Anatomy

Lab 1

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Introduction

Overview of Anatomy

Anatomical terminology from ancient Greek and Latin

Branches of anatomy

- Gross anatomy
- Microscopic anatomy
  - Cytology
  - Histology
- Developmental anatomy
  - Embryology
- Comparative anatomy

Structural organization from simplest to most complex

- Cellular
- Tissue – group of cells similar in structure and function
- Organ – 2 or more tissue types performing specific function
- Organ system – group of organs acting together to perform specific function
- Human organism

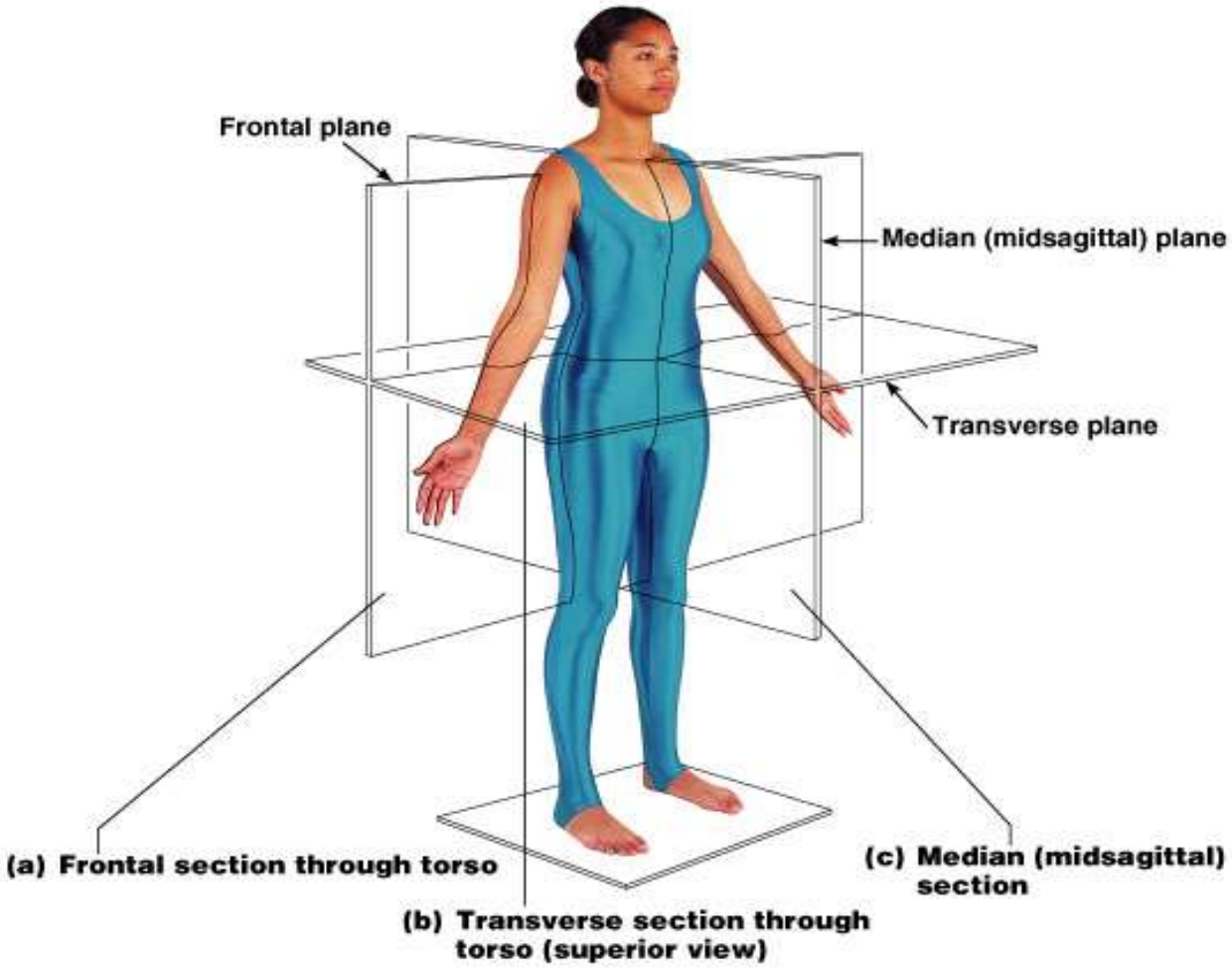
Organ systems

- Integumentary
- Skeletal
- Muscular
- Nervous
- Endocrine
- Cardiovascular
- Lymphatic/immune
- Respiratory
- Digestive
- Urinary
- Reproductive

Gross Anatomy

The anatomical position (see right)

Body planes and sections



Directional and regional terms

- Anterior
- Posterior
- Superior
- Inferior
- Medial
- Lateral
- Proximal
- Distal
- Superficial
- Deep
- Cephalic
- Vertebral
- Thoracic
- Appendicular
- Brachial
- Lumbar

Microscopic anatomy

Histology

- Microscopic examination of the fine structure of organs, tissues and cells
- Tissues are prepared by fixation and then cut into thin sections

Developmental anatomy:

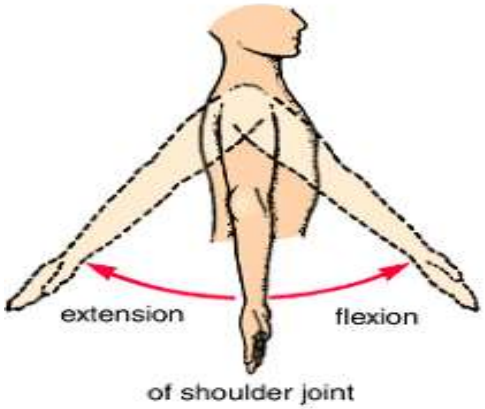
embryology later

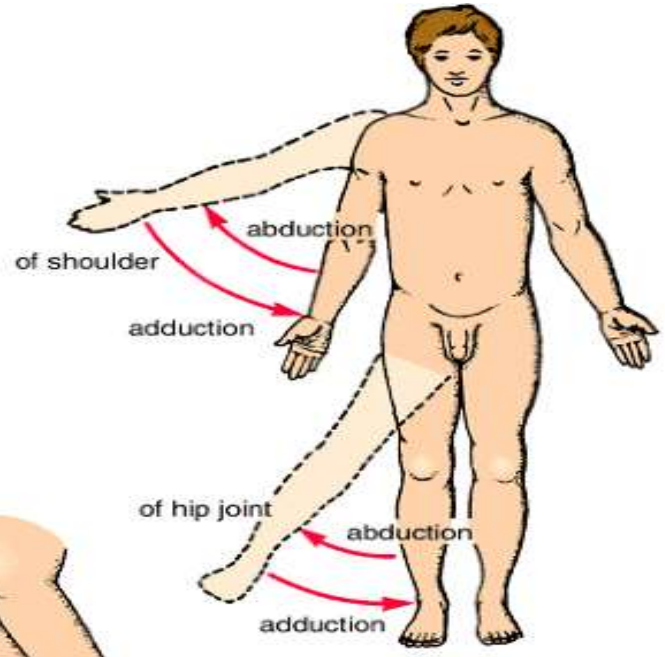
Comparative anatomy

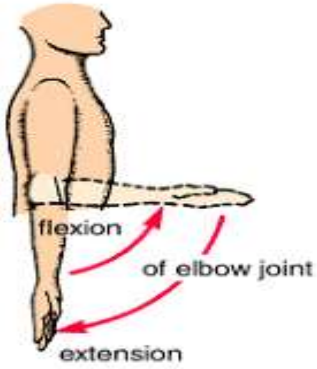
Different animals

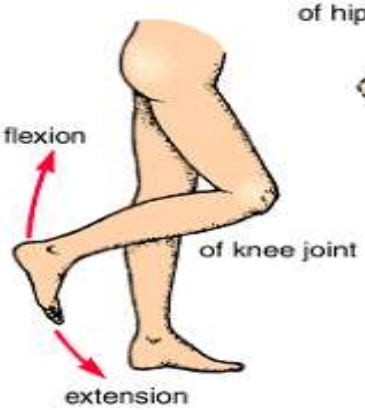
Terms Related to Movement

A site where two or more bones come together is known as a joint. Some joints have no movement (sutures of the skull), some have only slight movement (superior tibiofibular joint), and some are freely movable (shoulder joint).

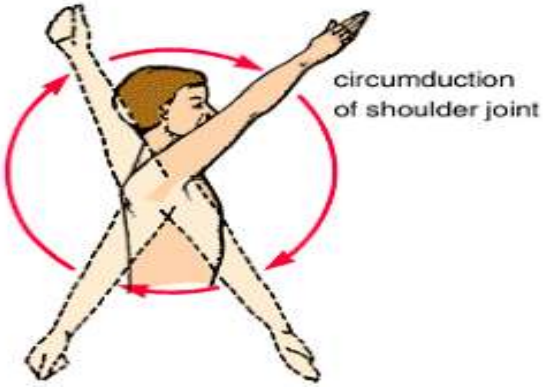

extension
flexion
of shoulder joint

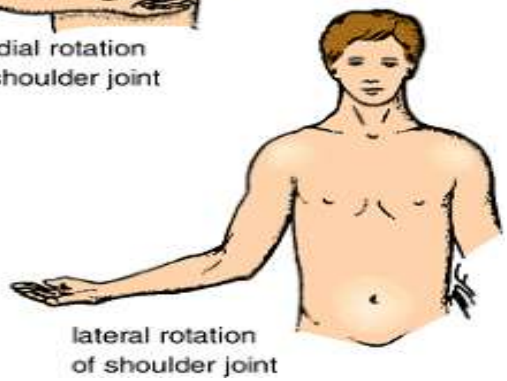

abduction
of shoulder
adduction
of hip joint
abduction
adduction

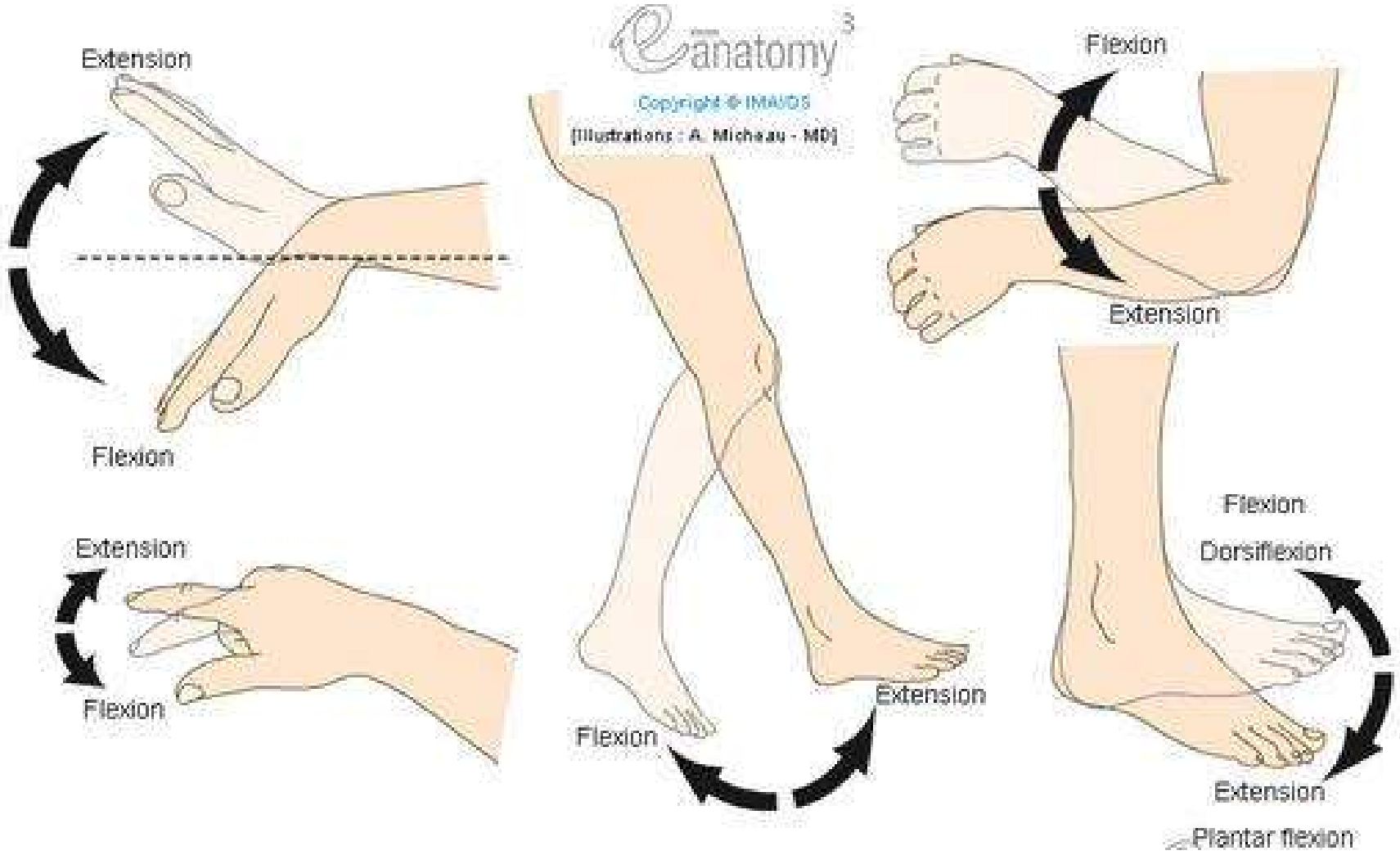

flexion
of elbow joint
extension


flexion
of knee joint
extension


medial rotation
of shoulder joint


circumduction
of shoulder joint


lateral rotation
of shoulder joint


Extension
Flexion
Extension
Flexion
anatomy 3
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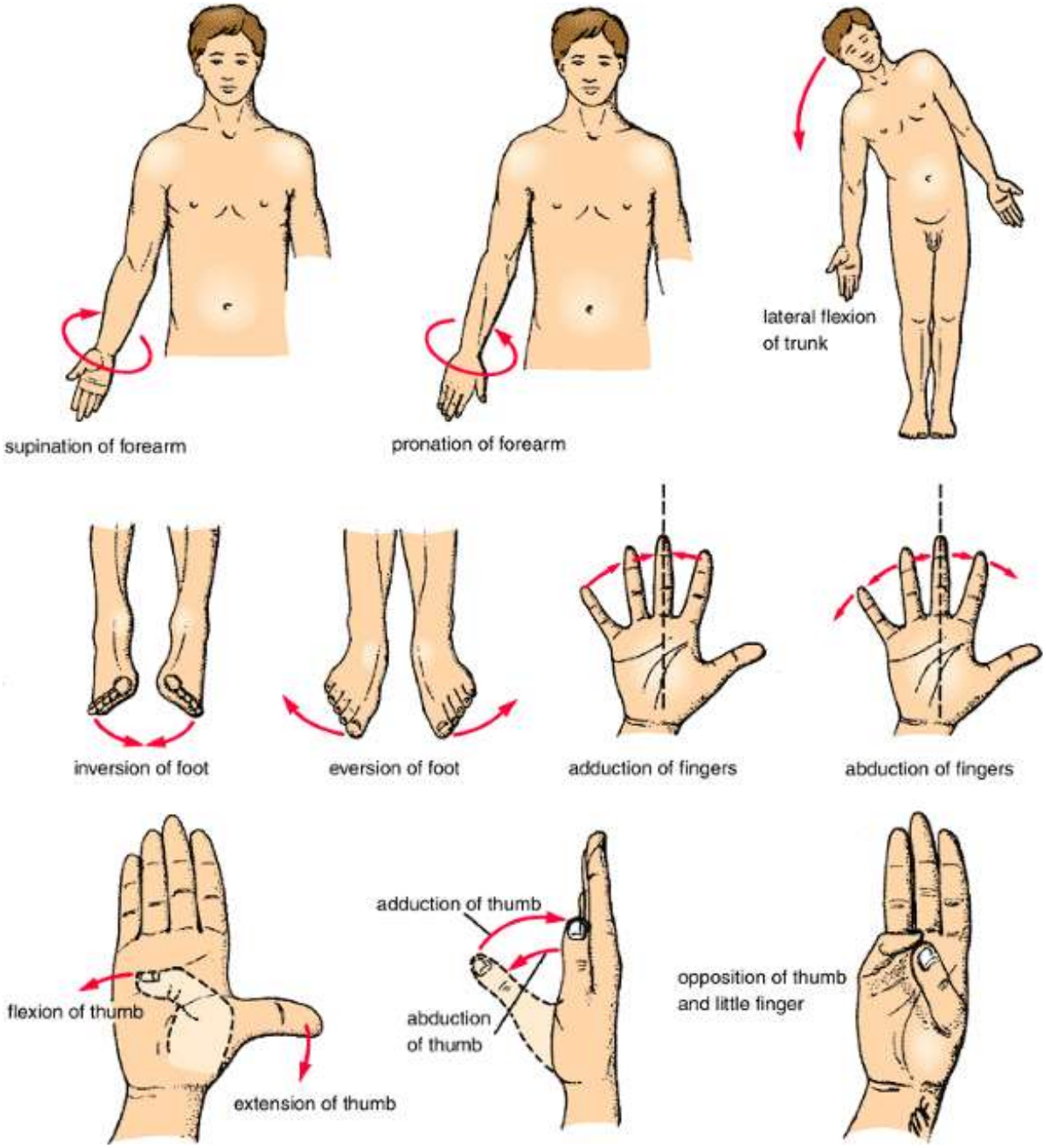
Flexion
Extension
Flexion
Extension
Flexion
Dorsiflexion
Extension
Plantar flexion


supination of forearm
pronation of forearm
lateral flexion
of trunk
inversion of foot
eversion of foot
adduction of fingers
abduction of fingers
flexion of thumb
extension of thumb
adduction of thumb
abduction
of thumb
opposition of thumb
and little finger

The Cell

Basic Unit of Structure and Function

structural and functional units of all living organisms, building blocks of the human body. adult human body contains ~ 75 trillion cells.

Each cell type performs specific function.

~200 cell types in humans

Study of Cells

Cytology: study of cells

Microscopic anatomy

- Individual cells observable by light microscopy
- Subcellular structures observable by electron microscopy.
  - Transmission EM
  - Scanning EM

Parts of a cell

Cell Membrane (or plasma membrane)
Cytoplasm (Cytosol and Organelles)
Nucleus

Plasma (Cell) Membrane

separates the internal contents of the cell from external materials.

Cytoplasm

general term for all cellular contents located between the plasma membrane and the nucleus.

Nucleus

“control center” of the cell
controls protein synthesis

Plasma membrane

Plasma membrane: composition

Lipids

- Phospholipids
  - Head: hydrophilic
  - Tail: hydrophobic
  - Form lipid bilayer
- Cholesterol
- Glycolipids
  - Carbohydrate component
  - Part of glycocalyx

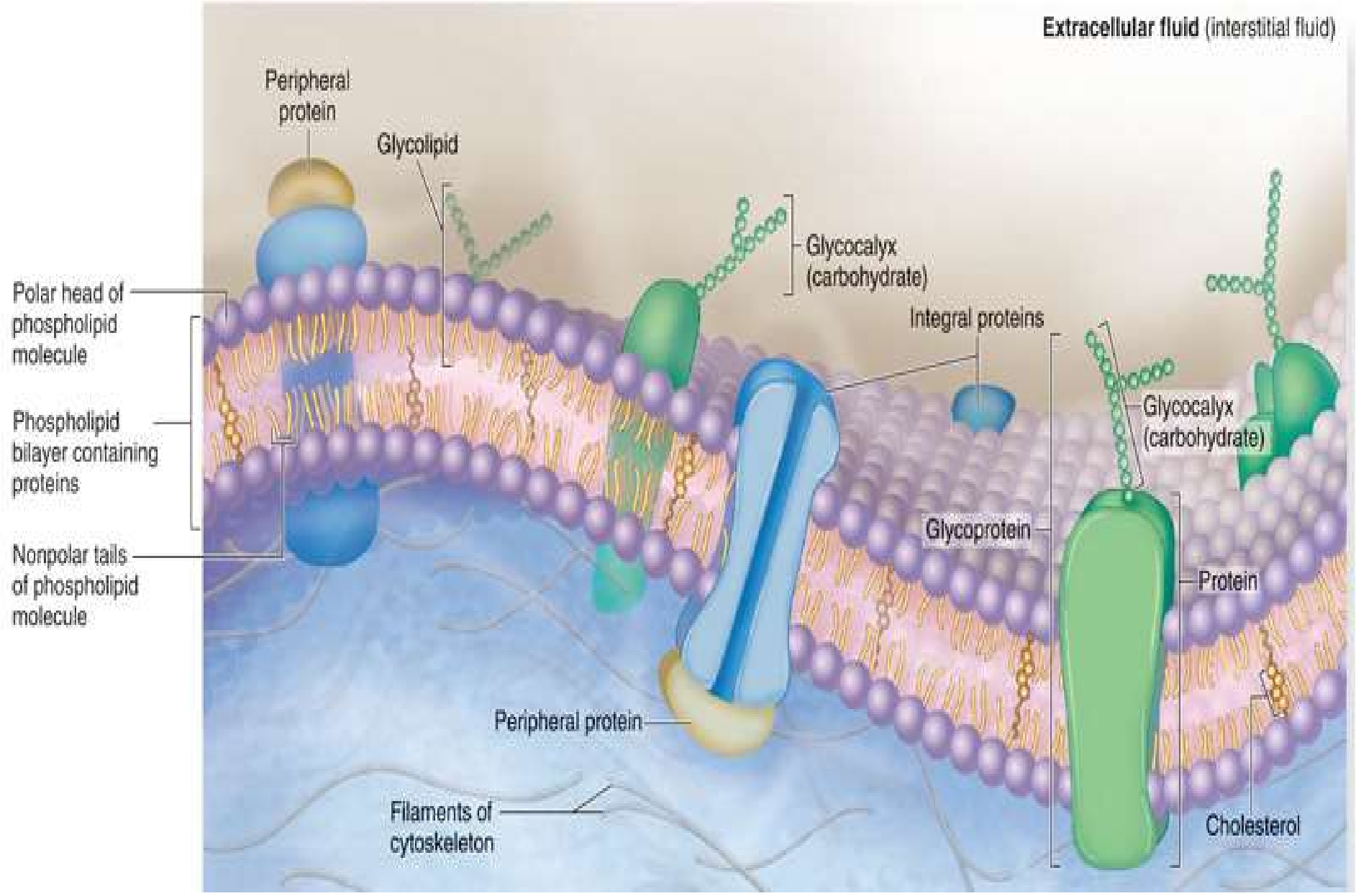
Protein

- Integral membrane proteins
- Peripheral membrane proteins

Plasma membrane: functions

Selectively permeable barrier

- Nutrient in
- Waste out


Extracellular fluid (interstitial fluid)
Peripheral protein
Glycolipid
Glycocalyx (carbohydrate)
Integral proteins
Glycocalyx (carbohydrate)
Polar head of phospholipid molecule
Phospholipid bilayer containing proteins
Nonpolar tails of phospholipid molecule
Glycoprotein
Protein
Peripheral protein
Filaments of cytoskeleton
Cholesterol

Cytoplasm: Organelles

Complex, organized structures, Each type performs a different function for the cell.

Include:

- Endoplasmic Reticulum
  - Rough Endoplasmic Reticulum (RER)
  - Smooth Endoplamic Reticulum (SER)
- Golgi
- Mitochondria

Endoplasmic Reticulum

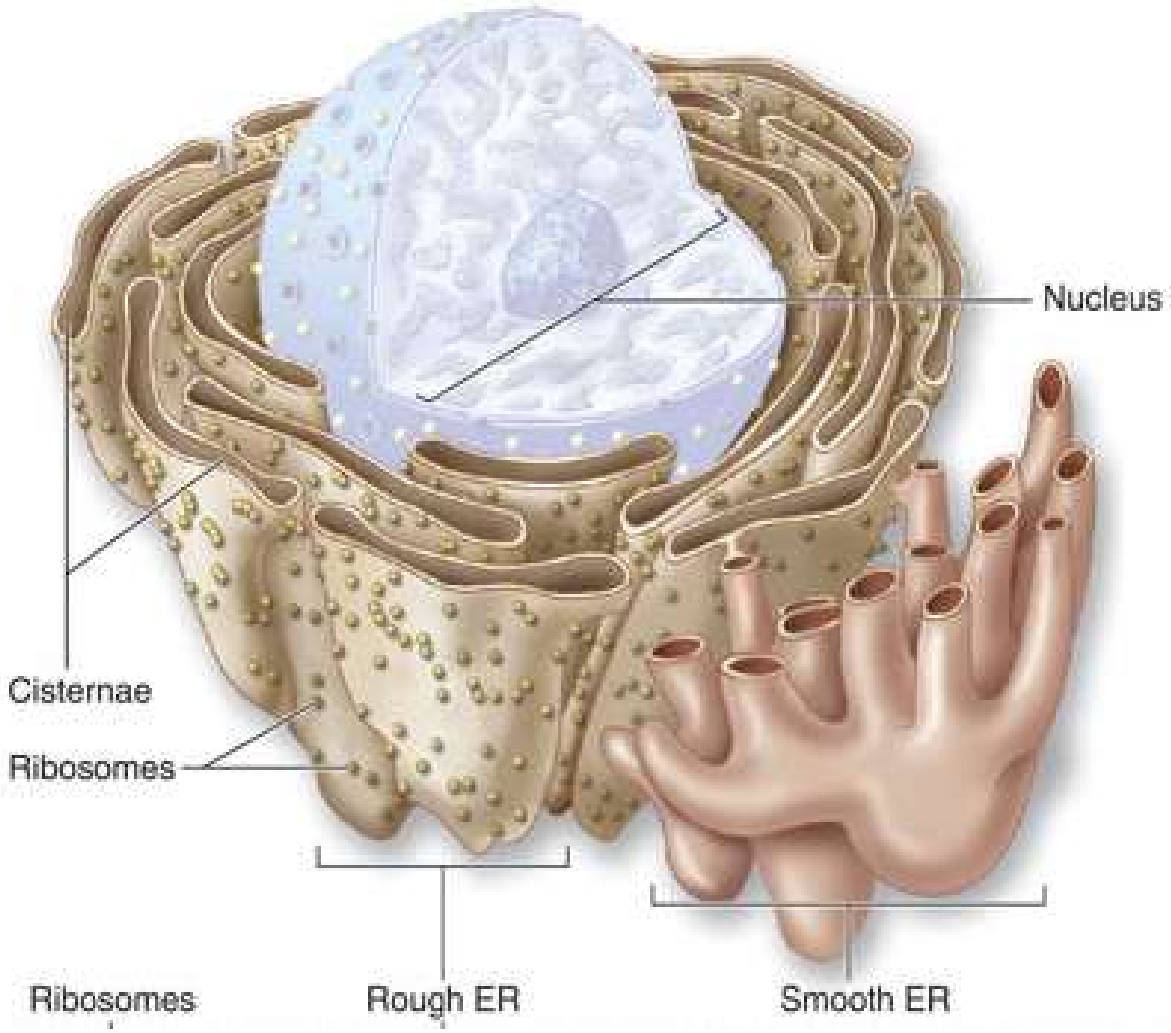
Rough Endoplasmic Reticulum (RER)

Have ribosomes and make protein

Smooth Endoplasmic Reticulum (SER)

Lipids and carbohydrates

Detoxification

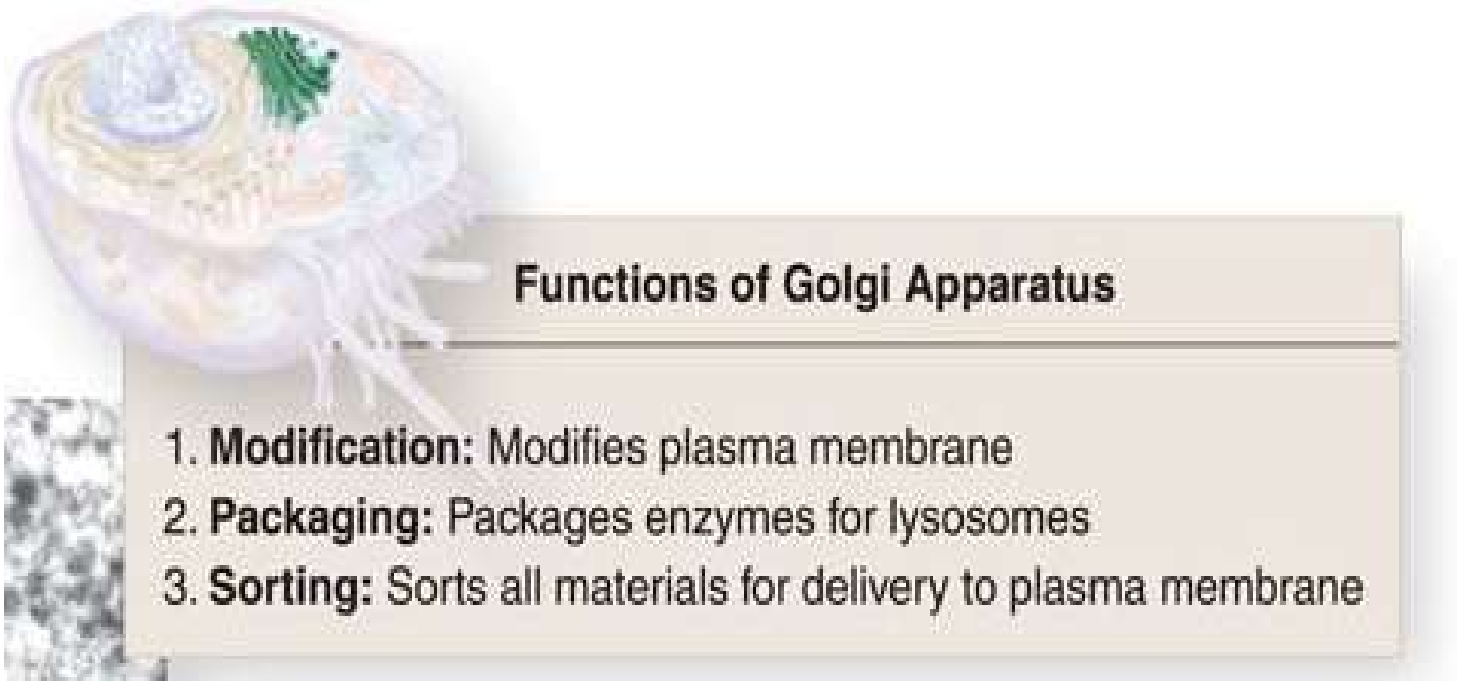

Nucleus
Cisternae
Ribosomes
Ribosomes
Rough ER
Smooth ER

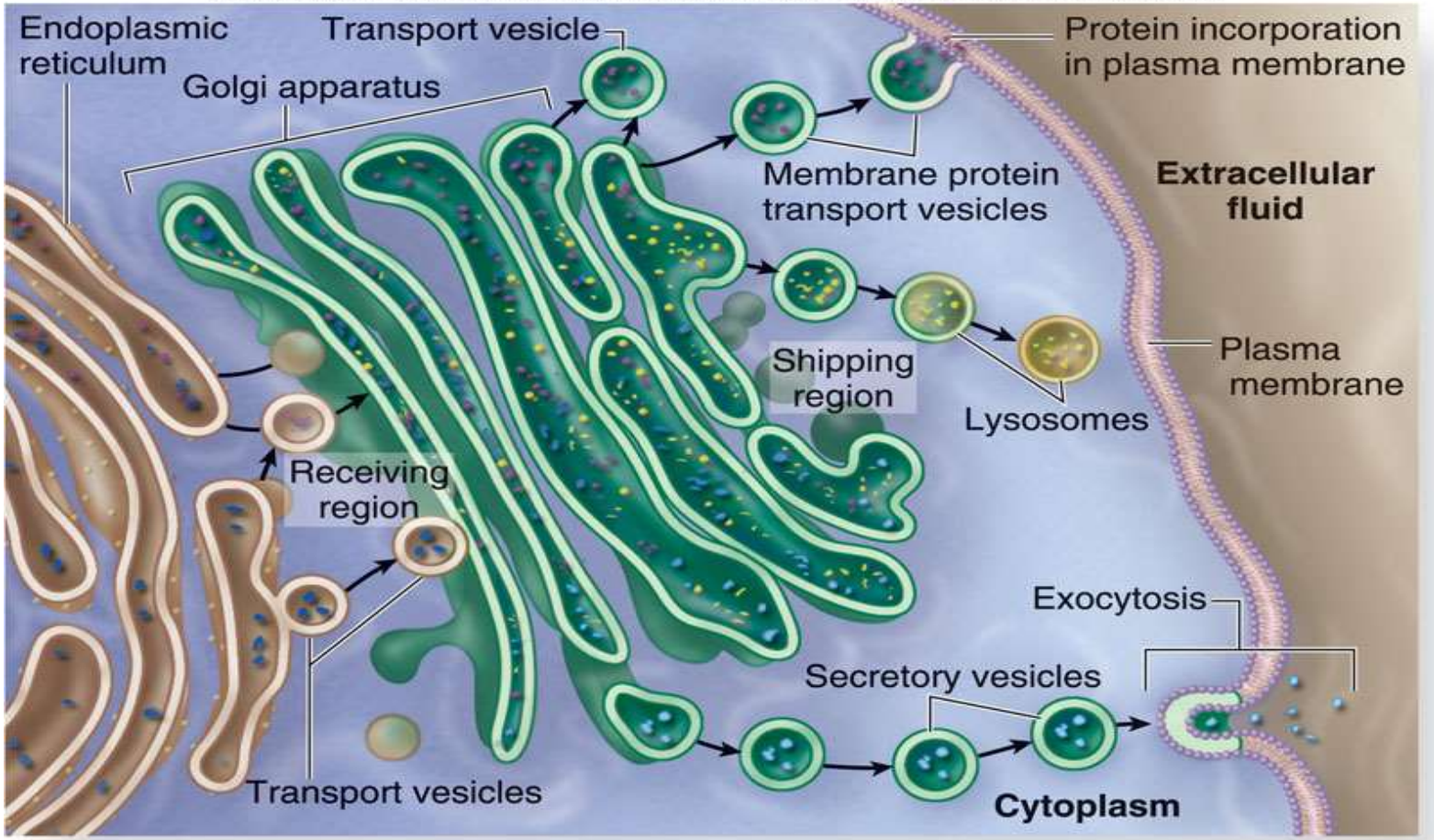
Functions of Endoplasmic Reticulum

1. **Synthesis:** Provides a place for chemical reactions
   a. Rough ER synthesizes proteins for secretion, plasma membrane, and lysosomes
   b. Smooth ER is the site of steroid, fatty acid, and phospholipid synthesis
2. **Transport:** Moves molecules through cisternal space from one part of the cell to another; sequestered away from the cytoplasm
3. **Storage:** Stores newly synthesized molecules
4. **Detoxification:** Smooth ER detoxifies both drugs and alcohol

Golgi Apparatus

- Modifies, stores and sorts material from RER
  - Receiving region (cis-face)
  - Shipping region (trans-face)
- Produces Lysosomes
  - Autophagy: removal of old organelles
  - Autolysis: destruction of the cell

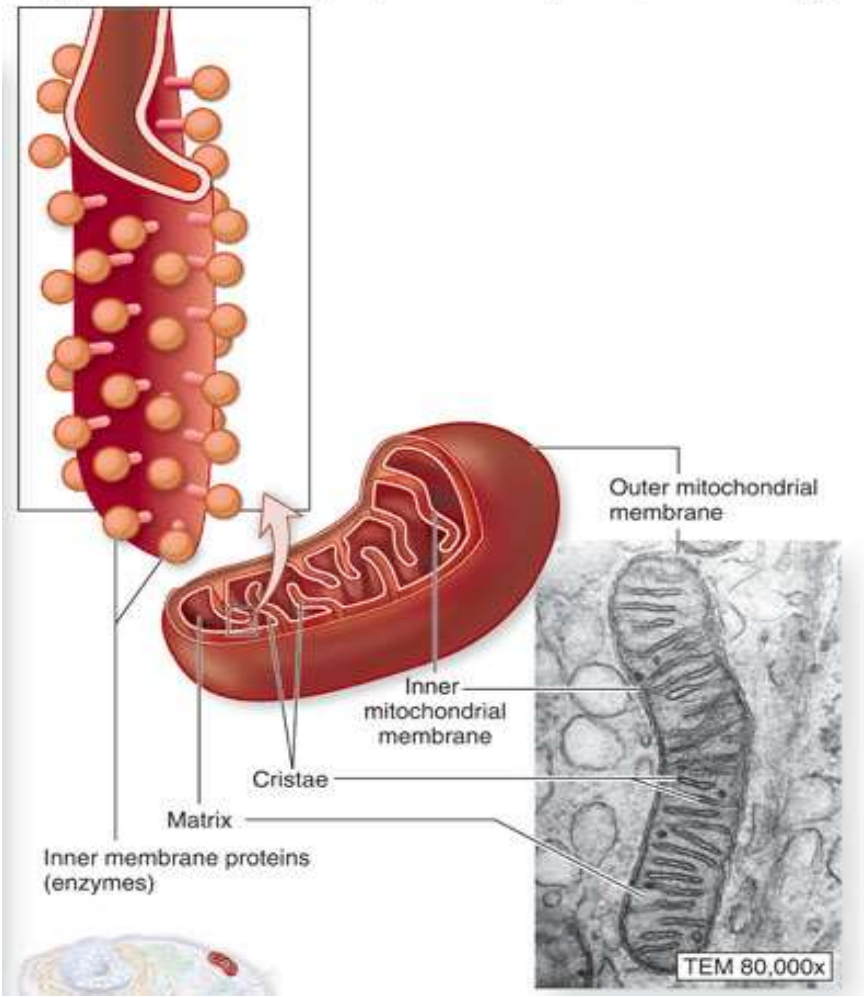




(b)

Mitochondria

are with double membrane organelles. Produce large amounts of ATP. Are called the “powerhouses” of the cell.



Ribosomes

Small, dense granules contain Protein and RNA

Site of protein synthesis. Each ribosome has a small and a large subunit.

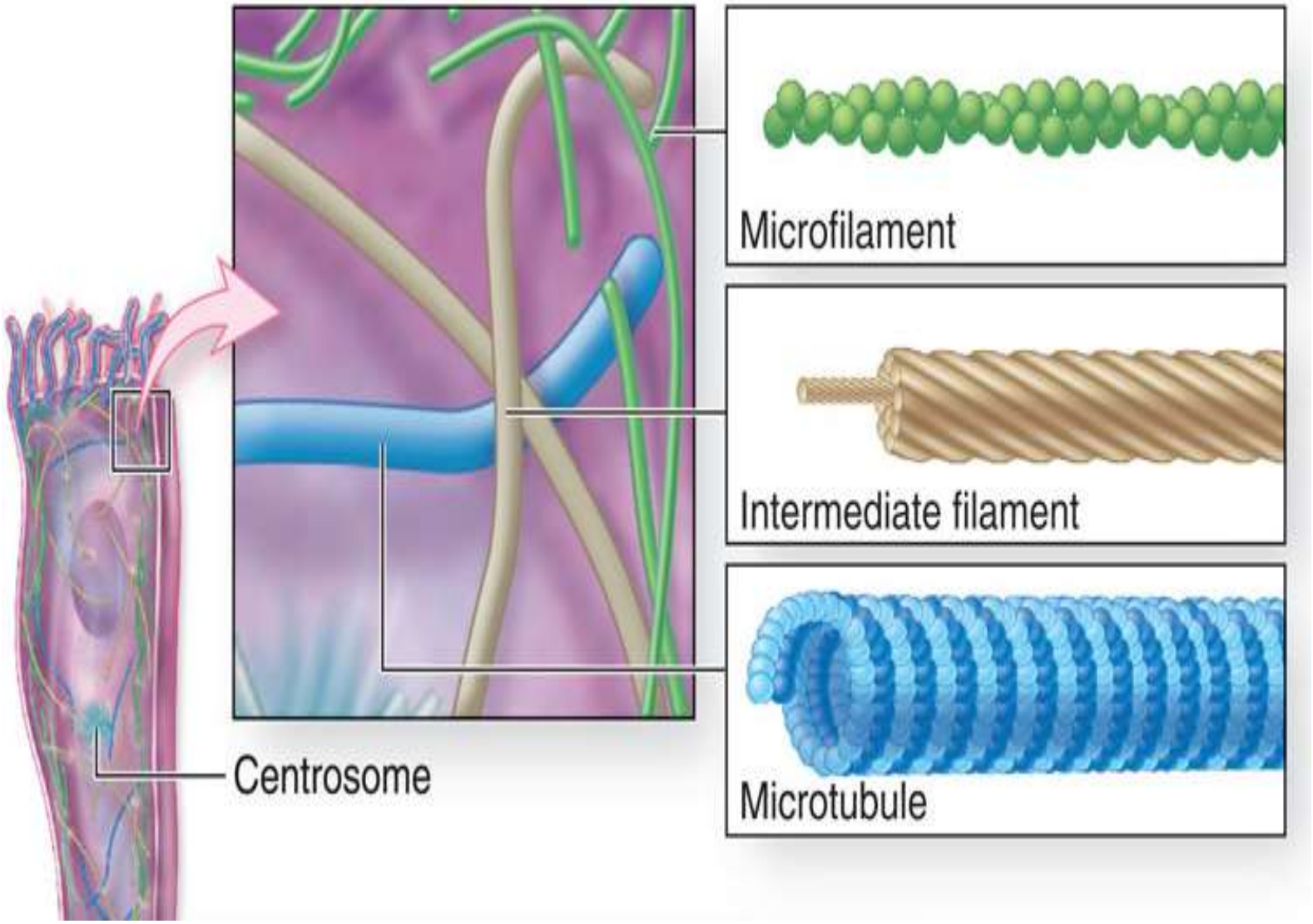
Cytoskeleton

Made of filamentous proteins

Helps give the cell its shape and Cell movement

Three categories:

- microfilaments
- intermediate filaments
- microtubules


Microfilament
Intermediate filament
Microtubule
Centrosome

Microvilli, Cilia and Flagella

Appendages extending from the surface of some cells.

Microvilli:

short, cytoplasmic extensions

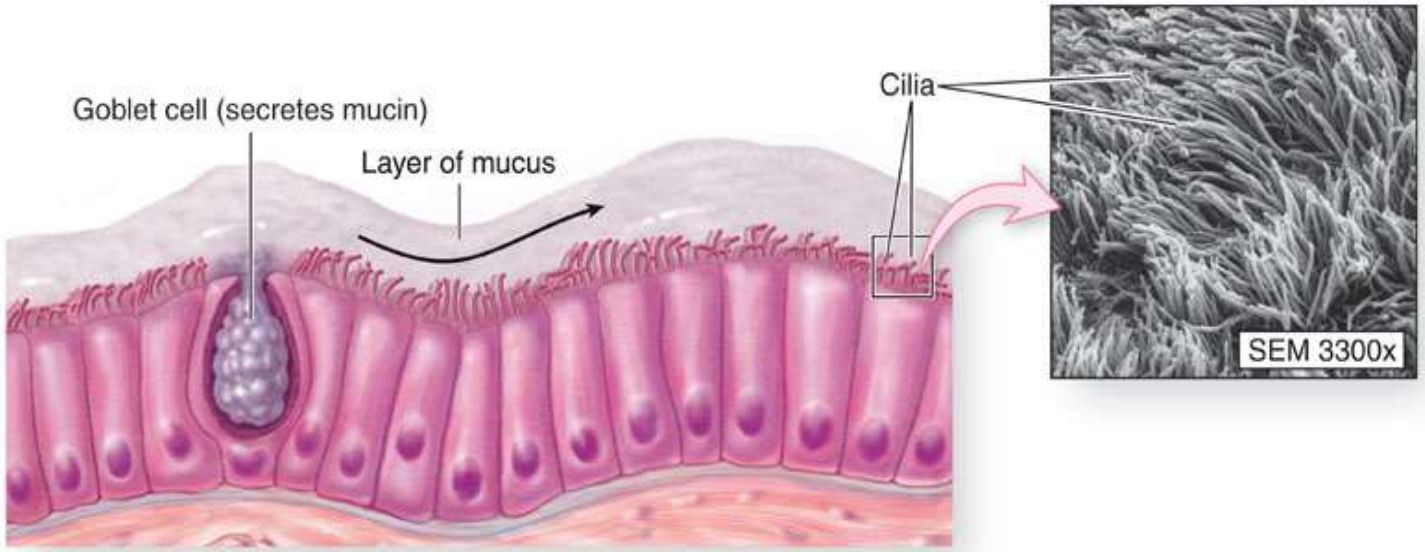
For absorption

Cilia:

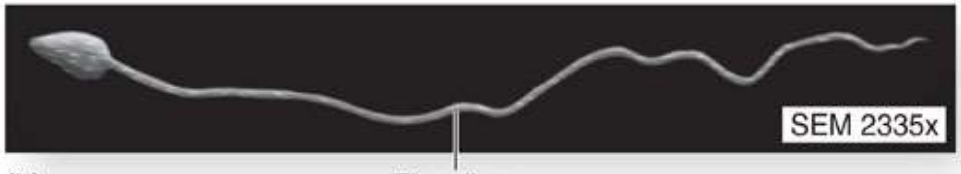
occur in large numbers and work together to move materials or fluids along the surface of a cell.

Flagella:

longer than cilia, occur as single appendages and Move the cell



(a)



(b)

Nucleus

Control center of cellular activities. it is the largest structure within the cell and appears as a single spherical or oval structure.

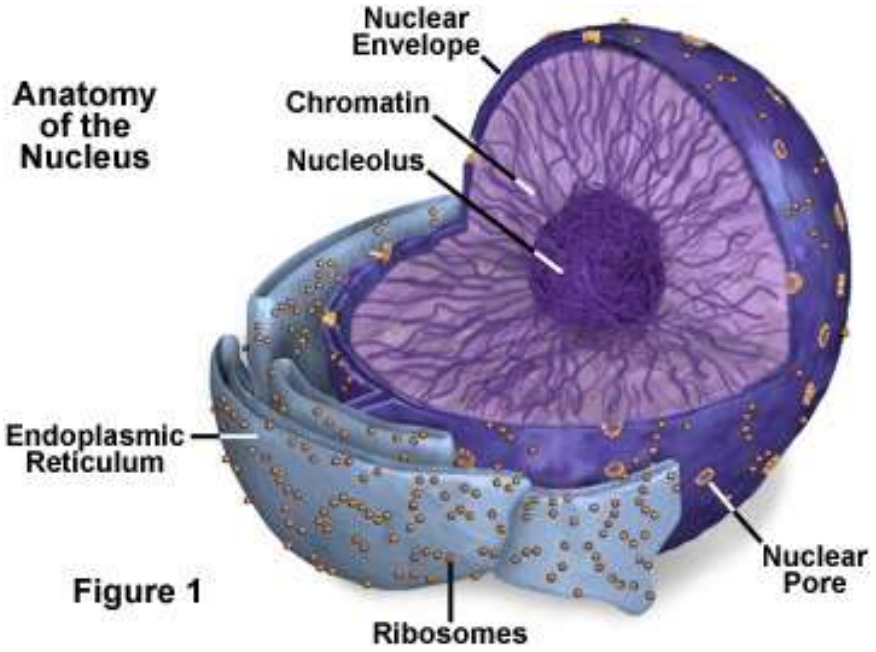


Figure 1

- Enclosed by a double membrane called **nuclear envelope**: controls the entry and exit of materials between the nucleus and the cytoplasm.
- may contain one or more nucleoli.
- are responsible for making the small and the large subunits of ribosomes.

Chromatin and DNA

DNA :

is the genetic material housed within nucleus. is a polymer of nucleotides :

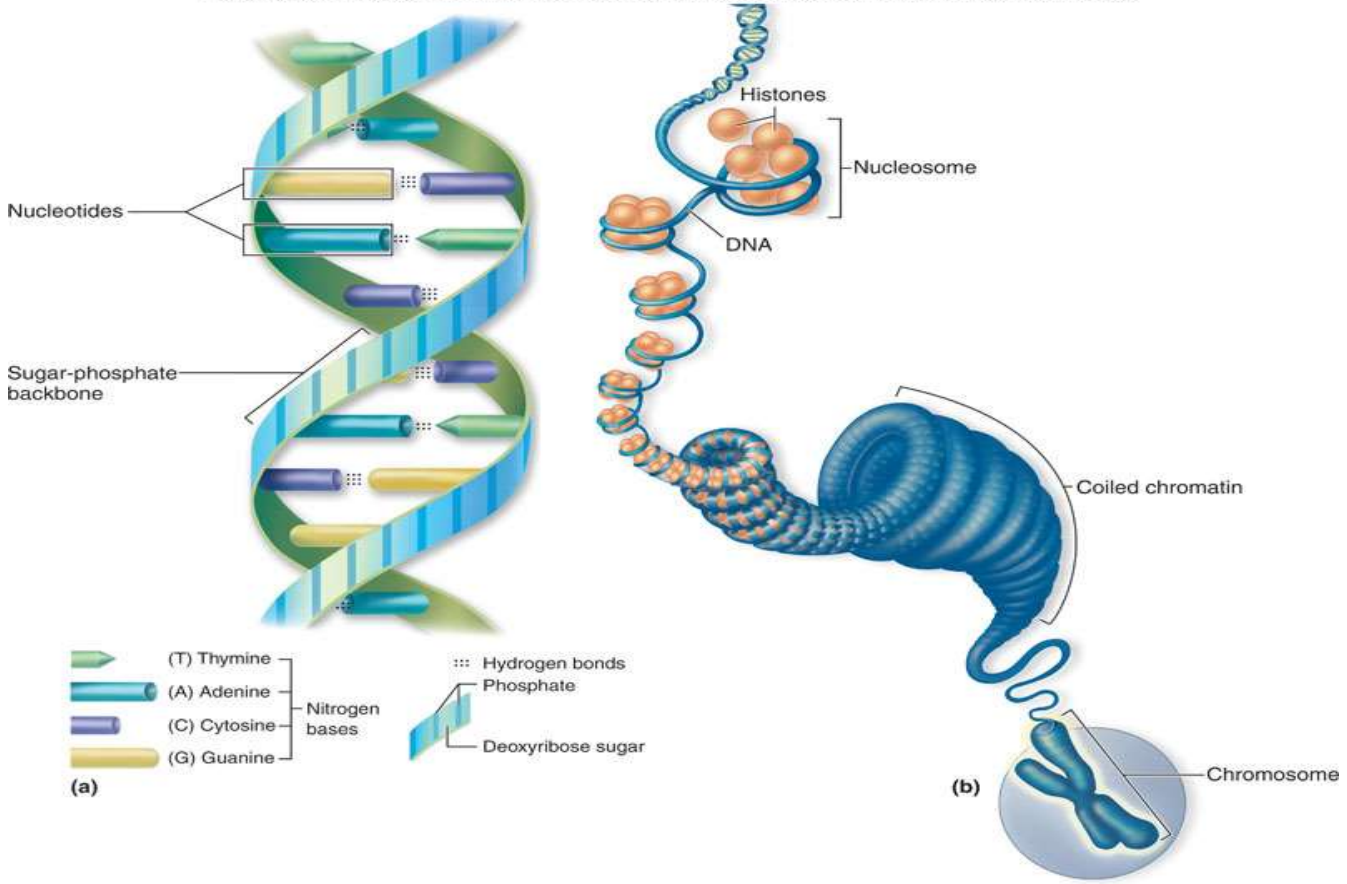
sugar, phosphate and nitrogen base

Is a double helix.

Chromatin:

Strands of DNA and histone proteins

- Euchromatin: uncoiled; active
- Heterochromatin: coiled. inactive



Chromosome

is the most organized level of genetic material. Each chromosome contains a single, long molecule of DNA and associated proteins. become visible only when cell is dividing.

Tissue

Tissue are grouping of similar cells with a common or related function.

Tissue types

1- epithelial tissue ---- covering

2- connective tissue ---- support and defense

3- nervous tissue ----- control

4- muscle tissue ------ movement

Epithelial tissue

Divide According to the number of cells layers we have :-

Simple epithelial tissue.
Stratified epithelial tissue.

According to the shape of cells we have :-

Squamous epithelial tissue.
Cuboidal epithelial tissue.
Columnar epithelial tissue.
Pseudostratified epithelial tissue

1-Simple Squamous epithelial tissue

It′s a single layer of than , flat , polygonal cell , each with a central nucleus.

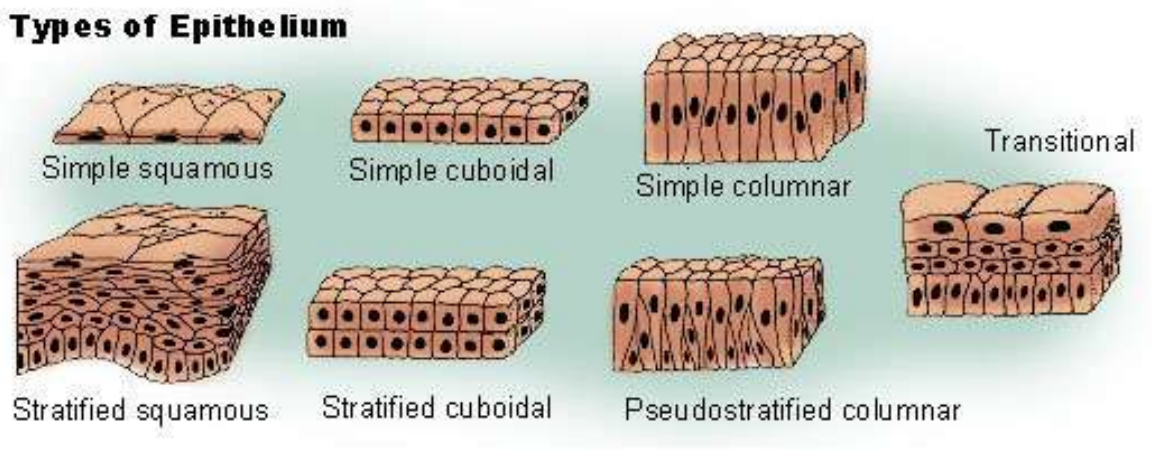
EX:- endothelium that lines blood vessels

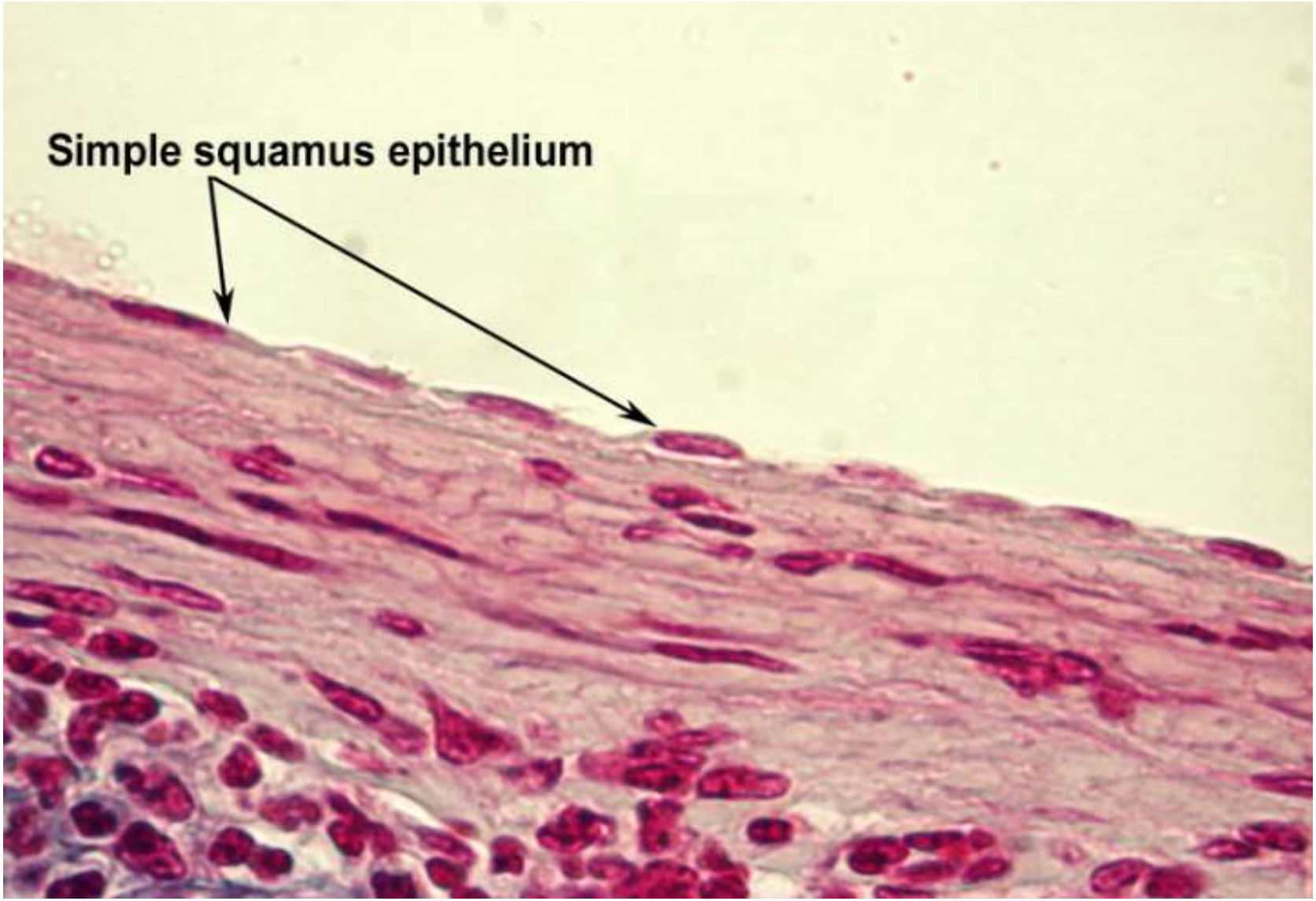
2-Simple cuboidal epithelial tissue .

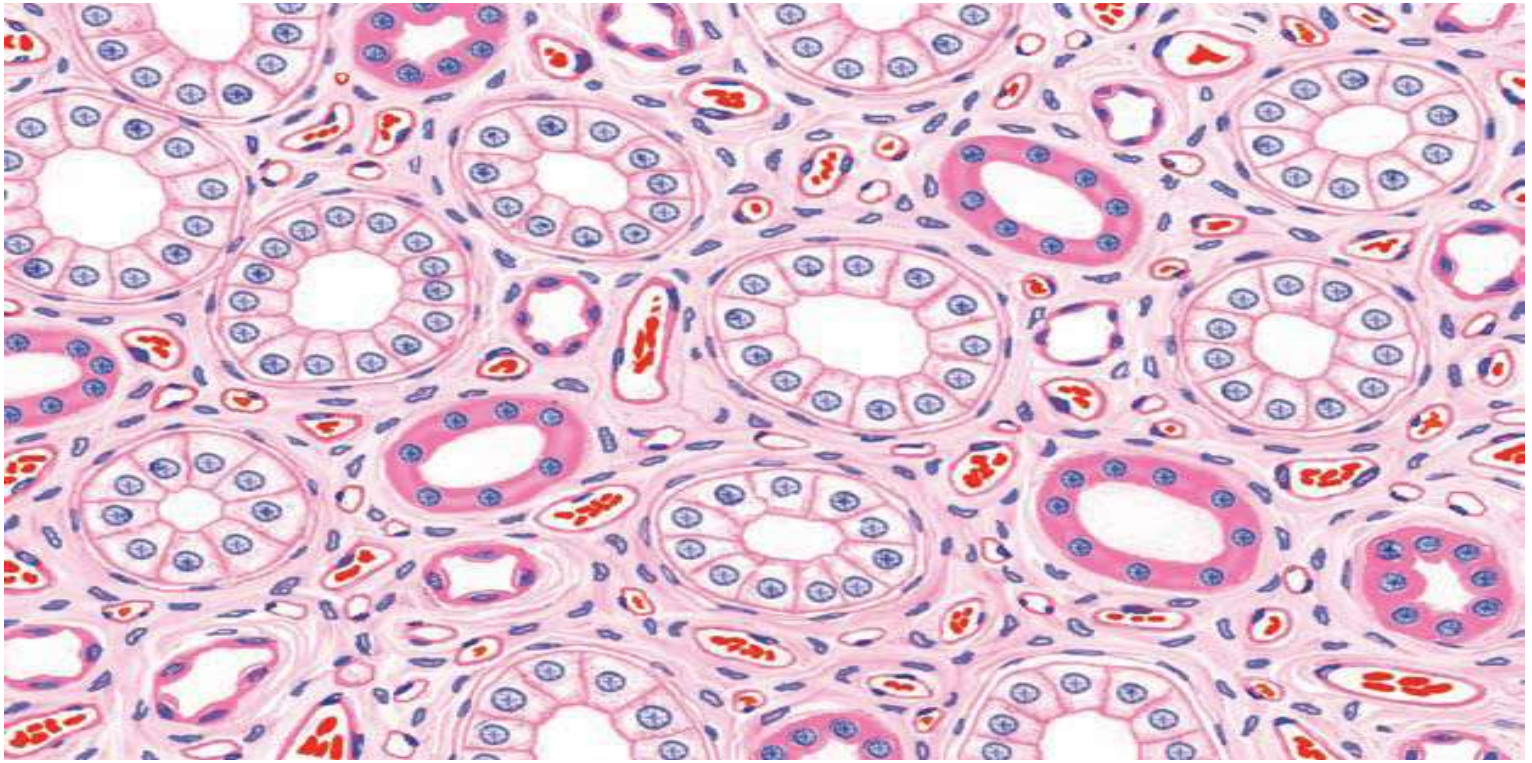
It′s a single layer of cube – shaped cells , each with a central spherical nucleus , its found in kidney tubules and in ducts of many gland

3- Simple Columnar epithelial tissue .

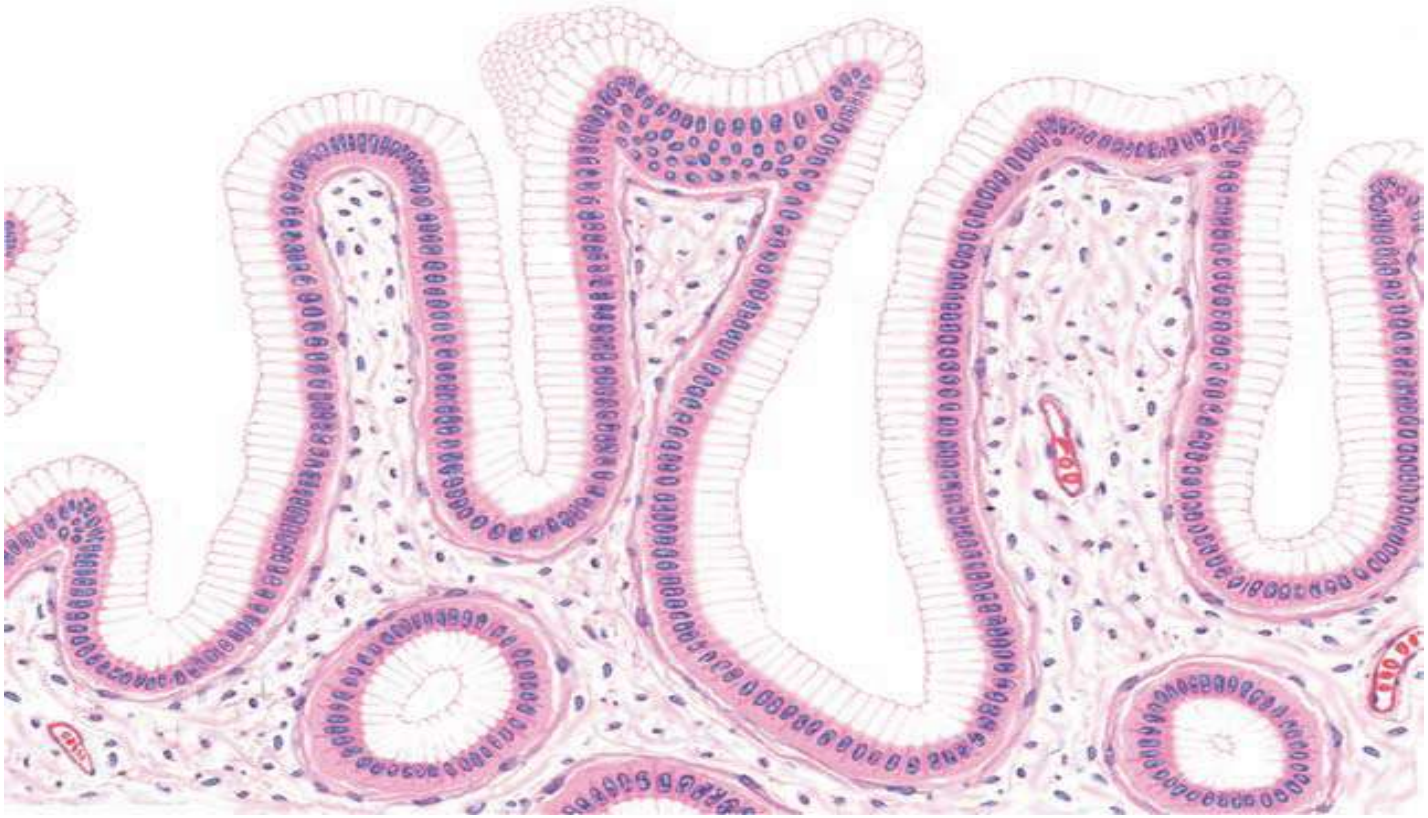
It′s a single layer of tall , cylindrical cell , each with a nucleus near the base , this tissue . which lines the digestive tract from the stomach to the anus.




Simple squamus epithelium



- **Simple cuboidal epithelial tissue**



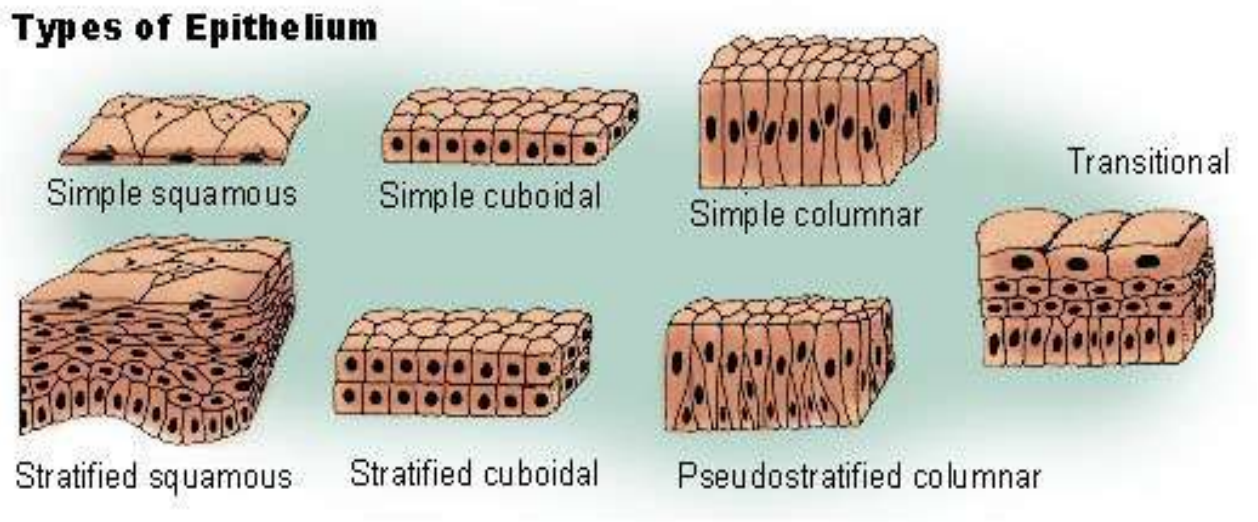
- Simple columnar epithelium: surface of stomach.

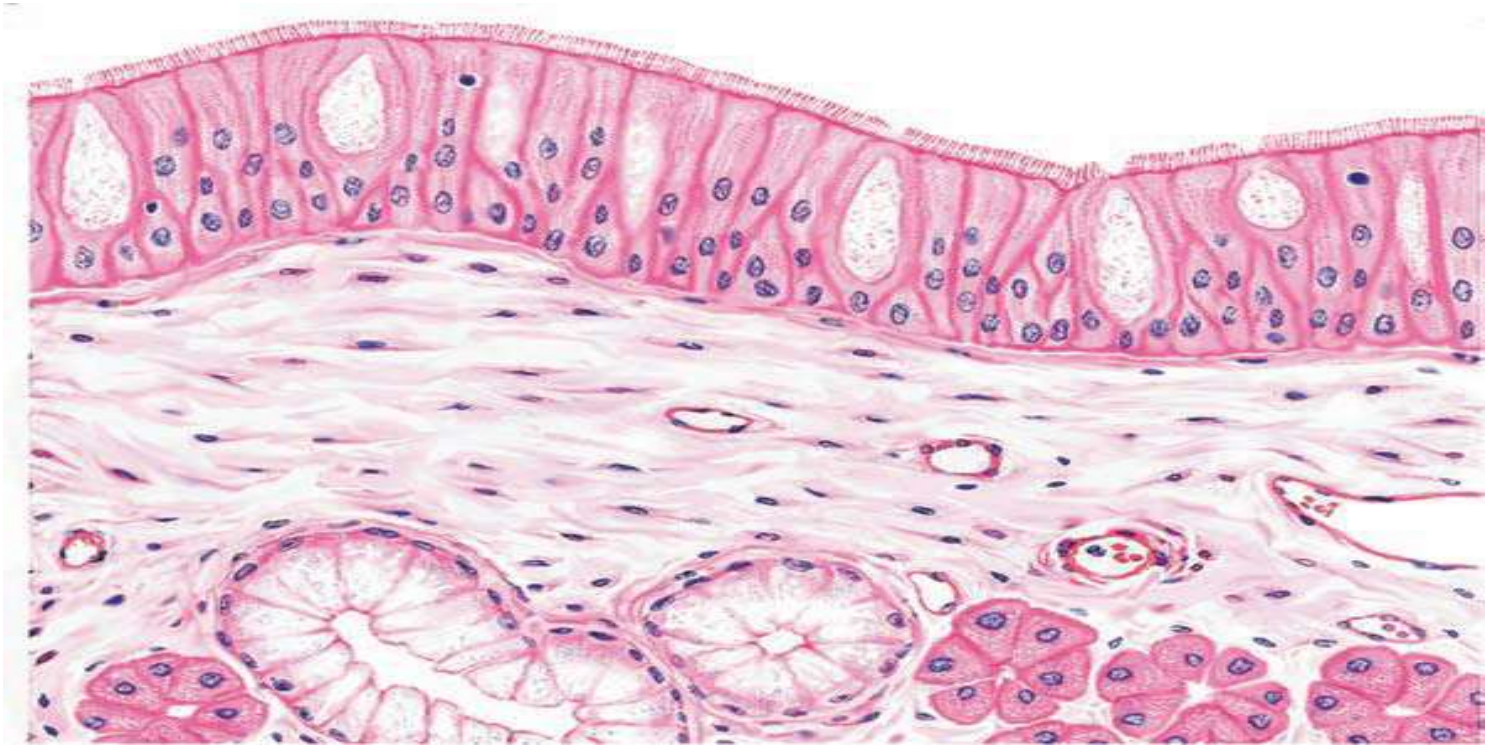
4- Pseudo stratified epithelial tissue .

It′s so called because the nuclei appear to lie in various layers ex: respiratory tract

1- Stratified Squamous epithelial tissue

cells from many layers : cuboidal or columnar in shape while the cells closer to the surface are irregular in shape and flatten found in skin, esophagus.





- **Pseudostratified columnar ciliated epithelium: respiratory passages—trachea**

Stratified Squamous non- keratinized epithelium: esophagus

2- Stratified cuboidal epithelial tissue

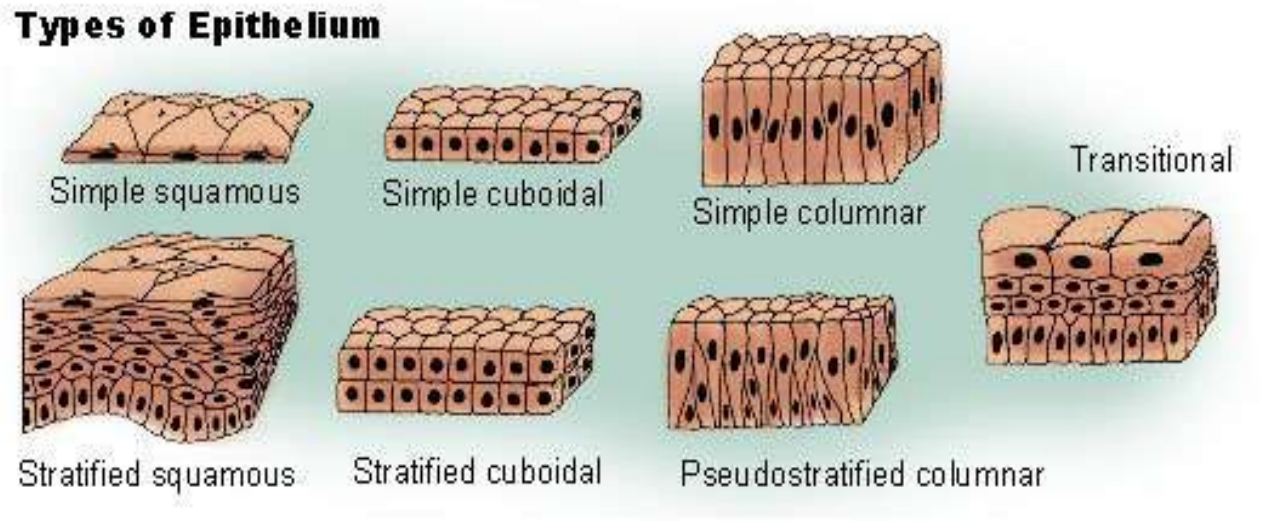
In which , the cells in the outer most layers are cubical in shape its present in the duct of sweat gland

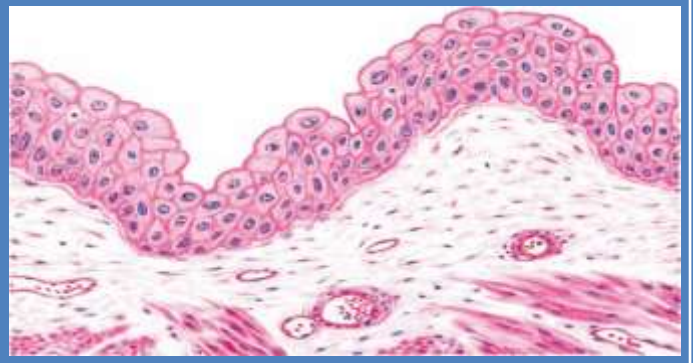
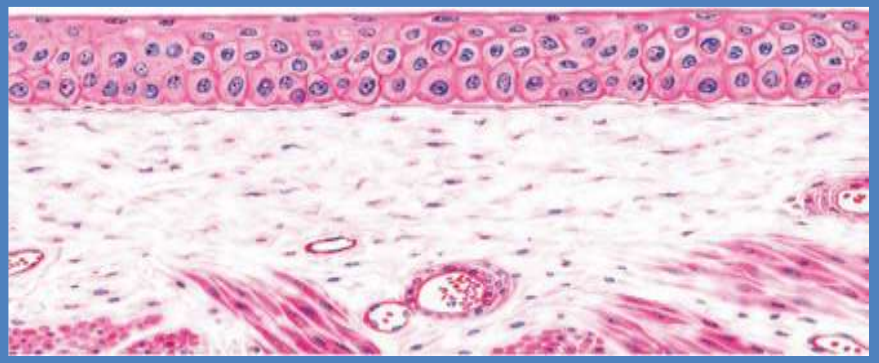
3- Stratified columnar epithelial tissue

The cell in the surface layer are columnar in shape ex: salivary glands.

4-Transitional epithelial tissue

It ,s characterized by the surface layer of dome like cells lines the urinary bladder and the ureter



	
transitional epithelium: bladder (unstretched or relaxed).	Transitional epithelium: bladder (stretched).

Connective tissue

Its support and protect , consist of :-

***cells (**Fibroblast, Plasma cell, Adipose cell**,** Melanocyte and pigment cell**,**Reticular cell)

* **fibers (**White (collagenous) fibers **,** Yellow (elastic) fibers**,** Reticular fibers **)**

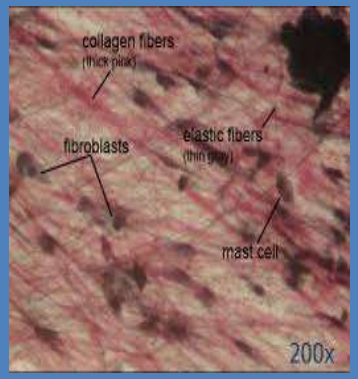
* **Ground substance** (homogenous, random, in shape may be viscous, semisolid or solid)

TYPES OF CONNECTIVE TISSUE

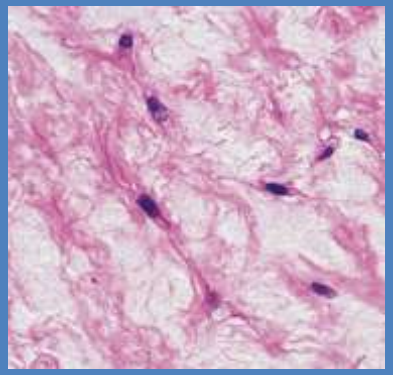
❑ **Proper connective tissue**

- **Loose connective tissue (low concentration of fibers)**

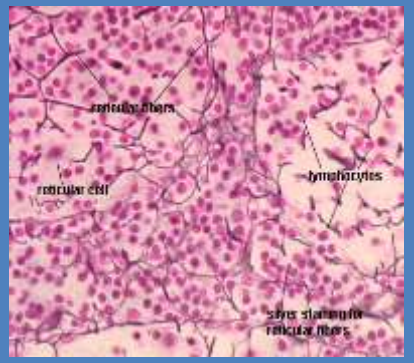
Areolar con . t
lung ,heart

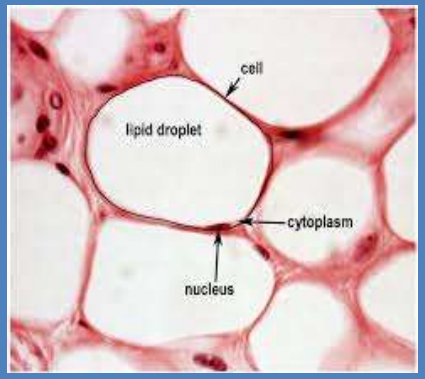


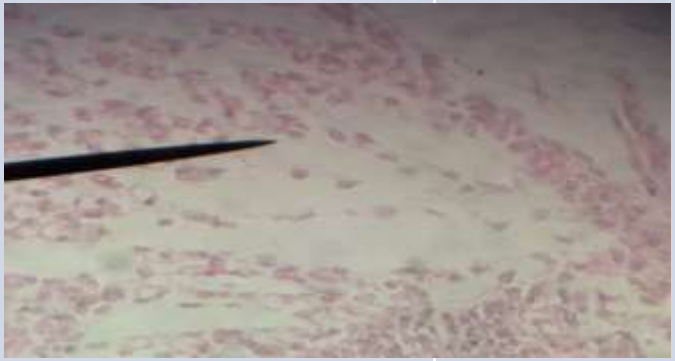
Mucoid con . t
its found in umbilical cord.



Reticular con .t
its found in lymph node







Adipose con. T
found in the skin

Mesenchymal con . t

- **Dense connective tissue**

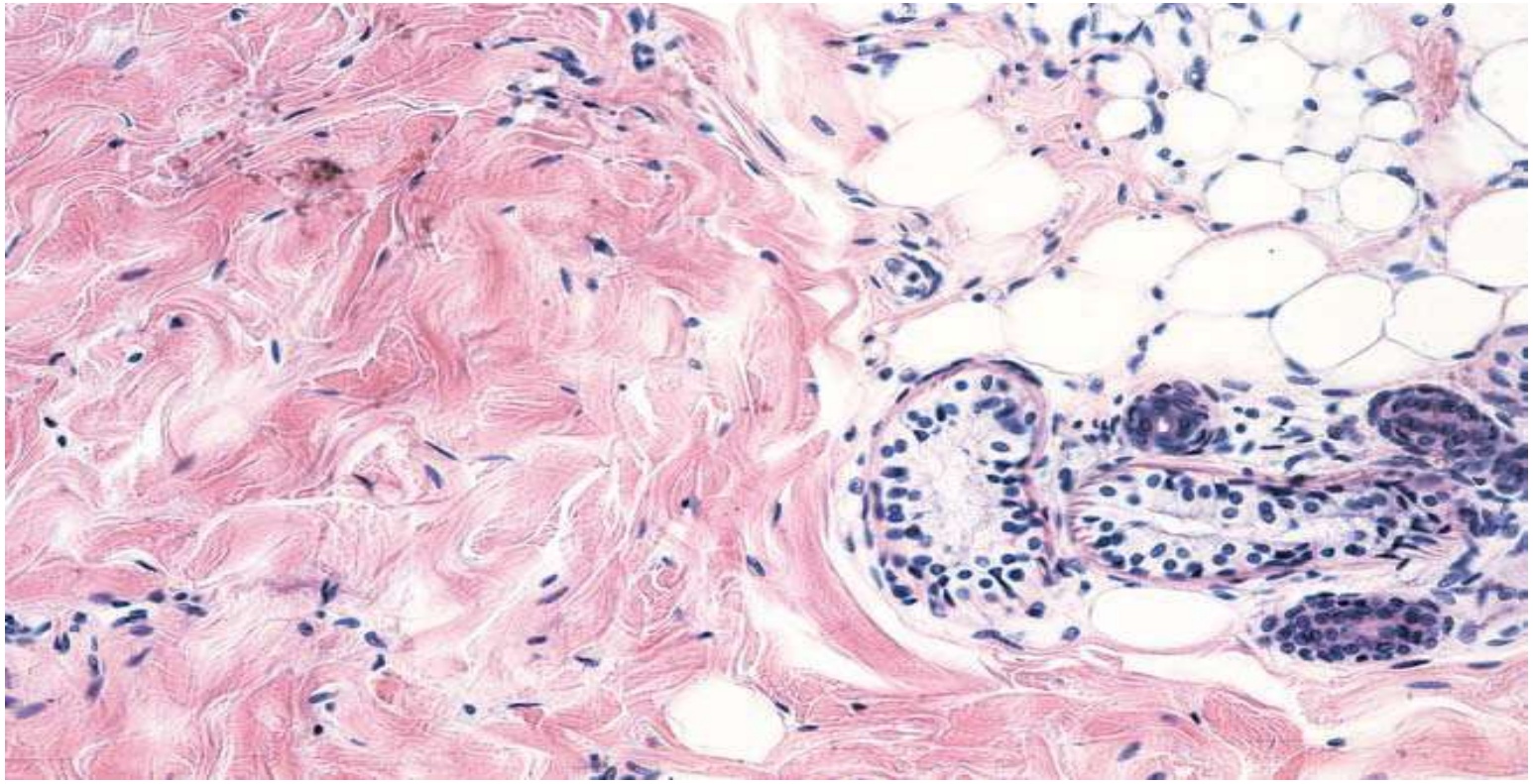
1-Irregular connective tissues (it can be seen in the dermis of skin)

2- Regulars connective tissues (tendon)

Special connective tissue

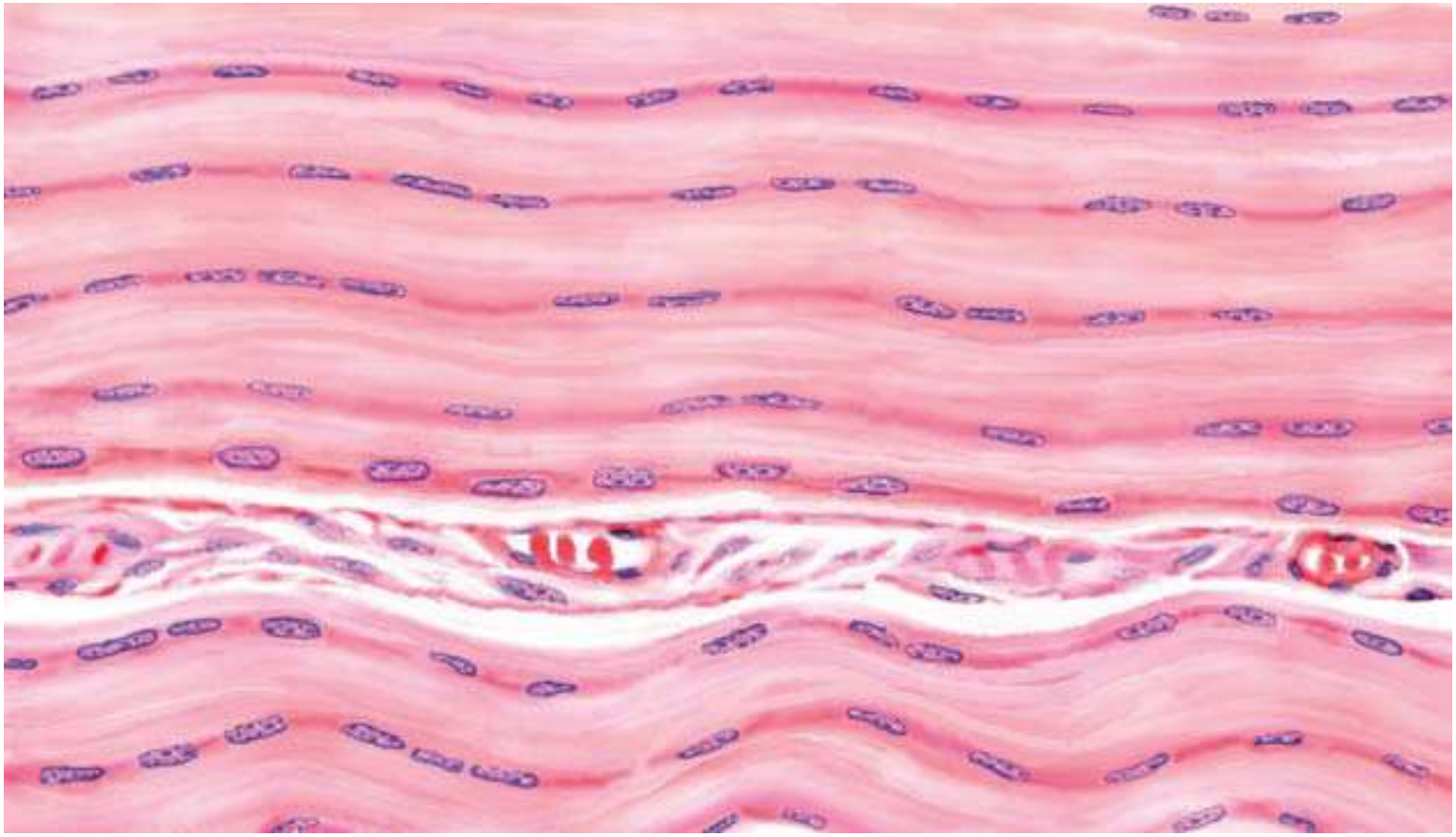
- bone connective tissue
- Cartilage

And blood of vascular C.T



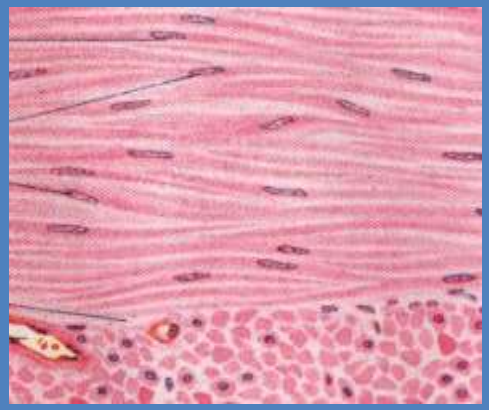
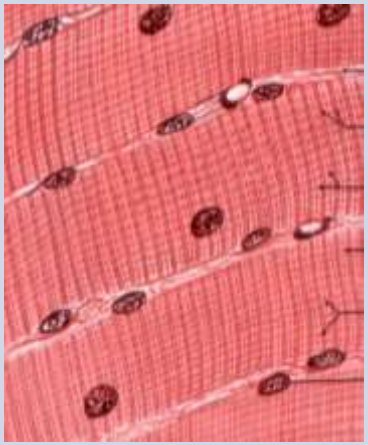
- Dense irregular connective tissue and adipose tissue.

Dense regular connective tissue: tendon (longitudinal section)



Muscular Tissue

Muscular tissue composed of specialized cell (fiber) for producing movement body . we can classify muscular tissue according to the function and structure to:-

Smooth muscle its non – striated , involuntary muscle ex:- esophagus to anus , urinary system	Skeletal muscle its striated voluntary muscle *its attached to skeletal back bone .	Cardiac muscle its striated , involuntary muscle ex:- muscles layer of heart
		

Nervous tissue

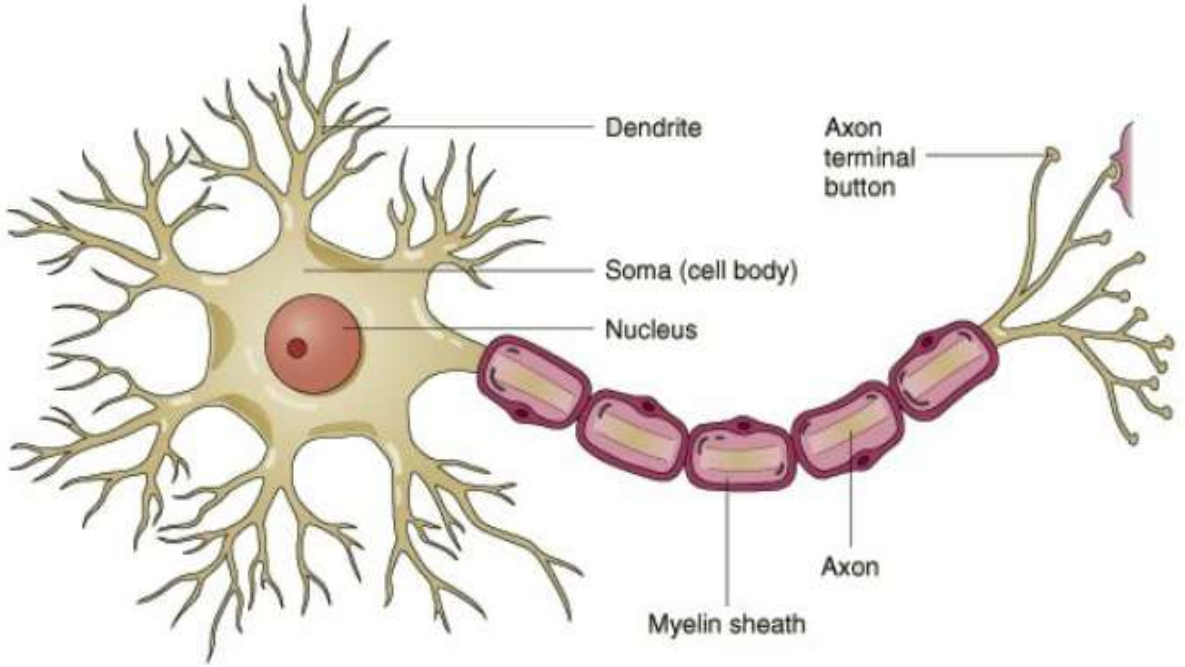
Is responsible for transport nervous impulse (motor and sensory impulse)

Nerve cell (neurons) :- are responsible for reception transmission and processing of stimuli and release neurotransmitters and are consist of :-

Dendrites

Cell body

Axon



What is the heaviest organ in the body?

What is the largest organ in the body?

Skin

The skin is a large organ responsible for:

***temperature regulation**
***protection of underlying tissues**
***Slowing the rate of water loss**
***housing sensory receptors**
***excreting wastes**
***vitamin D formation**

Skin (integument)

It is the heaviest organ in the body (16% of body weight, 1.2 - 2.3 m^2 of body surface area).

Parts:

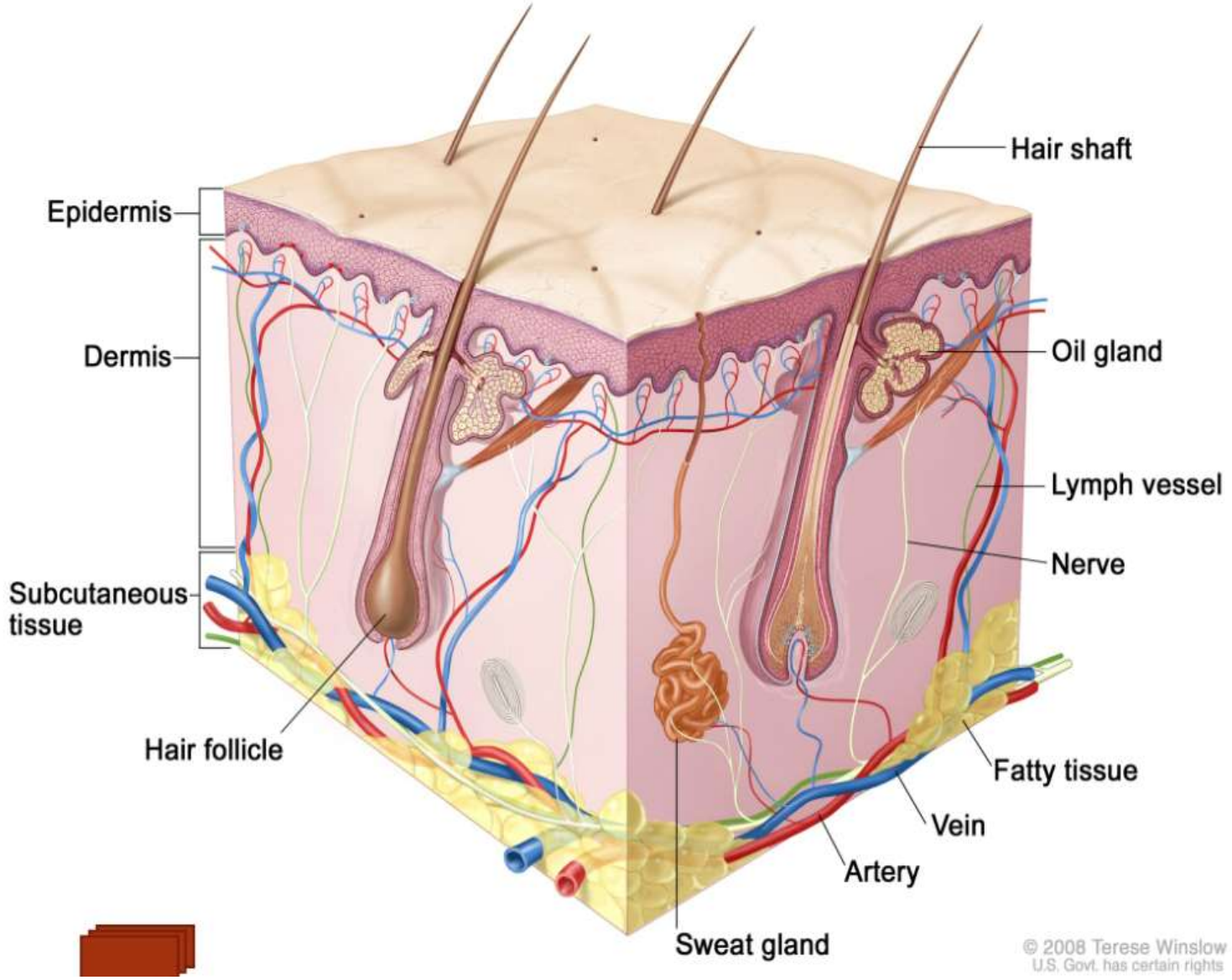
***Epidermis (Epithelium) – ectoderm.**

***Dermis (C. T.) – Mesoderm**

***Hypodermis (subcutaneous tissue).**

***Skin appendages**

***Accessory glands**



Structure of the Skin

it consists of two major layers:

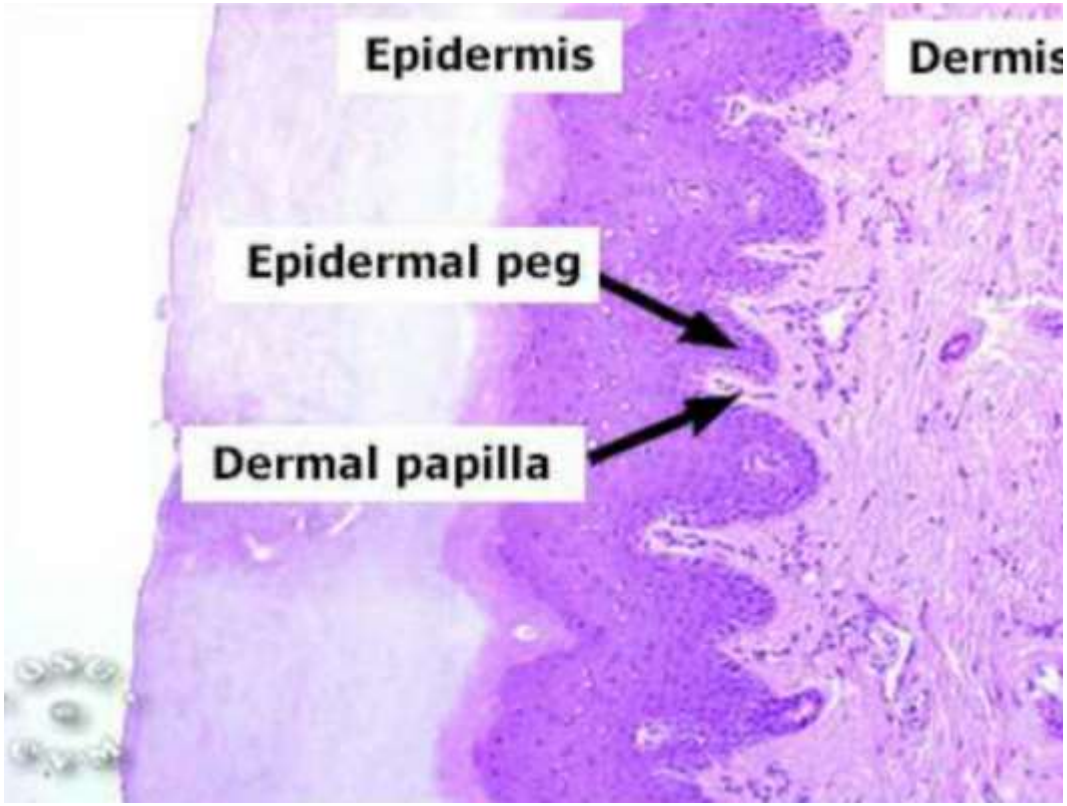
***outer, thinner layer called the epidermis, consists of epithelial tissue**

***inner, thicker layer called the dermis**

***Beneath the dermis is a subcutaneous layer (also called hypodermis) which attaches the skin to the underlying tissues and organs**

DERMO-EPIDERMAL JUNCTION

The boundaries between dermis and epidermis is irregular projection of the dermis called papillae inter-digitate with evaginations of the epidermis known as epidermal peg.



Epidermis

The epidermis contains four major layers (thin skin) or five major layers (thick skin)

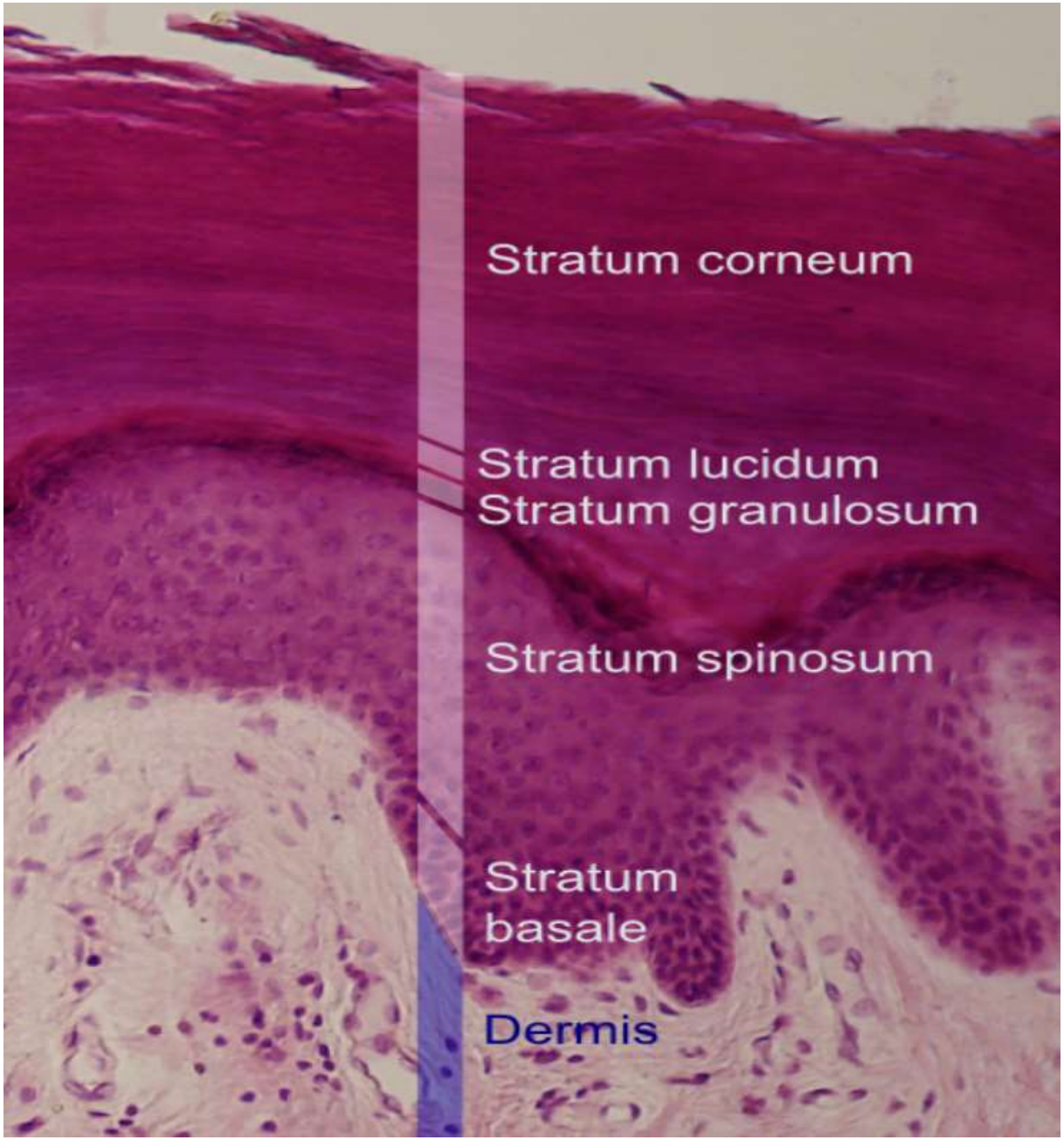
*Stratum basale (deepest layer) or stratum germinativum

*Stratum spinosum,

*Stratum granulosum,

*Stratum lucidum,

*Stratum corneum.


Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum
basale
Dermis

1.Stratum Germinativum /Basale;

(a) Keratinocyte , cuboidal – columnar, lie on a Basal lamina.

(b) Desmosomes, and hemidesmosomes.

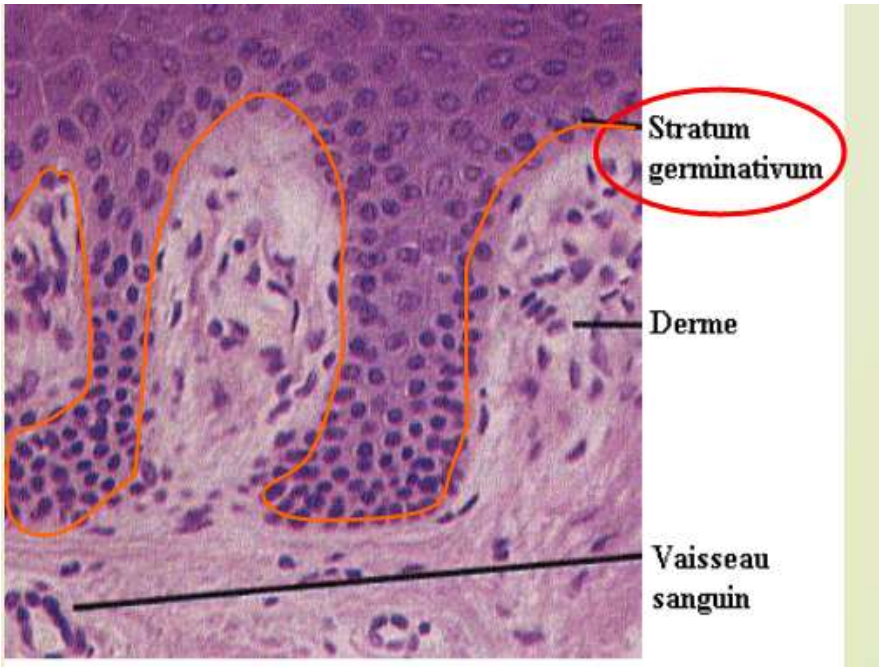
(C) indented by CT dermal papillae.

(d)Cells proliferate to replace lost surface cells.

(high mitotic activity , renewal ~ 15 -30 days).

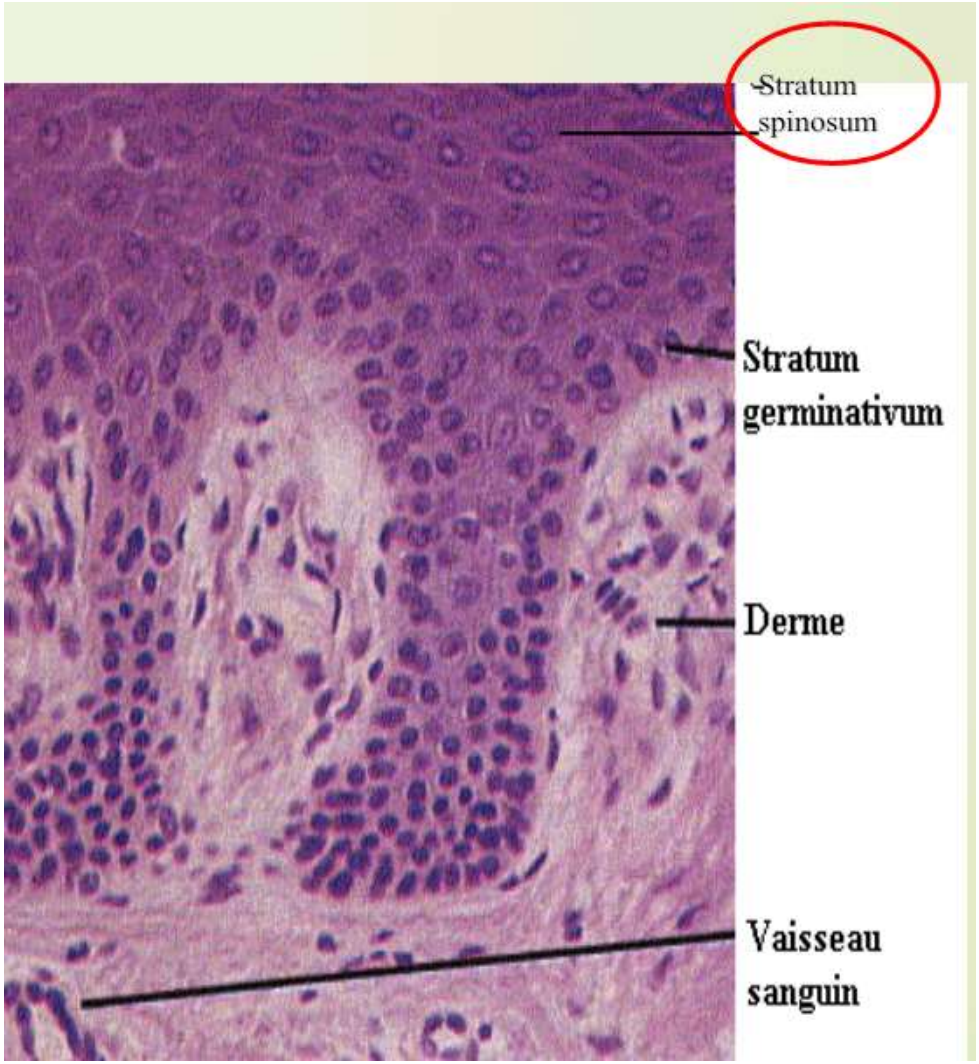
(e) Merkel cells

(f) Melanocytes



2. Stratum Spinosum

(a) 4 – 10 rows, Cuboidal – flattened cells (Keratinocytes)
(b) Central nucles
(c) Langerhans cells

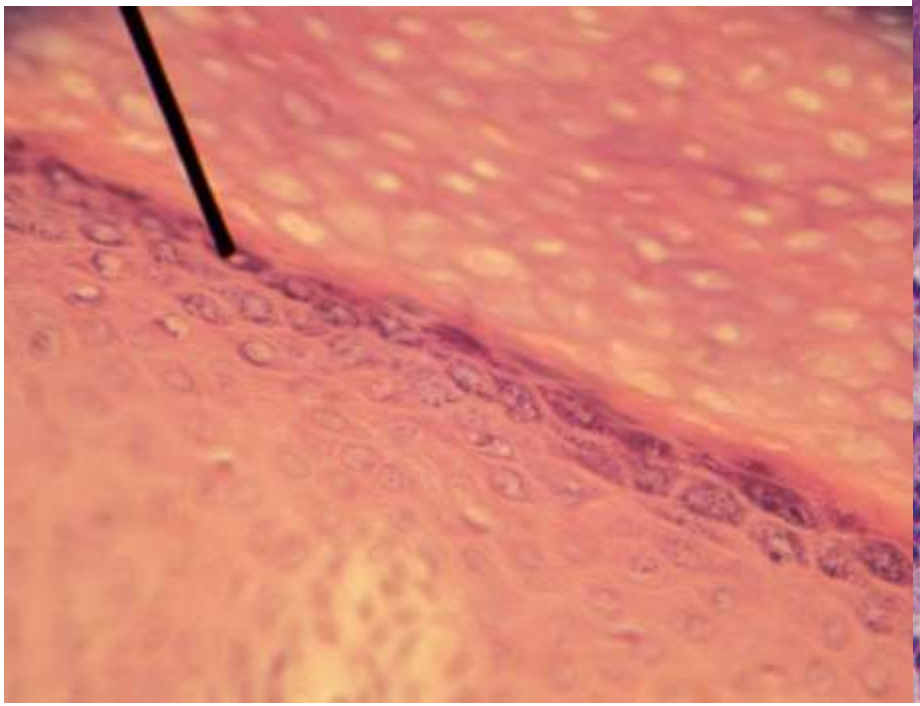


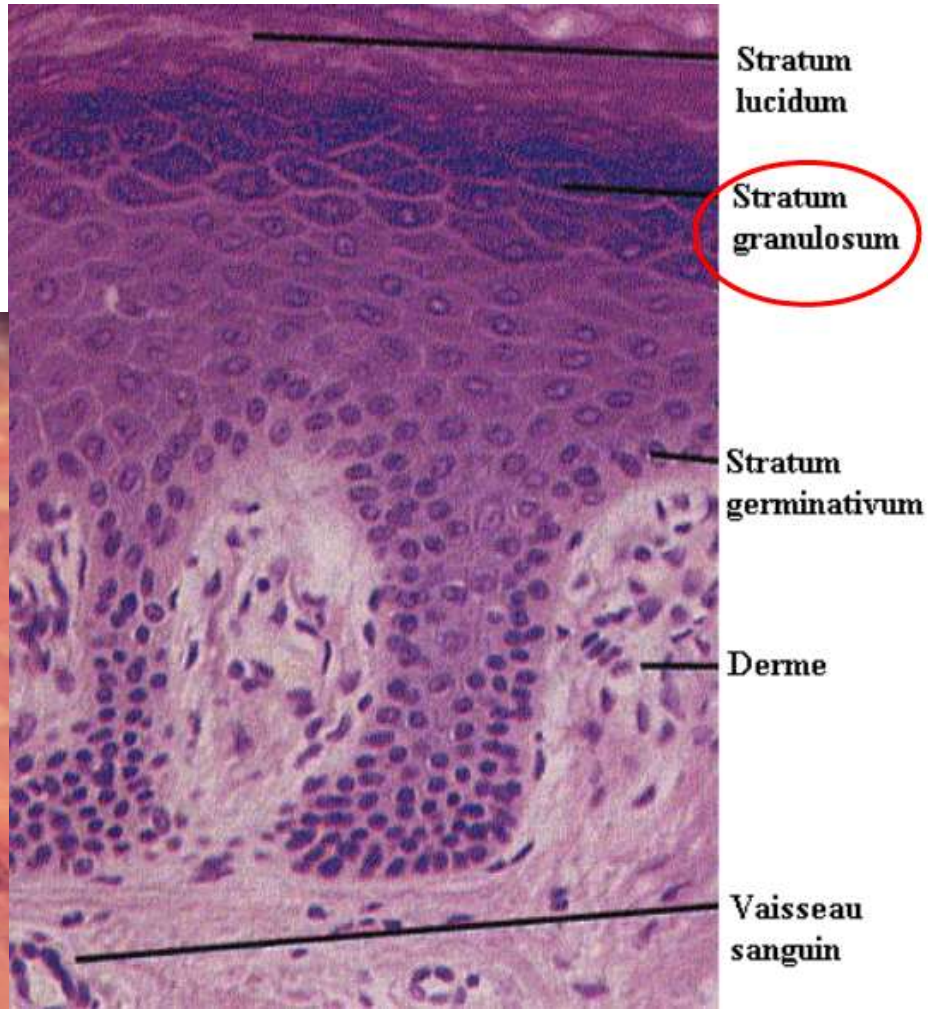
3 . Stratum Granulosum;

(a) 3 – 5 rows, flattened polygonal cells

(b) EM; lamellar granules

(c) Desmosomes





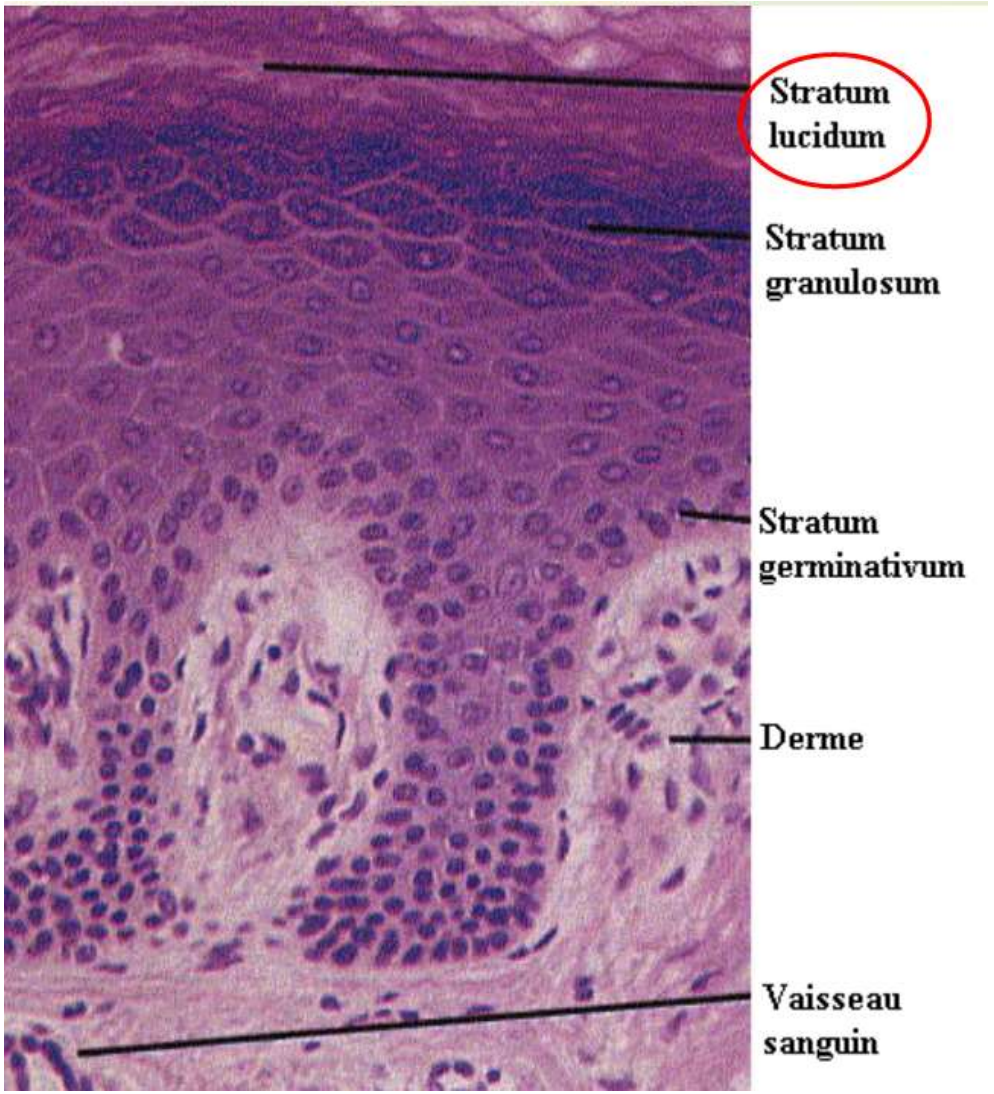
4. stratum lucidum

(a) in thick skin only

(b) Translucent

(c) Tightly packed cells that lack nuclei or organelles (dead)

(d) Desmosomes

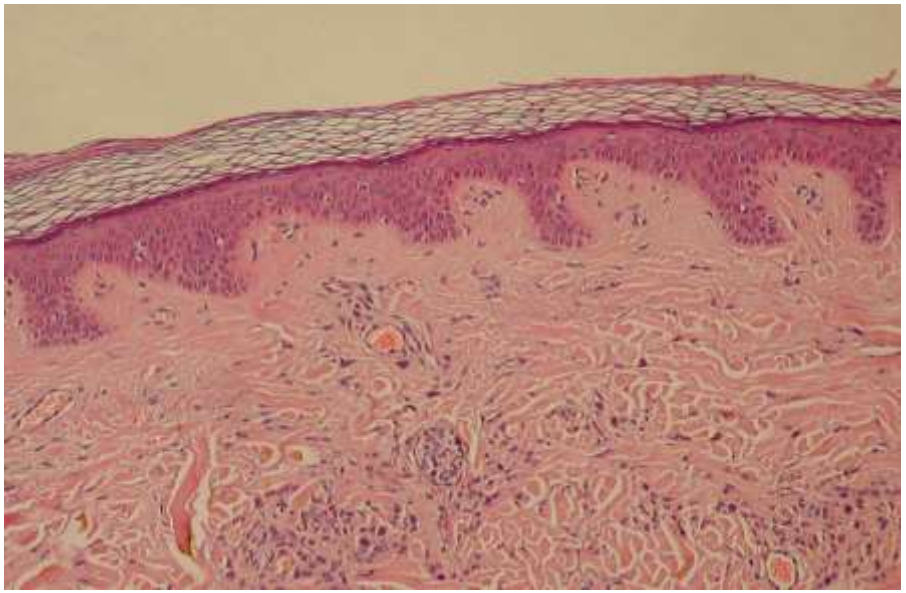


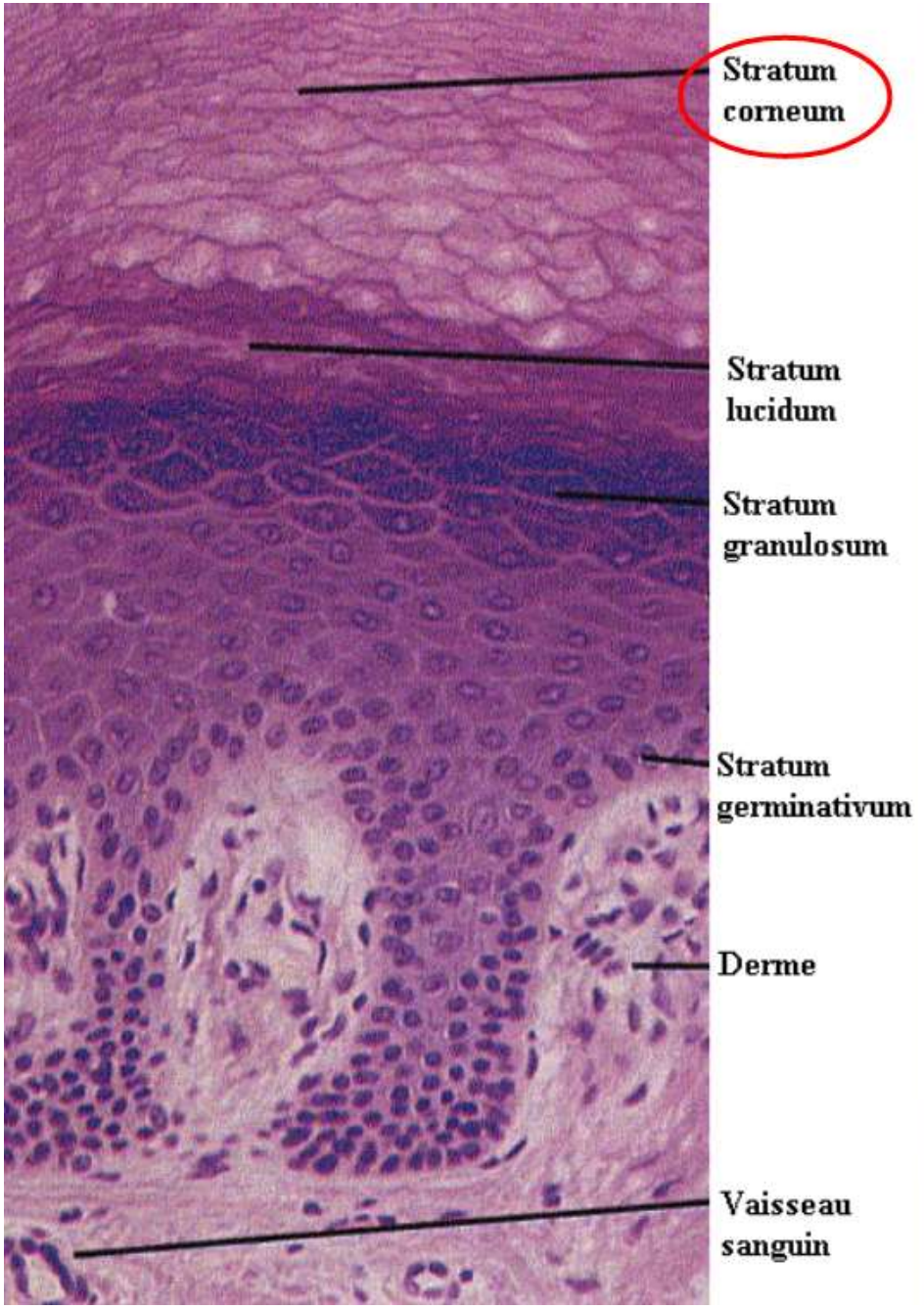
5. stratum corneum

(a) 15 – 20 rows of flattened , dead cells

(b) continually shed and replaced

[15 – 30 days for a cell to move from the stratum germinativum to the stratum corneum]




Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum germinativum
Derme
Vaisseau sanguin

Cells of epidermis:

1-Keratinocyte

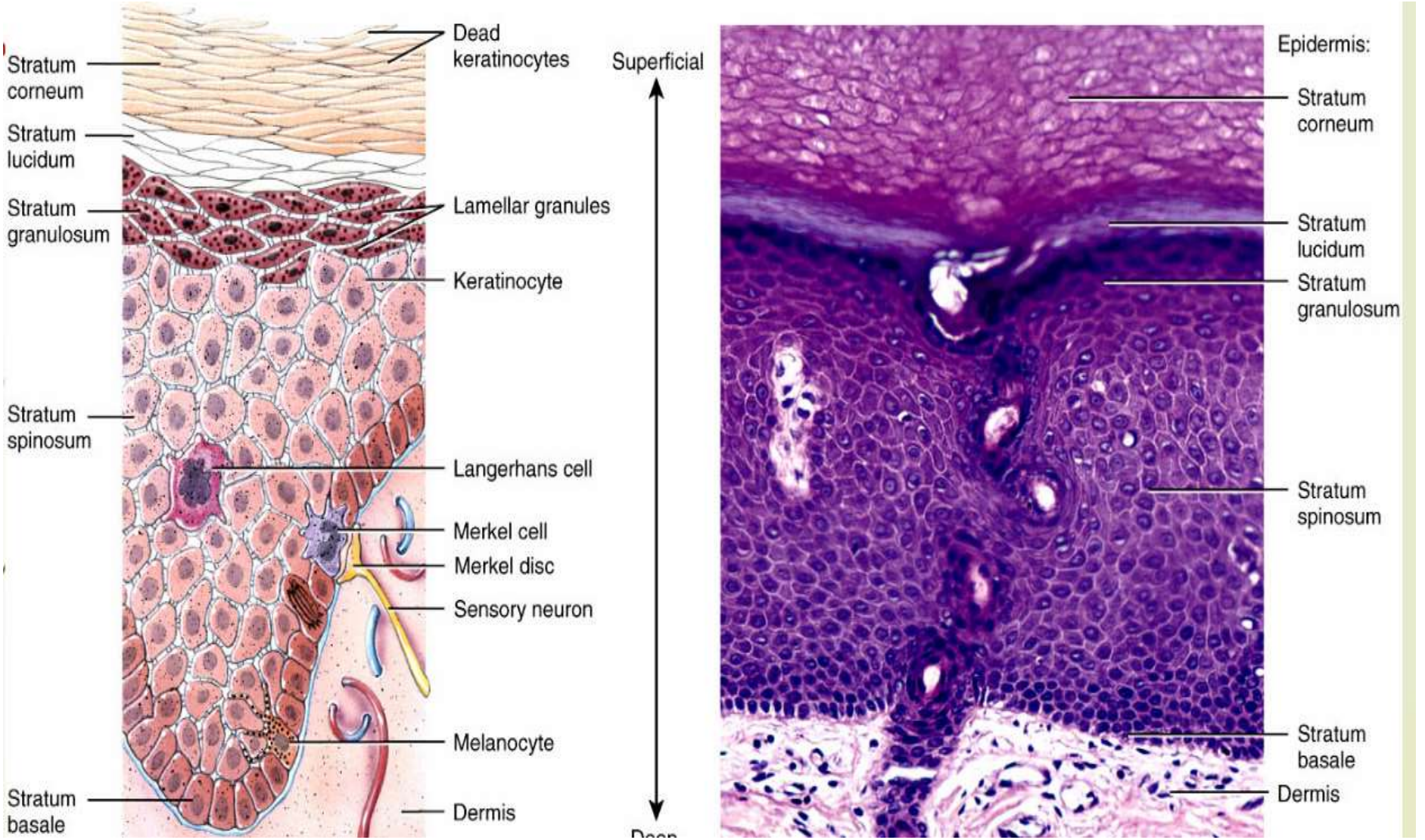
2-Melanocyte

3-Nonpigmented granular dendrocytes

(a) langerhan's cells

(b) Granstein cells

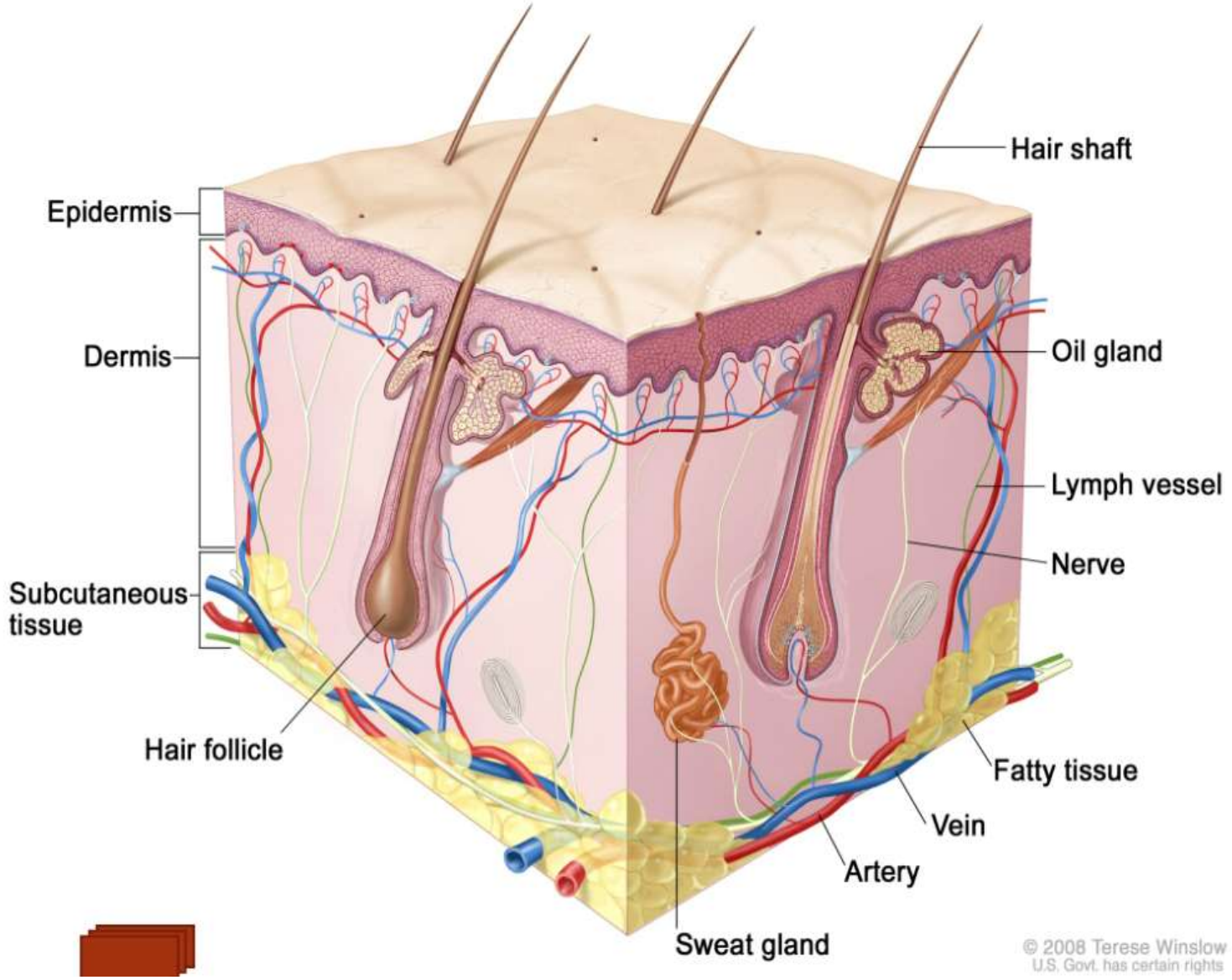
4-Merkel's cells


Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum basale
Dead keratinocytes
Lamellar granules
Keratinocyte
Langerhans cell
Merkel cell
Merkel disc
Sensory neuron
Melanocyte
Dermis
Superficial
Epidermis:
Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum basale
Dermis

Dermis

The dermis has several important characteristic

Is composed of connective tissue containing collagen, elastic fibers, blood vessels and nerve



Structural basis of skin color

Skin color arise from variations in the amounts of three pigments: melanin , carotene , and hemoglobin

Melanin – a yellow – red or brown – black pigment produced by melanocytes located mostly in the epidermis , where it absorbs uv radiation)
The number of melanocyte are about the same in all people , difference in skin color is due to the amount of pigment produce

Carotene – yellow – orange pigment (found in the stratum corneum, dermis, and subcutaneous layer)

Hemoglobin –red color (located in erythrocytes flowing through dermal capillaries)

Skin appendages
Glands of the skin

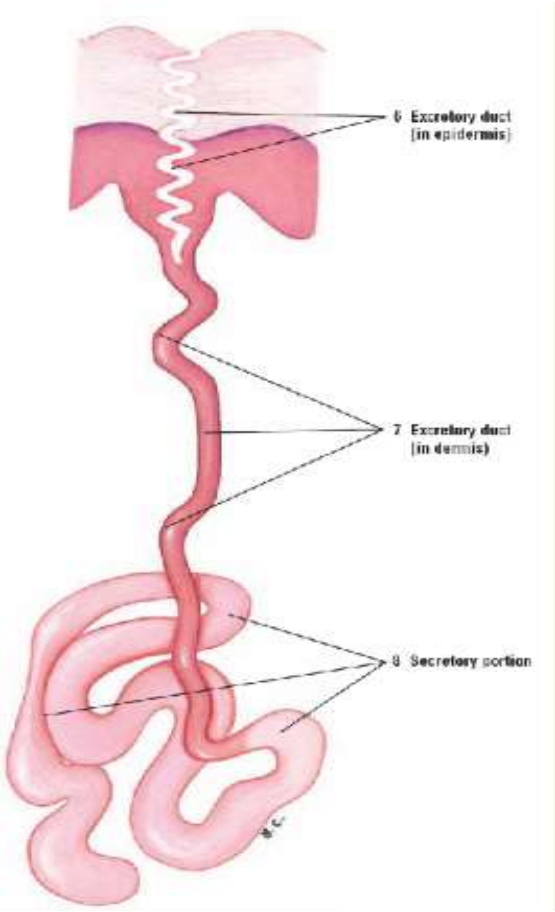
A- sweat glands

- Simple coiled tubular glands

- Secretory portion

- Excretory portion (duct)

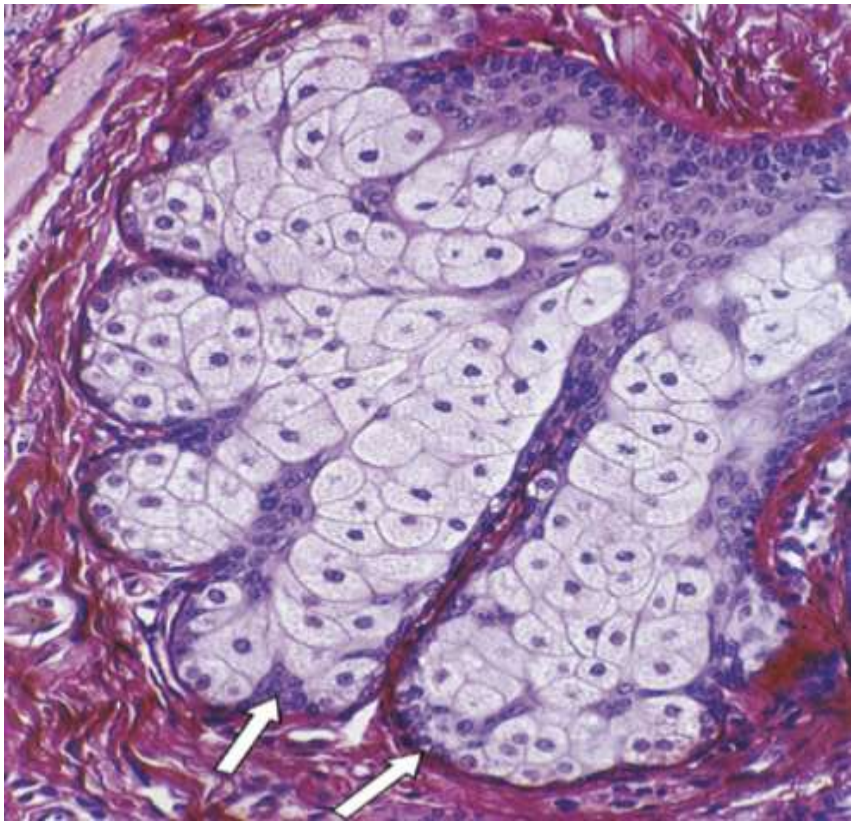
- Secretion



b- Sebaceous gland

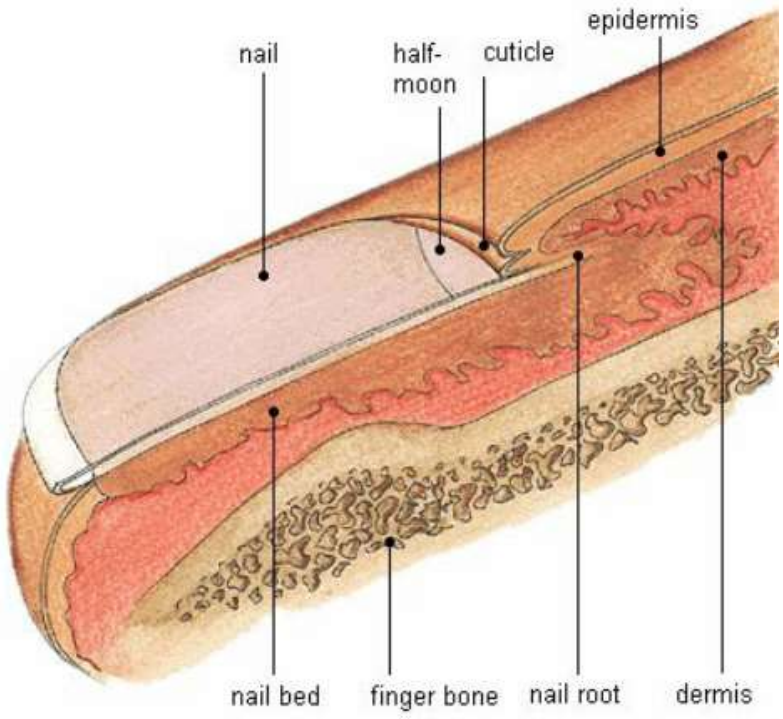
- Simple branched acinar gland

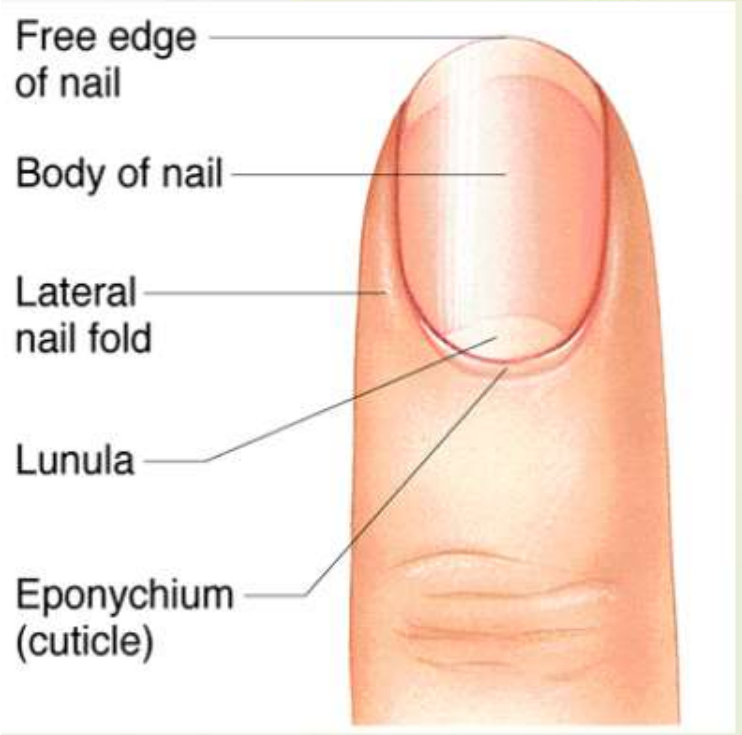
- Large vacuolated cells by the side of a hair follicle



Nails

- Nails are plates of dead cells packed with keratin
- The nail root , eponychium , nail plate , nail bed ,and lunula





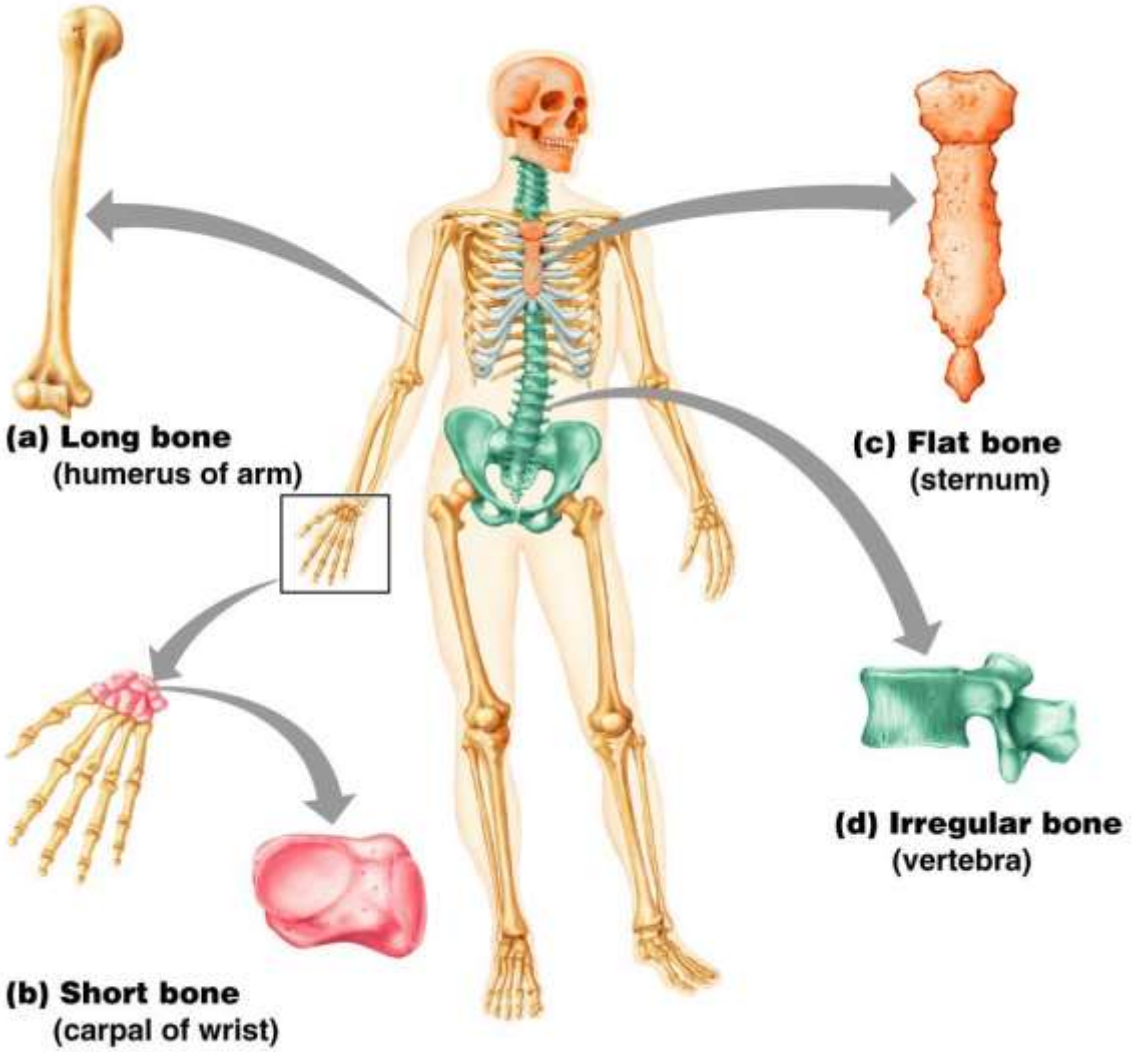
I. Bones

- Are calcified connective tissue
- consisting of :
  1. cells (osteocytes) in a matrix of ground substance &
  2. collagen fibers.

Functions:

- Serve as a reservoir for calcium and phosphorus
- act as levers on which muscles act to produce movements permitted by joints.
- Contain internal soft tissue, marrow, where blood cells are formed.

- Are classified, according to **shape**, into :
- **long,**
- **short,**
- **flat,**
- **irregular, and**
- **sesamoid bones;**



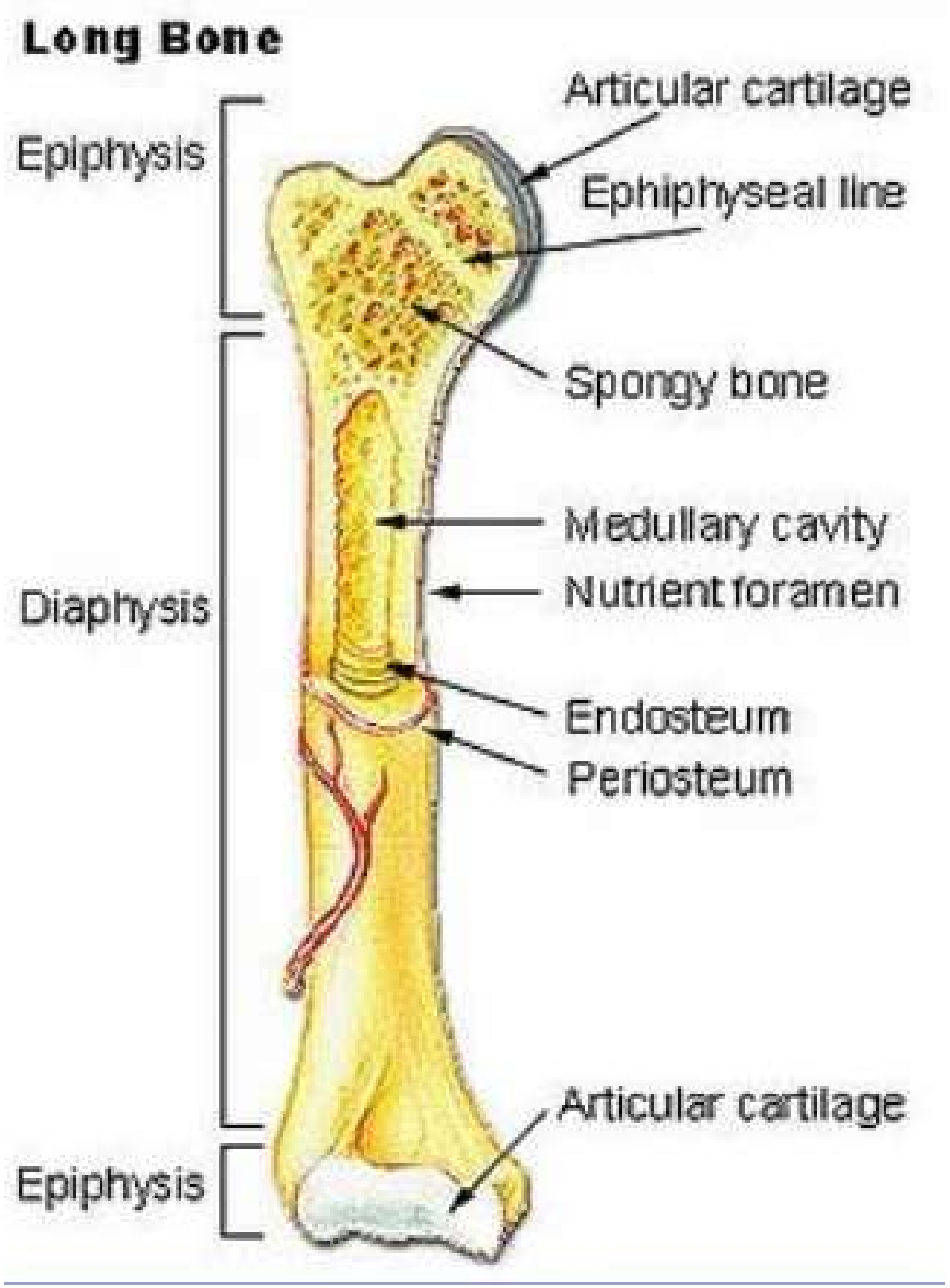
A. Long bones

Have :

- **a shaft (diaphysis)&**
- **two ends (epiphyses).**
- **metaphysis is a part of diaphysis adjacent to epiphyses.**

Include :

humerus, radius, ulna, femur, tibia, fibula, metacarpals, phalanges.



B. Short bones

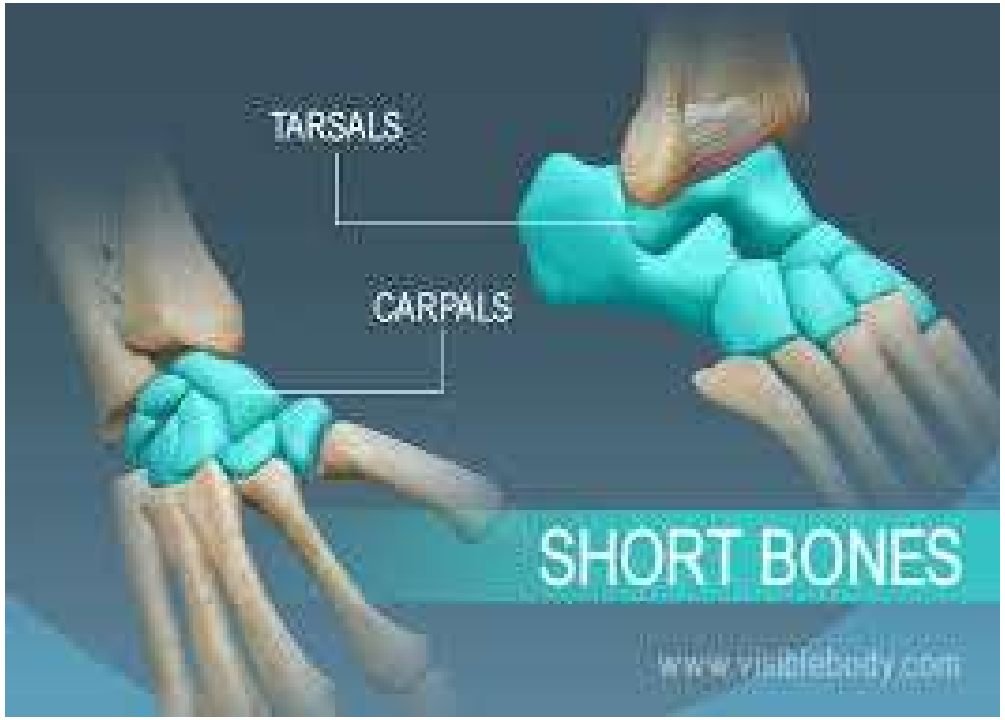
Include :

carpal and

tarsal bones

are approximately cuboid shaped.

Are composed of spongy bone and marrow surrounded by a thin outer layer of compact bone.

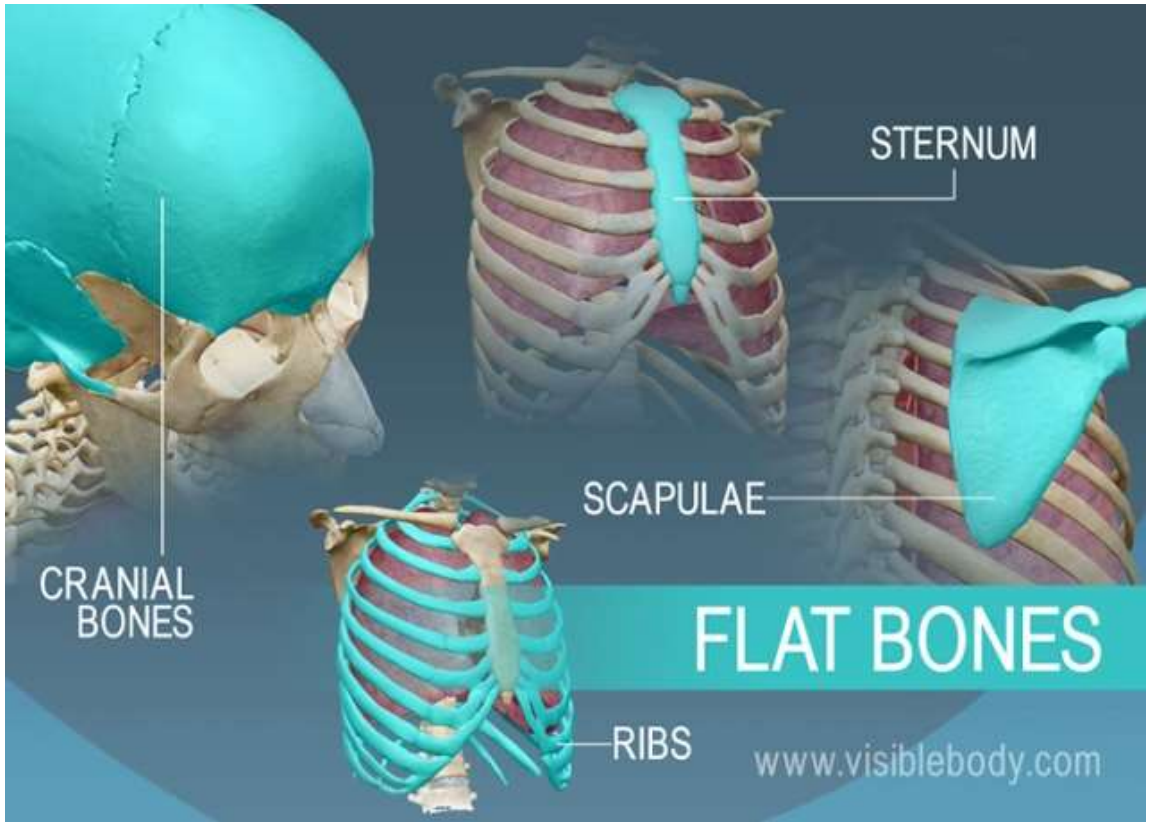


C. Flat bones

Include:

ribs, sternum, scapulae, bones of skull.

Consist of two layers of compact bone enclosing spongy bone and marrow space.



D. Irregular bones

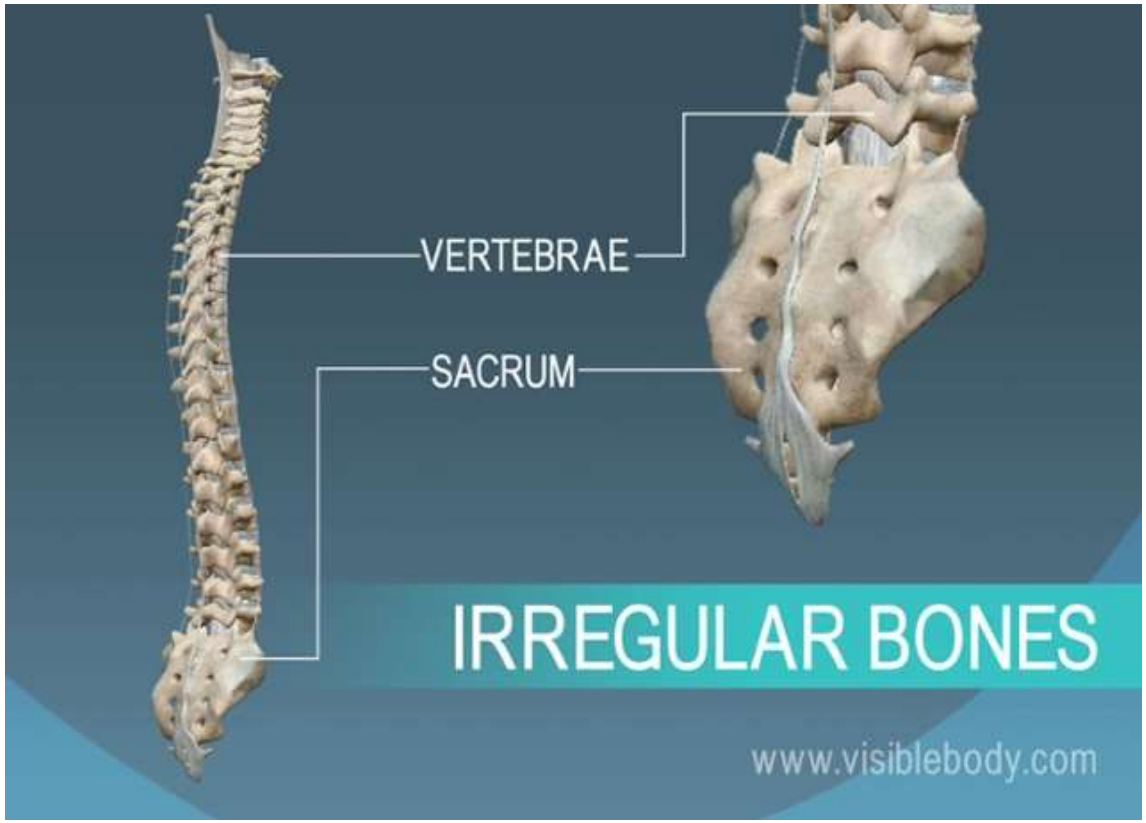
Include bones of mixed shapes such as :

bones of skull,

vertebrae, and

coxa.

Contain mostly spongy bone enveloped by a thin outer layer of compact bone

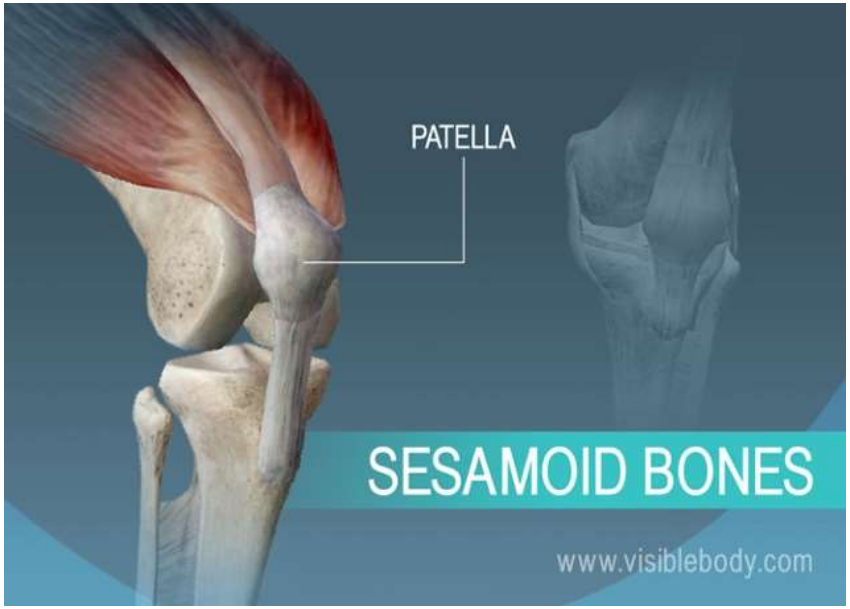


E. Sesamoid bones

-Develop in certain tendons

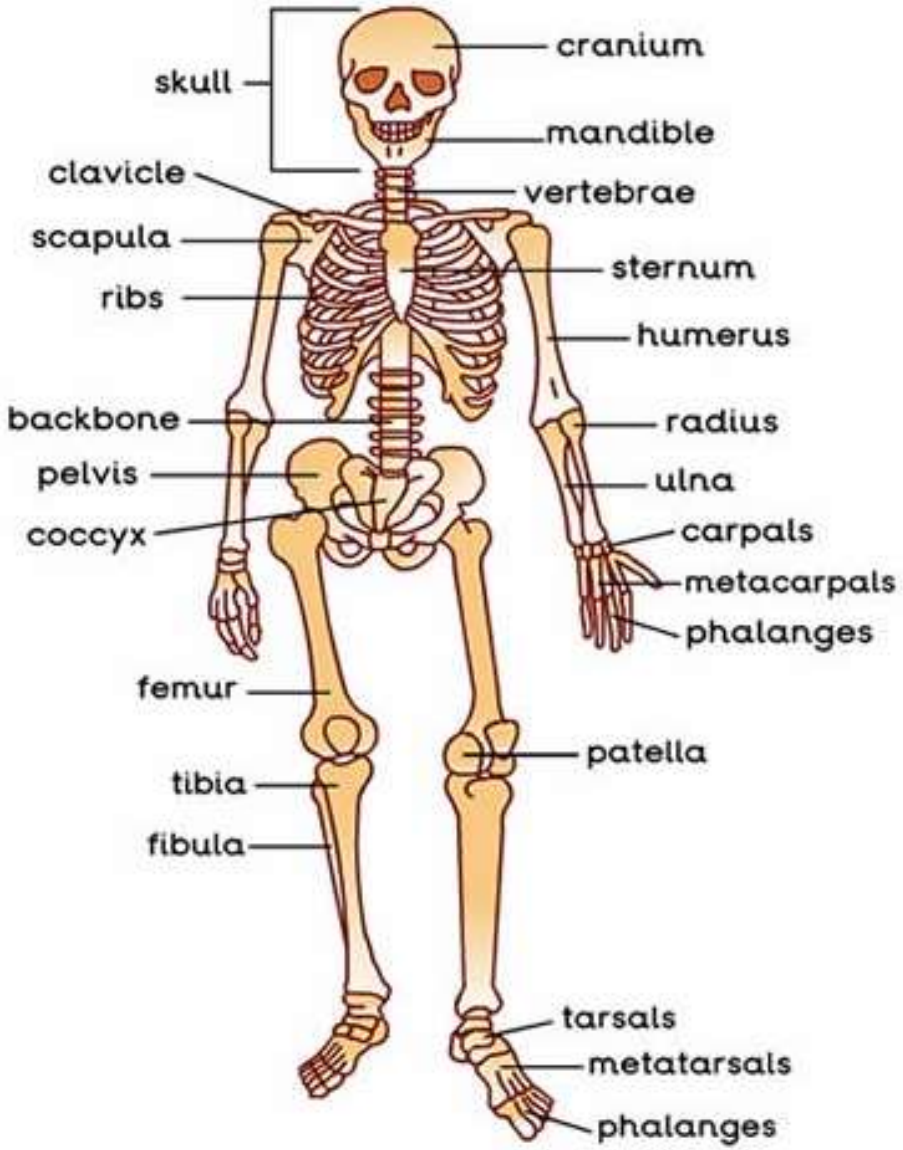
-reduce friction on tendon.

-Are found in long bones of limbs, as in wrist & knee (i.e., patella).



The Human Body

Skeleton



II. Joints

Joints

-Are places of union between two or more bones.

-Are classified on basis of their structural features into:

1- fibrous,

2- cartilaginous,

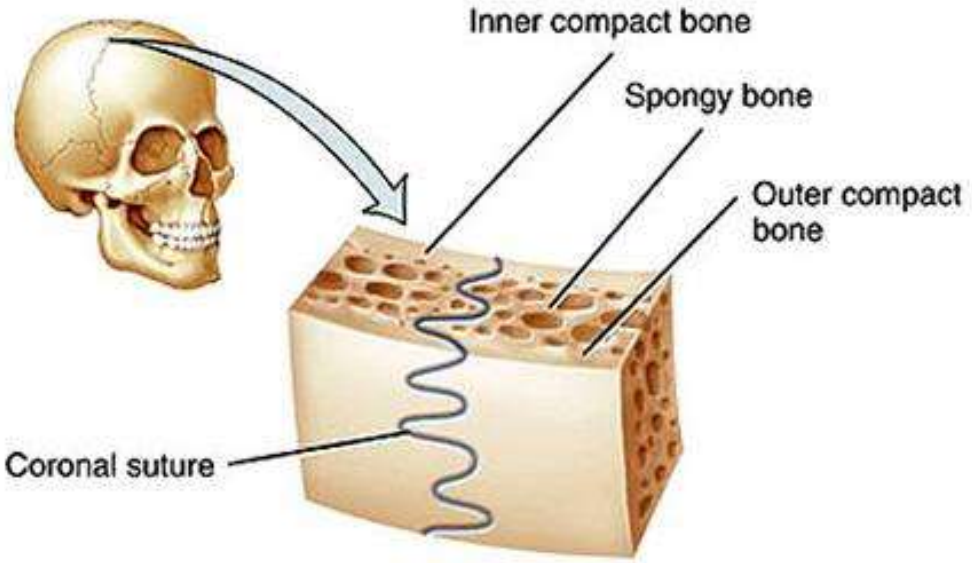
3- synovial types.

A. Fibrous joints

- have no joint cavities,
- permit little movement.

1. Sutures

- Are found between flat bones of skull.



(a) Suture between skull bones

2. Syndesmoses

- Occur as :

1.inferior tibiofibular syndesmoses.

B. Cartilaginous joints

- have no joint cavity.

1. Primary cartilaginous joints

- Permit no movement but growth in length of bone.
- Include :
  1. **manubriosternal joint**

2. Secondary cartilaginous joints

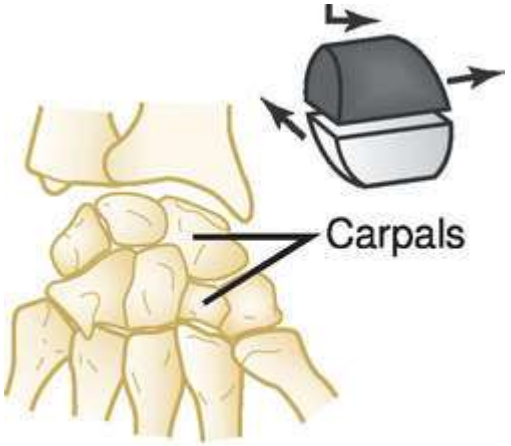
- are slightly movable joints.
- Include :
  1. **pubic symphysis and**
  2. **intervertebral disks.**

C. Synovial joints

- Permit a great degree of free movement
- Are characterized by three features:
  1. **joint cavity,**
  2. **synovial membrane (which produces synovial fluid),**
  3. **articular capsule.**
- **are classified according to shape of articulation and/or type of movement.**

1. Plane joints

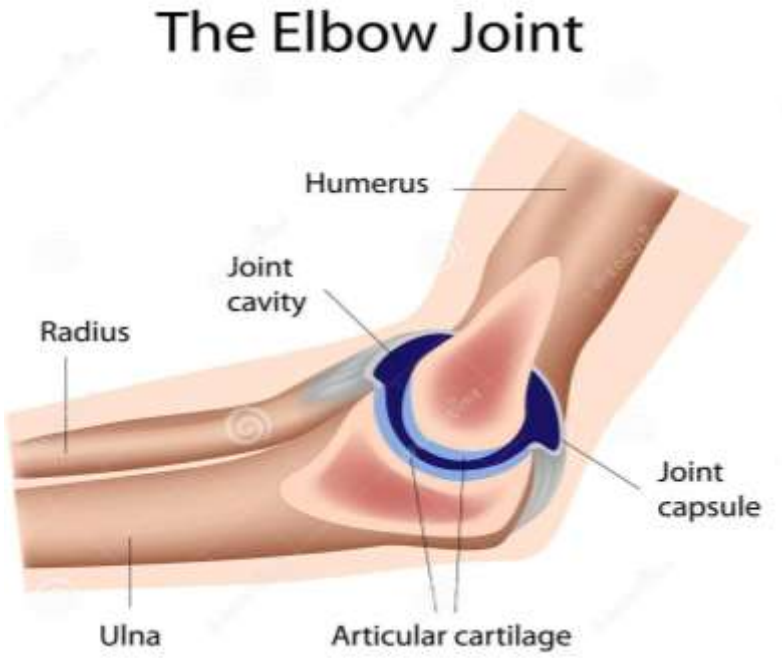
- Are united by two flat articular surfaces
- allow a simple gliding or sliding of one bone over other.
- Occur in :
  1. **proximal tibiofibular,**
  2. **intertarsal,**
  3. **intercarpal,**
  4. **intermetacarpal,**
  5. **carpometacarpal,**
  6. **Sternoclavicular joints.**



Plane joint

2. Hinge joints

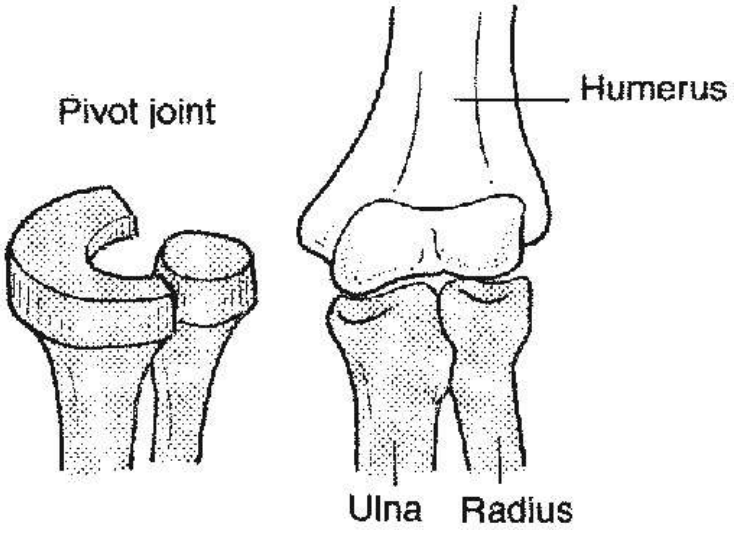
- Resemble door hinges
- allow only flexion and extension.
- Occur in
  1. **elbow,**
  2. **ankle, and**
  3. **interphalangeal joints**.



3. Pivot joints

- Allow only rotation (movement around a single longitudinal axis).
- Occur in :

  superior and inferior radioulnar joints



4. Condylar joints

- Have two convex condyles articulating with two concave condyles.
- Allow flexion and extension
- occur in :
  1. wrist (radiocarpal),
  2. metacarpophalangeal,
  3. knee (tibiofemoral)

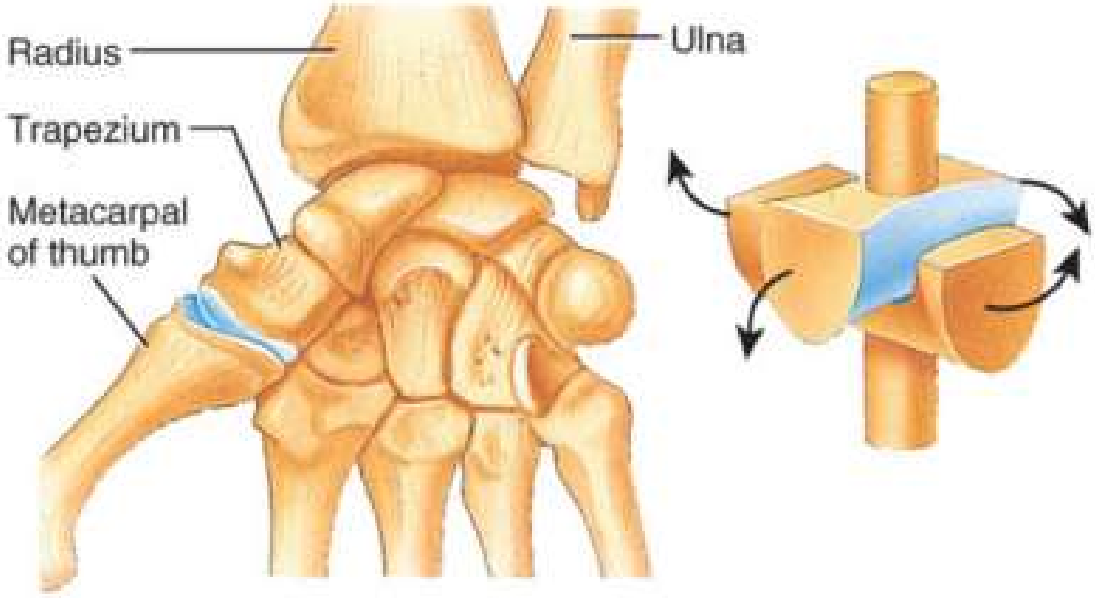
Condyloid joint

5. Saddle joints

- allow flexion and extension, abduction and adduction, and circumduction but no axial rotation.

Occur in:

1. **carpometacarpal joint of thumb**
2. **between femur and patella.**

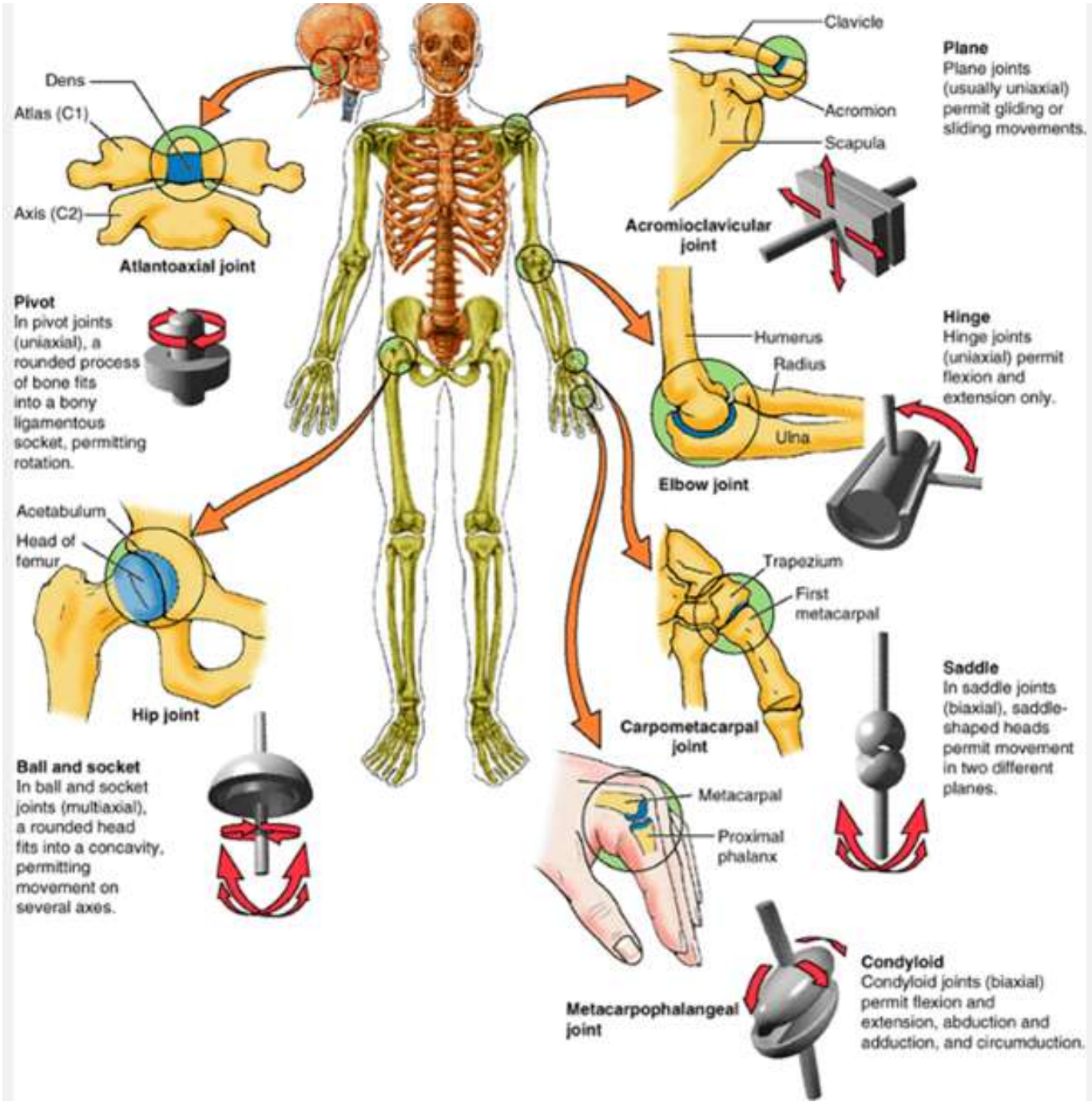


6. Ball-and-socket joints

- (ball-like) head into a cup-shaped cavity
- allow movement in many directions.
- Allow :
  A. flexion and extension,
  B. abduction and adduction,
  C. medial and lateral rotations, and circumduction

occur in

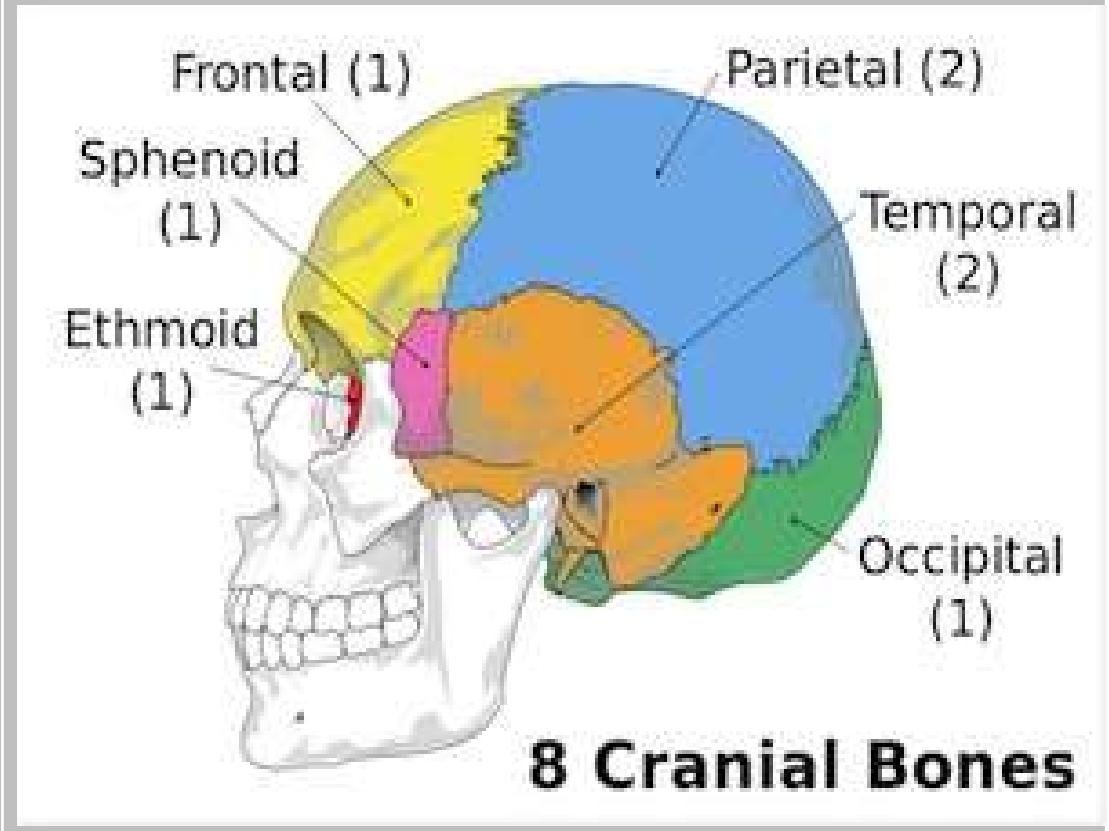
1. shoulder
2. hip joints.


Dens
Atlas (C1)
Axis (C2)
Atlantoaxial joint
Pivot
In pivot joints (uniaxial), a rounded process of bone fits into a bony ligamentous socket, permitting rotation.
Acetabulum
Head of femur
Hip joint
Ball and socket
In ball and socket joints (multiaxial), a rounded head fits into a concavity, permitting movement on several axes.
Clavicle
Acromion
Scapula
Acromioclavicular joint
Plane
Plane joints (usually uniaxial) permit gliding or sliding movements.
Humerus
Radius
Ulna
Elbow joint
Hinge
Hinge joints (uniaxial) permit flexion and extension only.
Trapezium
First metacarpal
Carpometacarpal joint
Saddle
In saddle joints (biaxial), saddle-shaped heads permit movement in two different planes.
Metacarpal
Proximal phalanx
Metacarpophalangeal joint
Condyloid
Condyloid joints (biaxial) permit flexion and extension, abduction and adduction, and circumduction.

1-bones of skull

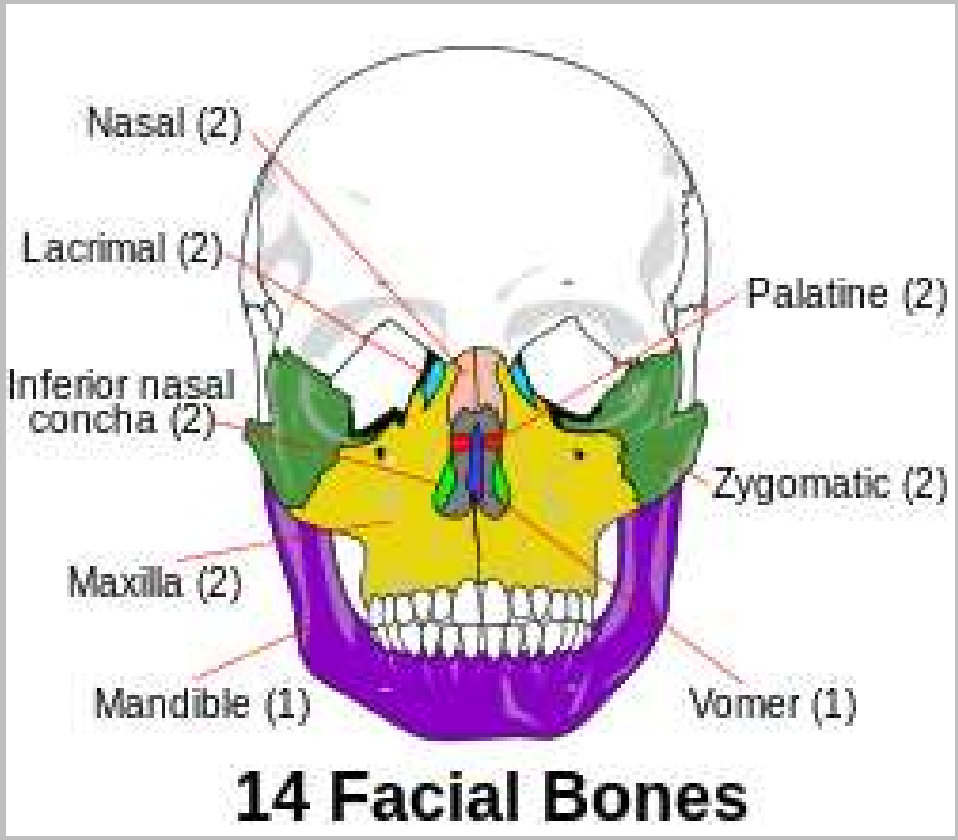
The human skull is generally consist of 22 bones
8 cranial bones are

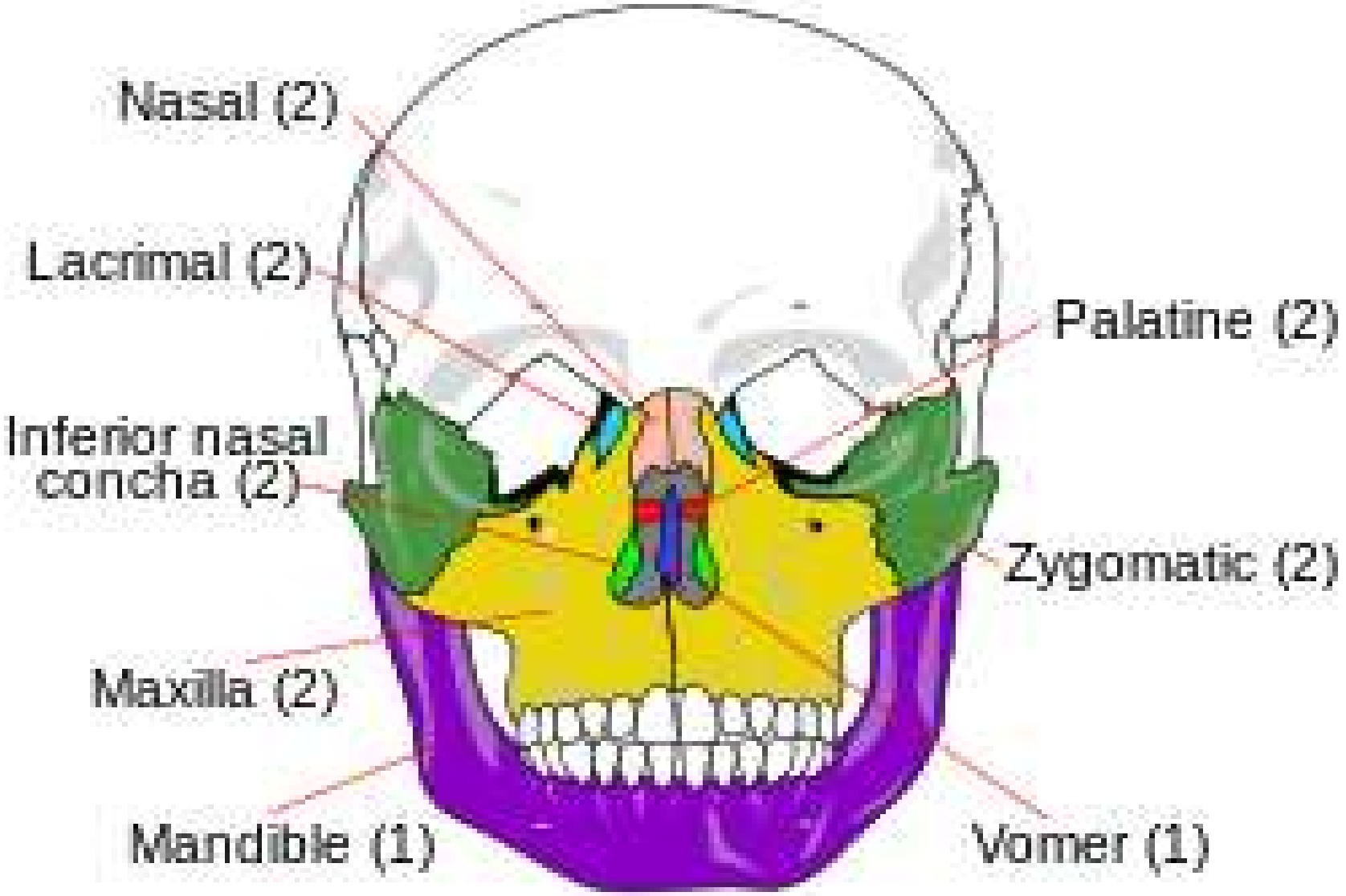
- occipital bone
- two temporal bones
- two parietal bones
- sphenoid
- ethmoid
- frontal bones.



The bones of the facial skeleton(14)

- vomer
- two nasal conchae
- two nasal bones
- two maxilla
- mandible
- two palatine bones
- two zygomatic bones
- two lacrimal bones.



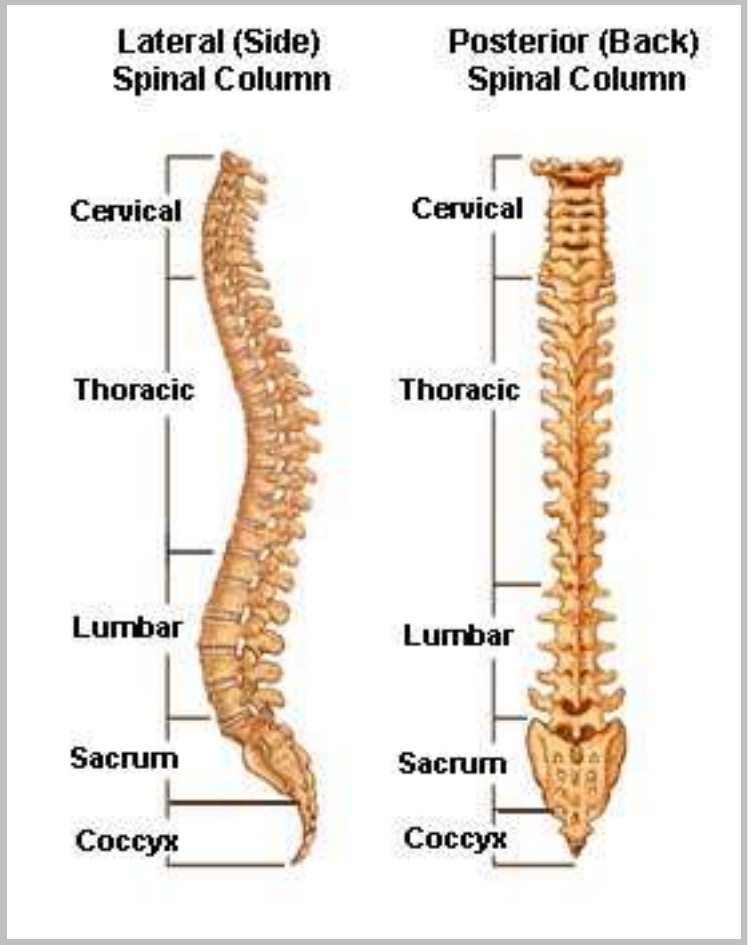


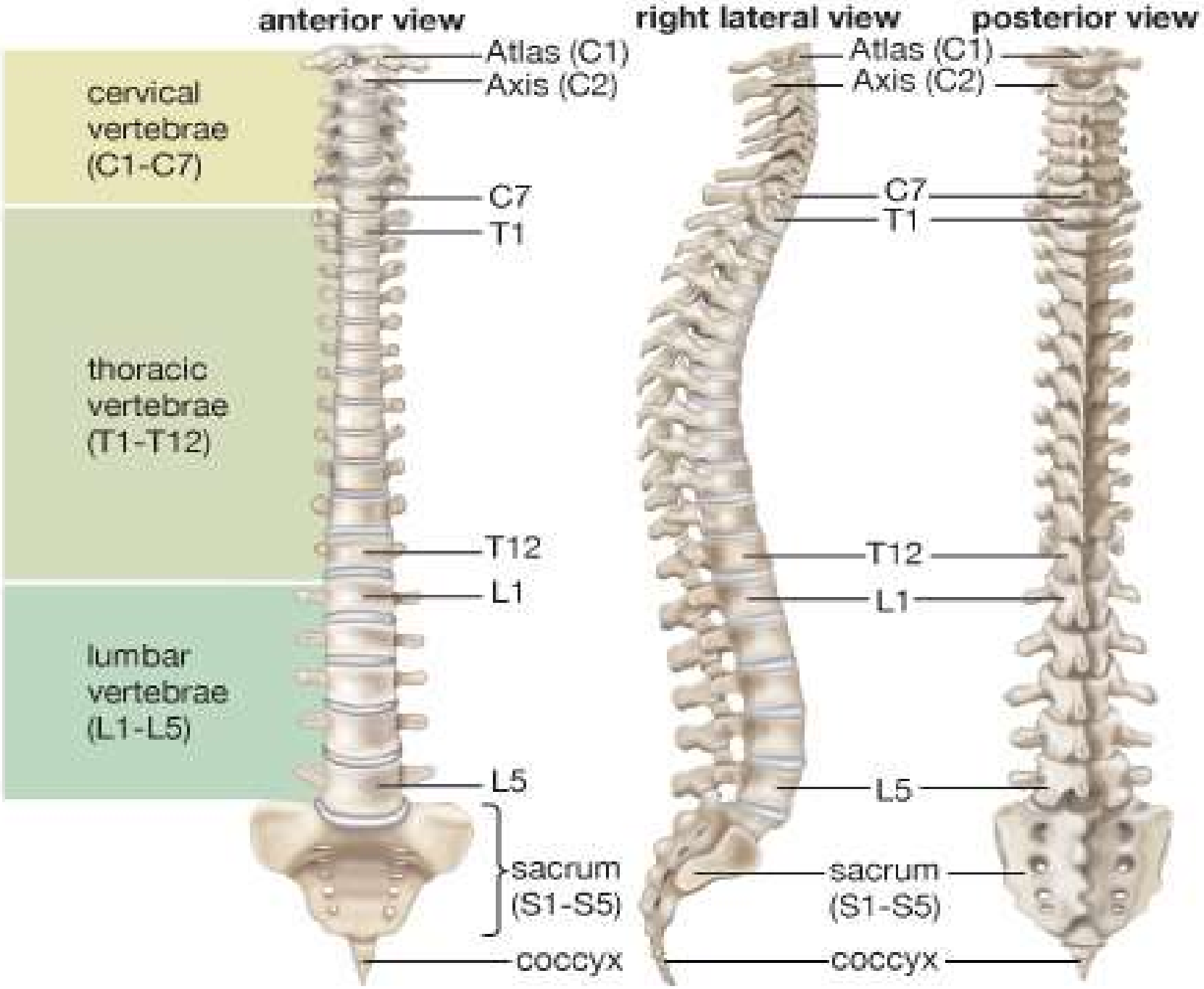
14 Facial Bones

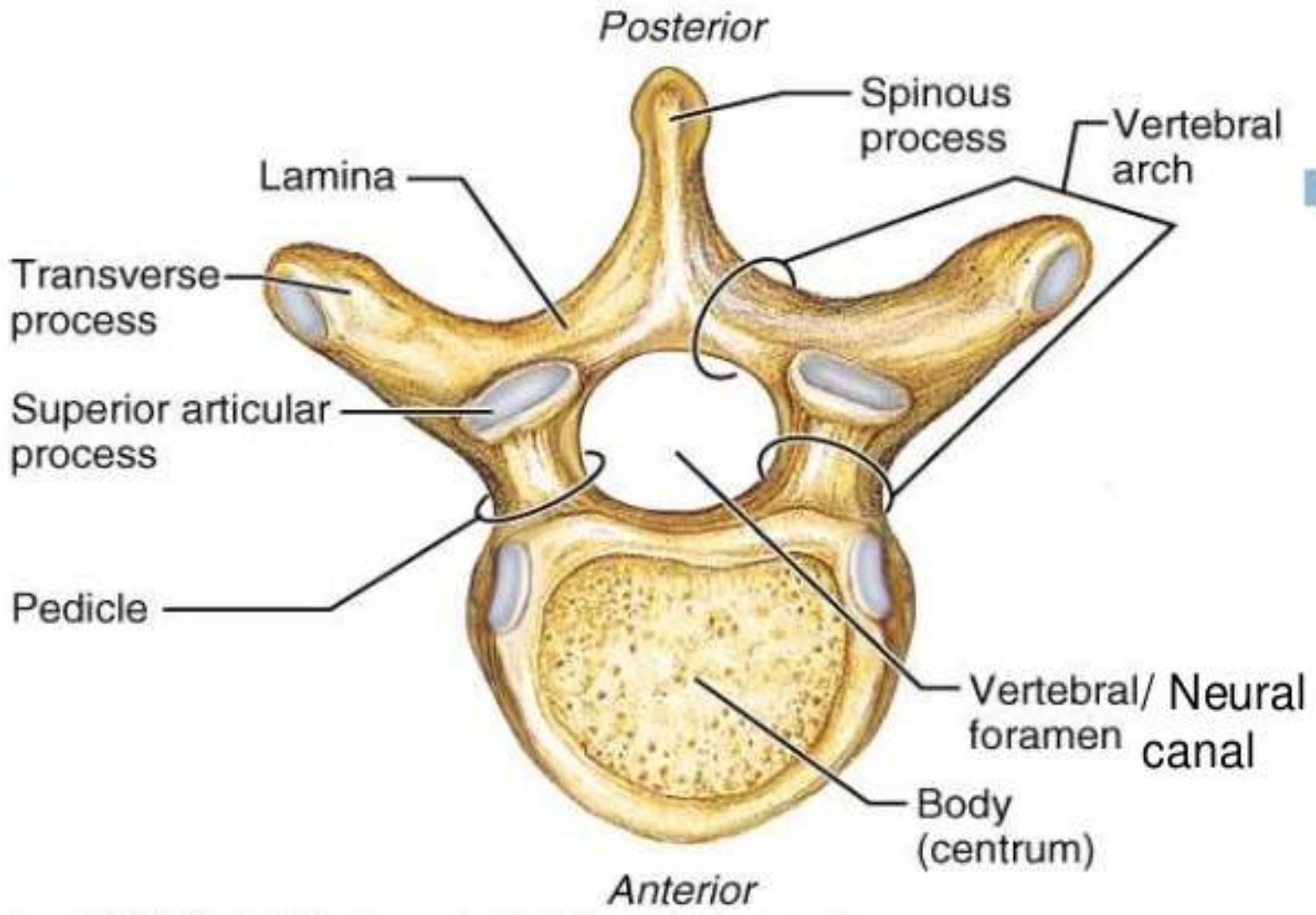
2- vertebral colomn

is part of the axial skeleton. The vertebral column consist of bones—vertebrae separated by intervertebral discs The vertebral column houses the spinal canal, a cavity that encloses and protects the spinal cord..the vertebrae are:

- **Cervical spine**: 7 vertebrae (C1–C7)
- **Thoracic spine**: 12 vertebrae (T1–T12)
- **Lumbar spine**: 5 vertebrae (L1–L5)
- **Sacrum**: 5 (fused) vertebrae (S1–S5)
- **Coccyx**: 4 (3–5) (fused) vertebrae

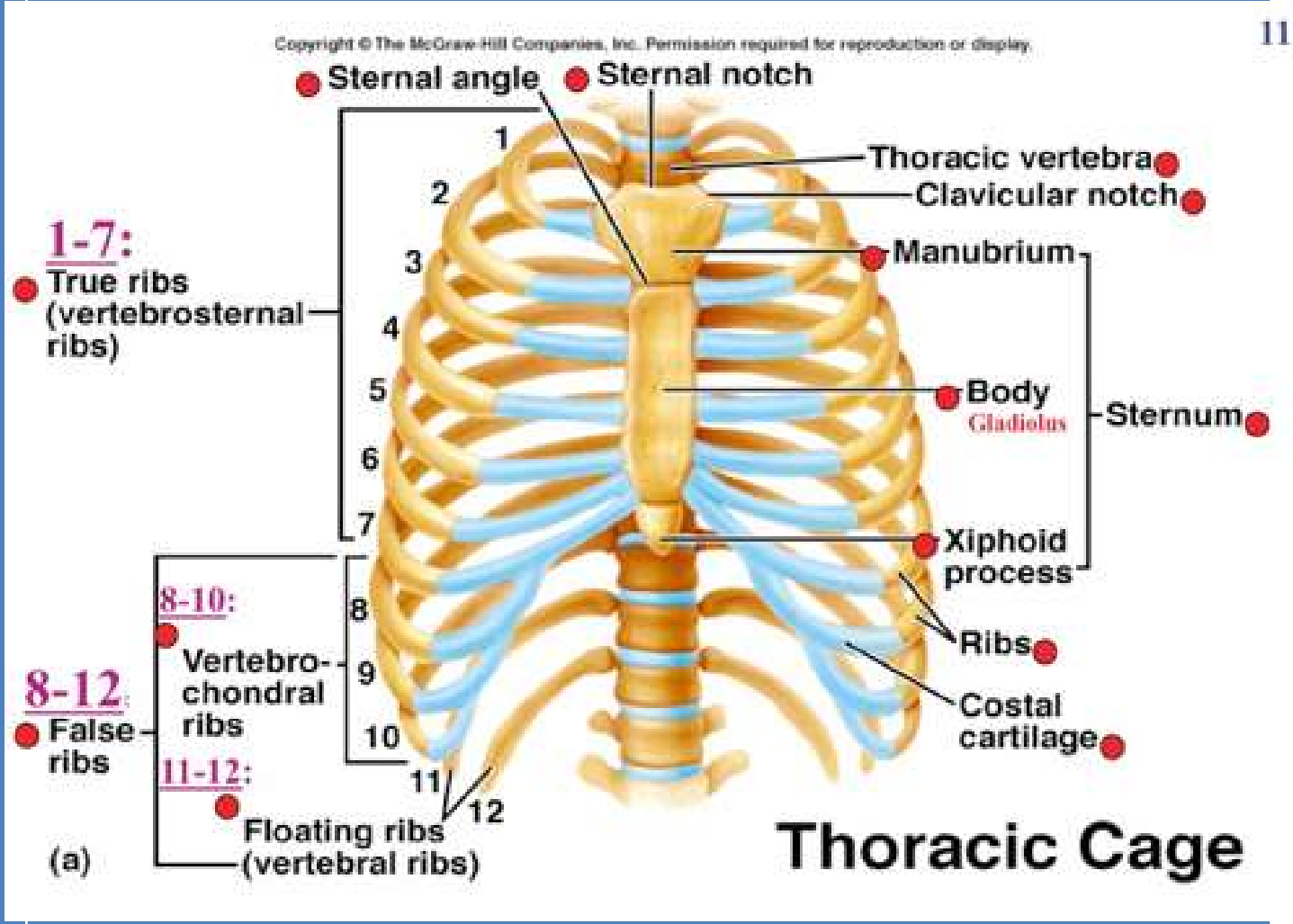


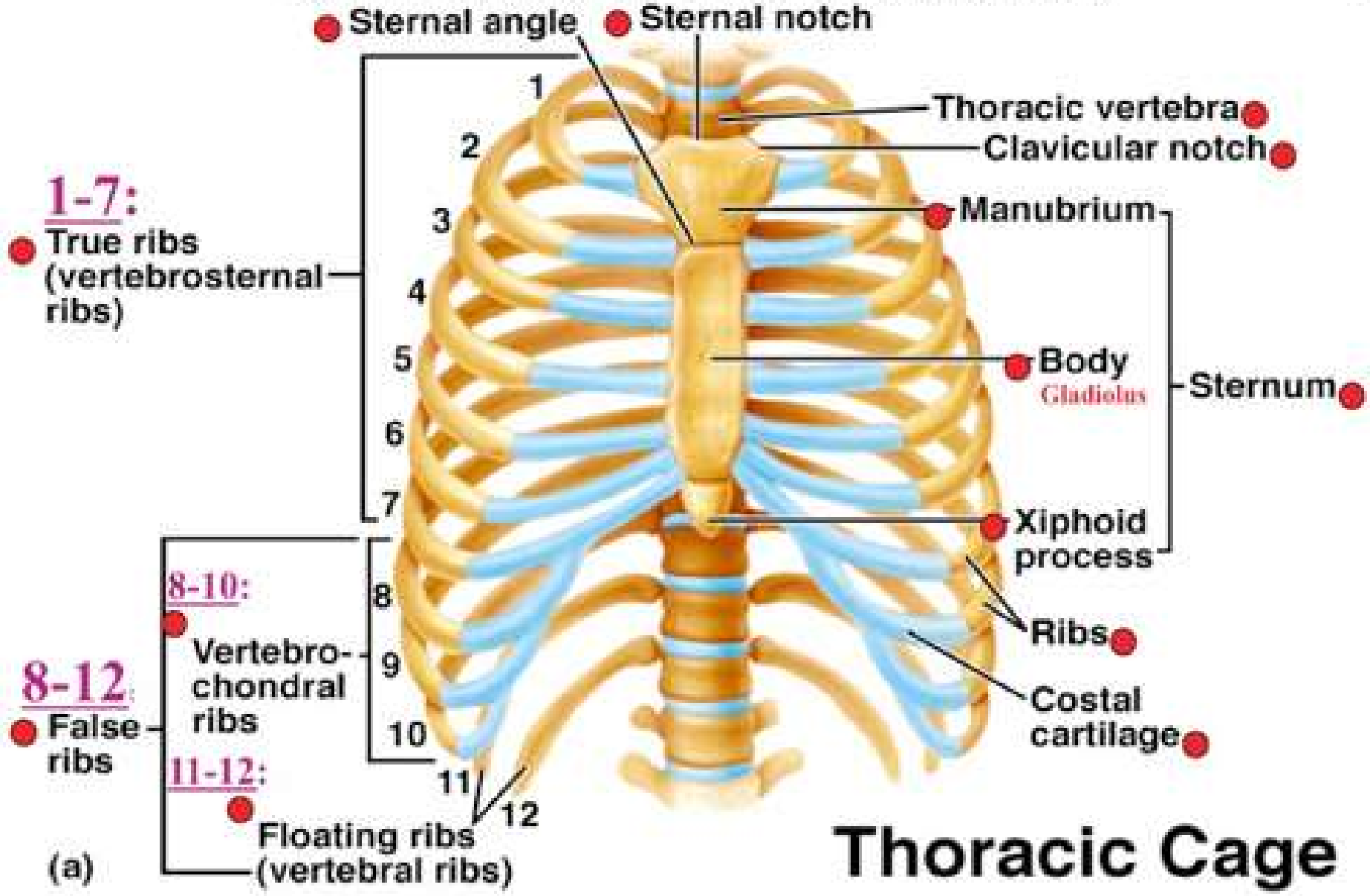

anterior view
right lateral view
posterior view
cervical vertebrae (C1-C7)
thoracic vertebrae (T1-T12)
lumbar vertebrae (L1-L5)
Atlas (C1)
Axis (C2)
C7
T1
T12
L1
L5
sacrum (S1-S5)
coccyx


Posterior
Spinous process
Vertebral arch
Lamina
Transverse process
Superior articular process
Pedicle
Vertebral/ foramen
Neural canal
Body (centrum)
Anterior

3- The Bony Thorax

- Sternum
  - Manubrium,
  - Body,
  - Xiphoid Process
- Ribs
  - 7 True Ribs
  - 5 False Ribs
- Clavicle
- Scapula
- Vertebrae
  - Thoracic



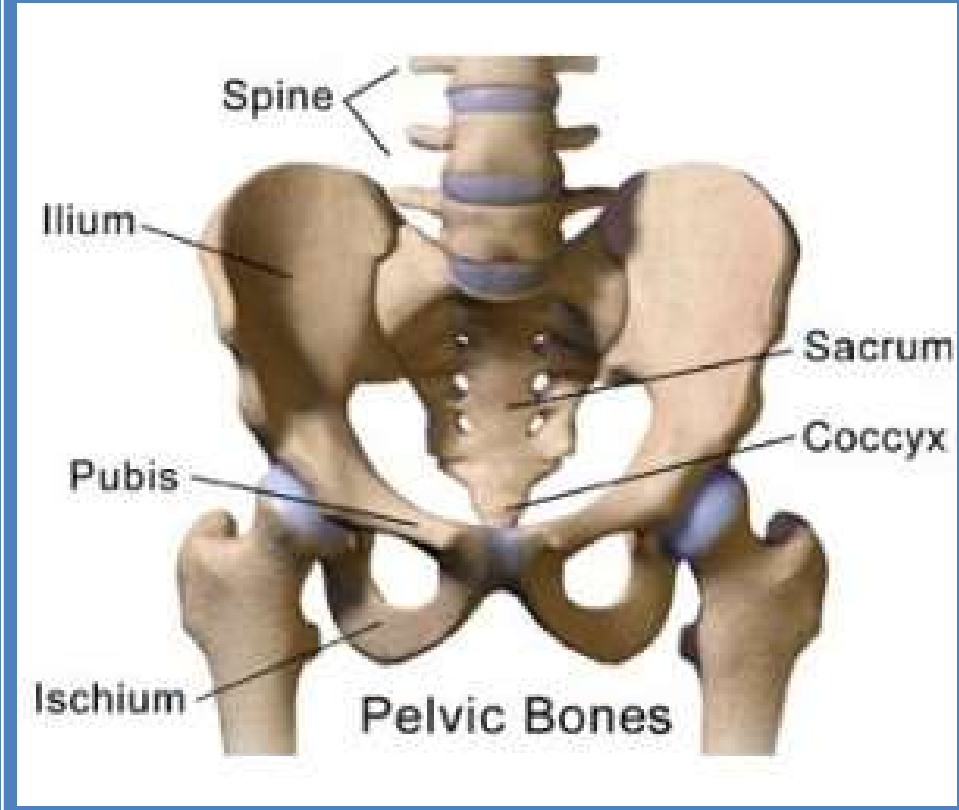


Thoracic Cage

4-Bony Pelvis

Pelvis is basin-shaped ring of bone formed by :

1. two hip bones
   (ilium, ischium, and pubis.)
   2-sacrum
   3-coccyx.



5- upper limbs

Shoulder joint composed of the clavicle and the scapula, connects the upper limb **.**

elbow joint is a complex of three joints — the humeroradial, humeroulnar, and superior radioulnar joints

wrist joint composed of the carpal bones, articulates at the wrist joint (or radiocarpal joint) proximally and the carpometacarpal joint distally

upper limbes bone

Arm

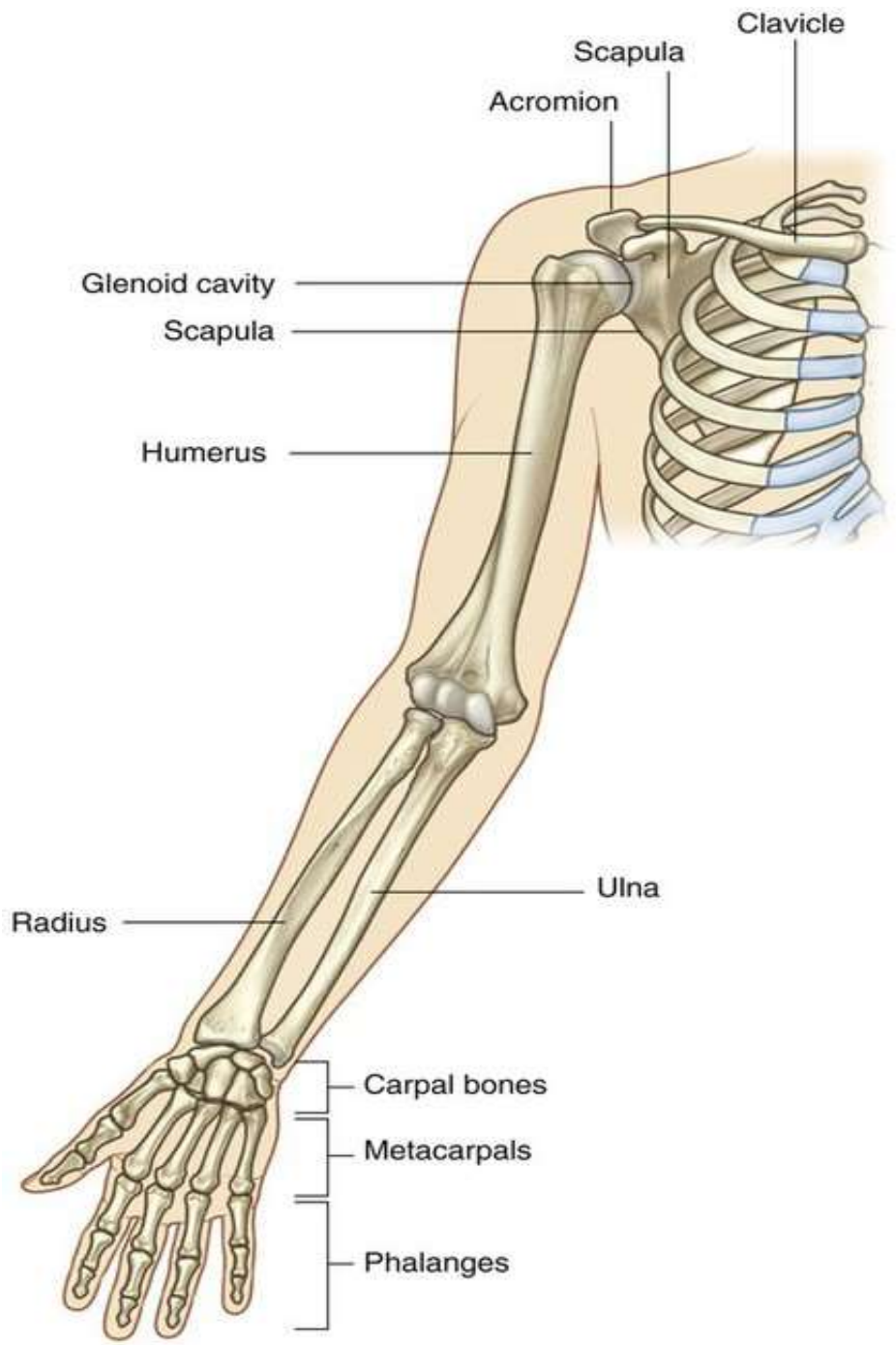
- **humerus**

Forarm

- **Radius**
- **Ulna**

Hand

- **Carpal**
- **Metacarpal**
- **Phalanges**



6 - lower limb

Hip joint is acetabulofemoral joint is the joint between the femur and acetabulum of the pelvis

knee joins the thigh with the leg and consists of two joints: one between the femur and tibia (tibiofemoral joint), and one between the femur and patella (patellofemoral joint)

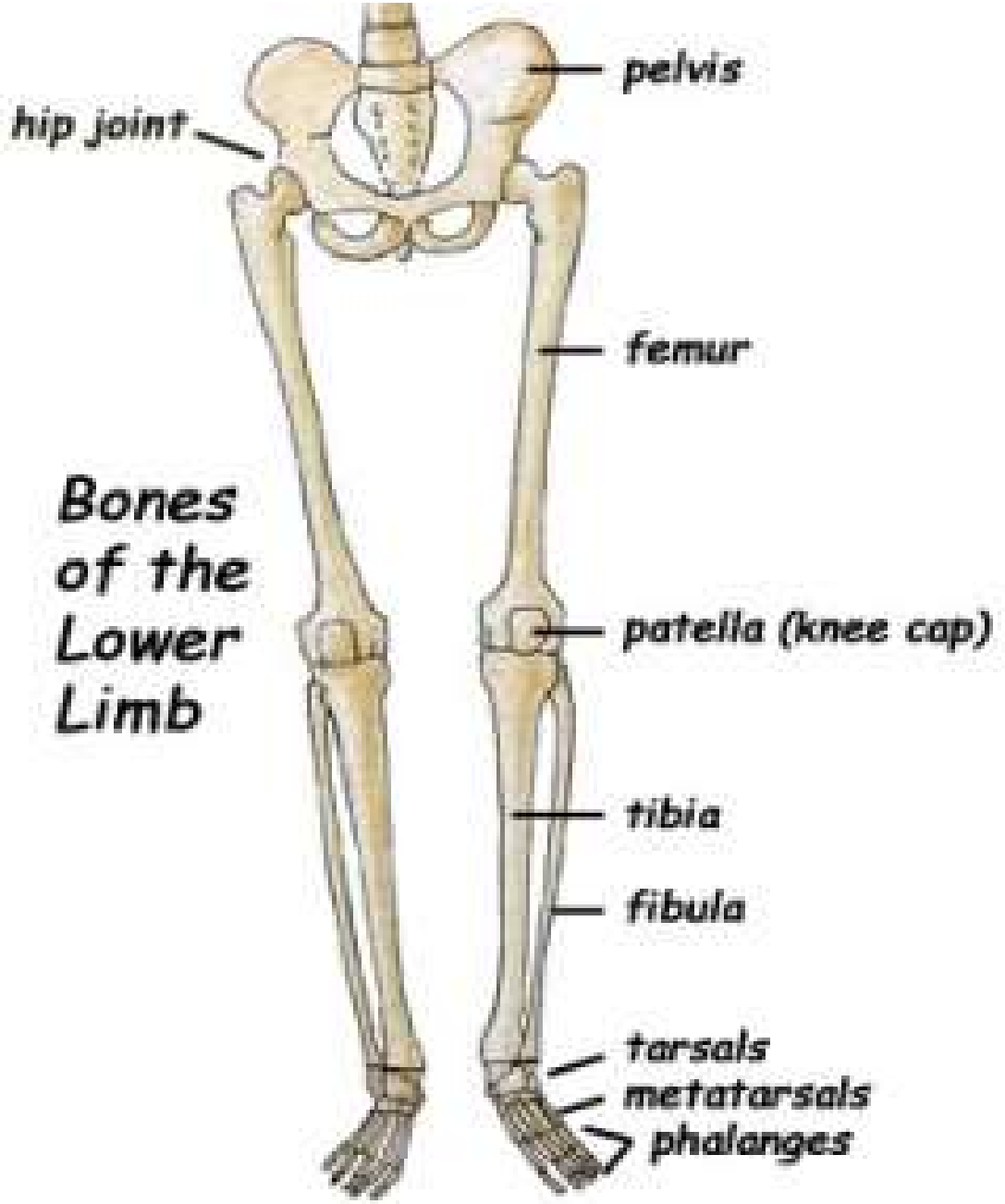
ankle is the region where the foot and the leg meet

Lower limb bone:

Thigh
- femur
- patella

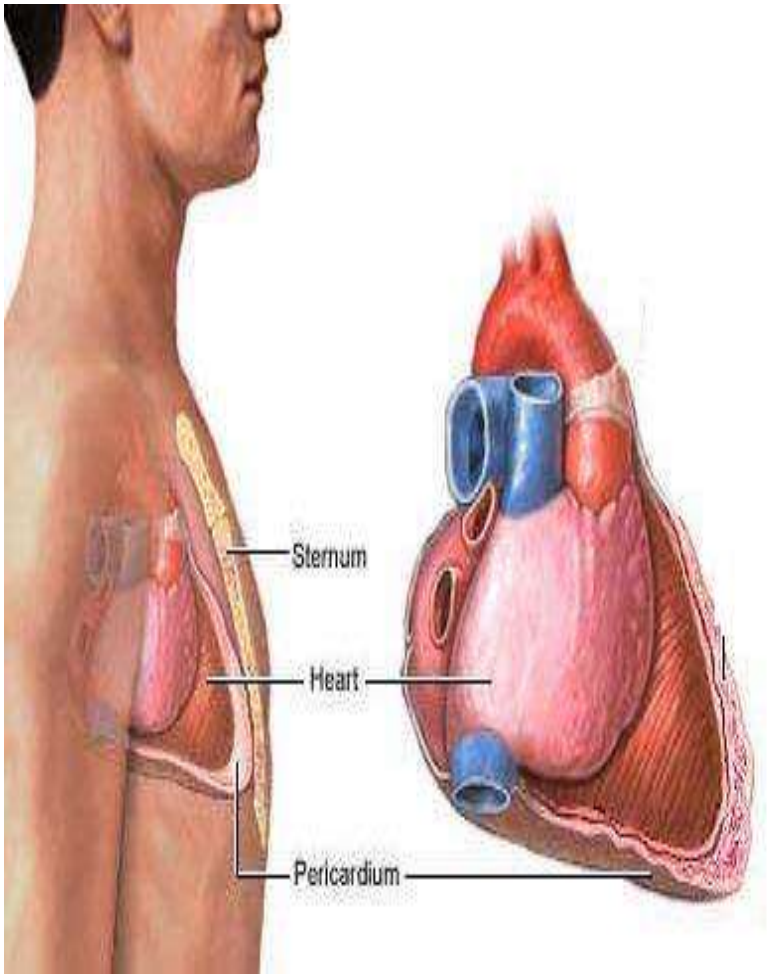
Leg
- tibia
- fibula

Foot
- tarsals
- metatarsals
- phalanges



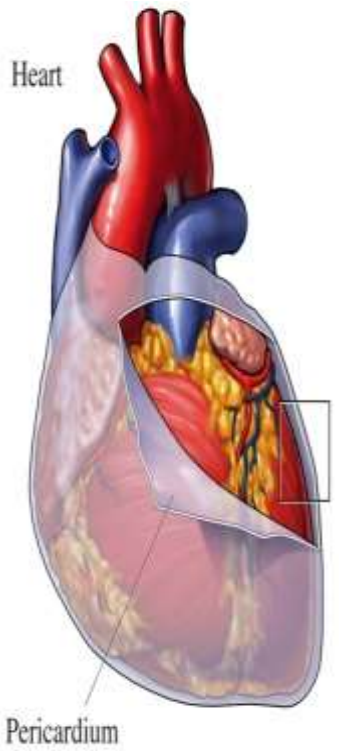
The Heart

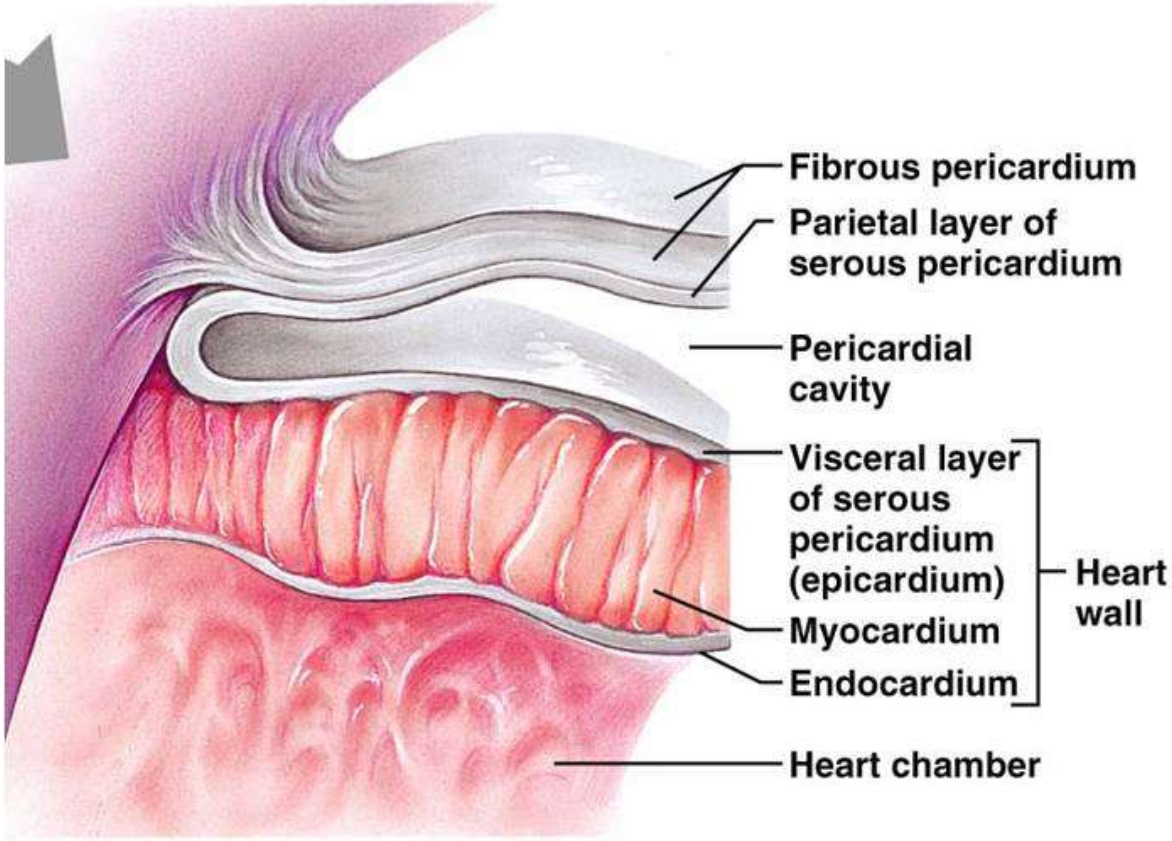
- is a hollow muscular organ
- pyramid shaped
- lies within pericardium in the mediastinum .
- It is connected at its base to the great blood vessels.



pericardium

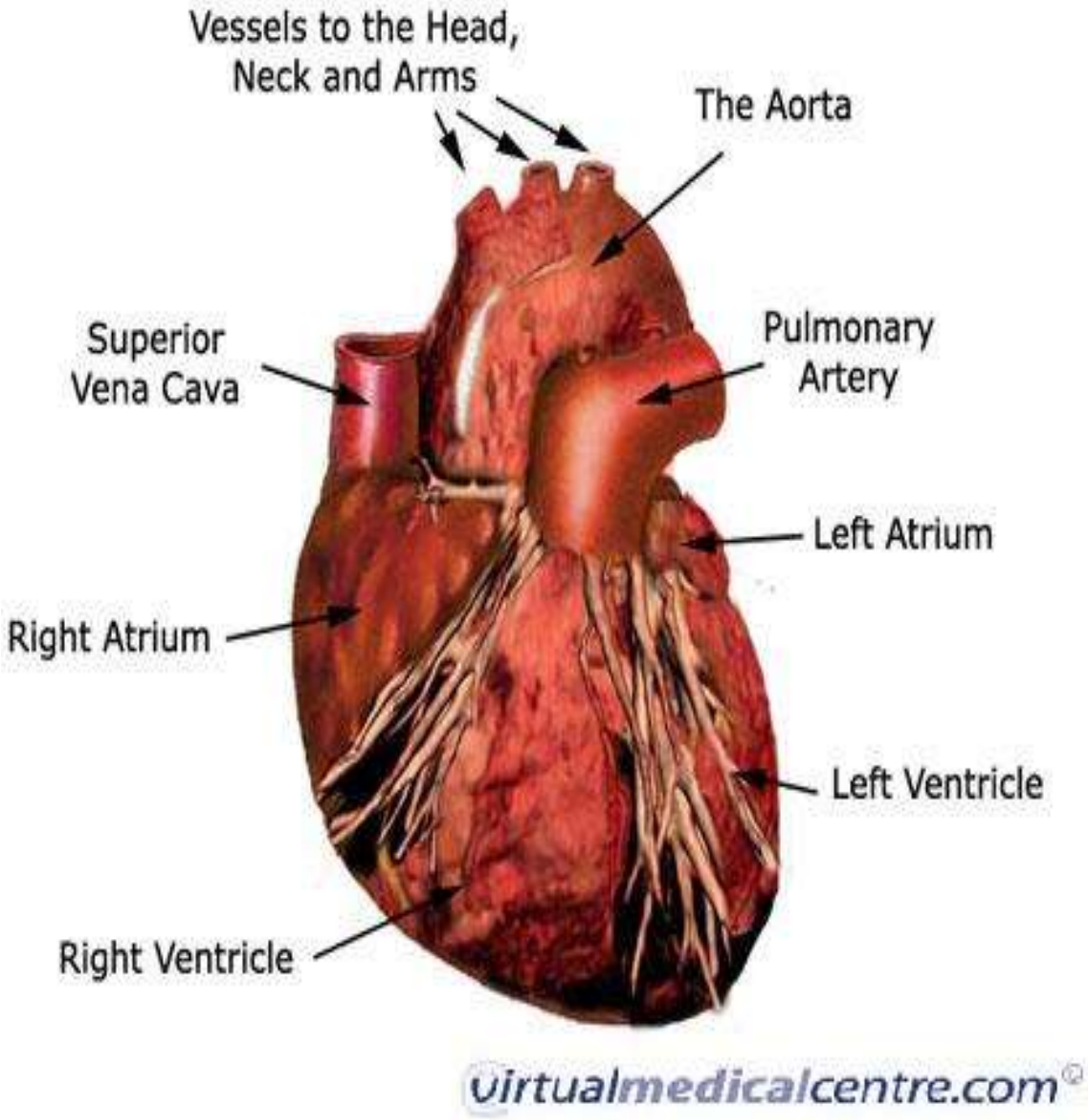
- is a fibroserous sac
- encloses the heart and the roots of the great vessels.
- lies within the middle mediastinum.





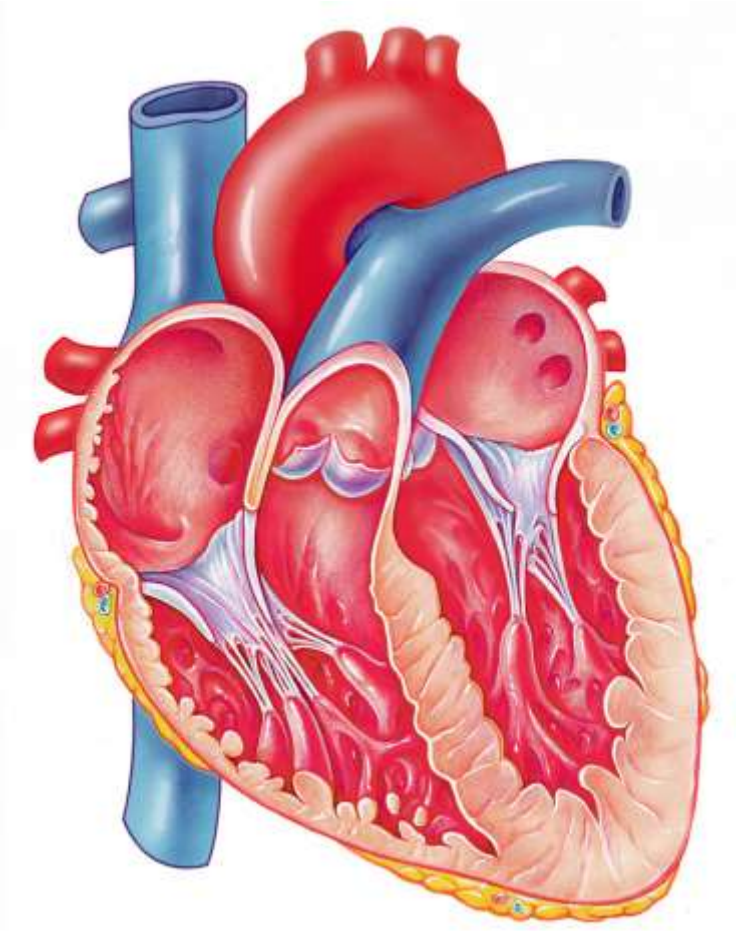
The Heart Chambers

- Four chambers
  - Two atria
    - (Right and Left)
  - Two ventricles
    - (Right and Left)



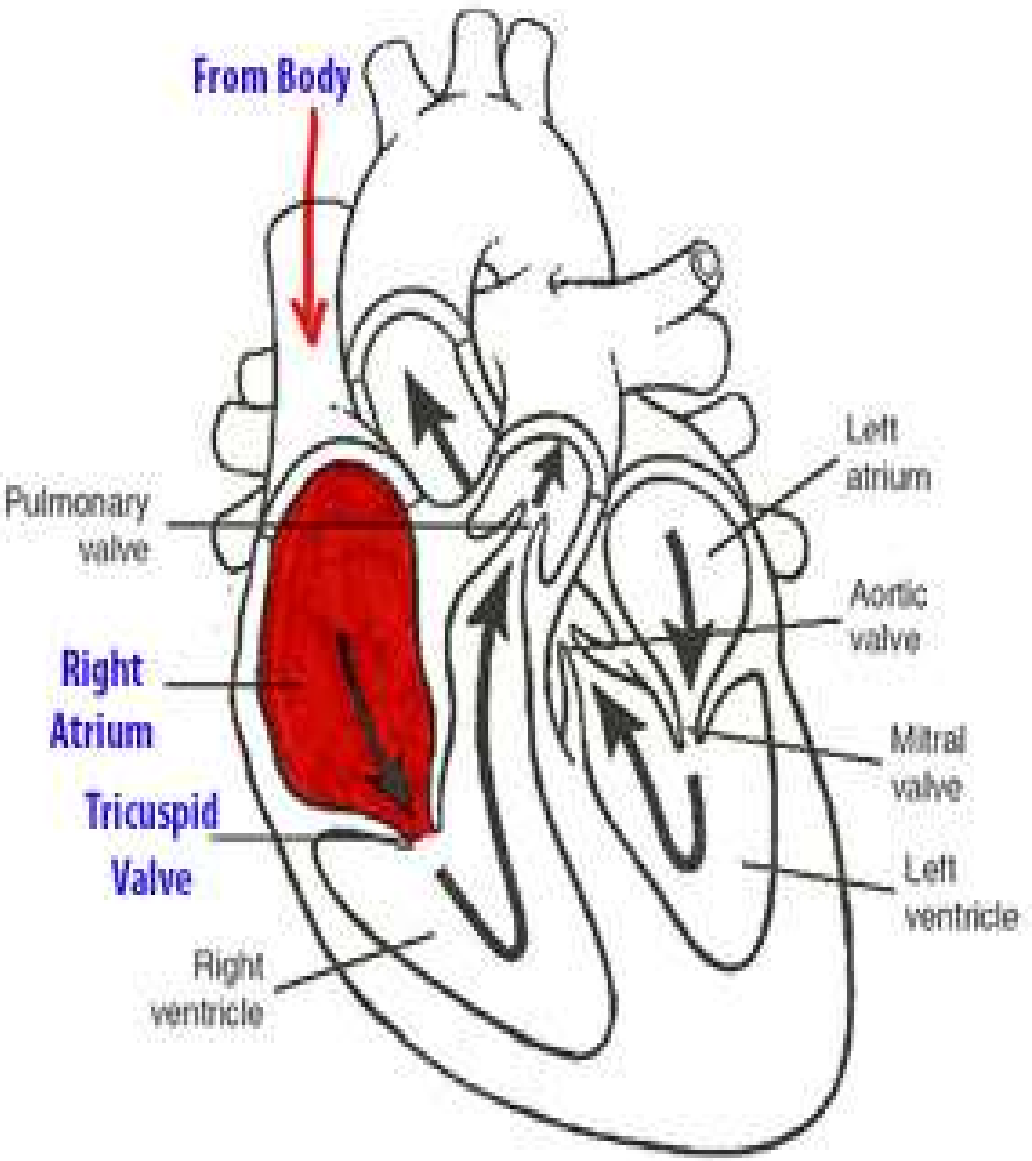
The Heart Chambers

- Atria
  - *Features*
    - small, thin-walled chambers
  - *Functions*
    - receiving chambers for blood returning to the heart from the circulation
    - push the blood into the adjacent ventricles.



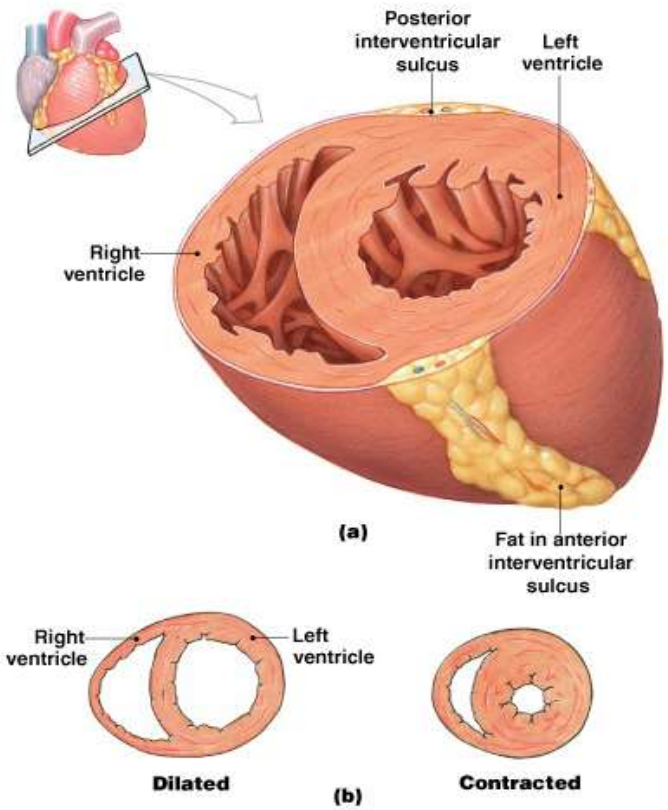
The Heart Chambers

- Atria
  - Receive blood from
    - ➢ *Right side*
    - ❖ Superior and Inferior Vena Cava
    - ❖ Coronary Sinus
    - ➢ *Left side*
    - ❖ Pulmonary Veins



The Heart Chambers

- Ventricles
  - Features
    - ➢ make up most of the mass of the heart
    - ➢ the walls of the left ventricle are **<u>3X</u>** thicker than those of the right



The Heart Chambers

- Ventricles
  - Functions

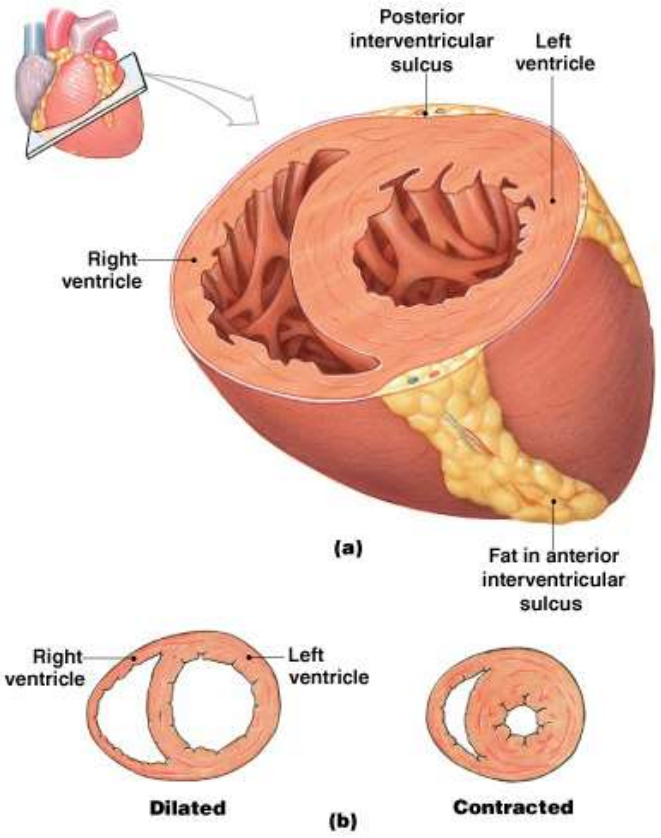
    propel blood to

    -Pulmonary Trunk

    ➢(right ventricle),

    - Aorta

    ➢(left ventricle)



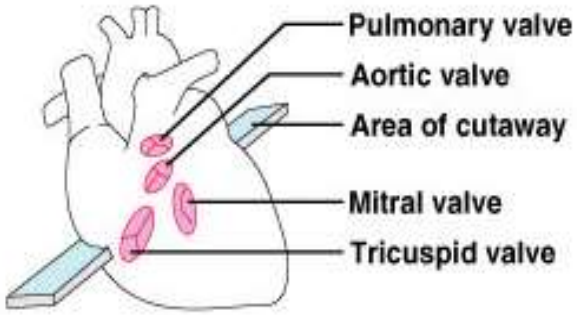
The Heart Valves

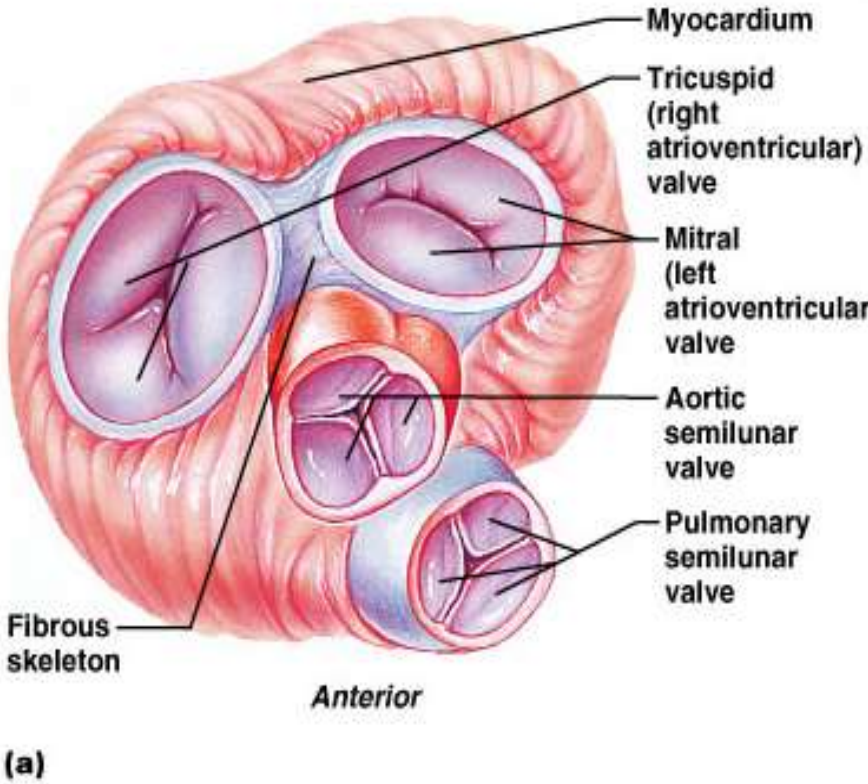
Two major types

- **Atrioventricular valves**
- **Semilunar valves**

- **Atrioventricular (AV) valves** lie between the atria and the ventricles
  - R-AV valve = tricuspid valve
  - L-AV valve = bicuspid or mitral valve

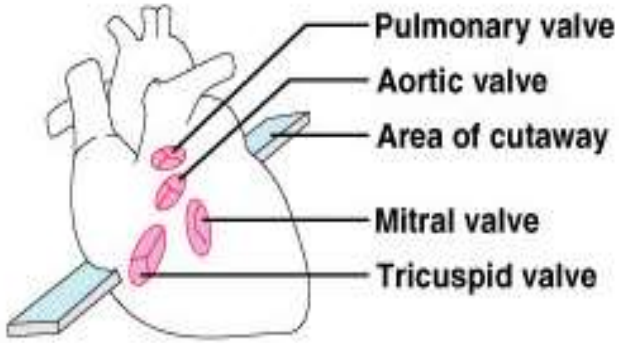
- AV valves prevent backflow of blood into the atria when ventricles contract

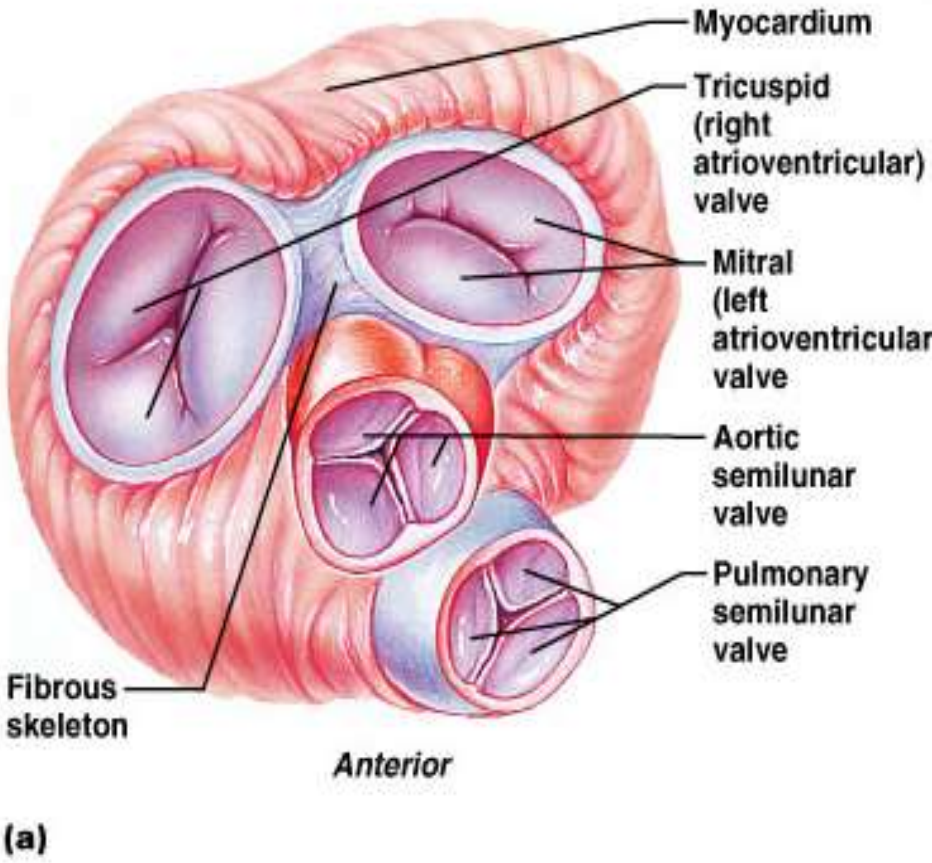




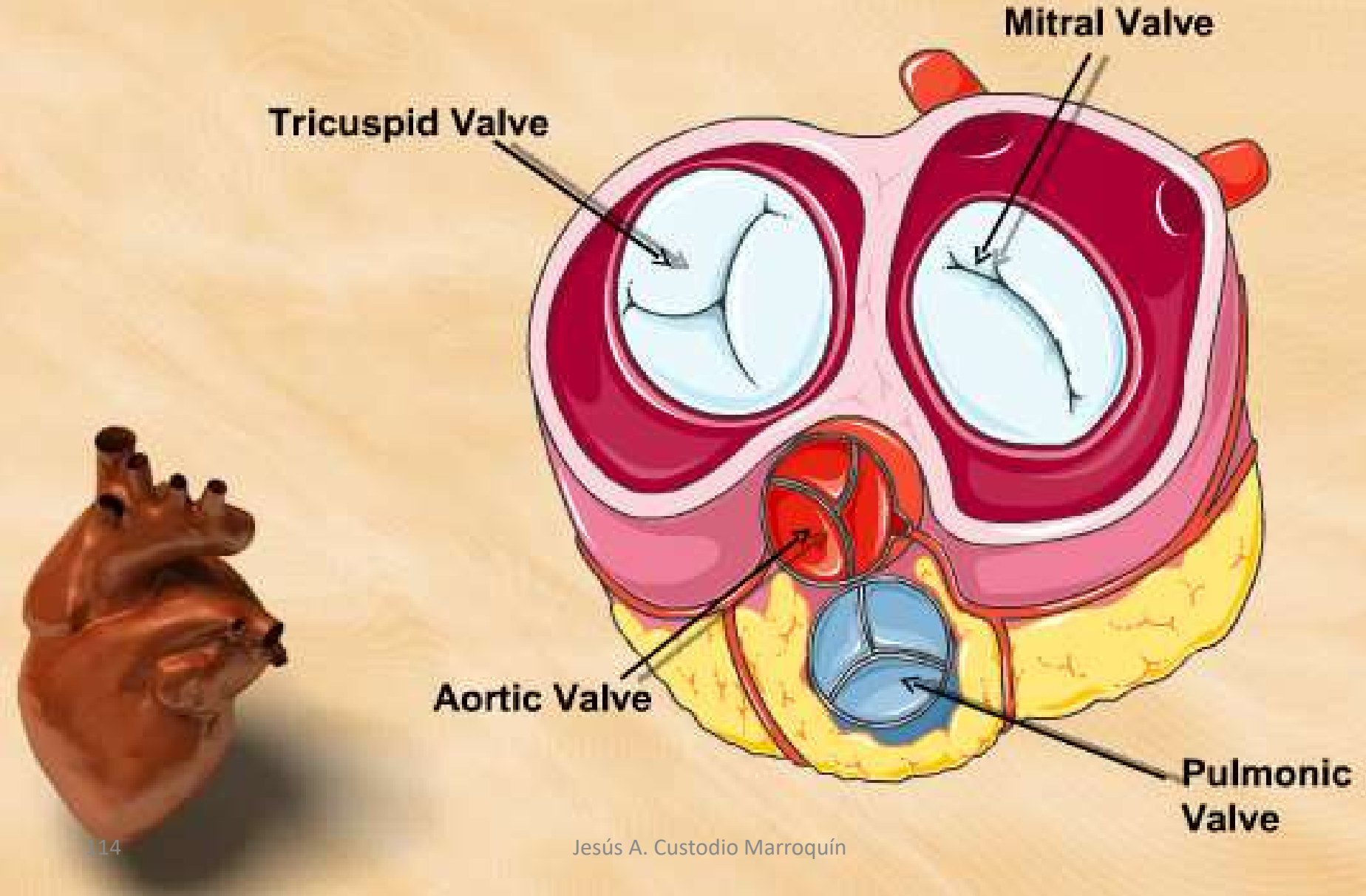
Semilunar Heart Valves

- Semilunar valves prevent backflow of blood into the ventricles
- **Aortic semilunar valve** lies between the left ventricle and the aorta
- **Pulmonary semilunar valve** lies between the right ventricle and pulmonary trunk
- Heart sounds ("lub-dup") due to valves closing
  - "Lub" - closing of atrioventricular valves
  - "Dub"- closing of semilunar valves

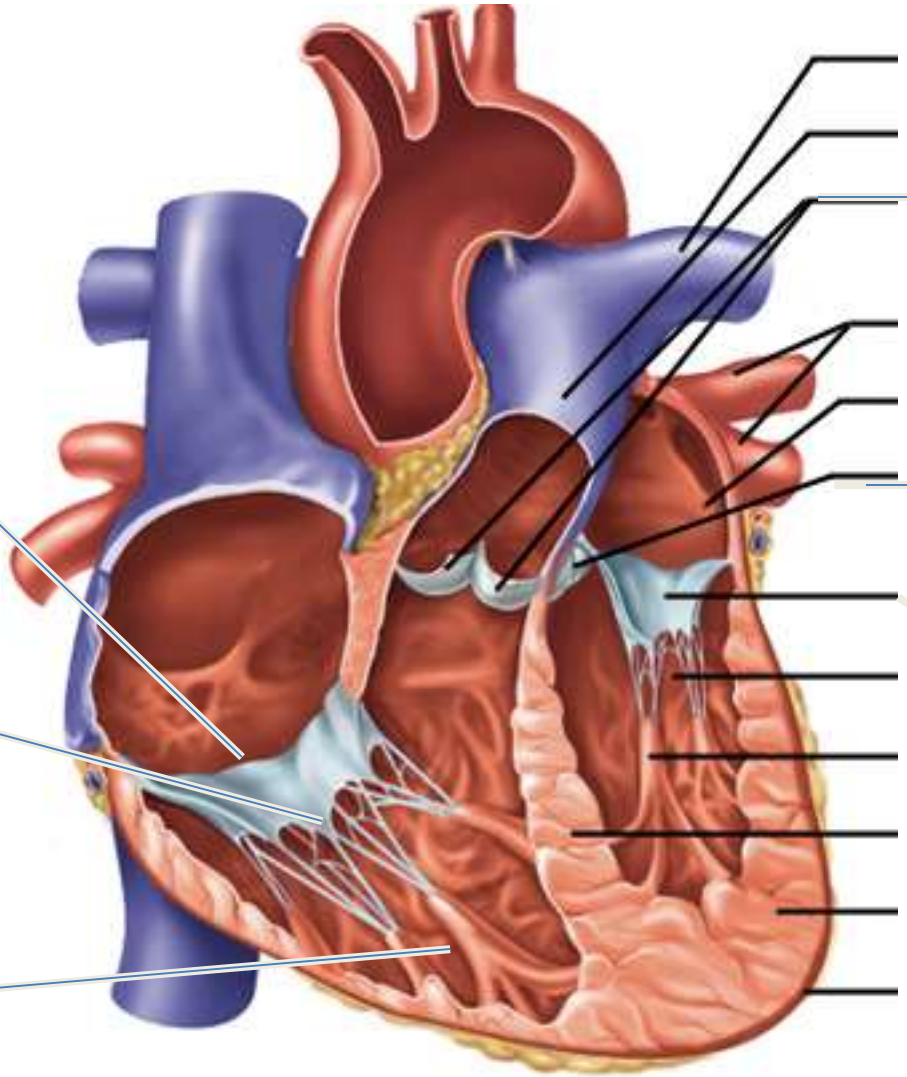




Valves of the Heart



The Heart Valves



Pulmonary semilunar valve

Aortic semilunar valve

Left AV (bicuspid) valve

Right AV (tricuspid) valve

Chordai tendineae

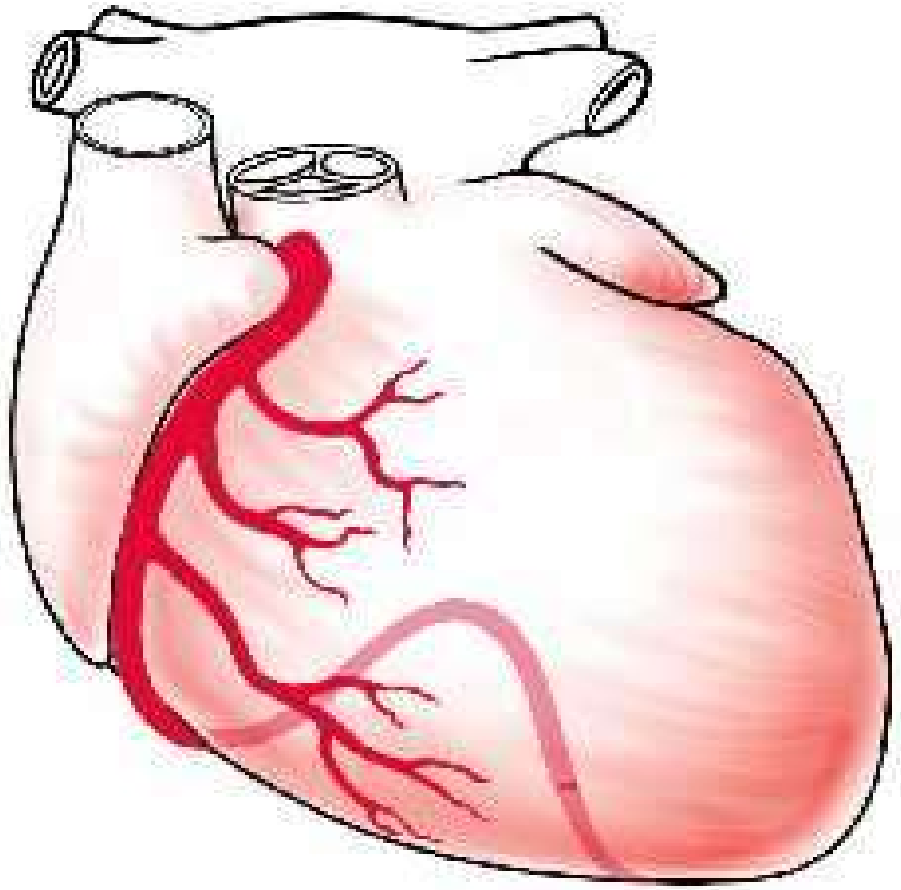
Papillary muscle

Arterial Supply of the Heart

Right coronary artery

Branches

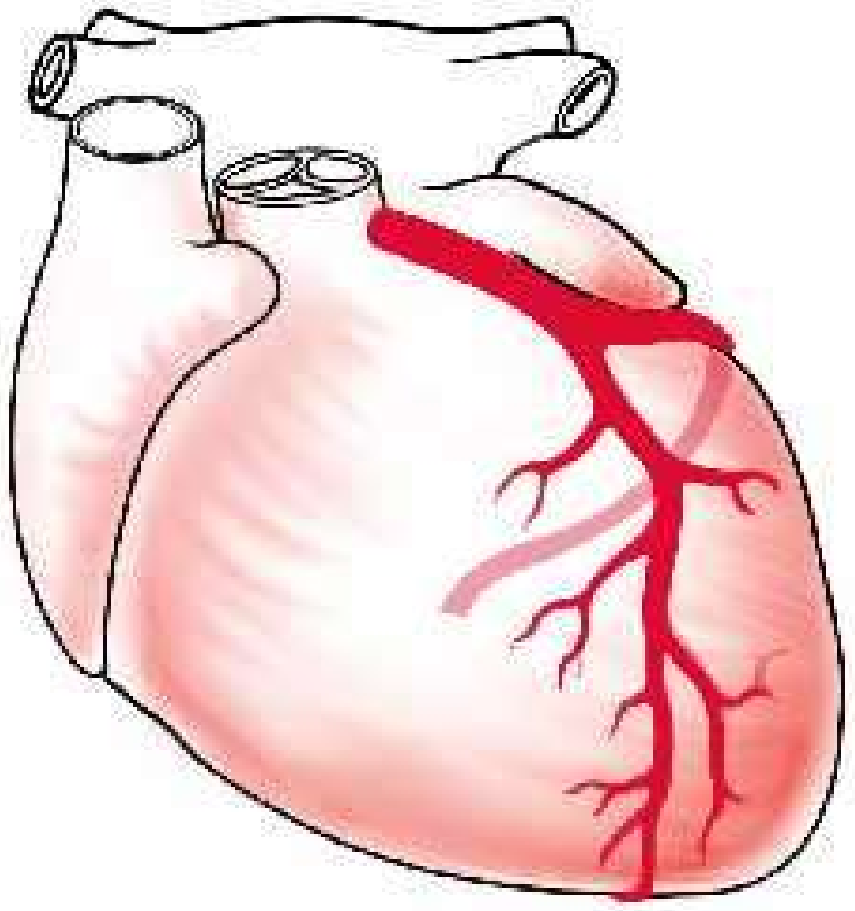
- Right marginal arteries
- Posterior interventricular artery.
- Sinoatrial nodal artery.
- Atrioventricular nodal artery.

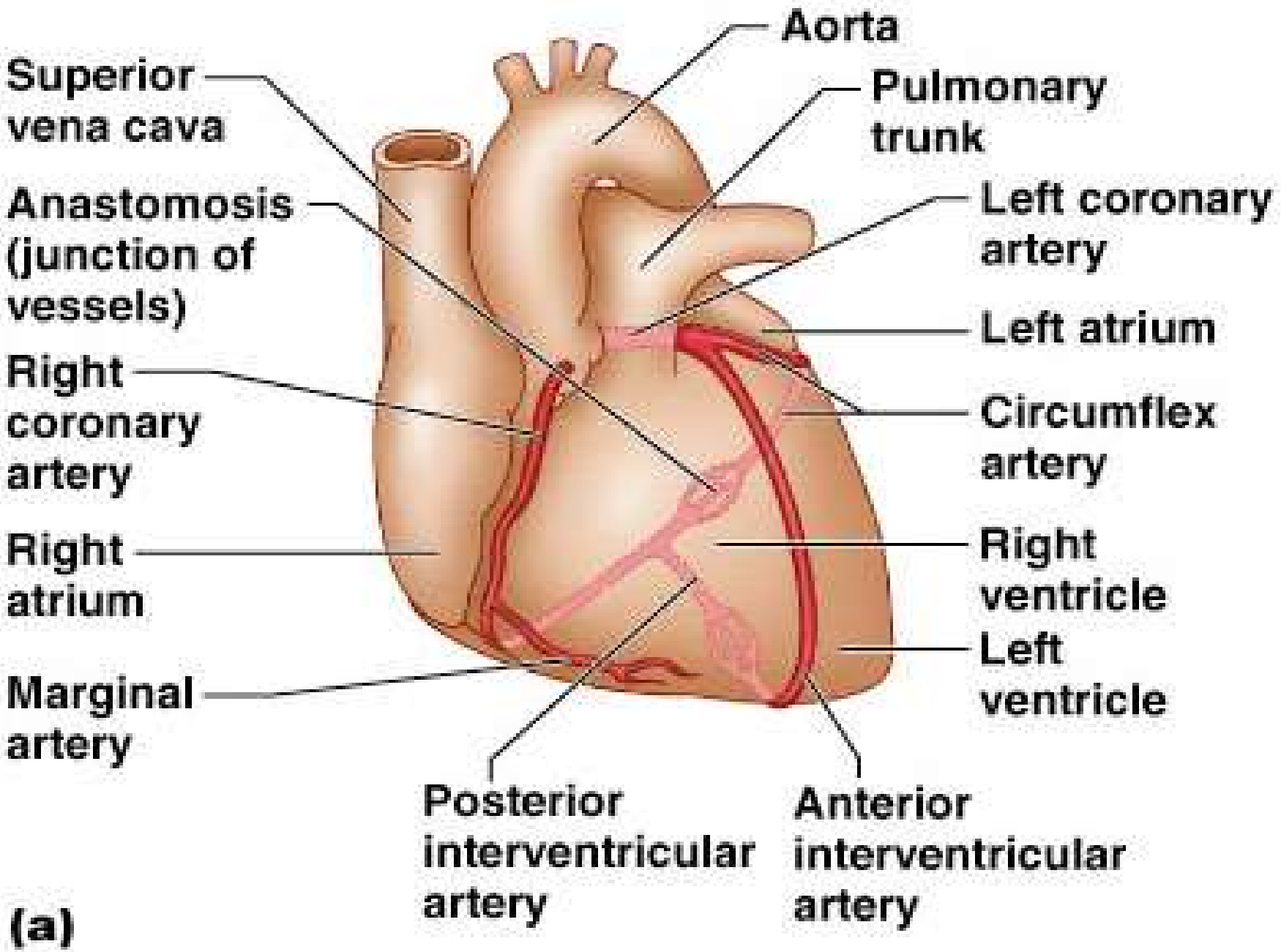


Left coronary artery

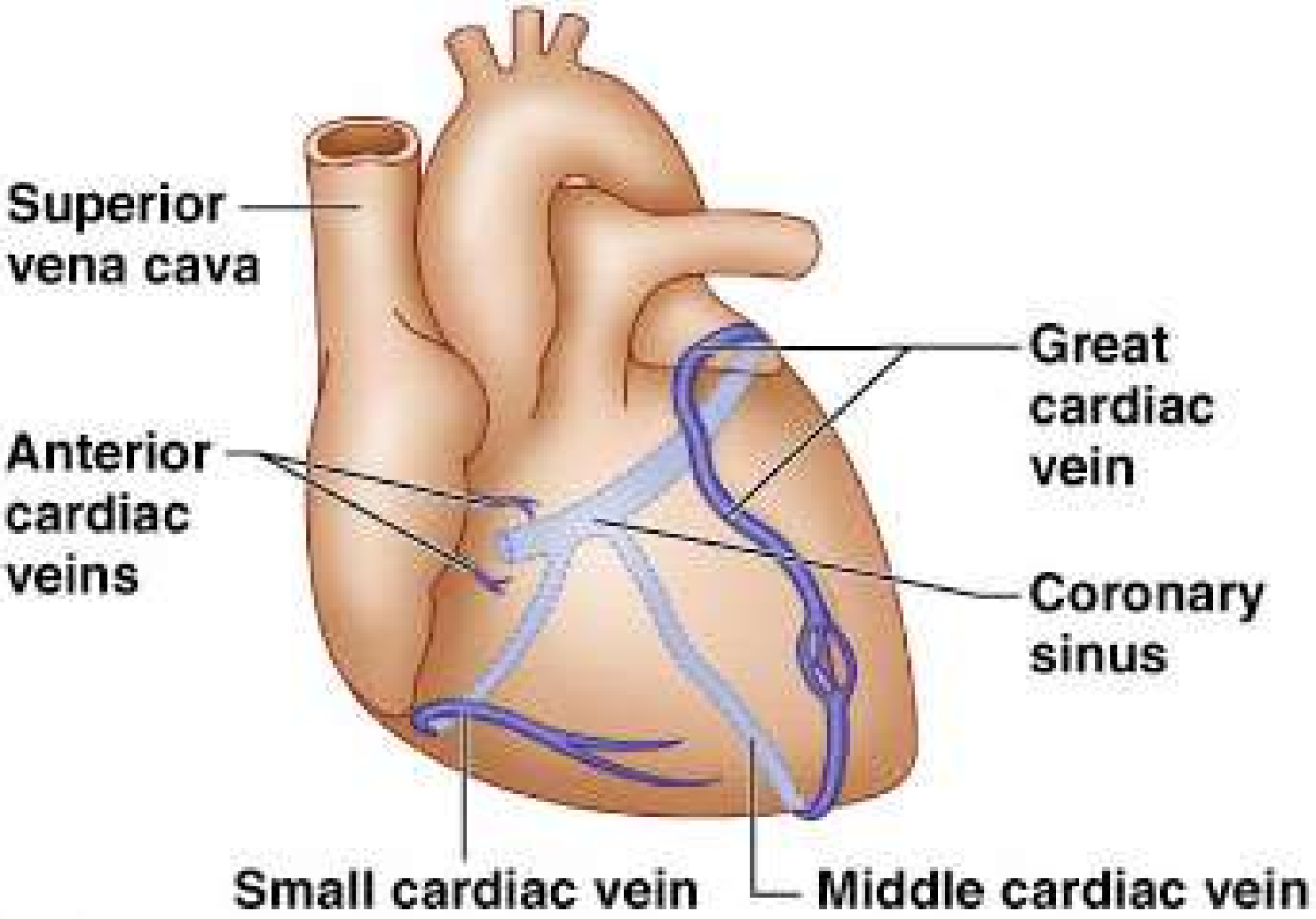
Branches

- Left anterior descending (LAD) or anterior interventricular artery.
- Left marginal artery.
- Left circumflex artery.



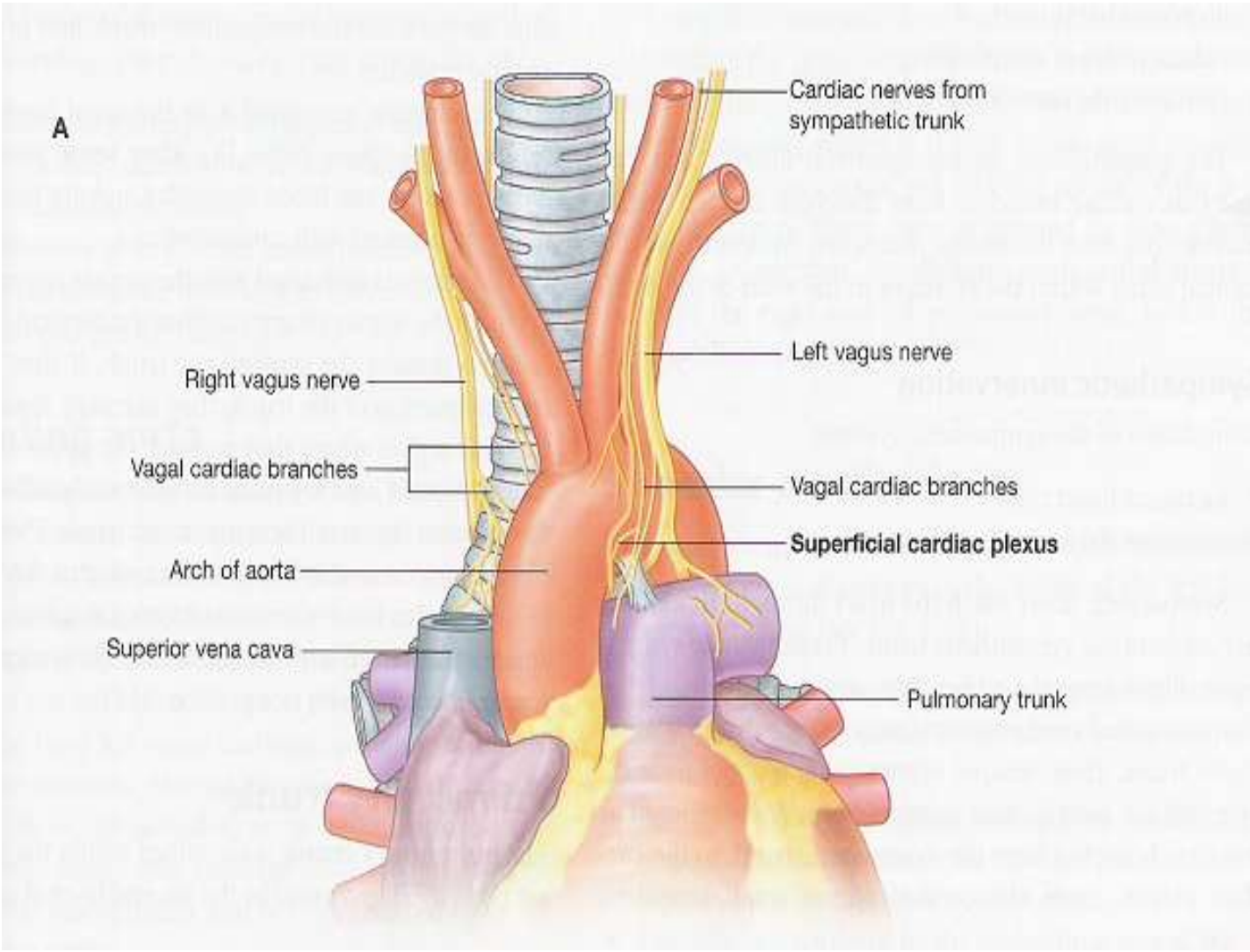

Aorta
Superior vena cava
Pulmonary trunk
Anastomosis (junction of vessels)
Left coronary artery
Left atrium
Right coronary artery
Circumflex artery
Right atrium
Right ventricle
Left ventricle
Marginal artery
Posterior interventricular artery
Anterior interventricular artery
(a)

Venous Drainage of the Heart

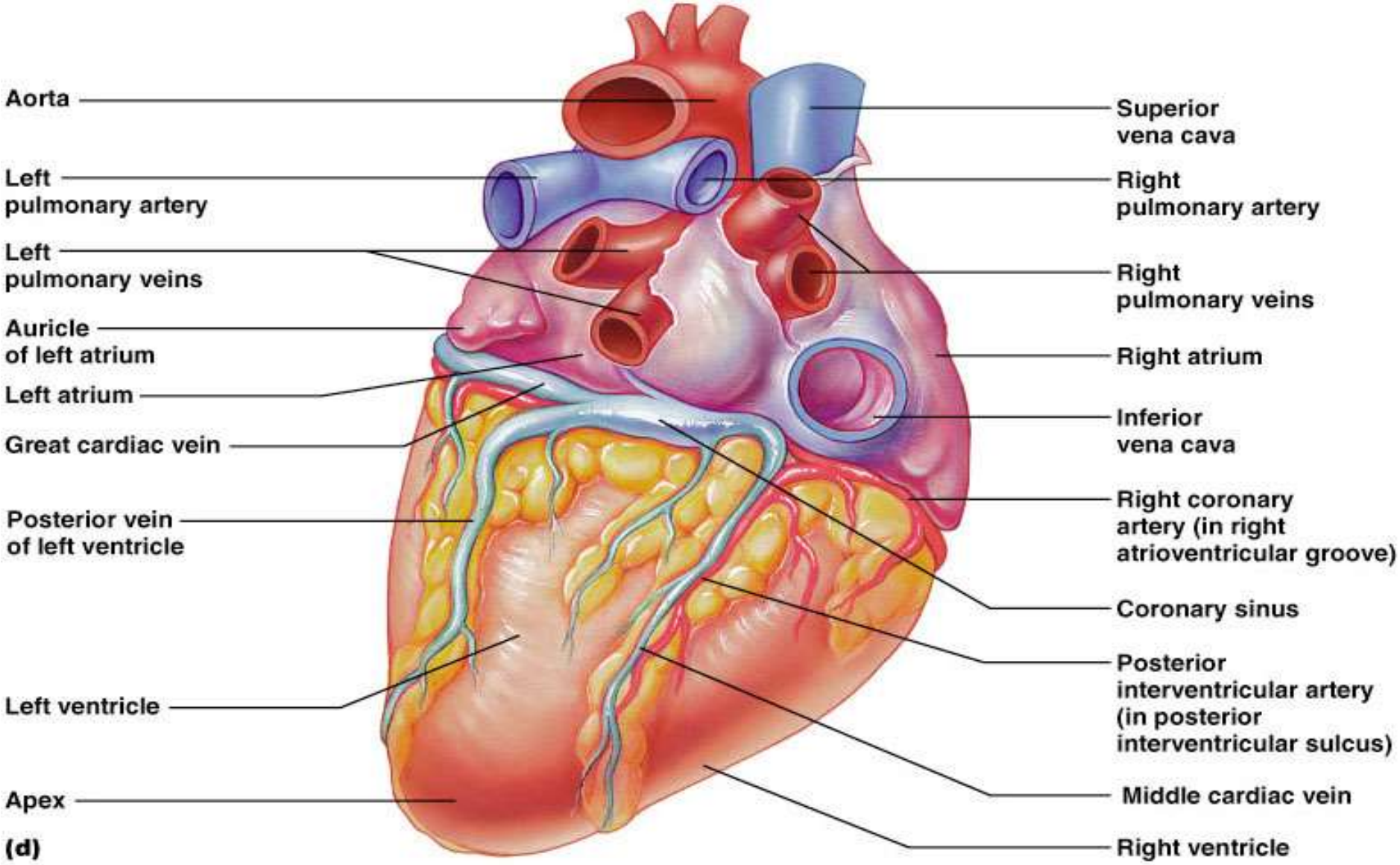


Nerve Supply of the Heart

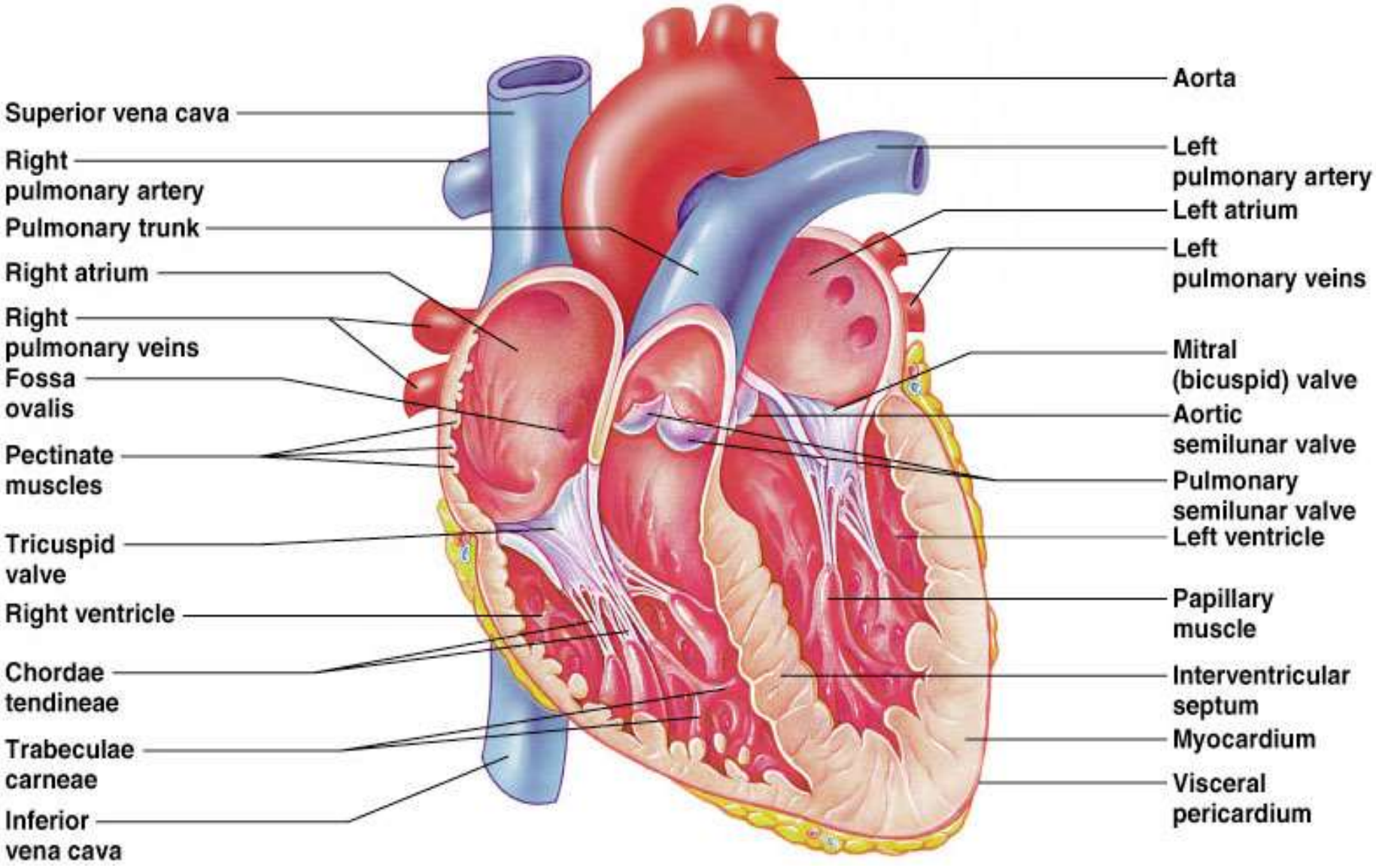
The heart is innervated by sympathetic and parasympathetic nerve



External Heart: Posterior View



Gross Anatomy of Heart: Frontal

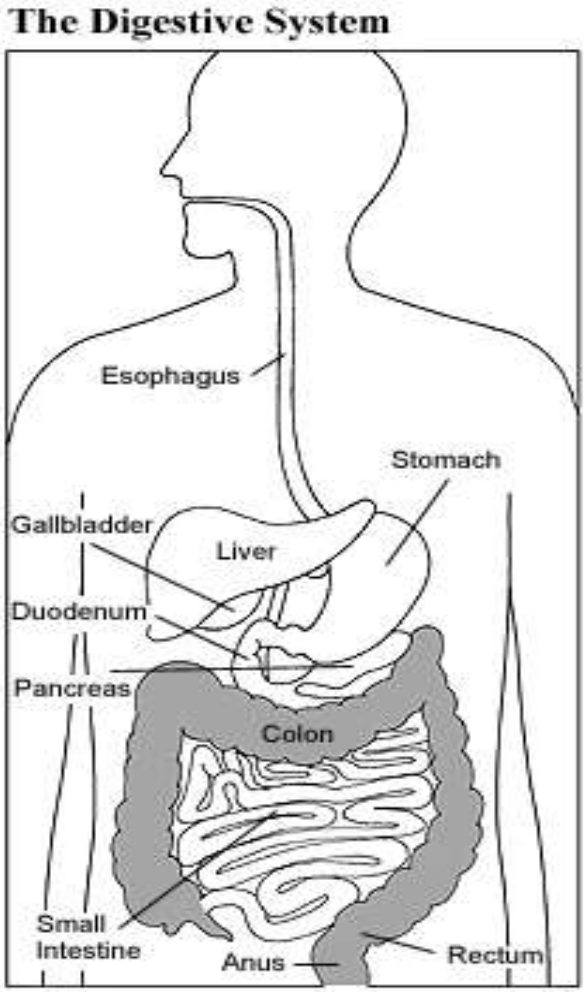


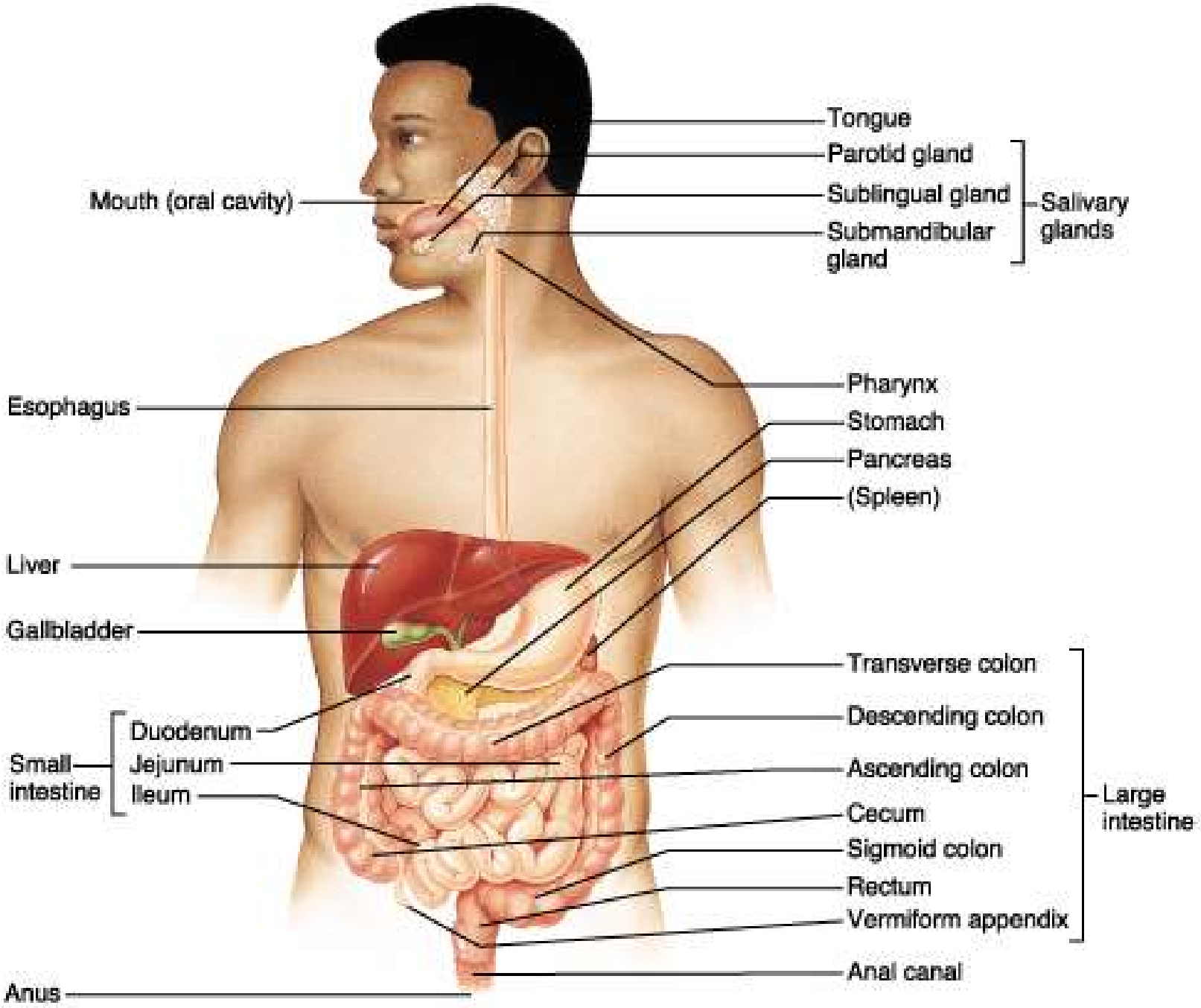
Digestive System

- is a long muscular tube
- lined with epithelial tissue passing through the body

Its primary function is to move water, nutrients and electrolytes from the external environment into the body's internal environment

- Digestive system
  - Esophagus
  - Stomach
  - Small intestine
  - Large intestine
  - Accessory organs
    - Liver & gall bladder
    - Bile ducts
    - Pancreas




Tongue
Parotid gland
Mouth (oral cavity)
Sublingual gland
Salivary glands
Submandibular gland
Pharynx
Esophagus
Stomach
Pancreas
(Spleen)
Liver
Gallbladder
Transverse colon
Descending colon
Duodenum
Small intestine
Jejunum
Ileum
Ascending colon
Large intestine
Cecum
Sigmoid colon
Rectum
Vermiform appendix
Anal canal
Anus

Begins with ….oral cavity (mouth and pharynx)

where chewing and the secretion of saliva starts digestion

Food moves through :

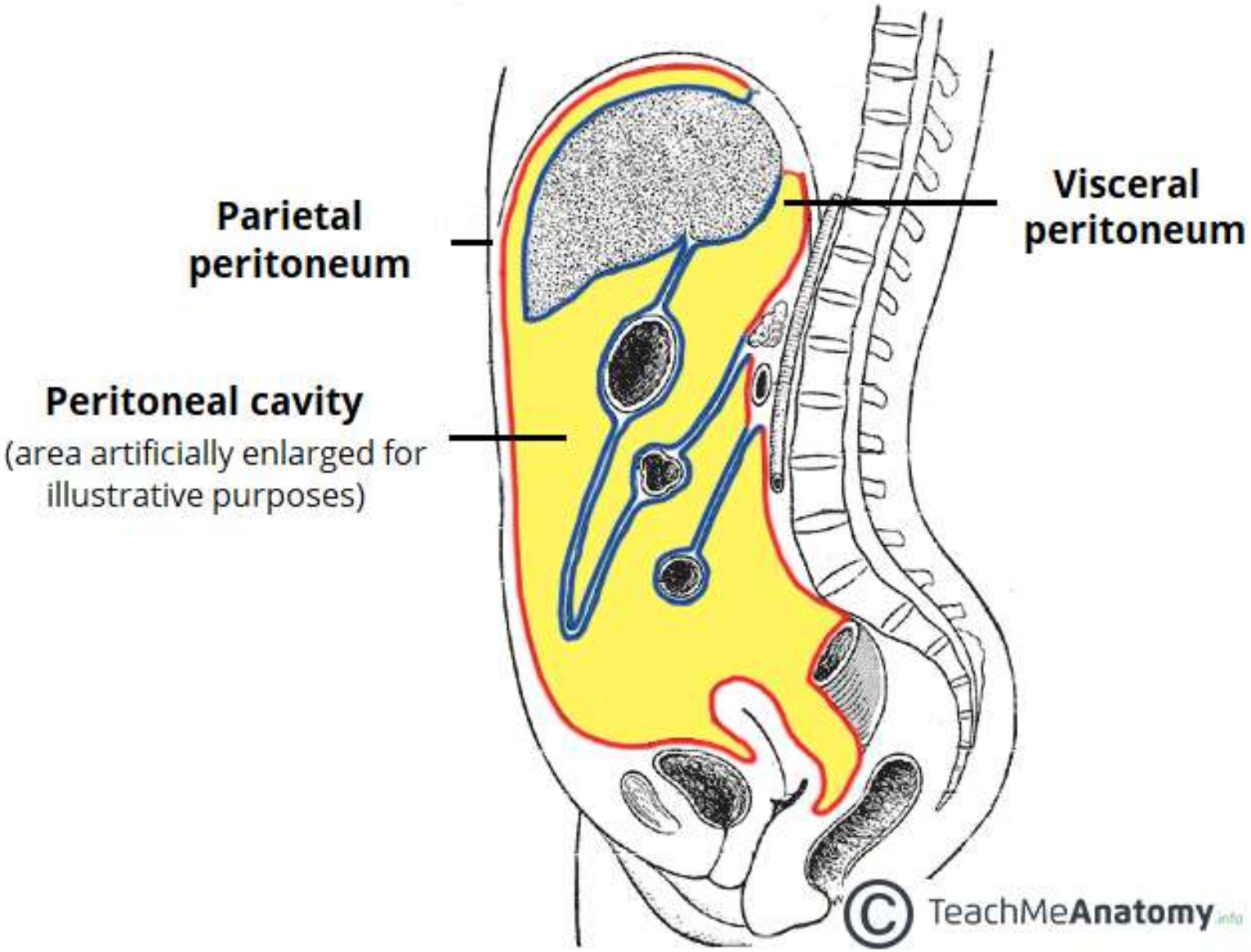
(esophagus → stomach → small intestine → large intestine) with different functions

Peritoneum

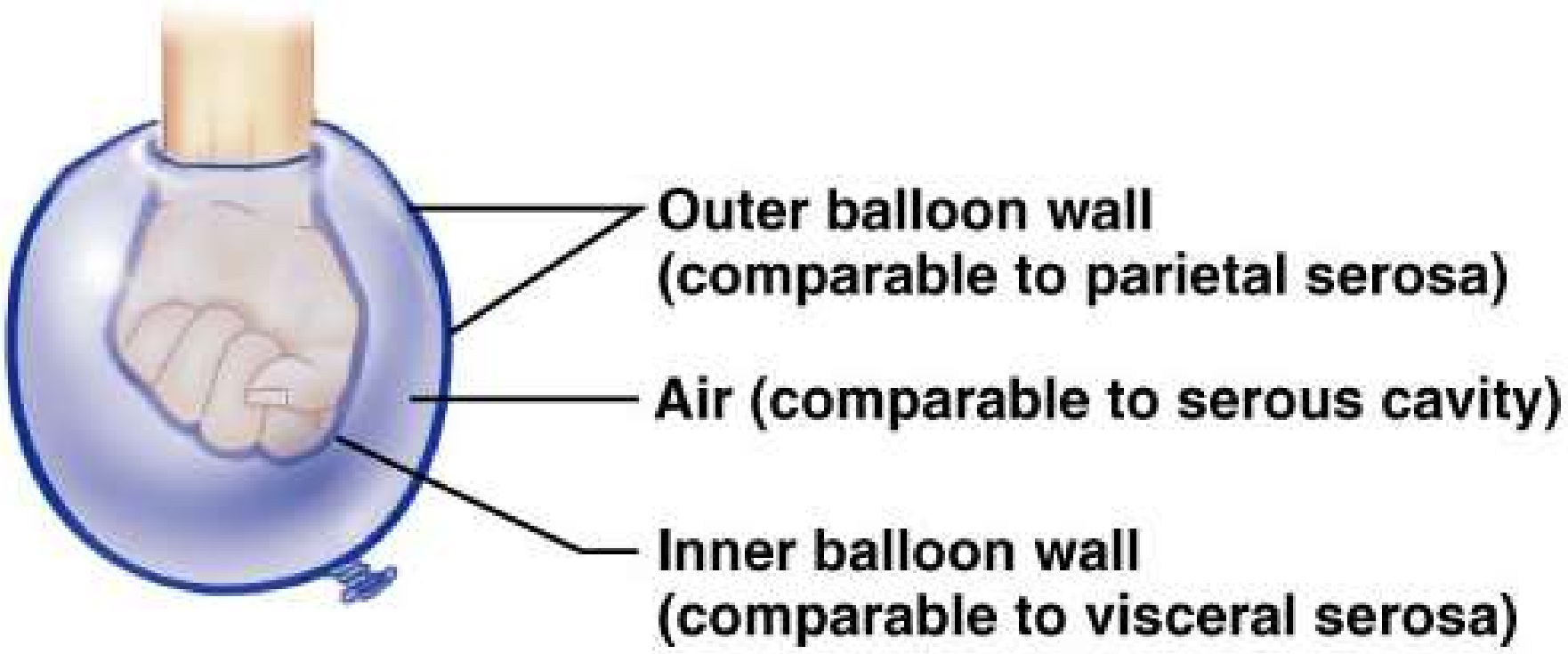
2 connective tissue membranes in abdominal cavity

- **Visceral** peritoneum
  - covers external surface of digestive organs
- **Parietal** peritoneum
  - lines the internal wall of the abdominal cavity

Between the 2 layers of peritoneum is peritoneal cavity is filled with peritoneal fluid


Parietal peritoneum
Visceral peritoneum
Peritoneal cavity
(area artificially enlarged for illustrative purposes)
© TeachMeAnatomy.info

Serosa

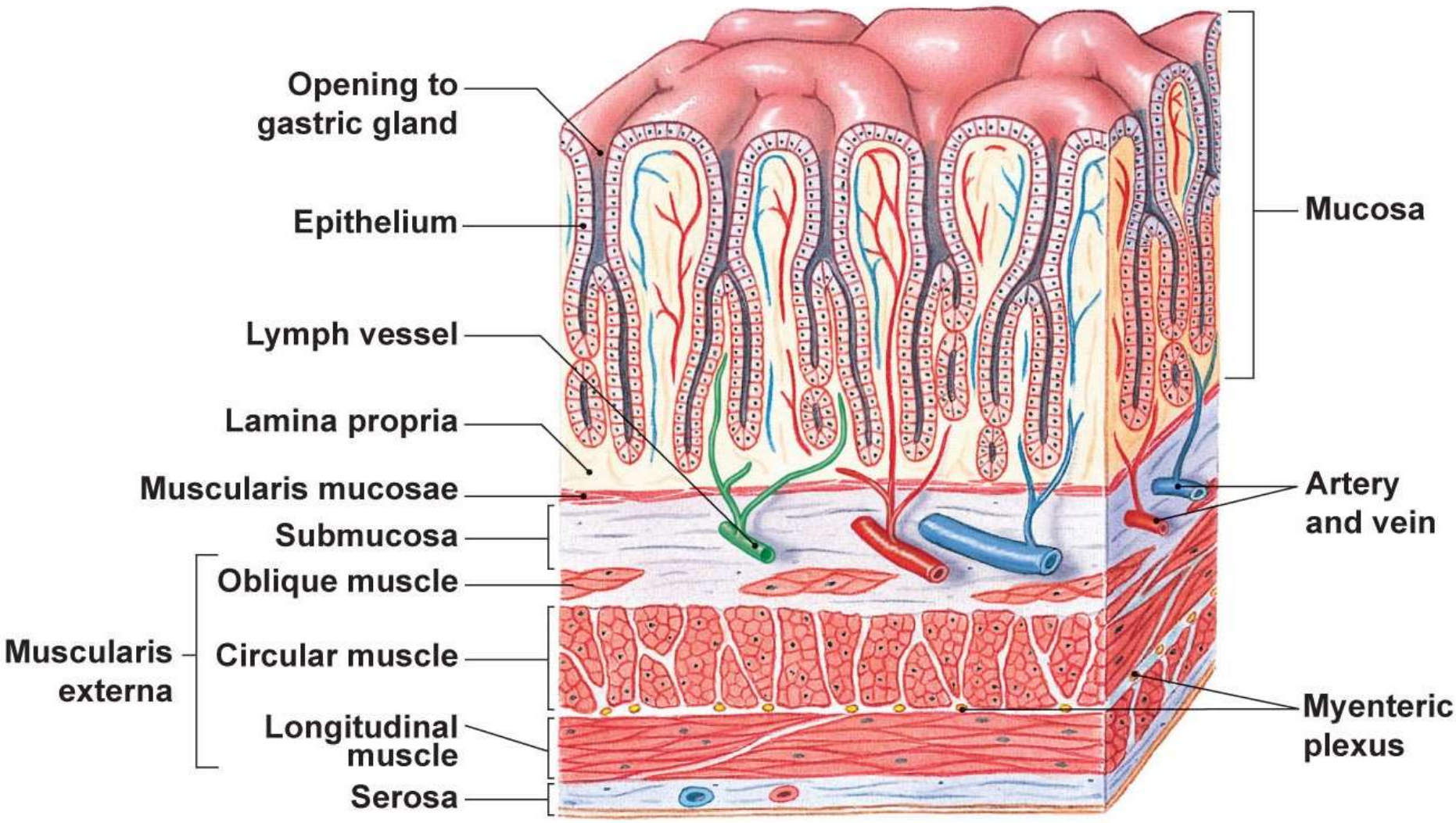

Outer balloon wall
(comparable to parietal serosa)
Air (comparable to serous cavity)
Inner balloon wall
(comparable to visceral serosa)

Wall of the Alimentary Canal

4 principle layers of GIT:

- **Mucosa** (superficial)
- **Submucosa**
- **Muscularis**
- **Serosa** (deep)

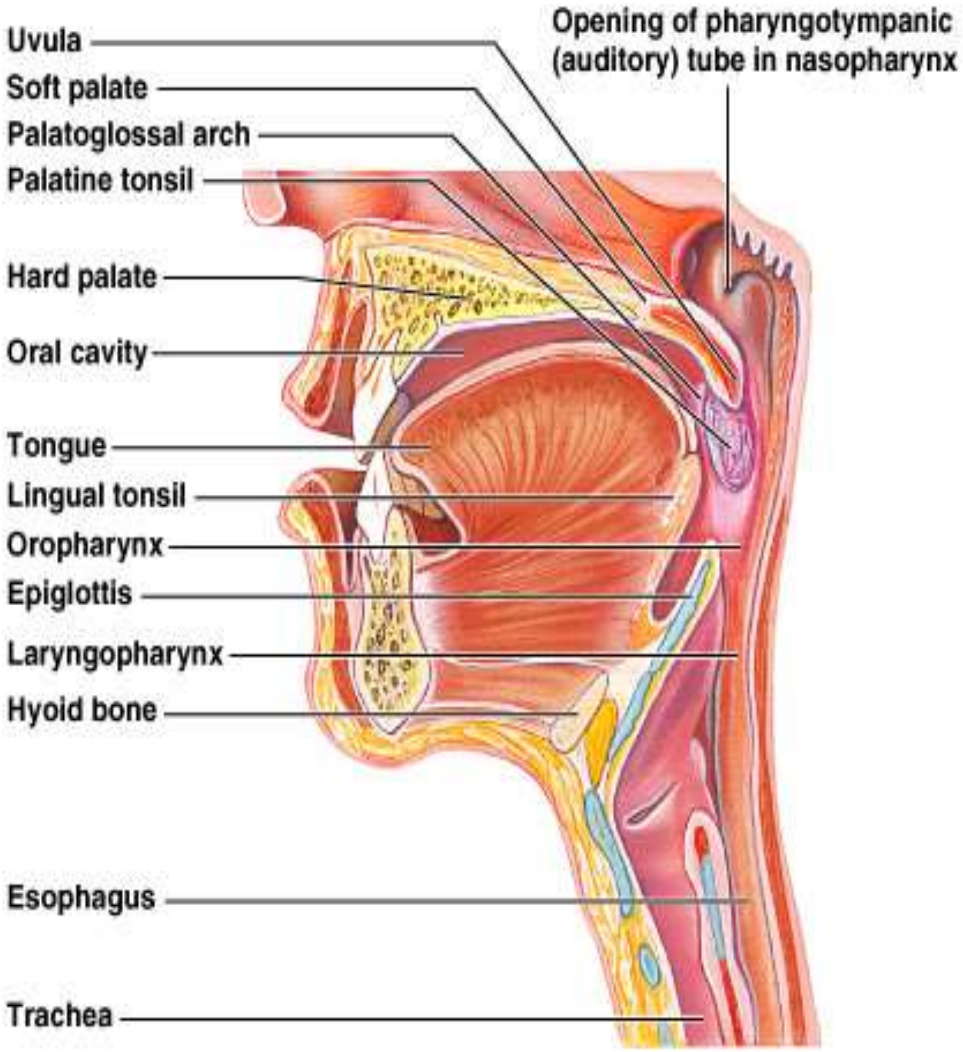
Layers of the Alimentary Canal Wall

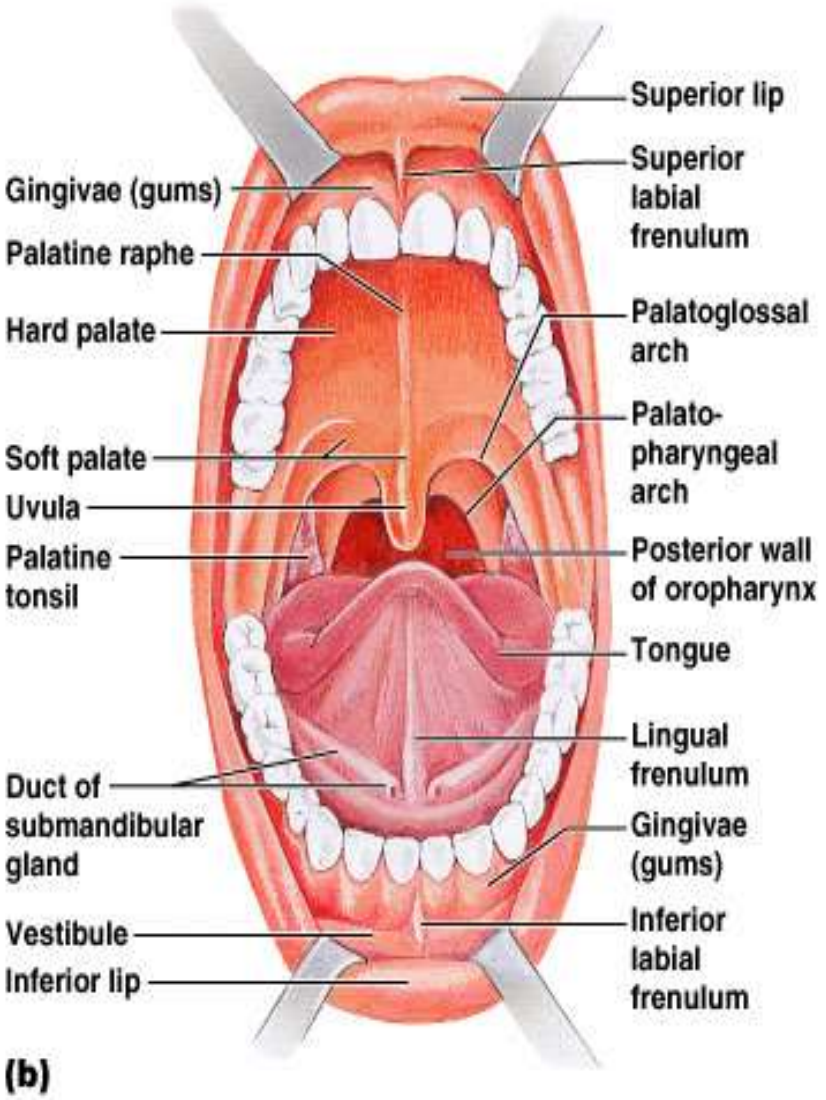


Features of the Mouth

- Buccal/oral cavity
- **Vestibule:** area bounded by lips and cheeks externally and teeth and gums internally
- **Lips:** no posses sweat or oil glands
- **Palate:** forms roof of the mouth, soft and hard palate, uvula

Anatomy of the Mouth

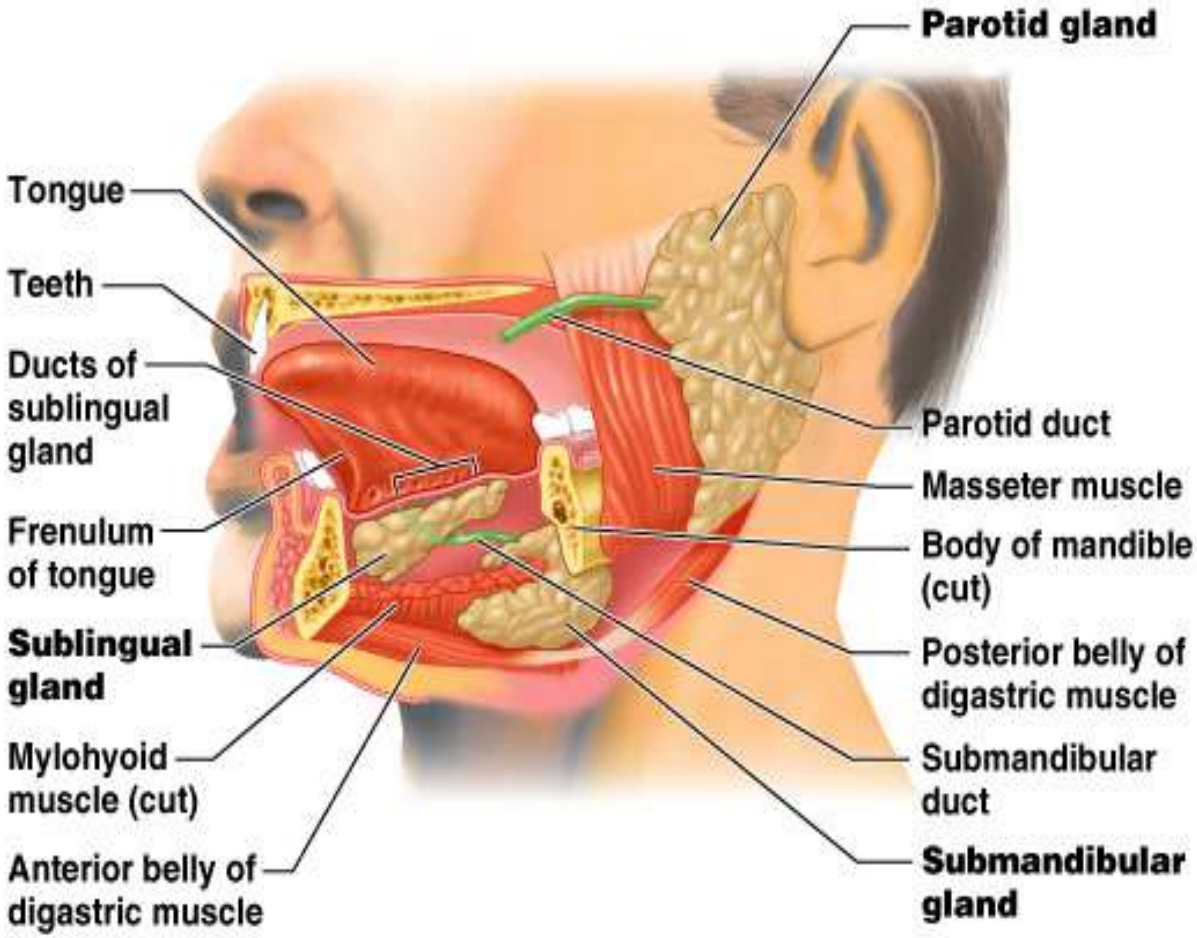


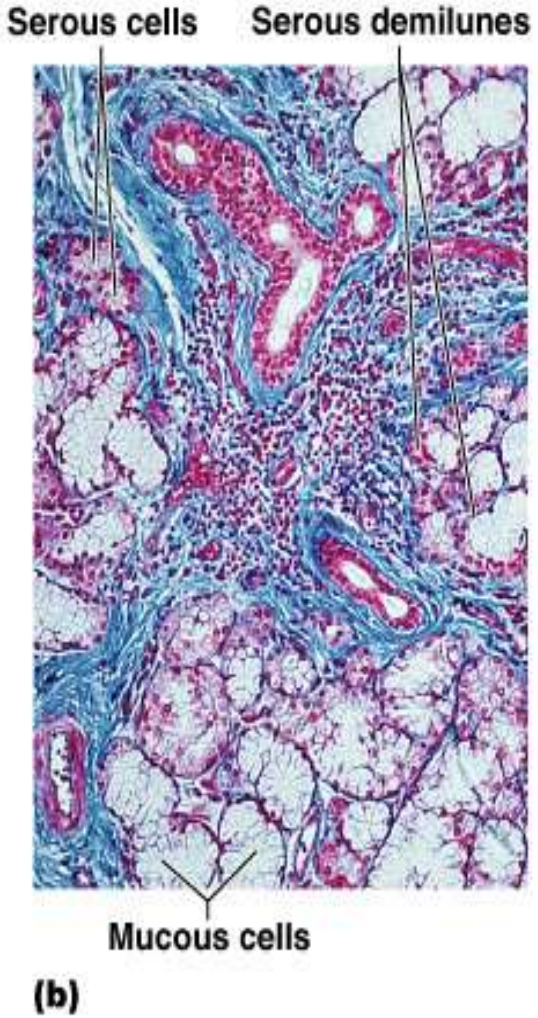


Types of Salivary Glands

- Submandibular Glands
  - Found underneath the mandible
- Sublingual Glands
  - Found underneath tongue
- Parotid Glands
  - Found anterior to the ear between masseter and skin

Anatomy of the Salivary Glands

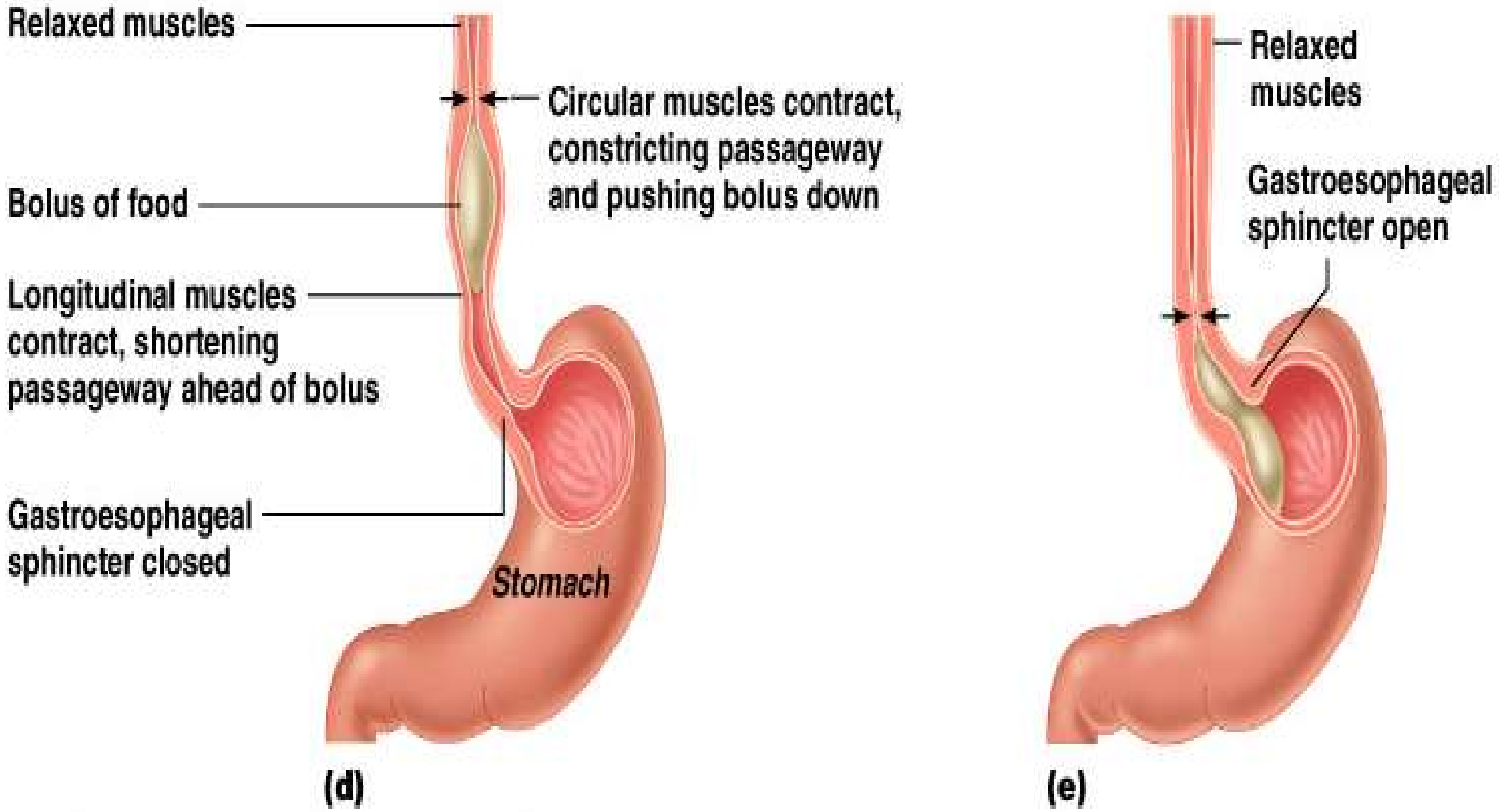




Features of Esophagus

- Muscular tube that propels food to stomach
- Esophageal sphincter – prevents backflow into oral cavity
- Cardiac sphincter- prevents backflow into esophagus

Anatomy of the Esophagus



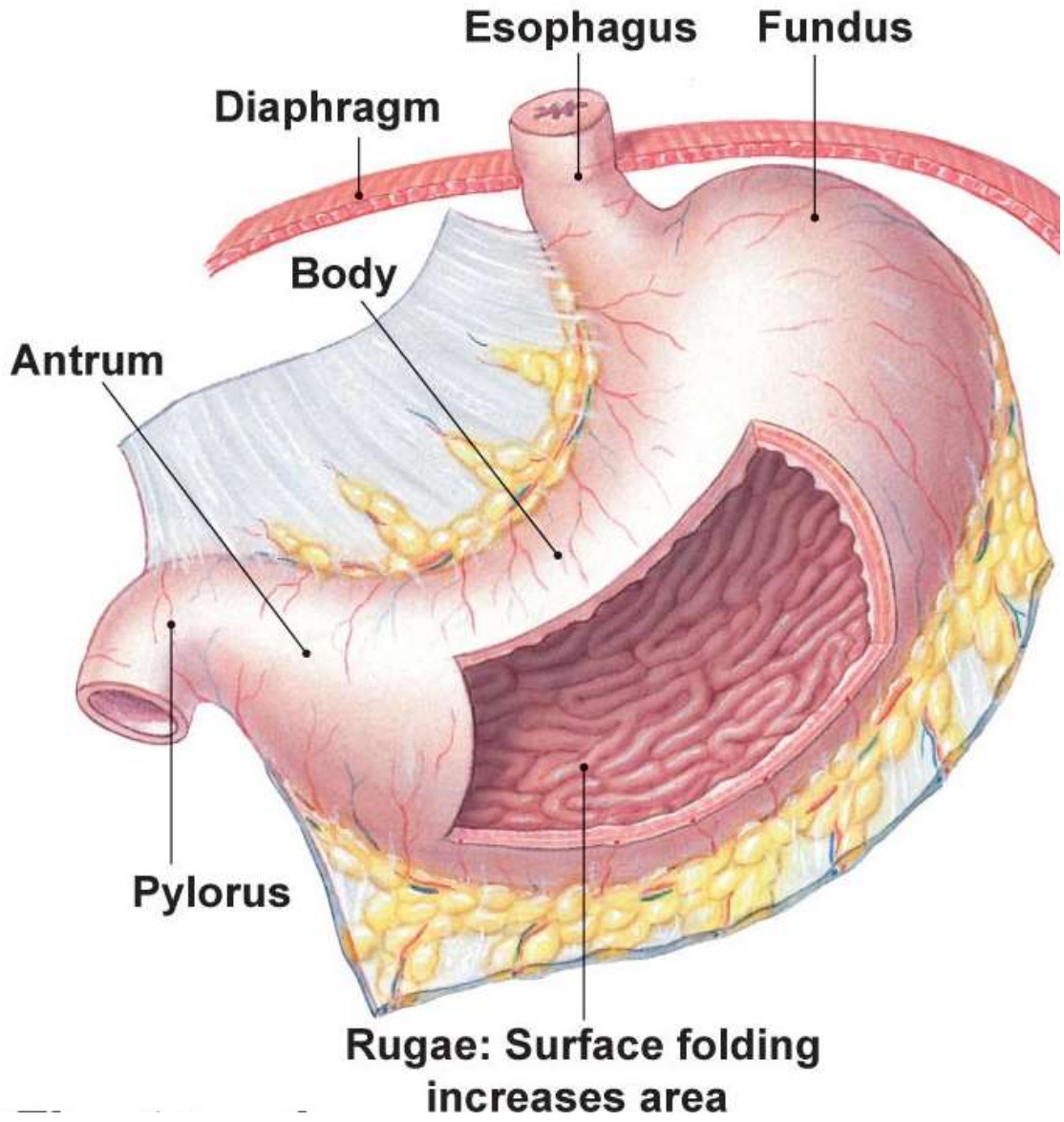
Features of the Stomach

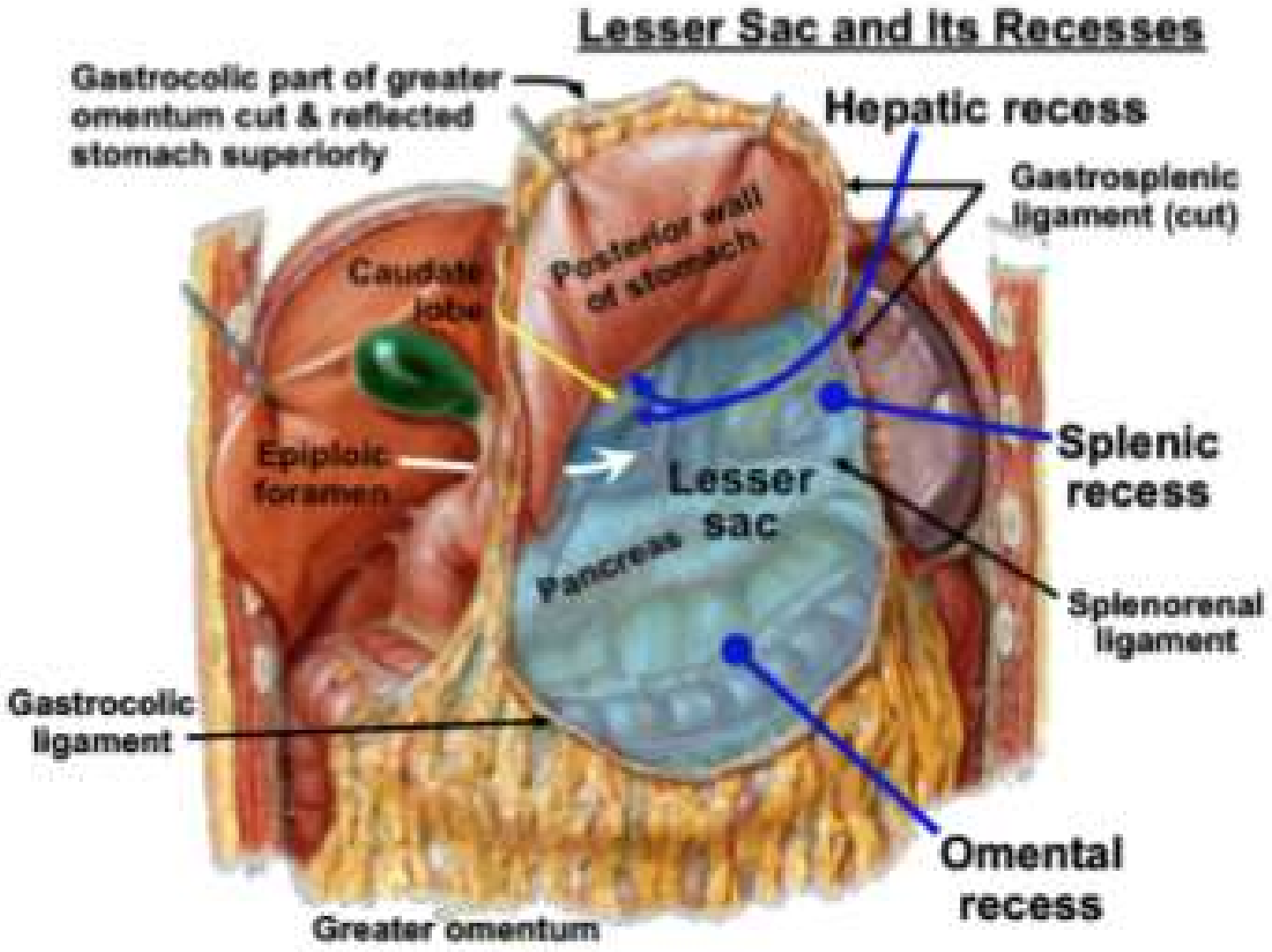
- Regions:
  - cardiac, fundus, body, and pyloric

- **Greater and Lesser Curvatures**: connected to greater and lesser omentums

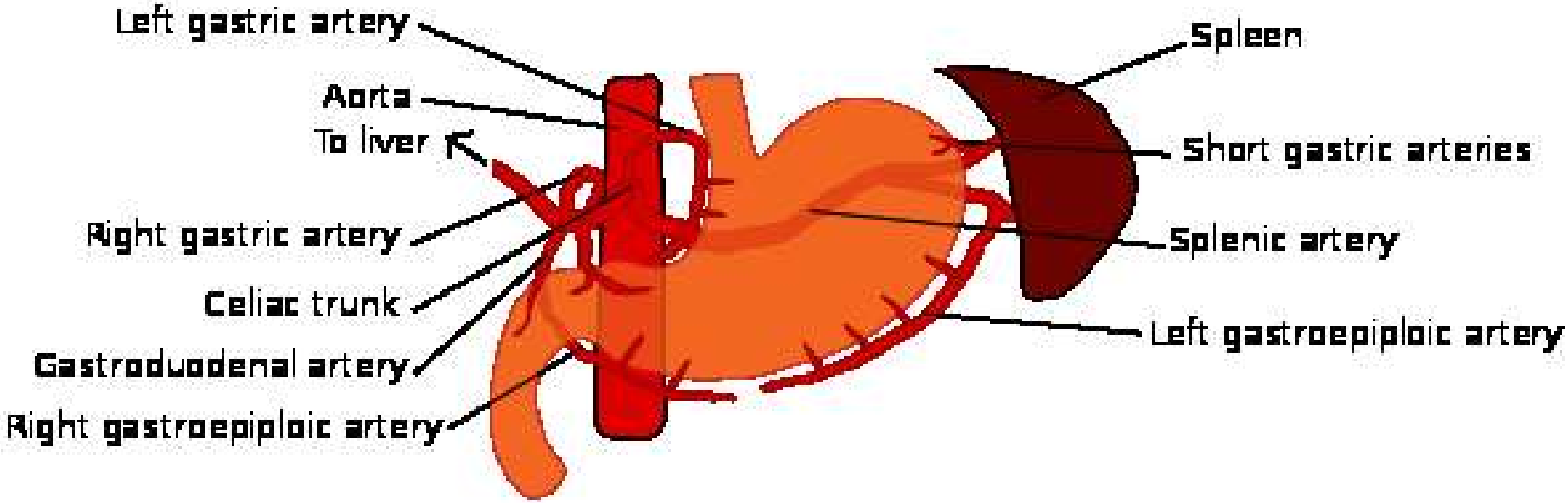
- **Rugae folds**: longitudinal folds in stomach wall

- Muscle layers arranged
    - circularly,
    - longitudinally,
    - obliquely


Esophagus
Fundus
Diaphragm
Body
Antrum
Pylorus
Rugae: Surface folding
increases area


Lesser Sac and Its Recesses
Gastrocolic part of greater omentum cut & reflected stomach superiorly
Hepatic recess
Gastrosplenic ligament (cut)
Caudate lobe
Posterior wall of stomach
Epiploic foramen
Lesser sac
Pancreas
Splenic recess
Splenorenal ligament
Gastrocolic ligament
Omental recess
Greater omentum

Blood supply of stomach



Small intestine

Are 3 segments :

- **duodenum** (proximal),
- **jejunum** (middle)
- **ileum** (distal)

intestinal enzymes aided digestion by the secretions of :

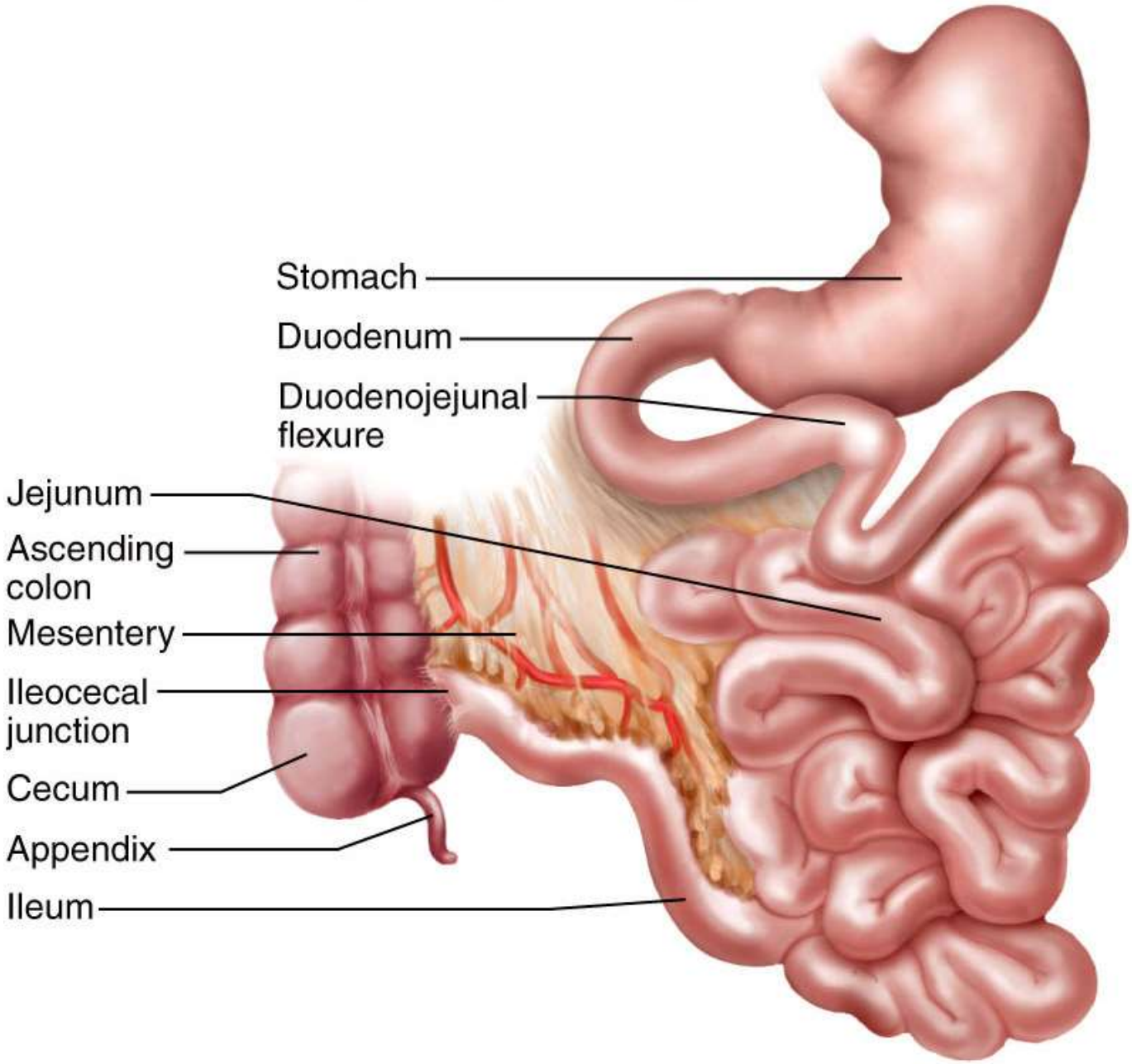
- liver
- pancreas
  - hepatic and pancreatic secretions (bile and pancreatic juice)

Features and Functions of the Small Intestine

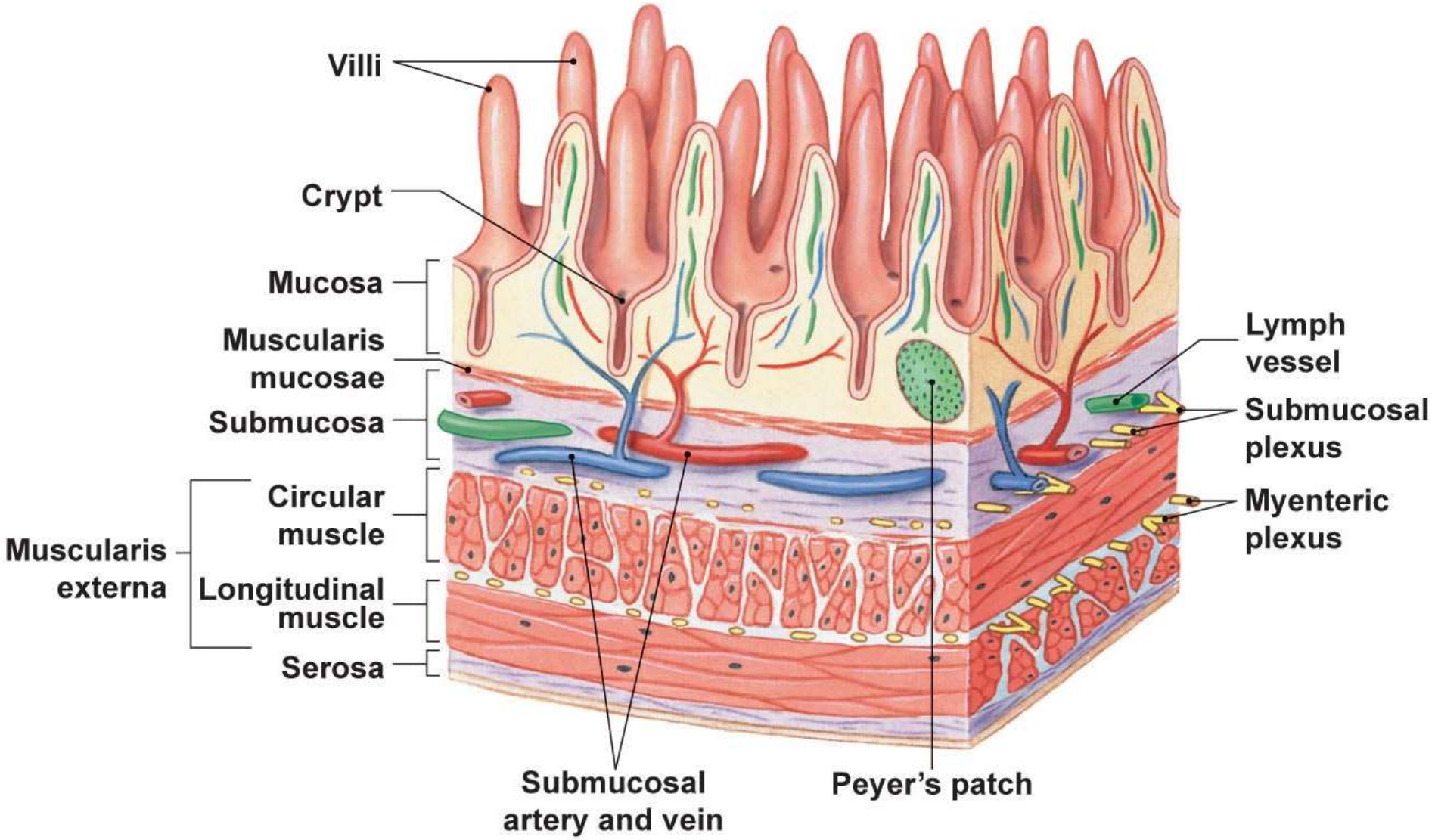
- Receives chyme from stomach; performs majority of digestion and absorption of nutrients
- Regions:
  - ***Duodenum*** (upper region receiving chyme from stomach and digestive enzymes from pancreas and bile from liver and gallbladder)
  - ***Jejunum/Ileum*** (lower regions where absorption occurs)

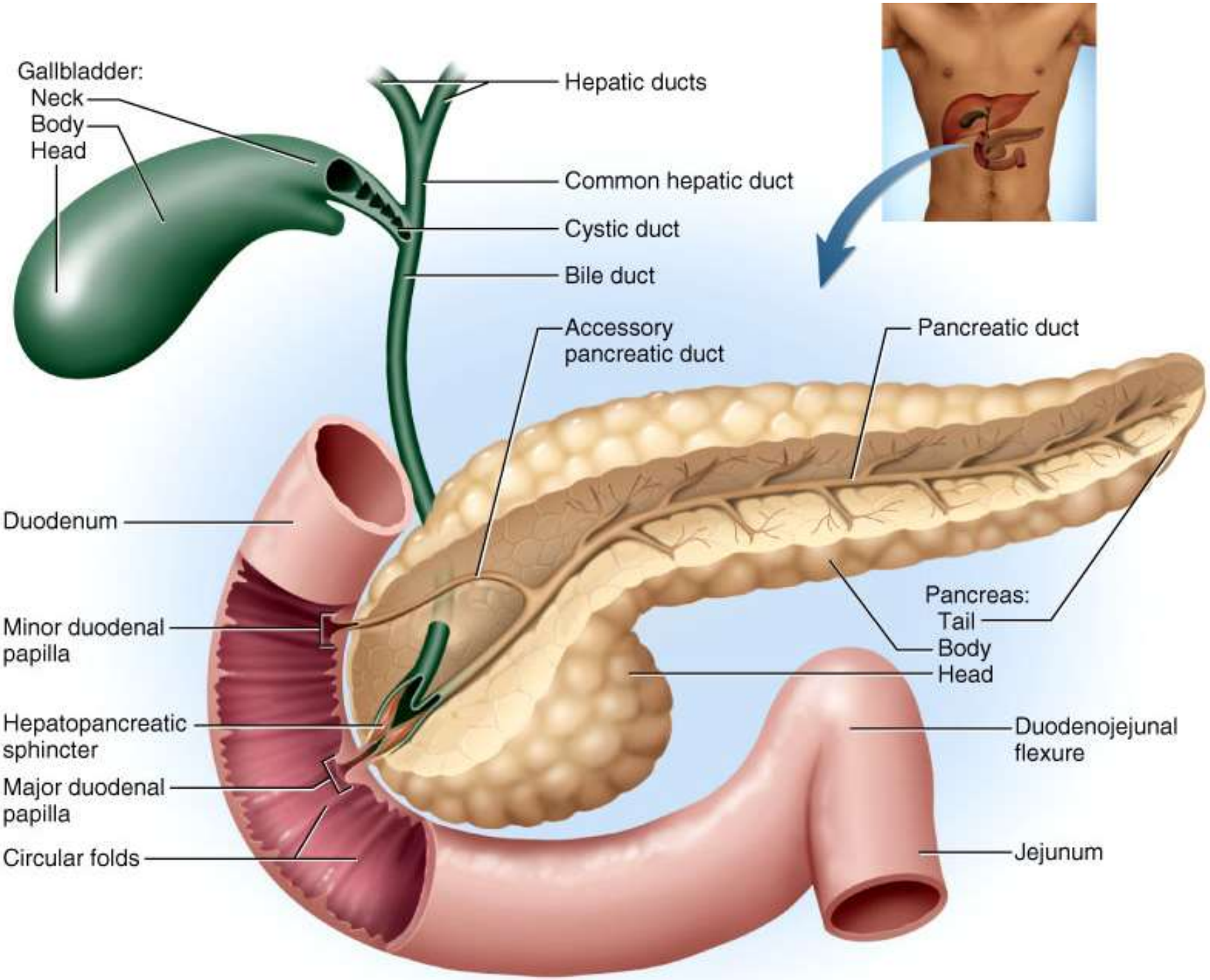
    - ***Plicae circulares*** (permanent folds in mucosa and submucosa that slow movement of chyme)

Small Intestine



Sectional View of Small Intestine




Gallbladder:
Neck
Body
Head
Hepatic ducts
Common hepatic duct
Cystic duct
Bile duct
Accessory pancreatic duct
Pancreatic duct
Duodenum
Minor duodenal papilla
Hepatopancreatic sphincter
Major duodenal papilla
Circular folds
Pancreas:
Tail
Body
Head
Duodenojejunal flexure
Jejunum

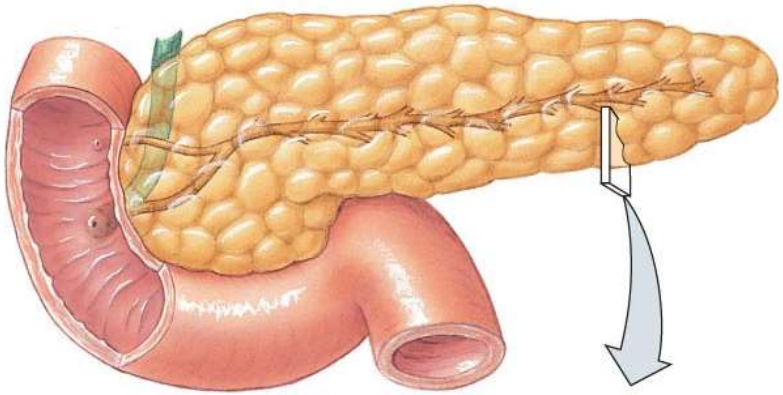
Pancreas

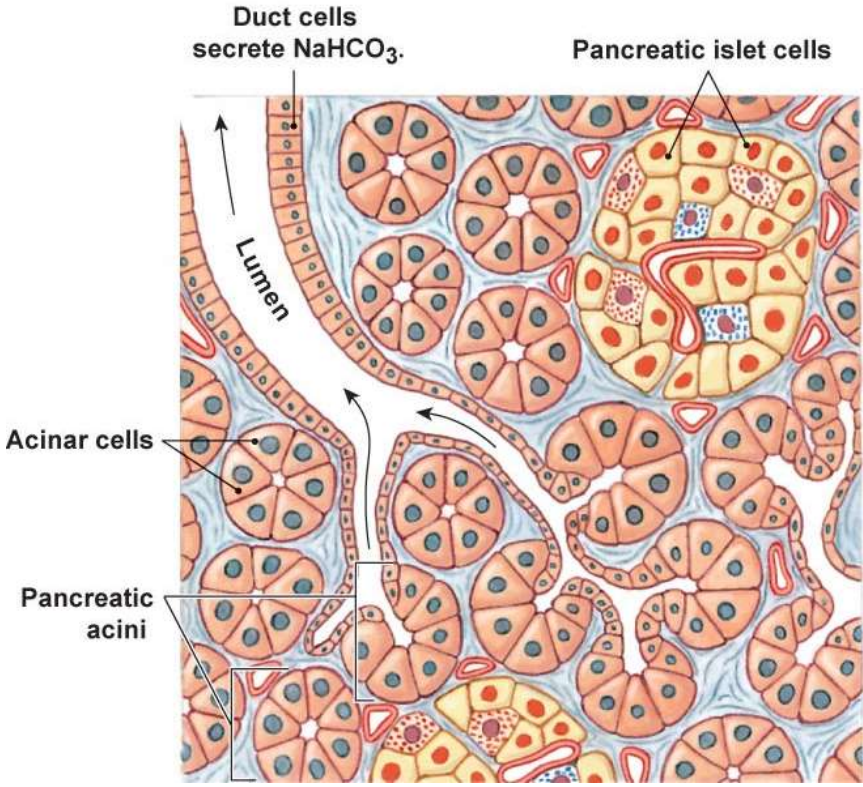
A triangular gland located behind the stomach which has both :

- **exocrine** functions

  &

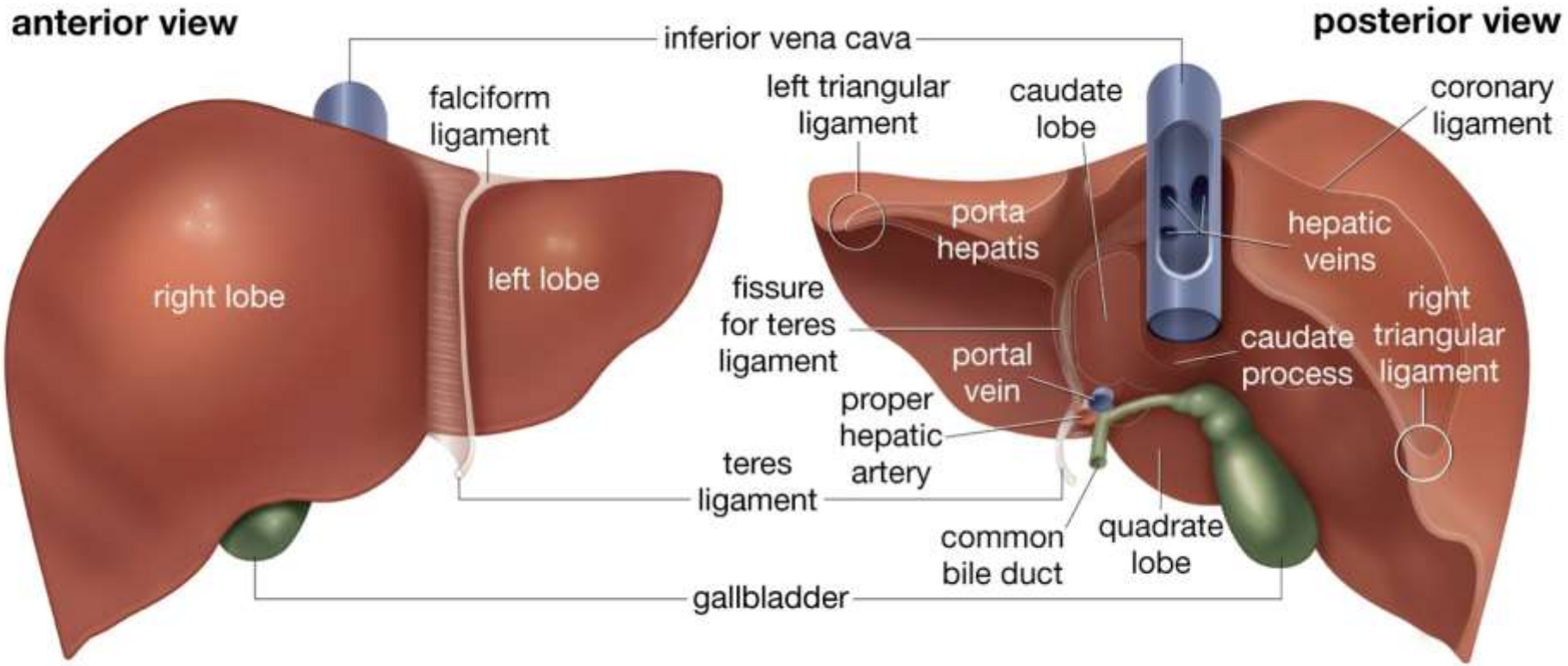
- **endocrine** functions





Anatomy of the Liver

- **Right and Left Lobes**: separated by *falciform ligament*
- **Caudate and Quadrate Lobes**: found on posterior side
- Blood vessels:
  - **Hepatic artery/vein and hepatic portal vein**
- **Gallbladder**: found underneath right lobe, stores bile


anterior view
posterior view
inferior vena cava
falciform ligament
left triangular ligament
caudate lobe
coronary ligament
porta hepatis
hepatic veins
right lobe
left lobe
fissure for teres ligament
portal vein
caudate process
right triangular ligament
proper hepatic artery
teres ligament
common bile duct
quadrate lobe
gallbladder

Liver and Gallbladder

- liver secrete **bile** into :
- hepatic ducts leading to gallbladder

- **Gallbladder**
  - a muscular sac
  - **stores** bile secreted from the liver

Large Intestine

- Any food in the small intestine that could not be chemically digested is moved into the large intestine
  - where most of the remaining water and ions are absorbed and the remaining material removed by defecation

Subdivided into 3 anatomical segments

1-colon

- **ascending colon**
- **transverse colon**
- **descending colon**
- **sigmoid colon**

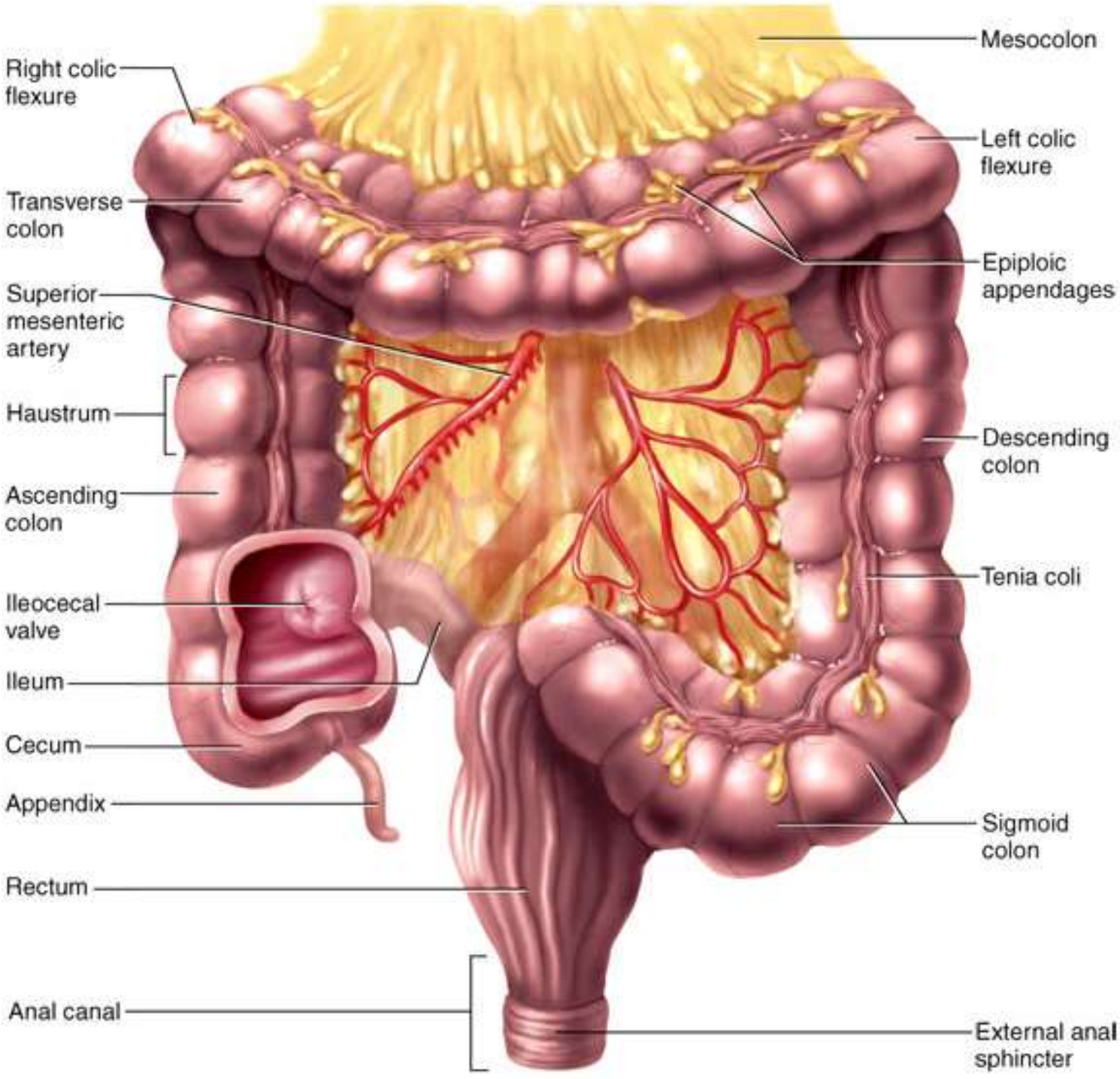
2-rectum

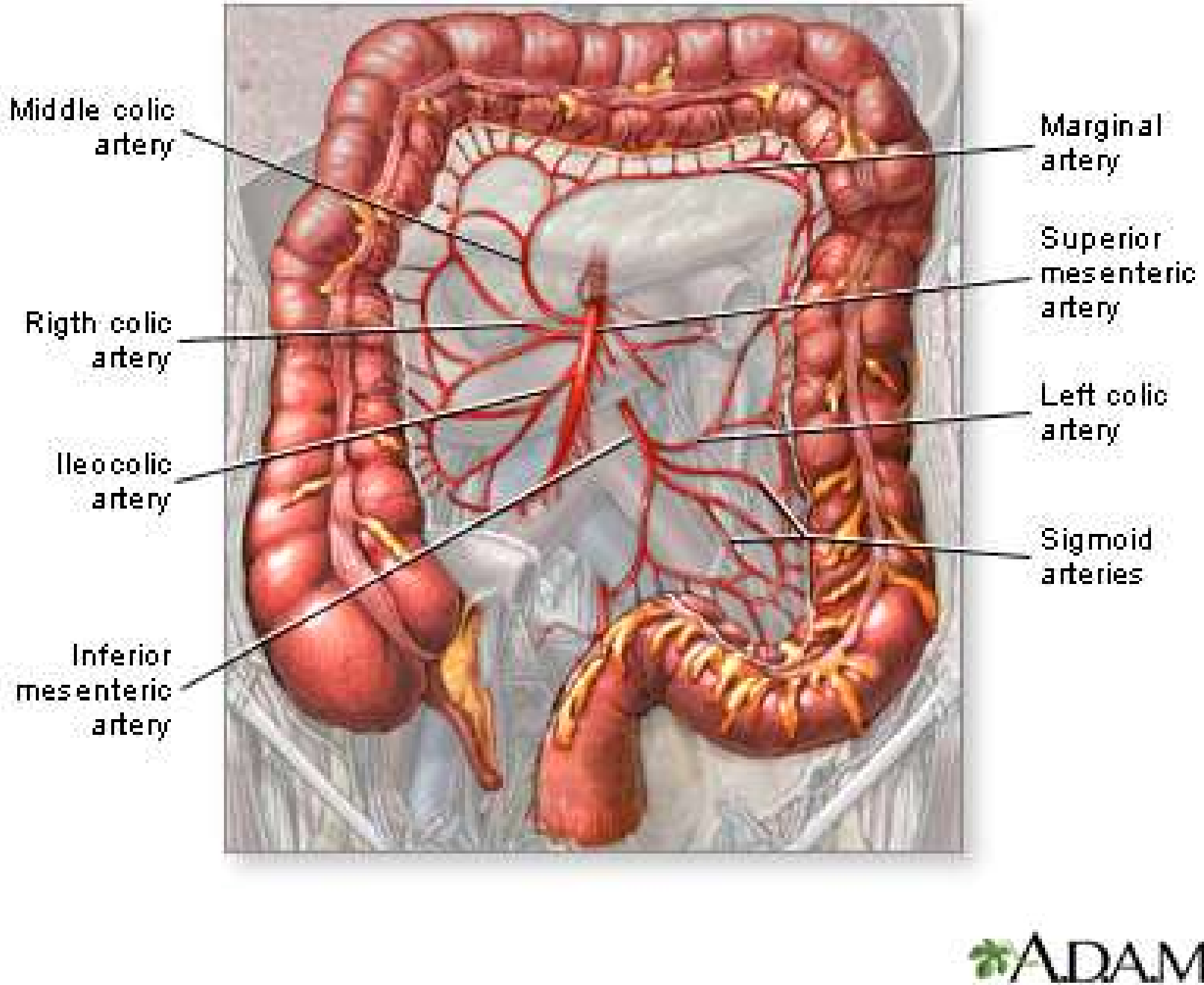
3-anal canal

Gross Anatomy of the Large Intestine

- **Teniae Coli**: bands of smooth muscle that create pocket-like sacs (**haustra)**
- **Cecum**: sac-like connection between the small and large intestines
- **Appendix**: small structure containing lymphoid tissue; small immune function
- **Ascending, Descending, Transverse, and Sigmoid Colon**
- **Splenic and hepatic flexure**
- **Rectum**: storage area
- **Anus**: regulates defecation with two sphincter muscles; internal and external

Large Intestine




Middle colic artery
Rigth colic artery
Ileocolic artery
Inferior mesenteric artery
Marginal artery
Superior mesenteric artery
Left colic artery
Sigmoid arteries
A.D.A.M.

Enteric Nervous System

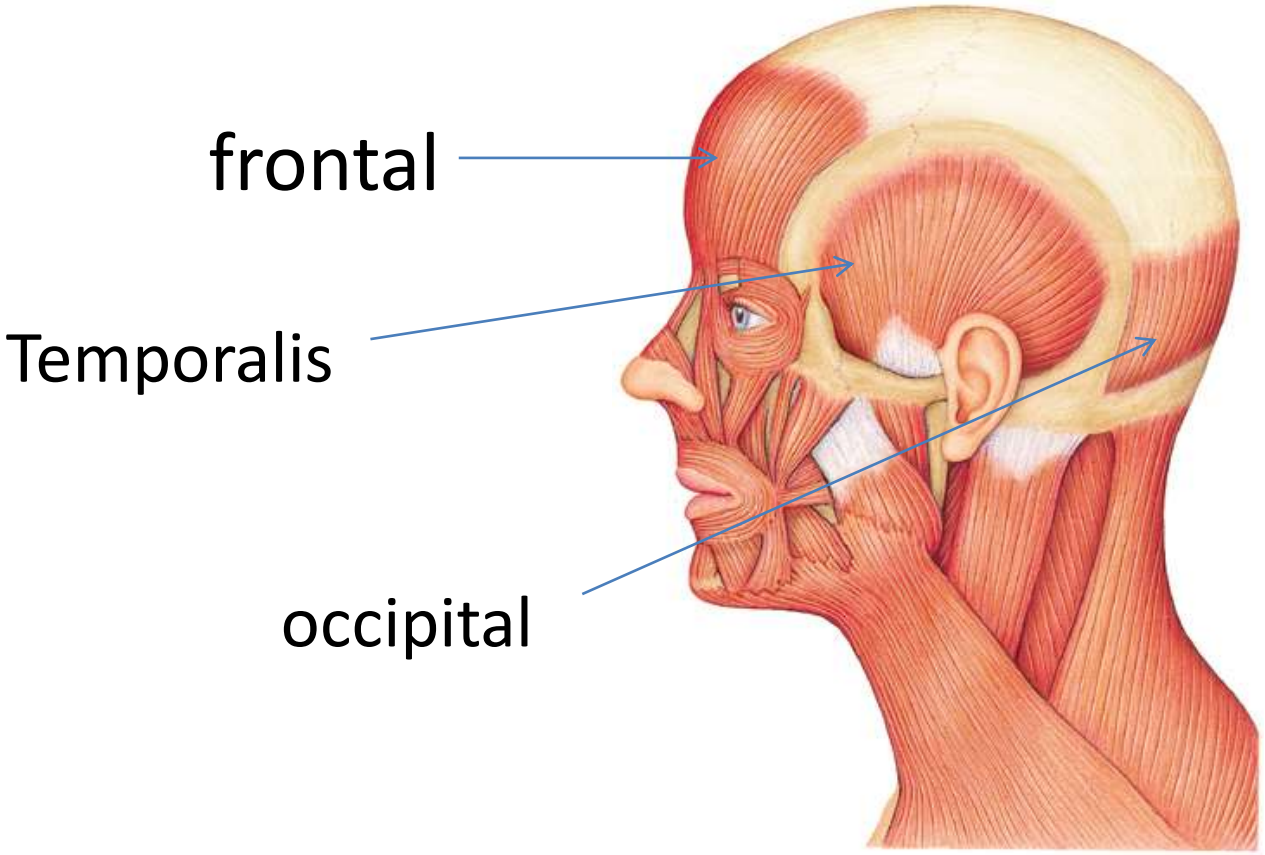
- Connected to the CNS via :

- **Parasympathetic NS**
  (stimulates digestion)

- **Sympathetic NS**
  (inhibits digestion)

Muscles of Head & Face

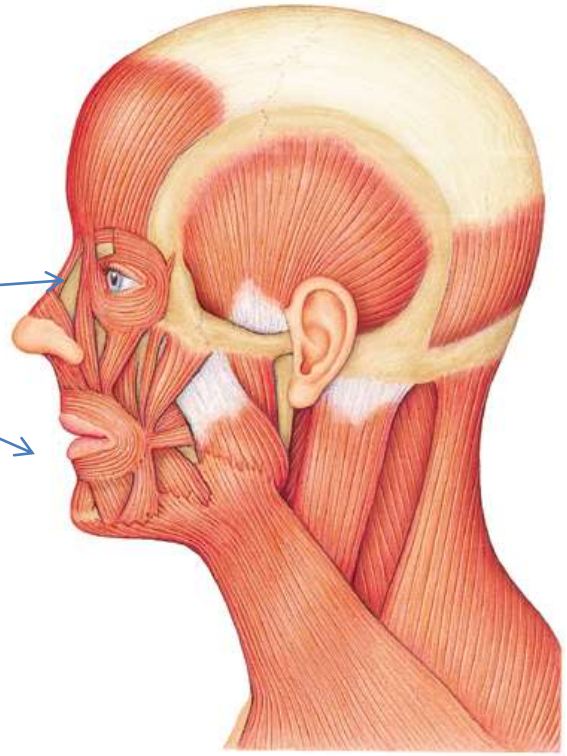
1-frontal muscle
2-occipital muscle
3-Temporalis (Connects frontal and occipital muscles)

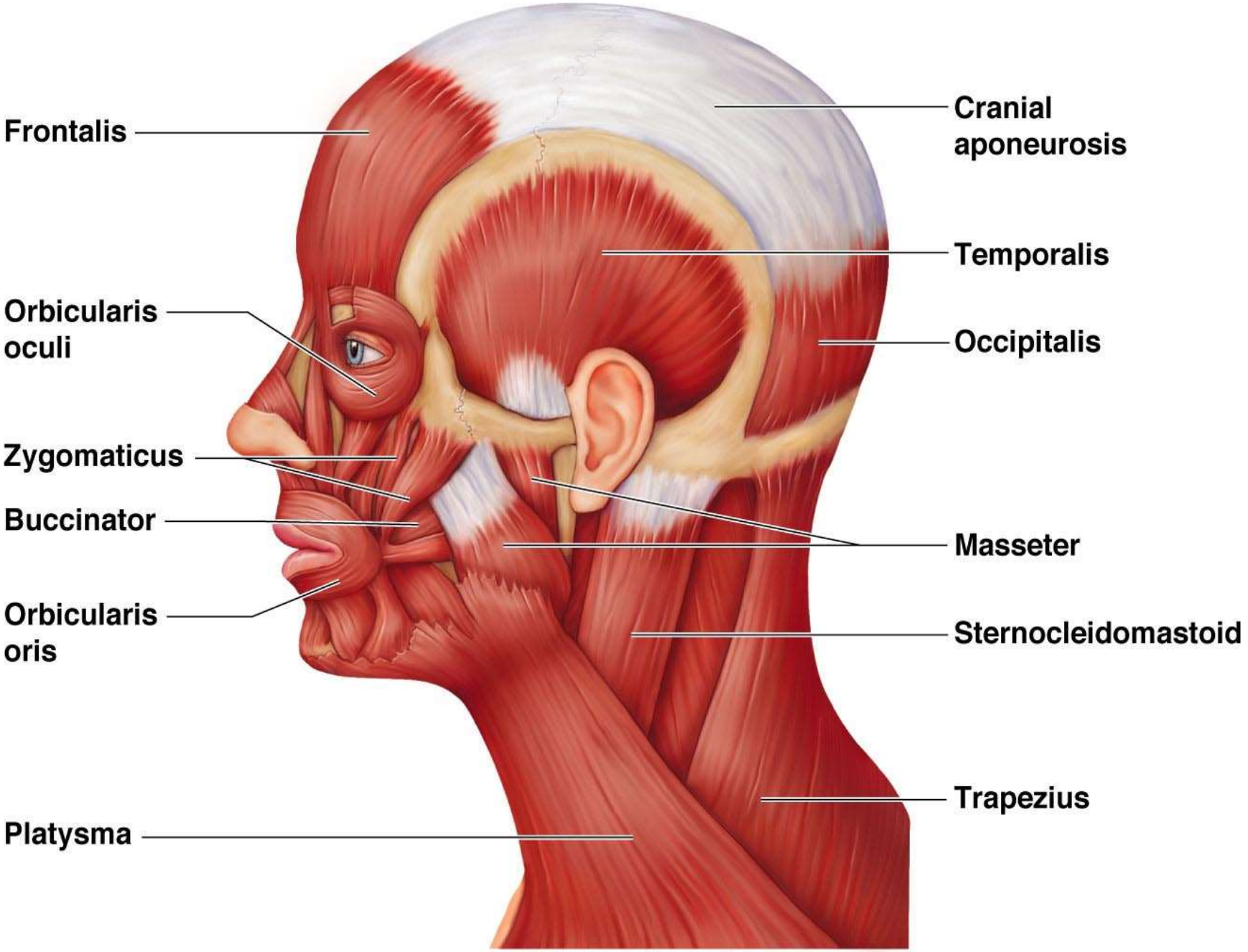


- Orbicularis Oris
  circular muscle around mouth

- Orbicularis Oculi
  circular muscles around eyes

- Zygomaticus major and minor
- Masseter



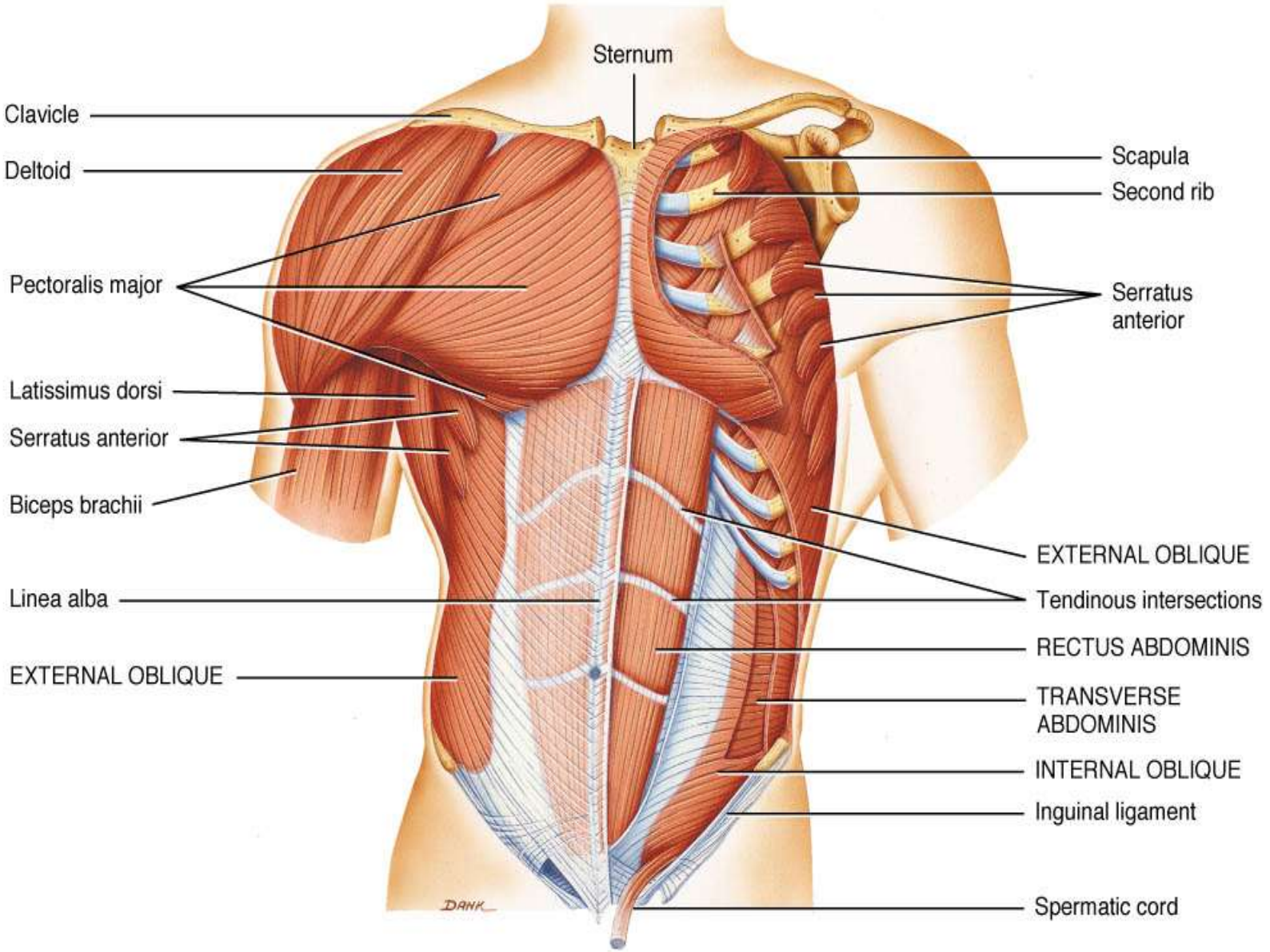


muscles of mastication

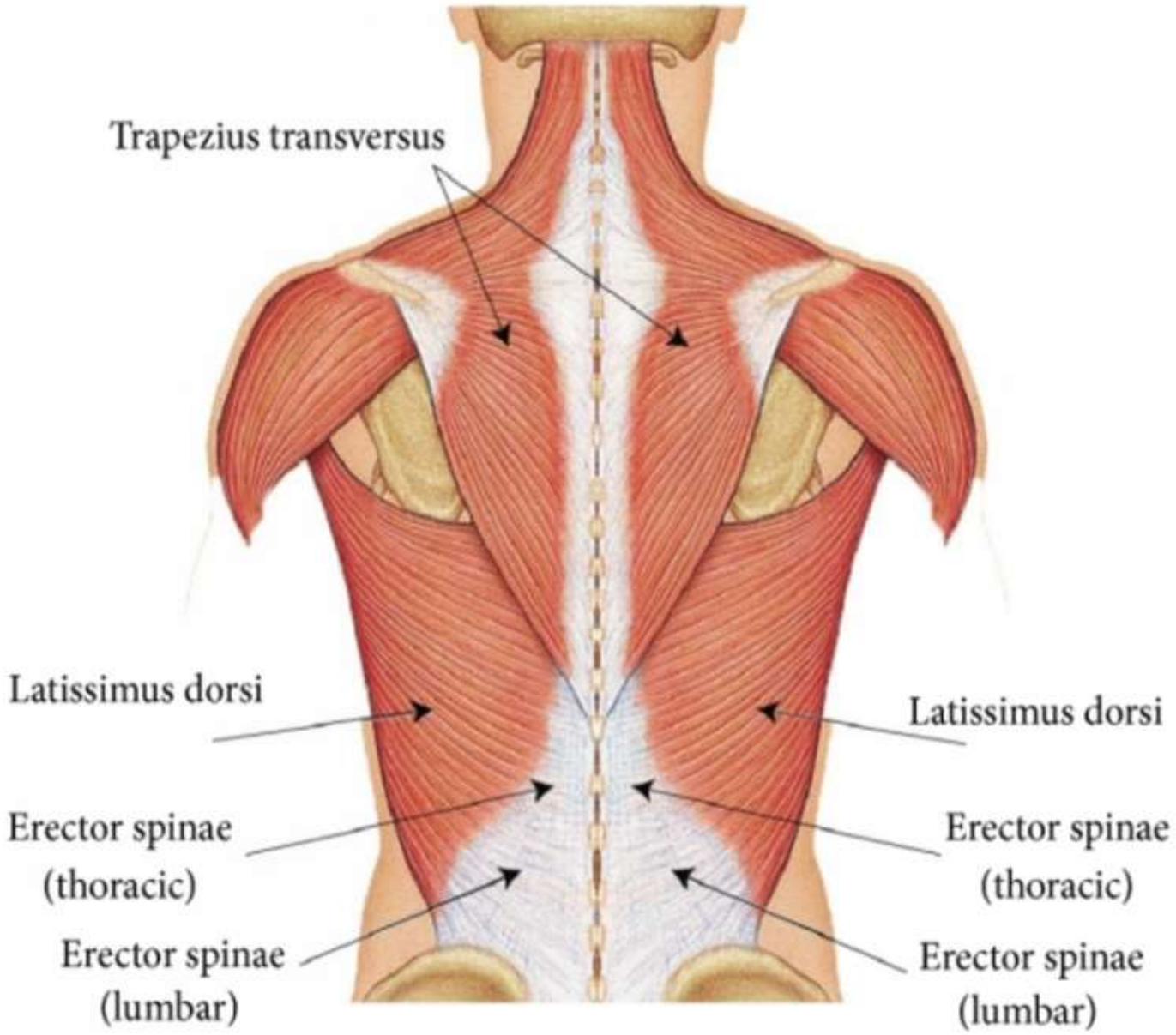
- temporalis,
- masseter,
- medial pterygoid,
- lateral pterygoid

Muscle of thoracic and abdominal region

anterior side



Posterior side



Muscle of upper limb

Muscle of arm

- biceps
- triceps
- brachialis
- brachioradialis

Muscle of forearm

anterior compartment (superficial compartment)

-flexor carpi ulnaris
- flexor carpi radialis
- palmaris longus
- pronator teres

anterior compartment (deep compartment)

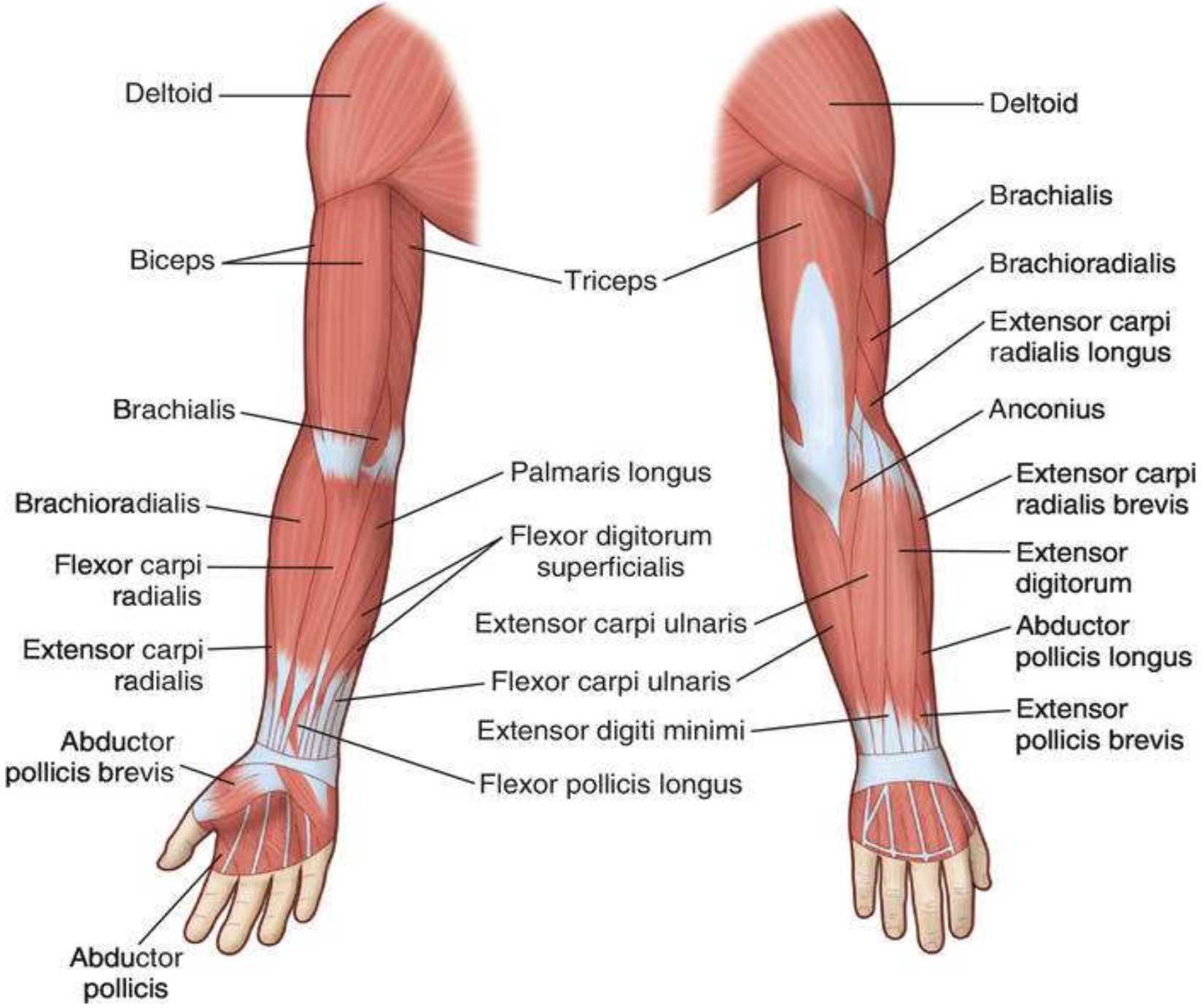
- flexor digitorum superficialis
- flexor pollicis lonugs

Posterior compartment (superficial compartment)

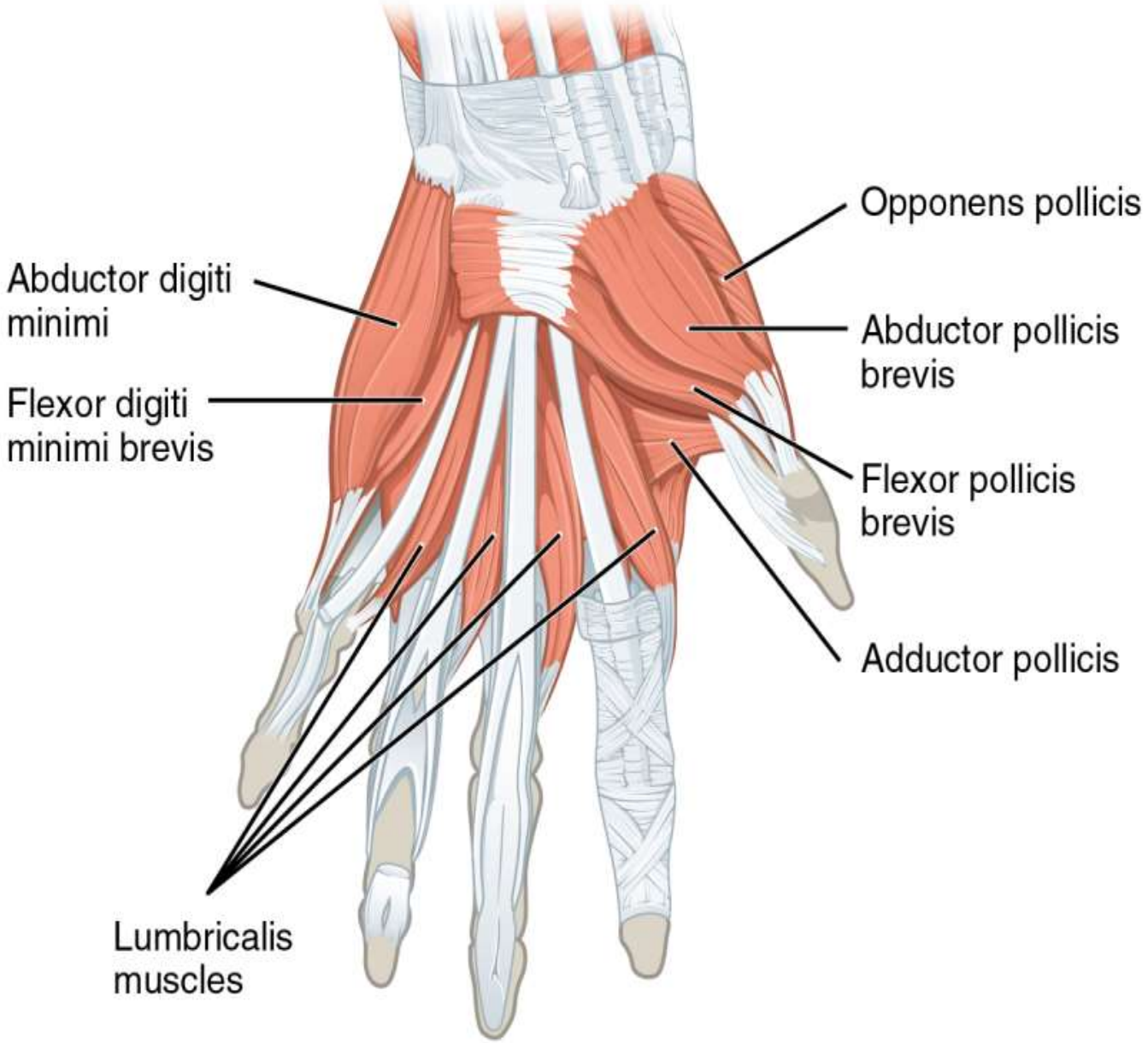
- extensor carpi radialis brevis
- extensor carpi ulnaris
- extensor digiti minimi
- extensor digitorum

Posterior compartment (deep compartment)

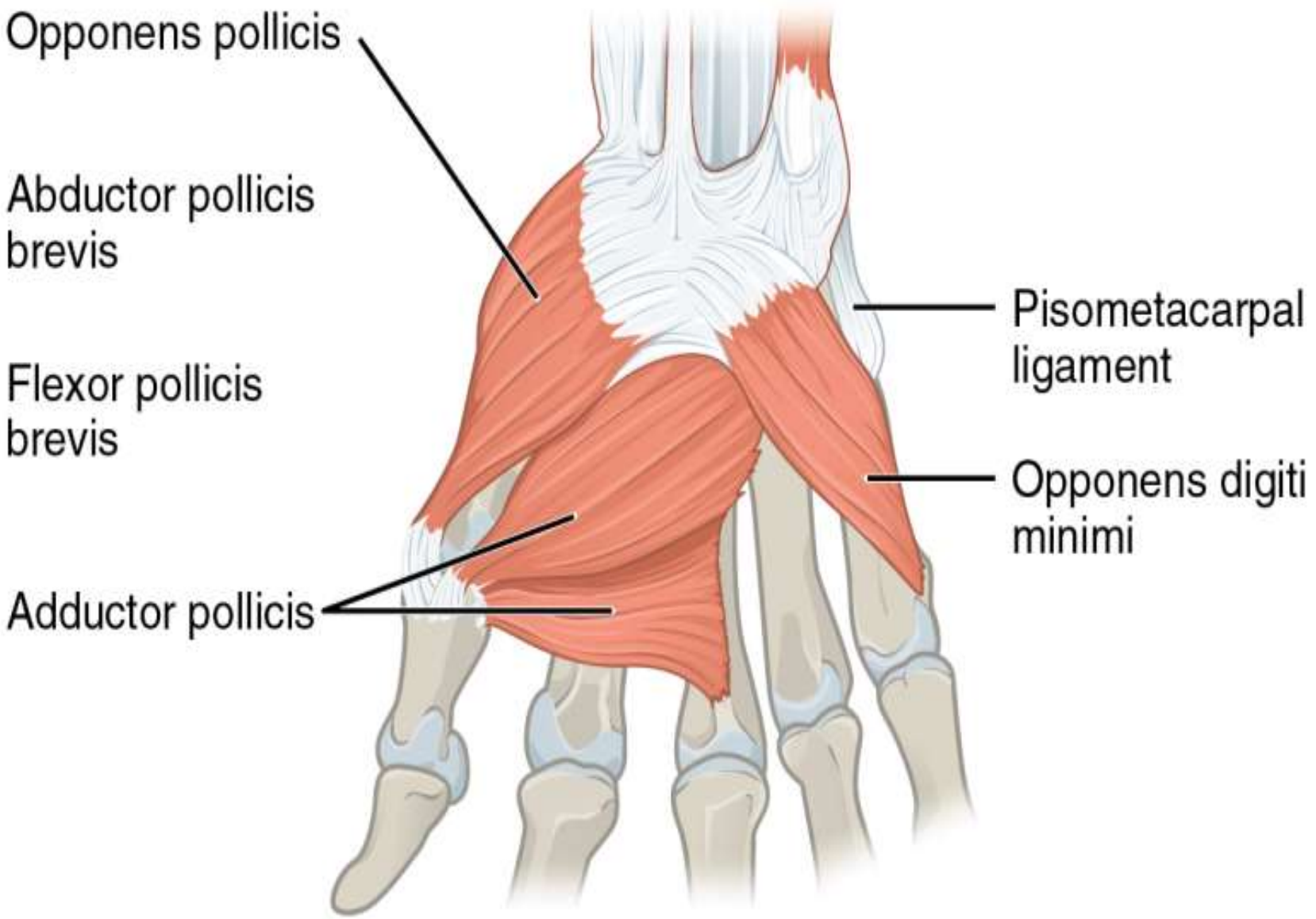
- abductor pollicis longus
- extensor pollicis brevis


Deltoid
Biceps
Triceps
Brachialis
Brachioradialis
Flexor carpi radialis
Extensor carpi radialis
Abductor pollicis brevis
Abductor pollicis
Palmaris longus
Flexor digitorum superficialis
Extensor carpi ulnaris
Flexor carpi ulnaris
Extensor digiti minimi
Flexor pollicis longus
Deltoid
Brachialis
Brachioradialis
Extensor carpi radialis longus
Anconius
Extensor carpi radialis brevis
Extensor digitorum
Abductor pollicis longus
Extensor pollicis brevis

Muscle of hand (anterior)



Muscle of hand (posterior)



Muscle of lower limb

muscles of lower limb are divided into:

muscles of thigh

Anterior group

- Sartorius
- Quadricep
    - Rectus femoris
    - Vastus medialis
    - Vastus lateralis
    - Vastus intermedius

Medial group

Pectineus

Adductor longus

Adductor brevis

Adductor magnus

Gracilis

Posterior group

Biceps femoris

Semitendinosus

Semimembranosus

Muscle of leg

Anterior group

Tibialis anterior

Extensor hallucis longus

Extensor digitorum longus

Peroneus tertius

Lateral group

Peroneus longus

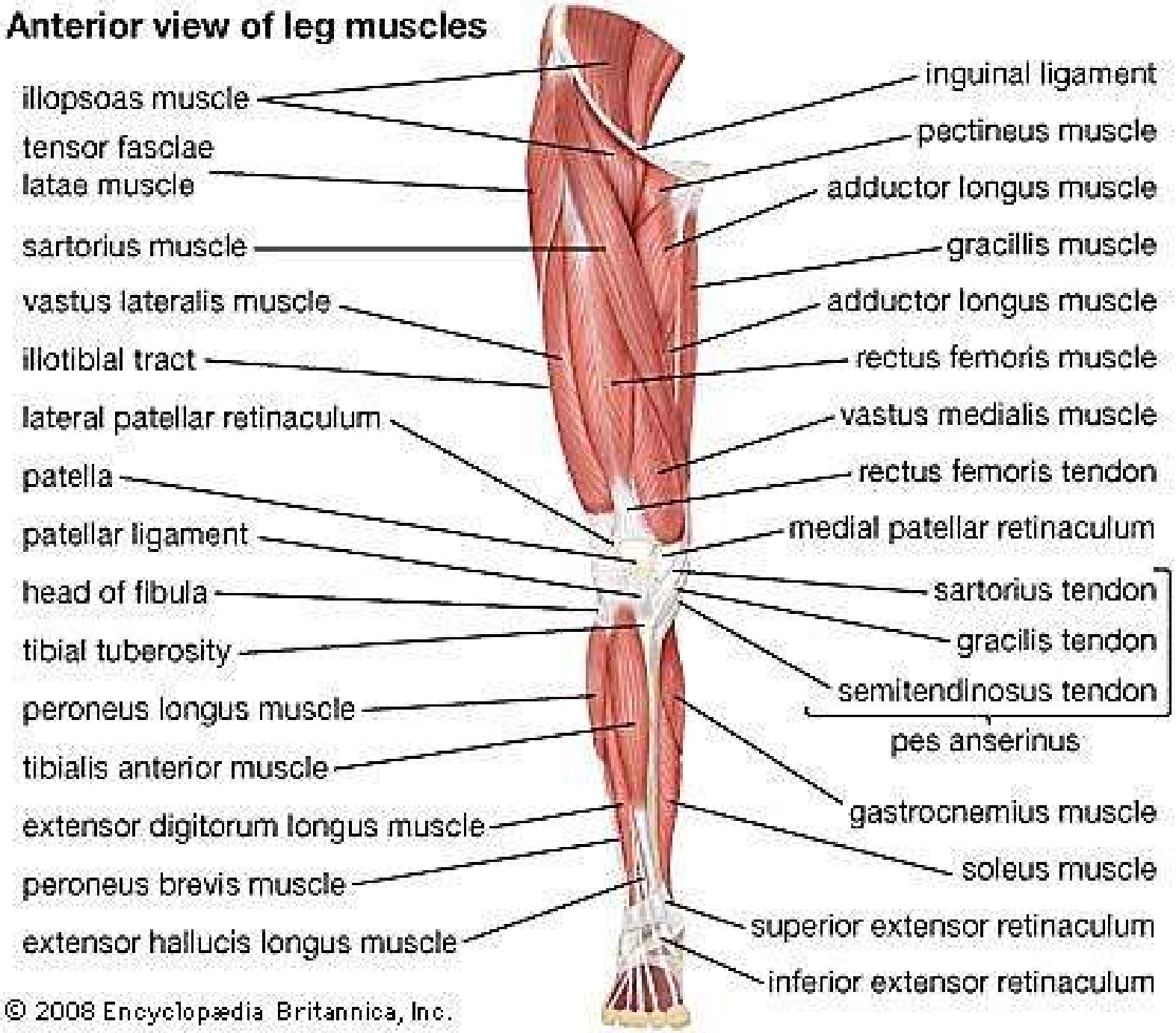
Peroneus brevis

Posterior group

Superficial lager triceps surae

Gastrocnemius

Soleus


Anterior view of leg muscles
iliopsoas muscle
tensor fasciae latae muscle
sartorius muscle
vastus lateralis muscle
iliotibial tract
lateral patellar retinaculum
patella
patellar ligament
head of fibula
tibial tuberosity
peroneus longus muscle
tibialis anterior muscle
extensor digitorum longus muscle
peroneus brevis muscle
extensor hallucis longus muscle
inguinal ligament
pectineus muscle
adductor longus muscle
gracillis muscle
adductor longus muscle
rectus femoris muscle
vastus medialis muscle
rectus femoris tendon
medial patellar retinaculum
sartorius tendon
gracilis tendon
semitendinosus tendon
pes anserinus
gastrocnemius muscle
soleus muscle
superior extensor retinaculum
inferior extensor retinaculum
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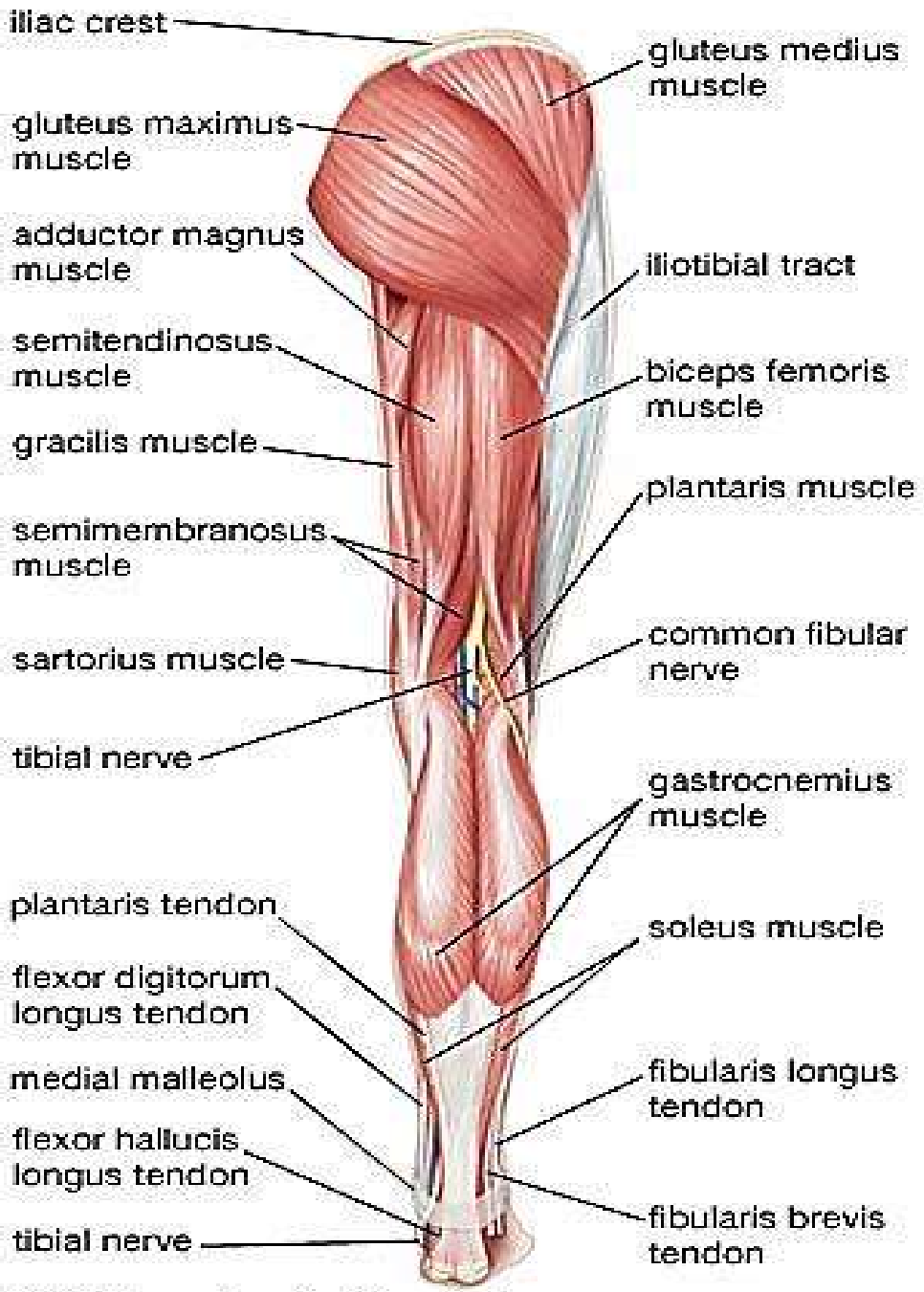


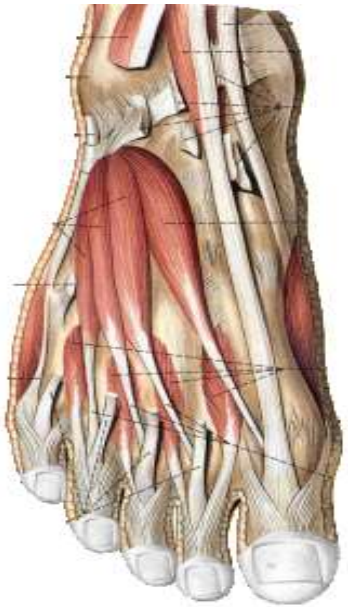
Muscles of foot

Muscles on dorsum:

- extensor digitorum brevis

Muscles in sole:

- medial,
- lateral &
- intermediate group



Respiratory system

Consists of the :

- Respiratory zone
- conducting zone

Respiratory zone

- Site of gas exchange

Consists of :

- bronchioles,
- alveolar ducts,
- alveoli

Conducting zone

- Provides rigid conduits for air to reach the sites of gas exchange

Includes

- **nose,**
- **nasal cavity,**
- **pharynx,**
- **Trachea**
- **bronchi**

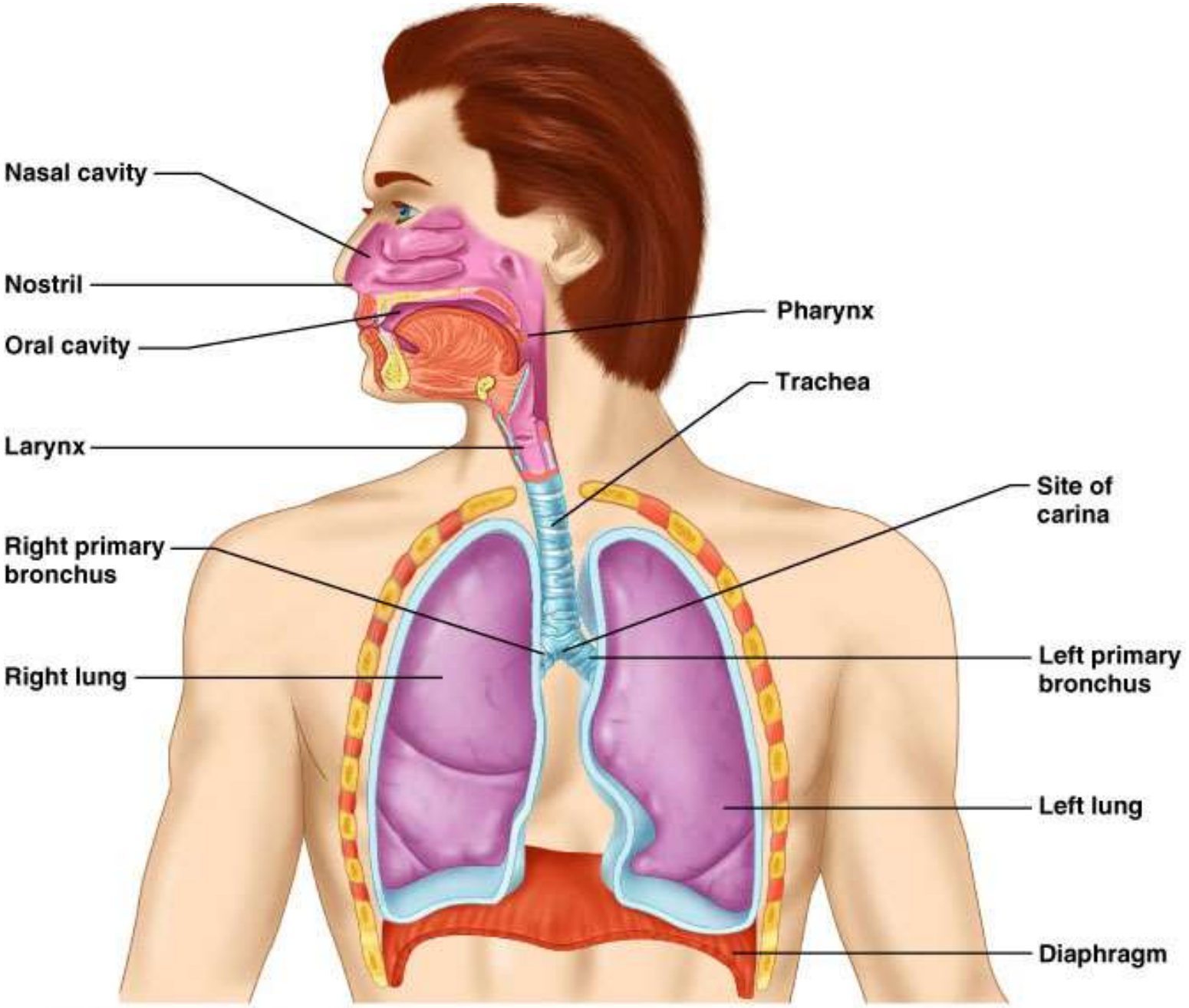

Nasal cavity
Nostril
Oral cavity
Larynx
Right primary bronchus
Right lung
Pharynx
Trachea
Site of carina
Left primary bronchus
Left lung
Diaphragm

Figure 22.1

Nose

consists of :

- external nose

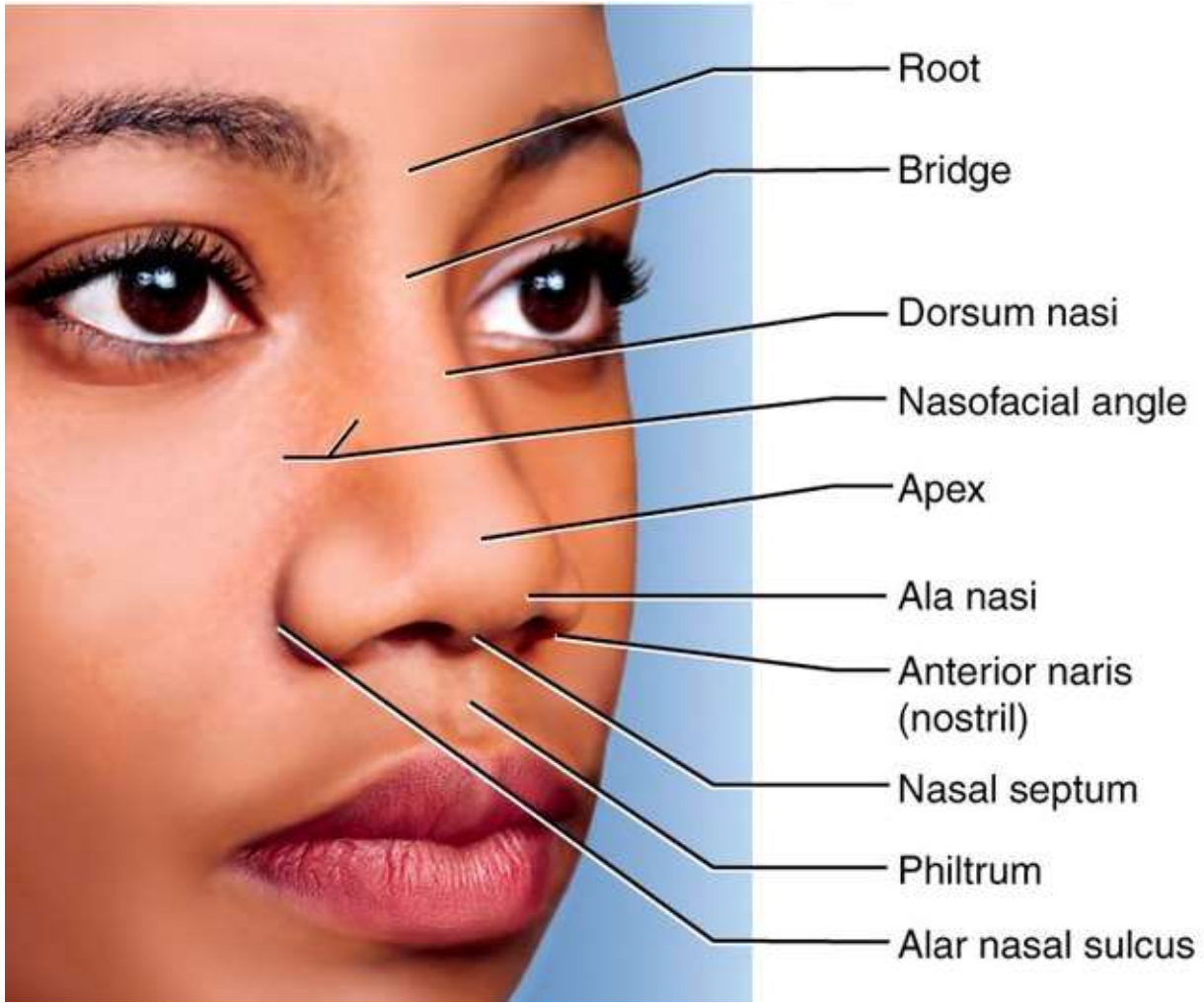
- nasal cavity,

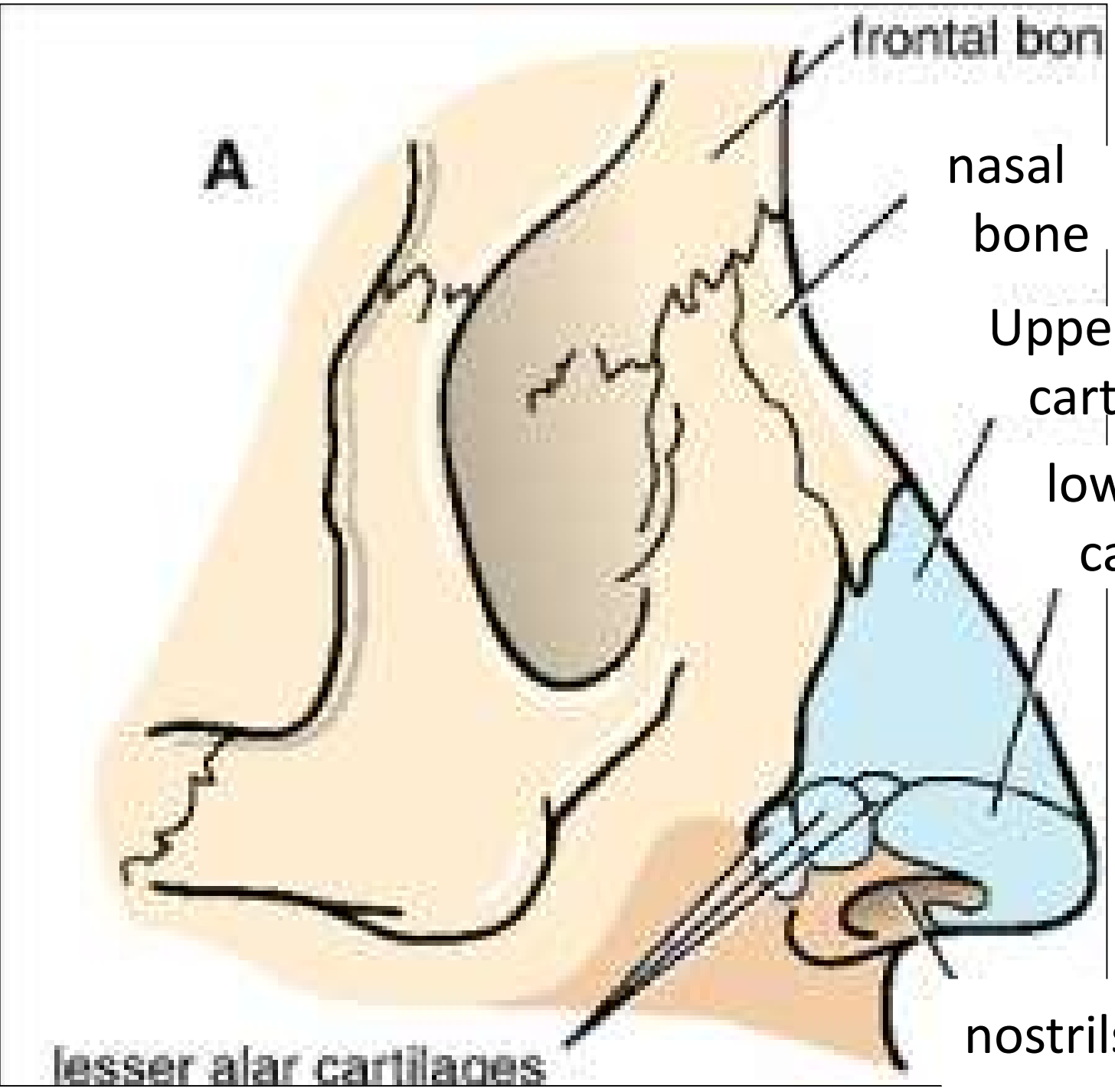
External Nose

nostrils,

nasal septum

ala nasi is




A
frontal bon
nasal bone
Upper nasal cartilage
lower nasal cartilage
nostrils
lesser alar cartilages

Blood Supply of External Nose

1. Ophthalmic artery &
2. maxillary artery

Nerve Supply of External Nose

1. ophthalmic nerve
2. maxillary nerve

Nasal Cavity

extends from :

- **nostrils**
- **posterior nasal apertures**

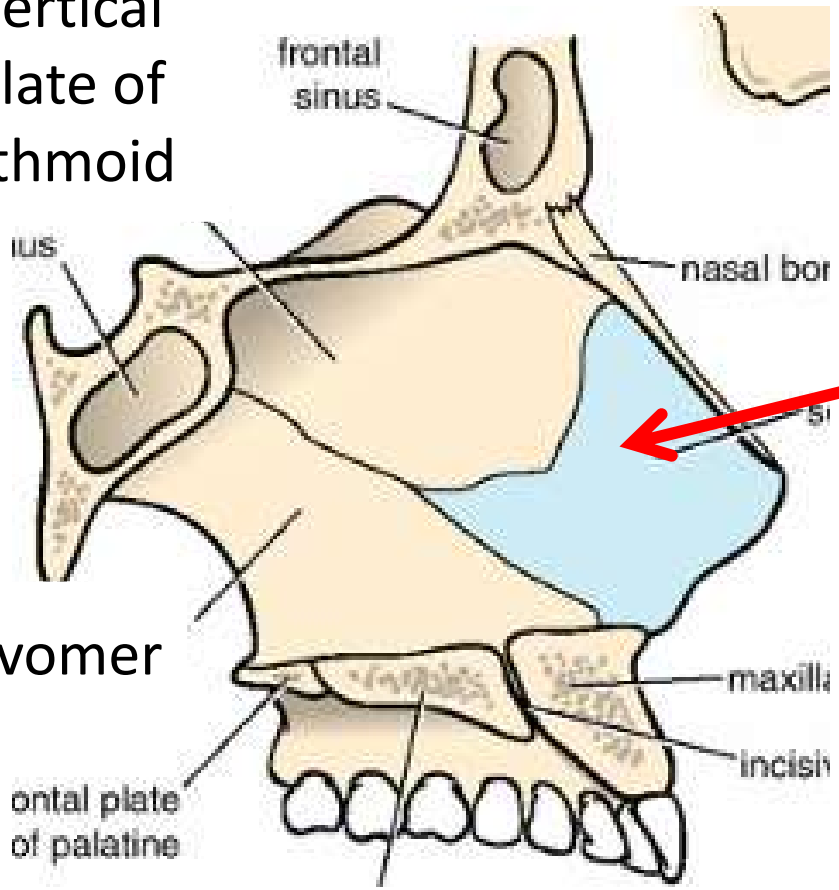
❑nose opens into nasopharynx.

- Nasal cavity divide into right and left halves by nasal septum.

❑septum is made up of :

1. **septal cartilage**
2. **septal bone,**
   - **ethmoid**
   - **vomer.**

Vertical plate of ethmoid



septal cartilage

vomer

Blood Supply to Nasal Cavity

maxillary artery,

Nerve Supply of Nasal Cavity.

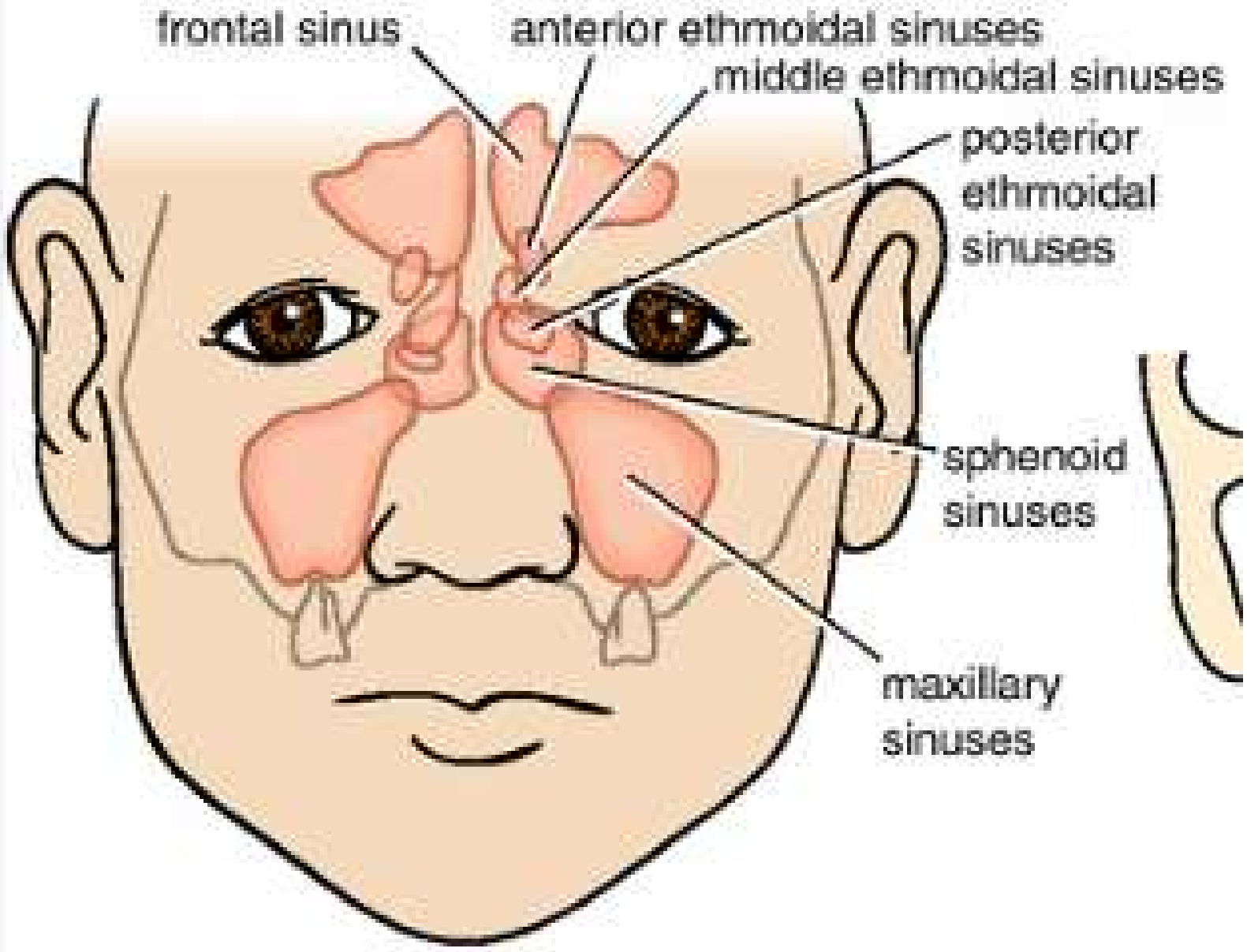
- olfactory nerves

- trigeminal nerve:

paranasal sinuses

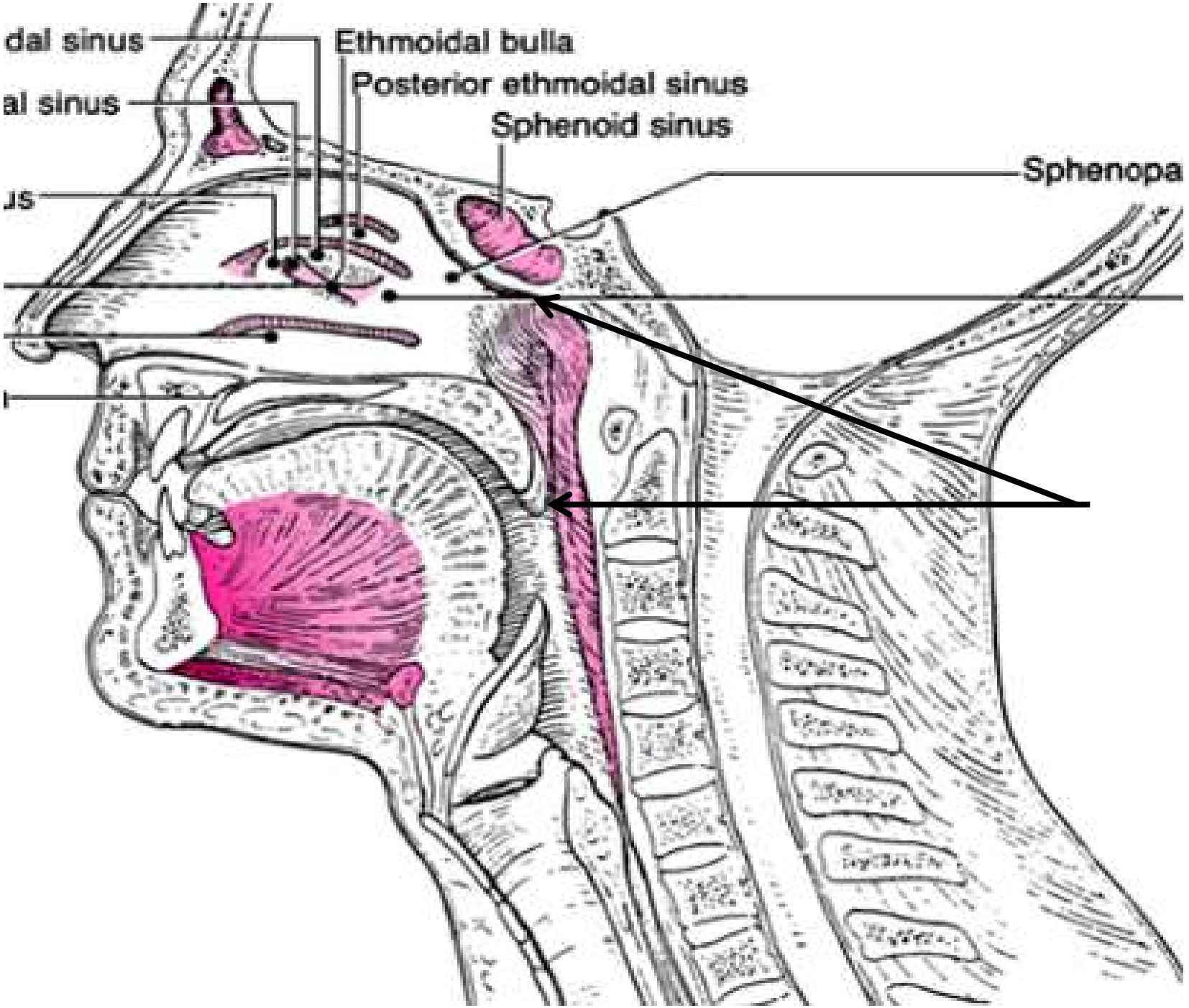
are cavities found in interior of

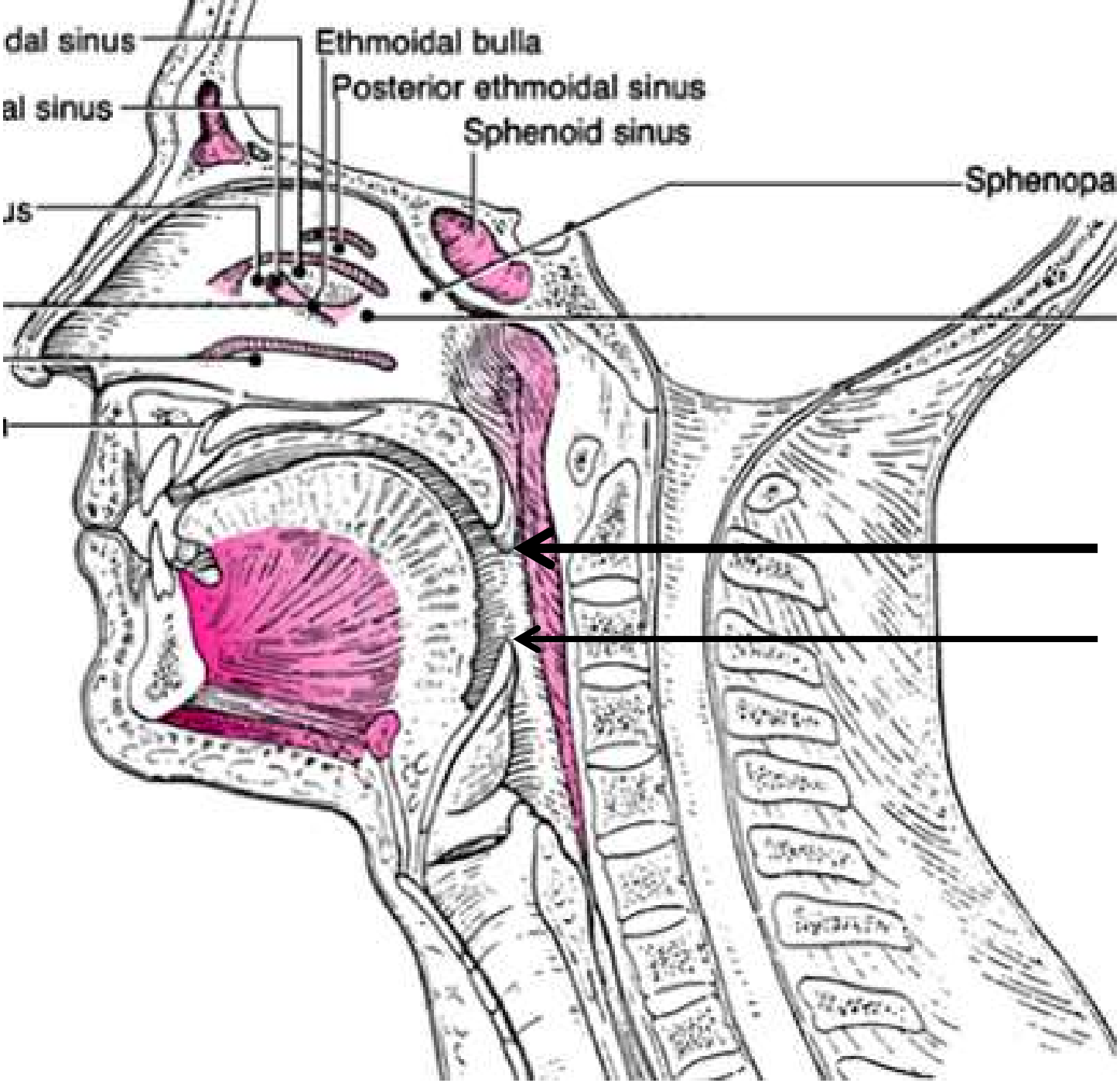
1. **maxilla,**
2. **frontal,**
3. **sphenoid, &**
4. **ethmoid bones**.

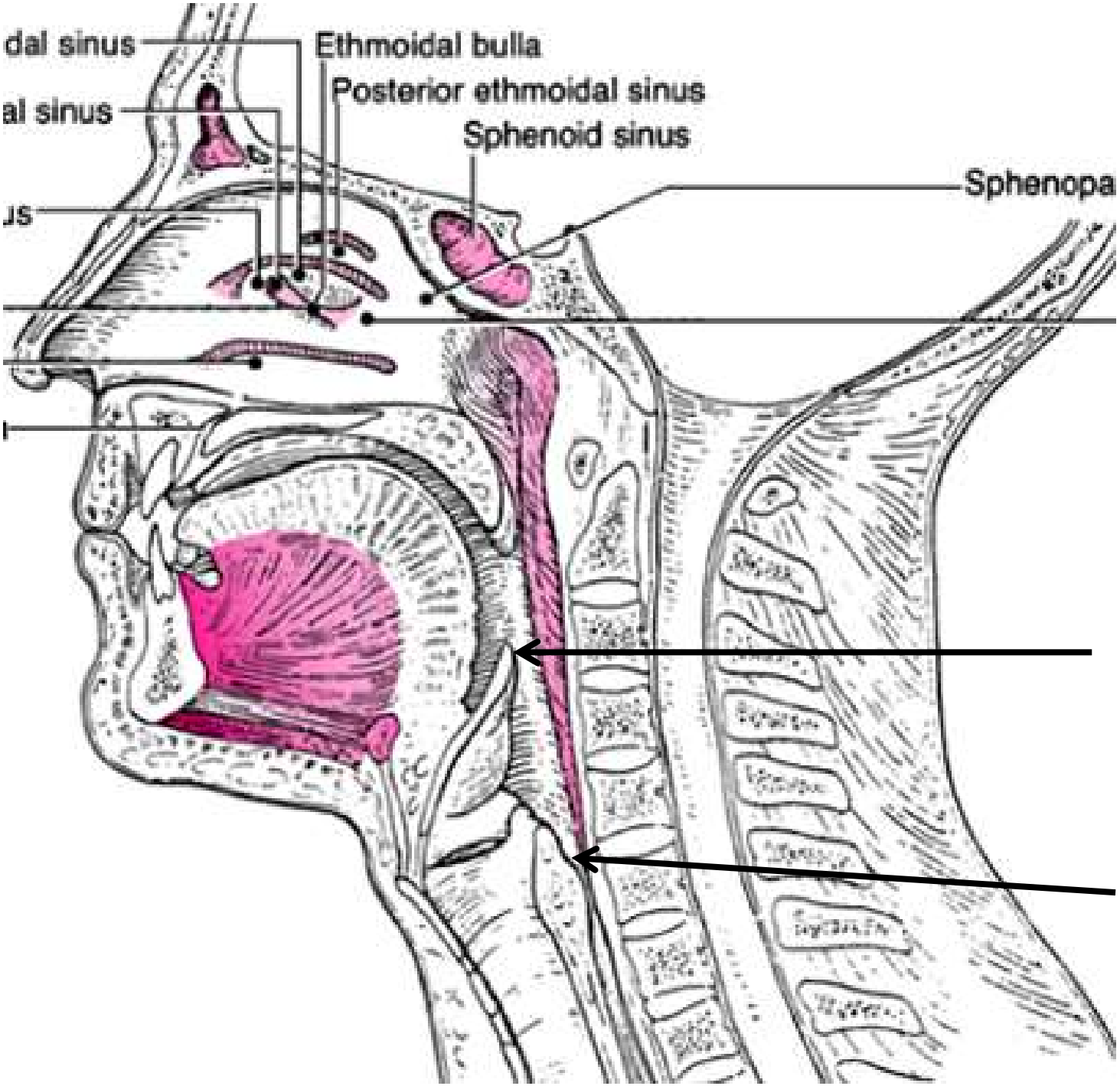

frontal sinus
anterior ethmoidal sinuses
middle ethmoidal sinuses
posterior ethmoidal sinuses
sphenoid sinuses
maxillary sinuses

Pharynx

- It is divided into three regions
  - ❑**Nasopharynx**
  - ❑**Oropharynx**
  - ❑**Laryngopharynx**


dal sinus
al sinus
Ethmoidal bulla
Posterior ethmoidal sinus
Sphenoid sinus
Sphenopa


dal sinus
Ethmoidal bulla
al sinus
Posterior ethmoidal sinus
Sphenoid sinus
Sphenopa

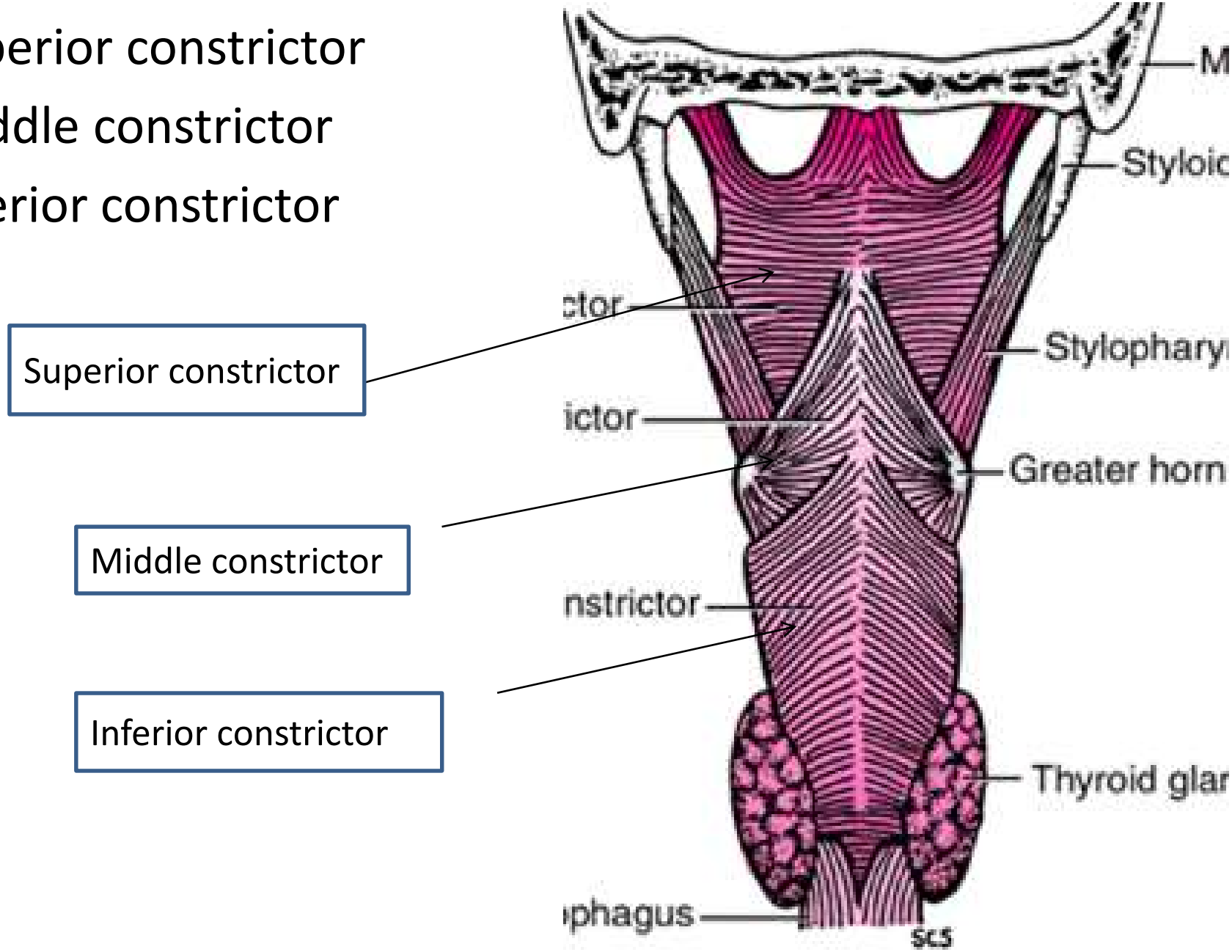

dal sinus
al sinus
Ethmoidal bulla
Posterior ethmoidal sinus
Sphenoid sinus
Sphenopa

Muscles of Pharynx

Superior constrictor

Middle constrictor

Inferior constrictor



Blood Supply of Pharynx

1. **pharyngeal artery**
2. **superior & inferior thyroid arteries**.

Innervation

1. **glossopharyngeal**
2. **vagus nerve**

Larynx (Voice Box)

Cartilages

A. Thyroid cartilage

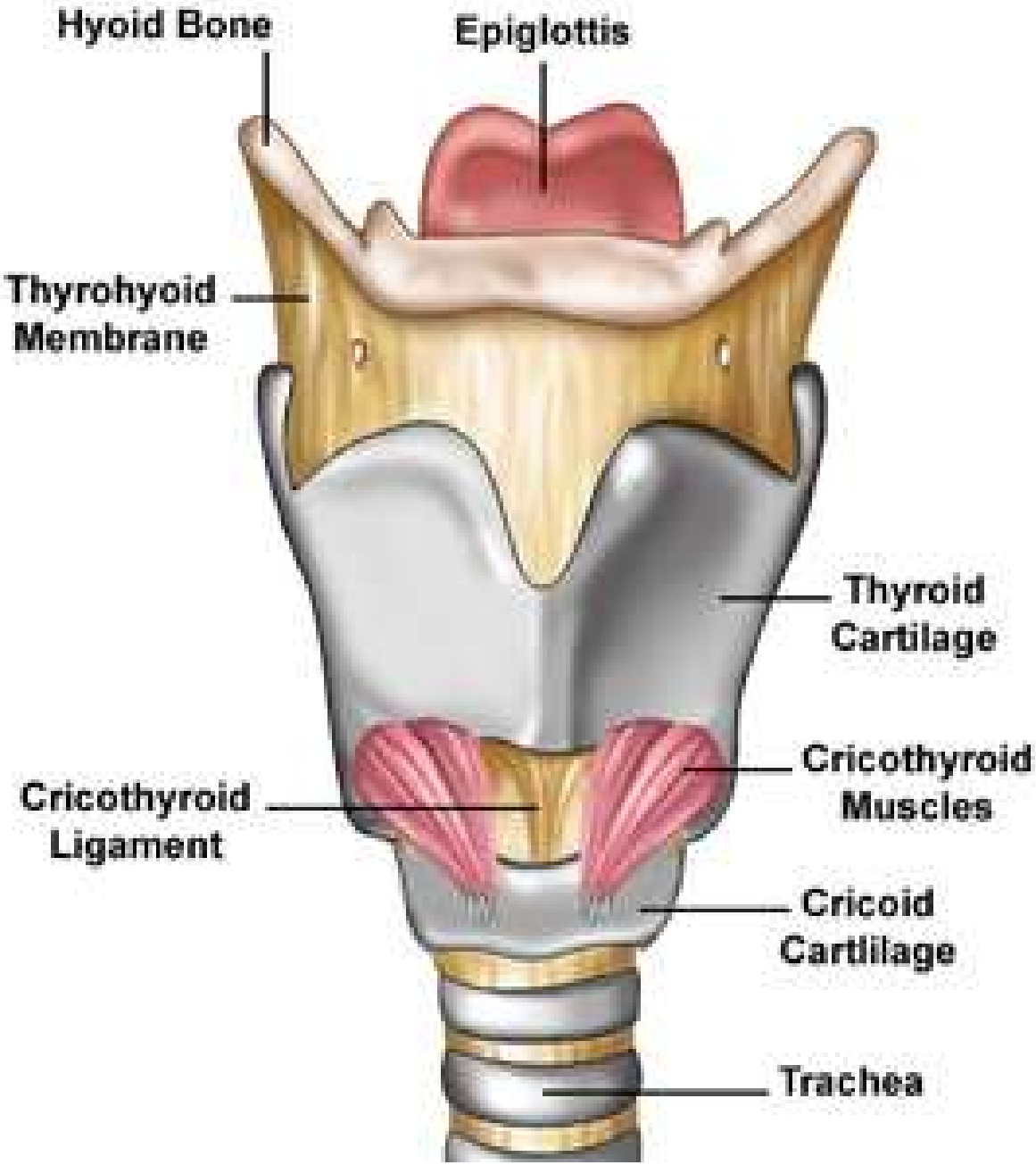
B. Cricoid cartilage

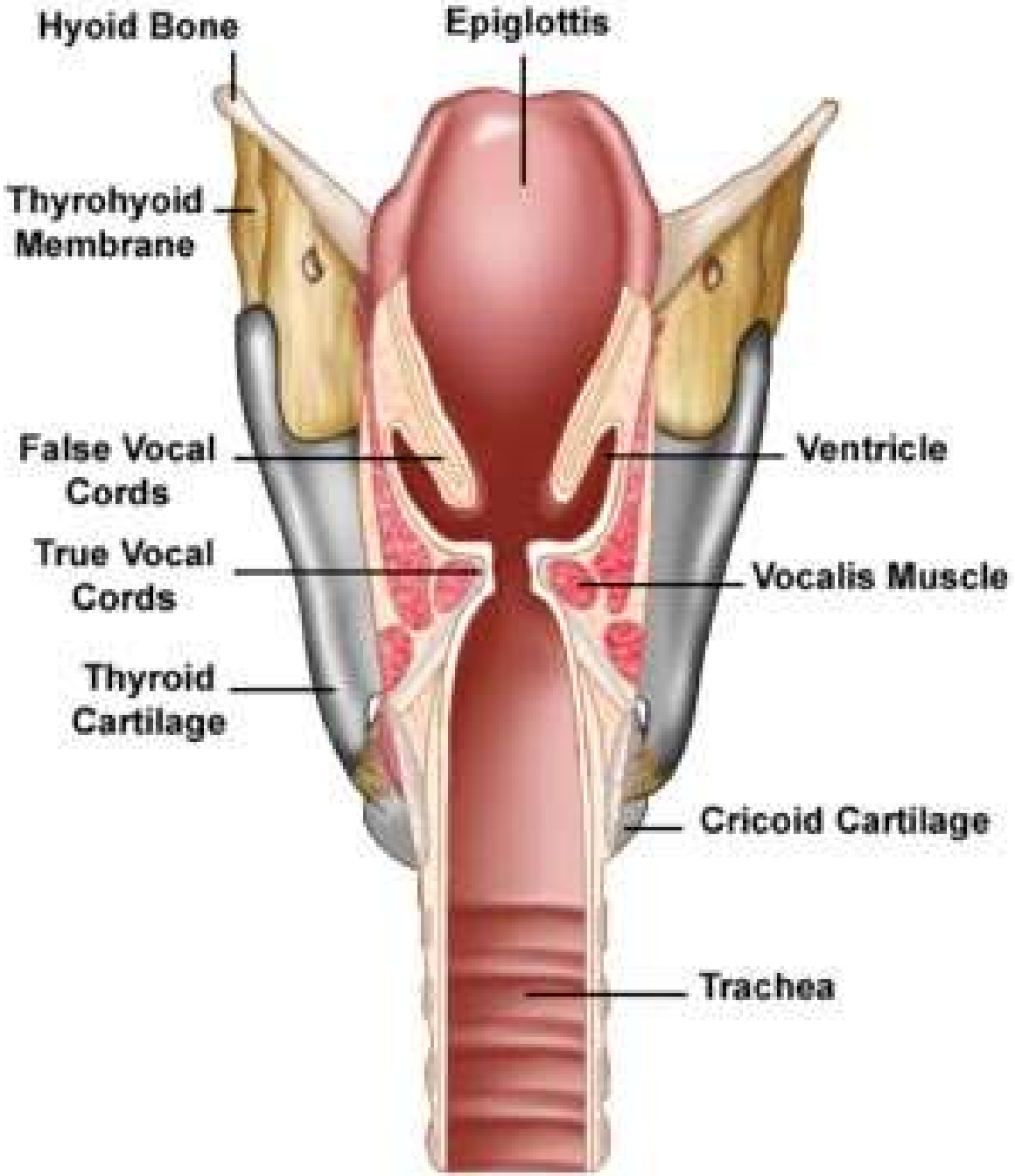
C. Epiglottis

D. Arytenoid cartilages

E. Corniculate cartilages

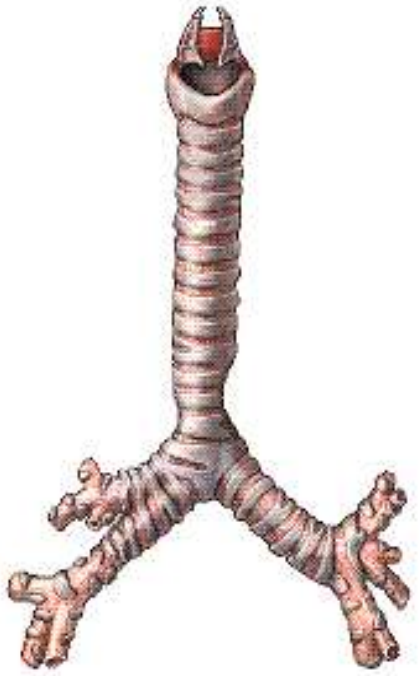
F. Cuneiform cartilages


Hyoid Bone
Epiglottis
Thyrohyoid Membrane
Thyroid Cartilage
Cricothyroid Muscles
Cricothyroid Ligament
Cricoid Cartilage
Trachea


Hyoid Bone
Epiglottis
Thyrohyoid Membrane
False Vocal Cords
Ventricle
True Vocal Cords
Vocalis Muscle
Thyroid Cartilage
Cricoid Cartilage
Trachea

Trachea

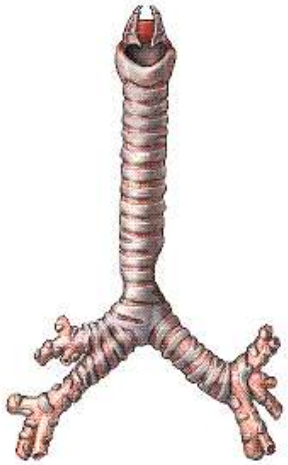
- Flexible and mobile tube
- extending from larynx into mediastinum
  - made of **C-**shaped rings of hyaline cartilage



Bronchi

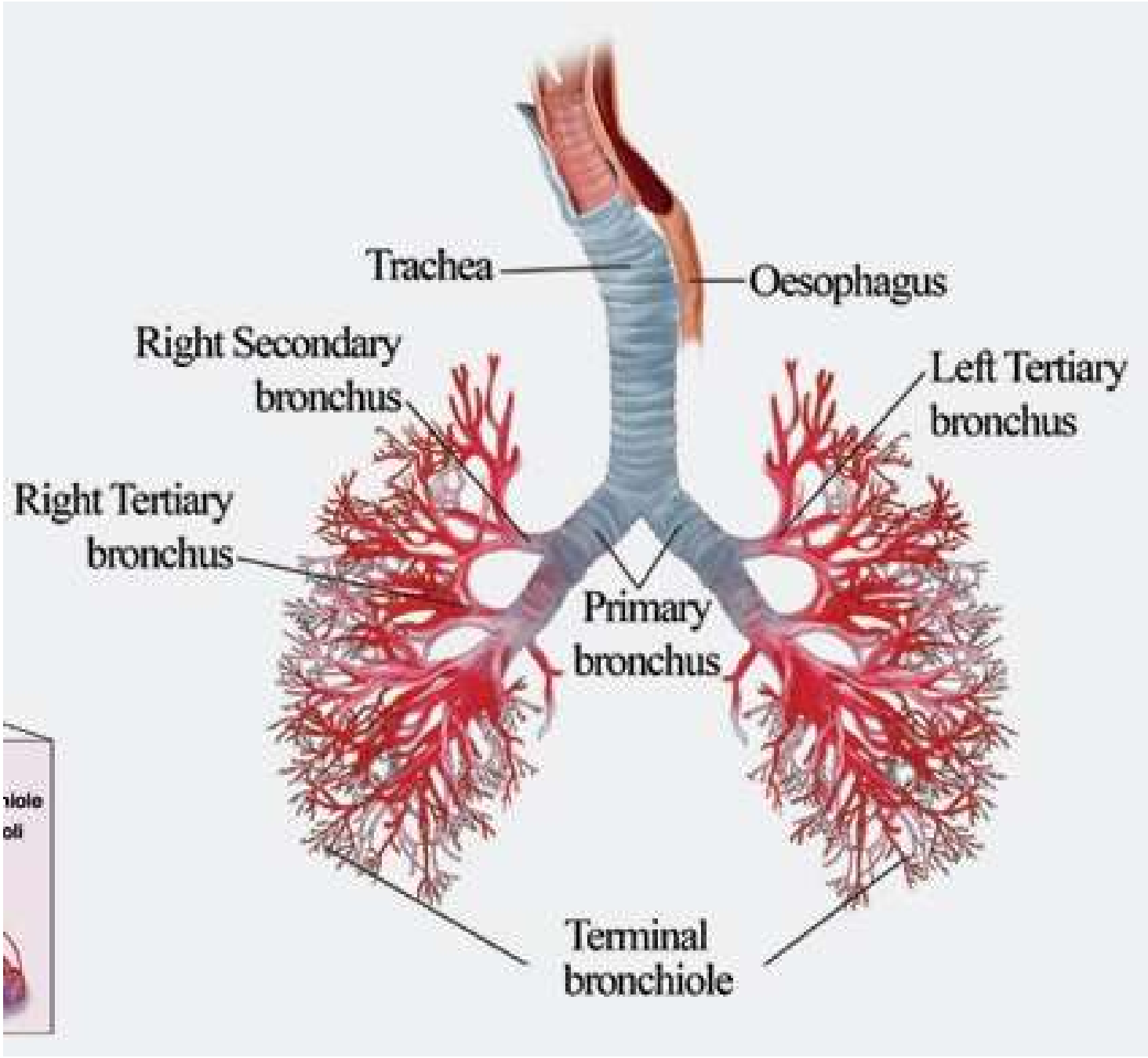
A highly branched system

Bronchi subdivide into :
primary, secondary bronchi, each supplying a lobe of the lungs

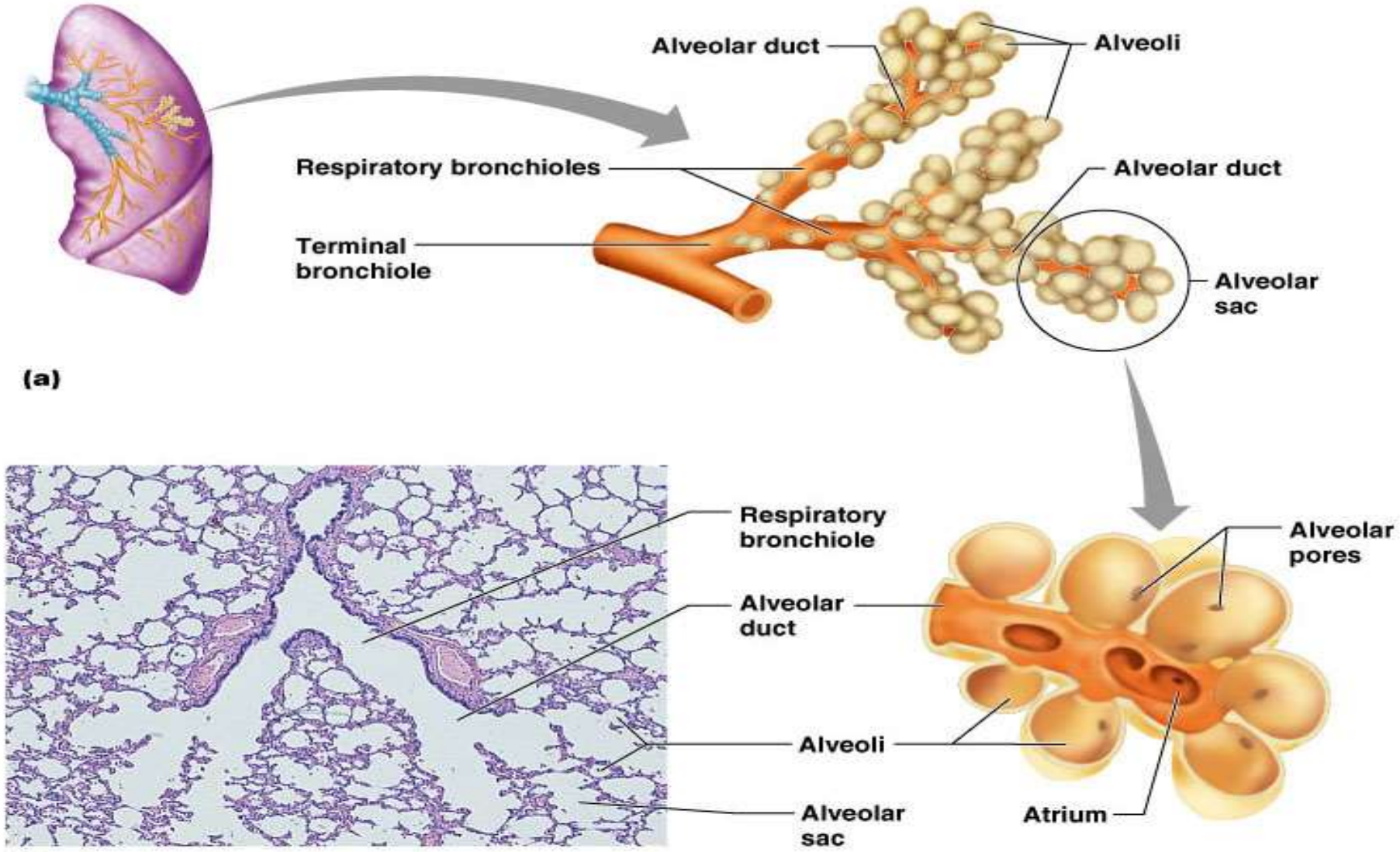


Bronchial Tree

primary bronchus -Secondary bronchi→ tertiary bronchi→ bronchioles→ terminal bronchioles


Trachea
Oesophagus
Right Secondary bronchus
Left Tertiary bronchus
Right Tertiary bronchus
Primary bronchus
Terminal bronchiole

Respiratory Zone of Lower Respiratory Tract

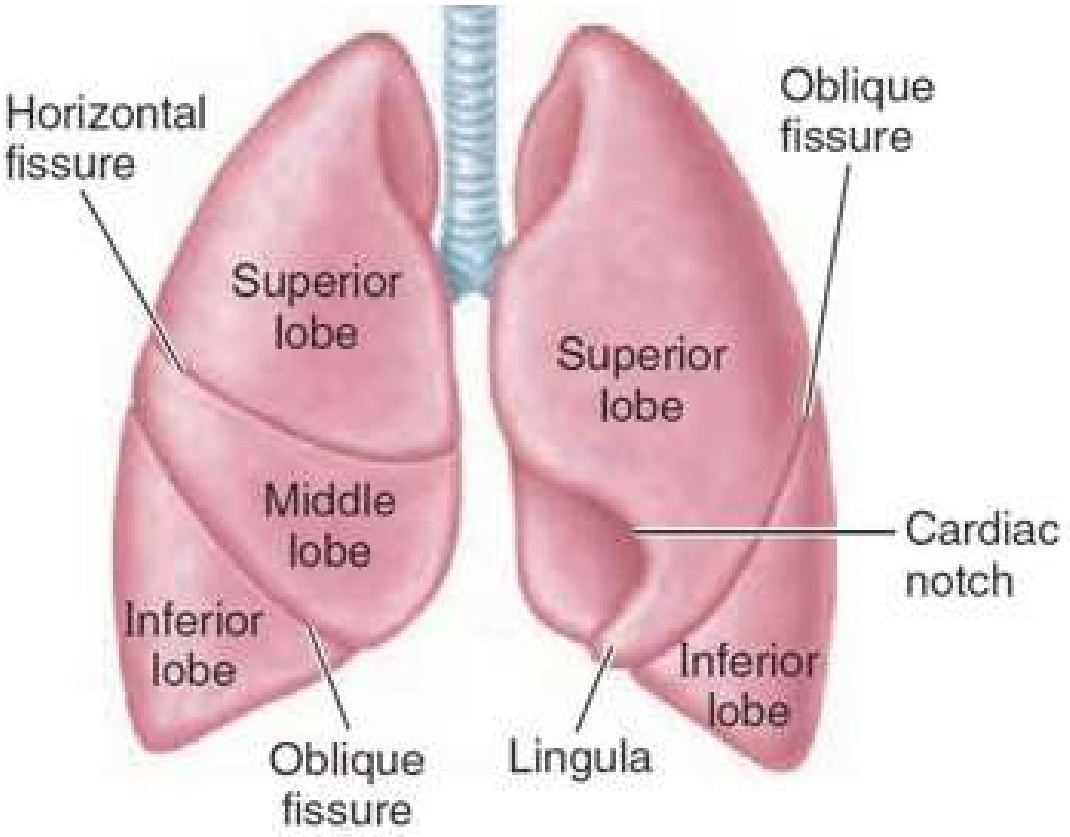


Lobar Bronchi

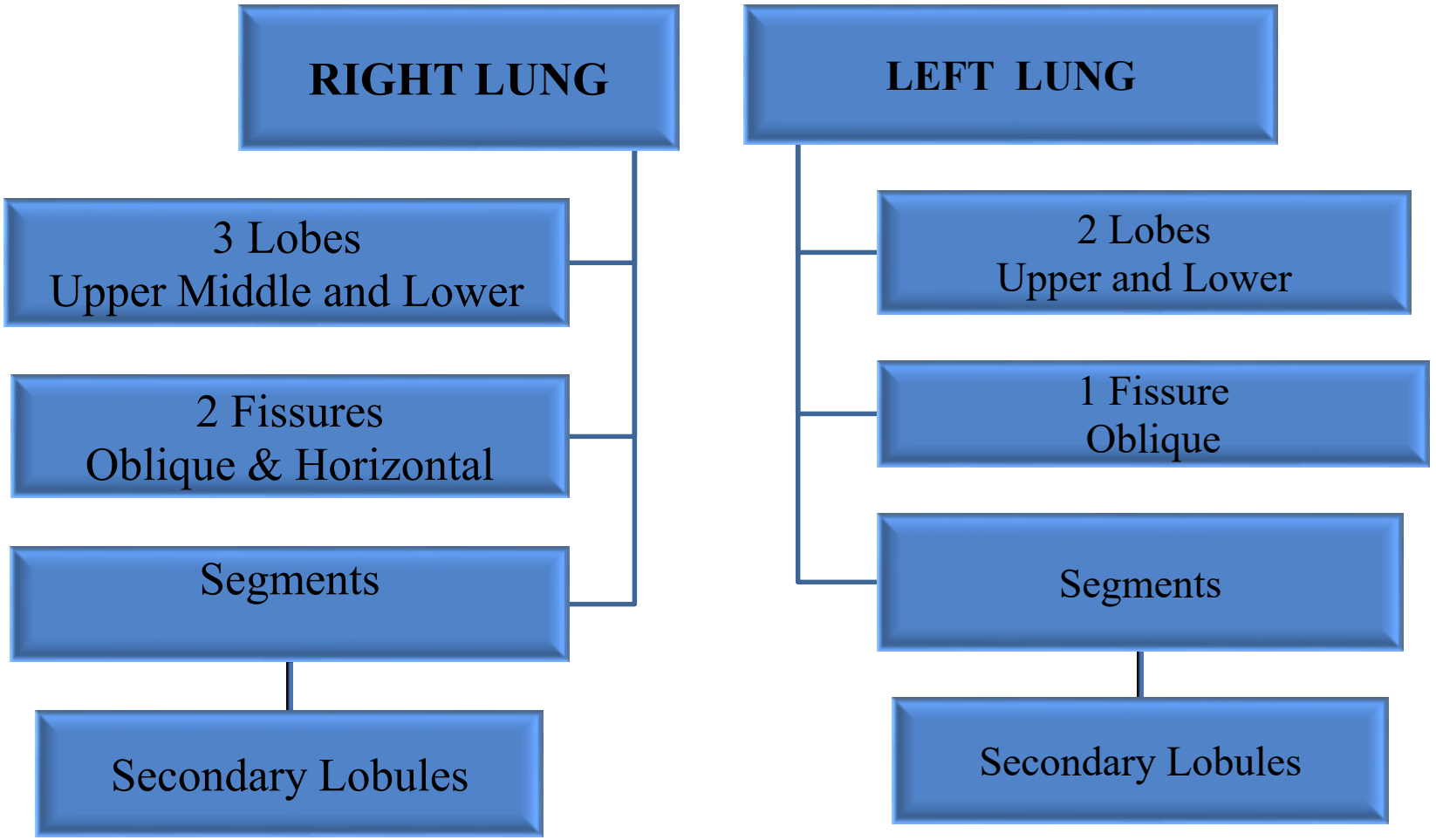
- R main stem divides into:
  - Upper lobar bronchus
  - Middle lobar bronchus
  - Lower lobar bronchus
- L main stem divides into:
  - Upper lobar bronchus
  - Lower lobar bronchus

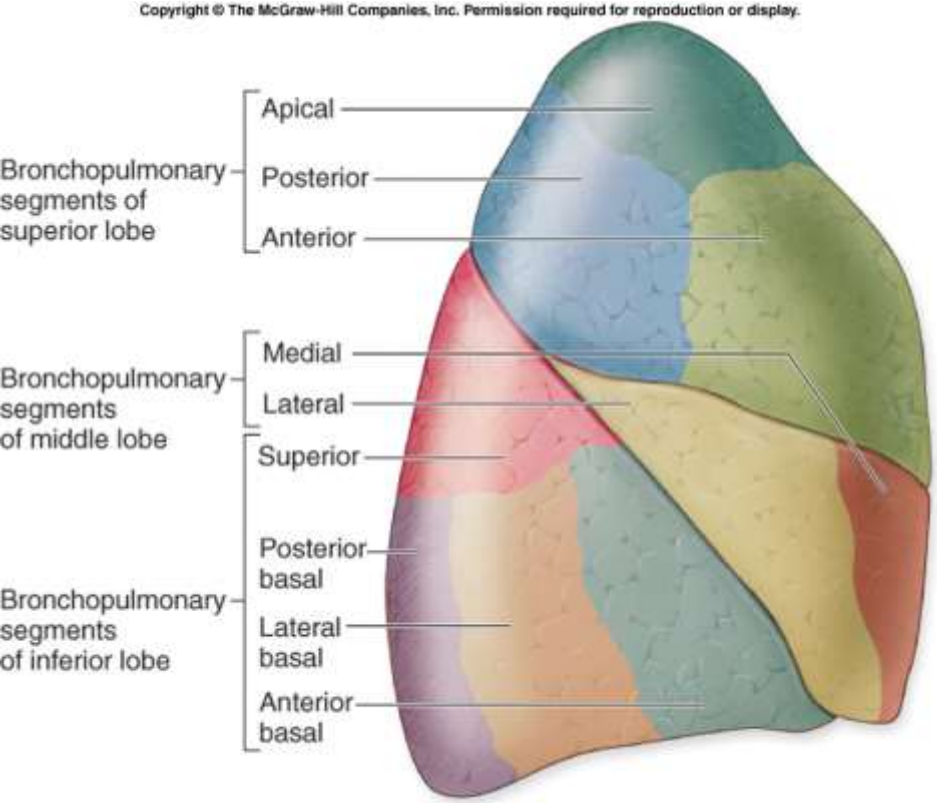
Lungs

- Pair of Cone-shaped organs
- Lie in pleural cavity
- Left lung is narrower
- Right lung is shorter

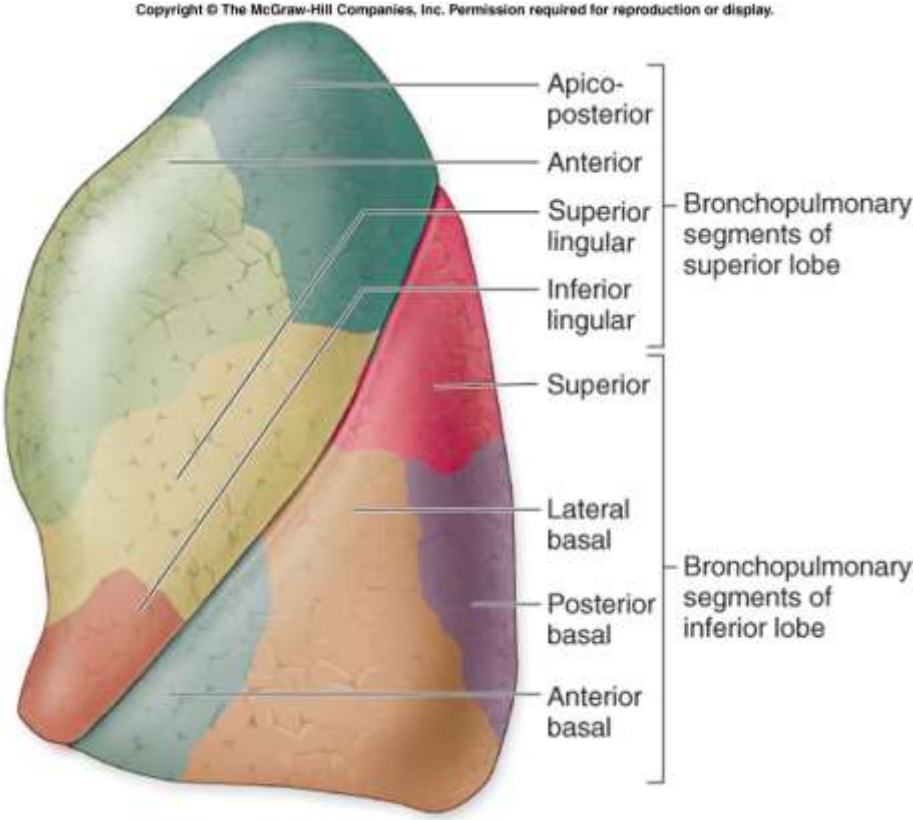


Lungs


RIGHT LUNG
3 Lobes
Upper Middle and Lower
2 Fissures
Oblique & Horizontal
Segments
Secondary Lobules
LEFT LUNG
2 Lobes
Upper and Lower
1 Fissure
Oblique
Segments
Secondary Lobules



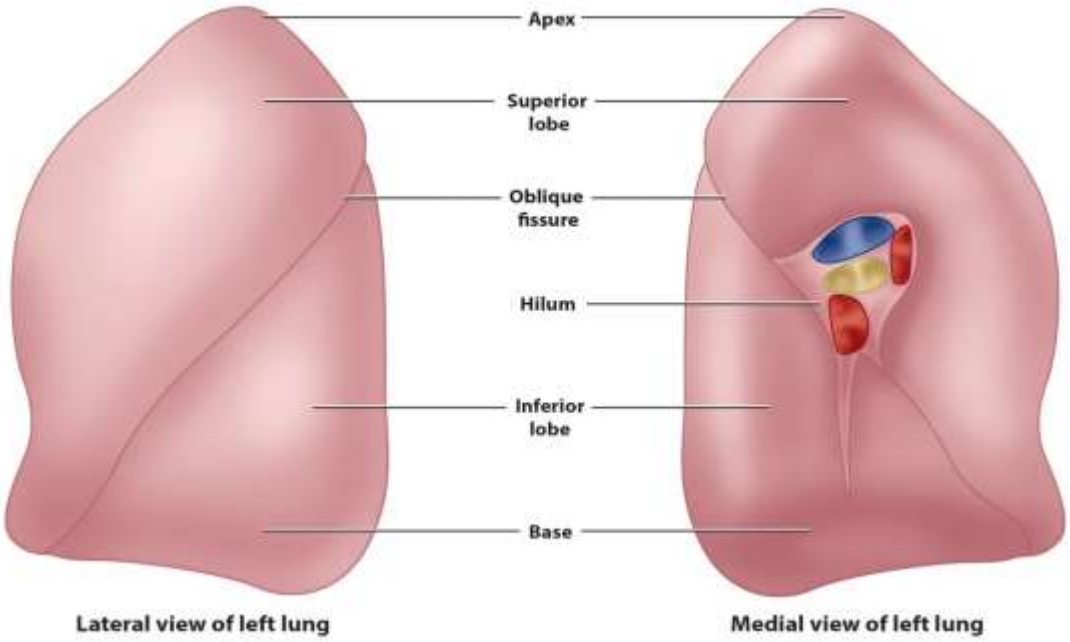
Right lung, lateral view



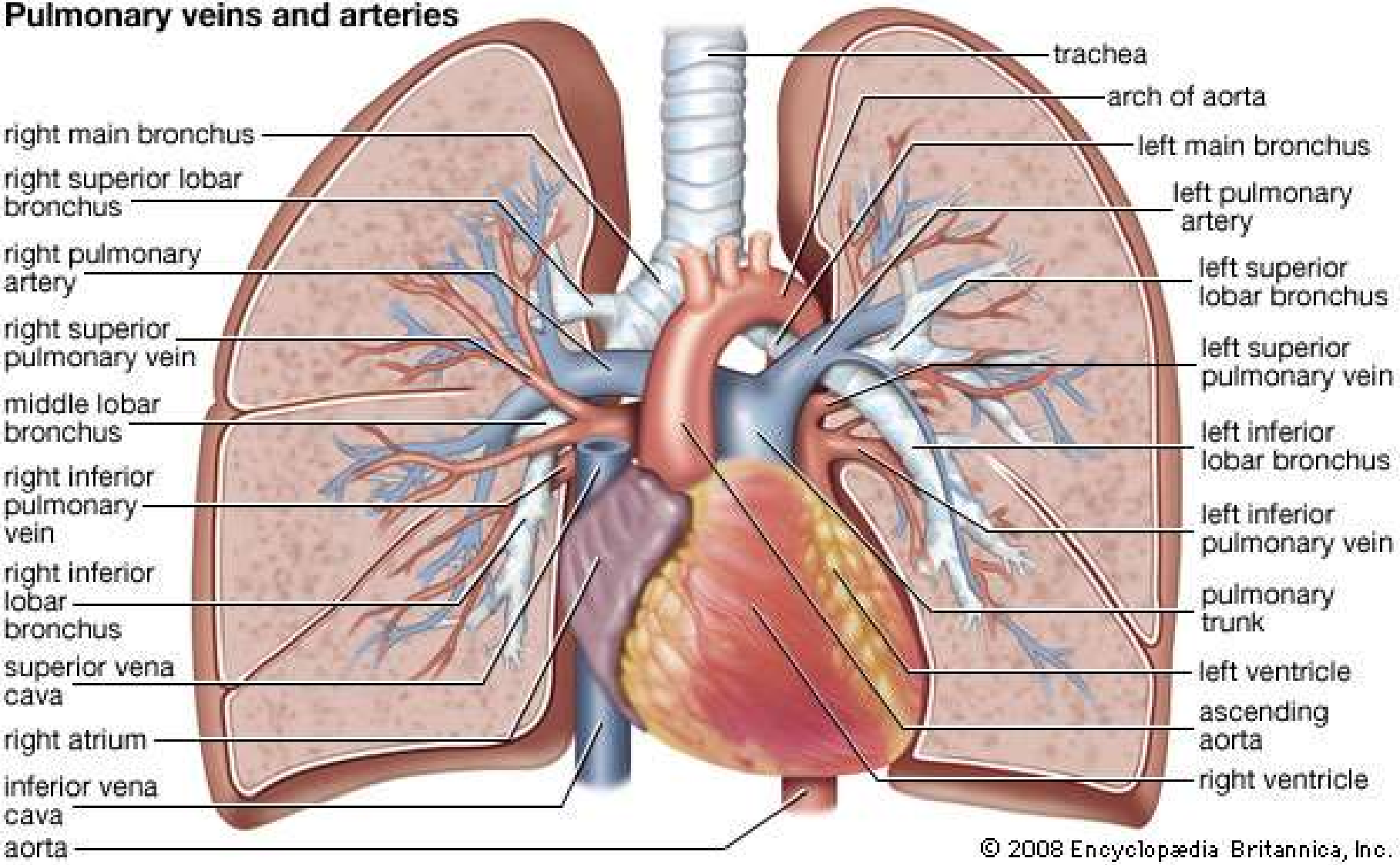
Left lung, lateral view

Hilum

- Opening on the medial surface of the lungs
- Contains:
  - Mainstem bronchi
  - Blood vessels
  - Lymphatics
  - nerves



Pulmonary veins and arteries



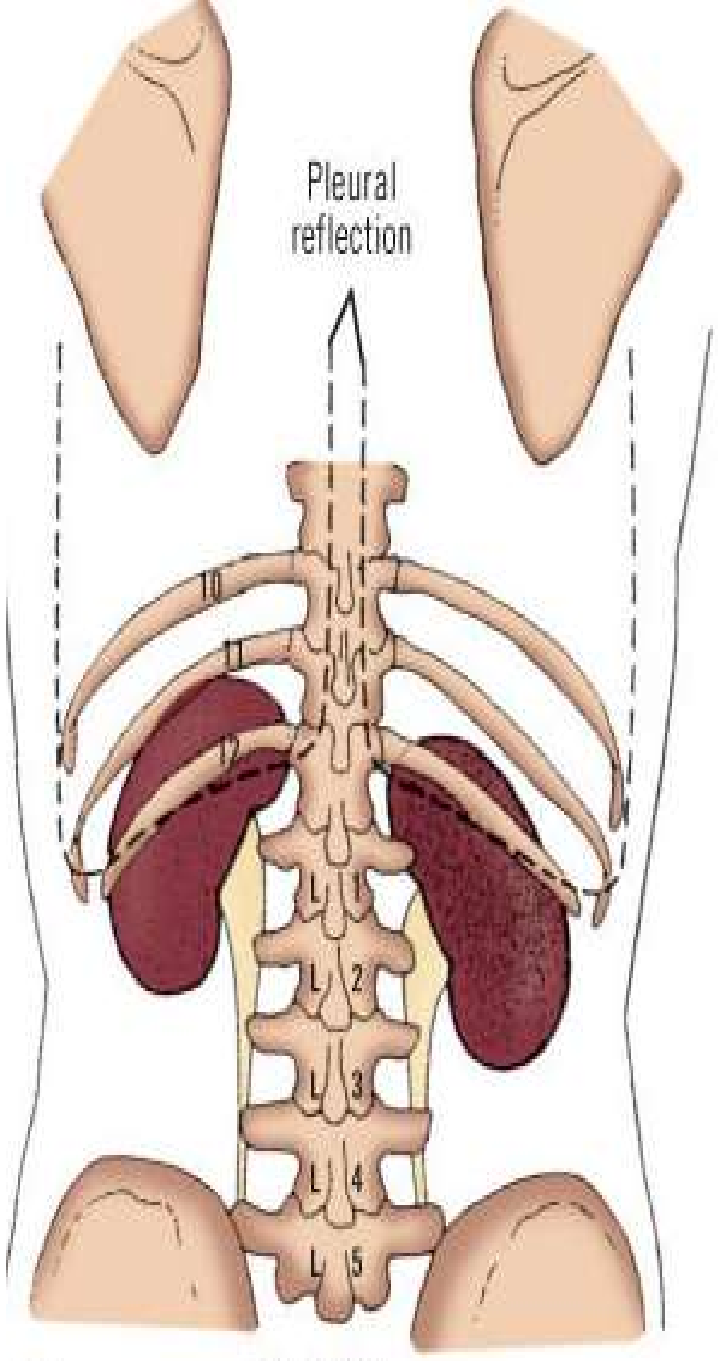
urinary system

The **urinary system**, also known as the **renal system** or **urinary tract**, consists of the kidneys, ureters, bladder, and the urethra.

The purpose of the urinary system is to eliminate waste from the body, regulate blood volume and blood pressure, control levels of electrolytes and metabolites, and regulate blood pH.

KIDNEY

- Is retroperitoneal
- extends from **T12 to L3** vertebrae in erect position.
- right kidney lies a little lower than left
  - because of large size of right lobe of liver.
- right kidney is related to rib **12** posteriorly,
- left one is related to **ribs 11 &12** posteriorly.



B Posterior

renal capsule :

- a firm, fibrous layer cover kidney

renal fascia:

deep fascia surround kidney

- divides ***fat*** into two regions:

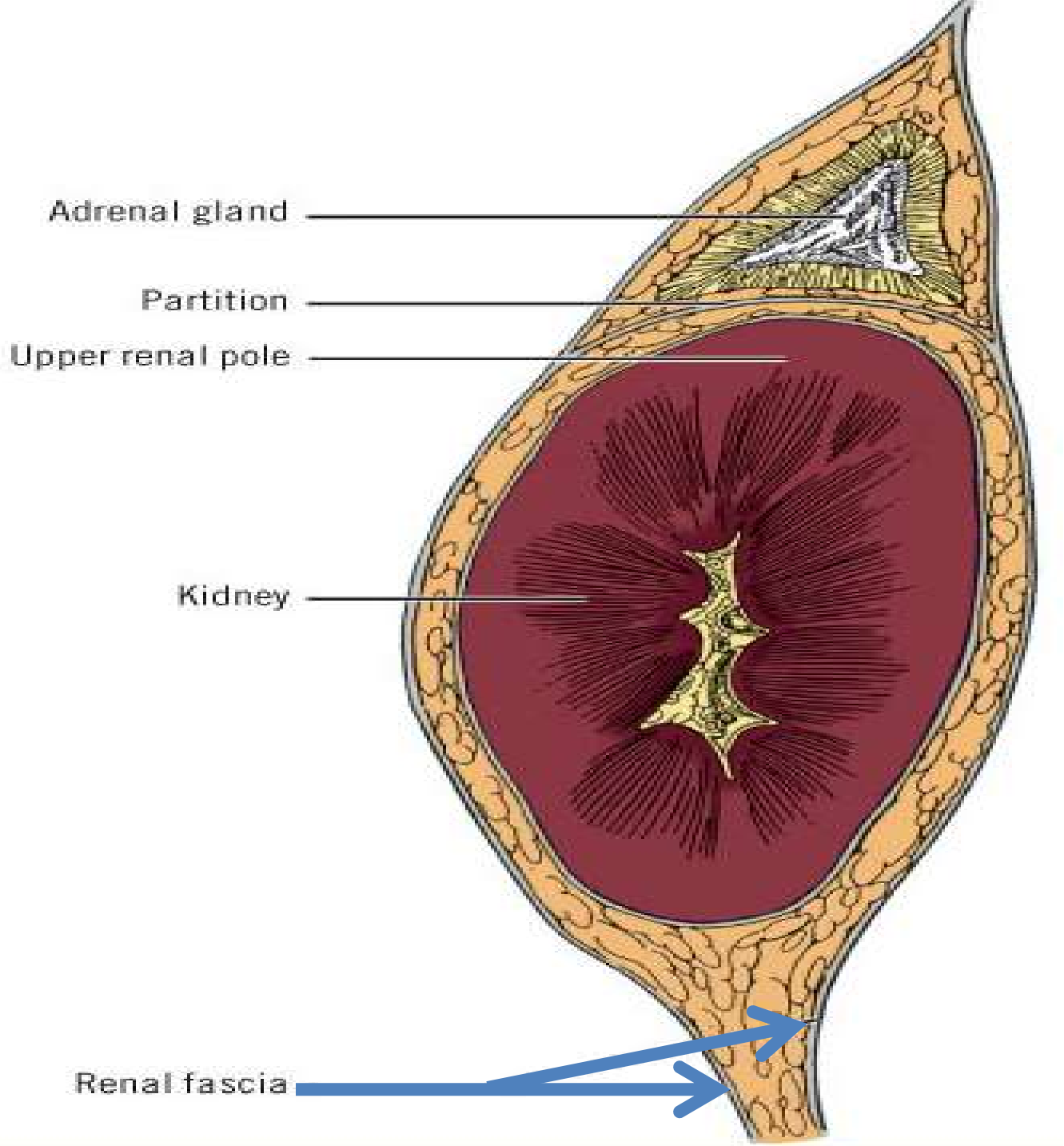
A-perirenal (perinephric) *fat*

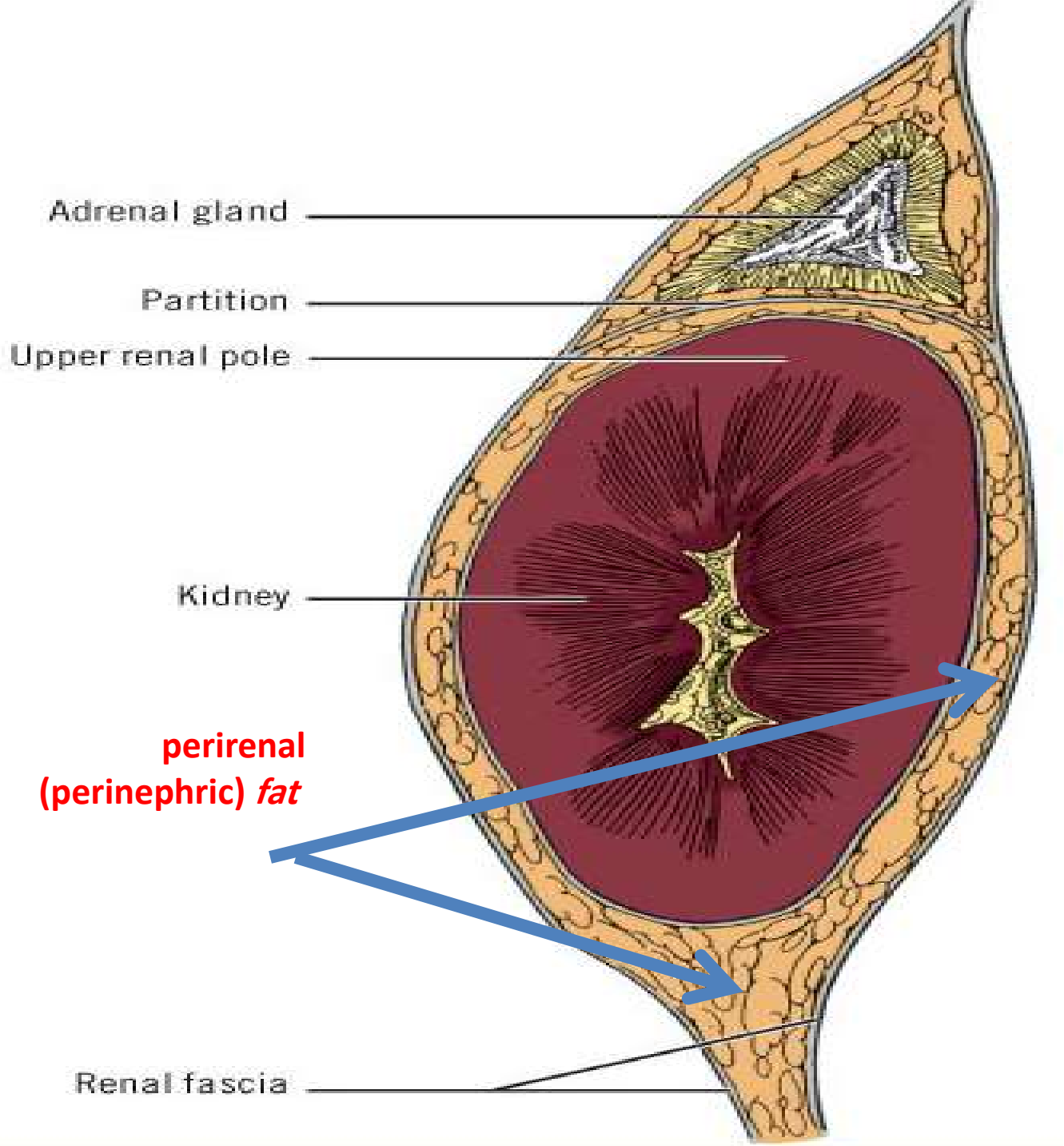
lies in perinephric space

between **renal capsule** & **renal fascia**,

B- pararenal (paranephric) *fat*

lies external to renal fascia.


Adrenal gland
Partition
Upper renal pole
Kidney
Renal fascia

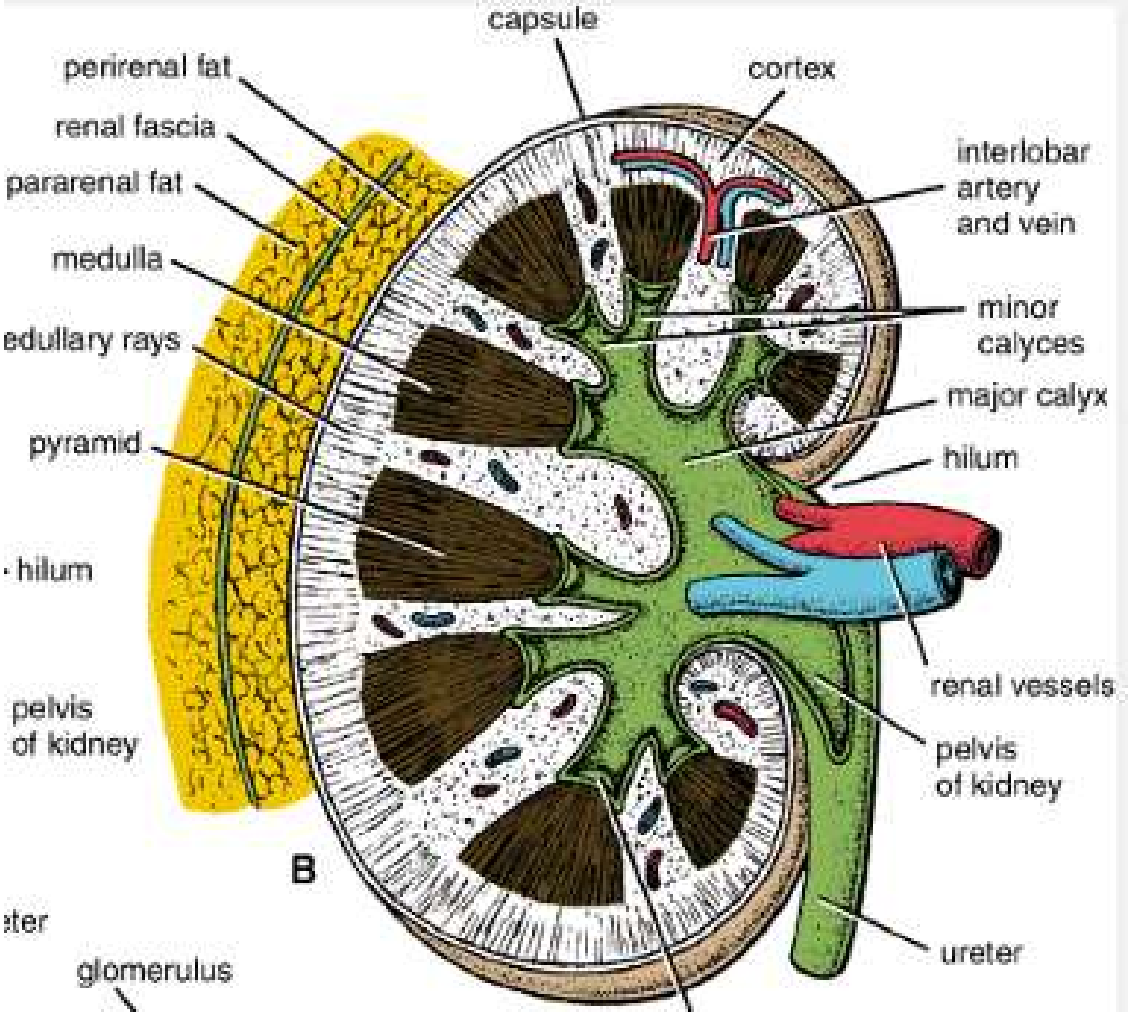

Adrenal gland
Partition
Upper renal pole
Kidney
perirenal
(perinephric) *fat*
Renal fascia

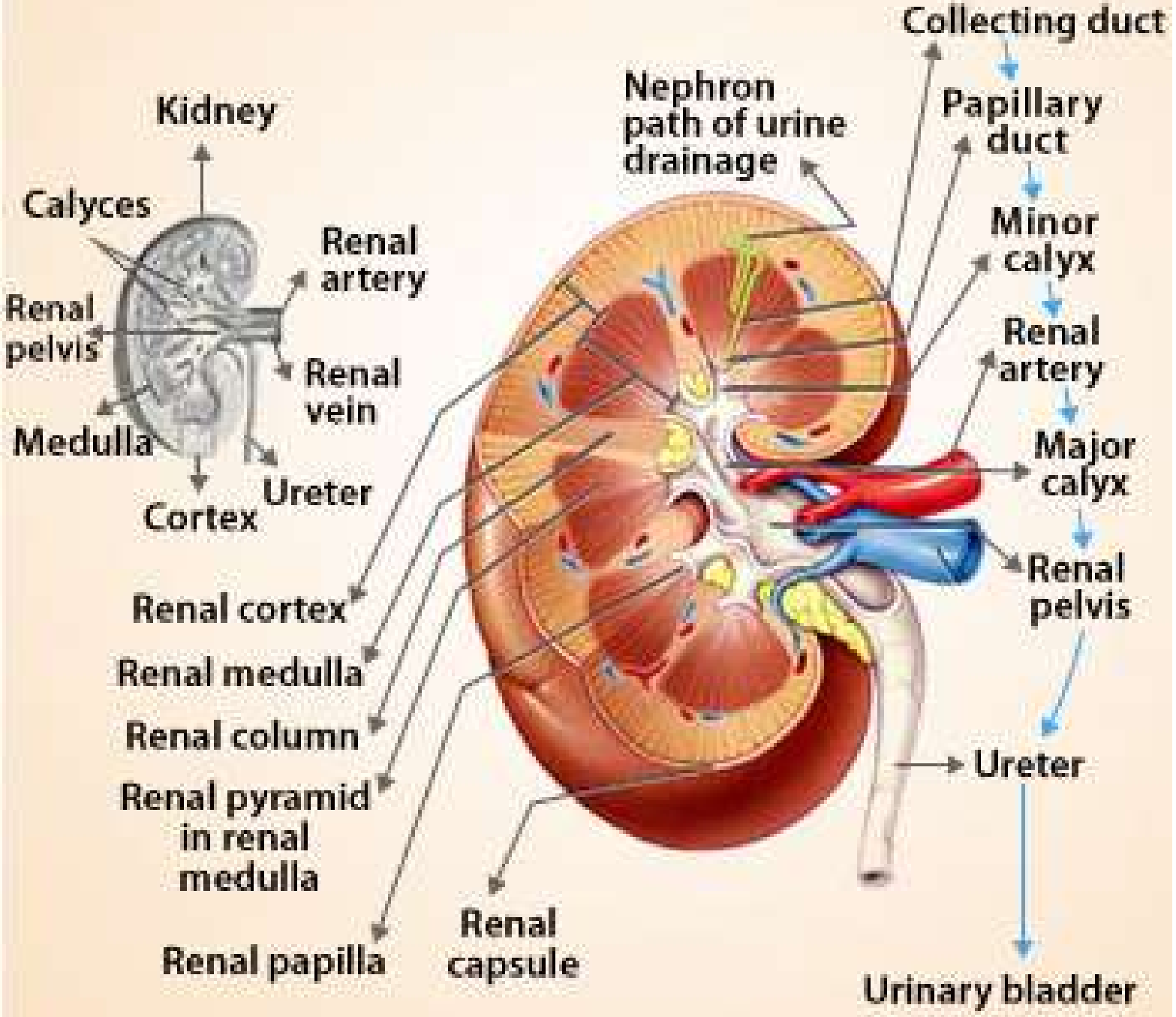
Hilus:

an indentation on its medial border, through which ureter, renal vessels, & nerves enter or leave it.

Kidney Consists of :

I. **medulla** &
II. **cortex**

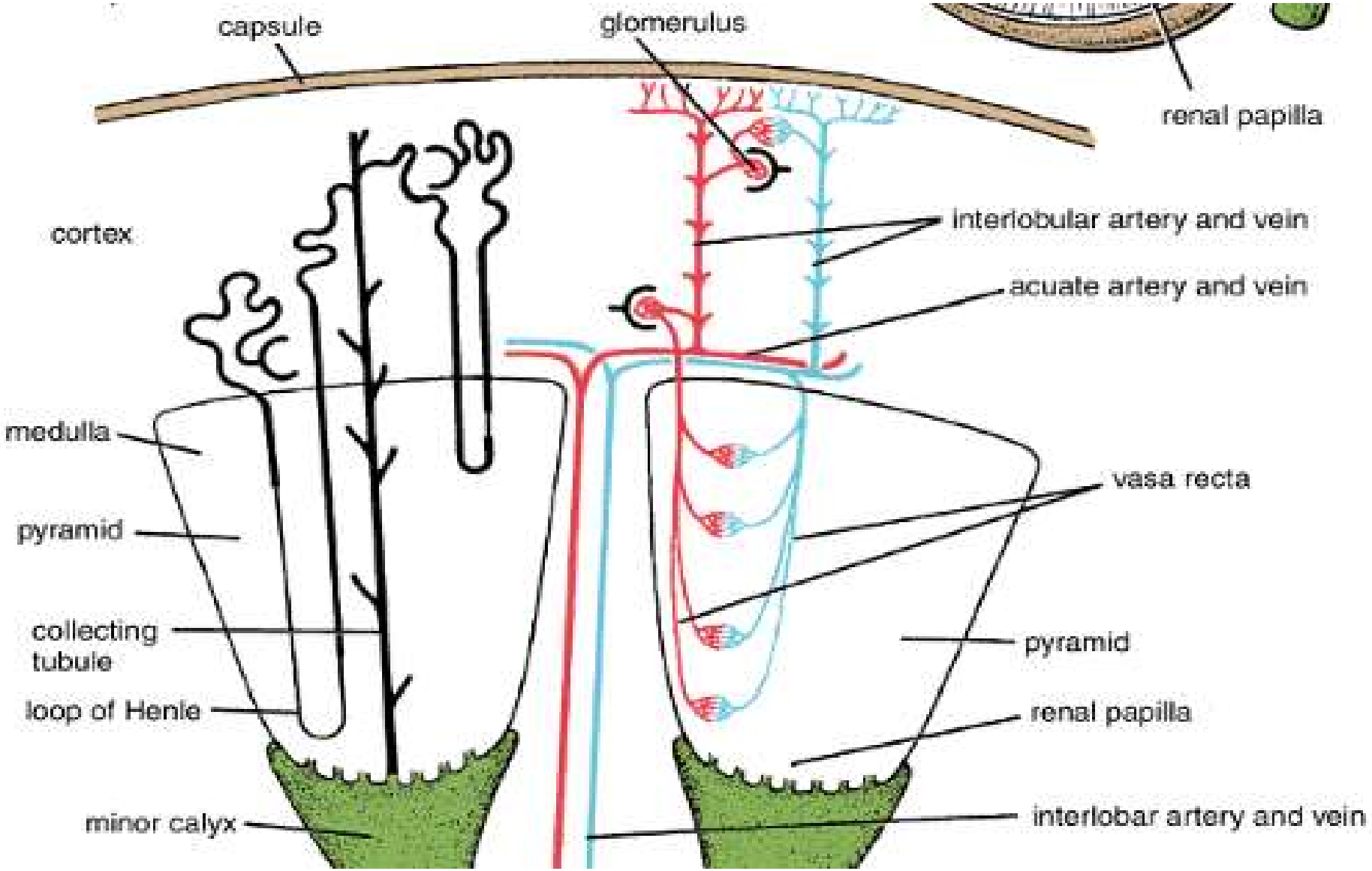


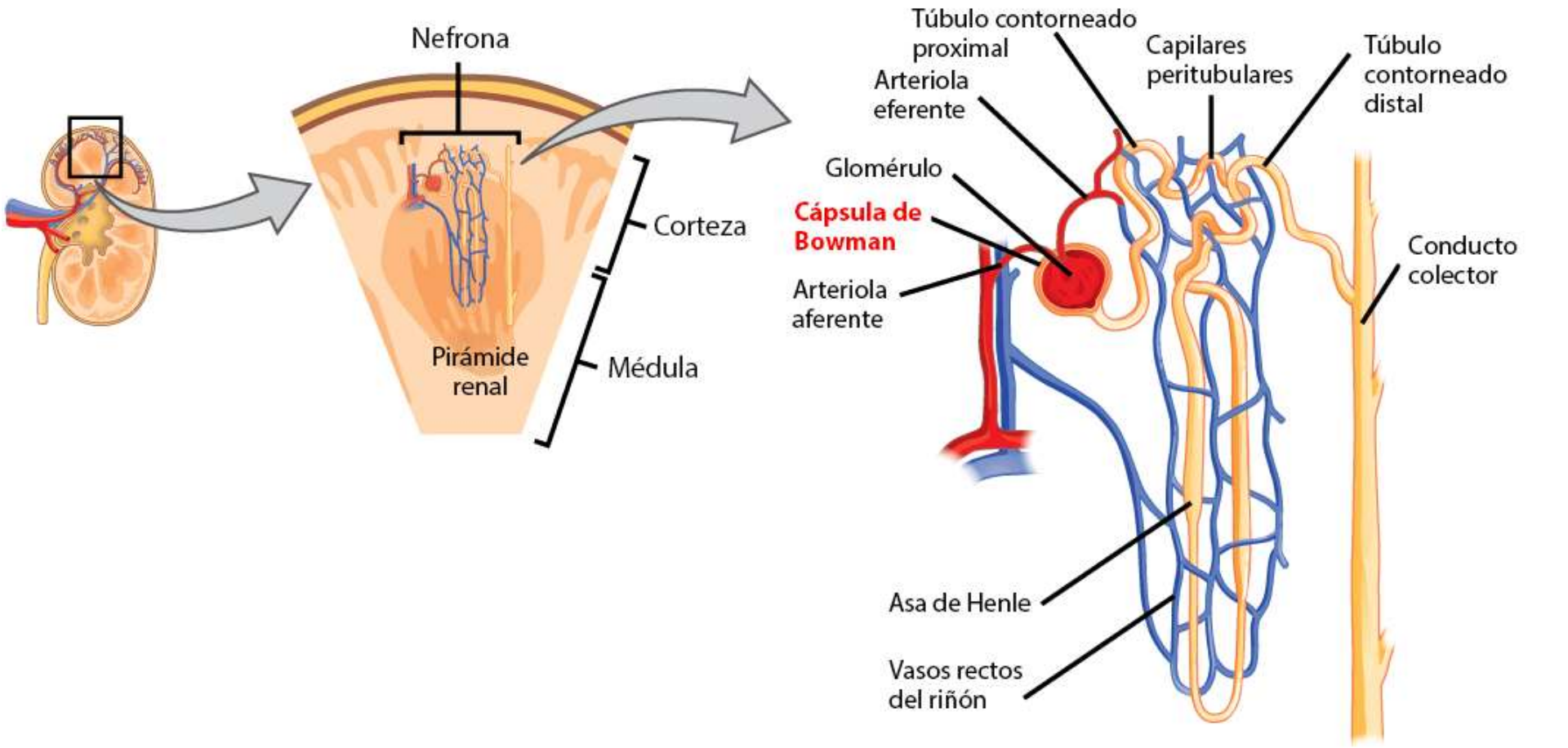

Kidney
Calyces
Renal artery
Renal pelvis
Renal vein
Medulla
Ureter
Cortex
Nephron path of urine drainage
Collecting duct
Papillary duct
Minor calyx
Renal artery
Major calyx
Renal pelvis
Ureter
Urinary bladder
Renal cortex
Renal medulla
Renal column
Renal pyramid in renal medulla
Renal papilla
Renal capsule

1. Cortex

- Forms outer part of it
- projects into medullary region between renal pyramids as ***renal columns***.

- Contains renal corpuscles & proximal & distal convoluted tubules.


capsule
glomerulus
renal papilla
cortex
interlobular artery and vein
acuate artery and vein
medulla
vasa recta
pyramid
collecting tubule
pyramid
loop of Henle
renal papilla
minor calyx
interlobar artery and vein


Nefrona
Corteza
Médula
Pirámide renal
Túbulo contorneado proximal
Arteriola eferente
Glomérulo
Cápsula de Bowman
Arteriola aferente
Capilares peritubulares
Túbulo contorneado distal
Conducto colector
Asa de Henle
Vasos rectos del riñón

2. Medulla

- inner part of kidney

consists of:

renal pyramids

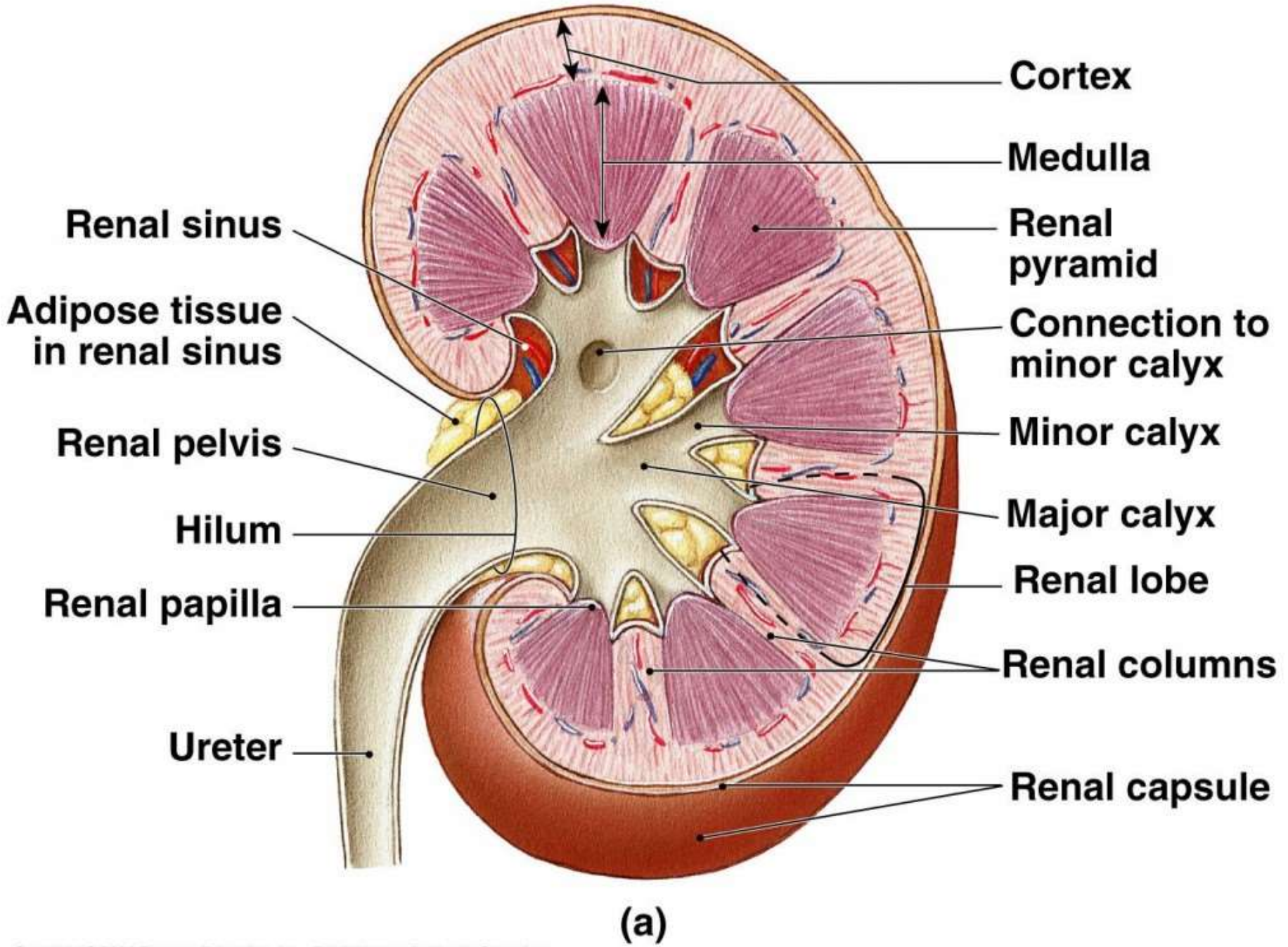
- *8- 12 in No.*,
- contain straight tubules (Henle's loops) and collecting tubules.

renal papilla:

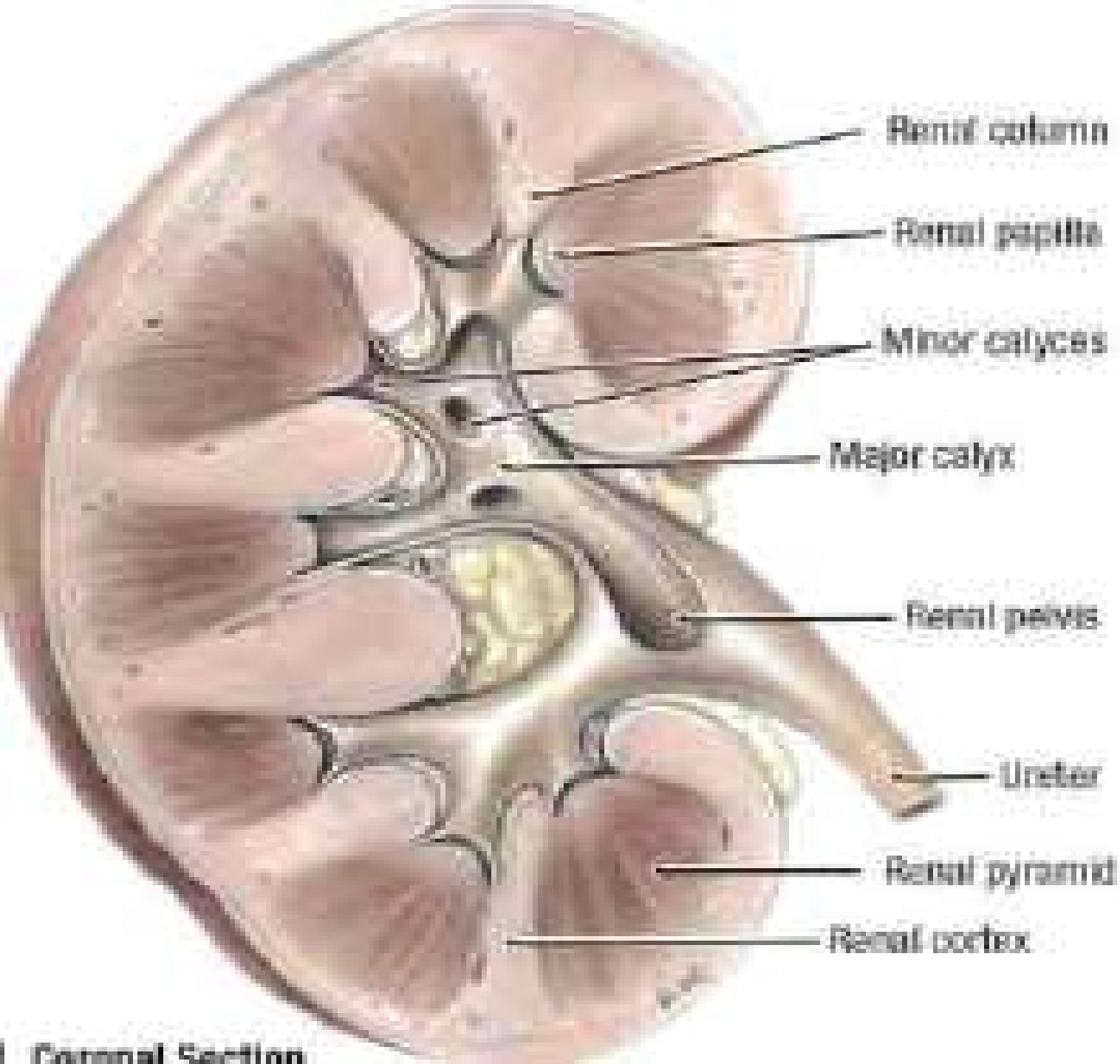
- An apex of renal pyramid,
- fits into cup-shaped **minor calyx**
- on which collecting tubules open (10 to 25 openings).
  - Like nipple of breast.

3. Minor calyces

- Receive urine from collecting tubules & empty into:
  - **two - three major calyces**, which in turn empty into,
  - **renal pelvis**. an upper dilated portion of ureter



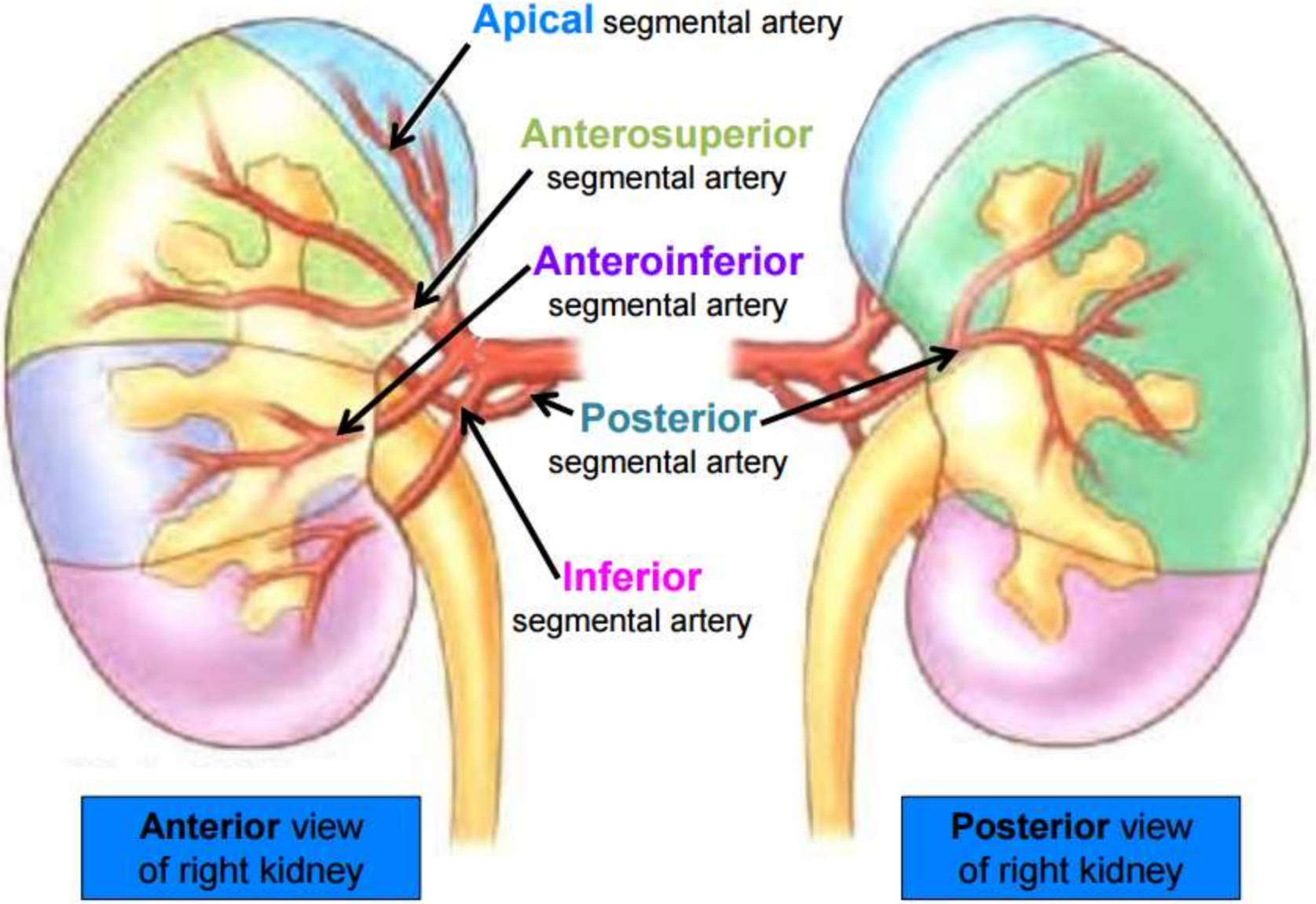
(a)

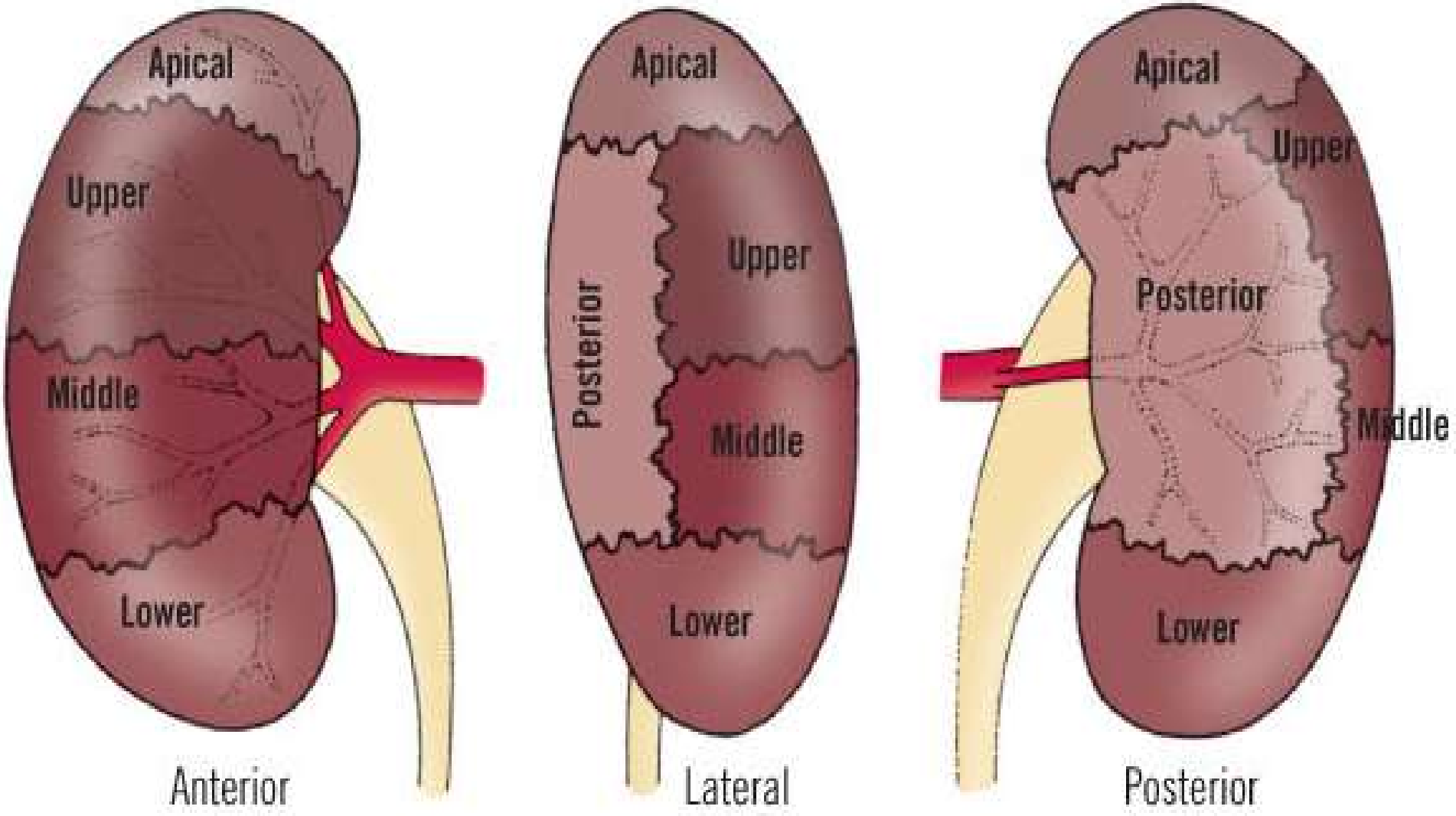


Coronal Section

- Has arterial segments including:
    1. **superior,**
    2. **anterosuperior,**
    3. **anteroinferior,**
    4. **inferior,**
    5. **posterior segment**,

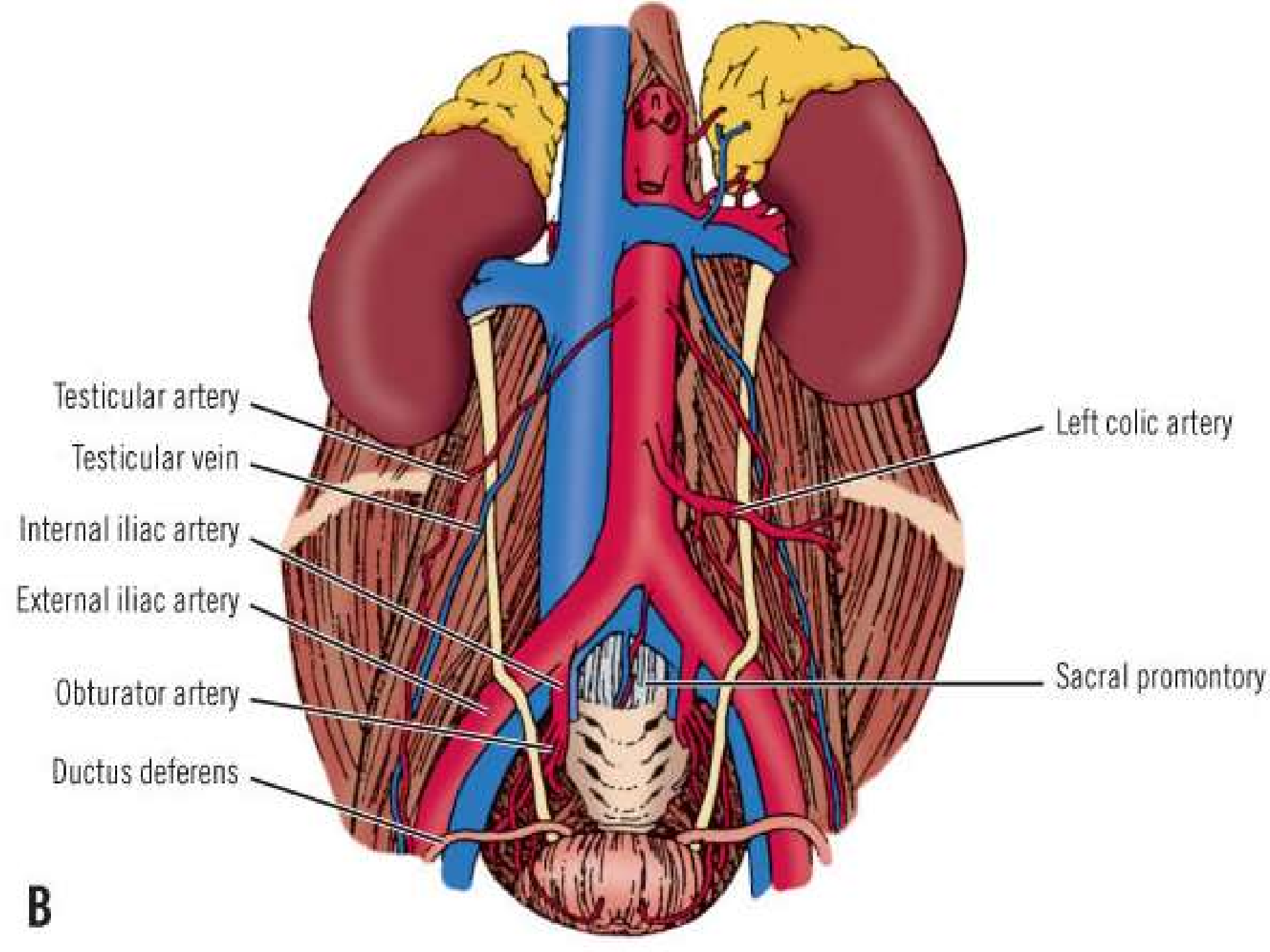
    -which are of surgical importance.


Apical segmental artery
Anterosuperior segmental artery
Anteroinferior segmental artery
Posterior segmental artery
Inferior segmental artery
Anterior view of right kidney
Posterior view of right kidney


Apical
Upper
Middle
Lower
Anterior
Apical
Posterior
Upper
Middle
Lower
Lateral
Apical
Upper
Posterior
Middle
Lower
Posterior

SUPRARENAL (ADRENAL) GLAND

- Is a ***retroperitoneal*** organ
- lying on superomedial aspect of kidney.
- is surrounded by a capsule and renal fascia.
- Is **pyramidal** on right and **semilunar** on left.
- has cortex and medulla


Testicular artery
Testicular vein
Internal iliac artery
External iliac artery
Obturator artery
Ductus deferens
Left colic artery
Sacral promontory
B

Ureter

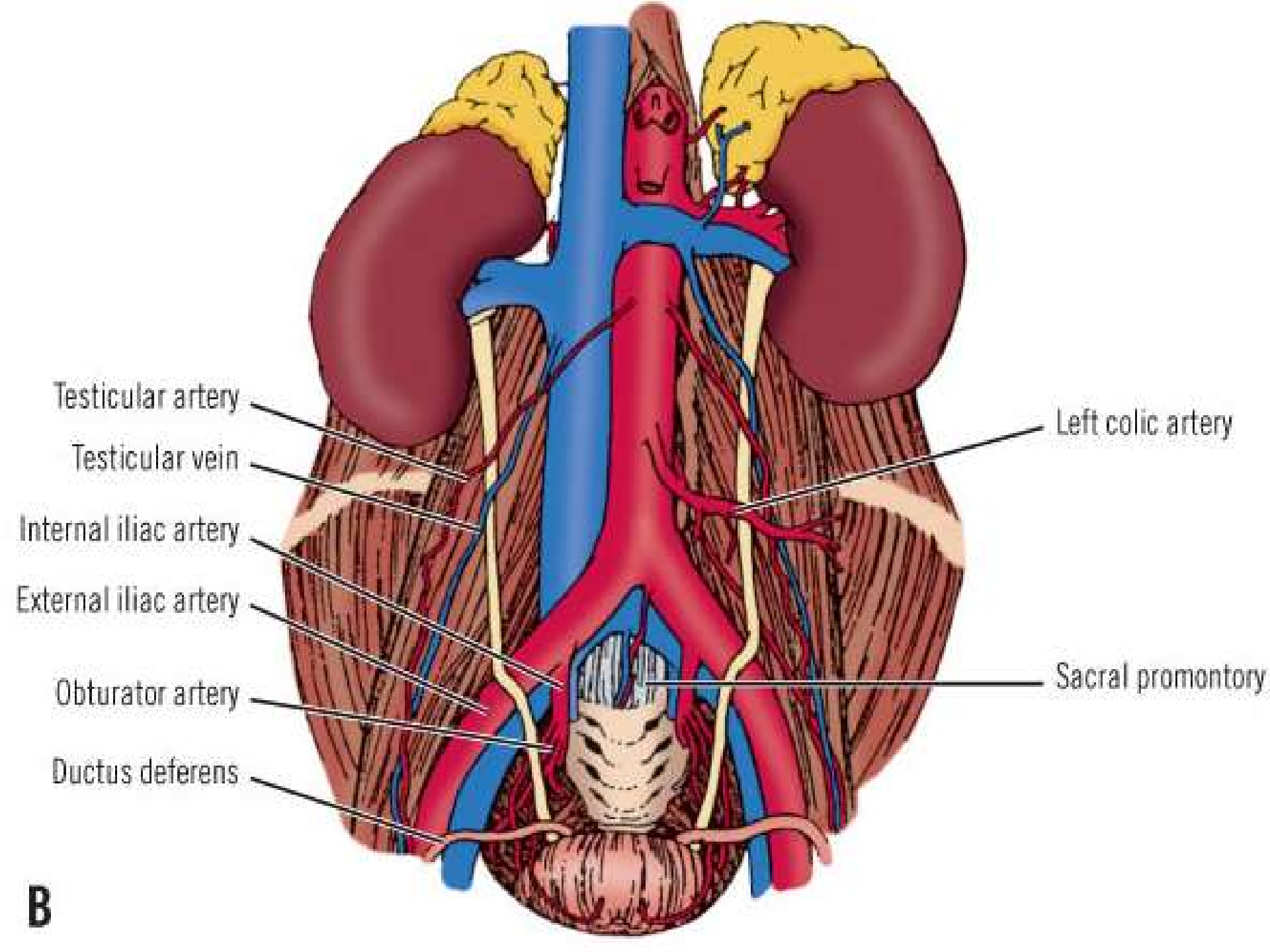
- Is a muscular tube that begins with renal pelvis, extending from kidney to urinary bladder. transmits urine

- Has three constrictions along its course:

1. at its origin where pelvis of ureter joins ureter,
2. where it crosses pelvic brim,
3. at its junction with bladder.

- Enters obliquely through base of bladder
- opens by a slit-like orifice that acts as a valve,
- circular fibers of intramural part of ureter act as a sphincter.

When bladder is distended, valve and sphincter actions prevent reflux of urine from urinary bladder into ureter


Testicular artery
Testicular vein
Internal iliac artery
External iliac artery
Obturator artery
Ductus deferens
Left colic artery
Sacral promontory
B

Receives blood from:

- aorta
- renal,
- gonadal,
- common
- internal iliac,
- umbilical,
- superior
- inferior vesical,
- middle rectal arteries.

Is innervated by:

a-lumbar (sympathetic)

b- pelvic (parasympathetic)

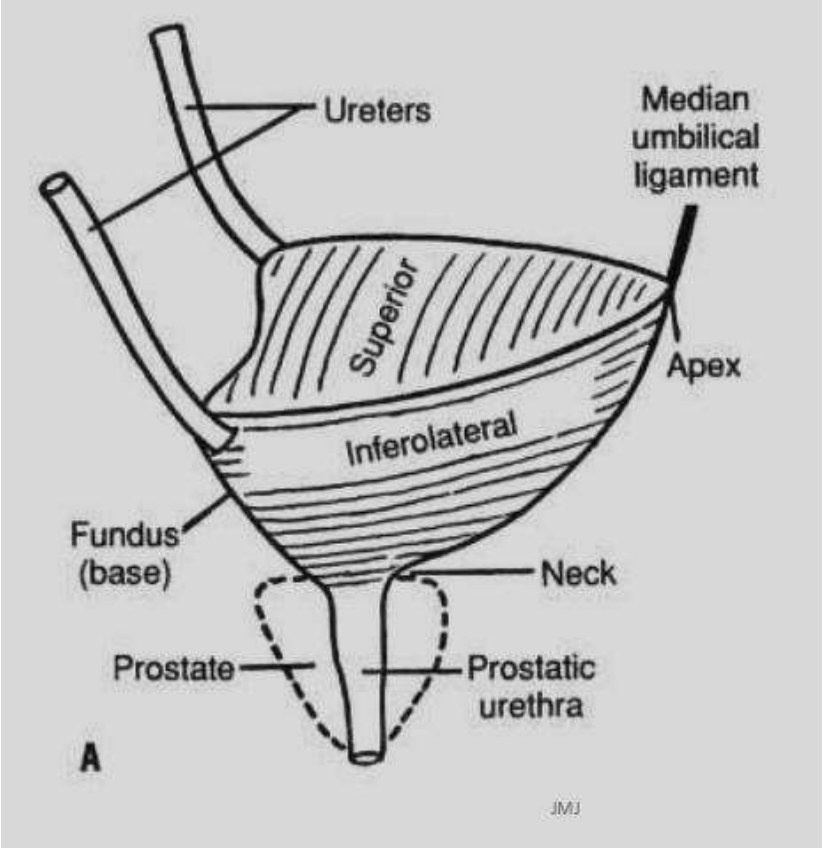
splanchnic nerves.

Urinary bladder

- Is situated below peritoneum
- is slightly lower in female than in male.

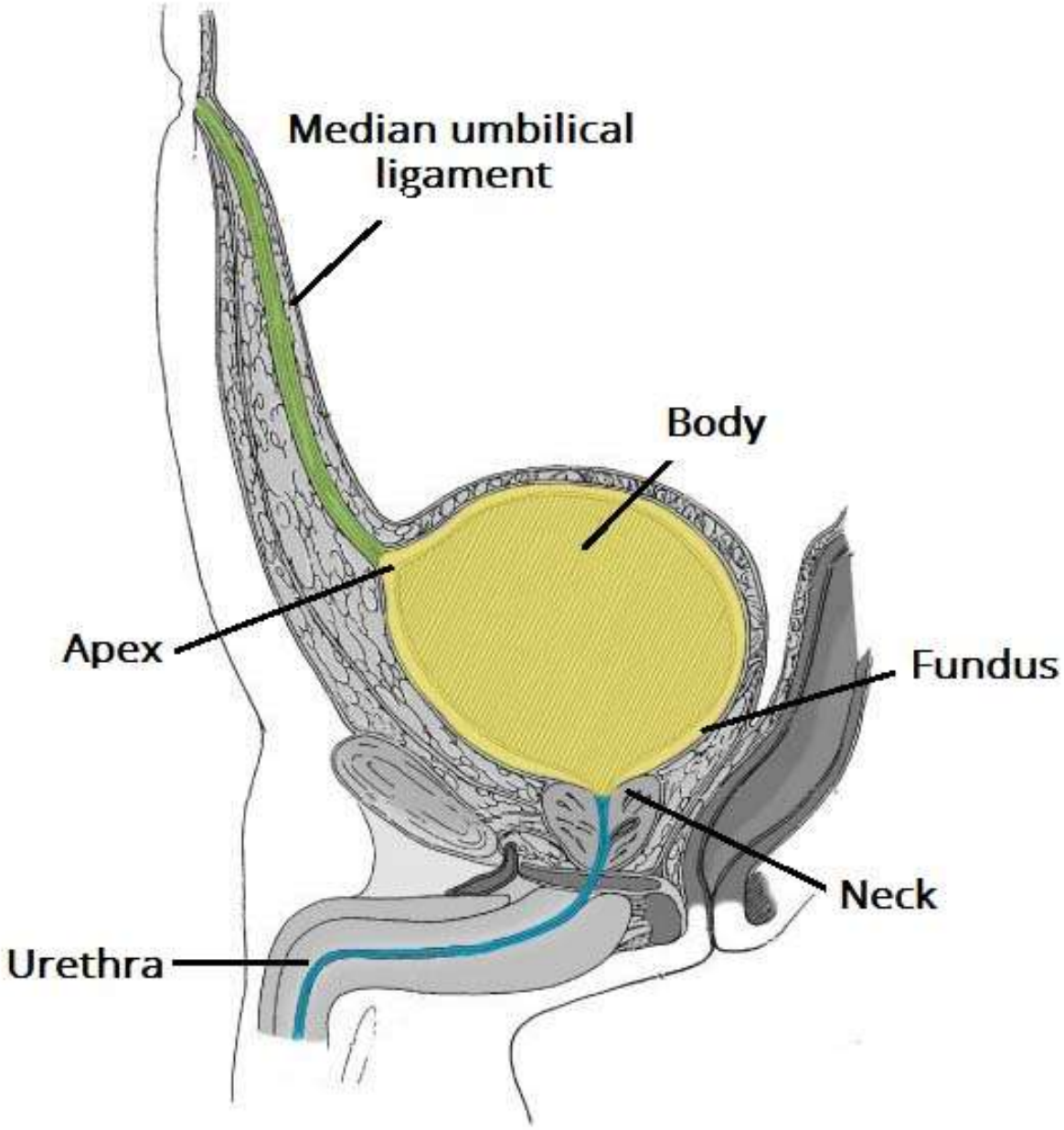
Has:

- ❑ **apex**
- ❑ **fundu**s or **base**
- ❑ **neck**,



trigone

is bounded by two orifices of ureters &internal urethral orifice,


Median umbilical ligament
Body
Apex
Fundus
Neck
Urethra

Has **detrusor muscle :**

bundles of smooth muscle fibers

Receives blood from :

1.superior vesical artery

2.inferior vesical artery

venous blood is drained by

- **prostatic (or vesical) plexus** of veins,
  - **empties into internal iliac vein**.

Innervation:

by from the

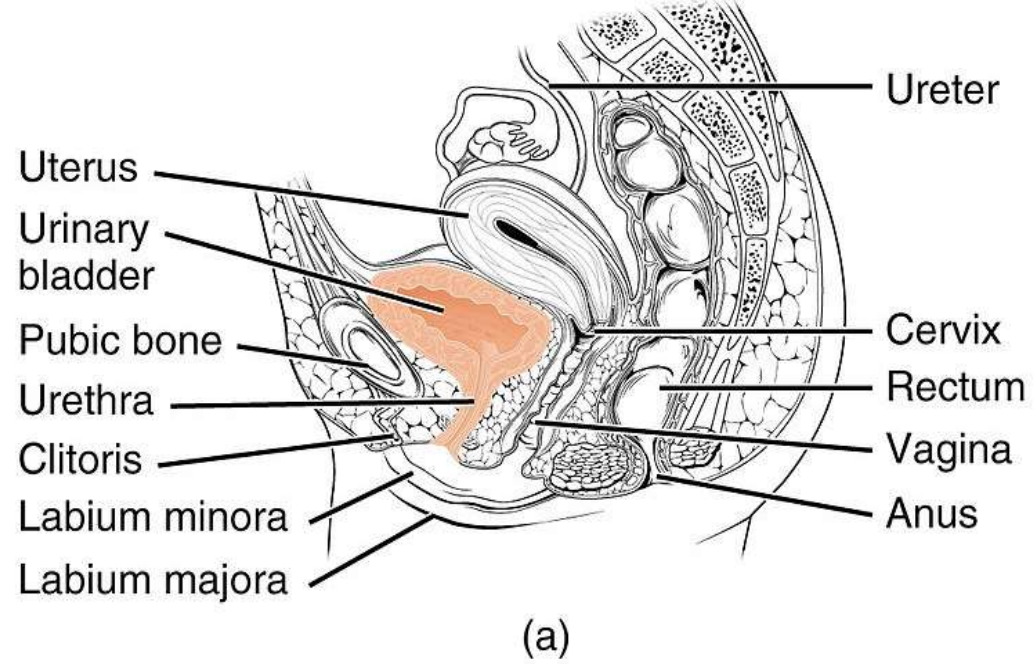
- vesical nerve plexuses
- prostatic nerve plexuses.

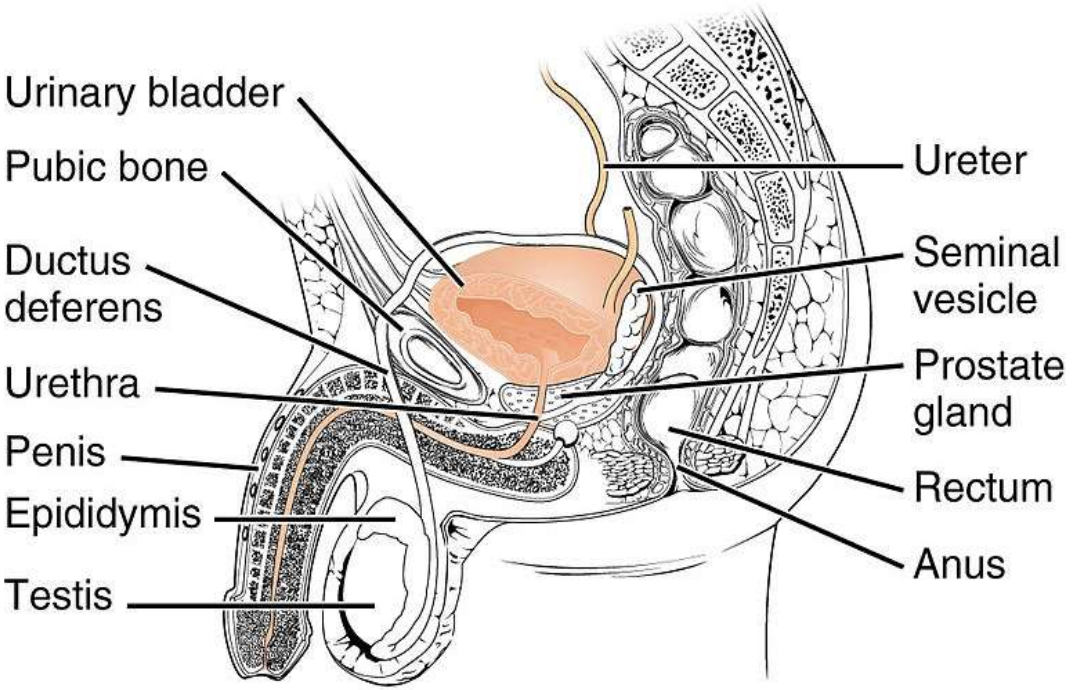
- parasympathetic nerve

- sympathetic nerve

urethra

is a tube that connects the urinary bladder to the urinary meatus for the removal of urine from the body. In males, the urethra travels through the penis and also
carries semen. In female the urethra connects to the urinary meatus above the vagina,





Nervous Systems

is divided into two main parts:

A-central nervous system,

I.brain

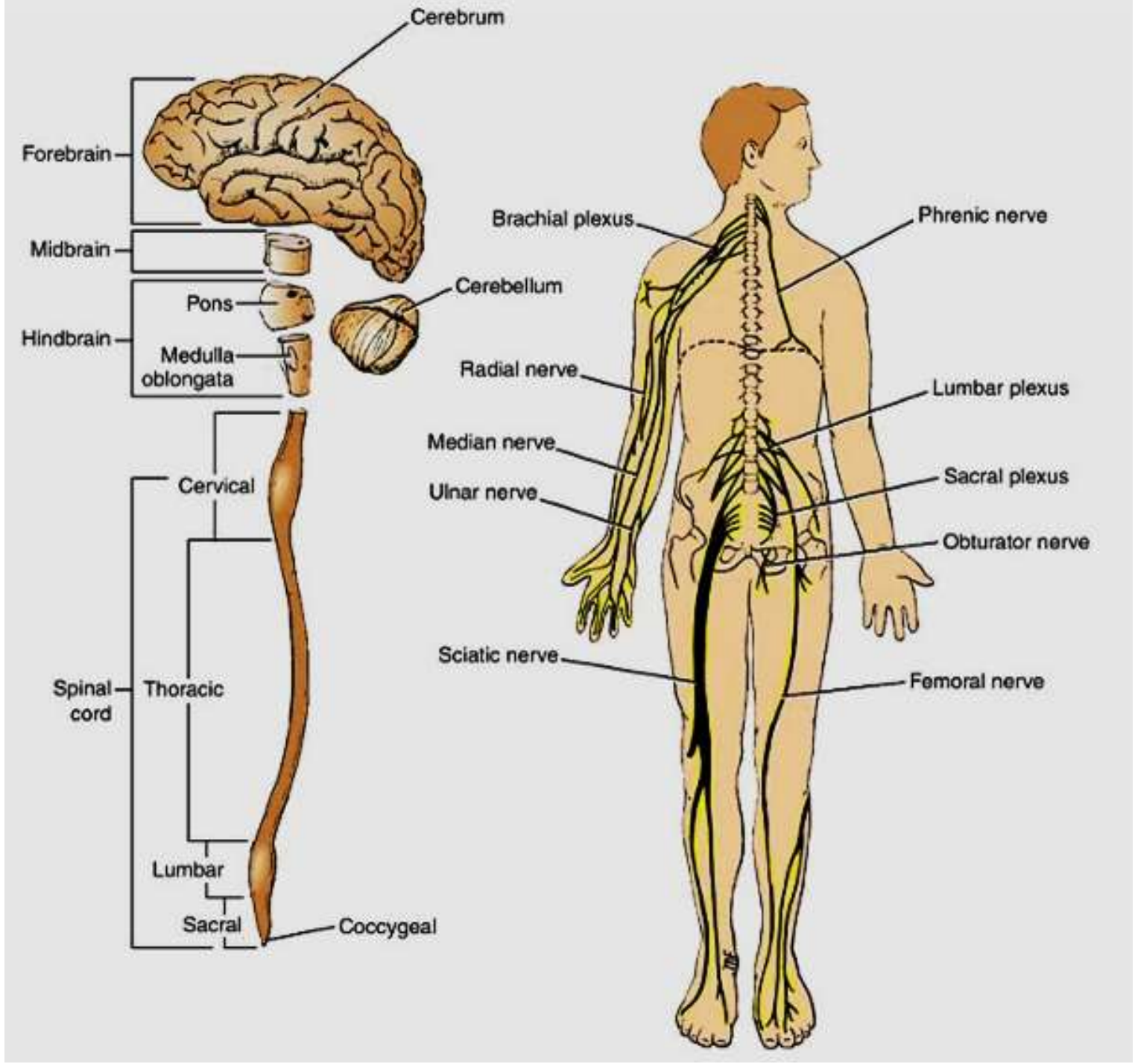
II.spinal cord,

B-peripheral nervous system,

1.cranial nerves

2.spinal nerves

With associated ganglia.


Cerebrum
Forebrain
Midbrain
Pons
Hindbrain
Medulla oblongata
Cerebellum
Cervical
Spinal cord
Thoracic
Lumbar
Sacral
Coccygeal
Brachial plexus
Phrenic nerve
Radial nerve
Lumbar plexus
Median nerve
Sacral plexus
Ulnar nerve
Obturator nerve
Sciatic nerve
Femoral nerve

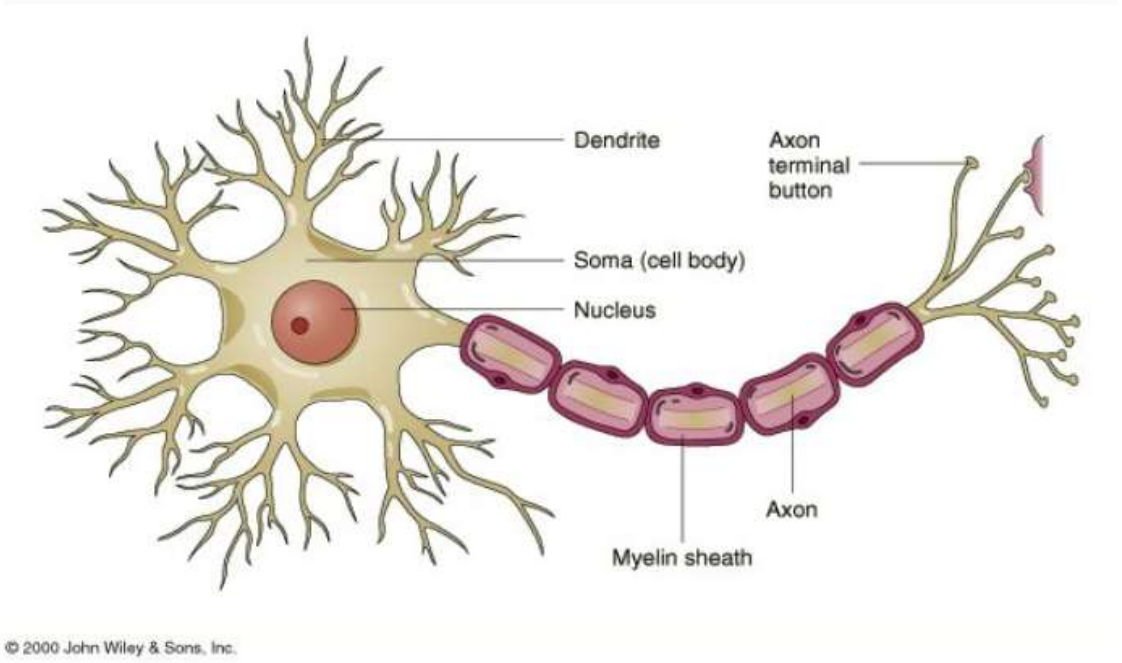
central nervous system

- are main **centers** where correlation & integration of nervous information
- are covered with a system of membranes, **meninges**,
- are suspended in **cerebrospinal fluid** **CSF**;
- are further protected by **bones** of :
  - **skull** &
  - **vertebral column**.

- **centers** is organized into :

1.gray matter…….cells neurons

2.white matter……axons with mylein sheath



Brain

- lies in cranial cavity
- is continuous with spinal cord through foramen magnum

It is surrounded by three meninges:

A.dura mater,

B.arachnoid mater,

C.pia mater;

- cerebrospinal fluid surrounds it in subarachnoid space.

is divided into three major divisions are:

I.forebrain.

II.midbrain,

III.hindbrain,

forebrain

subdivided into:

1.cerebrum.

2.diencephalon

is central part of forebrain,

Midbrain

- **is narrow part**
- **connects forebrain to hindbrain.**
- **narrow cavity of it is cerebral aqueduct,**
  connects third and fourth ventricles
- **contains :**
  1. **many nuclei &**
  2. **bundles of ascending and descending nerve fibers.**

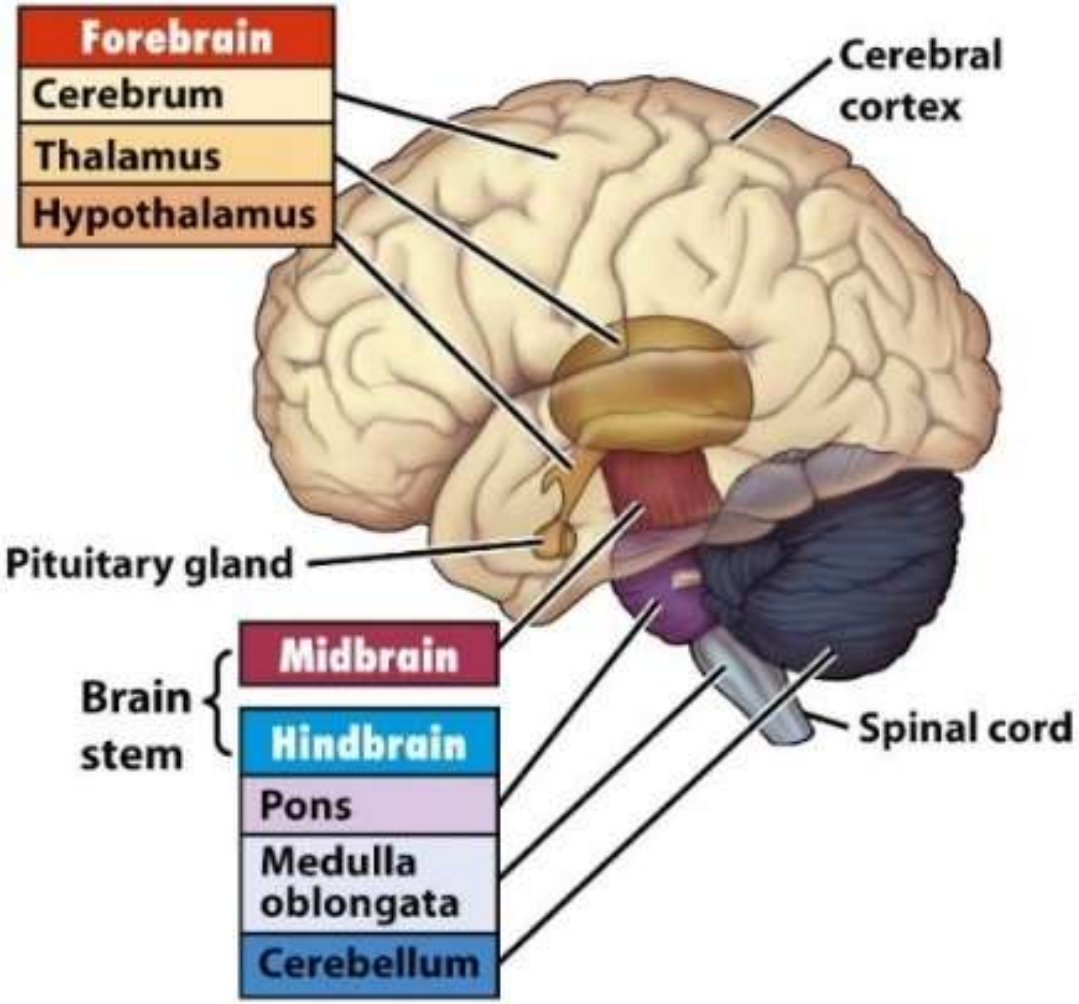
Hindbrain

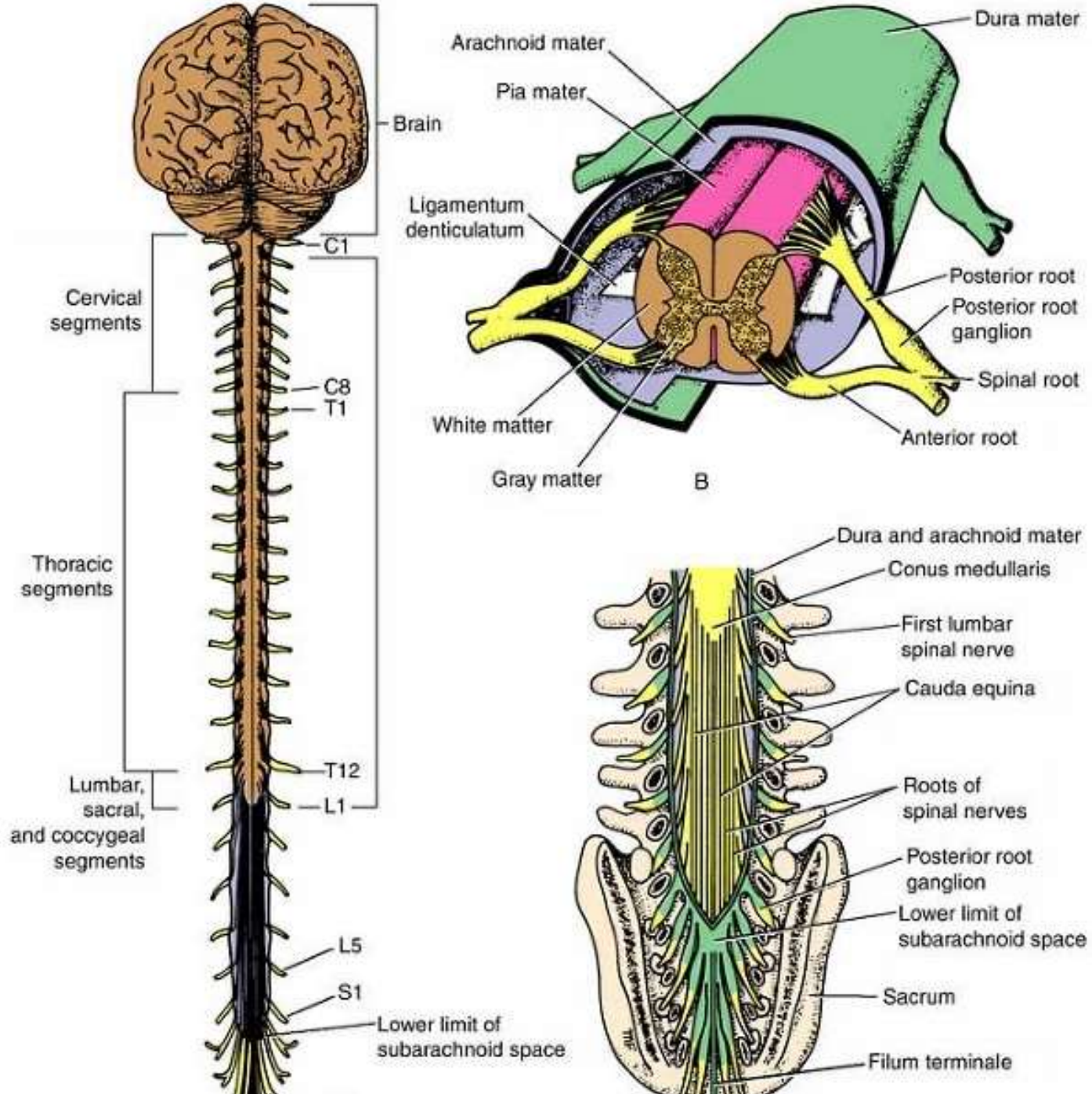
subdivided into:

A.medulla oblongata,

B.pons,

C.Cerebellum.




Brain
C1
Cervical segments
C8
T1
Thoracic segments
T12
Lumbar, sacral, and coccygeal segments
L1
L5
S1
Lower limit of subarachnoid space
Arachnoid mater
Pia mater
Dura mater
Ligamentum denticulatum
Posterior root
Posterior root ganglion
Spinal root
White matter
Anterior root
Gray matter
B
Dura and arachnoid mater
Conus medullaris
First lumbar spinal nerve
Cauda equina
Roots of spinal nerves
Posterior root ganglion
Lower limit of subarachnoid space
Sacrum
Filum terminale

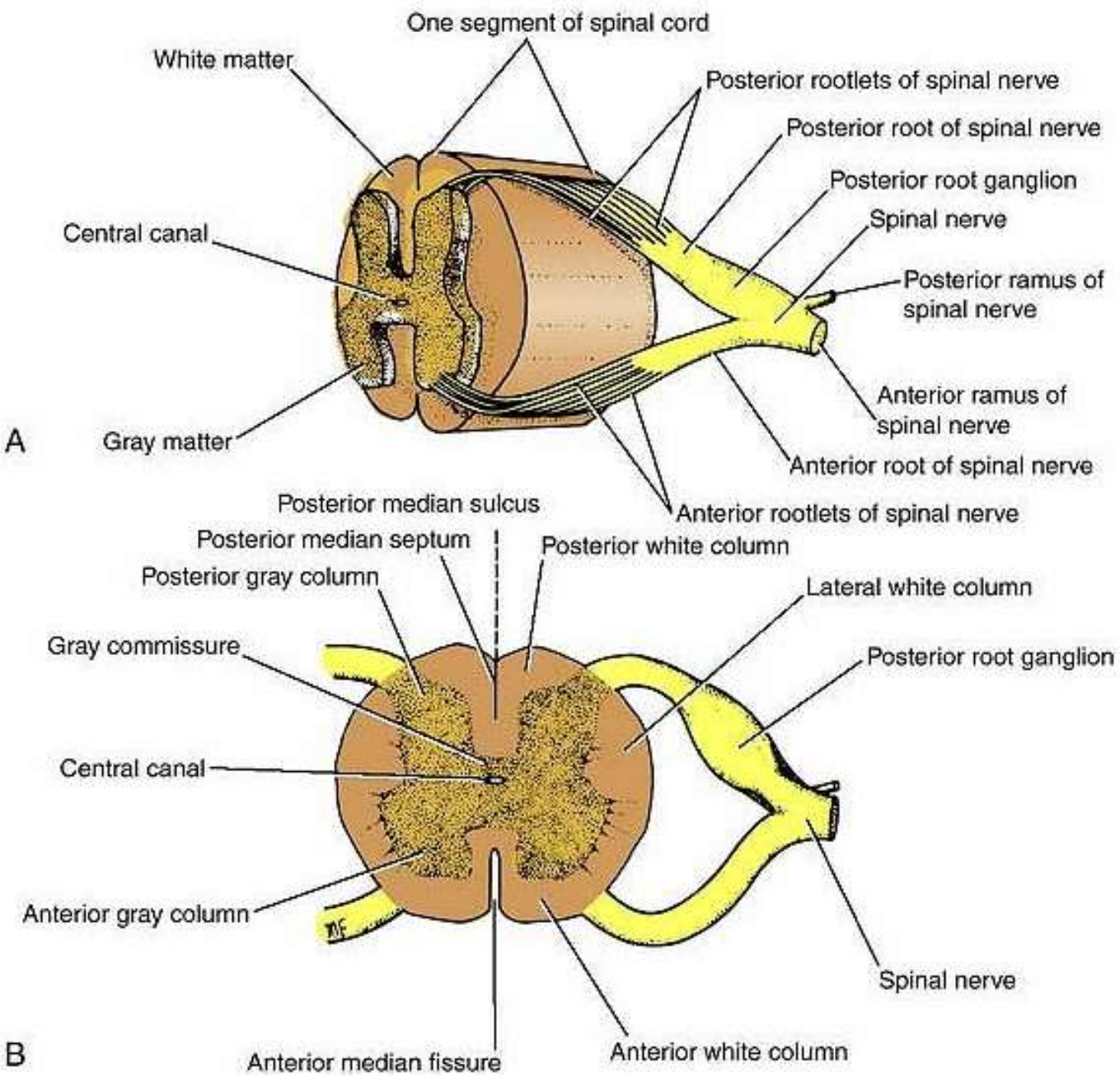


Figure 1-7 A: Transverse section through the lumbar part of the spinal cord, oblique view. B: Transverse

Cranial nerve

- olfactory nerve (I) ---- **sensory** : nose
- optic nerve (II) ---- **sensory** : eye
- oculomotor nerve (III) ---- **motor** : all eye muscle except those supplied by IV and VI
- trochlear nerve (IV) ---- **motor** : superior oblique muscle
- trigeminal nerve (V) ---- **sensory** : face, sinuses, teeth
  motor : muscles of mastication
- abducens nerve (VI) ---- **motor** :external rectus muscle
- fascial nerve (VII) ---- **motor** : muscle of the face
- vestibulocochlear nerve (VIII) ---- **sensory** : inner ear

- glossopharyngeal nerve (IX) ---- **motor**: pharyngeal musculature
  sensory : posterior part of tongue, tonsil, pharynx
- vagus nerve (X) ---- **motor** : heart, lungs, bronchi, gastrointestinal tract
  sensory: heart, lungs, bronchi, trachea, larynx, pharynx, gastrointestinal tract, external ear.
- Accessory nerve (XI) ---- **motor**: sternocledomastoid and trapezius muscle
- Hypoglossal nerve (XII) ---- **motor**: muscle of the tongue

Cranial and Spinal Nerves

Cranial Nerves

1- Olfactory nerve (I)

2- Optic nerve (II)

3- Oculomotor nerve (III)

4- Trochlear nerve (IV)

5- Trigeminal nerve (V)

6- Abducens nerve (VI)

7- Facial nerve (VII)

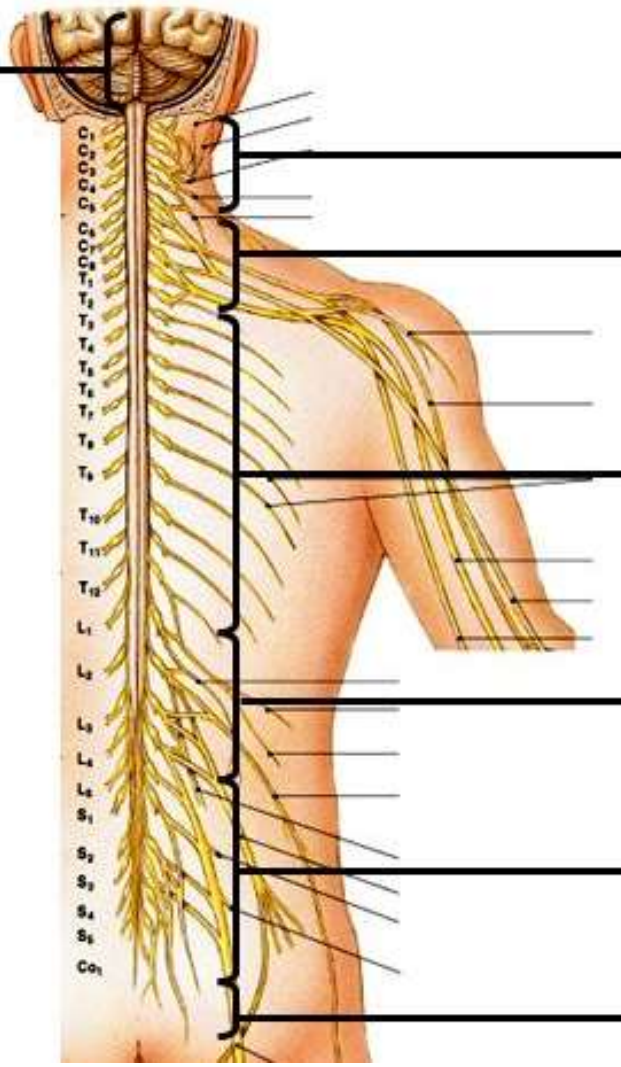
8- Vestibulocochlear nerve (VIII)

9- Glossopharyngeal nerve (IX)

10- Vagus nerve (X)

11- Accessory nerve (XI)

12- Hypoglossal nerve (XII)



Spinal Nerves

Cervical plexus

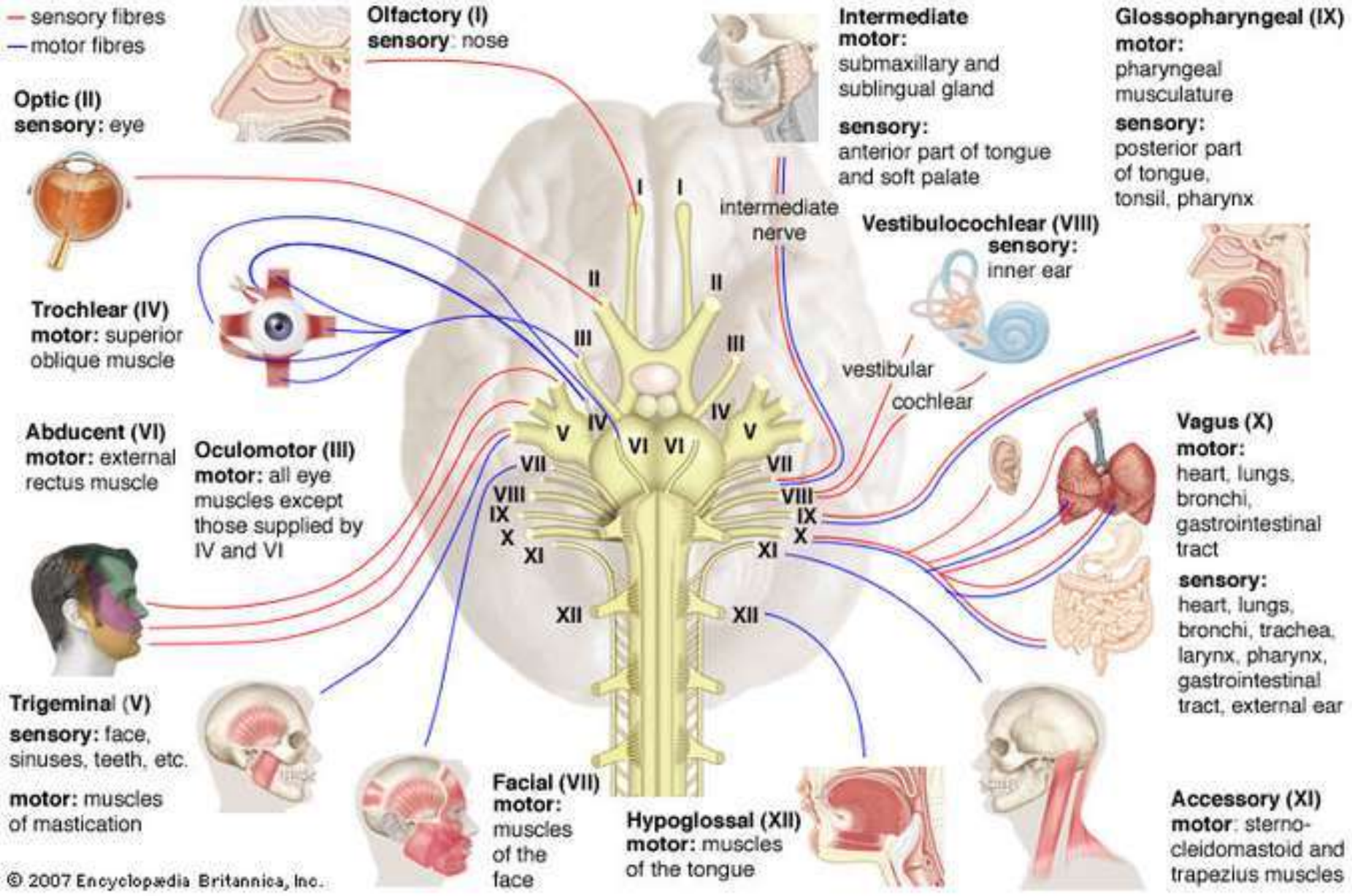
Brachial plexus

Thoracic nerves

Lumbar plexus

Sacral plexus

Coocygeal plexus


— sensory fibres
— motor fibres
Olfactory (I)
sensory: nose
Optic (II)
sensory: eye
Trochlear (IV)
motor: superior oblique muscle
Abducent (VI)
motor: external rectus muscle
Oculomotor (III)
motor: all eye muscles except those supplied by IV and VI
Trigeminal (V)
sensory: face, sinuses, teeth, etc.
motor: muscles of mastication
Facial (VII)
motor: muscles of the face
Hypoglossal (XII)
motor: muscles of the tongue
Intermediate
motor: submaxillary and sublingual gland
sensory: anterior part of tongue and soft palate
intermediate nerve
Vestibulocochlear (VIII)
sensory: inner ear
vestibular
cochlear
Glossopharyngeal (IX)
motor: pharyngeal musculature
sensory: posterior part of tongue, tonsil, pharynx
Vagus (X)
motor: heart, lungs, bronchi, gastrointestinal tract
sensory: heart, lungs, bronchi, trachea, larynx, pharynx, gastrointestinal tract, external ear
Accessory (XI)
motor: sterno-cleidomastoid and trapezius muscles
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
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peripheral nervous system:

1. cranial nerves
2. spinal nerves

peripheral nervous system:

1. Somatic Nervous System
2. Autonomic Nervous System

Somatic Nervous System

- Sensory &
- Motor

Autonomic Nervous System

- sympathetic part
- parasympathetic