

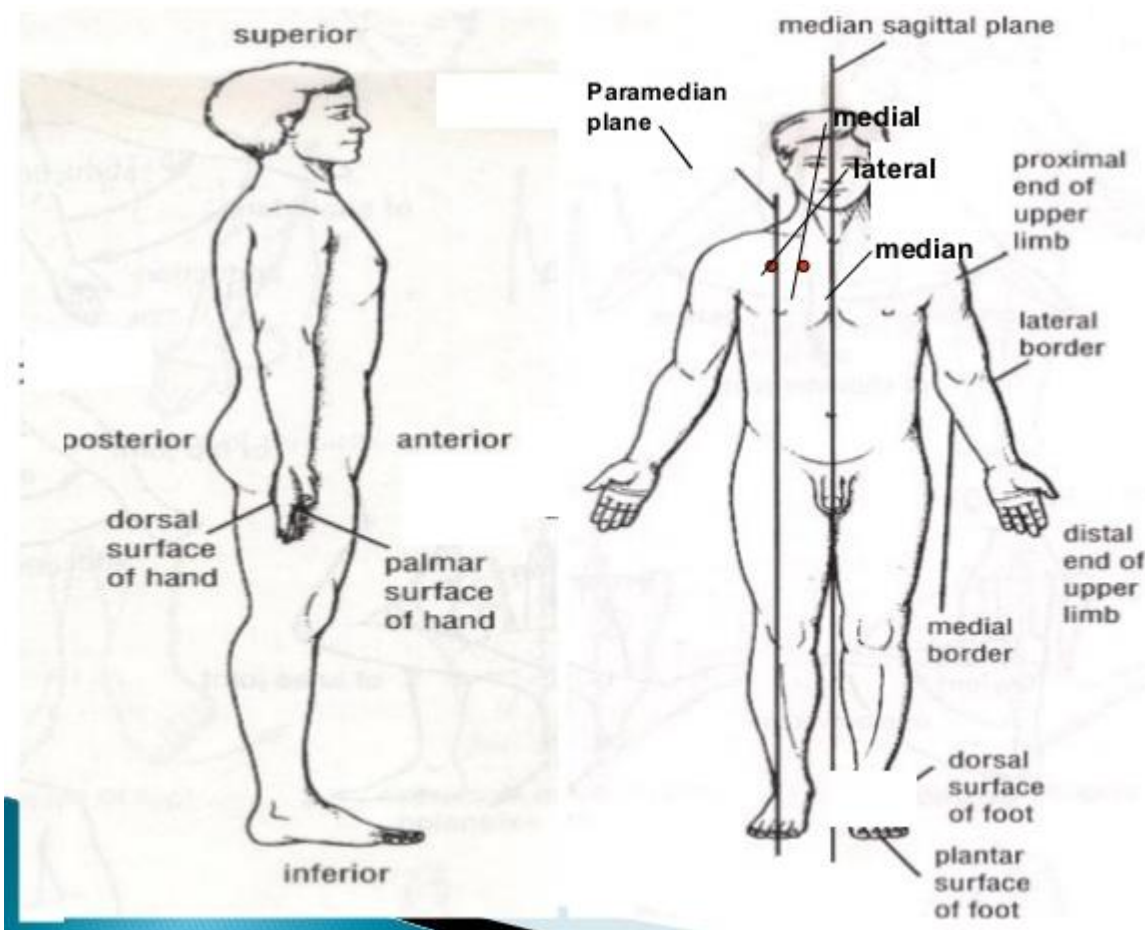
Introduction to Anatomy

Anatomical terms :

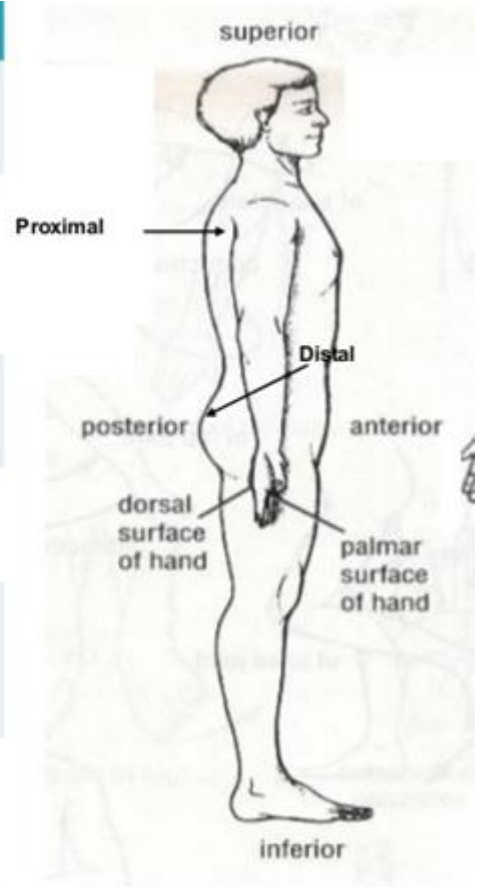
1. Median : on the midline .
2. Medial : nearer to median plane .
3. Lateral : away from the median plane .
4. Anterior : near the front of the body .
5. Posterior : near the back of the body

The body can be sectioned (divided) into many planes :

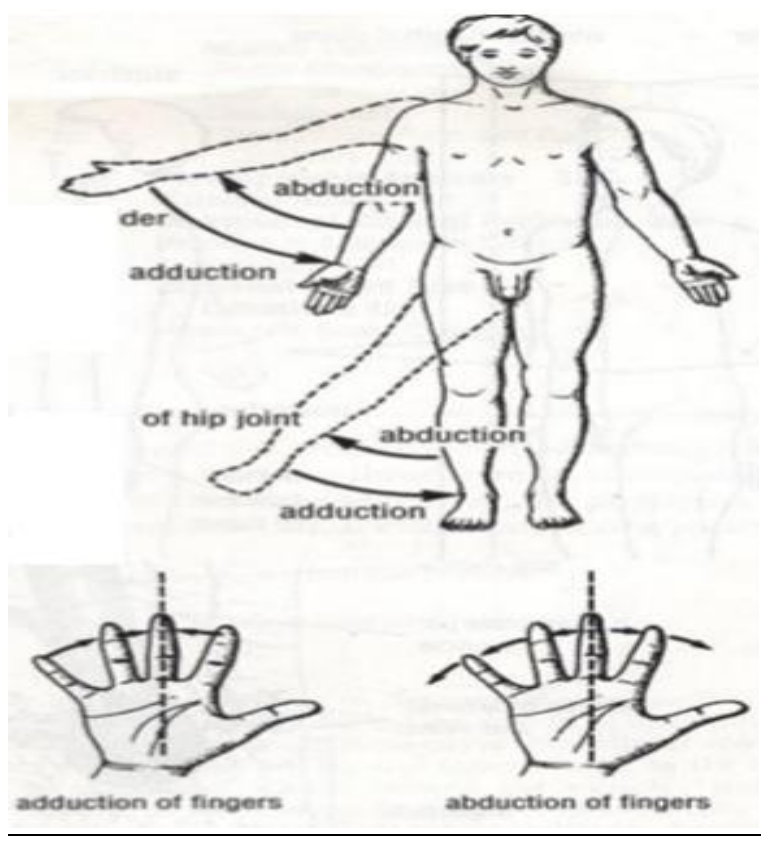
1. Sagittal plane : divides into right and left
2. Frontal \ coronal plane : divides into anterior and posterior
3. Transverse \horizontal plane : divides into superior and inferior
4. Oblique plane : diagonal cuts between horizontal & vertical



Terms	Meaning
Proximal	near to the root of the limb.
Distal	Far away from the root of the limb.
Superficial	near to the surface of the body.
Deep	far away from the surface of the body.
Superior	near to the upper end of the body.
Inferior	far away from the upper end of the body.



- **Abduction** : movement of limb away from the midline of the body .
- **Adduction** : movement of the limb toward the midline of the body .



The body as a whole

- **The skull:**
This consist of the cranium, which protect the brain, the eyes, and the mandible.
- **The thorax:**
This cavity consists of bony framework supporting various muscles.

Contents of the thorax:

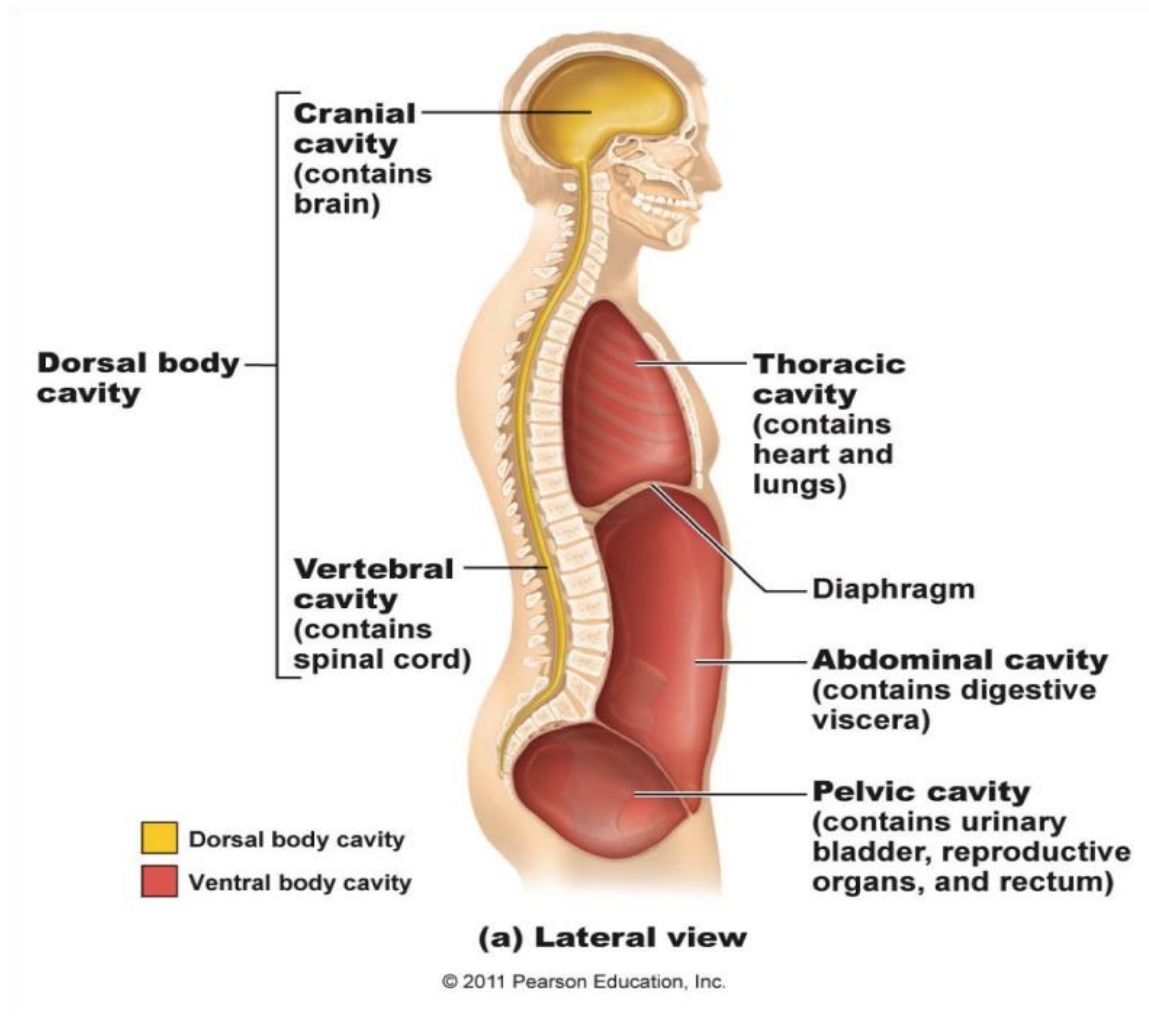
1. lungs.
2. Heart.
3. Trachea
4. esophagus
5. Major blood vessels, aorta, superior & inferior vena cava.
6. Thymus gland
7. Thoracic duct & lymphatic gland.

The abdomen :

It is the largest cavity in the body. It is divided into 2 cavity:

- -Abdominal cavity
- -Pelvic cavity.

<u>Abdominal cavity</u>	Stomach, , small and large intestine ,liver, spleen, pancreas, gall bladder, kidney, ureter abdominal aorta, inferior vena cava
<u>Pelvic cavity</u>	Urinary bladder, seminal vesicle, uterus, ovary, sigmoid colon, rectum



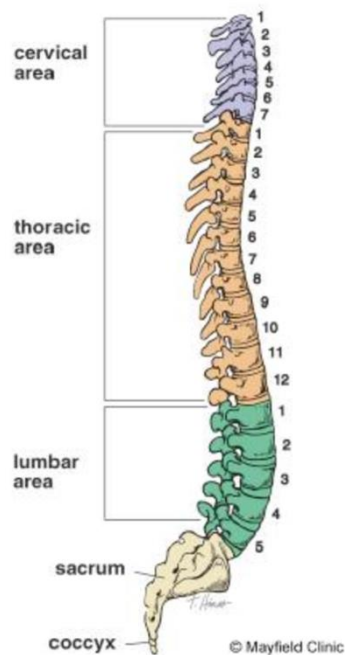
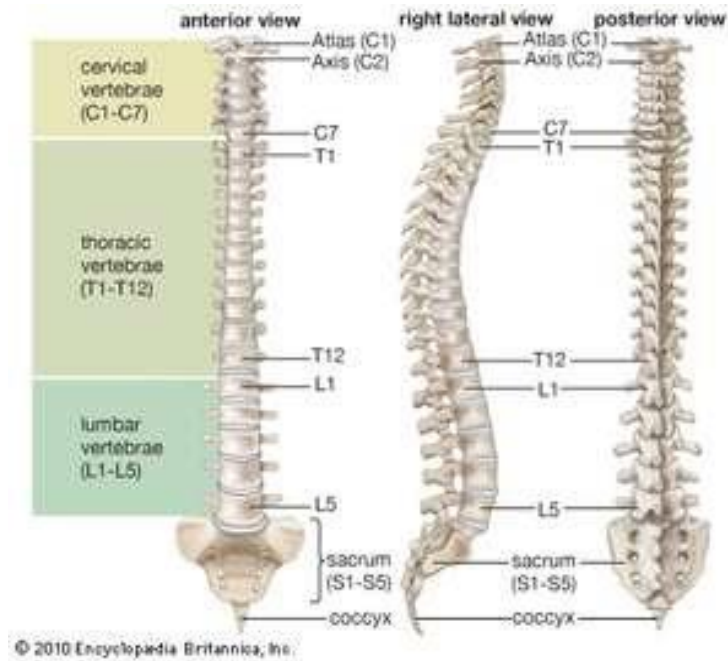
The skeleton:

- The skeleton is the framework of the body,
- Consisting of the bones, cartilages & ligaments which bind together.

Human skeleton

Consists of 206 individual bones, is made up of:

1. The skull, bones of cranium, face & lower jaw.
2. The bones of the trunk, spinal column, ribs & sternum.
3. Bones of limbs, together with shoulder & pelvic girdles.
4. Ribs: are 12 in number.
5. Vertebral column: consist of 33 vertebrae & divided into:
 - a- cervical = 7.
 - b- thoracic or dorsal = 12.
 - c- lumber = 5.
 - d- sacral = 5.
 - e- coccygeal = 4.



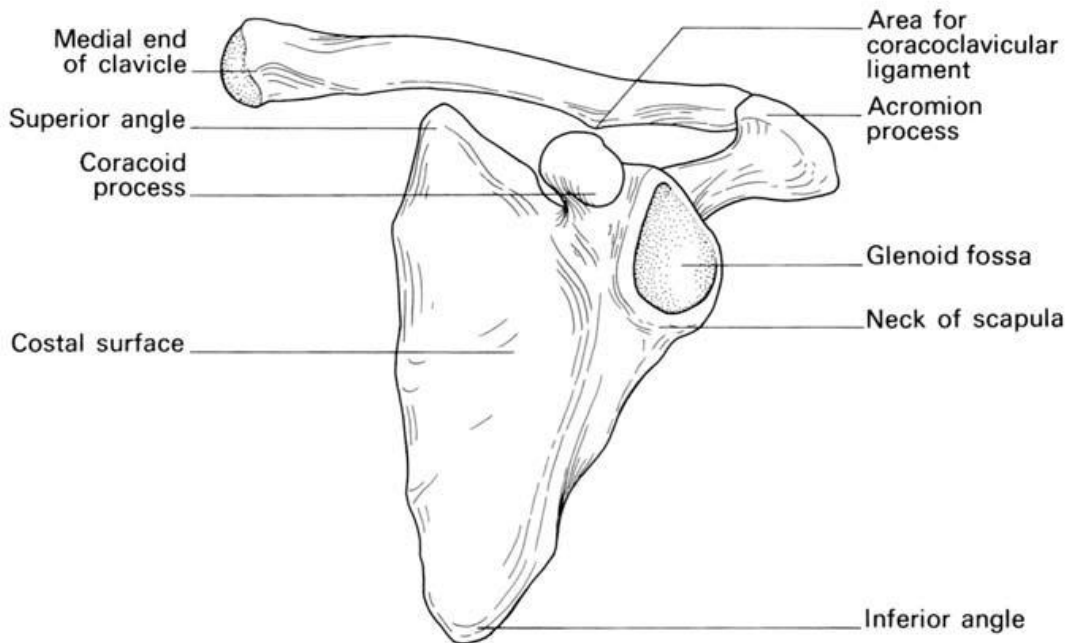
Bones of the shoulder girdle and upper arm:

The scapula:

It is large flat bone, have large range of movement. It is triangular in shape.

The clavicle:

It is along bone situated under skin at the root of the neck. Its lateral end articulate with scapula and its medial end with sternum.



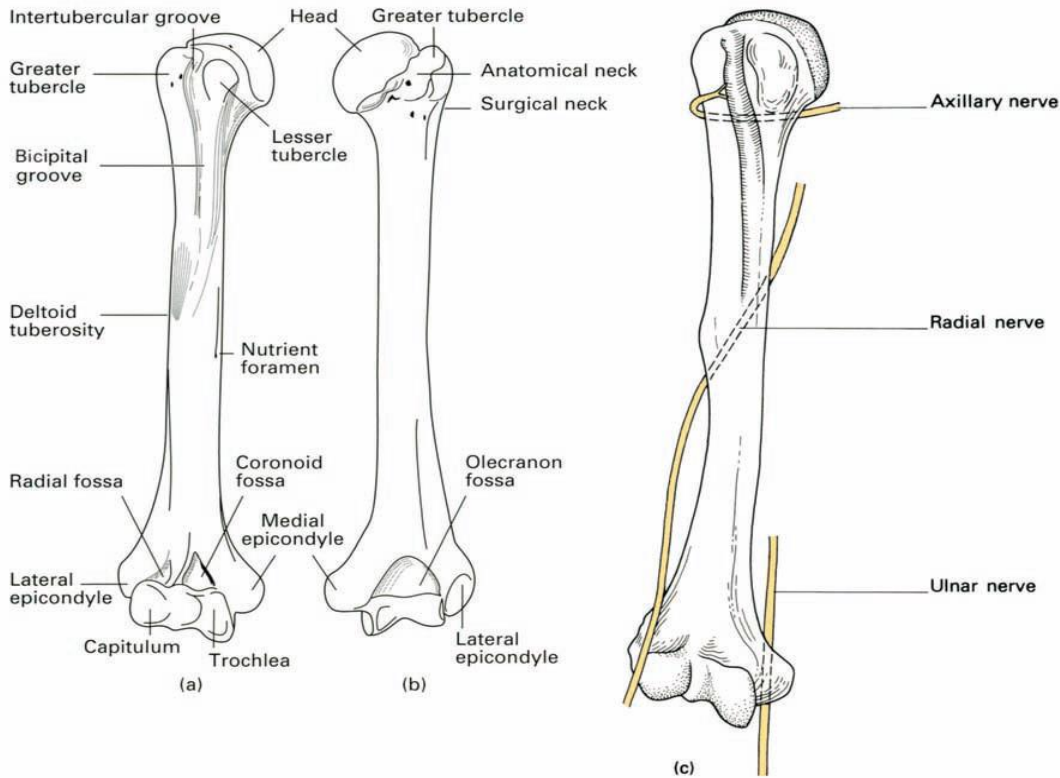
The humerus:

It is the long bone of the arm. It consists of shaft and expanded upper and lower extremities. The slight groove which surrounds the head of humerus called the anatomical neck.

- The tapering region where the upper extremity of humerus joint the shaft called surgical neck. (It is a common site of fracture).

The humerus may be fractured at almost any level but is commonly fractured at three sites:

1. Surgical neck, with damage the axillary nerve,
2. Mid shaft, with damage to the radial nerve
3. at the lower end, may damage the ulner nerve.



Bone of the forearm:

The forearm consist of two long bones when the forearm placed in anatomical position.

- The radius on the lateral (outer) side
- The ulna on the medial (inner) side

The radius:

It is the lateral bone of the forearm. It is long bone with a shaft and extended extremities,

. The shaft has sharp medial border facing the ulna and attach to it the interosseous membrane which stretch between the radius and ulna.

. At the lateral surface there is the styloid process.

On the medial surface, there is articulation with the ulna.

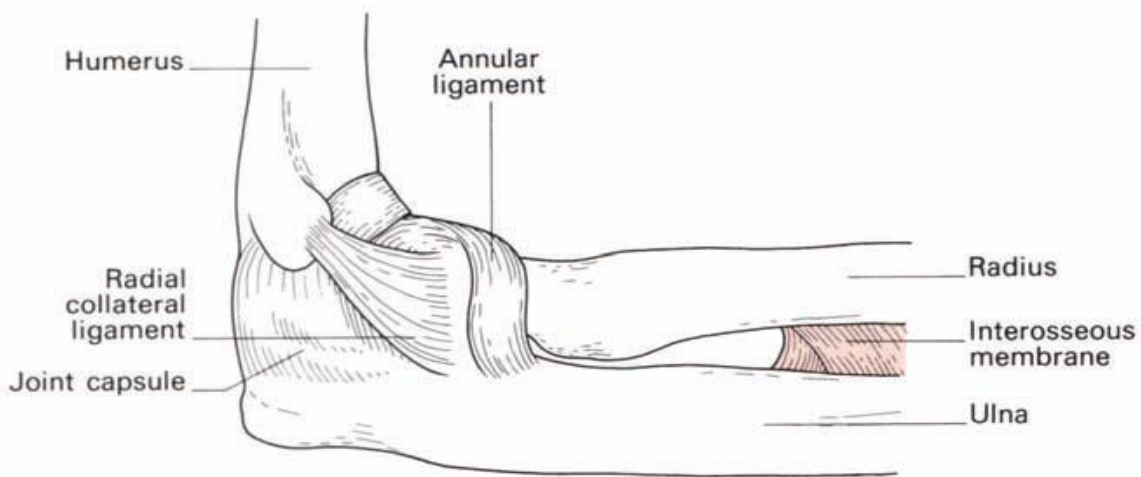
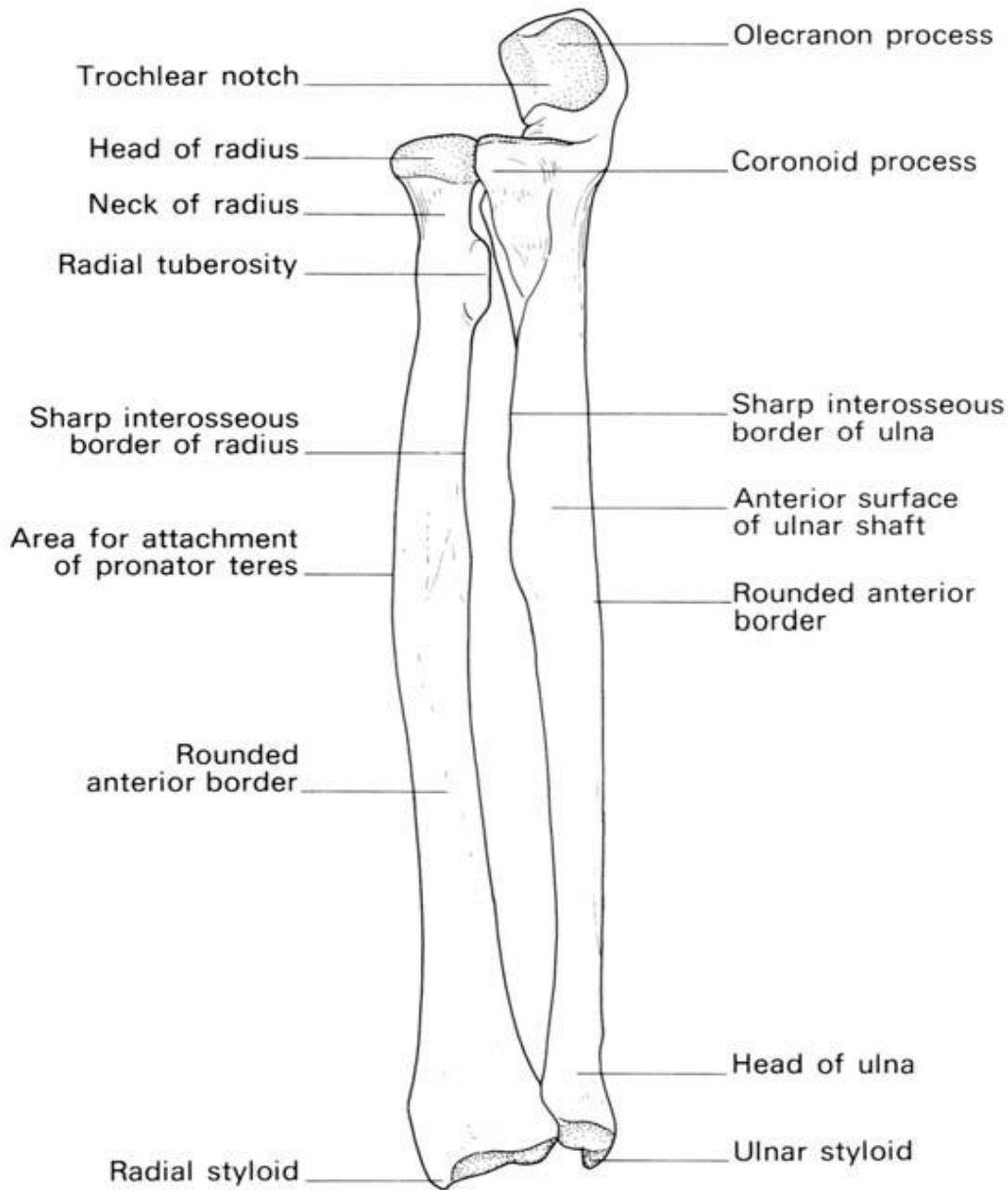
- A common fracture occurs about an inch above the lower end of the radius known as Colle's fracture and Smith's fracture





The ulna:

- It is the medial bone of the arm and slightly longer.
- The upper end of the ulna is expanded.
- The shaft of the ulna is narrow but expand slightly at its lower end to form the head of ulna,
- on the medial side, there is the styloid process.
- The bones of the forearm are a common site of fracture

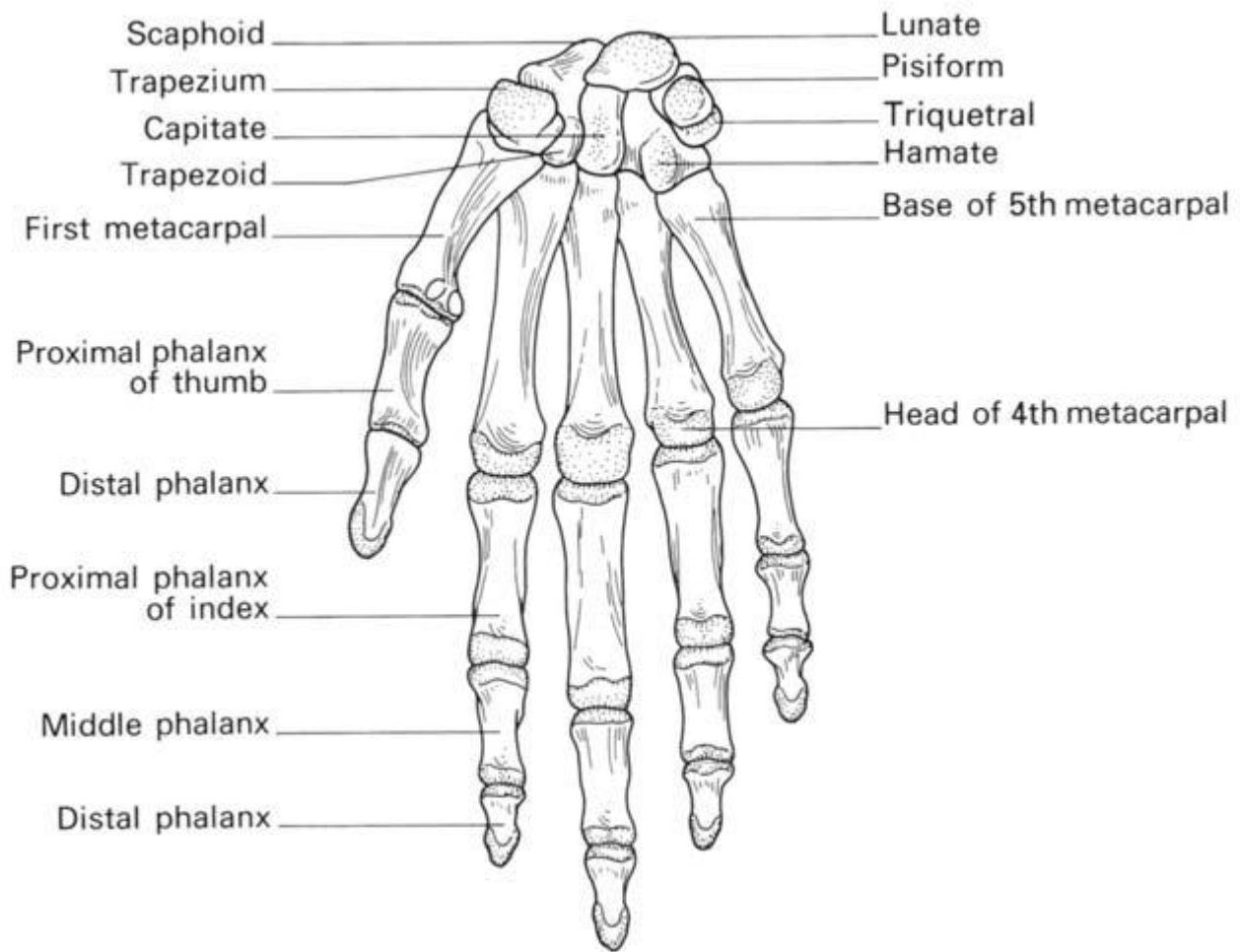


Bones of the wrist:

The carpus or wrist consists of 8 bones arranged in two rows:

Proximal row: scaphoid, lunate, triquetral, pisiform.

Distal row: trapezium, trapezoid, capitate, hamate.



Scaphoid fractures are the second commonest group of fractures that are seen following a fall onto an outstretched hand and result in wrist pain, specifically tenderness in the anatomical snuffbox.



- **The metacarpal bones:**

It is bones of the palm. It is long bones each with base, shaft and head. The bases articulate with distal row of carpal bone and the heads with proximal row of phalanges.

- **The phalanges:**

It is a long bone.

The thumb has only two phalanges. The fingers have three phalanges: proximal, middle and distal. The proximal being the longest. The joints between Metacarpals and the phalanges are called metacarpophalangeal joints.

Those between phalanges themselves are called the interphalangeal joints.

Bones of pelvic girdle:

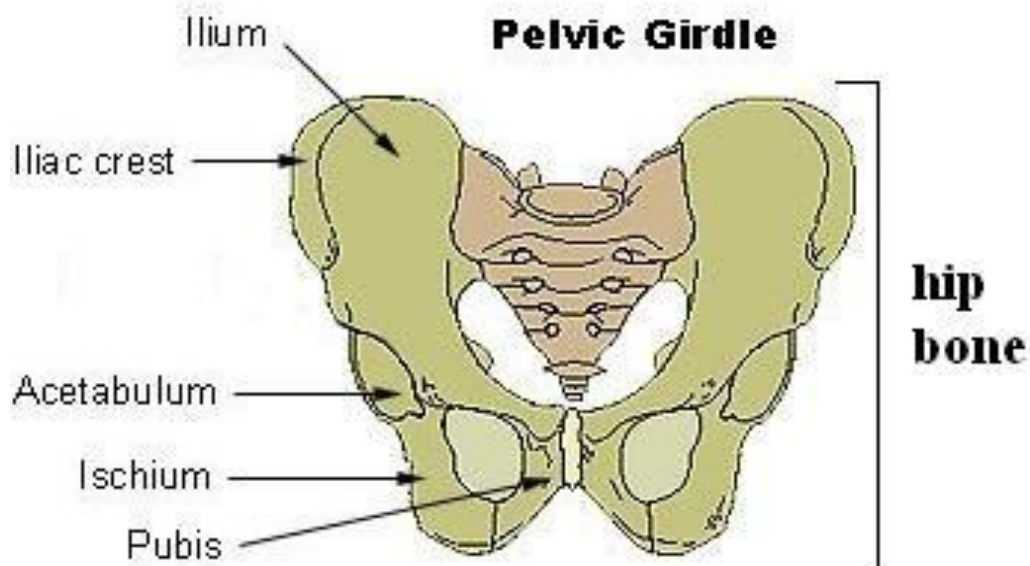
Hip bones:

The two hip bones join (articulate) together anteriorly at the pubic symphysis and are connected together posteriorly by the sacrum.

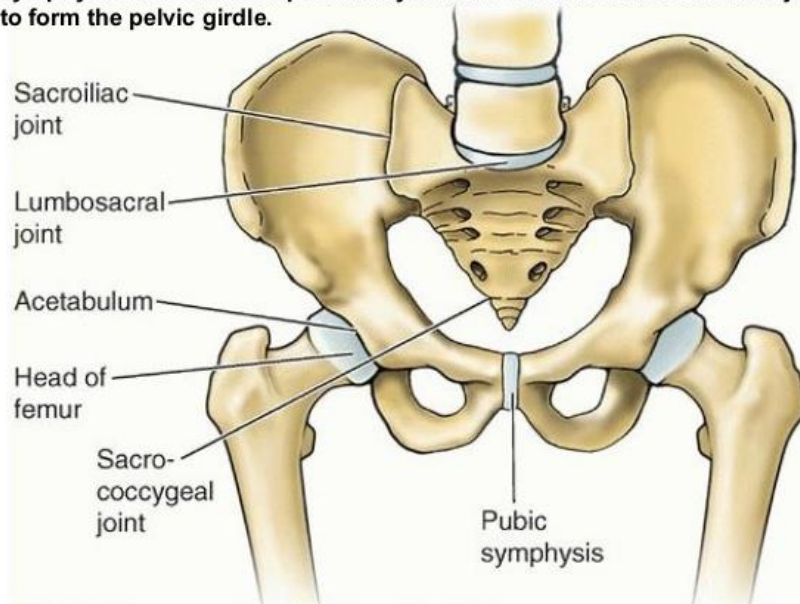
The hip bone is consist of three bones:

1. The upper part called ilium.
2. Anterior part called pubis.
3. Posterior part called ischium.

All three bones united to form cup-shaped cavity on the outer surface, known as acetabulum, into which fits the head of the femur .



Bones forming Pelvis: The two hip bones are joined anteriorly at the pubic symphysis and articulate posteriorly with the sacrum at the sacroiliac joints to form the pelvic girdle.



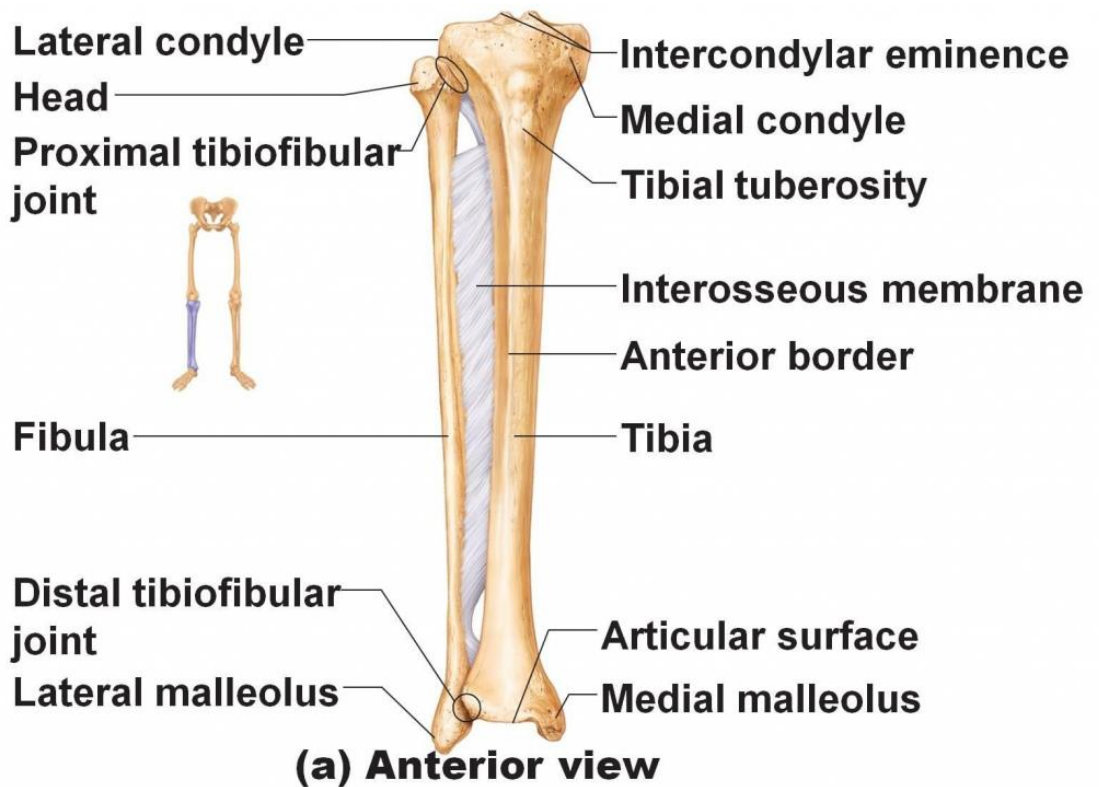
Hip joint replacement :



Lower limb bones

The bones of the lower limb:

1. Femur or thigh bone.
This is the longest and strongest bone in the skeleton.
2. The patella (knee-cap) .
3. The tibia (shin bone) .
It is the second long bone in the body;
4. The fibula .



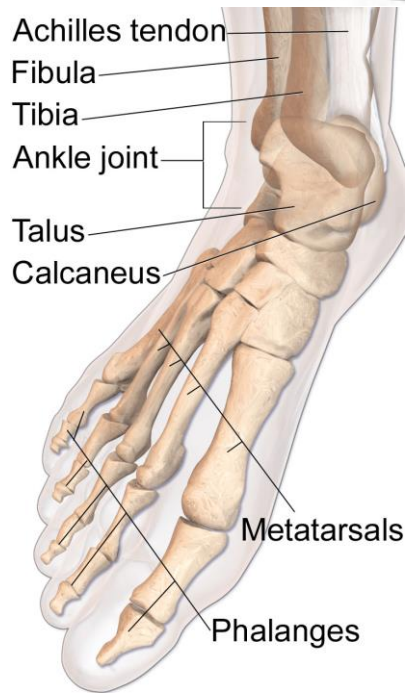
The bones of the foot:

The tarsus:

It consists of medial and lateral series of bones:

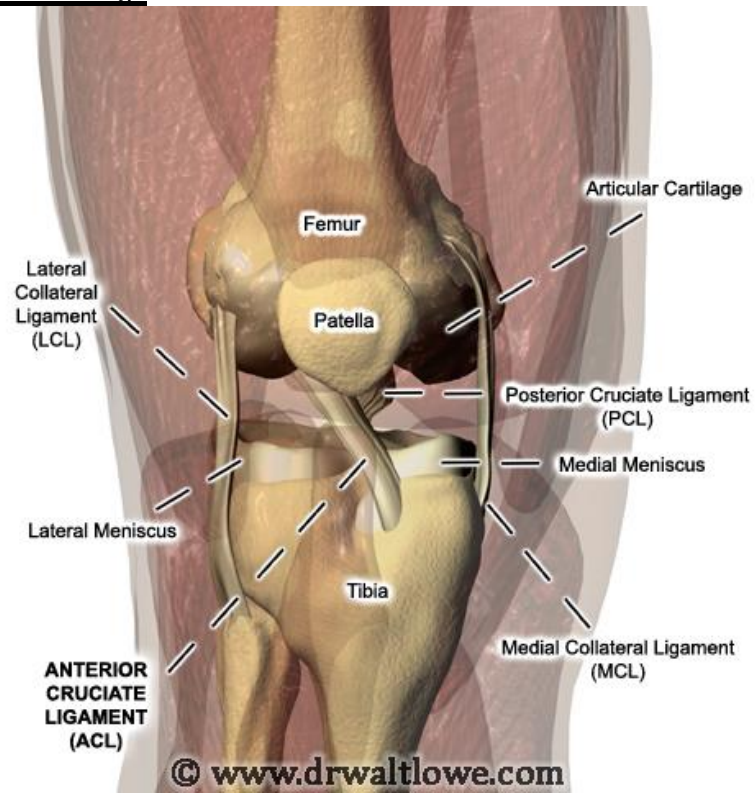
1. Medial series: consist of talus, navicular and the three cuneiform bones.
2. Lateral series: are composed of calcaneus and cuboid.

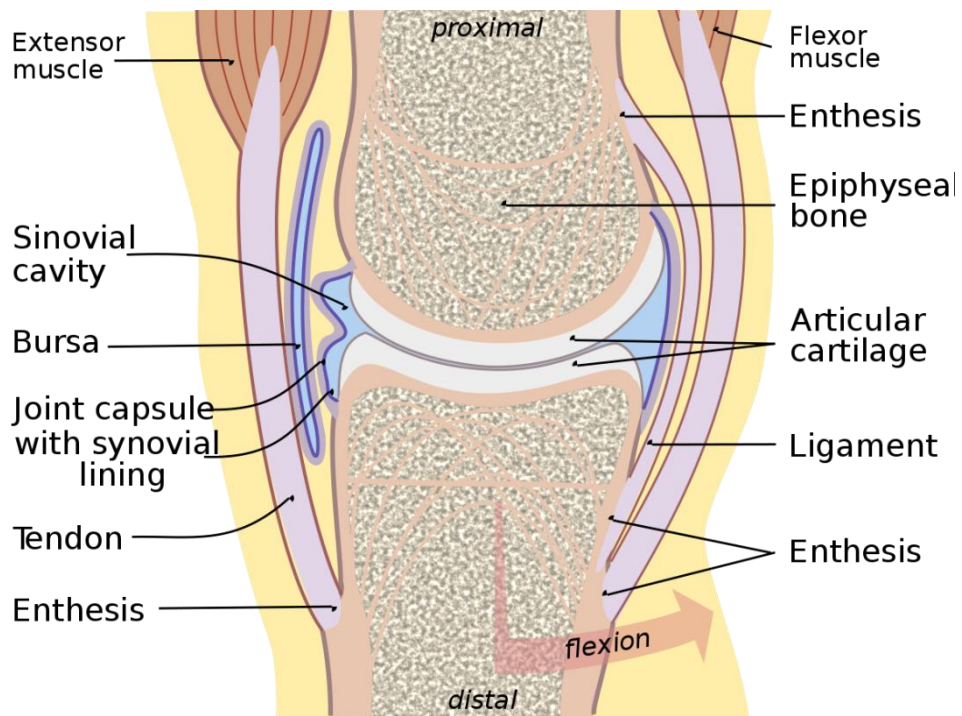
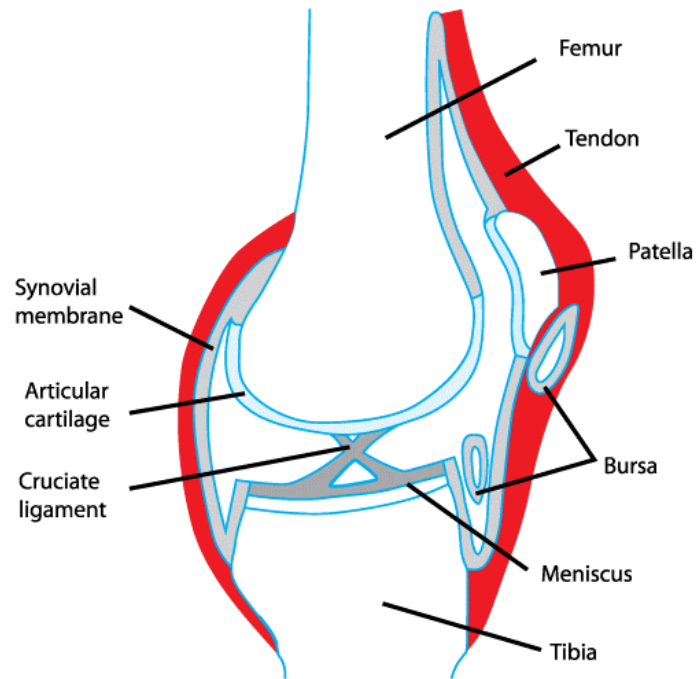
The foot has longitudinal arch on medial side; result from the talus is placed on top and above the level of the calcaneus. The transverse arch is marked at level of the base (proximal end of the metatarsus). These arches are very important in walking.



Lower Leg and Foot

Knee joint anatomy





Articular Capsule of the Knee Joint

The knee joint is formed by the connection of the lower part of the **femur** (thigh bone) and the upper part of the **tibia** (shin bone). The **patella** (knee cap) is a round bone that moves along the front of the knee and it is attached to the tibia by the patellar tendon.



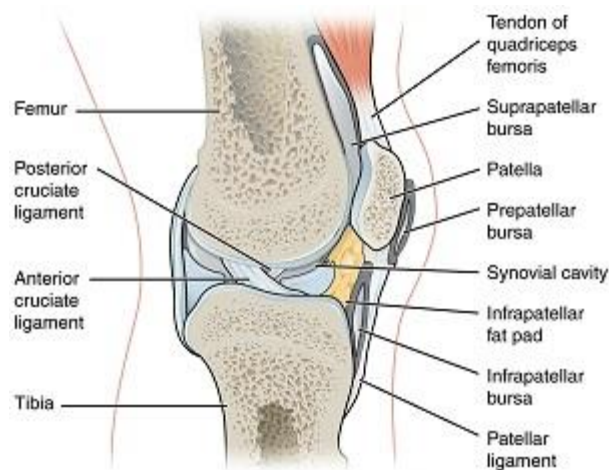
The bones that make up the knee joint are the tibia, femur, and patella.

Articular Capsule: Definition

The **articular capsule** of the knee joint surrounds the knee and consists of two main layers, an outer and inner layer. The outer layer is made up of a tough, fibrous membrane that is made up of ligament tissue.

The inner layer is made up of a synovial membrane, which secretes, a clear, yellowish fluid called **synovial fluid**.

The articular capsule of the knee also contains bursae, which are fluid filled sacs, and a fat pad located behind the patella.



The articular capsule of the knee also contains bursae, synovial fluid, and a fat pad.

Articular Capsule: Function

All of these structures of the articular capsule of the joint (outer layer, inner layer, synovial fluid, bursae, fat pad) all have specific functions in the knee.

Outer Layer:

The main function of the fibrous membrane of the outer layers is to provide stability to the joint by holding the bones of the knee (femur, tibia, patella) in their correct positions in the knee.

Inner Layer:

the synovial membrane of the inner layer secretes a viscous material called synovial fluid. This synovial fluid functions to lubricate the joint, helping to reduce friction and irritation of the bones, ligaments, and tendons when the knee joint moves.

Lecture -2

-----Dr. Mohammed A.Hayawi

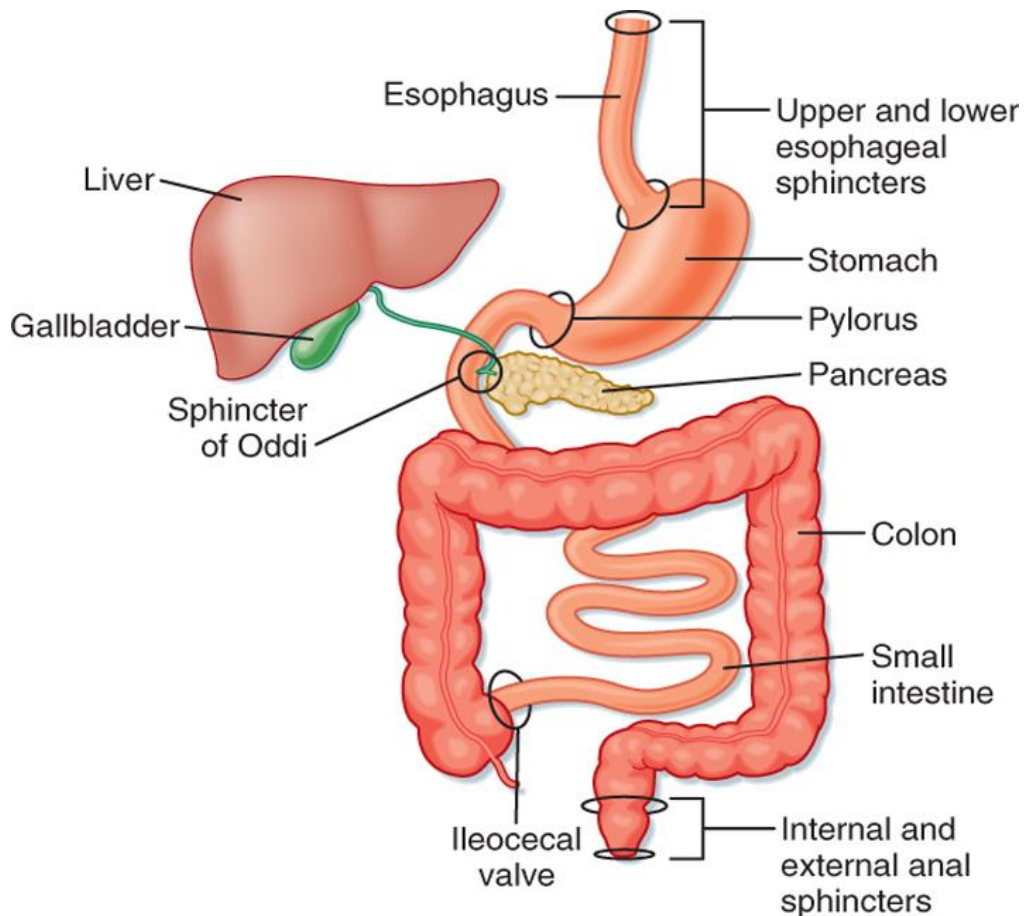
Digestive system

Anatomy of Digestive System

Digestive system consists of:

1. Gastrointestinal Tract (GIT).
2. Accessory organs.

GIT is a digestive tract consists of oral cavity, pharynx, esophagus, stomach, small intestinal, large intestinal, and anus.



Koepfen & Stanton: Berne and Levy Physiology, 6th Edition.
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ORAL CAVITY

Structures of Oral Cavity are:

1. Lips: It is a mucous membrane protecting the anterior opening of the mouth. It's also called labia.

2.Lymphoid tissue (Tonsils) :

- a. **Palatine tonsils** are in the oropharynx, at the end of the soft palate.
- b. **Pharyngeal tonsil (adenoids when enlarge).** Often-called adenoids are located high in the nasopharynx.
- c. **Lingual tonsil:** are at the base of the tongue.

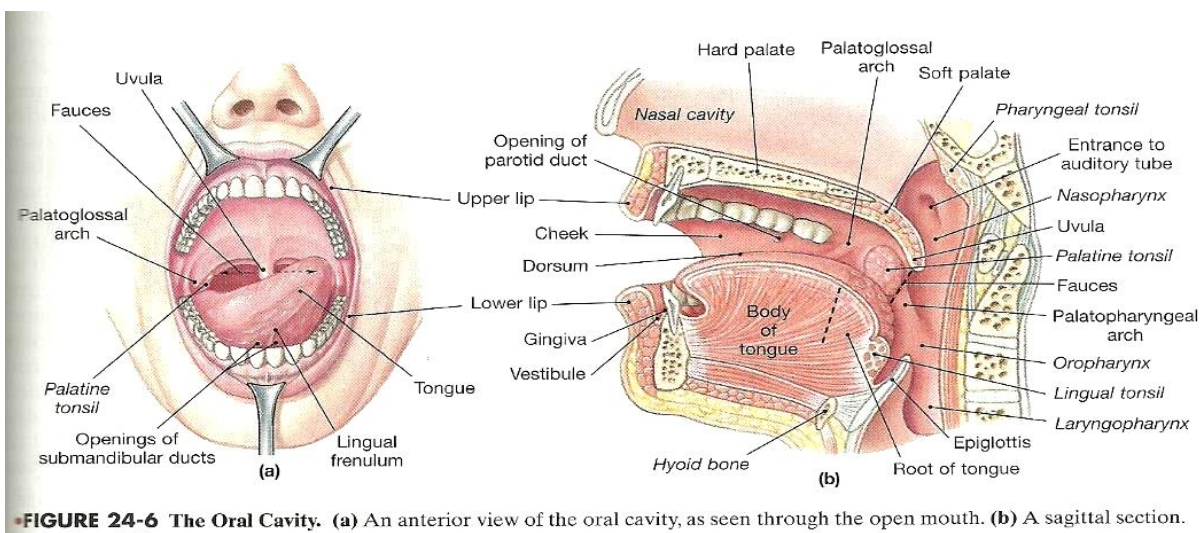
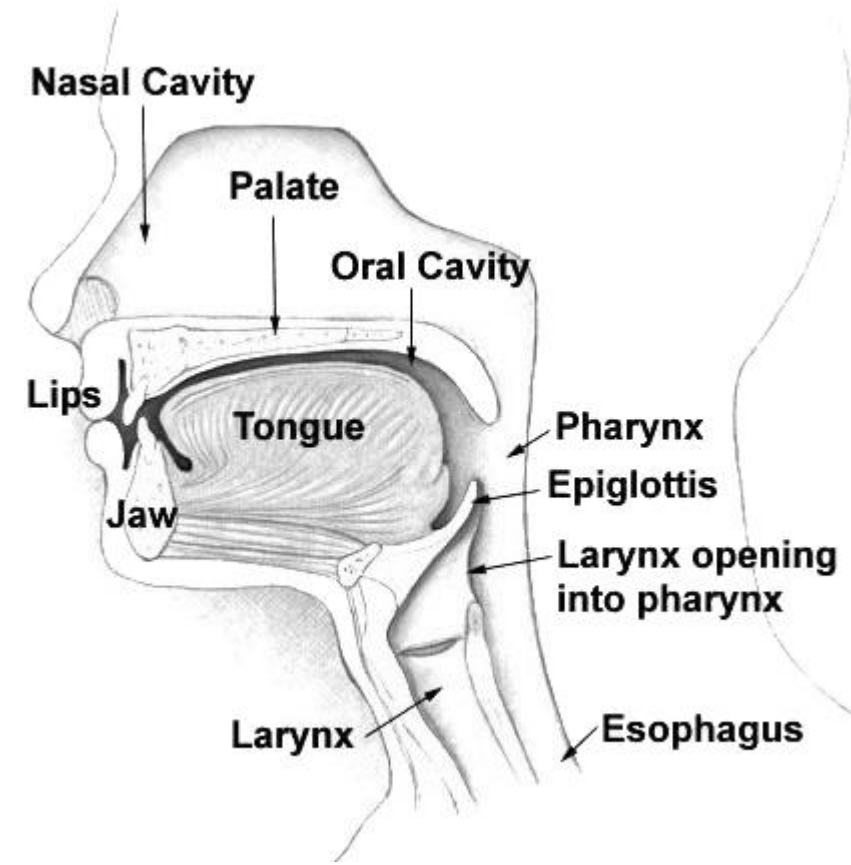
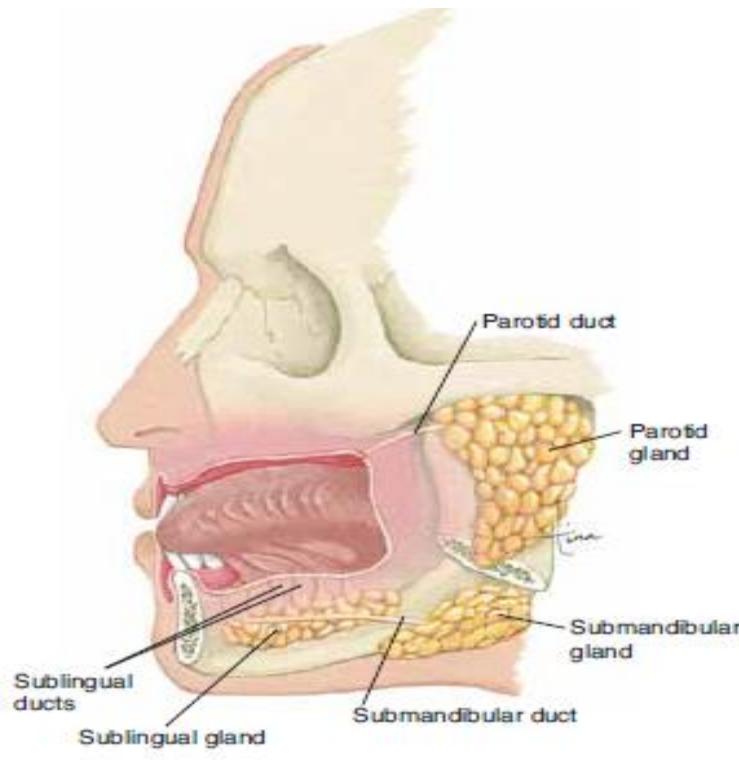


FIGURE 24-6 The Oral Cavity. (a) An anterior view of the oral cavity, as seen through the open mouth. (b) A sagittal section.

3. **Hard palate.** It is forms the anterior roof of the mouth.
4. **Soft palate.** It is forms the posterior roof of the mouth.
5. **Uvula.** Is a fleshy finger like projection of the soft palate which extends downward from its posterior edge

6. Salivary glands: 3- pairs of salivary glands empty their secretions into the mouth:

- **The parotid glands (large glands lies anterior to the ear)**
- **The submandibular gland**
- **Small sublingual gland**



Pharynx:

From the mouth, food passes posterior into the oropharynx and laryngopharynx.

The pharynx is subdivided into:

- **Nasopharynx,** is a part of respiratory passageway.
- **Oropharynx,** is posterior to oral cavity.
- **Laryngopharynx,** which continuous with the esophagus.

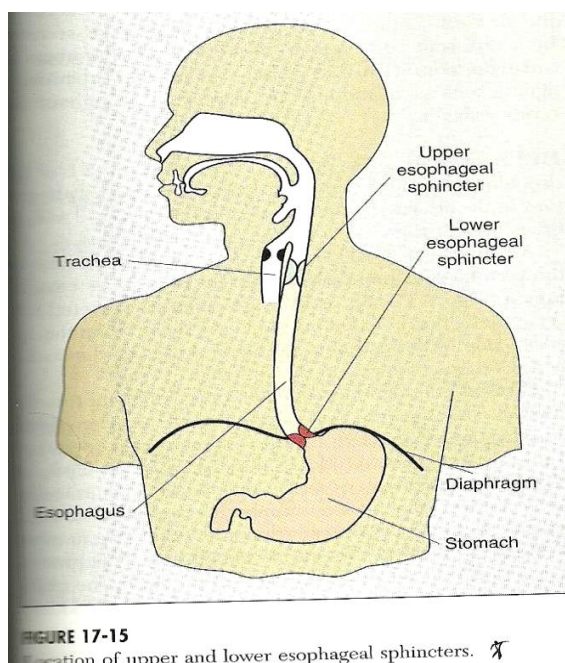
Alternating contractions of the pharynx's skeletal muscles propel food through the pharynx into the esophagus below. This propelling mechanism is called peristalsis.

Esophagus (gullet):

It runs from the pharynx through the diaphragm to the stomach, about 25cm (10 inches) long, descends toward thoracic cavity posterior to the trachea, and then enters the abdominal cavity through the esophageal hiatus, an opening in the diaphragm, to empty into the stomach. It is essentially a passageway that conducts food to the stomach.

- **Esophagus Comprises:**

- 1. **Upper esophageal sphincter** just below the pharynx and composed from **skeletal muscle fibers**, to prevent air from entering esophagus.
- 2. **Middle third** of esophagus muscular layers compose from mixture of **skeletal fibers and smooth muscle cells**
- 3. **Lower esophageal sphincter (cardiac sphincter)** composed from **smooth muscle**, which normally remains in state of active contraction to prevent backflow of materials from the stomach into esophagus. Esophagus innervated by sympathetic and parasympathetic (esophageal plexus).



STOMACH

Stomach is Divided into Four Regions:

- | | |
|-------------------|---------------------|
| 1. Cardiac region | 3. Body of stomach. |
| 2. Fundus . | 4. Pylorus |

The pylorus continuous with the small intestine through the pyloric sphincter or valve.

The stomach is approximately **25cm long**, but its diameter depends on how much food it contains when it's full. It can hold about 4 liters of food. Stomach is innervated by sympathetic and parasympathetic nerve fibers (esophageal plexus).

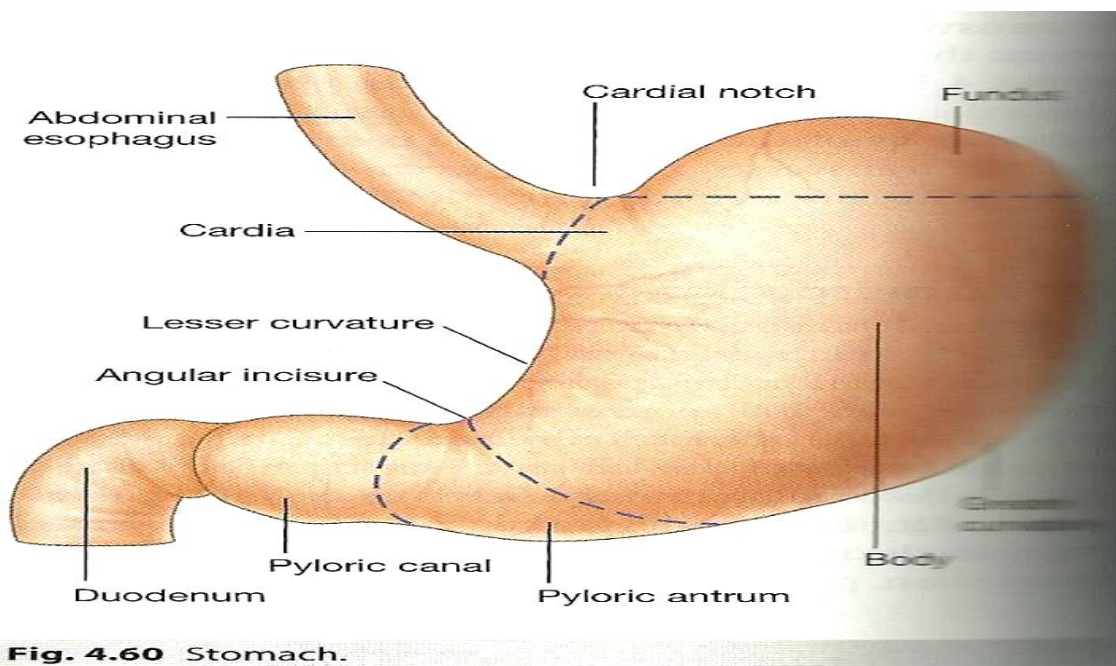
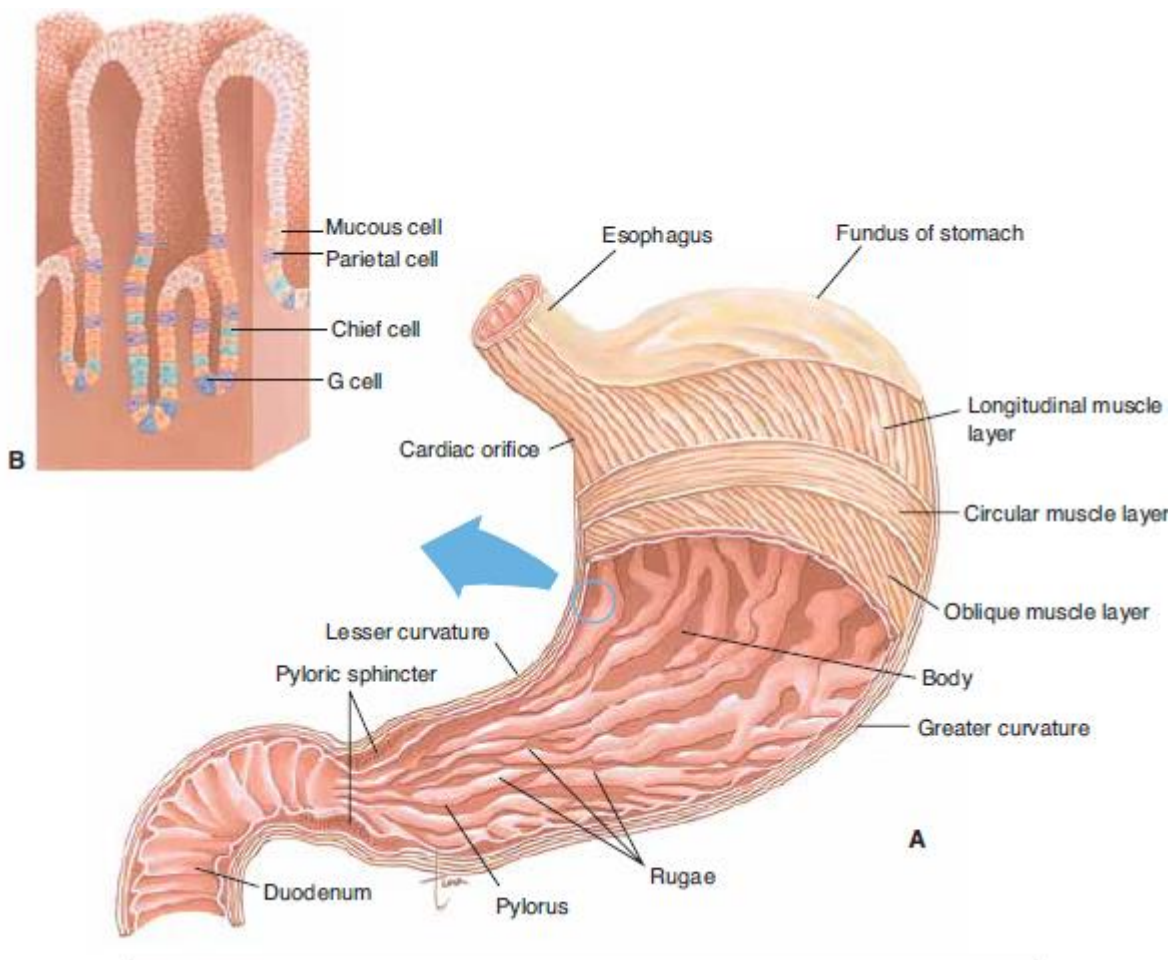
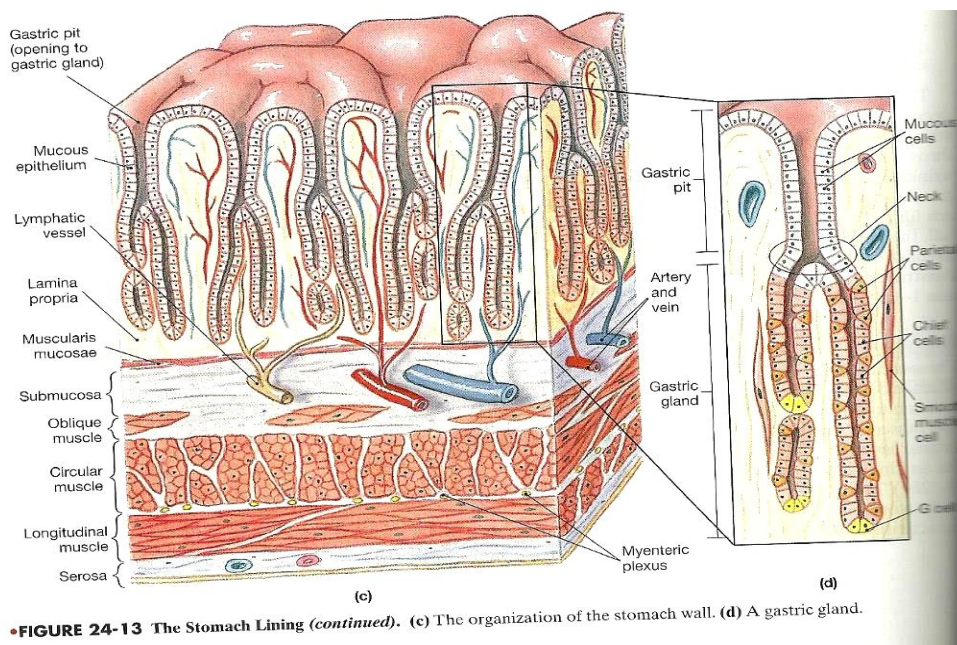


Fig. 4.60 Stomach.



Musculature of the Stomach:

- the Muscularis mucosa and Muscularis externa of the stomach contain extra layers of smooth muscle cells in addition to circular and longitudinal layers,
- The third layer called **oblique layer of smooth layer** which strength the stomach wall. Internally the stomach lining is composed of numerous gastric folds (rugae) these folds are observed only when the stomach is empty.



SMALL INTESTINE

* **Anatomically** , small intestine has three subdivisions:

1. **Duodenum**: 25 cm.
2. **Jejunum**: is about 2.5 meters..
3. **Ileum**: about 3.5 meters, It is joins the large intestine at the ileocecal valve.

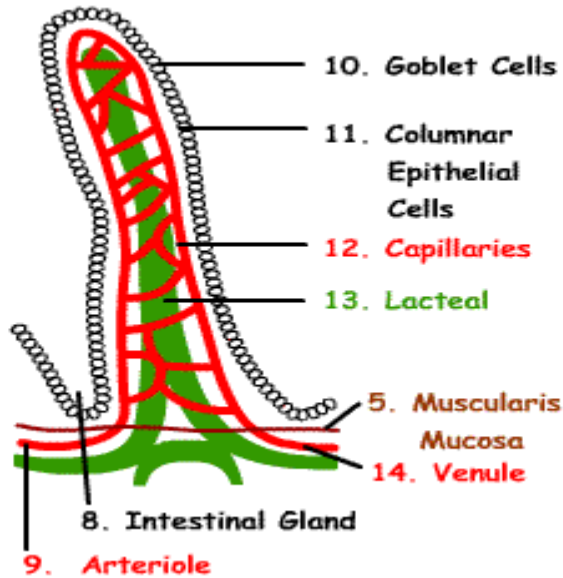
***Histologically**: Structures of Small Intestinal

1.Plica: the intestinal lining show transverse folds called plica and this is a permanent feature that does not disappear when the small intestine fills, small intestine contains roughly 800 plica to increase the surface for absorption .

2.Villi: mucosa of small intestine is project into a series of fingerlike structures called intestine villi.

Structures of Villi:

- a. epithelium (simple columnar epithelium)
- b. capillary network
- c. lacteal (lymphatic vessels)
- d. nerves

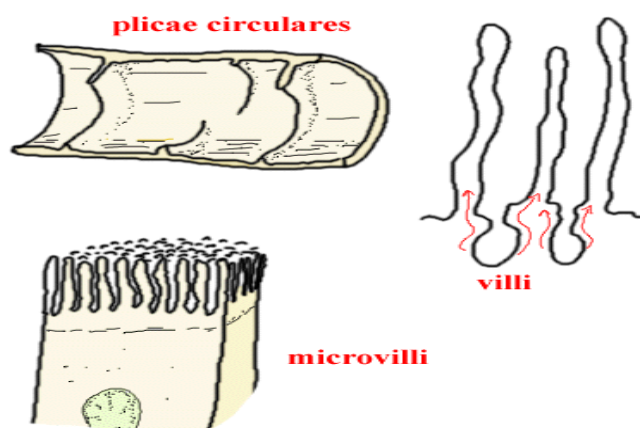


3. Payer's patches (aggregated lymphoid nodules):

Lamia propria of ileum contains 20-30 masses of lymphoid tissue (lymphoid nodules) called payer's patches to protect small intestine from bacteria.

4. Intestinal gland

- a. Goblet cells.
- b. Intestinal glands or crypts of lieberkuhn.
- c. Submucosal glands or Brunner's glands



LARGE INTESTINE

Large Intestine is Divided into Four Structures

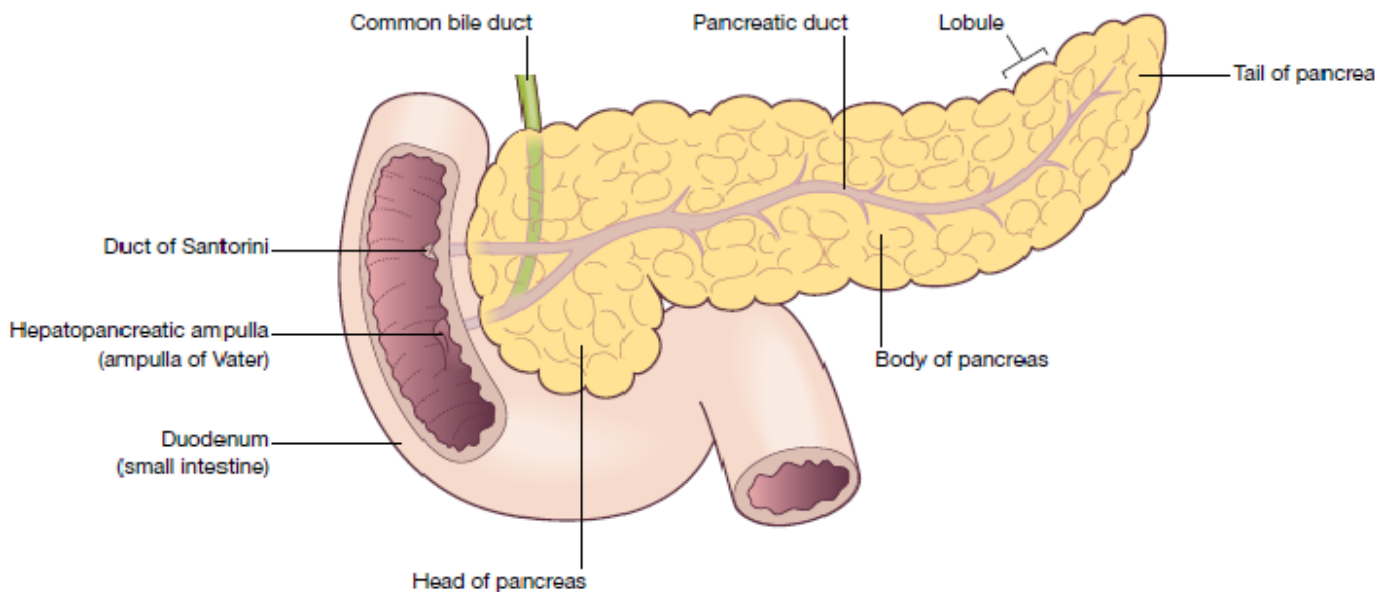
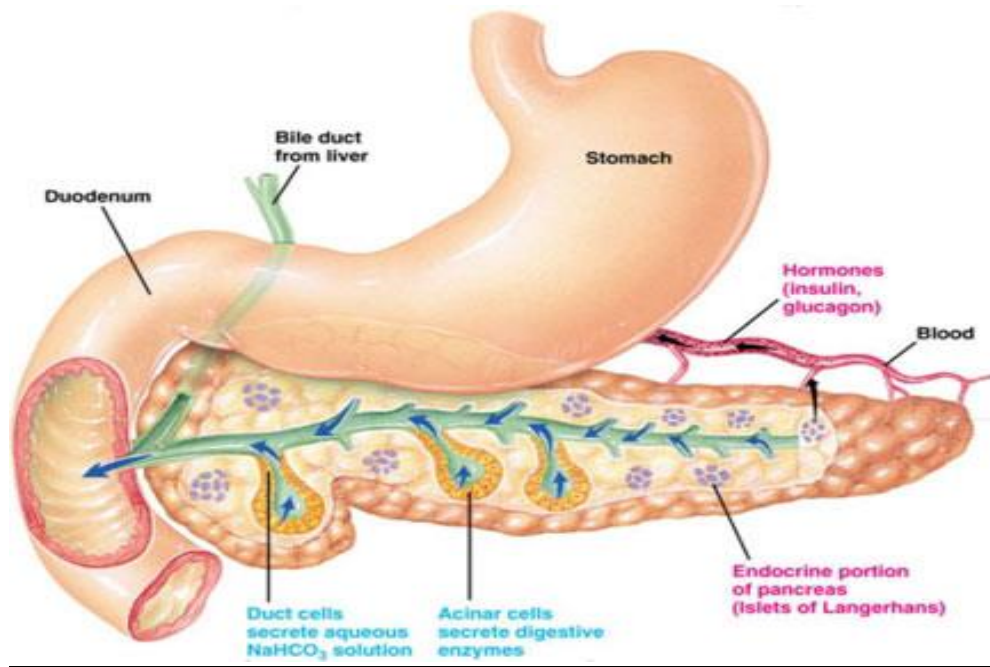
- **Cecum and appendix.** is the first part. It contains worm like **appendix**, a potential trouble spot, since it is usually twisted. It's an ideal location for bacteria to accumulate and multiply. Inflammation of the appendix – appendicitis is the usual result.
- **Colon:** divided into: -
 1. **Ascending colon:** travels up the right side of the abdominal cavity and makes a turn in the right **side** or hepatic flexure.
 2. **Transverse colon:** travels across the abdominal cavity.
 3. **Descending colon:** turns at the left side to enter the pelvis.
 4. **Sigmoid colon:** S-shaped, the part of colon that enters the pelvis.
The sigmoid colon, rectum and anal canal lie in the pelvis.
- **Rectum.**
- **Anal canal:** The anal canal ends at the anus, which opens to the exterior. The anal canal has an :
 - External voluntary skeletal muscle (voluntary sphincter)
 - Internal involuntary sphincter formed by smooth muscle.

PANCREAS

I. Structures of Pancreas : 1.Head 2.Body 3.Tail

The pancreas is approximately 12–15 cm long and 2.5 cm thick. It is situated across the back of the abdomen, behind the stomach. The head of the pancreas is on the right side of the abdomen and it is connected to the duodenum (the first section of the small intestine)

through a small tube called the pancreatic duct. The narrow end of the pancreas, called the tail, extends to the left side of the body



LIVER

I. Structures of the Liver

The liver is the largest solid organ in the body. In adults, the liver can weigh up to 1.5 kg. It is in the upper-right abdomen, just under the rib cage and below the diaphragm (the thin muscle below the lungs and heart that separates the chest cavity from the abdomen.)

1. Right lobe
2. left lobe
3. Caudate lobe
4. Quadrate lobe

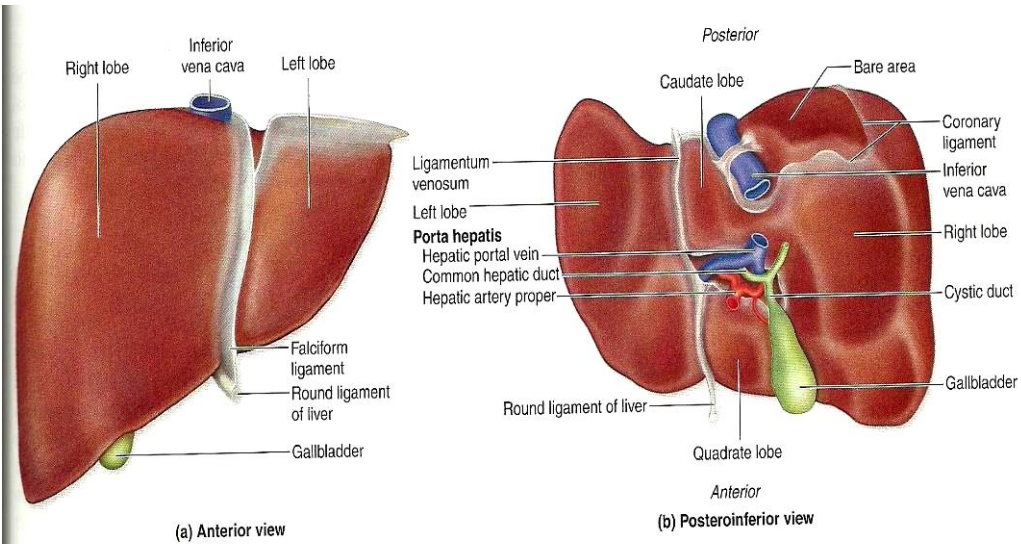
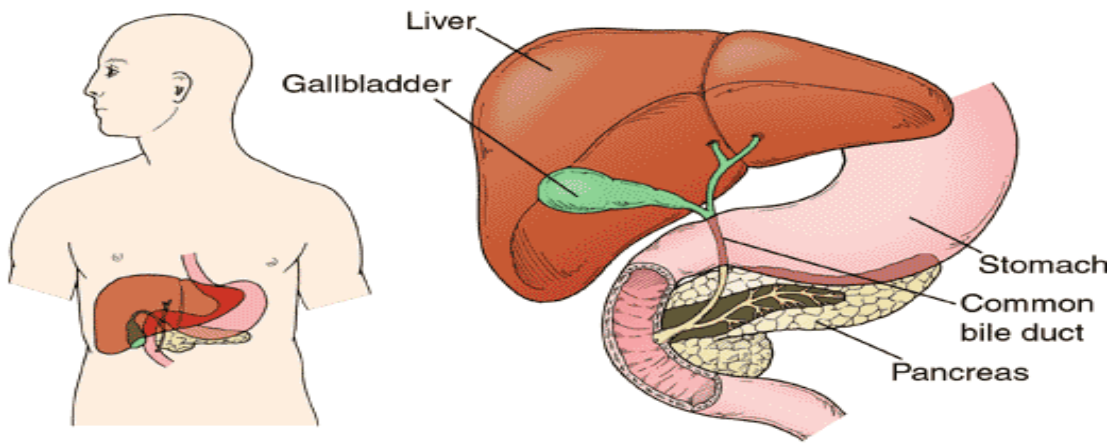


Figure 26.18

Gross Anatomy of the Liver. The liver is in the upper right quadrant of the abdomen. (a) Anterior and (b) posteroinferior views show the four lobes of the liver, as well as the gallbladder and the porta hepatis.

Liver and Gall bladder: The liver is the larger gland in the body. It is located under the diaphragm more to the right side of the body.

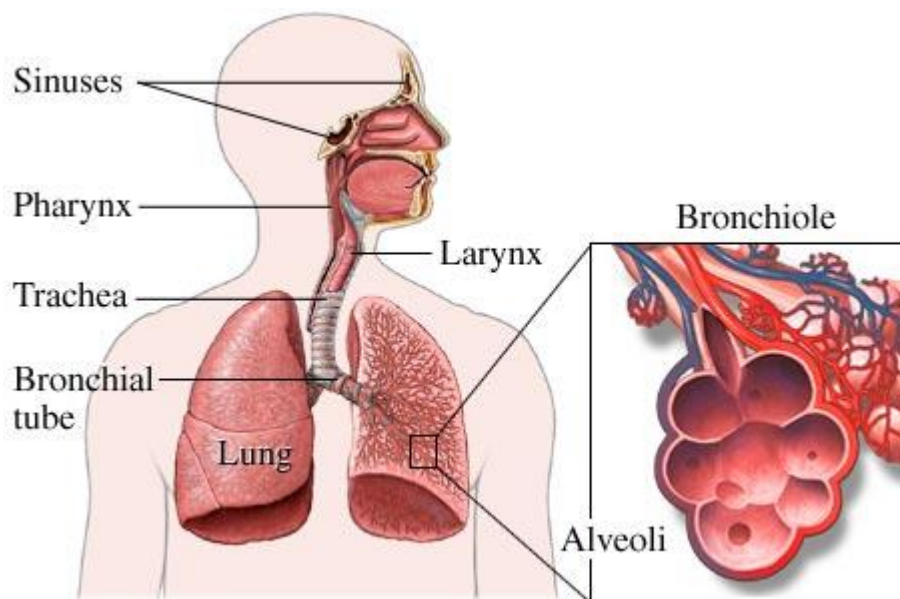
The liver has four lobes and is suspended from the diaphragm and abdominal wall by a delicate mesentery cord, the falciform ligaments.

Anatomy

Respiratory System

The respiratory system consists of the :

Nose , mouth , pharynx , larynx , trachea , bronchi , bronchiole & alveoli .



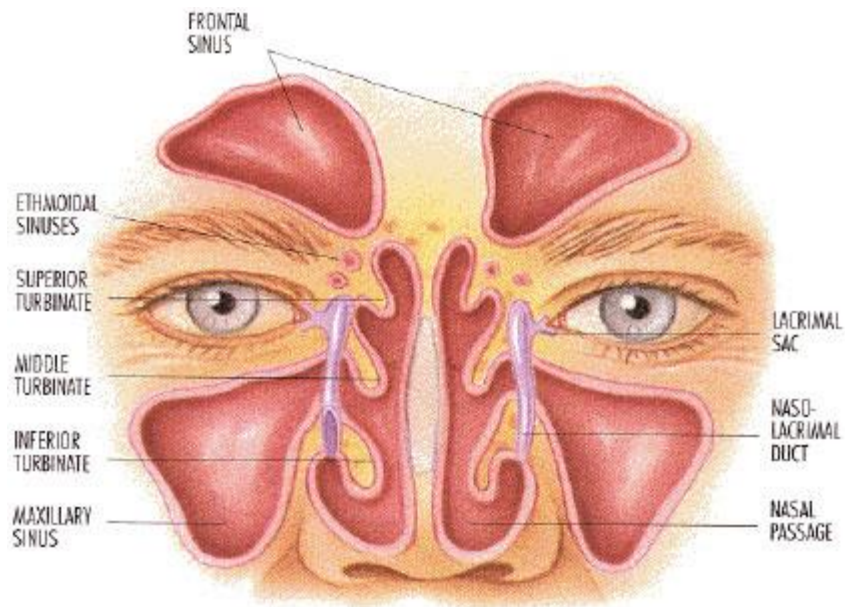
Nasal Cavity

Nose: It's the only externally visible part of the respiratory system, during breathing; the air enters the nose by nostrils.

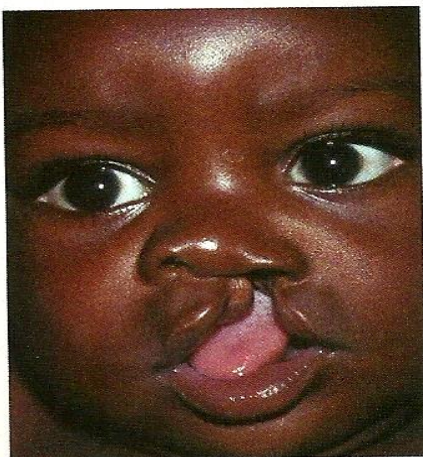
- The nasal cavities are separated into right & left by nasal septum .
- The sticky mucosa produces by the mucus glands moisten the air and traps incoming bacteria and other foreign bodies.
- The ciliated cells of the nasal mucosa help to control the body temperature.
- The posterior nares are situated at the back of the nasal cavity & constitute the entrance to the nasopharynx .

Structures of Nasal Cavity

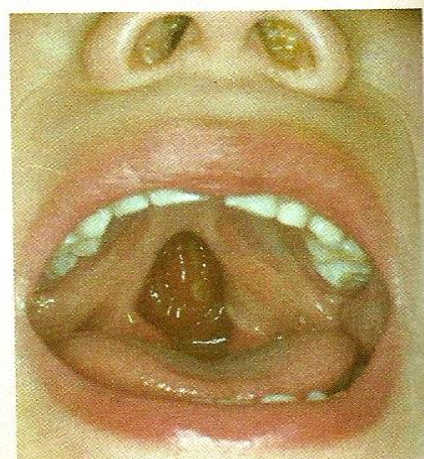
1. Superior, middle, and inferior concha (تقعر بين ارتفاعين).
2. Superior, middle, and inferior turbinate (عظم ملفوف)
3. Soft palate .
4. Nasopharynx.



- The nasal cavity is separated inferiorly from the oral cavity by the palate :
 1. **Hard palate:** the palate supported by bone.
 2. **Soft palate:** the unsupported posterior part (not contain bone).



Cleft lip



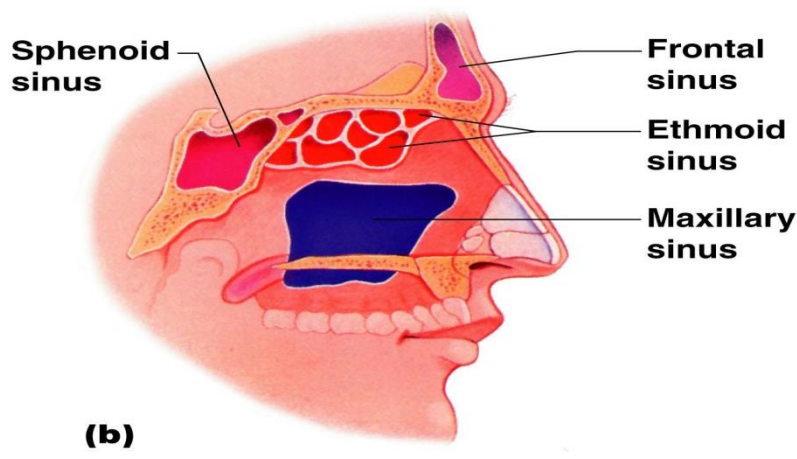
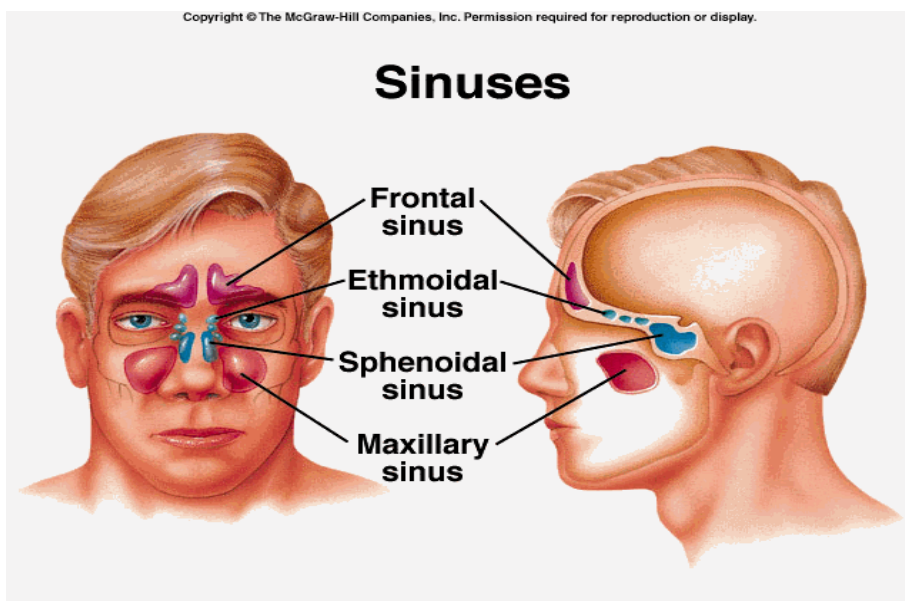
Cleft palate

Cleft palate: it is a genetic defect, characterized by the failure of the bones forming the palate to fuse medially, results in breathing difficulty.

- The roof of the mouth (palate) is formed between the sixth and ninth weeks of pregnancy.
- The lip forms between the fourth and seventh weeks of pregnancy

Nasal sinuses: The nasal cavity is surrounded by a ring of Para nasal sinuses as the following: -

1. Frontal sinuses
2. Sphenoid sinuses (الجيب الوتدي الاسفيني)
3. Ethmoid sinuses (الجيب المصفوي)
4. Maxillary sinuses



LARYNX

Larynx (Voice Box):

The larynx or voice box, play a role in speech. It is located inferior to the pharynx.

- It has special function of voice production
 - It has situated in the midline of the neck between the pharynx above & the trachea below .
 - It's formed by eight rigid hyaline cartilages
-
- The largest of cartilage is the thyroid cartilage, which protrudes anteriorly and is commonly called the Adam's apple.
 - The epiglottis protects the superior opening of the larynx. It's closes the opening of the larynx during eating and drinking preventing the food and fluids to enter the larynx.

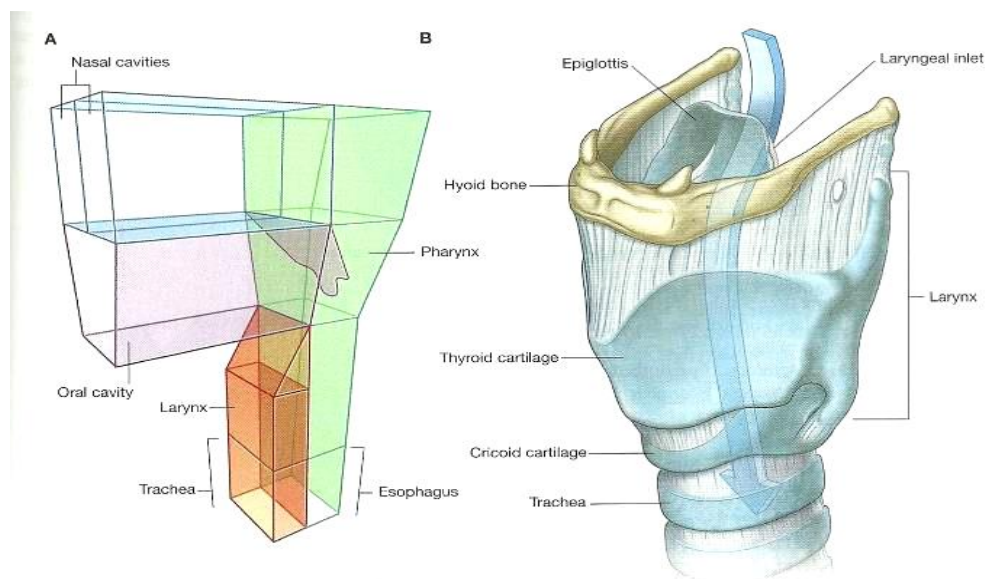


Fig. 8.196 Larynx. A. Relationship to other cavities. B. Lateral view.

Trachea :

- It is 12 cm long , 2.5 cm in diameter .
- It divided into two main bronchi.
- The trachea consist of number of C – shaped rings of hyaline cartilage. Air entering the trachea from the larynx travels down , its length (10 – 12 cm) to the level of the fifth thoracic vertebrae. The trachea is lined with a ciliated mucosa.

- These cartilages keep the trachea permanently open , so that its wall do not collapse like those of the esophagus .

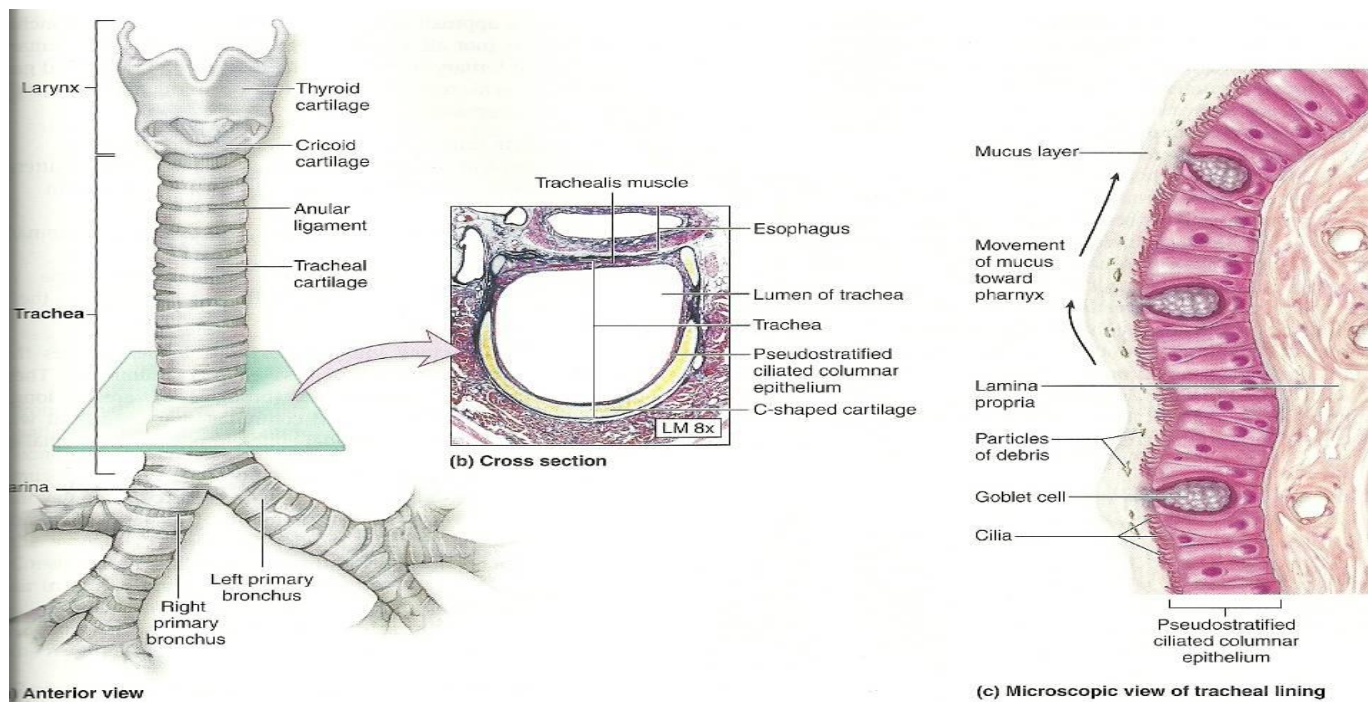
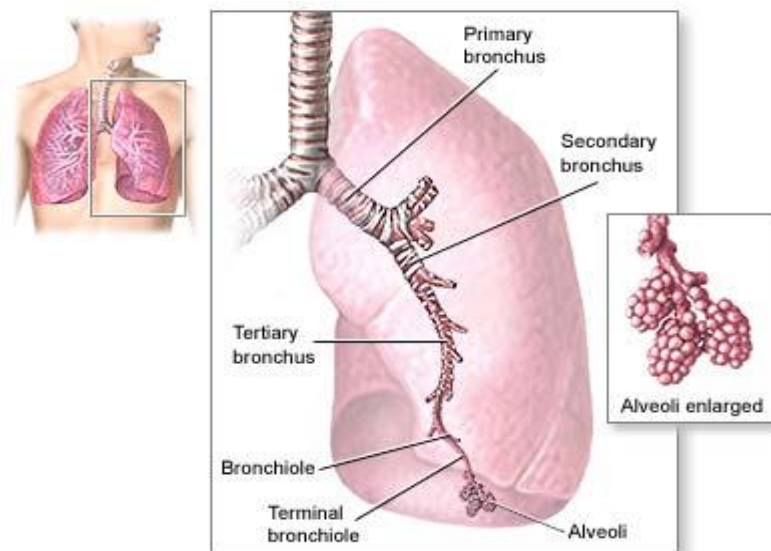


Figure 25.7

Trachea. (a) The trachea connects the larynx superiorly and the primary bronchi inferiorly. (b) A cross-sectional photomicrograph shows the relationship of the trachea (anteriorly) and the esophagus (posteriorly). The wall of the trachea is supported by C-shaped rings of cartilage. (c) The trachea is lined with a pseudostratified ciliated columnar epithelium that propels mucus and debris away from the lungs and toward the pharynx.

Bronchi :

- The trachea ends by dividing or bifurcating into two main bronchi (right & left) , each bronchus passes to the corresponding lung .
- From each main bronchus numerous smaller bronchi are given off , like branches of tree & the smallest bronchial tubes are called bronchioles .



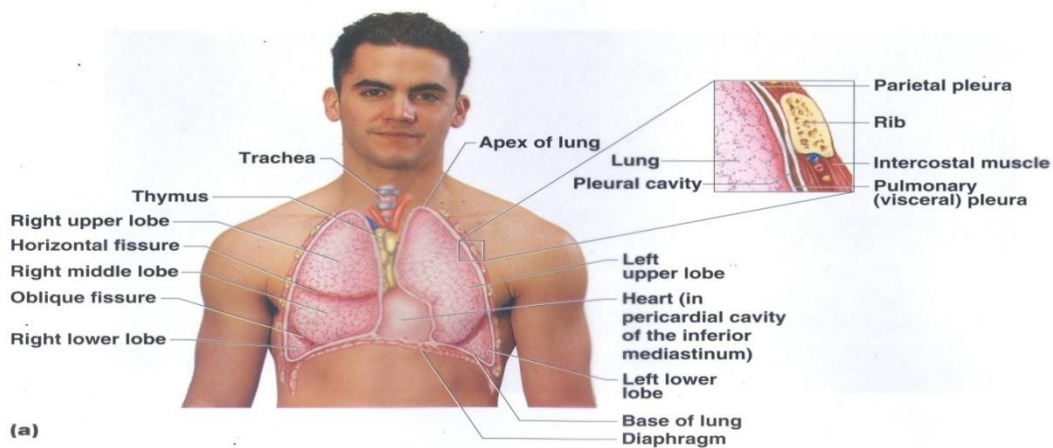
ADAM.

Lungs :

1. **Right lung** composed from 3- lobes
 - a. Superior lobe. b. Middle lobe. c. Inferior lobe.
 2. **Left lung** is smaller than the right and composed from 2- lobes.
 - a. Superior lobe.
 - b. Inferior lobe
- The lungs are pair of conical- shaped organs , each enveloped in a serous membrane (pleura) .
 - The apex of the lung rises into the root of the neck for about one inch above the clavicle .
 - The base is concave & is related to the upper surface of the diaphragm .
 - The lungs contain about 3 million alveoli, each alveolus composed of the following
 - a. Simple Squamous epithelium (type I pneumocytes)
 - b. Surfactant secreting cells (type II pneumocytes)
 - c. Macrophages which are responsible for removing debris and microbes from the alveoli
 - **Pleural Membrane:**
 - The covering membranes of the lung consists from:
 1. **Parietal pleura** lines the inner surface of the thoracic cavity.
 2. **Visceral pleura** cover the outer surface of the lungs.
 - **Pleural Cavity:**

- The thin space between parietal pleura and visceral pleura called pleural cavity. Both pleura secrete a small amount of pleural fluid .
- Pleural fluid gives a moist, slippery coating that provides lubrication, thereby reducing friction between the parietal and visceral surfaces as you breath.

Figure 13.4a: Anatomical relationships of organs in the thoracic cavity.



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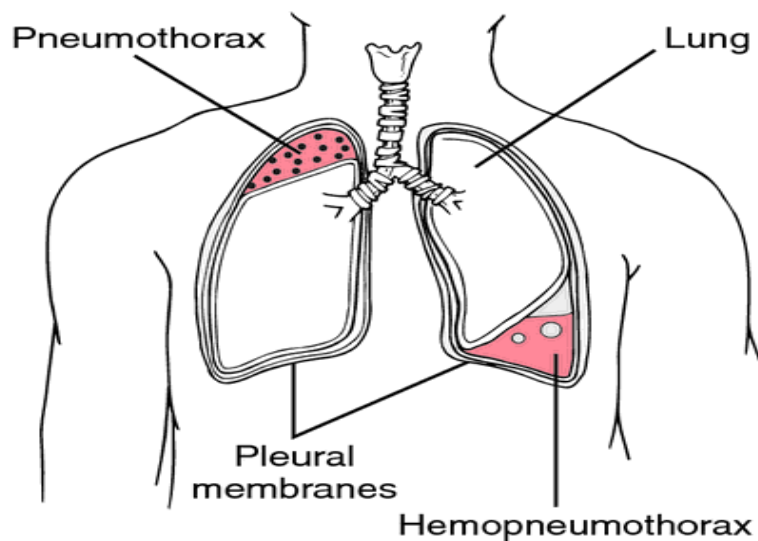
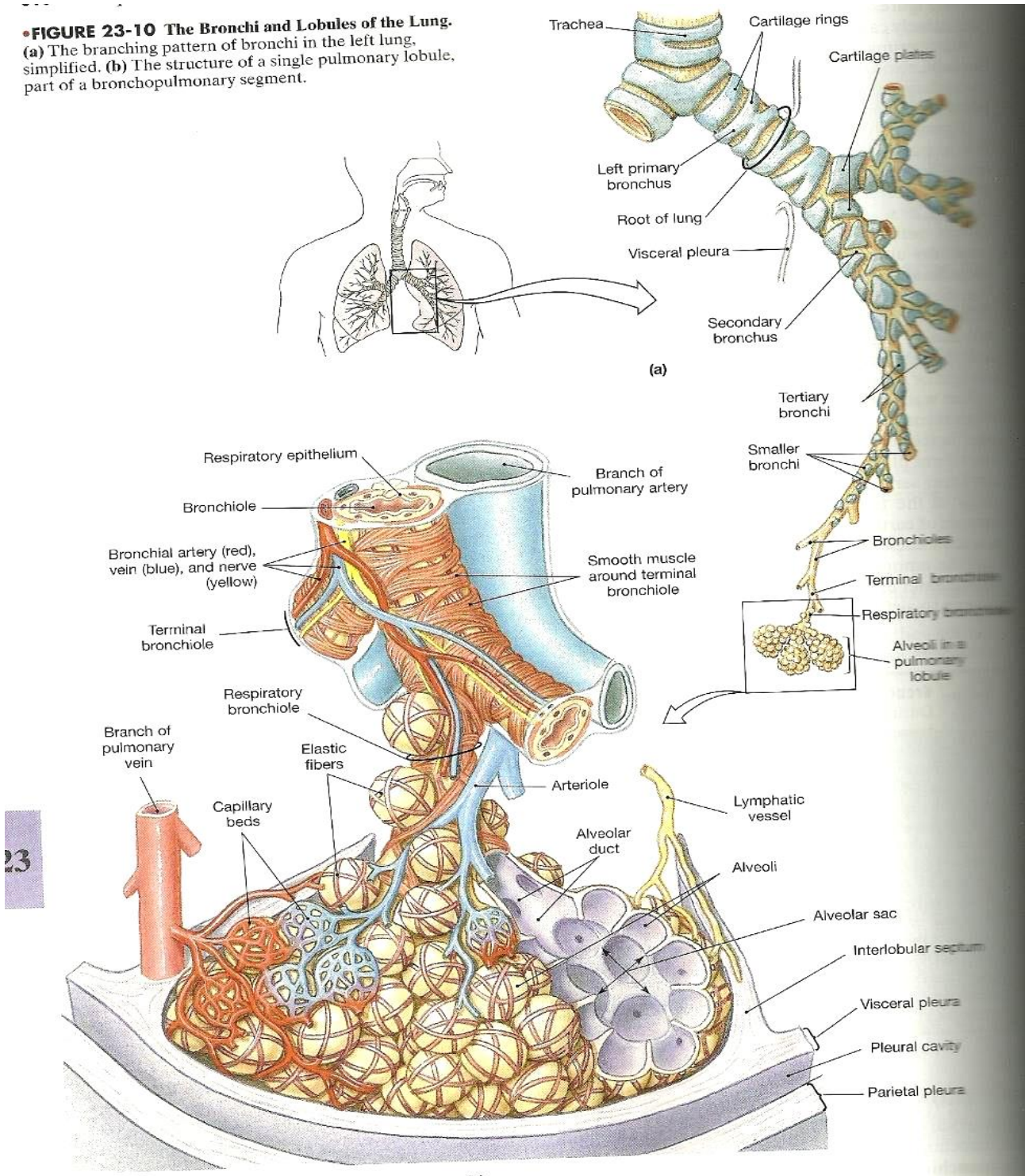


FIGURE 23-10 The Bronchi and Lobules of the Lung.
(a) The branching pattern of bronchi in the left lung, simplified. **(b)** The structure of a single pulmonary lobule, part of a bronchopulmonary segment.



23

Figure 22.12: Detail structures of the respiratory tract

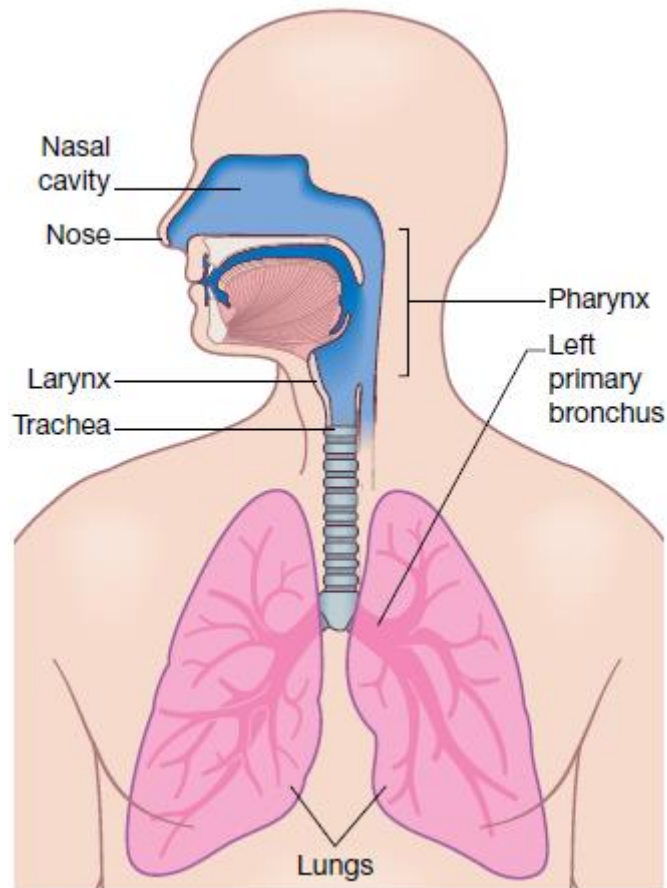
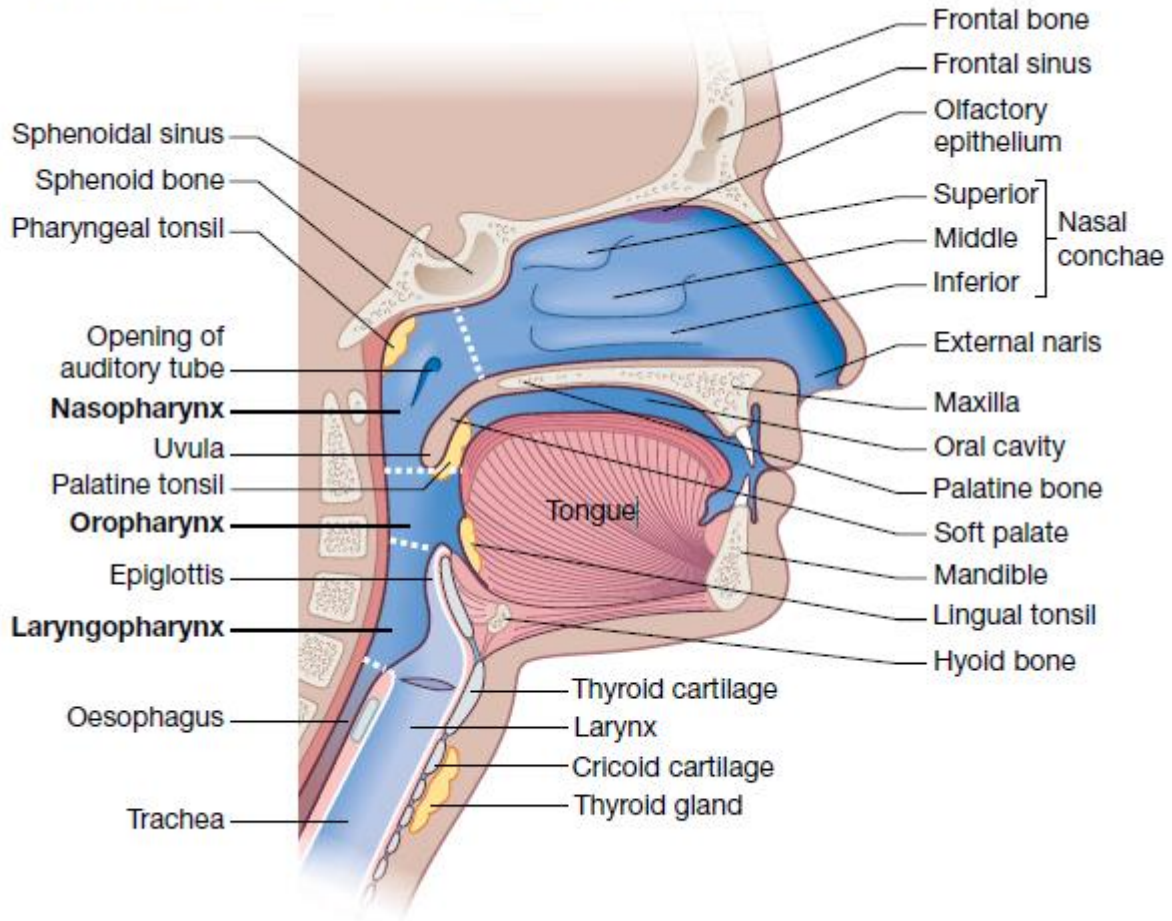


Figure 22.3 Lower respiratory tract

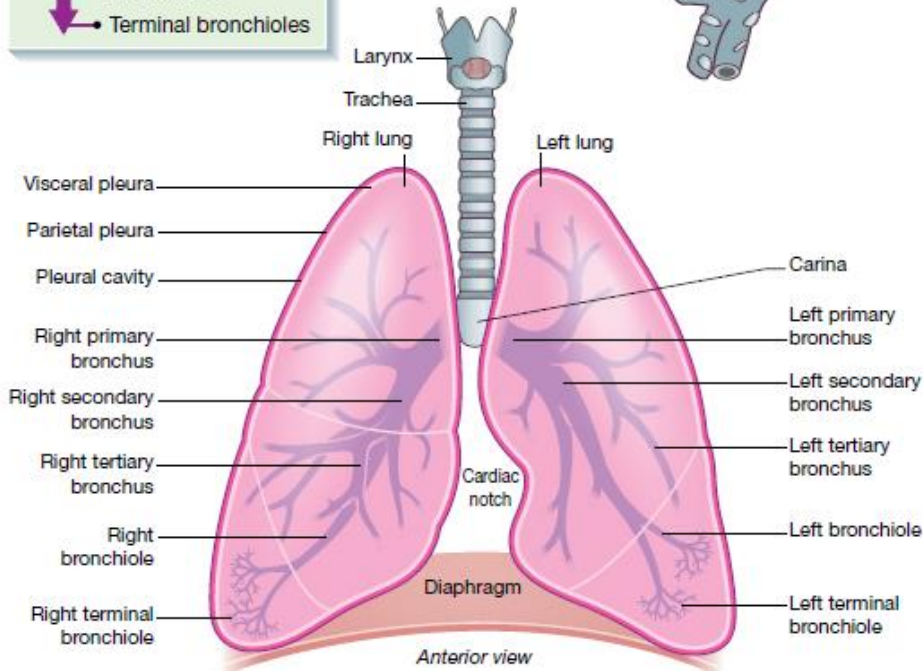
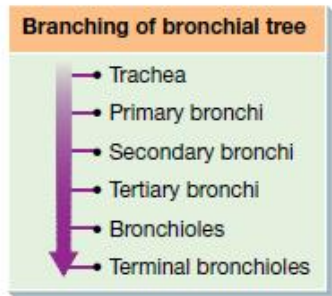
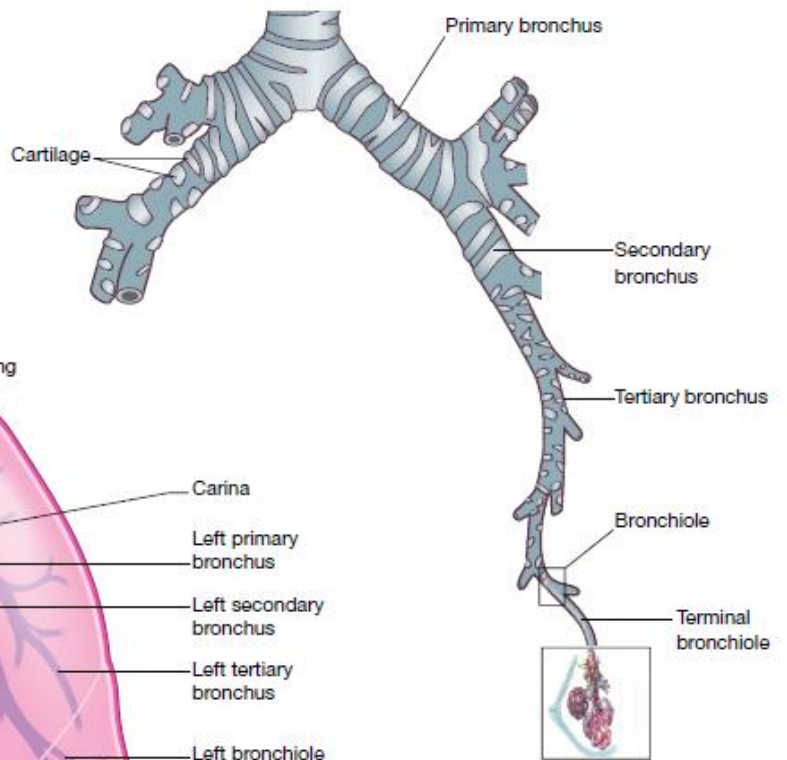


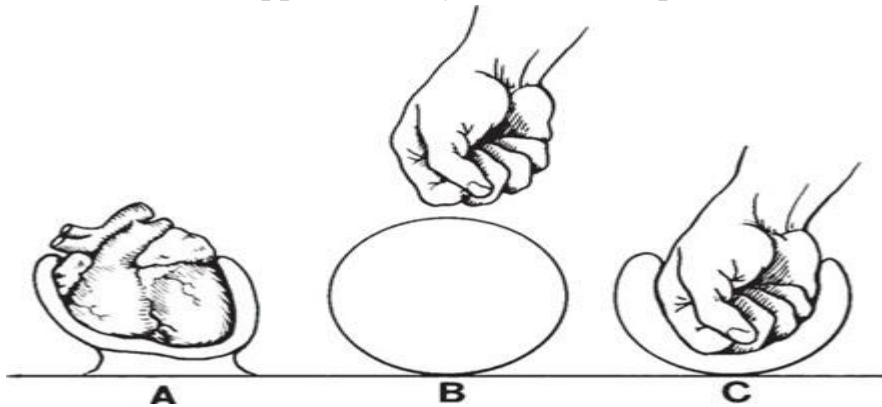
Figure 22.4 Bronchial tree



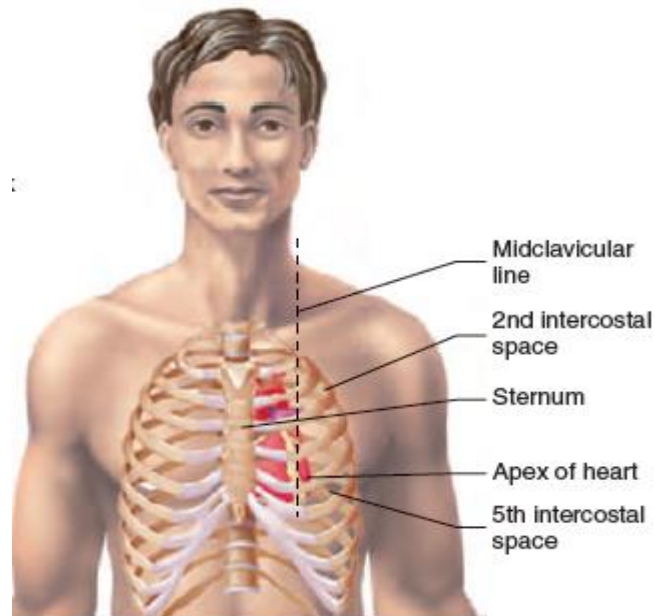
Anatomy of Heart

Anatomy of the heart

- **Location & size:**
- The size of the heart is approximately the size of a person's fist.



- The heart is located within the bony thorax.
- Its apex is directed towards the left hip and rests on the diaphragm at the end of the fifth intercostals space.
- The base of the heart is directed towards the right shoulder and lies beneath the second rib.



Covering and wall :

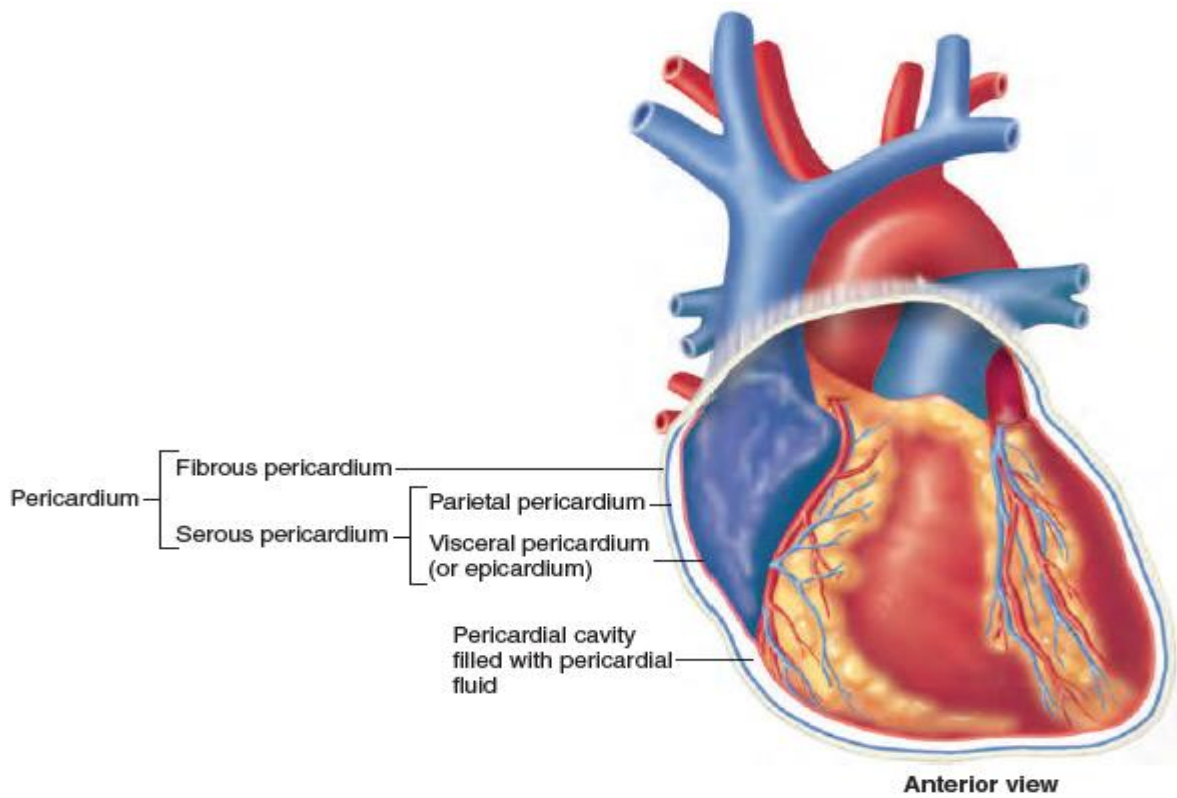
The heart is surrounded and covered by its own cavity, the **pericardial cavity** (*peri*, around +*cardio*, heart)

Covering: The pericardium is the double layer membrane that surrounds the heart.

1. Parietal pericardium, which is **fibrous pericardium**,(outer layer)

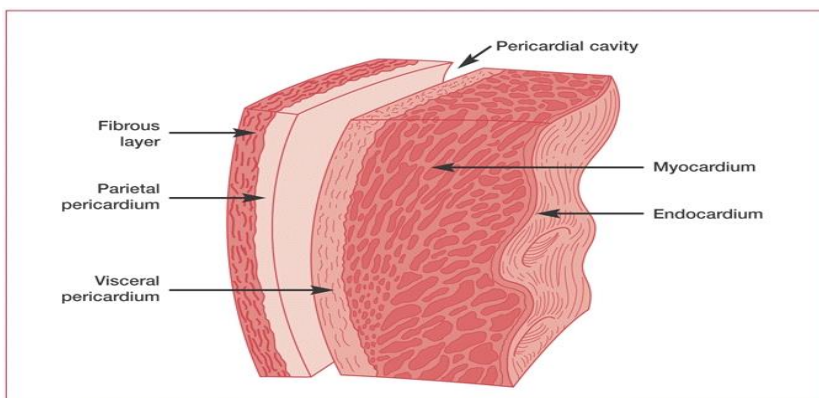
2. Visceral pericardium : which the inner layer of the heart consist of flat epithelial cells called the **serous pericardium**..

Between the parietal and visceral pericardial membranes is **serous fluid**, which prevents friction as the heart beats and allows the heart to beat easily.



Walls of the heart: The heart walls are composed of three layers:

1. Epicardium (outer layer)
2. Myocardium (middle layer), which is actually contract.
3. Endocardium (inner layer), it's a thin layer that lines the heart chambers.



Chambers and associated Great walls

The heart has four chambers or cavities.

1. **Two atria (auricles)**
2. **Two ventricles**
 - The **superior atria(upper)** are primarily the receiving chambers.
 - The **inferior ventricles(lower)** are discharging chambers.
 - The **left ventricle** forms its apex.

Valves :

The heart has four valves, which allow blood to flow in only one direction and prevent back flow into the atria when the ventricles contract.

A. Atrio - ventricular valves:

- **Bicuspid valve** (mitral valve) separates the left atrium from the left ventricle.
- **Tricuspid valve** separates the right atrium from the right ventricles.

Function:

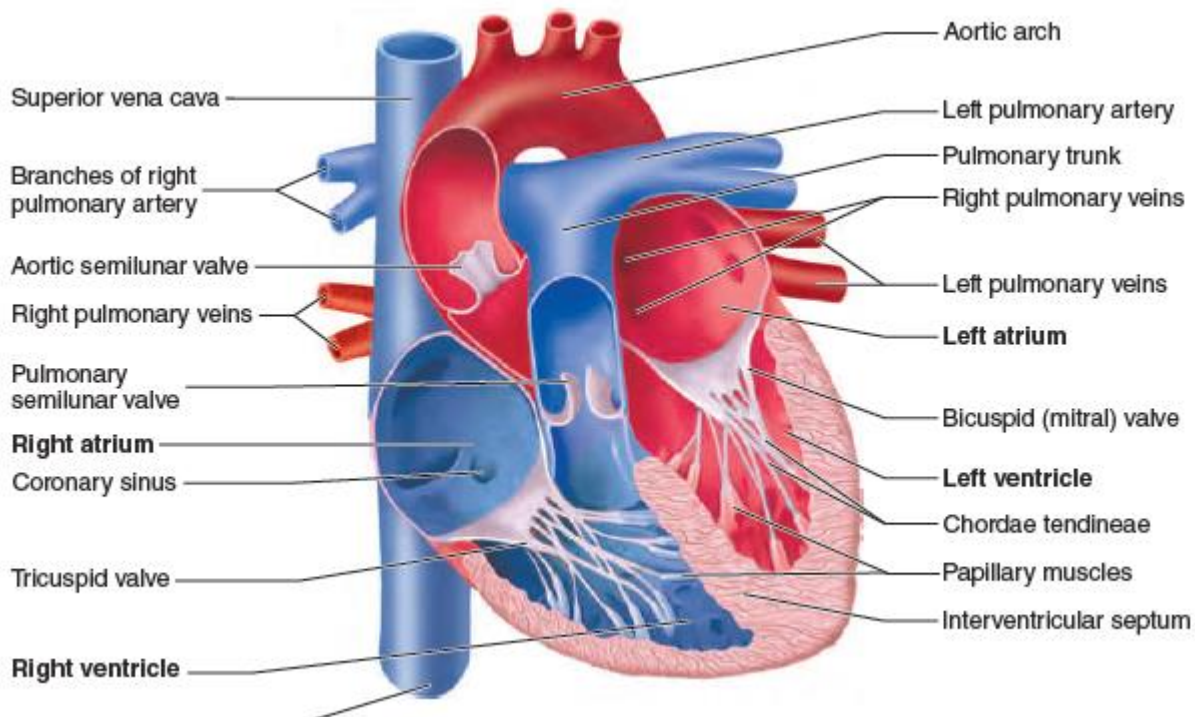
Prevent backflow into the atria when the ventricles are contracting.

B. Semi lunar valves:

- **Aortic valve** separates the left ventricle from the aorta.
- **Pulmonary valve** separates the right ventricle from the pulmonary artery (trunk).

Function:

- Prevent backflow into a ventricle when the heart is relaxed.



Coronary circulation(Cardiac) :

The heart receives about **5%** of the body's blood supply.

The heart receives the oxygenated blood & is nourished by the right and left coronary arteries . The coronary arteries branch from the ascending aorta and encircle the heart like a crown.

Blood flow to the myocardium occurs **during the relaxation phase**, this is the opposite of every other part of the body

1. Right coronary artery supplies:

- (i) **lateral** wall & **posterior** wall of the right ventricle.
- (ii) **Inferior** wall of the left ventricle.

3. The left coronary divides into :

- a. Left circumflex artery
- b. left anterior descending artery(LAD)

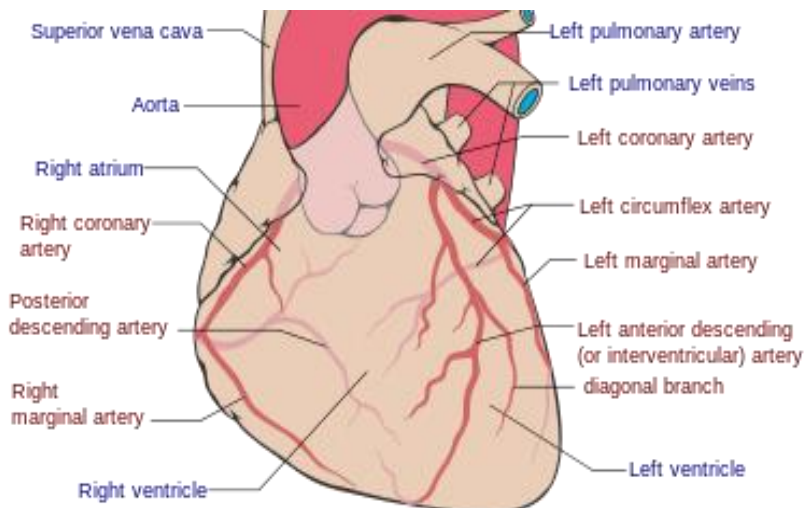
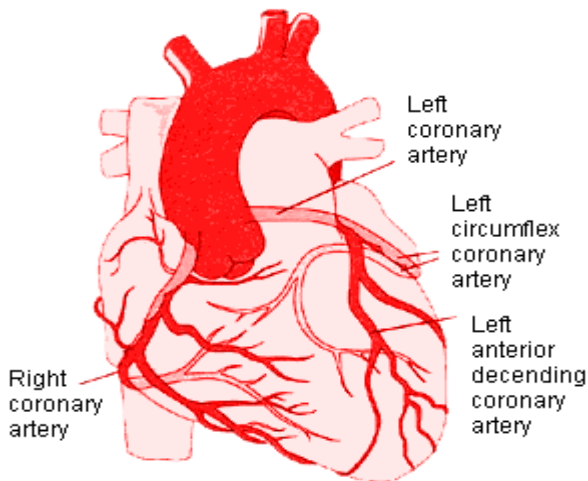
a. Circumflex artery supply:

- (i) The left atrium
- (ii) The **posterior** & **lateral** wall of the **left** ventricle

b. LAD supply:

- (i) The antero-lateral wall of the **left** ventricle
- (ii) The interventricular septum

(iii) The anterior wall of the **right** ventricle



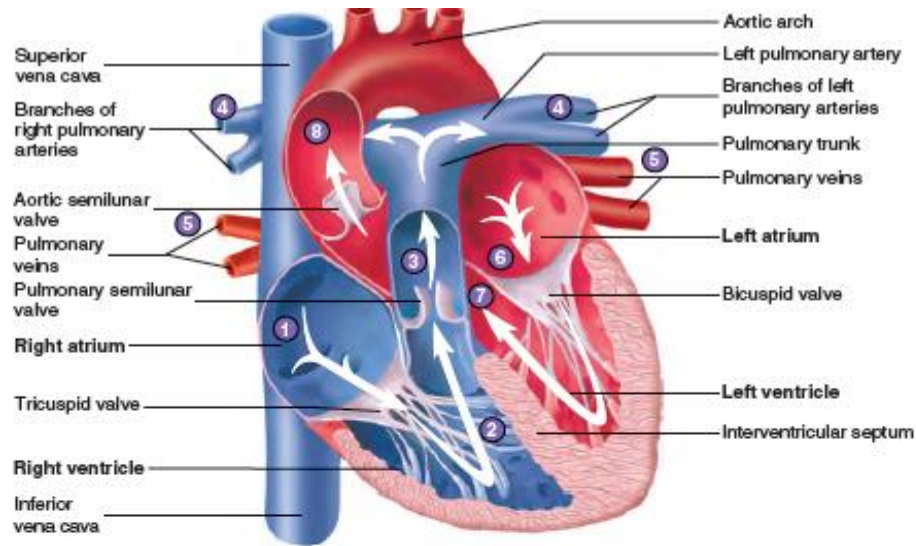
Systemic circulation: (from left ventricle to right atrium).

Systemic circulation which carries oxygenated blood away from the heart to the body, and returns deoxygenated blood back to the heart.

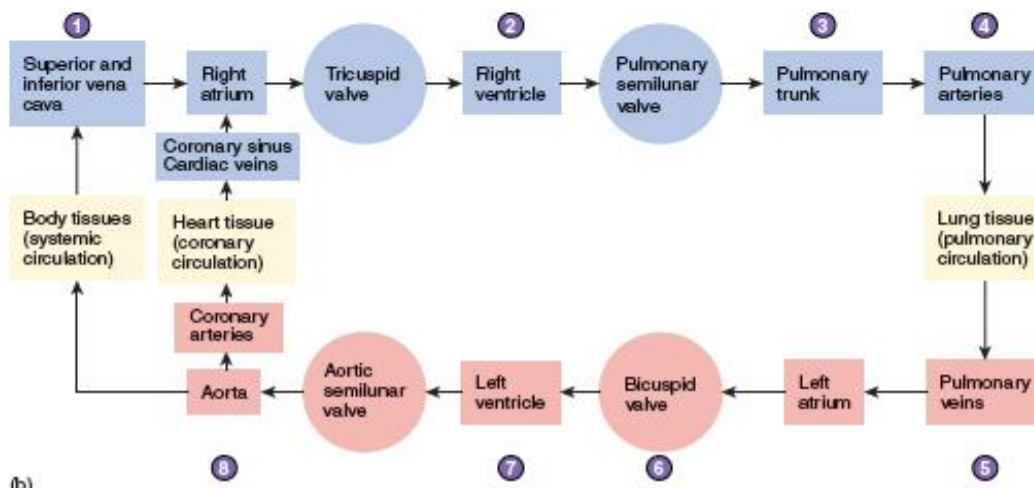
In systemic circulation the blood leaves the heart, through the

left ventricle –to **aorta** - to **smaller arteries**, - to **arterioles**, and finally

capillaries, oxygen in the blood diffuses into the cell.. Waste and carbon dioxide diffuse out of the cell into the blood which then moves to venous side, and then to the inferior and superior vena cava, through which the blood re-enters the heart at the right atrium.



(a)



(b)

Arteries and veins that connect with the heart and their functions :

1. **Superior vena cava** returns deoxygenated blood to the right atrium from the head and upper extremities.
2. **Inferior vena cava** returns deoxygenated blood to the right atrium from the trunk and lower extremities
3. **Pulmonary arteries** (two) carry blood from right atrium to the lungs.
4. **Pulmonary veins** (four) carry blood from lungs to the left side of the heart.
5. **Aorta** carries blood from the left side of the heart to the organs of the body.

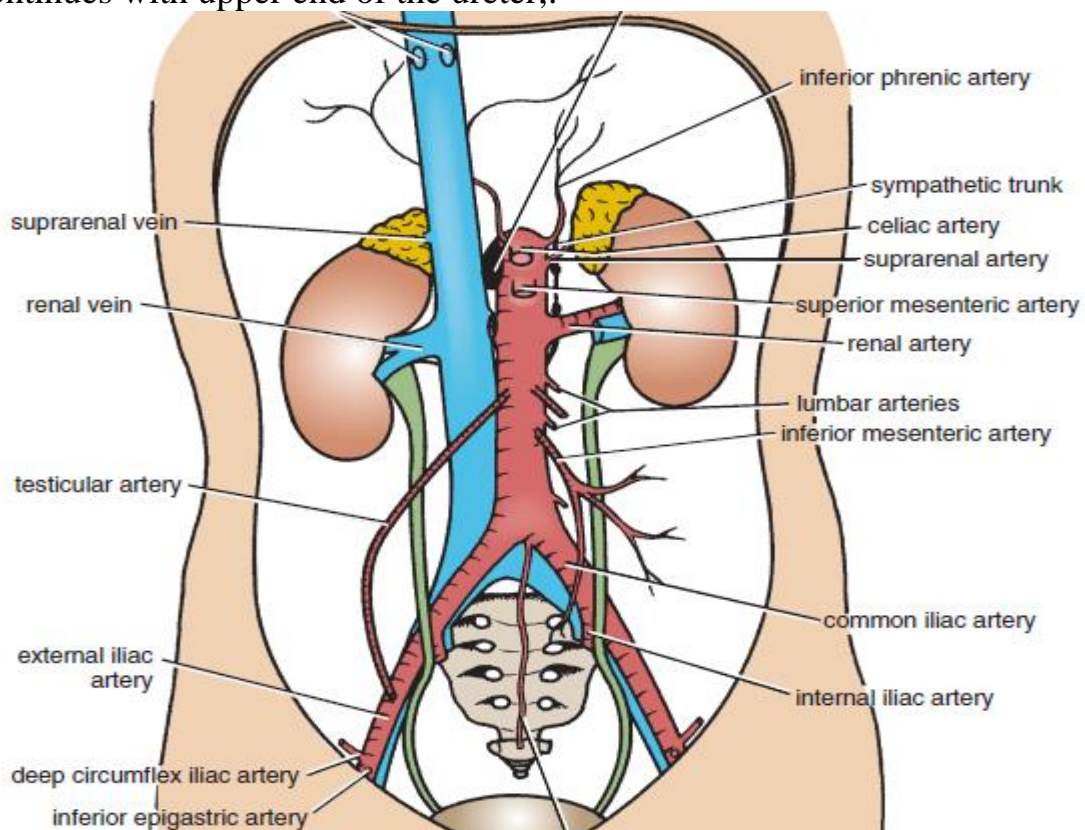
Anatomy

The Urinary System

The urinary system consists of the of 2 kidneys , two ureters, bladder, and urethra.

The Kidneys :

- The kidneys are solid, bean shaped organs.
- The right kidney is positioned slightly lower than the left.
- Each of which is about 11 cm long , 6 cm wide , 3 cm thick .
- The average weight is 150 gm in male & 135 gm in female
- Each kidney has lateral convex & medial concave border .
- In the center of medial border is a notch known as the hilum , which contain renal blood vessels , nerves .
- Medial to the hilum is the renal pelvis which is flat funnel shaped structure continues with upper end of the ureter.,.

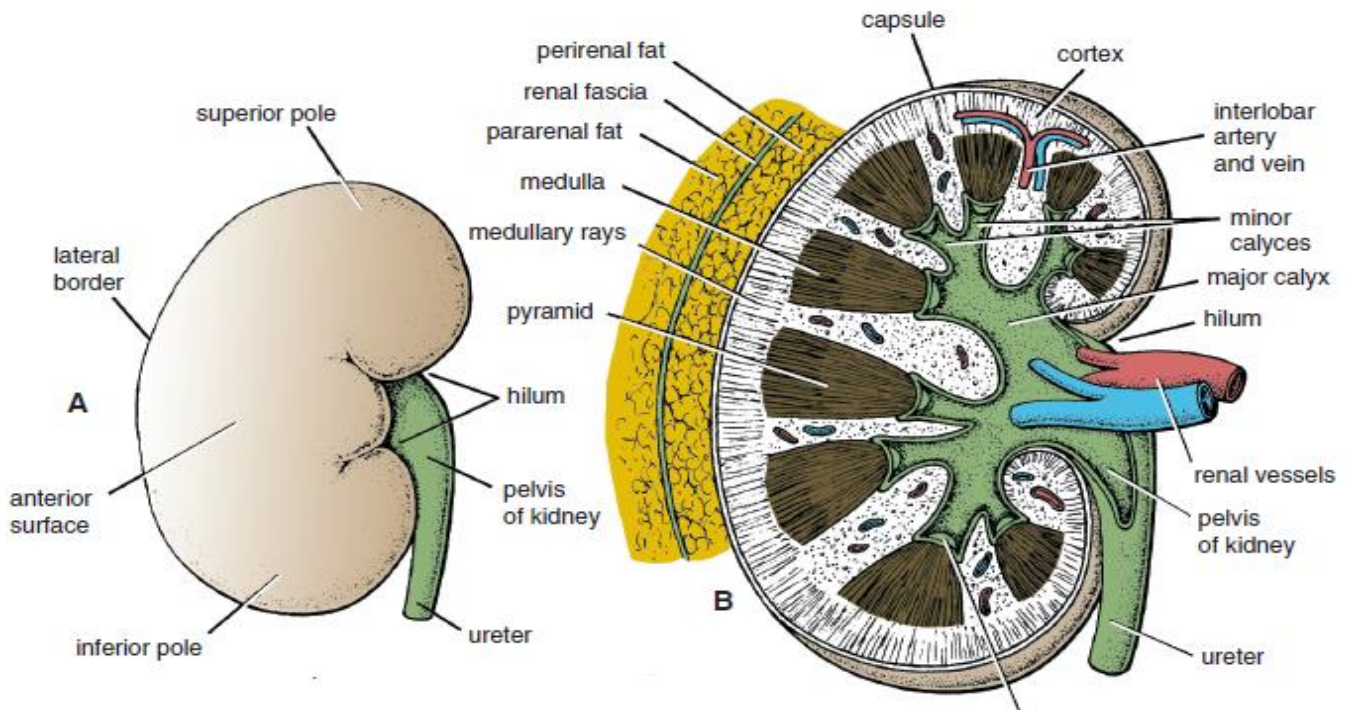


The Suprarenal glands (Adrenal glands) : Are situated on the upper pole of the kidney

Coverings of kidneys :

The kidneys have the following coverings :

1. **Fibrous capsule:** This surrounds the kidney and is closely applied to its outer surface.
2. **Perirenal fat:** This covers the fibrous capsule.
3. **Renal fascia:** This is a condensation of connective tissue that lies outside the perirenal fat and encloses the kidneys and suprarenal glands
4. **Pararenal fat:** This lies external to the renal fascia and is often in large quantity.



Longitudinal section

When a kidney is cut lengthwise, 2- regions become apparent.

1. **Cortex:** The outer region, which is light in color.
2. **Medulla:** It is a darker reddish-brown area, deep to the cortex.

The parenchyma of the kidney consists of closely packed renal tubules

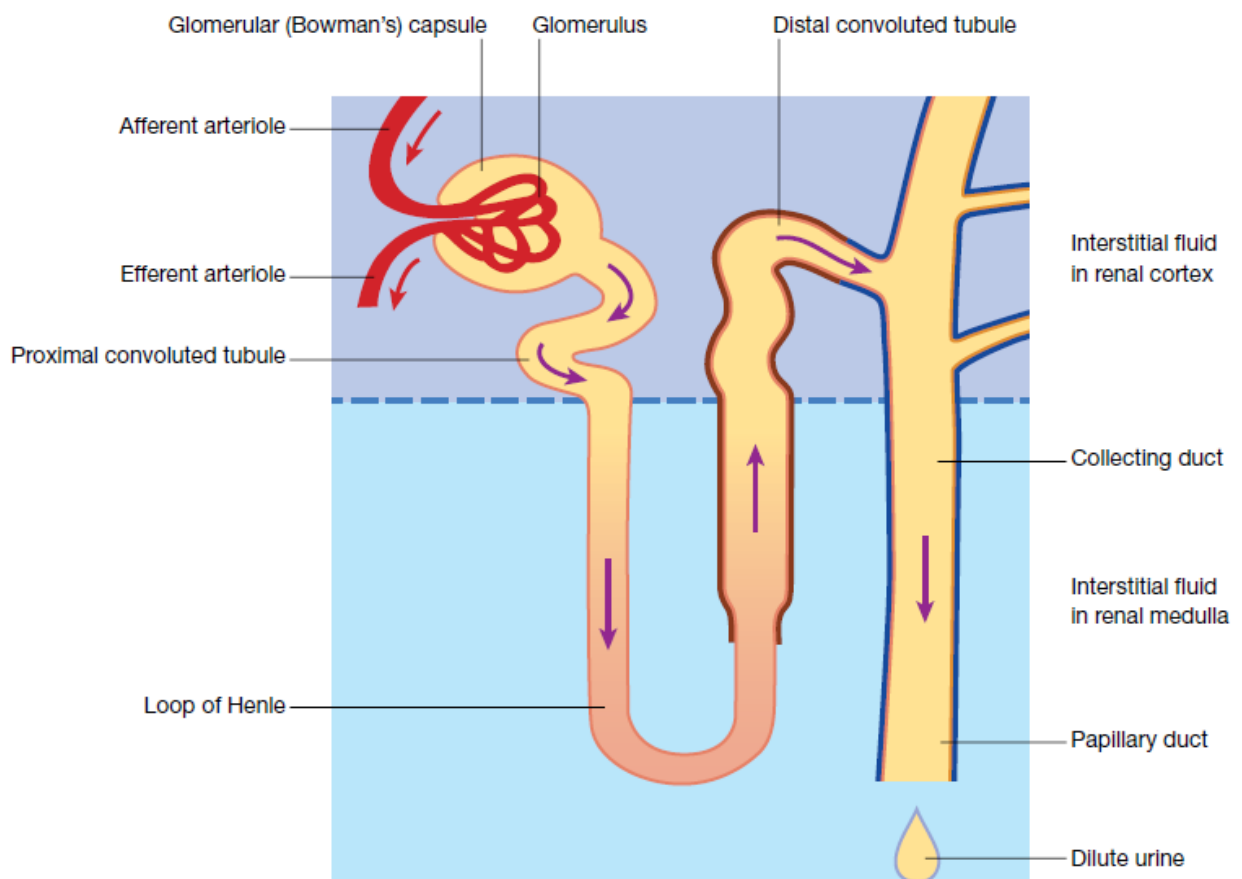
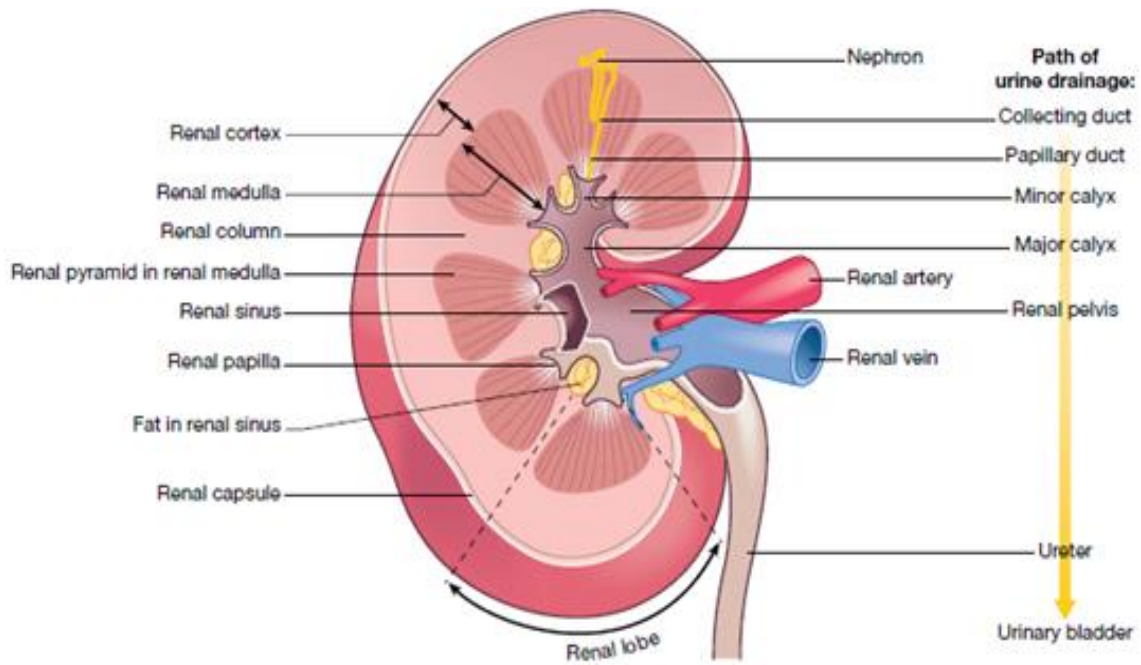
These renal tubules are consist of

1. Secretory tubules (Nephron):its function is the formation of urine.
2. Excretory tubules: Which are ducts that collect urine and carry it to the pelvis,

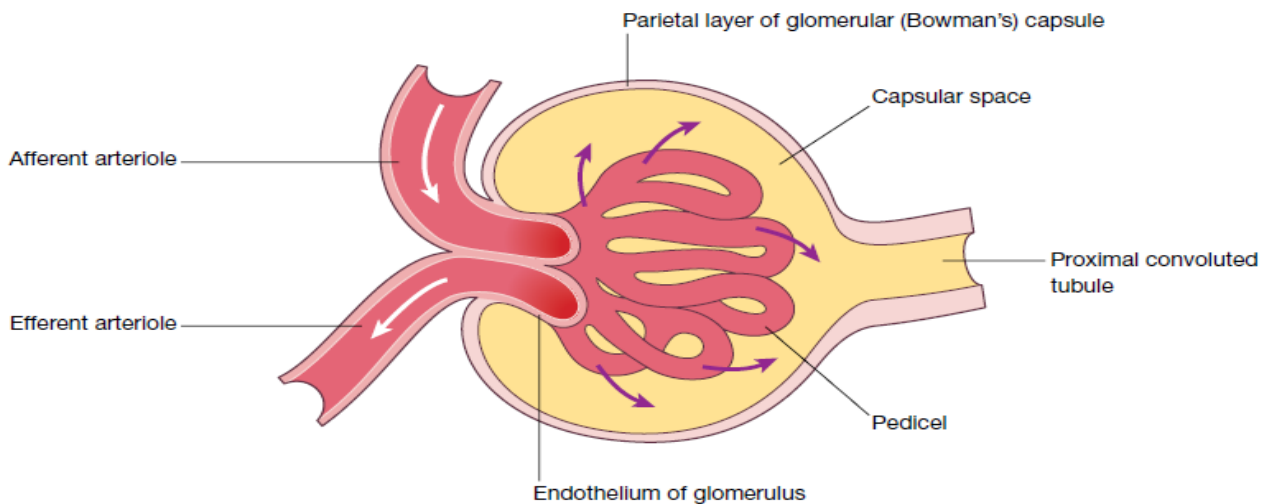
• Each nephron consist of:

1. Renal corpuscle which consist of two parts (Glomerulus, Bowman's capsule)
2. Proximal convoluted tubule.

- 3. Loop of Henle.
- 4. distal convoluted tubule



Bowman's capsule



The Ureter :

The ureters are slender tubes, 25-30cm long and 6mm in diameter. Each ureter runs from the kidney to the posterior aspect of the bladder.

Functions: The ureters carry urine from the kidneys to the bladder .

Urinary Bladder :

It is a smooth, collapsible muscular sac that stores urine temporarily.

. Three openings are seen in the bladder- the two ureter openings and the single opening of the urethra, which drain the bladder.

- In males, the prostate gland surrounds the neck of the bladder where it empties into the urethra.
- Empty bladder is 5-7.5cm long, while the full bladder is about 12.5cm long and holds about 500ml of urine, but it is capable of holding more than twice that amount (1500ml).
- Is the reservoir for urine received from kidneys.

The Urethra :

Is the canal conveying the urine from bladder to the exterior . It differs in the two sexes . The female urethra is short 4 cm long , which leaves the base of the bladder at the trigon . As urethra leaves the bladder it is surrounded by the external or urethral sphincter .

The male urethra is a channel it has 3 parts :

1. Prostatic portion
2. Perineal & membranous portion
3. Penile or spongy portion

----- End

Nursing College

Lecture -

Dr.Mohammed A.hayawi

Anatomy Nervous System

The nervous system

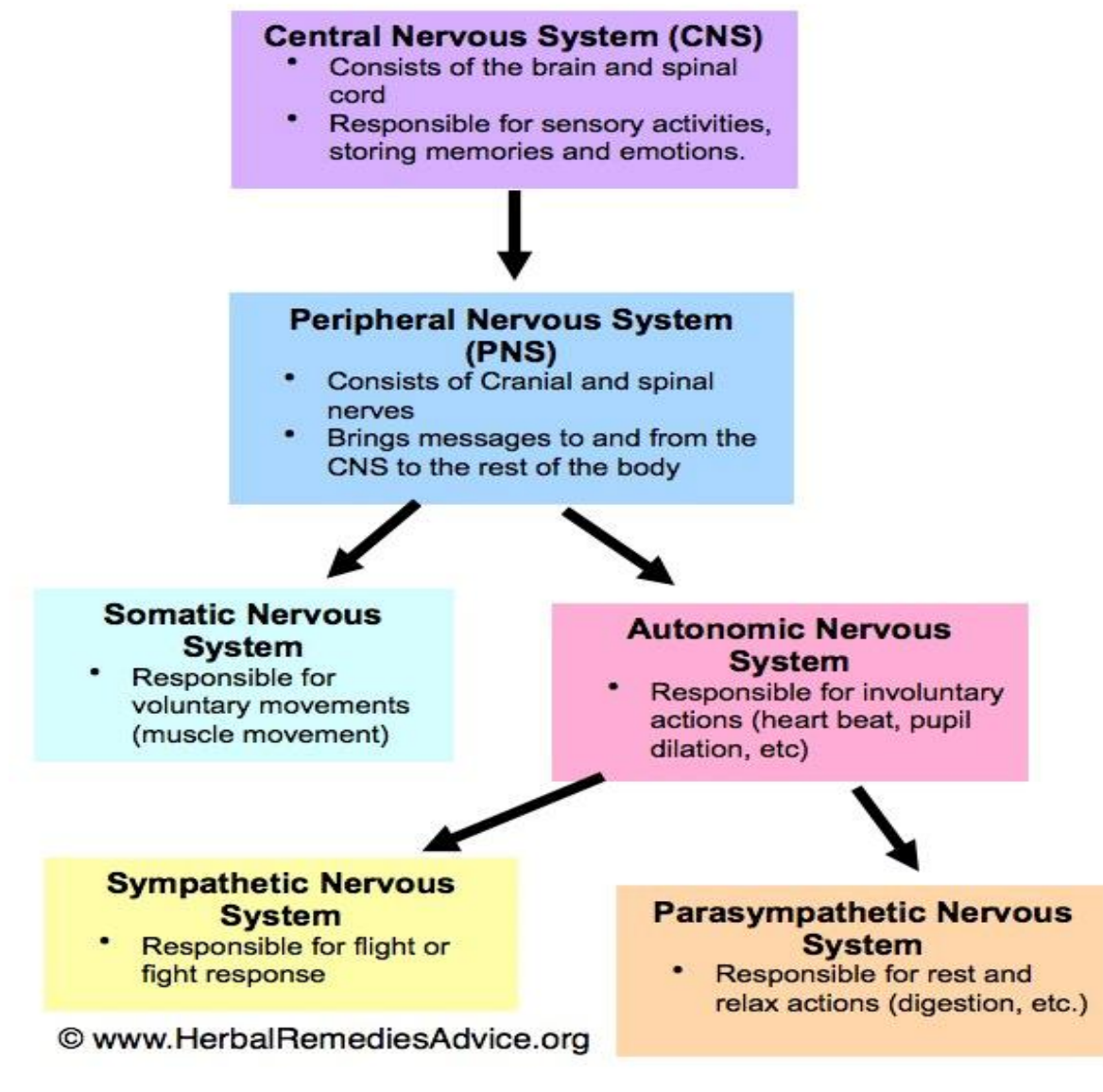
The Nervous System controls and coordinates all the functions of the body
It is the major controlling and communicating system of the body.

- The Nervous System consists of two main sub-divisions:
 - Central Nervous System (CNS): consist of **brain** and **spinal cord**
 - Peripheral Nervous System (PNS)
- The **Peripheral Nervous System** -- is the nerves outside the brain and spinal cord divided into two sub-divisions:
 - Somatic - voluntary (sensory and motor)
 - Autonomic - involuntary (sympathetic and parasympathetic)

Somatic ----- convey messages from the sense organs to the CNS
and from the CNS to the muscles and glands

Autonomic -----a set of neurons that control the heart, the intestines, and other organs

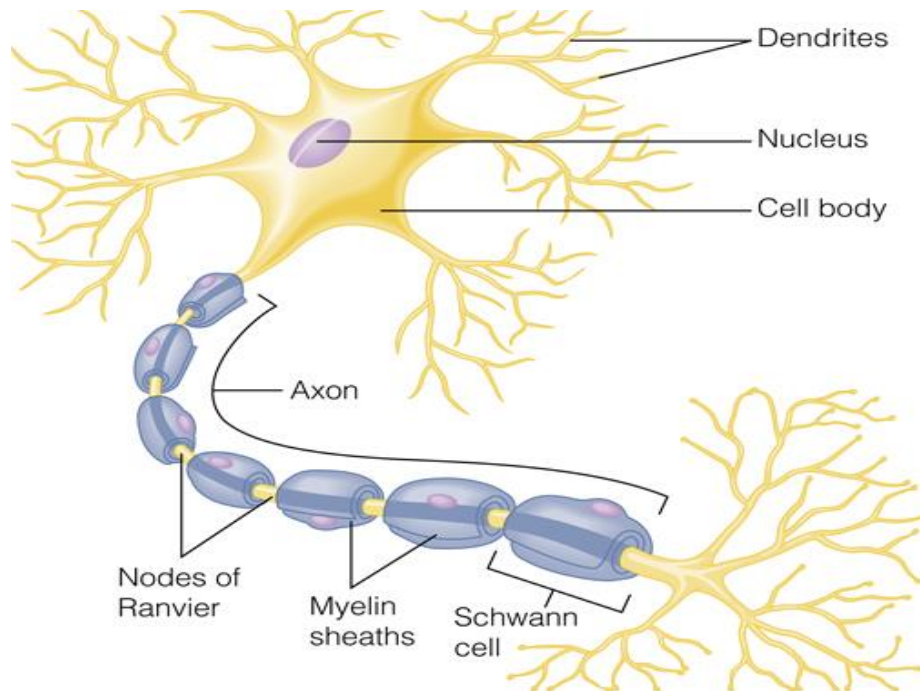
- **Type of neurons :**
 1. **Sensory neurons (afferent)**: send information from sensory receptors (e.g., in skin, eyes, nose, tongue, ears) TOWARD the central nervous system
 2. **Motor neurons (efferent)**: carries impulses from the CNS to organs, muscles and glands.
 3. **Interneurons:** send information BETWEEN sensory neurons and motor neurons.
Most interneurons are located in the central nervous system



Neurons : Also it called nerve cells.

Anatomical structures:

- **Cell body:** which contains the nucleus and is the metabolic center of the cell.
- **Dendrites:** highly branched processes
- **Axon:** a long process extending out from the neuron cell body.
- **Myelin:** It is a wax like membrane that covers the longest nerve fibers.
- **Schwann cells:** Specialized supporting cells that wrap tightly around the axon .
- **Myelin sheath:** encloses the axon



Brain ventricles:

It is a system of four communicating cavities within the brain and continuous with the central canal of the spinal cord.

The four ventricles consist of the **a. two lateral ventricles,**

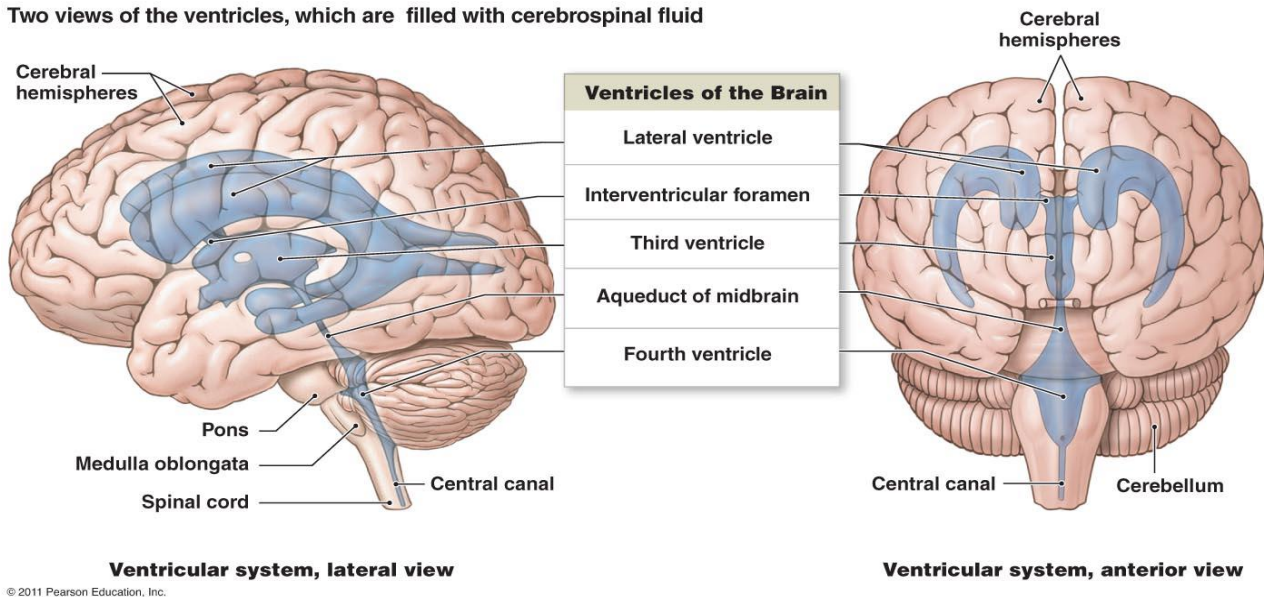
b. Third ventricle

c. Fourth ventricle:

- **Lateral ventricles** The lateral ventricles are two cavities located within the [cerebrum](#). The lateral ventricles communicate with the third ventricle through the interventricular foramen (opening).
- **The third ventricle** is a median (midline) cavity in the brain that is bounded by the thalamus and hypothalamus on either side. The third ventricle is a narrow cavity located between the two hemispheres
- **The fourth ventricle** is the most inferior (lowest) of the four ventricles of the brain.
- The fourth ventricle has a characteristic diamond shaped cavity located behind the [Pons](#) and [medulla oblongata](#).

The ventricles are filled with cerebrospinal fluid, which is formed by structures called choroid plexuses located in the walls and roofs of the ventricles.

Two views of the ventricles, which are filled with cerebrospinal fluid



Cerebrum (Cerebral Hemispheres): Cerebrum is the largest part of the human brain, which consists of two hemispheres separated by longitudinal fissure. It covers the superior part of the brain.

Diencephalons (interbrain)

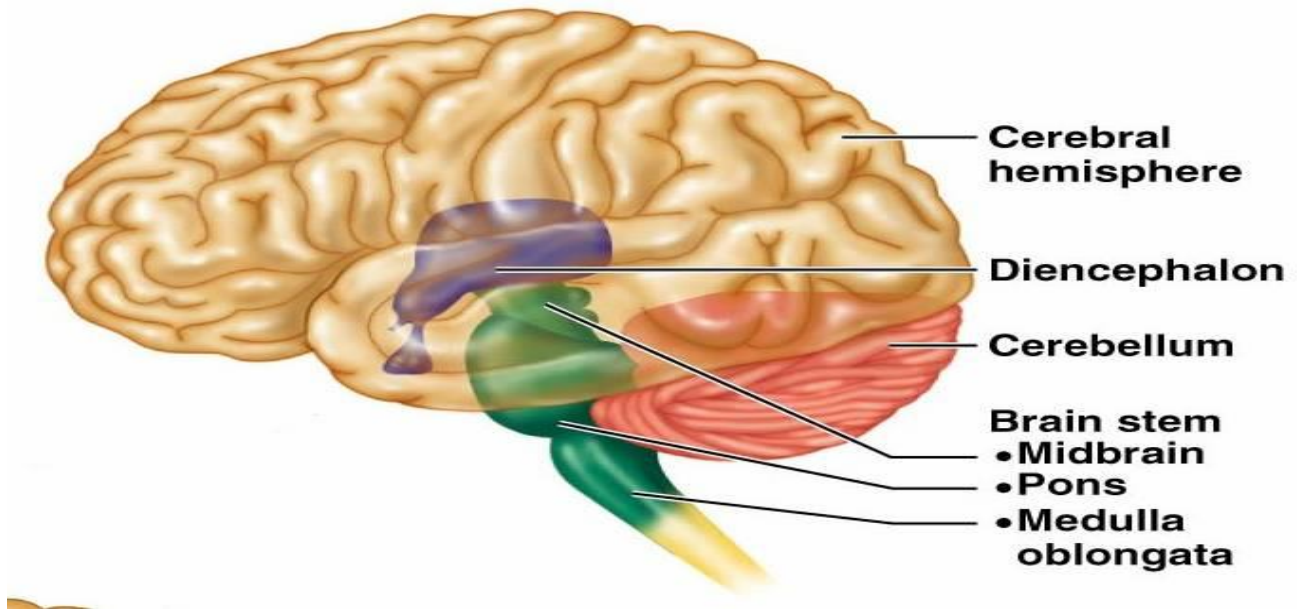
The major structures of the diencephalons are the

- 1. Thalamus:
- 2. Hypothalamus
- 3. Epithalamus

Brain stem

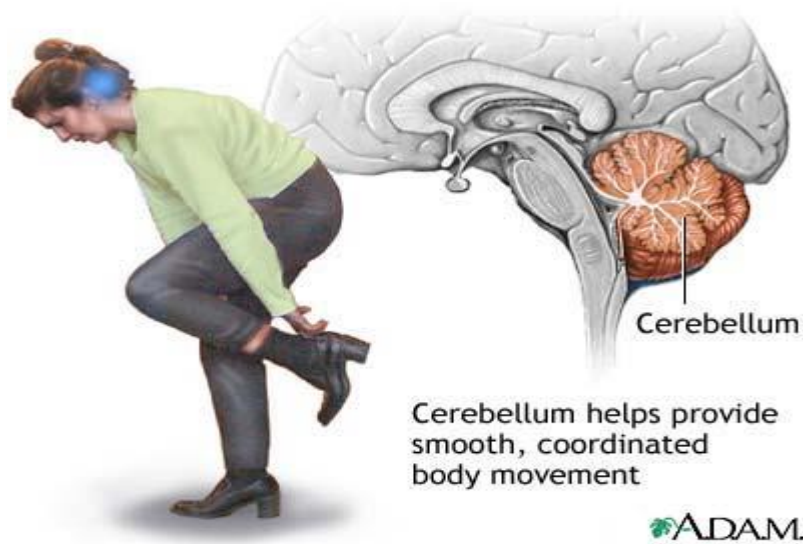
It is about the size of a thumb in diameter and approximately 3 inches long. Its structures are

- 1. Midbrain الدماغ المتوسط
- 2. Pons (الجسر)
- 3. Medulla oblongata:

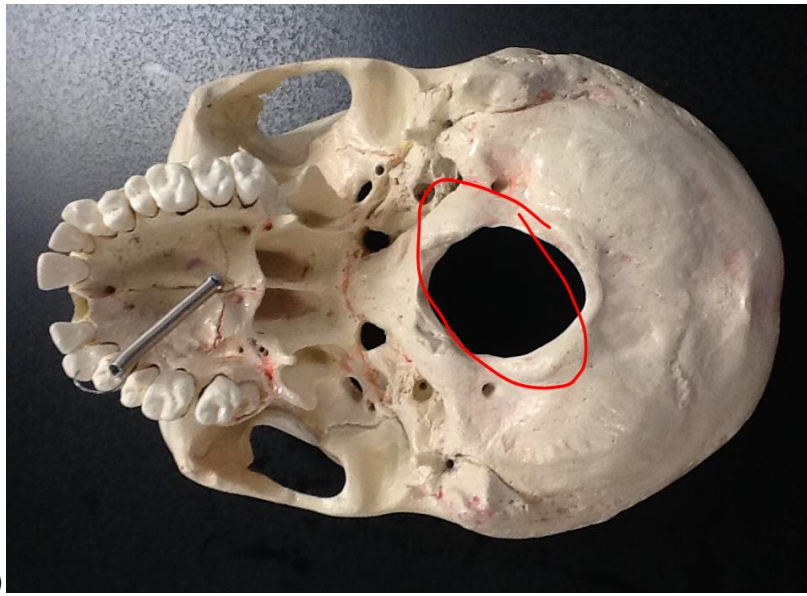


Cerebellum

The large cauliflower like structure, projects dorsally from under the occipital lobe of cerebrum.



Spinal cord: is a continuation of brain stem. It extends from the large opening (foramen magnum) in the base of skull down to the lower back (1st lumbar vertebrae). It is a cylindrical shaped structure about 42 cm long and about 2.5 cm in diameter.



Cranial nerves

The 12 pairs of cranial nerves primarily supply the head and neck. **Only one pair (vagus nerves) extends to the thoracic and abdominal cavities.**

Classification

Sensory nerves S 821	Motor nerves 12, 11,643	Mixed nerves 1975
I Olfactory	III Oculomotor	V Trigeminal
II Optic	IV Trochlear	VII Facial
VIII Vestibulo-cochlear	VI Abducens	IX Glossopharyngeal
	XI Spinal accessory	X Vagus
	XII Hypoglossal	

Spinal nerve and nerve plexus

The 31 pairs of human spinal nerves are formed by the combination of the ventral and dorsal roots of the spinal cord.

- Cervical nerves – 8 pairs (C1: emerges between the skull and the 1st vertebrae)
- Thoracic nerves – 12 pairs
- Lumbar nerves – 5 pairs
- Sacral nerves – 5 pairs
- Coccygeal nerves – 1 pair

Almost immediately after being formed, each spinal nerve divides into dorsal and ventral rami, making each spinal nerve only ½ inch long.

- The rami contain both motor and sensory fibers, thus damaging the spinal nerve or either of its rami results both in loss of sensation and flaccid paralysis.

Nursing College

Lecture -

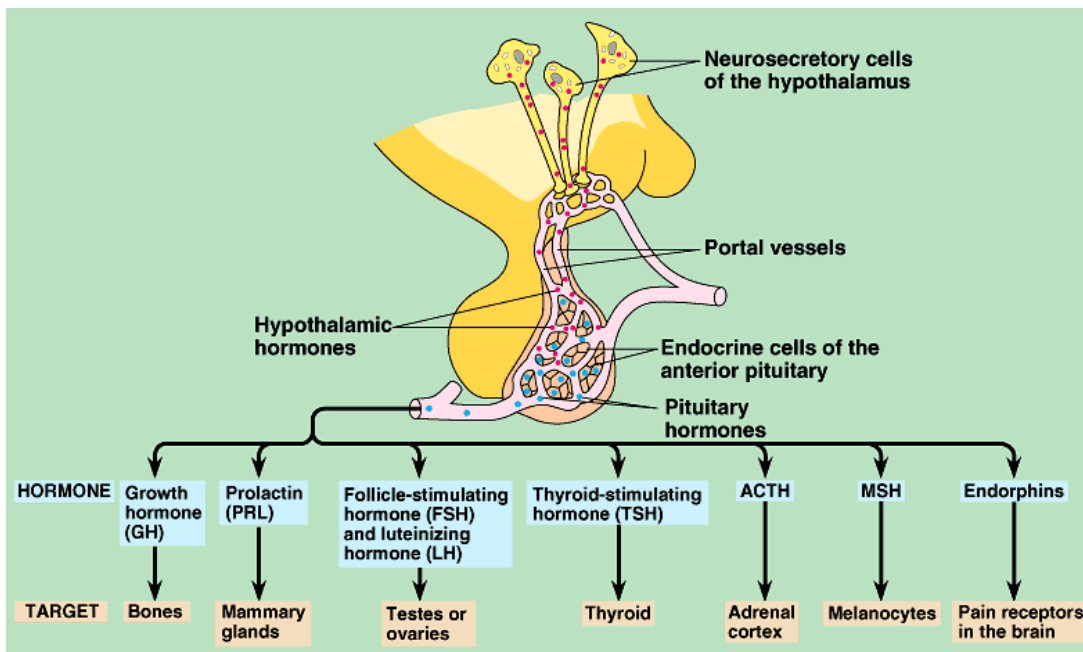
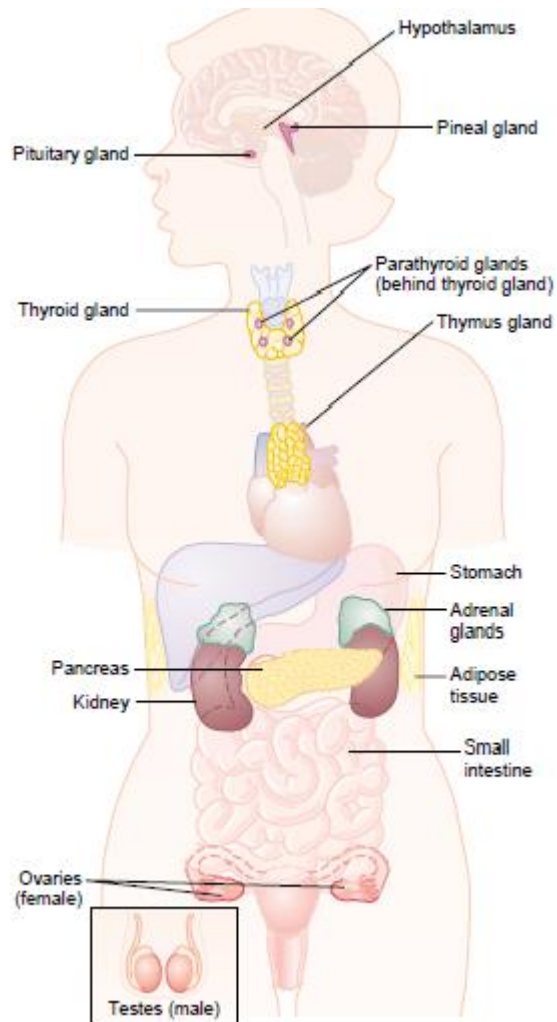
Dr.Mohammed A.hayawi

Endocrine System

Endocrine glands: are ductless glands that produce their hormones and release into the blood or lymph. They have a very rich blood supply. The endocrine glands of the body include: **pituitary, thyroid, parathyroid, adrenal, pineal and thymus glands, pancreas, the gonads (ovaries and testes) and hypothalamus.**

Difference between endocrine and exocrine glands :

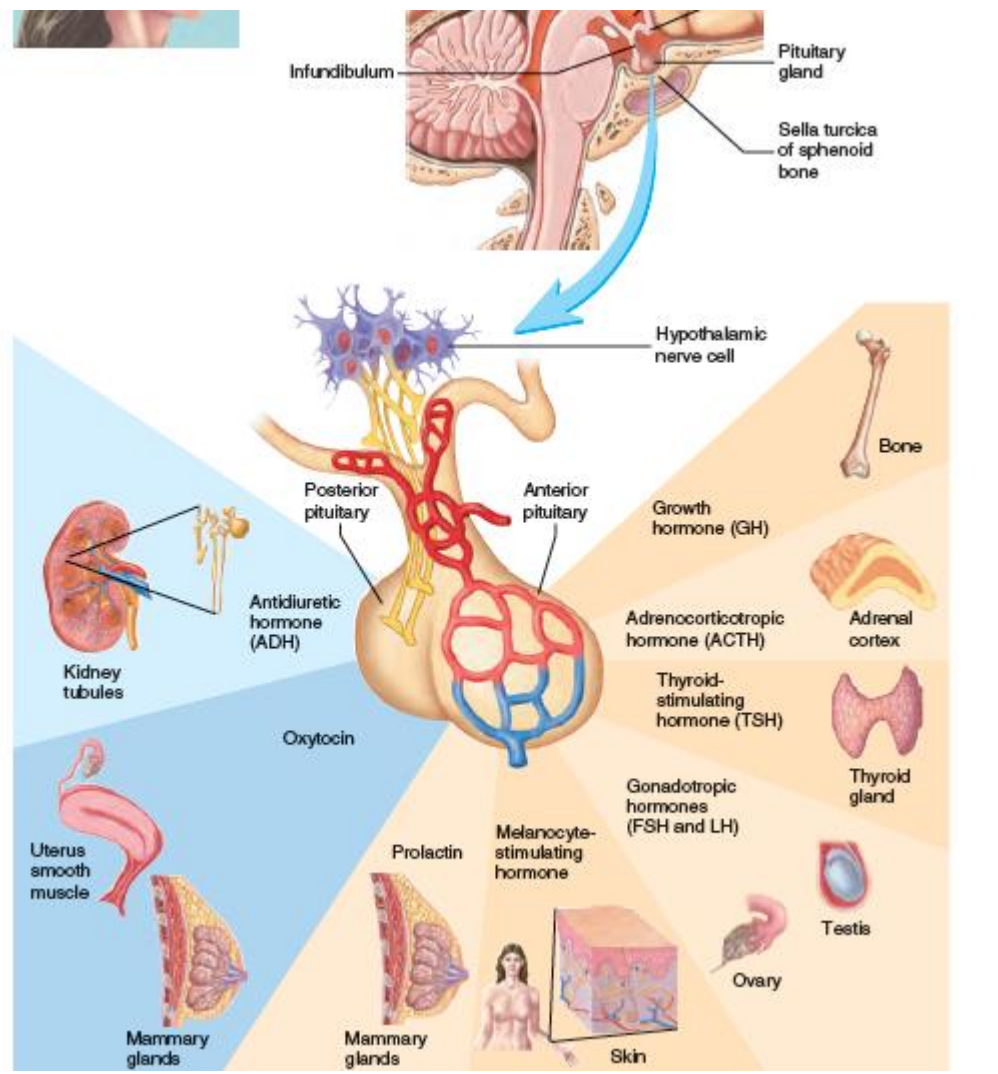
Exocrine glands: These glands release their products at the body's surface or into body cavities through ducts.



(b) The anterior pituitary

Pituitary glands (hypophysis)

Is a small gland— about 1 centimeter in diameter and 0.5 to 1 gram in weight— that lies in the *sella turcica*, a bony cavity at the base of the brain, and is connected to the hypothalamus by the *pituitary* (or *hypophysial*) stalk.



The pituitary gland is divided into two distinct portions: and

1. The *anterior pituitary*, also known as the *adenohypophysis*,
2. The *posterior pituitary*, also known as the *neurohypophysis*.

The hypothalamus is responsible for the control of pituitary gland
Pituitary gland has two functional lobes :

- * **Anterior** pituitary (**glandular tissue**)
- * **Posterior** Pituitary (**nervous tissues**)

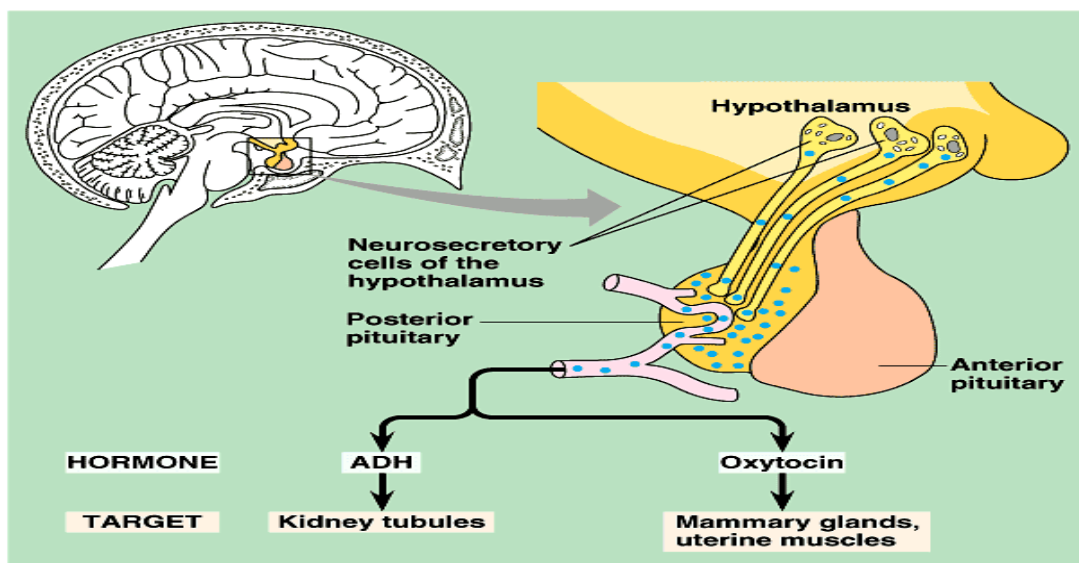
Hormones of the anterior pituitary

1. Growth hormone (GH)
2. Prolactin (PRL)
3. Adrenocorticotropic hormone (ACTH)
4. Thyroid – stimulating – hormone (TSH) or Thyrotropic Hormone
5. Gonadotropic hormones.
 - a. Follicle – stimulating – hormone (FSH)
 - b. Luteinizing hormone (LH).

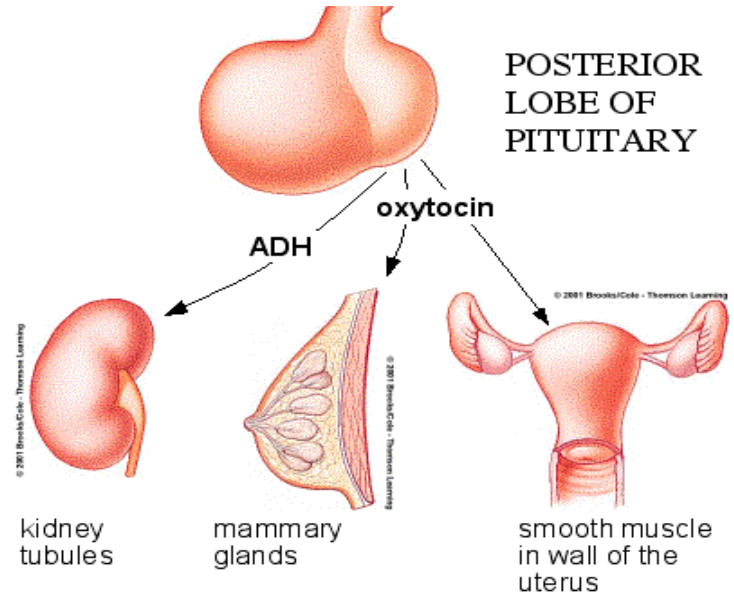
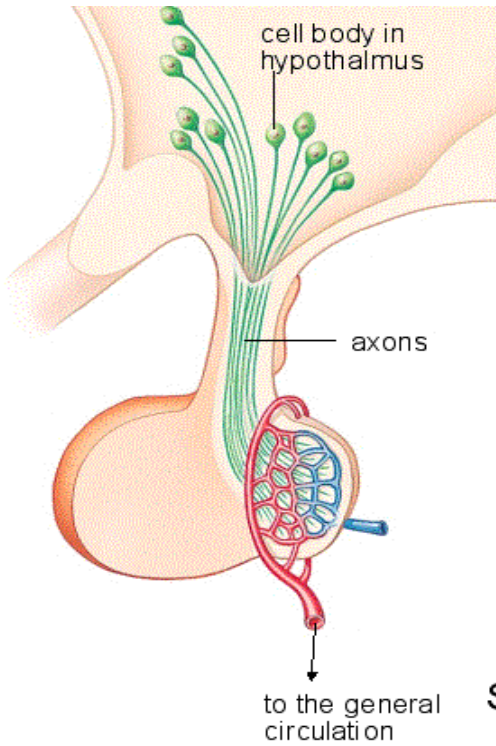
• Hormones of the posterior pituitary gland

The posterior pituitary is not an endocrine gland in the strict sense, because it is simply acts as a storage area for hormones made by hypothalamic neurons.

1. Antidiuretic hormone (ADH or vasopressin)
2. Oxytocin (OT)



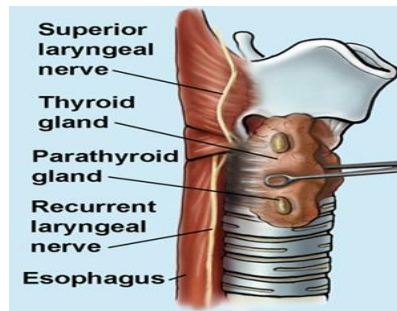
(a) The posterior pituitary



Stores and secretes hormones that were synthesized in the hypothalamus

Thyroid gland

- It is a big structure located at the midline of the neck in front of the larynx and trachea below Adam's apple. It consists of 2 lobes right and left



It secretes two hormone

1. Thyroid hormones - thyroxin T₄ (tetra iodothyronine)
- T₃ (tri iodothyronine)
2. Calcitonin

The T means thyroid and are present in the

The (3,4) refers to the numbers of iodine atoms that , molecule of the hormone

Secretion of thyroid hormones

- The hypothalamus is responsible for the control of pituitary gland.
- The hypothalamus secrete TRH hormone(thyroid releasing hormone) that reach the anterior pituitary cells and causing secretion of TSH.
- TSH reaches the thyroid gland through the blood stream which lead to secretion of T3 and T4 .
- T3 and T4 receptors are found in all of the body cells.

Calcitonin :

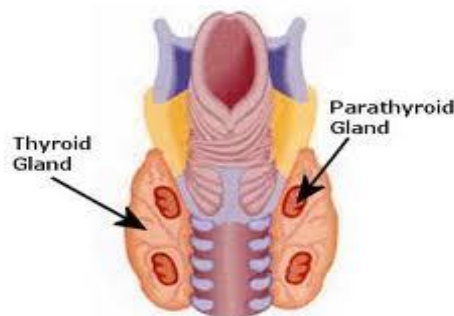
It acts **antagonistically** to parathyroid hormone.

- **Secreted** by Para follicular cells (C cells).
- **Secretion** stimulated by **increased blood calcium level**.
- **Actions: decreases blood calcium levels**.
- **Bone:** increased the rate of calcium deposited in bone.

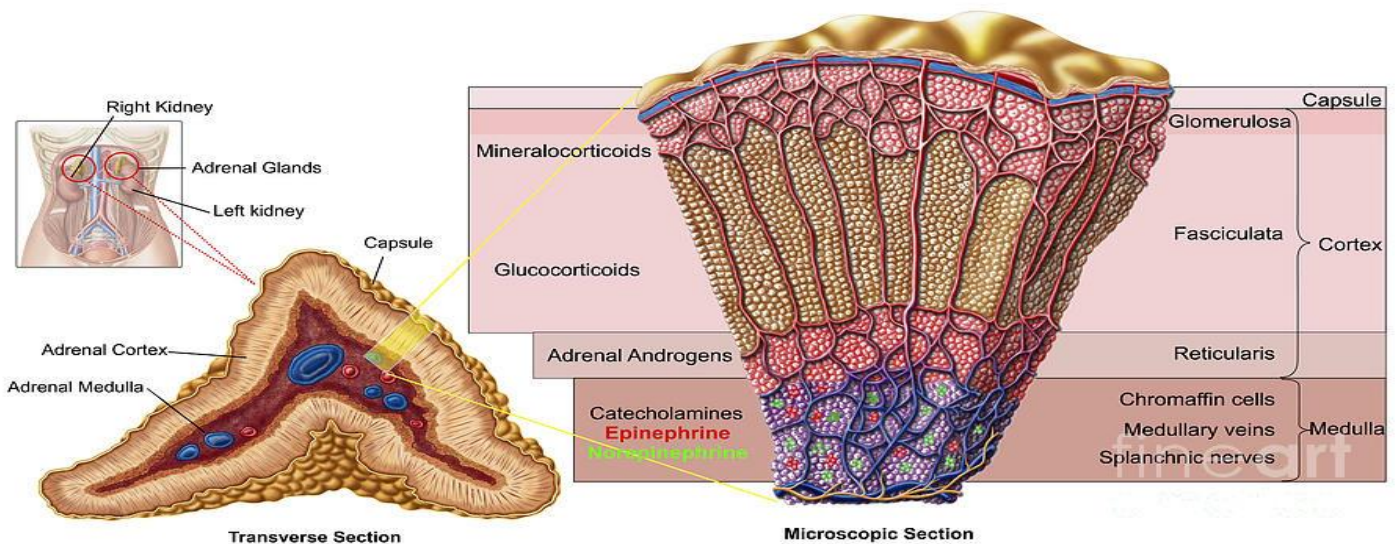
Parathyroid glands

They are four collection of cells embedded in the substances of the thyroid gland.

Secrete **Parathormone hormone**,.



Adrenal glands



There are two adrenal glands, one above each kidney. The outer portion of each gland is called the adrenal cortex; the inner portion is called the adrenal medulla.

Histologically , the glands consist of **cortex** and **medulla** .

- The cortex is more important than medulla
- The **adrenal cortex is essential for life**
- The **cortex is glandular** in the histological nature while the **medulla is neural**.

The adrenal cortex has three layers:

1. **The outer layer** is called:
Zona glomerulosa and secretes **mineralo-corticoids** mainly **Aldosterone**.
2. **The middle layer** is called:
Zona fasciculata and secretes **gluco-corticoids** mainly **Cortisol**.
3. **The inner layer** is called :
Zona reticularis and secretes **gonado-corticoids** (Sex hormones).

ZONA GLUMERULOSA:

- Its cells secrete a group of hormones called **mineralocorticoids** .

The most well known hormones of mineralocorticoids are :

1. aldosterone
2. deoxycorticosterone (DCC)

ZONA FASCICULATA:

- It secretes about ten hormones which are collectively called **glucocorticoids**
- **The most important two are :**
 1. Cortisol
 2. Corticosterone.

Regulation and control of cortisol

- **CRH** that secreted by hypothalamus stimulates corticotrops of anterior pituitary to secrete ACTH in the blood and reaching zona fasciculata of the adrenal glands and cells to secrete cortisol.
- **If cortisol** increased above normal level this will inhibit the secretion of both CRH from the hypothalamus and ACTH from the anterior pituitary.

ZONA RETICULARIS

- it secretes a group of hormones called sex hormones
- Zona reticularis secrete androgen and estrogens in both sexes .

The adrenal medulla is the center of the adrenal gland.

It secretes catecholamine hormone (epinephrine (80%) and non-epinephrine (20%)).

Hormones of adrenal medulla-

- **The hormones secreted by the adrenal medulla are called catecholamine and include adrenaline and noradrenalin.**
- **Tumor of the medullary cells is called pheochromocytoma. This causes excessive secretion of the catecholamines results in the hypertension that is of hormonal cause**

Thymus gland

It is located in the upper thorax, posterior to the sternum. It is large in infants and children. It decreases in size throughout adulthood

The thymus produces a hormone called thymosin. During childhood thymosin hormone acts an “incubator” for the maturation of a special group of white blood cells (lymphocytes) that are important in the immune response

Pancreas

Pancreatic islet

The pancreas is located close to the stomach in the abdominal cavity. It contains both exocrine and endocrine cells.

- **The exocrine cells** (acinar cells) release digestive enzymes into the duodenum via the pancreatic duct.
- **The endocrine cells** release hormones into the blood stream. The endocrine portion of the pancreas consists of a cluster of cells called **pancreatic islets** (islets of langerhans)

CONTROL AND REGULATION OF SECRETION OF INSULIN:

- B- cells of islets of Langerhans are highly sensitive to glucose level in blood,
- After the meals, increase in glucose level will stimulate the B-cells to secrete insulin to deal with this excess of glucose. In **contrast** ,hypoglycemia inhibits the B-cells to secrete insulin .
- liver regulates the blood glucose level.
- Excess glucose is converted to glycogen (glycogenesis) when blood glucose is high; the hormones insulin and cortisol facilitate this process.

During hypoglycemia or stress situations, glycogen is converted back to glucose (glycogenolysis) to raise the blood glucose level. Epinephrine and glucagon are the hormones that facilitate this process.

Pineal gland (pineal body)

It is a small coned shaped gland found in the roof of the third ventricles of the brain.

Although many chemical substances have been identified in the pineal glands, only one hormone ---**Melatonin** appears to be secreted in substantial amounts. The level of melatonin rises and falls during the course of the day and night.

- Peak level occurs at night and makes us drowsy.
- The lower level occurs during daylight around noon.
- Melanin appears to play an important role in establishing the body's day-night cycle.

