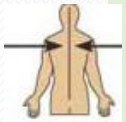
Table 1–3 TERMS OF LOCATION AND POSITION

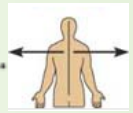


Term	Definition	Example
Superior	above, or higher	The heart is superior to the liver.
Inferior	below, or lower	The liver is inferior to the lungs.
Anterior	toward the front	The chest is on the anterior side of the body.
Posterior	toward the back	The lumbar area is posterior to the umbilical area.
Ventral	toward the front	The mammary area is on the ventral side of the body.
Dorsal	toward the back	The buttocks are on the dorsal side of the body.
Medial	toward the midline	The heart is medial to the lungs.
Lateral	away from the midline	The shoulders are lateral to the neck.
Internal	within, or interior to	The brain is internal to the skull.
External	outside, or exterior to	The ribs are external to the lungs.
Superficial	toward the surface	The skin is the most superficial organ.
Deep	within, or interior to	The deep veins of the legs are surrounded by muscles.
Central	the main part	The brain is part of the central nervous system.
Peripheral	extending from the main part	Nerves in the arm are part of the peripheral nervous system.
Proximal	closer to the origin	The knee is proximal to the foot.
Distal	farther from the origin	The palm is distal to the elbow.
Parietal	pertaining to the wall of a cavity	The parietal pleura lines the chest cavity.
Visceral	pertaining to the organs within a cavity	The visceral pleura covers the lungs.









Body Cavities and Membranes

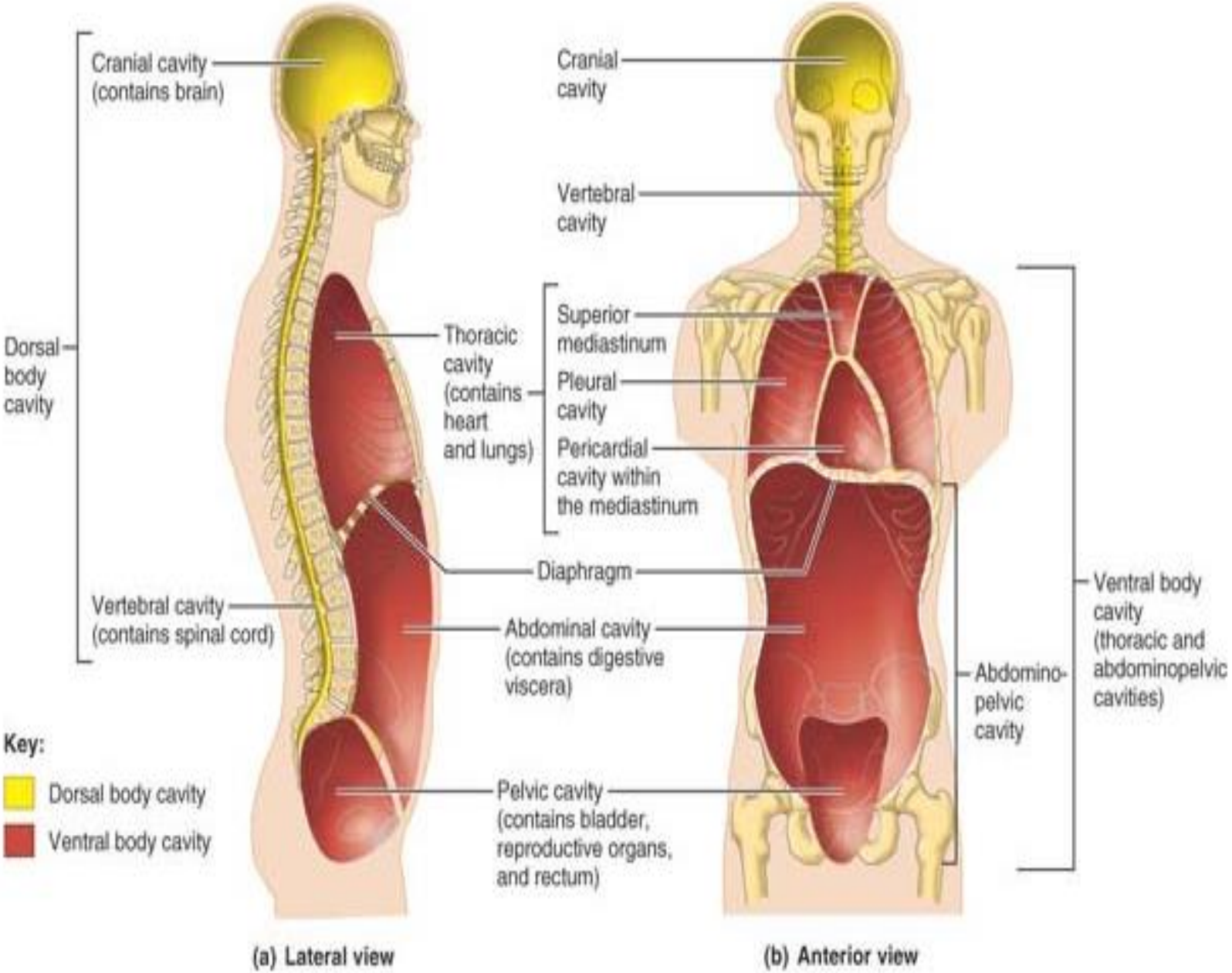
- Two sets of internal body cavities called the **dorsal** and **ventral body cavities**. These cavities are closed to the outside and provide different degrees of **protection to the organs** contained within them.

Dorsal Body Cavity

The dorsal body cavity, which protects the fragile nervous system organs, has two subdivisions:

- **The cranial cavity**, in the skull, encases the brain.
- **The vertebral, or spinal, cavity,** which runs within the bony vertebral column, encloses the delicate spinal cord.

- The spinal cord is essentially a continuation of the brain, and the cranial and spinal cavities are **continuous** with one another.
  The membranes that line these cavities and cover the brain and spinal cord are called the meninges.
- The **membranes** that line these cavities and cover the brain and spinal cord are called the **meninges.**


Cranial cavity (contains brain)
Dorsal body cavity
Thoracic cavity (contains heart and lungs)
Vertebral cavity (contains spinal cord)
Diaphragm
Abdominal cavity (contains digestive viscera)
Pelvic cavity (contains bladder, reproductive organs, and rectum)
Key:
Dorsal body cavity
Ventral body cavity
(a) Lateral view
Cranial cavity
Vertebral cavity
Superior mediastinum
Pleural cavity
Pericardial cavity within the mediastinum
Abdomino-pelvic cavity
Ventral body cavity (thoracic and abdominopelvic cavities)
(b) Anterior view

Ventral Body Cavity

The more **anterior and larger** of the closed body cavity with two major subdivisions

- the **thoracic cavity** (**superior subdivision**)
- the **abdomino-pelvic cavity**. (**Inferior subdivision**)

- The ventral body cavity houses internal organs collectively called the **viscera** (vis′er-ah; viscus = an organ in a body cavity), or visceral organs.

- The superior subdivision, the **thoracic cavity** is surrounded by the **ribs and muscles of the chest**. The thoracic cavity is further subdivided into lateral **pleural cavities** (2 in numbers) each enveloping a lung, and the medial **mediastinum**. The mediastinum contains the **pericardial cavity** which encloses the **heart**, and it also surrounds the remaining thoracic organs (**esophagus, trachea, and others).**

- The inferior sub division of ventral body cavity; **Abdomino-pelvic cavity** is separated from the more superior thoracic cavity by the **diaphragm**, a dome-shaped muscle important in breathing.
- The **abdomino-pelvic cavity**, as its name suggests, **has two parts**. However, these regions are not physically separated by a muscular or membrane wall. Its ***superior portion, the*** **abdominal cavity**, contains the **stomach, intestines, spleen, liver, and other organs**. The ***inferior part***, the **pelvic cavity**, lies in the bony pelvis and contains the **bladder, some reproductive organs, and the rectum**.
- The abdominal and pelvic cavities are not aligned with each other. Instead, the bowl-shaped pelvis tips away from the perpendicular.

Note:

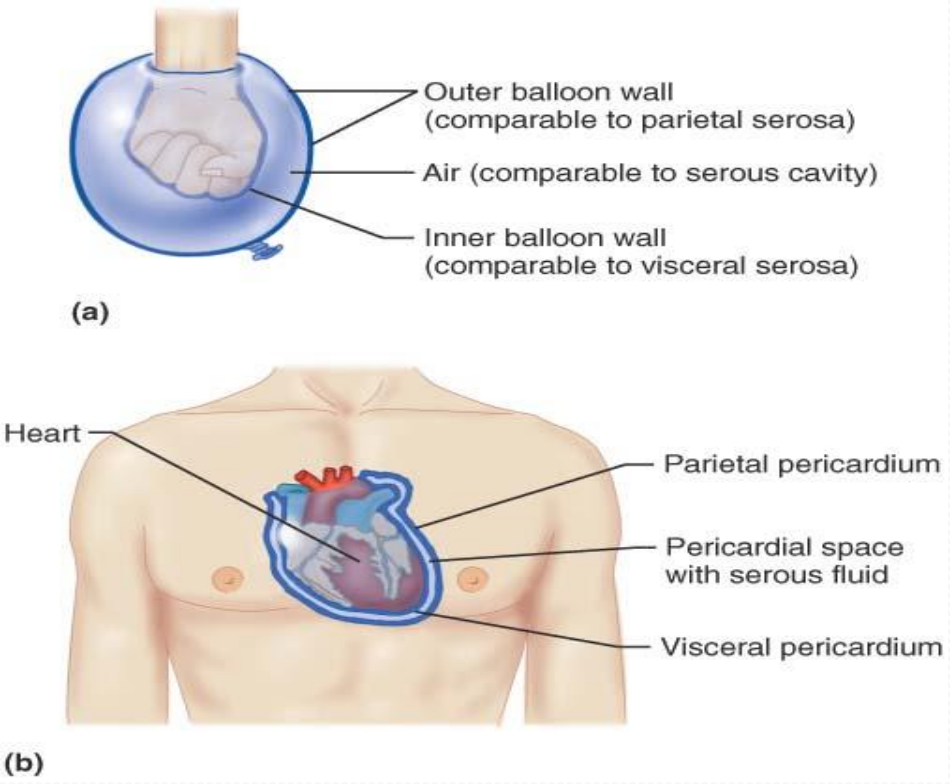
When the body is subjected to physical trauma (as often happens in an **automobile accident**), the **abdomino-pelvic organs are most vulnerable**. This is *because the walls of the abdominal cavity are formed only by trunk muscles and are not reinforced by bone.* The pelvic organs receive a somewhat greater degree of protection from the bony pelvis

Membranes in the Ventral Body Cavity

- The walls of the ventral body cavity and the outer surfaces of the organs it contains are covered by a thin, double-layered membrane, the **serosa** or **serous membrane**. The part of the membrane *lining the cavity walls* is called the **parietal serosa** (parie = wall). It folds in on itself to form the **visceral serosa,** *covering the organs in the cavity*.
- unlike the balloon, parietal serosa (outer) is never exposed but is always fused to the

cavity wall.

In the body, the *serous membranes are separated not by air* **but by a thin layer of lubricating fluid, called serous fluid,** which is secreted by both membranes



- The serous membranes are named for the specific cavity and organs with which they are associated.

For example, the **parietal pericardium** lines the pericardial cavity and reflects back as the **visceral pericardium**, which covers the heart. The **fluid between** these pericardia (parietal & visceral) is called **pericardial fluids**.

Likewise, the **parietal pleura** lines the walls of the thoracic cavity, and the **visceral pleura** covers the lungs. The **fluid between** these pleurae is called **pleural fluid**.

The **parietal peritoneum** is associated with the walls of the abdomino-pelvic cavity, while the **visceral peritoneum** covers most of the organs within that cavity. The fluid between these peritonae is called **ascitic fluid**.

The function of slippery serous fluid:

allows the ***organs to slide without friction*** across the cavity walls and one another as they carry out their routine functions. This ***freedom of movement*** is especially important for mobile organs such as the ***pumping heart and the churning stomach***.

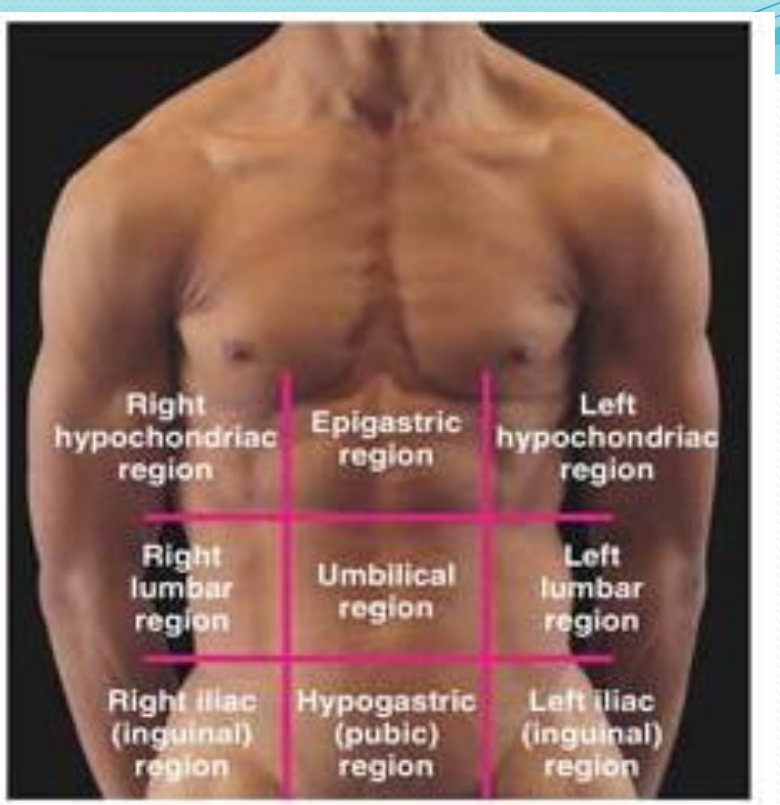
Note: When **serous membranes are inflamed**, *their normally smooth surfaces become roughened*. This leads to **unbearable pain as the organs stick together and drag across one another**, as anyone who has experienced pleurisy (inflammation of the pleurae) or peritonitis (inflammation of the peritonea) knows

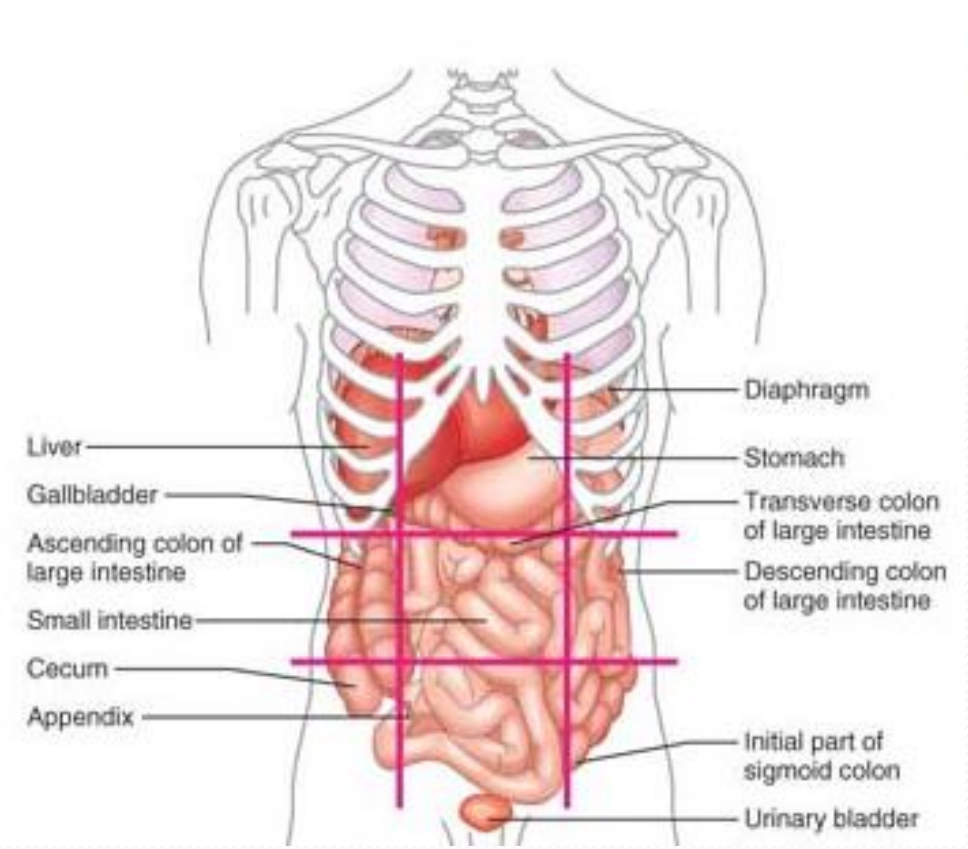
Abdomino-pelvic Regions and Quadrants

Because the abdomino-pelvic cavity is **large and contains several organs**, it is helpful to **divide it into smaller areas for study**. two transverse and two parasagittal planes dividing the cavity into **nine regions**

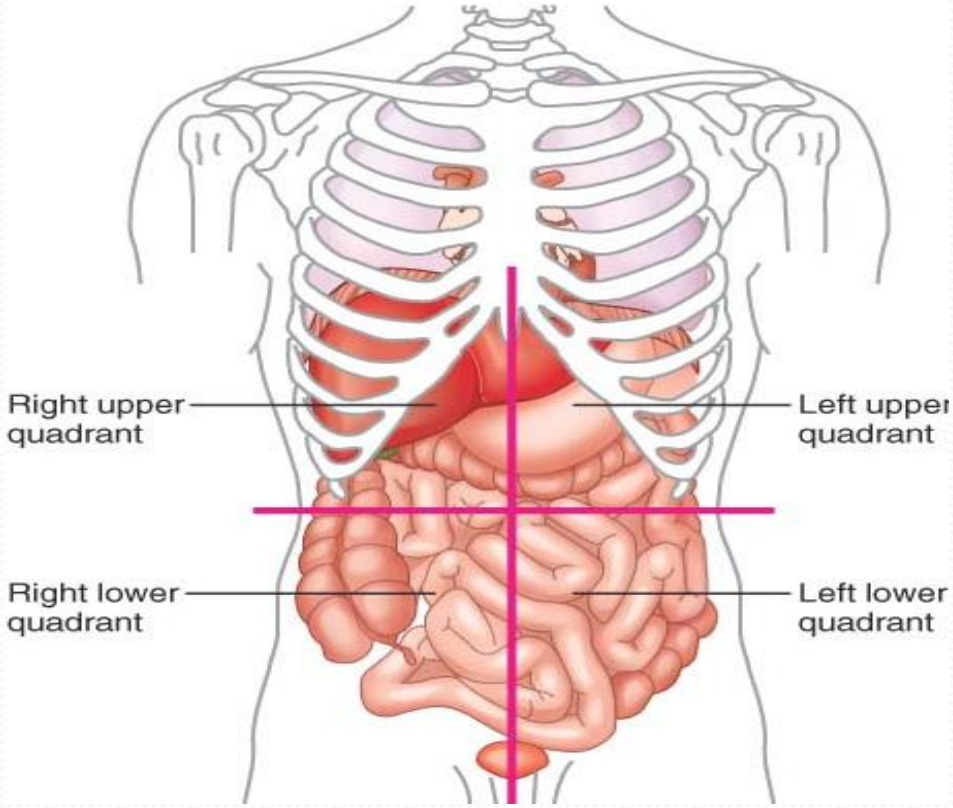
1. *The umbilical region* is the centermost region deep to and surrounding the umbilicus (navel).
2. *The epigastric region* is located superior to the umbilical region (epi = upon, above; gastri = belly).
3. *The hypogastric (pubic) region* is located inferior to the umbilical region (hypo = below).
4. *The right and left iliac, or inguinal, regions* are located lateral to the hypogastric region (iliac = superior part of the hip bone).
5. *The right and left lumbar regions* lie lateral to the umbilical region (lumbus = loin).
6. *The right and left hypochondriac regions* flank the epigastric region laterally (chondro = cartilage).

- The superior transverse plane is just inferior to the ribs; the inferior transverse plane is just superior to the hip bones; and the parasagittal planes lie just medial to the nipples





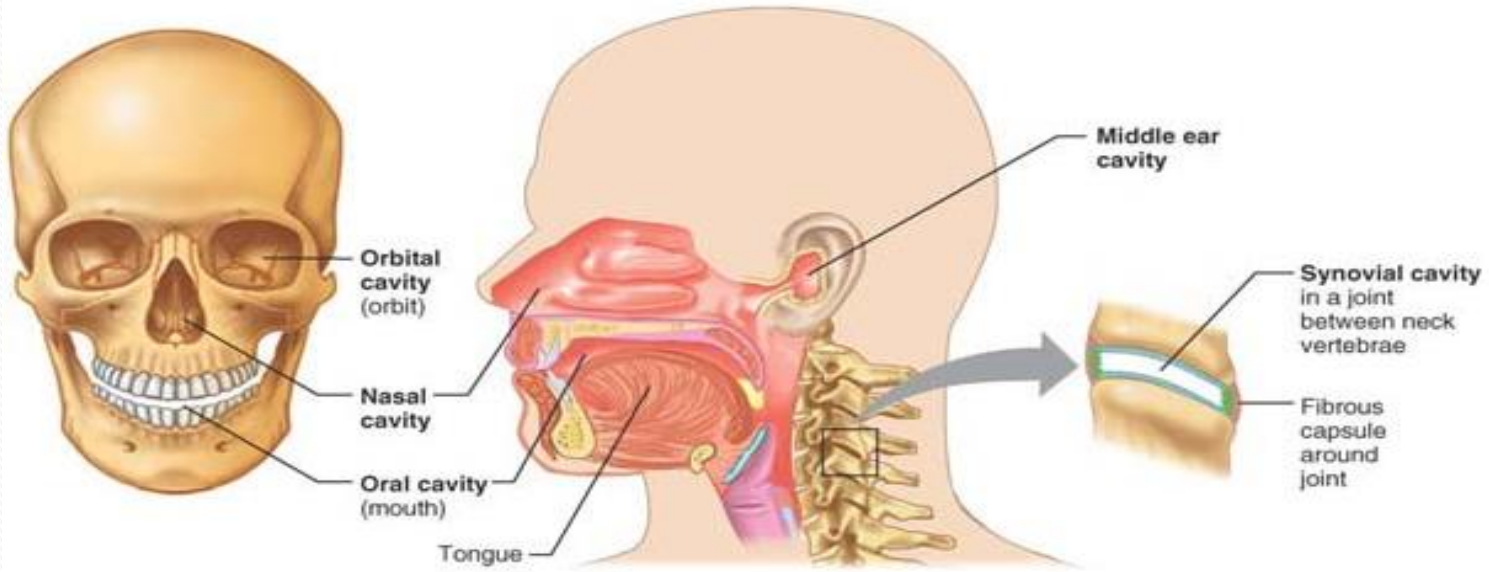
- **Medical personnel** usually use a simpler scheme to localize the abdomino-pelvic cavity organs.
- In this scheme, **one transverse and one median sagittal plane pass through the umbilicus at right angles**. The resulting quadrants are *named according* to their positions from the *subject's point of view* not from the observer's point of view. (figure and its naming will be tubsy turby i.e on observer's right hand side there will be a figure naming as left quadrant).



Other Body Cavities

In addition to the large closed body cavities, there are several smaller body cavities.

A. **Oral and digestive cavities**
B. **Nasal cavity**
C. **Orbital cavities**
D. **Middle ear cavities**
E. **Synovial cavities** : Synovial cavities are *joint cavities.* They are enclosed within fibrous capsules that surround freely movable joints of the body (such as the *elbow and knee joints*).



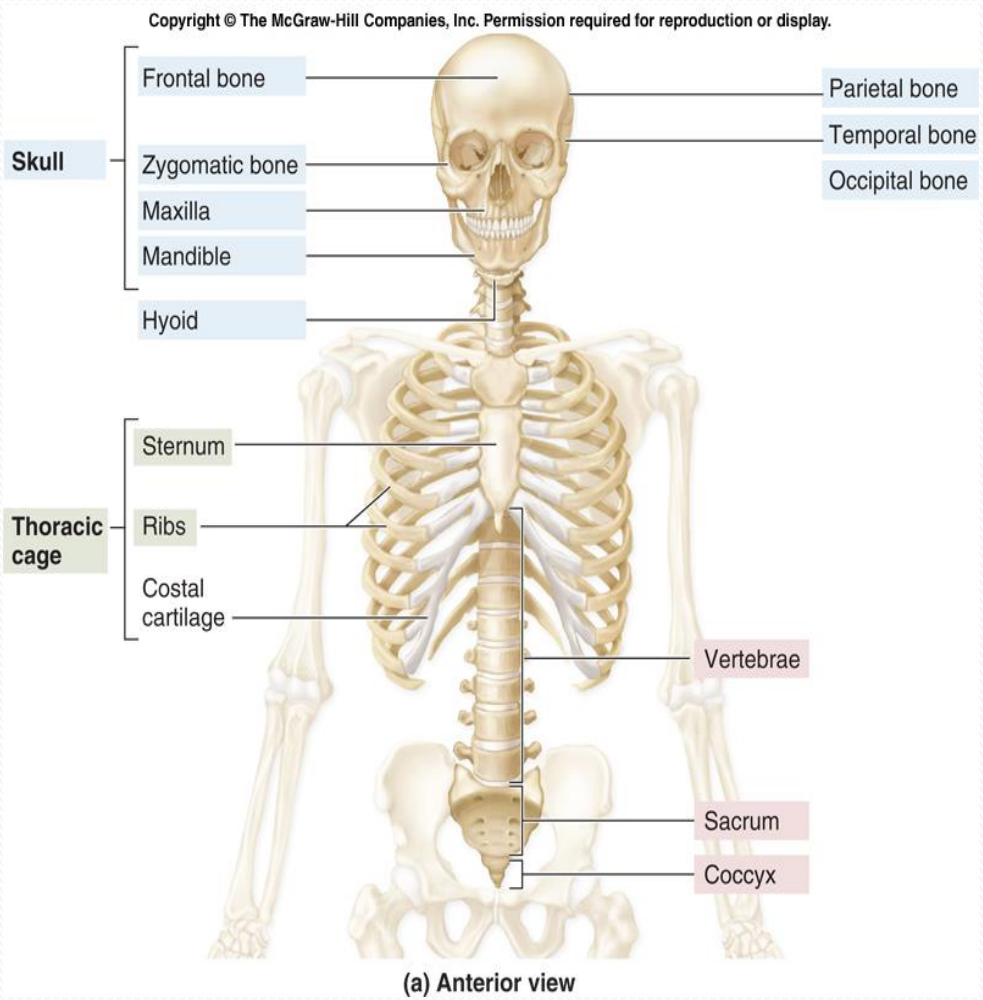
Body Regions

- The human body is partitioned into two main regions, called the axial and appendicular regions.
  - the **axial region** includes the head, neck, and trunk which comprise the main vertical axis of our body
  - our limbs, or appendages, attach to the body's axis and make up the **appendicular region**

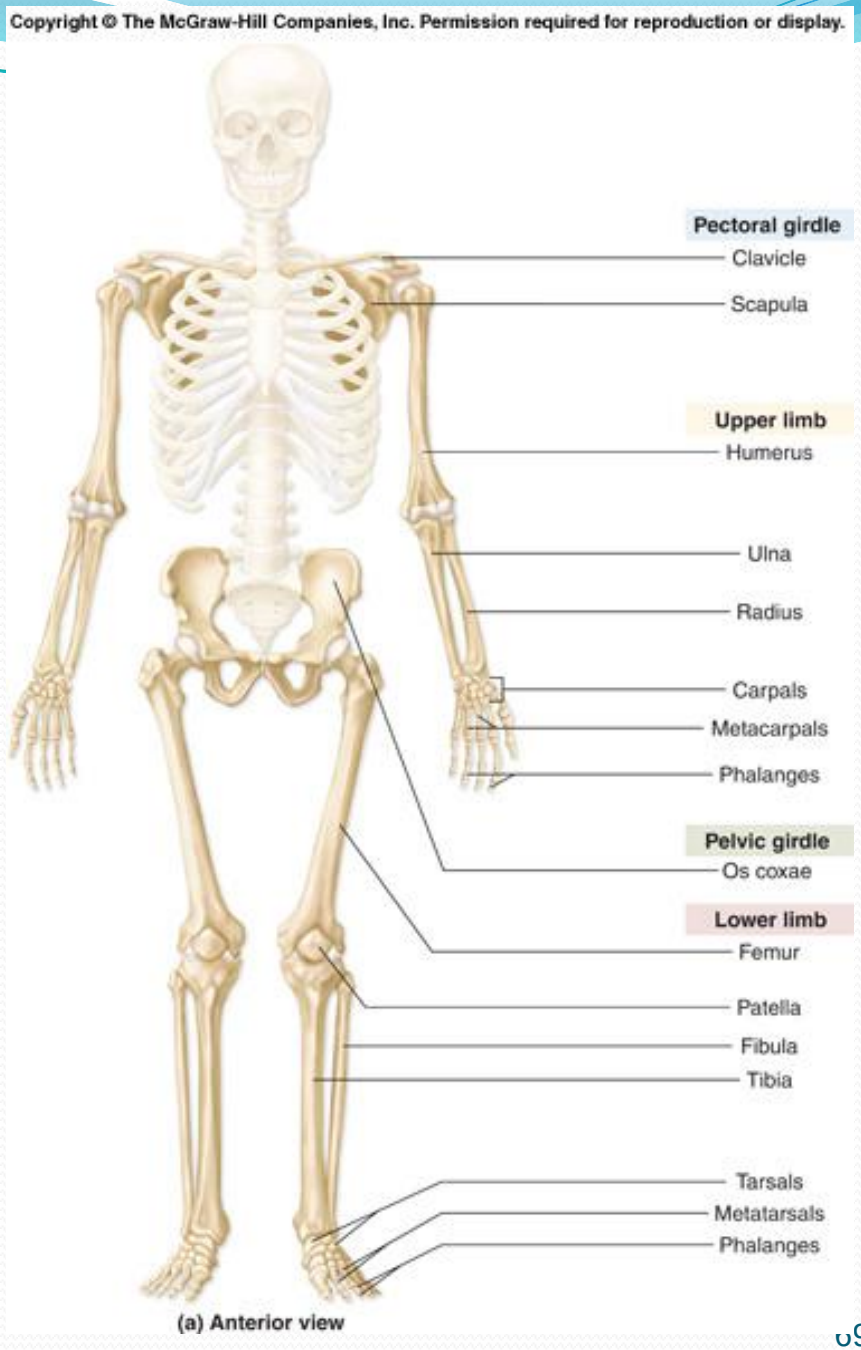
Skeletal System

- The axial skeleton is composed of the bones along the central axis of the body,
  - the skull
  - the vertebral column
  - the thoracic cage
- The appendicular skeleton consists of the bones of the appendages
  - upper and lower limbs
  - the bones that hold the limbs to the trunk of the body.

- axial skeleton



appendicular skeleton

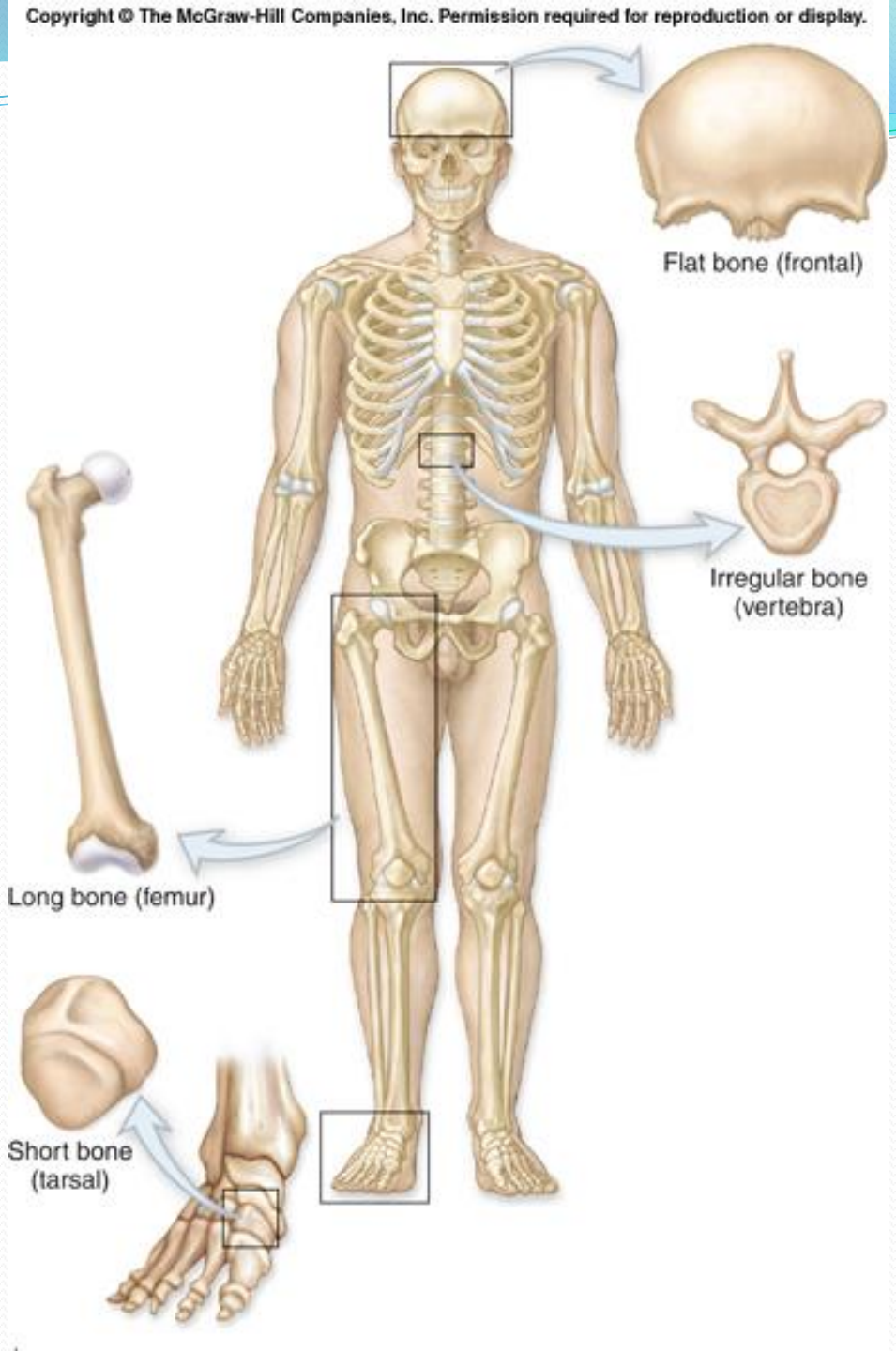


Classification of Bone by Organization

- Axial
  - Skull
  - Vertebral column
  - Thorax
    - Sternum
    - ribs
- Appendicular
  - Pectoral
    - Girdle
    - appendage
  - Pelvic
    - Girdle
    - appendage

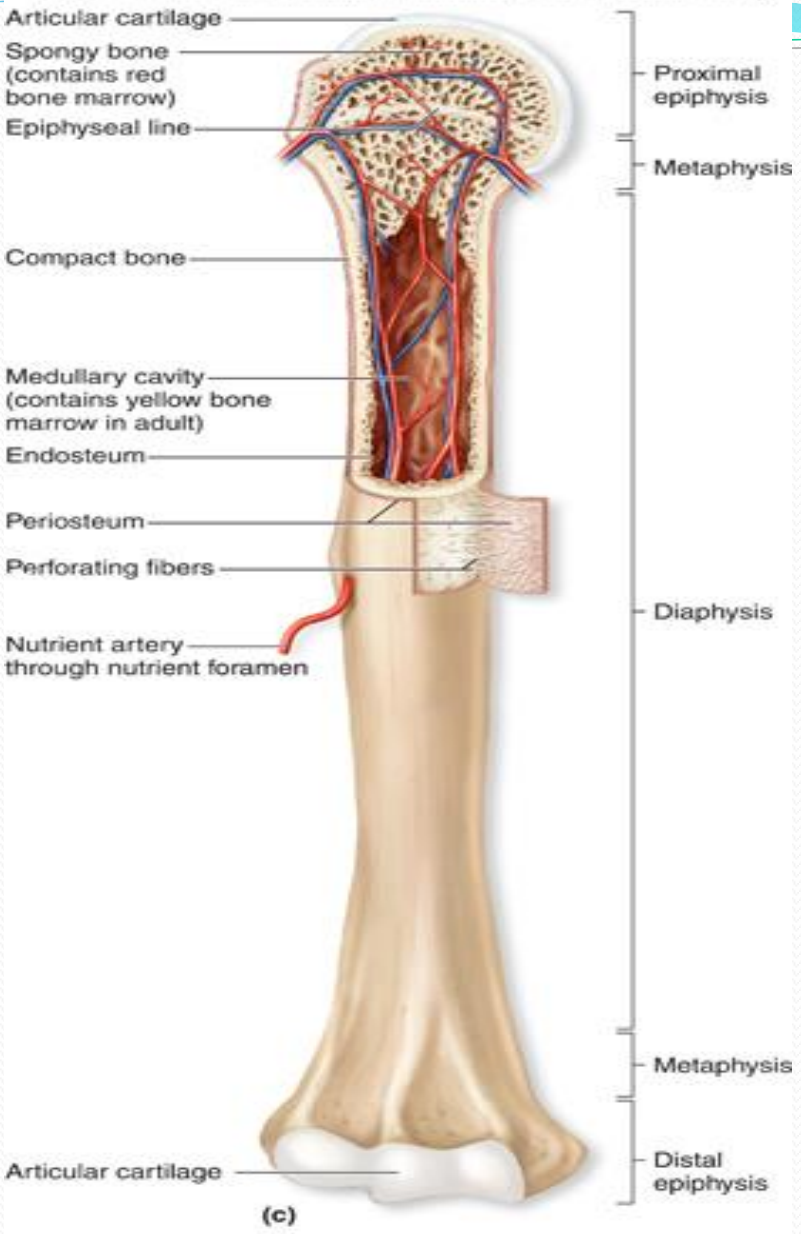
Classification of Bone by Shape

- Long
- Short
- Flat
- Irregular



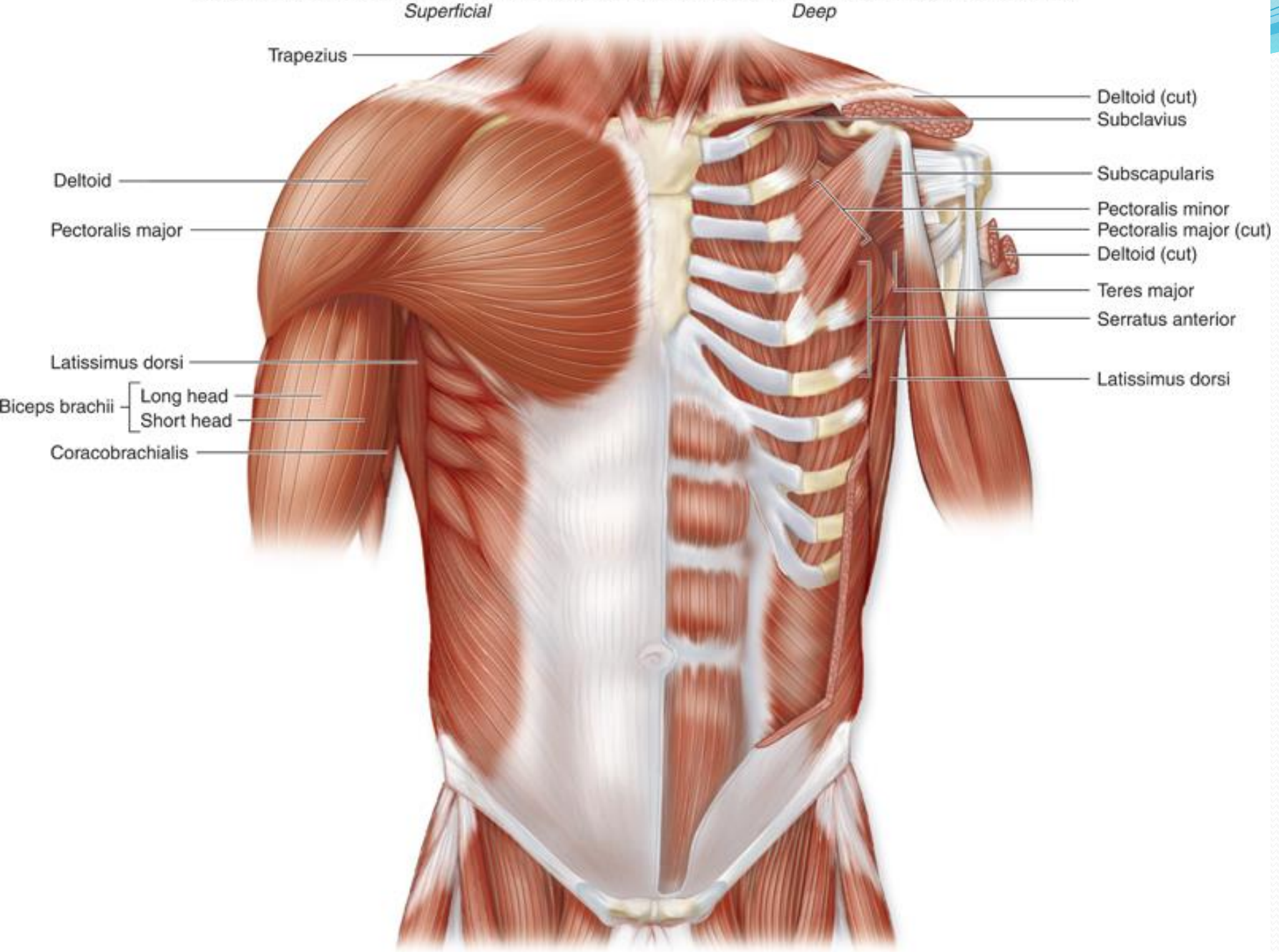
Structure of a Long Bone

- Diaphysis
- Epiphysis
  - proximal
  - distal
- Metaphysis
- Epiphyseal line
- Articular cartilage
- Medullary cavity

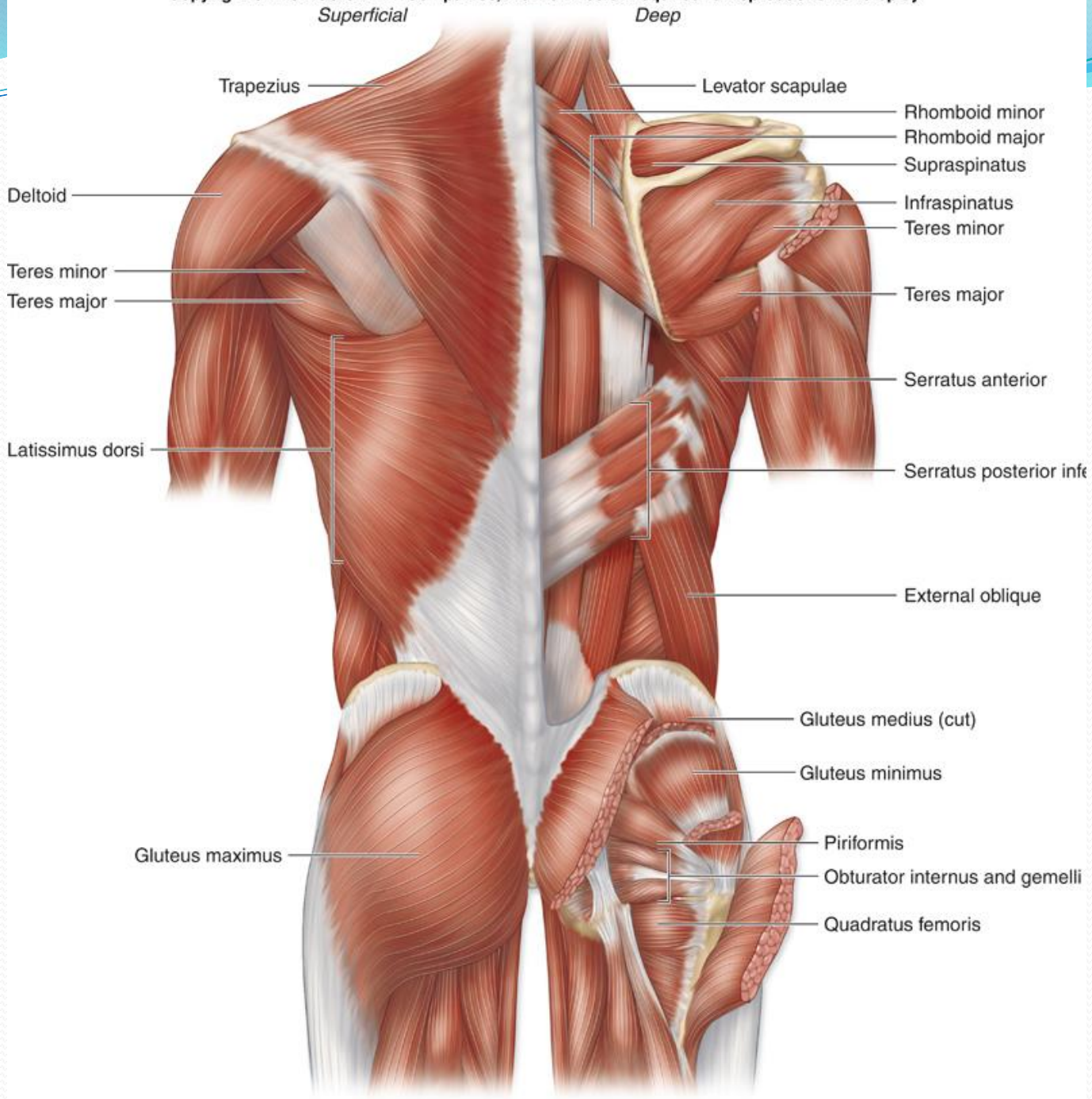


Appendicular Muscles

- Organized into specific groups.
  - muscles that move the pectoral girdle
  - muscles that move the glenohumeral joint/arm
  - arm and forearm muscles that move the elbow joint/forearm
  - forearm muscles that move the wrist joint, hand, and fingers
  - intrinsic muscles of the hand



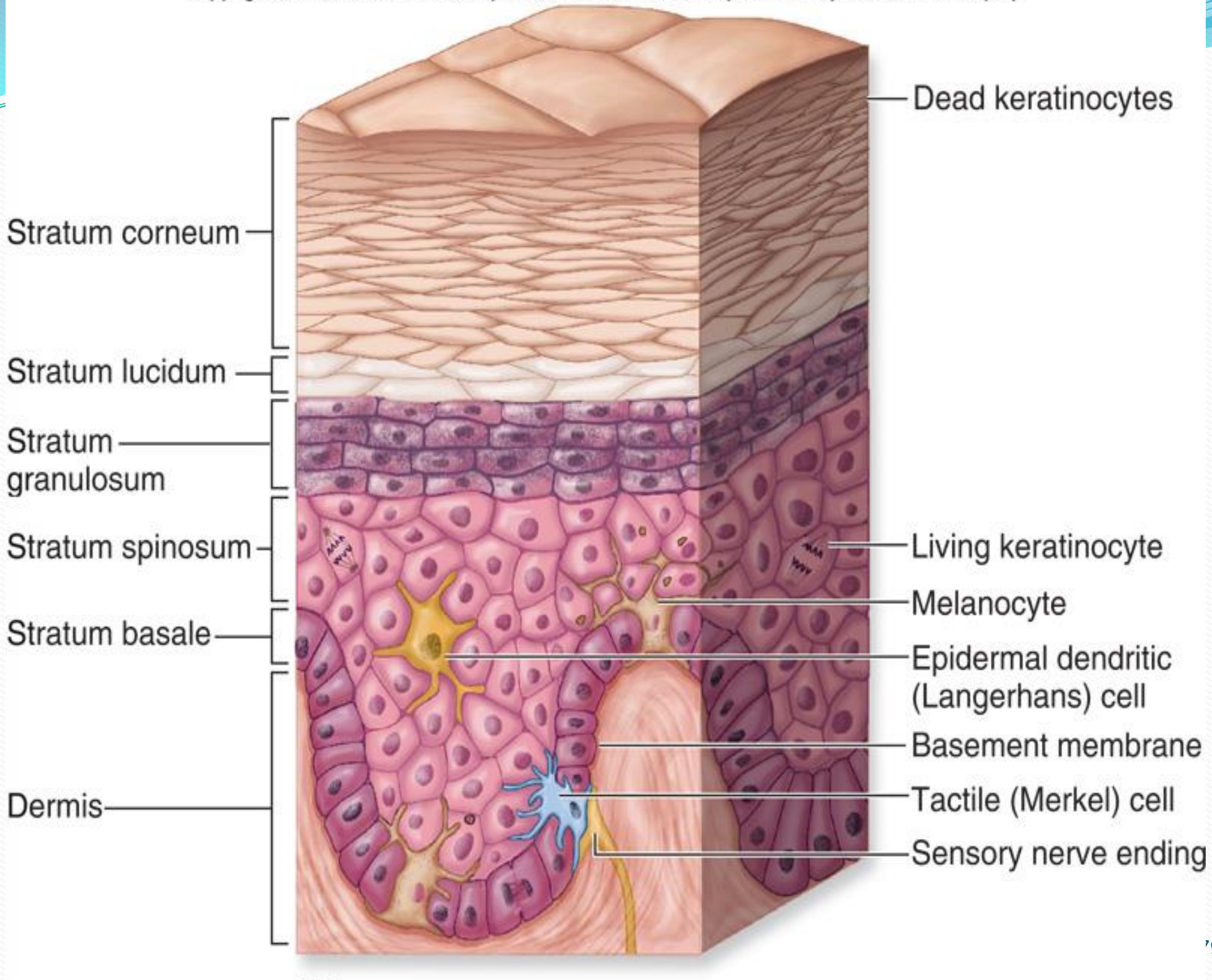
Anterior view



Posterior view

The Integument/ The skin

- The skin that covers your body.
- Skin is also known as the cutaneous membrane.
- Integumentary system consists of the skin and its derivatives—nails, hair, sweat glands, and sebaceous glands.




ANY QUESTIONS