Short Notes
in
ANATOMY

First year - Nursing college

By

Dr. Wasfi Dhahir

2017-2018

المعلومات في هذه الملزمة تعتبر خطوط دالة وملاحظات تشير الى المواضيع المنهجية

ودليل لمراجعة المصادر المعتمدة لهذه لمادة التشريح

References

Kenneth.S Saladin (2007)anatomy and physiology.4th edition

Eliane N. Marieb (2007) human anatomy and physiology 7th edition San Francisco CA94111.

Gary A and Kevin T (2007) anatomy and physiology 8th edition . printed by United States of America

Anne W. na Allison Grant (2010) anatomy and physiology 11th edition .British library . printed in chaina.

Susannah N . (2005) Mader' S understanding Human anatomy and physiology , 6th edition

Introduction of human body

Human anatomy is one of the basic essential sciences of medicine, concerned with the study of the structure of organisms and their parts including their systems, organs and tissues**.** Anatomy mean **cutting parts**

It includes

1-The appearance

2-Position of the various parts.

3-The materials from which they are composed.

4- Their locations .

5-Their relationships with other parts**.**

Methods used include dissection, in which a body is opened and its organs studied, and endoscopy, in which a video camera-equipped instrument is inserted through a small incision in the body wall and used to explore the internal organs and other structures. Angiography using X-rays or magnetic resonance angiography are methods to visualize blood vessels.

In addition to visual, there are three other methods by which anatomy is studied: **palpation,** which is physical contact **;Auscultation**, such as when a doctor listens to your breathing; and **percussion**, such as when a doctor taps on your chest. Medical devices such as CT scans or magnetic resonance imaging (MRI), and dissection can also be used to assist in the study of anatomy.

Types of anatomy

Comparative anatomy

description and comparison of the form and structure of different animals.

Developmental anatomy

the changes in form from fertilization to adulthood, including embryology, fetology and postnatal development.

Gross anatomy(Macroscopic anatomy)

that dealing with structures visible with the unaided eye. Called also macroscopic anatomy.

Microscopic anatomy

anatomy revealed by microscopy; includes histology and cytology.

Morbid anatomy

anatomy of diseased tissues. Called also pathological anatomy.

Pathological anatomy

see morbid anatomy (above).

Radiological anatomy

anatomy revealed by the techniques of radiography and fluoroscopy.

Special anatomy

anatomy devoted to study of particular organs or parts.

Topographic anatomy

that devoted to determination of relative positions of various body parts; regional anatomy.

X-ray anatomy

Tissue cells

All organisms, from the simplest to the most complex, are composed of cells—whether the single cell of a bacterium or the trillions of cells that constitute the human body. These cells are responsible for all structural and functional properties of a living organism.

Cytology, is the science deal with the study of cell structure and function, is therefore indispensable to any true understanding of the workings of the human body, the mechanisms of disease, and the rationale of therapy.

The modern cell theory:

1. All organisms are composed of cells and cell products.

2. The cell is the simplest structural and functional unit of life. There are no smaller subdivisions of a cell or organism that, in themselves, are alive.

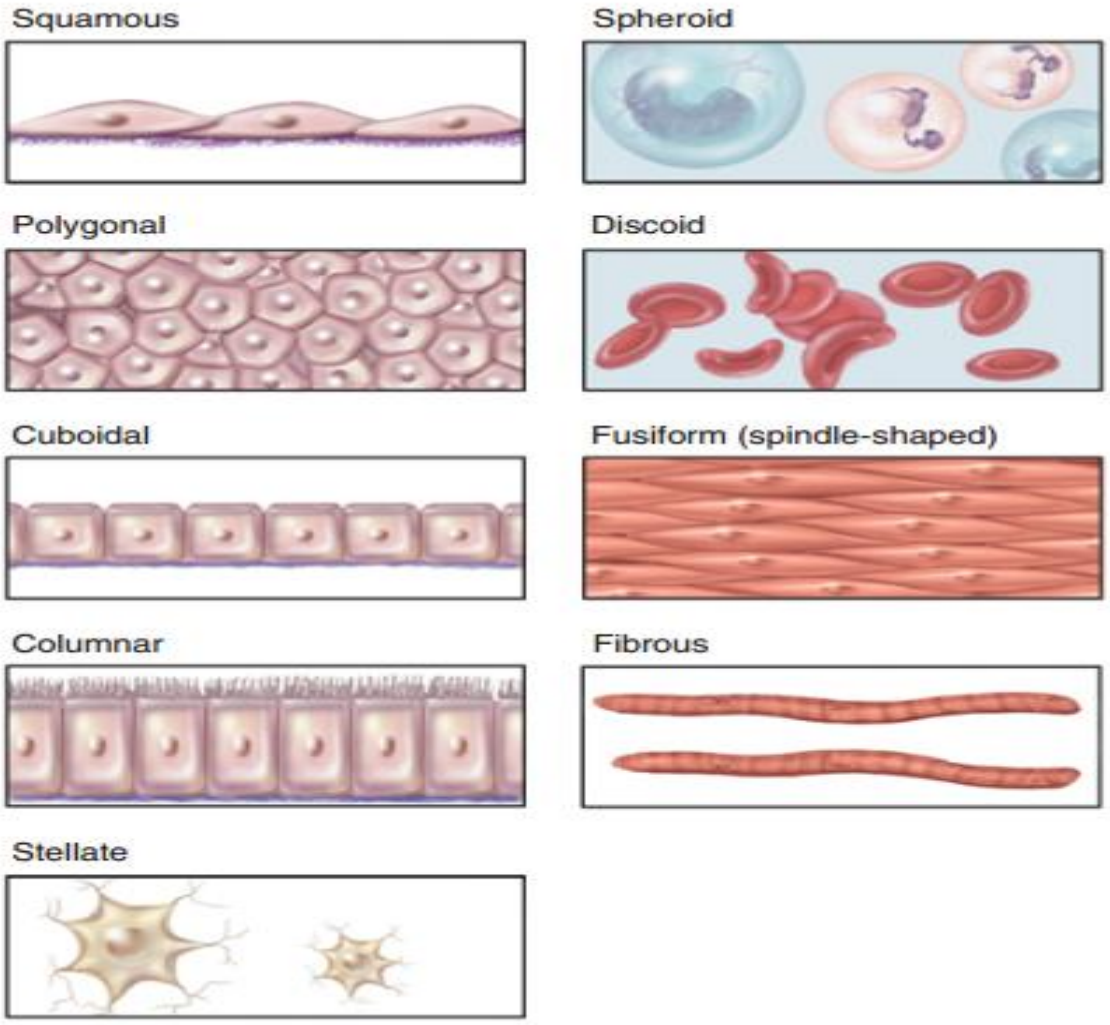
3. An organism's structure and all of its functions are ultimately due to the activities of its cells.

4. Cells come only from preexisting cells, not from nonliving matter. All life, therefore, traces its ancestry to the same original cells.

5. Because of this common ancestry, the cells of all species have many fundamental similarities in their chemical composition and metabolic mechanisms.

Cell Shapes and Sizes

Most human cells range from 10 to 15 micrometers (um) in diameter. (The human egg cell, an exceptionally large 100 um in diameter.



Elementary tissues of the body

Human body generally consist of five elementary tissues

1-Epithelial tissue

consists of a flat sheet of closely adhering cells, one or more cells thick, with the upper surface usually exposed to the environment or to an internal space in the body. Epithelium covers the body surface, lines body cavities, forms the external and internal linings of many organs, and constitutes most gland tissue.

a-Simple Epithelia

Generally, a simple epithelium has only one layer of cells, although this is a somewhat debatable point in the pseudostratified type. Three types of simple epithelia are named for the shapes of their cells:

1- simple squamous (thin scaly cells).

2- simple cuboidal(square or round cells),

3- simple columnar (tall narrow cells).

4- pseudostratified columnar, not all cells reach the free surface; the shorter cells are covered over by the taller ones.

b-Stratified Epithelia

Stratified epitheliarange from 2 to 20 or more layers ofcells, with some cells resting directly on others and only the deepest layer resting on the basement membrane.

The stratified epithelia are three types

1- stratified squamous,

2- stratifiedcuboidal,

3- stratified columnar epithelia.

4- Transitional epithelium, was named when it was thought to represent a transitional stage between stratified squamous and stratified columnar epithelium.

2-Connective tissue

Typically consists mostly of fibers and ground substance, with widely separate Fibrous Connective Tissue

a-Fibrous connective tissues are the most diverse type of connective tissue. They are also called fibroconnective tissue or connective tissue proper.

The cells of fibrous connective tissue include the following types:

•Fibroblasts.

These are large, flat cells that often appear tapered at the ends and show slender, wispy branches. They produce the fibers and ground substance that form the matrix of the tissue..

•Macrophages.

These are large phagocytic cells that wander through the connective tissues, where theyengulf and destroy bacteria,

that produce monocytes.

•Leukocytes,

white blood cells (WBCs).WBCs travel briefly in the bloodstream, then crawl out through the capillary walls and spend most of theirtime in the connective tissues..

•Plasma cells.

Certain lymphocytes turn into plasma cells when they detect foreign agents. The plasma cells then synthesize disease-fighting proteins called

antibodies.

•Mast cells.

These cells, found especially alongside blood vessels, secrete a chemical called heparin that inhibits blood clotting, and one called histamine that increases blood flow by dilating blood vessels.

•Adipocytes(AD-ih-po-sites).

fat cells.These are large rounded cells filled mainly with a droplet of

triglyceride, which forces the nucleus and cytoplasm to occupy only a thin layer just beneath the plasma membrane.

Fibers

Three types of protein fibers are found in fibrous

connective tissues:

•Collagenous(col-LADJ-eh-nus)**fibers**.

These fibers, made of collagen, are tough and flexible and resist **•Reticular fibers**.

These are thin collagen fibers coated with glycoprotein. They form a spongelike framework for such organs as the spleen and lymph nodes.

•Elastic fibers.

These are thinner than collagenous fibers, and they branch and rejoin each other along their course. They are made of a protein called **elastin,** whose coiled structure allows it to stretch and recoil like a rubber band.

Ground Substance

Amid the cells and fibers in some tissue sections, there appears to be a lot of empty space. In life, this space is occupied by the featureless ground

substance.Ground substance usually has a gelatinous to rubbery consistency resulting from three classes of large molecules:

1-glycosaminoglycans.

2-proteoglycans.

3-adhesive glycoproteins.

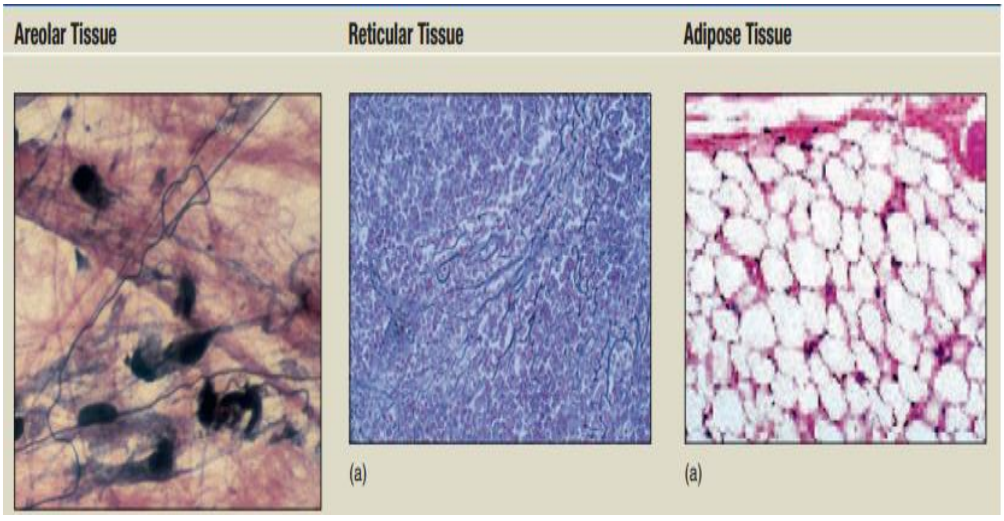
Types of Fibrous Connective Tissue

1- Loose connective tissue

a- Areolar (AIR-ee-OH-lur) tissue

b- Reticular tissue.

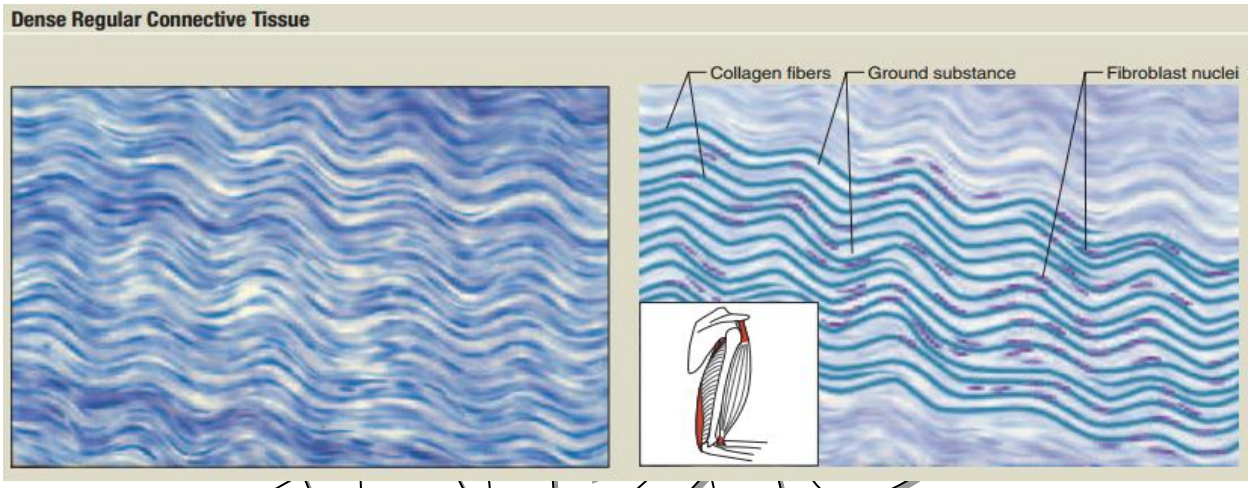
c- Adipose tissue ,or fat,



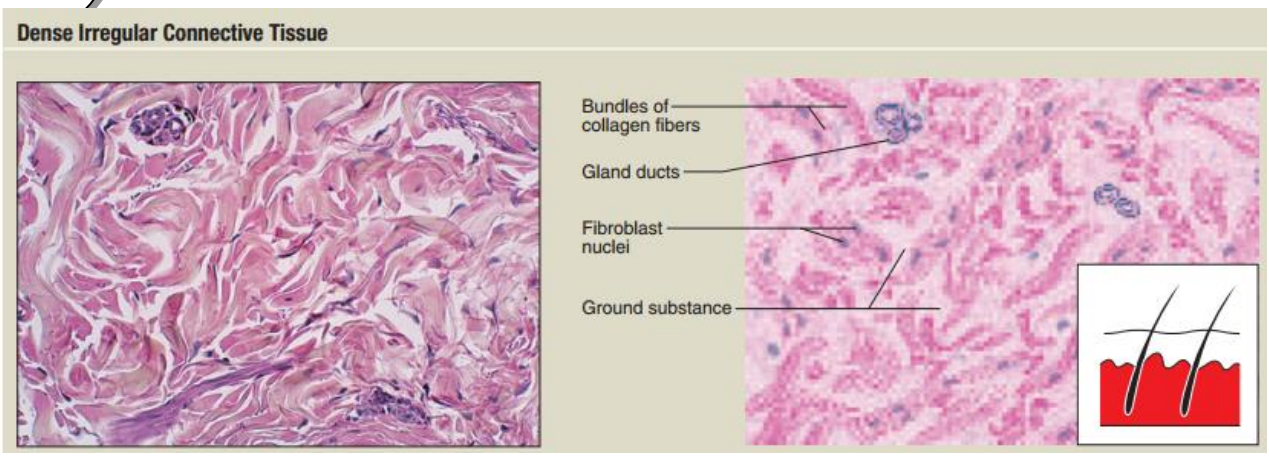
2- Dense connective tissue

a- Dense regular connective tissue

Densely packed, parallel, often wavy collagen fibers; slender fibroblast nuclei compressed between collagen bundles; scanty open space (ground substance); scarcity of blood vessels



b- Dense irregular connective tissue: Densely packed collagen fibers running in random directions; scanty open space (ground substance); few visible cells; scarcity of blood vessels



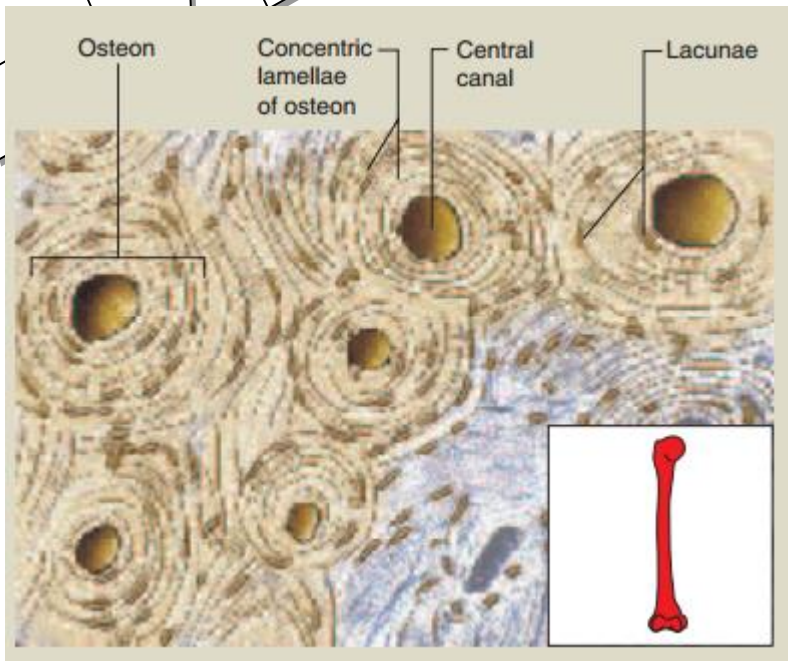
3-Bone

The term bonerefers both to organs of the body such as the femur and mandible, composed of multiple tissue types, and to the bone tissue, or osseous tissue,that makes up most of the mass of bones. There are two forms of osseous tissue:

(1)Spongy bone :fills the heads of the long bones. Although it is calcified and hard, its delicate slivers and plates give it a spongy appearance.

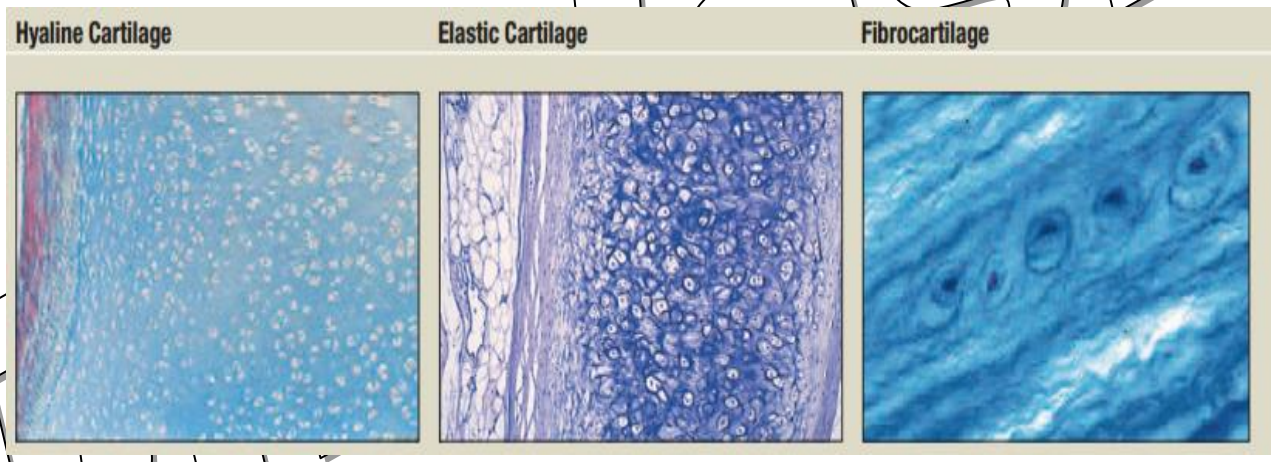
(2)Compact (dense)

Bone is a more dense calcified tissue with no spaces visible to the naked eye. It forms the external surfaces of all bones, so spongy bone, when present, is always covered by compact bone.



Cartilage

Cartilageis a supportive connective tissue with a flexible rubbery matrix. It gives shape to the external ear, the tip of the nose, and the larynx the most easily palpated cartilages in the body. Cells called chondroblasts



a- Hyaline cartilage

Clear, glassy matrix, often stained light blue or pink in tissue sections; fine, dispersed collagen fibers, not usually visible; chondrocytes often in small clusters of three or four cells (cell nests), enclosed in lacunae; usually covered by perichondrium.

b- Elasic cartilage

Elastic fibers form weblike mesh amid lacunae; always covered by perichondrium.

c- Fibro cartilage

Parallel collagen fibers similar to those of tendon; rows of chondrocytes in lacunae between collagen fibers; never has a perichondrium

Blood

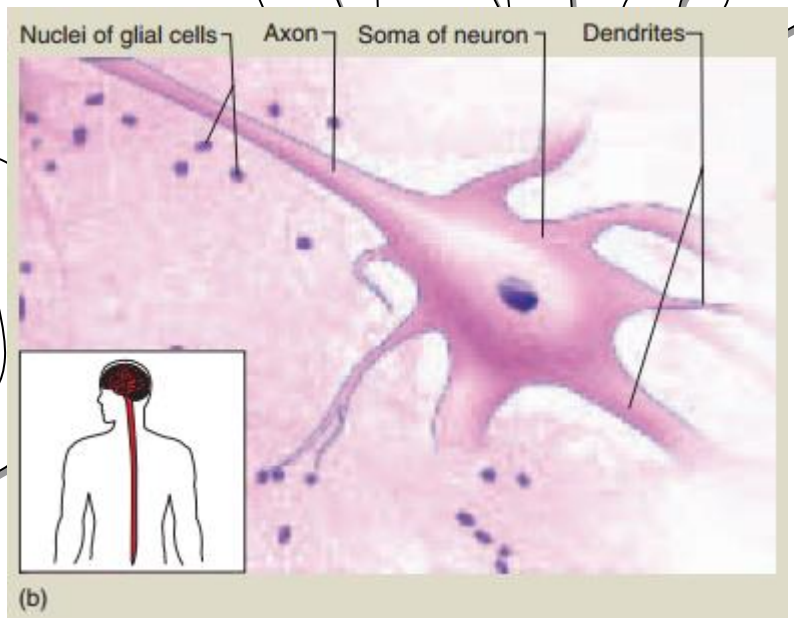
Blood is a fluid connective tissue that travels through tubular vessels. Its primary function is to transport cells and dissolved matter from place to place. Blood consists of a ground substance called plasma and of cells and cell fragments collectively called formed elements**. Erythrocytes** (eh-RITH-ro-sites), or red blood cells, are the most abundant formed elements. In stained blood films, they look like pink discs with a thin, pale center. They have no nuclei. Erythrocytes transport oxygen and carbon dioxide.

Leukocytes, white blood cells, serve various roles in defense against infection and other diseases.

4-Nervous Tissue

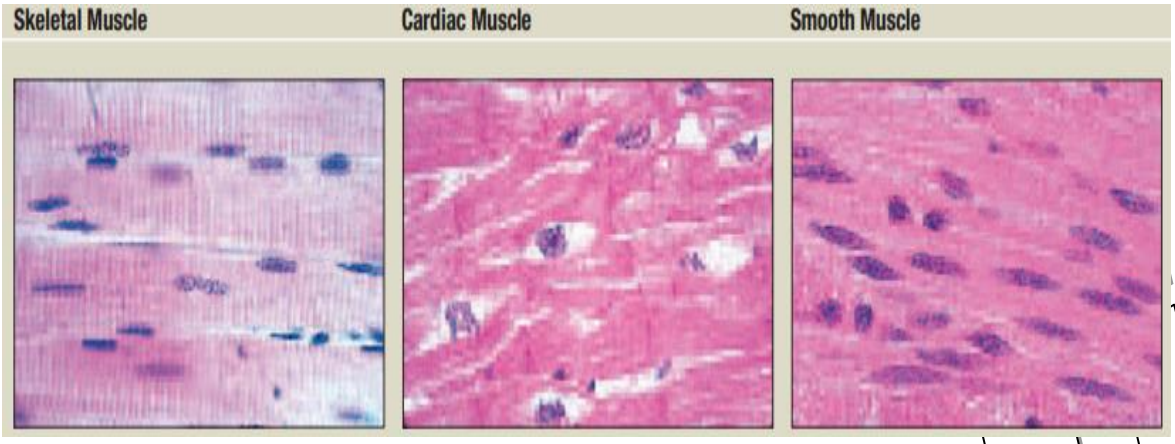
Nervous tissue consists of neurons(NOORons), or nerve cells, and a much greater number of neuroglia (noo-ROG-lee-uh), or glial (GLEE-ul) cells ,which protect and assist the neurons. Neurons are specialized to detect stimuli, respond quickly, and transmit coded

information rapidly to other cells. Each neuron has a prominent soma, or cell body, that houses the nucleus and most other organelles. This is the cell's center of genetic control and protein synthesis. Somas are usually round, ovoid, or stellate in shape. Extending from the soma, there are usually multiple short, branched processes called dendrites that receive signals from other cells and transmit messages to the soma, and a single, much longer axon ,or nerve fiber, that sends outgoing signals to other cells. Nervous tissue is found in the brain, spinal cord, nerves, and ganglia, which are knotlike swellings in nerves.



5-Muscular Tissue

Muscular tissue consists of elongated cells that are specialized to respond to stimulation by contracting; thus, its primary job is to exert physical force on other tissues and organs—for example, when a skeletal muscle pulls on a bone, the heart contracts and expels blood, or the bladder contracts and expels urine.



a-Skeletal muscle

Long, cylindrical, unbranched cells (fibers), relatively parallel in longitudinal tissue sections; striations; multiple nuclei per cell, near plasma membrane.

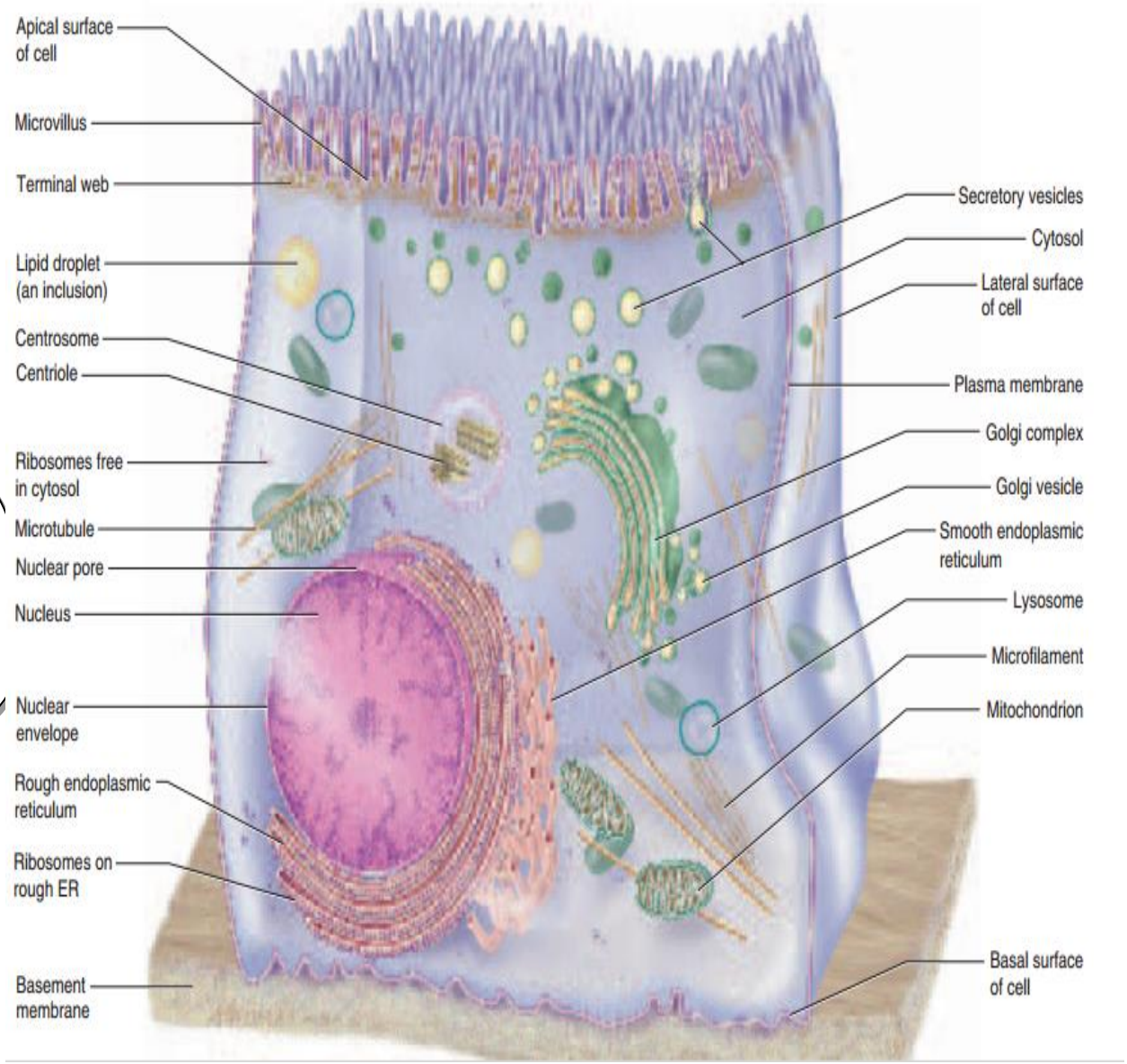
b-Cardiac muscle

Short branched cells (myocytes); less parallel appearance in tissue sections; striations; intercalated discs; one nucleus per cell, centrally located and often surrounded by a light zone.

C-Smooth muscle

Short fusiform cells overlapping each other; nonstriated; one nucleus per cell, centrally located.

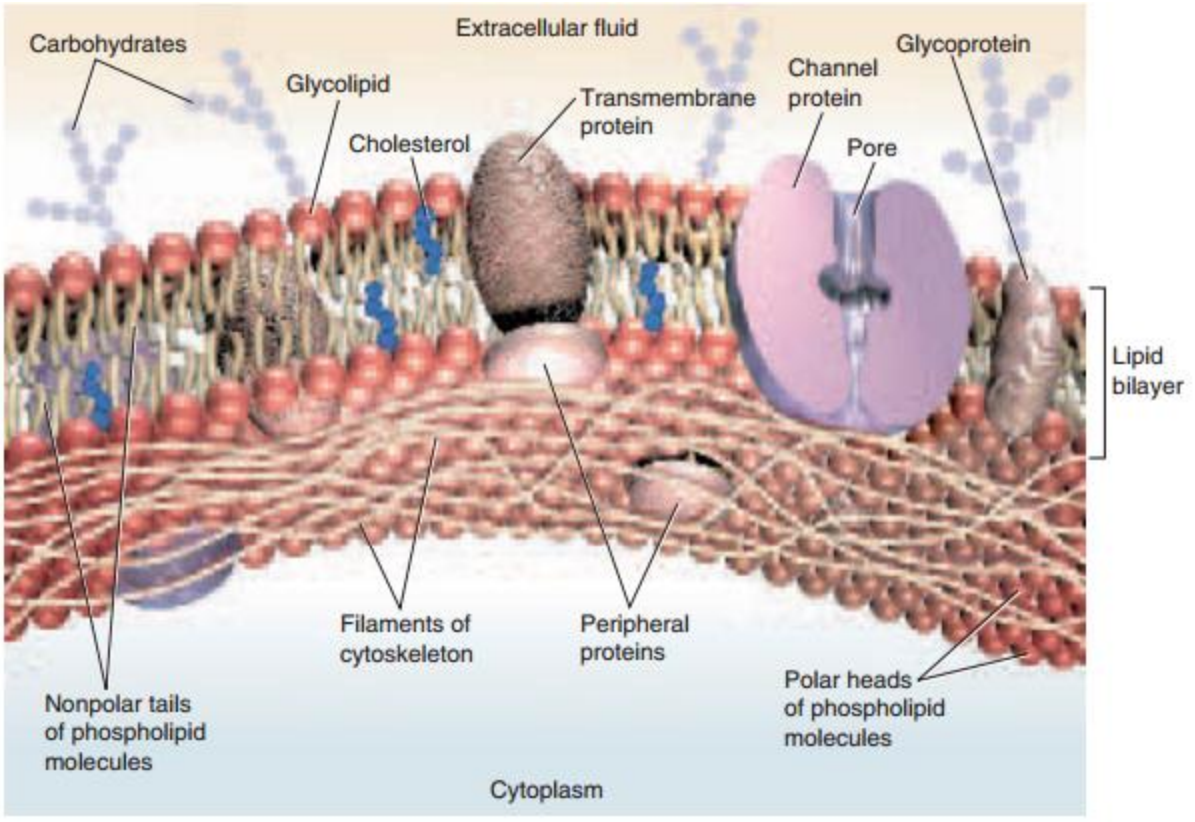
Cell structure and function



The plasma membrane

Is the unit membrane at the cell surface. It defines the boundaries of the cell, governs its interactions with other cells, and controls the passage of materials into and out of the cell. The side that faces the cytoplasm is the **intracellular face** of the membrane, and the side that faces outward is the **extracellular face**.

The plasma membrane—an oily film of lipids with diverse proteins embedded in it. Typically about 98% of the molecules in the membrane are lipids, and about 75% of the lipids are phospholipids. These amphiphilic molecules arrange themselves into a bilayer, with their hydrophilic phosphate-containing heads facing the water on each side of the membrane and their hydrophobic tails directed toward the center of the membrane.



Membrane Proteins

1- Integral (transmembrane) proteins, pass through the membrane. They have hydrophilic regions, most integral proteins are glycoproteins, which are conjugated with oligosaccharides on the extracellular side of the membrane.

2-nPeripheral proteinsdo not protrude into the phospholipid layer but adhere to the intracellular face of the membrane.

Membrane proteins include the following:

•**Receptors** The chemical signals by which cells communicate with each other

•**Second-messenger systems**.When a messenger binds to a surface receptor, it may trigger changes within the cell that produce a second messenger in the cytoplasm.

•**Enzymes**. Enzymes in the plasma membranes of cells carry out the final stages of starch and protein digestion in the small intestine, help produce second messengers, and break down hormones and other signaling molecules whose job is done, thus stopping them from excessively stimulating a cell.

•**Channel proteins** Channel proteins are integral proteins with pores that allow passage of water and hydrophilic solutes through the **Carriers Carriers are integral** proteins that bind to glucose, electrolytes, and other solutes and transfer them to the other side of the membrane. Some carriers, called pumps,consume ATP in the process.

•**Molecular motors**

These proteins produce movement by changing shape and pulling on other molecules.

•**Cell-identity markers .**

Are glycoproteins contribute to the glycocalyx,a carbohydrate surface

coating discussed shortly.

- **Cell-adhesion molecules.**

Cells adhere to one another and to extracellular material through certain membrane proteins called cell-adhesion molecules (CAMs).

Cellular compartments

in cell biology comprise all of the closed parts within the cytosol of a eukaryotic cell, usually surrounded by a single or double lipid layer membrane.

These compartments are often, but not always, defined as membrane enclosed regions. The formation of cellular compartments is called compartmentalization.

Most organelles are compartments:

1-**mitochondria**

is a double membrane-bound organelle found in most eukaryotic cells. The word mitochondrion comes from the Greek *μίτος*, *mitos*, i.e. "thread", and *χονδρίον*, *chondrion*, i.e. "granule"[2] or "grain-like". It is also the powerhouse of the cell.

2-peroxisomes, **lysosomes**,

Also called **microbodies**) are organelles found in virtually all eukaryotic cells.[2] They are involved in the catabolism of very long chain fatty acids .

3- the endoplasmic reticulum

Is a type of organelle in the cells of eukaryotic organisms that forms an interconnected network of flattened, membrane-enclosed sacs or tube-like structures known as cisternae. The endoplasm is the inner core of the cytoplasm and the membranes of the ER are continuous with the outer nuclear membrane

4- the cell nucleus

In cell biology, the **nucleus** (pl. *nuclei*; from Latin *nucleus* or *nuculeus*, meaning kernel) is a membrane-enclosed organelle found in eukaryotic cells. Eukaryotes usually have a single nucleus, but a few cell types have no nuclei, and a few others have many. Cell nuclei contain most of the cell's genetic material.

5- Golgi apparatus.

known as the Golgi complex, Golgi body, or simply the Golgi, is an organelle found in most eukaryotic cells. It was identified in 1897 by the Italian physician Camillo Golgi and named after him in 1898. Golgi body is a part of the cellular endomembrane system, the Golgi apparatus packages proteins into membrane-bound vesicles inside the cell before the vesicles are sent to their destination.

6- **Smaller elements like vesicles**, and sometimes even **microtubules** can also be counted as compartments.

SKIN

Skin is the soft outer covering of vertebrates. The adjective cutaneous means "of the skin" (from Latin cutis, skin).

The skin is an organ of the integumentary system made up of multiple layers of ectodermal tissue, The skin interfaces with the environment and is the

1-first line of defense from external factors.

2- excessive water loss

3-insulation,

4- temperature regulation

5- sensation.

6-The production of vitamin D.

Skin layers

Epidermis

The epidermis is composed of the outermost layers of the skin. Keratinocytes are the major cells, constituting 95% of the epidermiswhile **Merkel cells**, **melanocytes** and **Langerhans cells** are also present. The epidermis contains **no blood vessels**, and cells in the deepest layers are nourished by diffusion from blood capillaries extending to the upper layers of the dermis.

The epidermis can be further subdivided into the following strata or layers (beginning with the outermost layer.

Stratum corneum

Stratum lucidum (only in palms and soles)

Stratum granulosum

Stratum spinosum

Stratum germinativum (also called the stratum basale)

Keratinocytes in the **stratum basale** proliferate through mitosis and the daughter cells move up the strata changing shape and composition as they undergo multiple stages of cell differentiation to eventually become anucleated. During that process, keratinocytes will become highly organized, forming cellular junctions (desmosomes) between each other and secreting keratin proteins and lipids which contribute to the formation of an extracellular matrix and provide mechanical strength to the skin Keratinocytes from the **stratum corneum** are eventually shed from the surface (desquamation).

Basement membrane

The epidermis and dermis are separated by a thin sheet of fibers called the basement membrane, and is made through the action of both tissues. The basement membrane controls the traffic of the cells and molecules between the dermis and .

Dermis

The dermis is the layer of skin beneath the epidermis that consists of connective tissue and cushions the body from stress and strain.

Papillary region

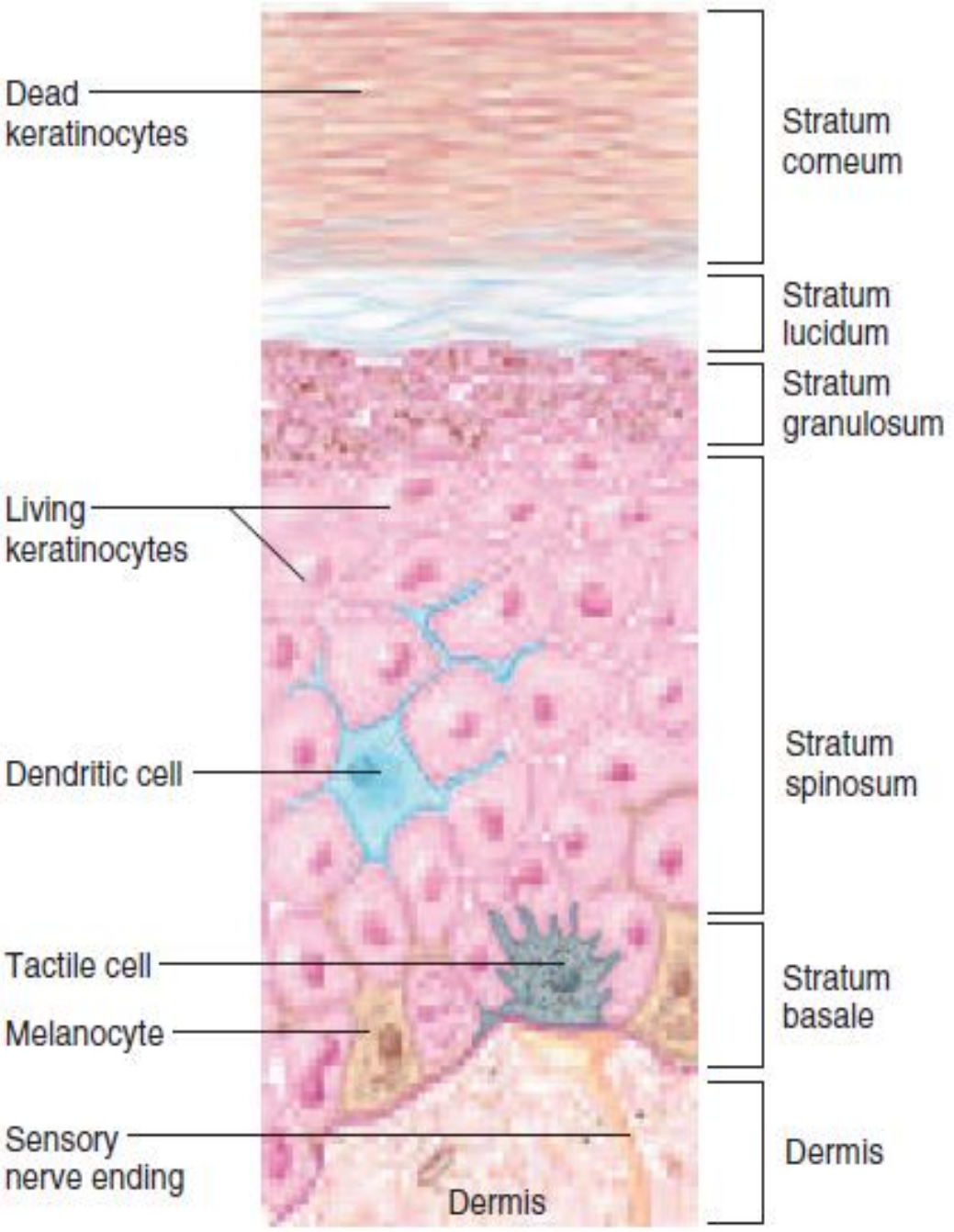
The papillary region is composed of loose areolar connective tissue.This is named for its fingerlike projections called papillae that extend toward the epidermis. The papillae provide the dermis with a "bumpy" surface that interdigitates with the epidermis, strengthening the connection between the two layers of skin.

Reticular region

The reticular region lies deep in the papillary region and is usually much thicker. It is composed of dense irregular connective tissue . within the reticular region are the roots of the hair, sebaceous glands, sweat glands, receptors, nails, and blood vessels.

Hypodermis

The hypodermis is not part of the skin, and lies below the dermis. Its purpose is to attach the skin to underlying bone and muscle as well as supplying it with blood vessels and nerves. It consists of loose connective tissue and elastin.


Dead keratinocytes
Stratum corneum
Stratum lucidum
Stratum granulosum
Living keratinocytes
Dendritic cell
Stratum spinosum
Tactile cell
Melanocyte
Stratum basale
Sensory nerve ending
Dermis
Dermis

(a)

Basrah University
College of Nursing
Department of medical sciences
Lecturer: Dr. Wasfi Dhahir
Subject: Anatomyy
Stage:1st nursing

Digestive system

The science which study the digestive tract and the diagnosis and treatment and its disorders called **gastroenterology**. Anatomically the digestive system subdivided for two anatomical parts

1-The digestive tract: is a tube extending from mouth to anus and called alimentary canal include mouth , pharynx, esophagus, stomach, small intestine and large intestine. Stomach and intestine called (GI) gastrointestinal tract.

2-The accessory organs: include teeth tongue, salivary gland, liver, gall bladder and pancreas.

The main function of the digestive system is to processes food and extracts nutrient from it and eliminate the residue and this occur in four stages

1- Ingestion: The selective intake of food

2- Digestion: Mechanical and chemical break down of food.

3- Absorption: uptake of nutrients molecules into the epithelial cells of digestive tract to blood and lymph.

4- Defecation: the elimination of indigestive residue.

Most of the digestive tract follows the basic structural composed of the following tissue layers, in order from the inner to the outersurface:

Mucosa

Epithelium

Lamina propria

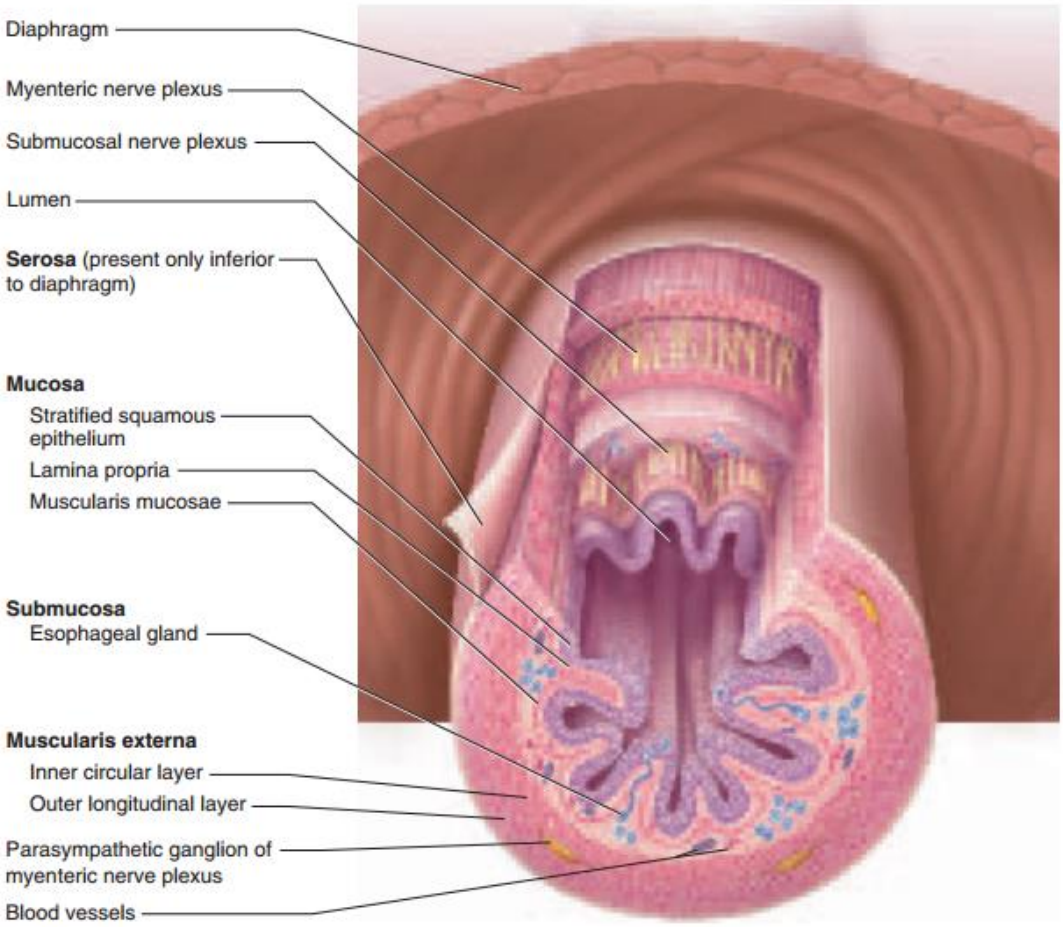
Muscularis mucosae

Submucosa

Muscularis externa

Inner circular layer

Outer longitudinal layer



Tissue Layers of the Digestive Tract. Cross section of the esophagus just below the diaphragm.

The mouth

The moth (oral cavity) serves for ingestion. Sensory response to food, mastication. Chemical digestion ,deglutition, speech and respiration.

The mouth is enclosed by the cheeks, lips, palate, and tongue . Its anterior opening between the lips is the oral orifice and its posterior opening into the throat is the fauces (FAW-seez). The oral cavity is lined with non keratinized stratified squamous epithelium.

Mastication is the breakdown of food into pieces smaller to be walled and exposed it to chemical digestion.

Salivary gland: There are three pairs of salivary gland

a-extrinsic

1-Parotid gland

2-submandibular gland

3-Sublingual gland

b-intrinsic

1-Lingual

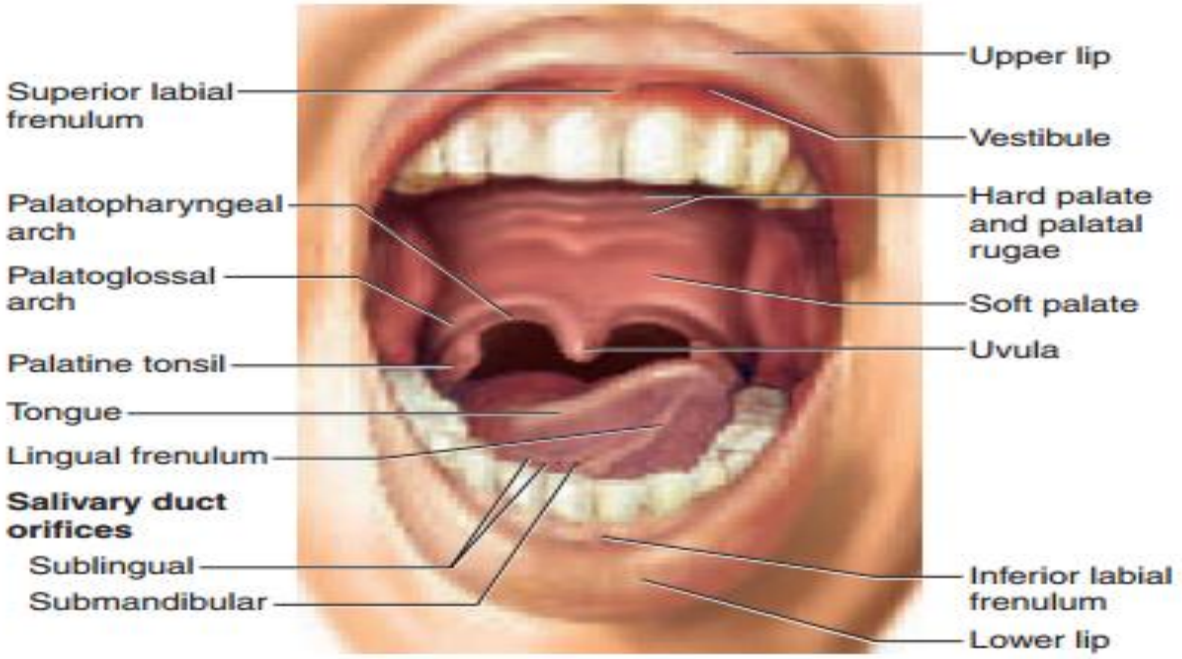
2-Buccle

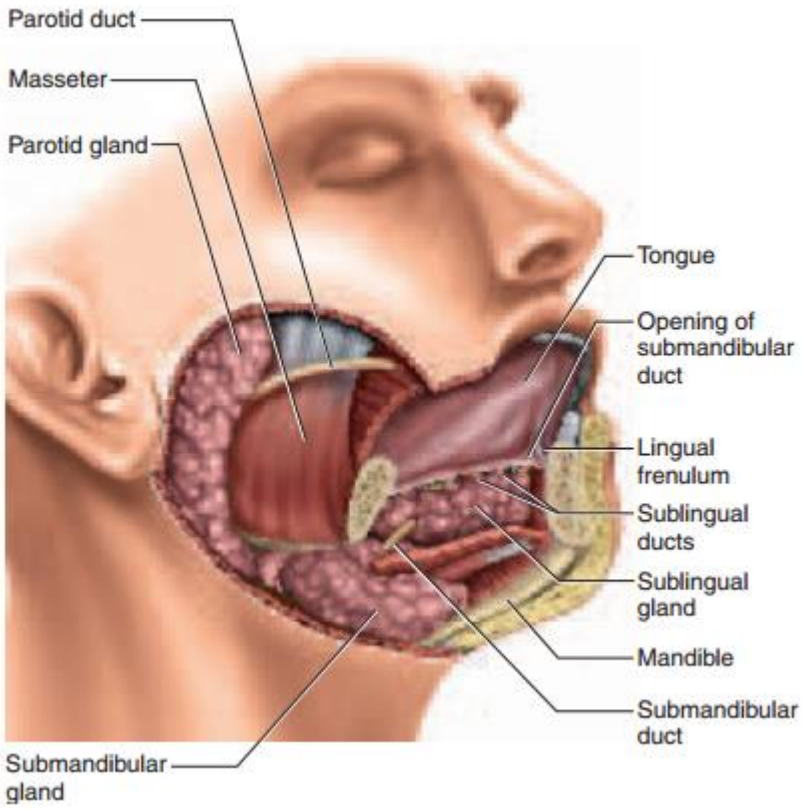
3-labial

Function of saliva

The gland secrete about 1-1 L of saliva per day

1. moisten
2. Digest starch.
3. Clean the mouth.
4. Inhibit bacterial growth.
5 - Make the food as bolus.


Upper lip
Superior labial frenulum
Vestibule
Palatopharyngeal arch
Hard palate and palatal rugae
Palatoglossal arch
Soft palate
Palatine tonsil
Uvula
Tongue
Lingual frenulum
Salivary duct orifices
Sublingual
Submandibular
Inferior labial frenulum
Lower lip



The pharynx :is muscular funnel and it is of two parts, the respiratory part (nasopharynx and the oral part (orapharynx) and aid in swallowing.

The esophagus: muscular tube extend from pharynx till stomach lubricated by mucosa., its main function swallowing of food and drink to stomach which drop by gravity and peristalsis movement,

The stomach : is J – shape relatively vertical in tall people and horizontal in short people have two curvature ,the lesser and greater curvature and two opening the in late(cardiac orifice) and pyloric orifice (the gate way).

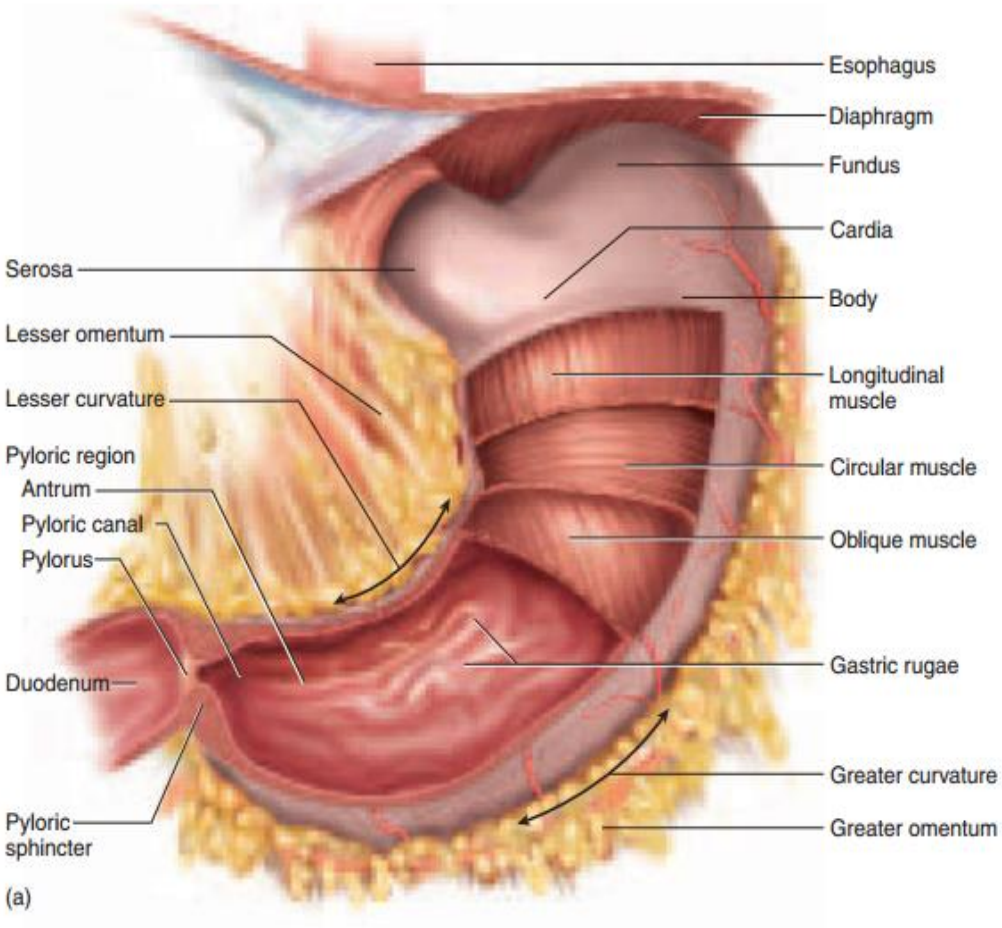
and four regions

1- The fundus

2- The body

3- Pyloric

4- Antrum



Function of the stomach

- Storing
- Mixing
- Digestion
- Emptying

The cell of stomach

- Mucosal cell: secrete mucus
- Stem cells: produce new cells
- Parietal cells: secrete HCL
- Chief cells: secrete chymosin(Pepsinogen) and lipase
- Enteroendocrine cells: secrete hormones

The small intestine

It began at the pyloric orifice(the gate way from stomach) and ends at the ileocecal junction(gate way of the large intestine. It consist of duodenum(25cm) ,jejunum(2.5meter) and ileum(3.6 meter) the internal surface contain villi with absorptive cells and goblet cells.

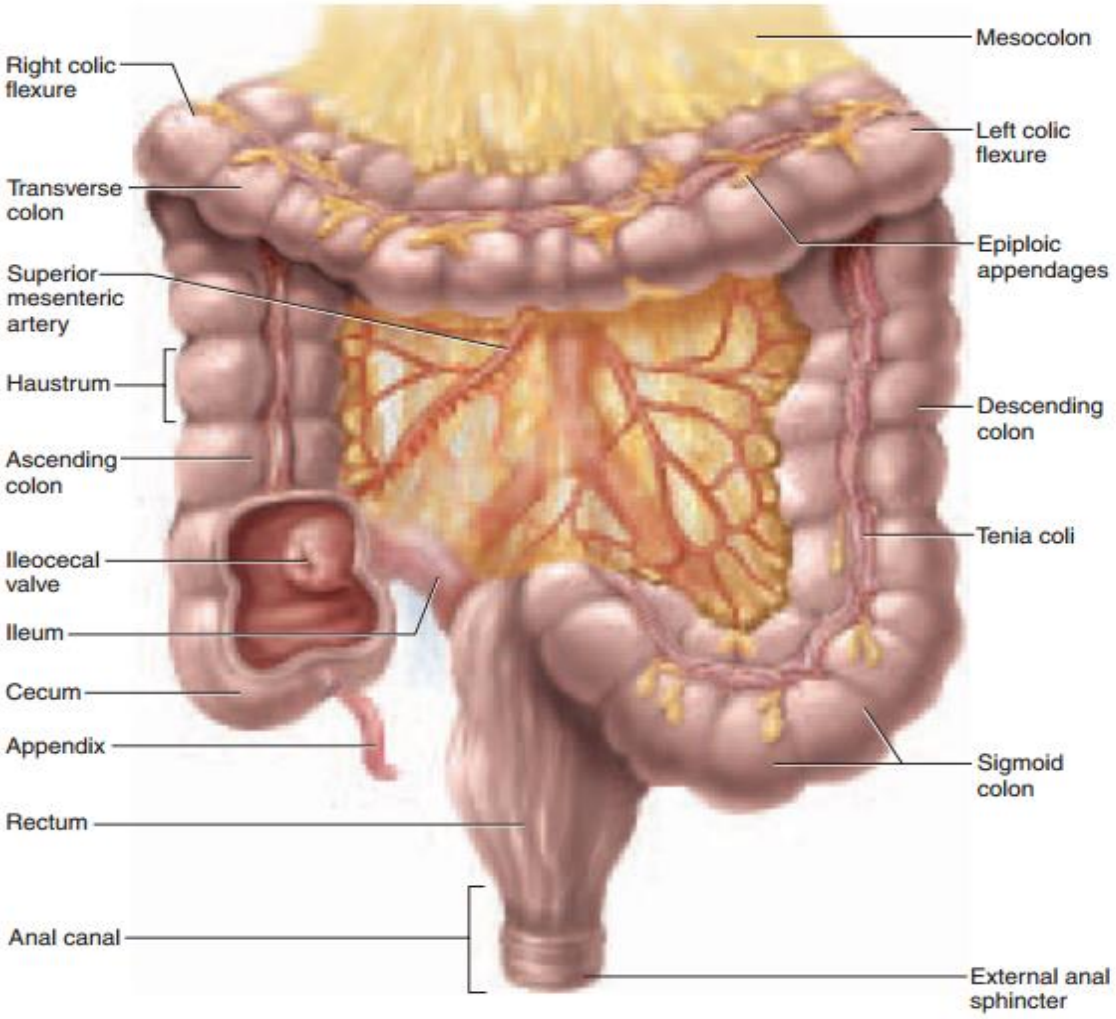
The movement of intestine include segmentation contraction and wave of peristalsis called **migration motor complex.**

Chemical digestion and absorption in small intestine

- Amylase digests the starch to monosaccharide
- Pepsin digests proteins to amino acids
- Lipids digests by lingual lipase and gastric lipase and most of it digested by pancreatic lipase and bile helps in breaking the fat into emulsification droplets to triglycerides and to monoglycerides and fatty acids and then absorbed to blood through villi.

Large intestine

It is about 1.5 meter consist of the cecum, ascending colon(right site of abdomen) , descending colon(left site of abdomen) , transverse colon, rectum , anal canal and anus. The large intestine absorbs water and salts from indigestible food,


Mesocolon
Right colic flexure
Left colic flexure
Transverse colon
Epiploic appendages
Superior mesenteric artery
Haustrum
Descending colon
Ascending colon
Tenia coli
Ileocecal valve
Ileum
Cecum
Appendix
Sigmoid colon
Rectum
Anal canal
External anal sphincter

Accessory organs

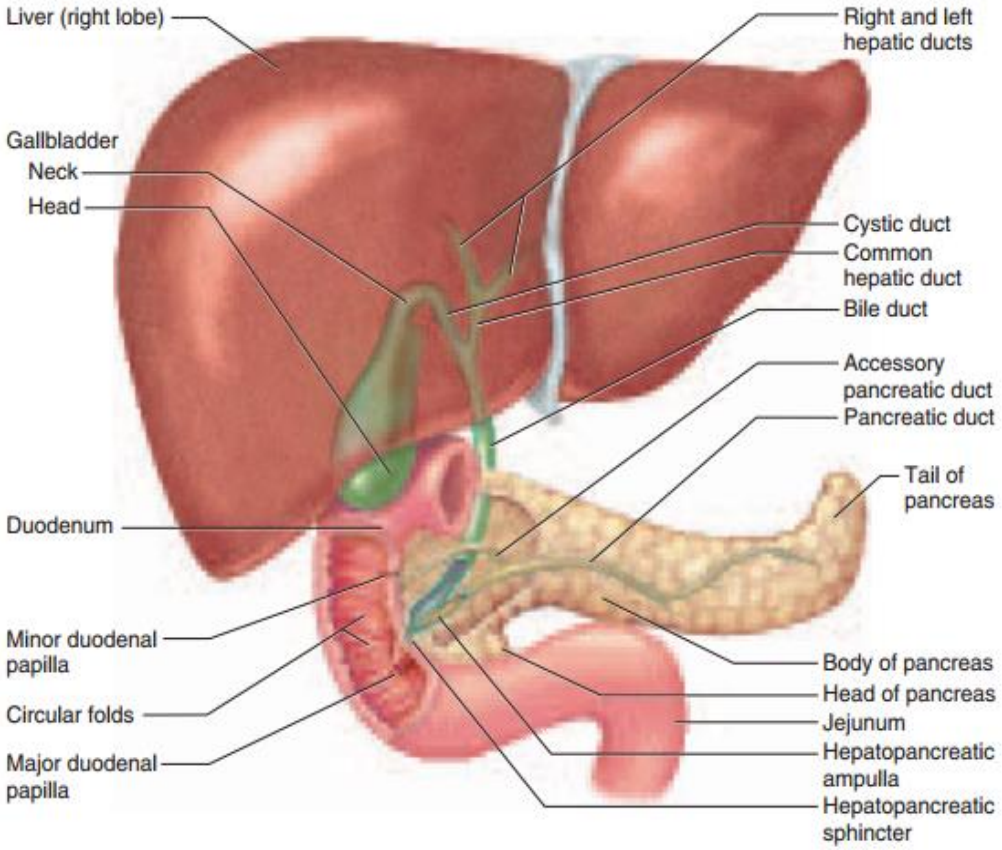
The liver

Is largest reddish brown gland located immediately inferior to the diaphragm in the right hypocondral and Epigastric region, has four lobes (left ,right ,quadrate and caudate lobes) separated from each other by falciform ligament.

Gall bladder: Greenish sac on the underside of the liver which store and concentrate bill(water, fat , cholesterol, phospholipids, bile pigment and bile acids act on lipids digestion)

Note/ Bile pigments cause the brown color of feces

Pancreas: pink lobulated gland located between the fold of the duodenum secrete hormone(insulin and glucagon) and enzyme lipase , amylase and trypsin ,chymotrepsin and carboxypeptidase which digest proteins.


Liver (right lobe)
Right and left hepatic ducts
Gallbladder
Neck
Head
Cystic duct
Common hepatic duct
Bile duct
Accessory pancreatic duct
Pancreatic duct
Tail of pancreas
Duodenum
Minor duodenal papilla
Circular folds
Major duodenal papilla
Body of pancreas
Head of pancreas
Jejunum
Hepatopancreatic ampulla
Hepatopancreatic sphincter

Cardiovascular System

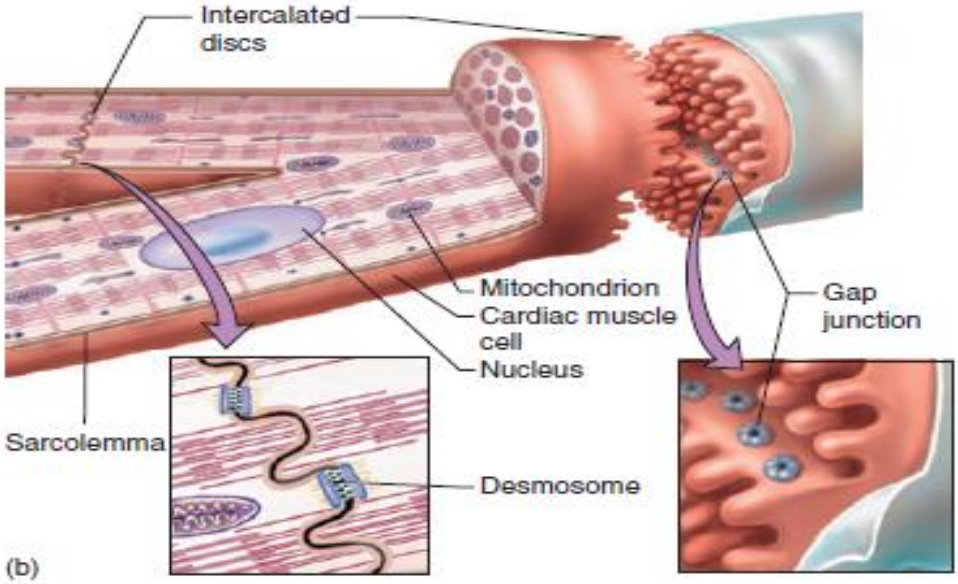
The term **circulatory system** refers to the heart, blood vessels, and blood. The term **cardiovascular system,** however, refers only to the passages through which the blood flows—the **heart,** a four-chambered muscular pump; **arteries,** the vessels that carry blood away from the heart; **veins,** the vessels that carry blood back to the heart; and **capillaries,** microscopic blood vessels that connect the smallest arteries to the smallest veins.

Structure of Cardiac Muscle

Cardiac muscle is striated like skeletal muscle but otherwise differs from it in many structural and physiological ways. Cardiac myocytes (muscle cells), or *cardiocytes*, are relatively short, thick, branched cells.

They usually have only one, centrally placed nucleus. The sarcoplasmic reticulum (SR) is less developed than in skeletal muscle.

The myocytes are joined end to end by thick connections called **intercalated discs,** which appear as dark lines (thicker than the striations) in properly stained tissue sections.



Gross Anatomy of the Heart

Size, Shape, and Position of the Heart

The heart is located in the **thoracic cavity** in the mediastinum, the area between the lungs. About two-thirds of it lies to the left of the median plane . The broad superior portion of the heart, called the **base,** is the point of attachment for the great vessels described previously. Its inferior end, the **apex,**. The adult heart is about 9 cm (3.5 in.) wide at the base, 13 cm (5 in.)

The Pericardium

Is a double-walled sac called the **pericardium, composed of** The **parietal pericardium (pericardial sac)** and **visceral pericardium** Between the parietal and visceral membranes is a space called the **pericardial cavity.** It contains 5 to 30 mL of **pericardial fluid,**

The Heart Wall

The heart wall consists of three layers—

1-Epicardium,

2-Myocardium,

3- Endocardium

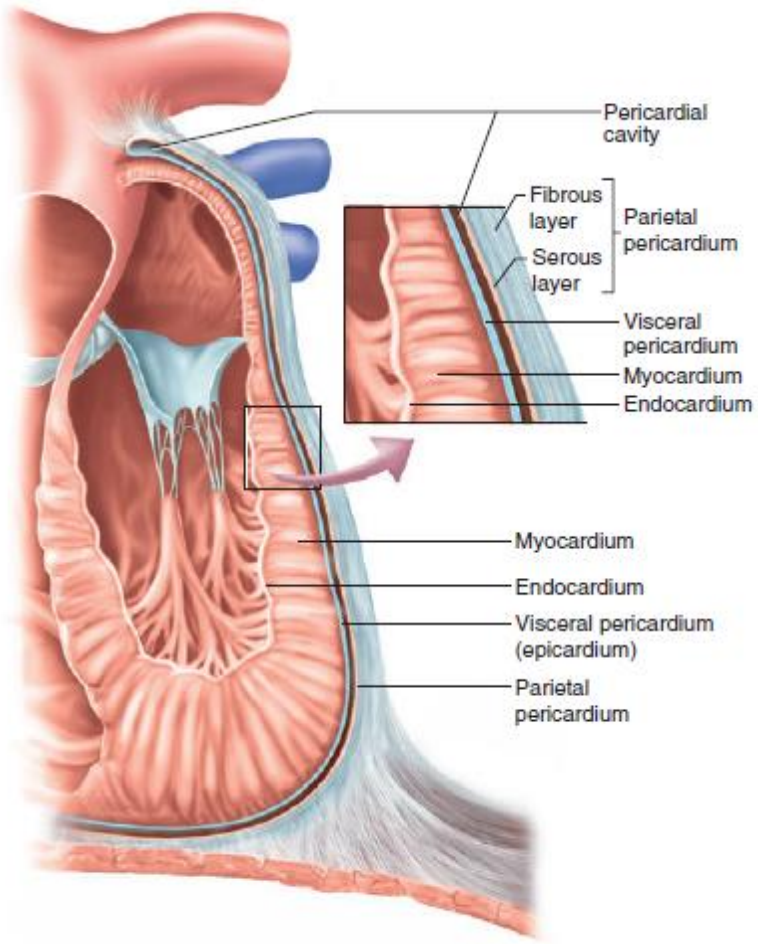
The Chambers

The heart has four chambers .Blood returning

The **right** and **left atria**. These are mostly posterior in position, so only a small portion of each is visible from the anterior aspect. Each atrium has a small earlike extension called an **auricle** that slightly increases its volume.

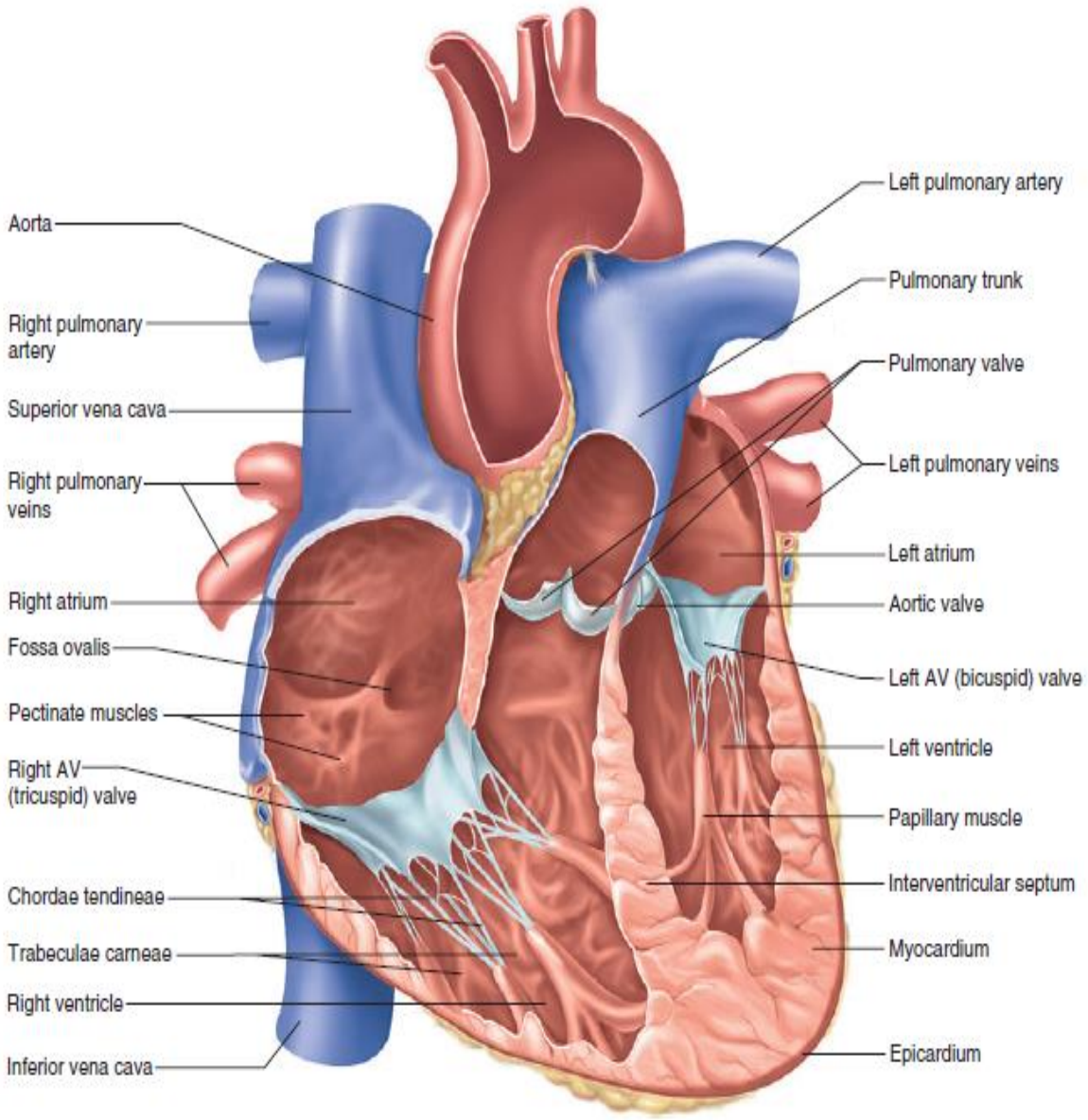
The two inferior chambers, the **right** and **left ventricles,** are the pumps that eject blood into the arteries.

The heart is crisscrossed by **sulci** (grooves) that mark the boundaries of the four chambers.



The Valves

To pump blood effectively, the heart needs valves that ensure a predominantly one-way flow. There is a valve between each atrium and its ventricle and at the exit from each ventricle into its great artery Each valve consists of two or three fibrous flaps of tissue called **cusps.**



The cuspid valves

1-The **right AV (tricuspid) valve** has three cusps

2-The **left AV (bicuspid) valve** has two also called **mitral** (MY-trul)

Stringlike **chordate tendineae** (COR-dee ten-DIN-ee-ee), reminiscent of the shroud lines of a parachute, connect the AV valve cusps to conical **papillary muscles** on the floor of the ventricle.

The semilunar valves

1-The **pulmonary valve** controls the opening from the right ventricle into the pulmonary trunk,

2-The **aortic valve** controls the opening from the left ventricle into the aorta. Each has three cusps shaped somewhat like shirt pockets .

The Lymphatic and Immune Systems

The **lymphatic system** is composed of a network of vessels that penetrate nearly every tissue of the body, and a collection of tissues and organs that produce immune cells.

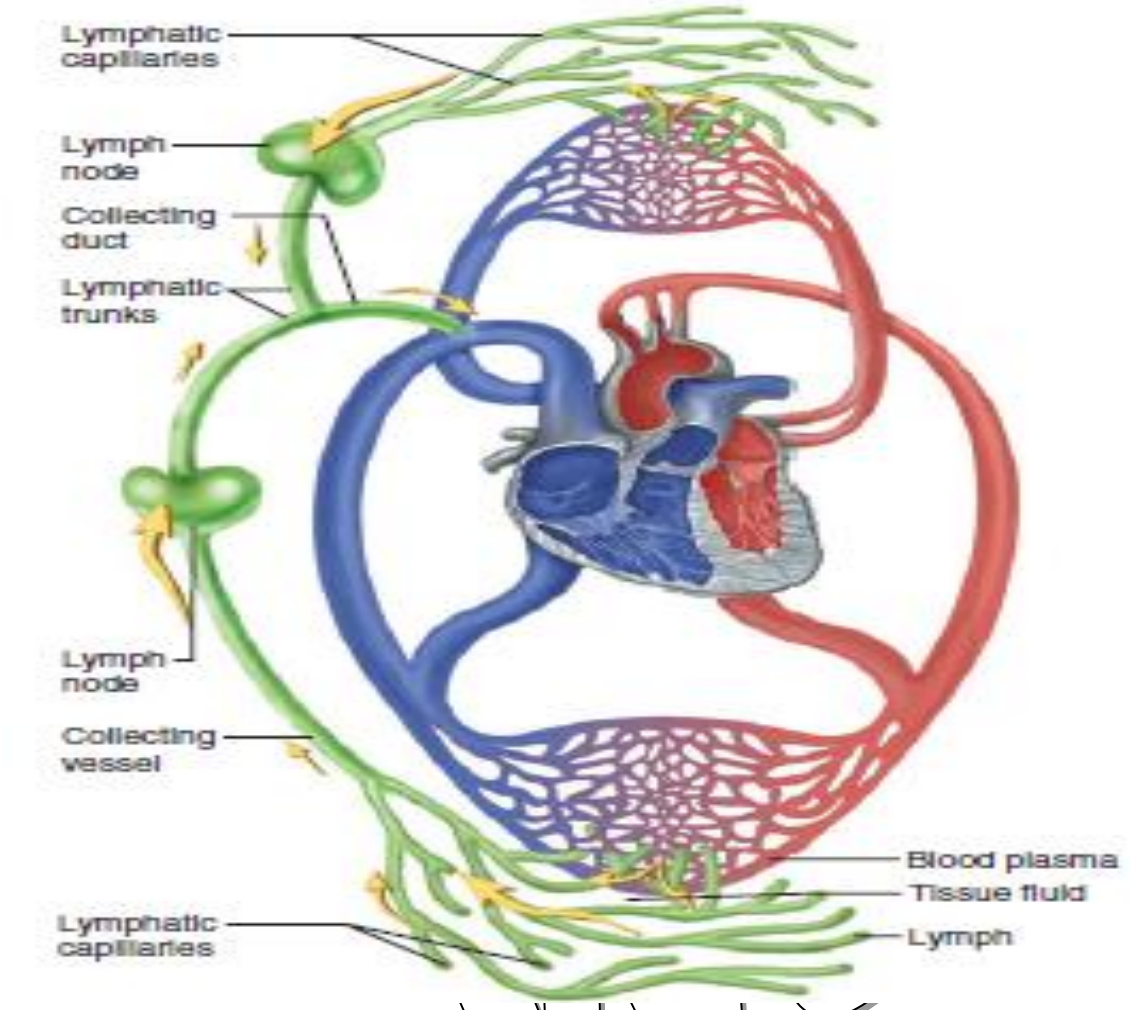
The lymphatic system has three functions:

1. **Fluid recovery.** Fluid continually filters from our blood capillaries into the tissue spaces.
2. **Immunity.** As the lymphatic system recovers excess tissue fluid, it also picks up foreign cells and chemicals from the tissues.
3. **Lipid absorption.** In the small intestine, special lymphatic vessels absorb dietary lipids that are not absorbed by the blood capillaries

The components of the lymphatic system

1-Lymph and the Lymphatic Vessels

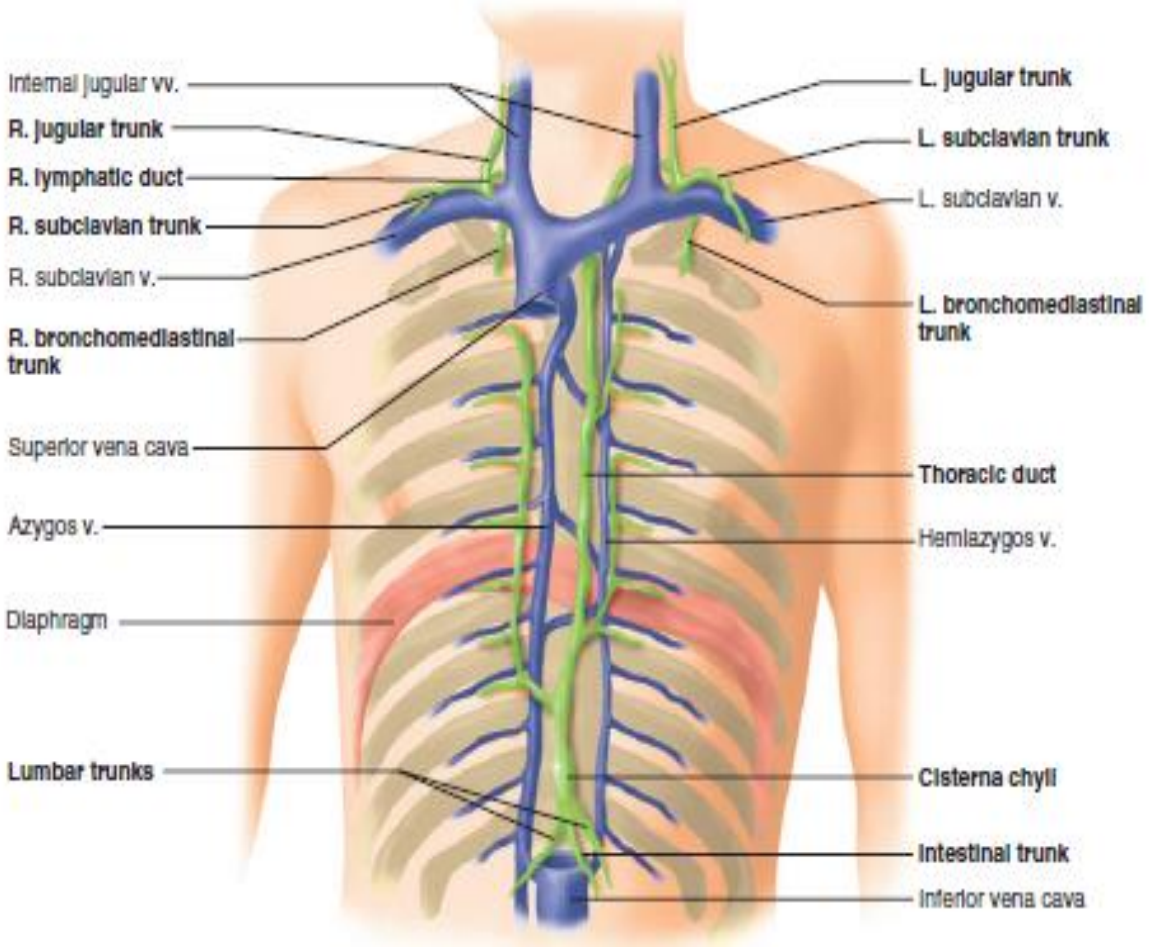
Lymph is usually a clear, colorless fluid, similar to blood plasma but low in protein, has a milky appearance because of its high lipid content. ,contains a large number of lymphocytes also contain bacteria, viruses, cellular debris, or even traveling cancer cells.



Lymphatic Vessels.

1) The **right lymphatic duct** begins in the right thoracic cavity with the union of the right jugular, subclavian, and bronchomediastinal trunks. It receives lymphatic drainagefrom the right arm and right side of the thorax and head and empties into the right subclavian vein

(2) The **thoracic duct,** on the left, is larger and longer. It begins as a prominent sac in the abdominal cavity called the **cisterna chyli** and then passes through the diaphragm and up the mediastinum. It receives lymph from all parts of the body



Lymphatic Cells and Tissues

1. **T lymphocytes (T cells).** These are so-named because they develop for a time in the thymus and later depend on thymic hormones.

2. **B lymphocytes (B cells).** These are named for an organ in chickens (the *bursa of Fabricius*1) in which they were first discovered. When activated, B cells differentiate into *plasma cells*, which produce circulating **antibodies**

3. **Macrophages.** These cells, derived from monocytes of the blood, phagocytize foreign matter **(antigens)** and "display" fragments of it to certain T cells, thus

alerting the immune system to the presence of an enemy.

4. **Dendritic cells.** These are APCs found in the epidermis, mucous membranes, and lymphatic organs. (In the skin, they are often called *Langerhans cells*.)

5. **Reticular cells.** These are branched cells that contribute to the stroma (connective tissue framework) of the lymphatic organs and act as APCs
in the thymus.

Lymphatic Organs

These organs include the lymph nodes, tonsils, thymus, and spleen.

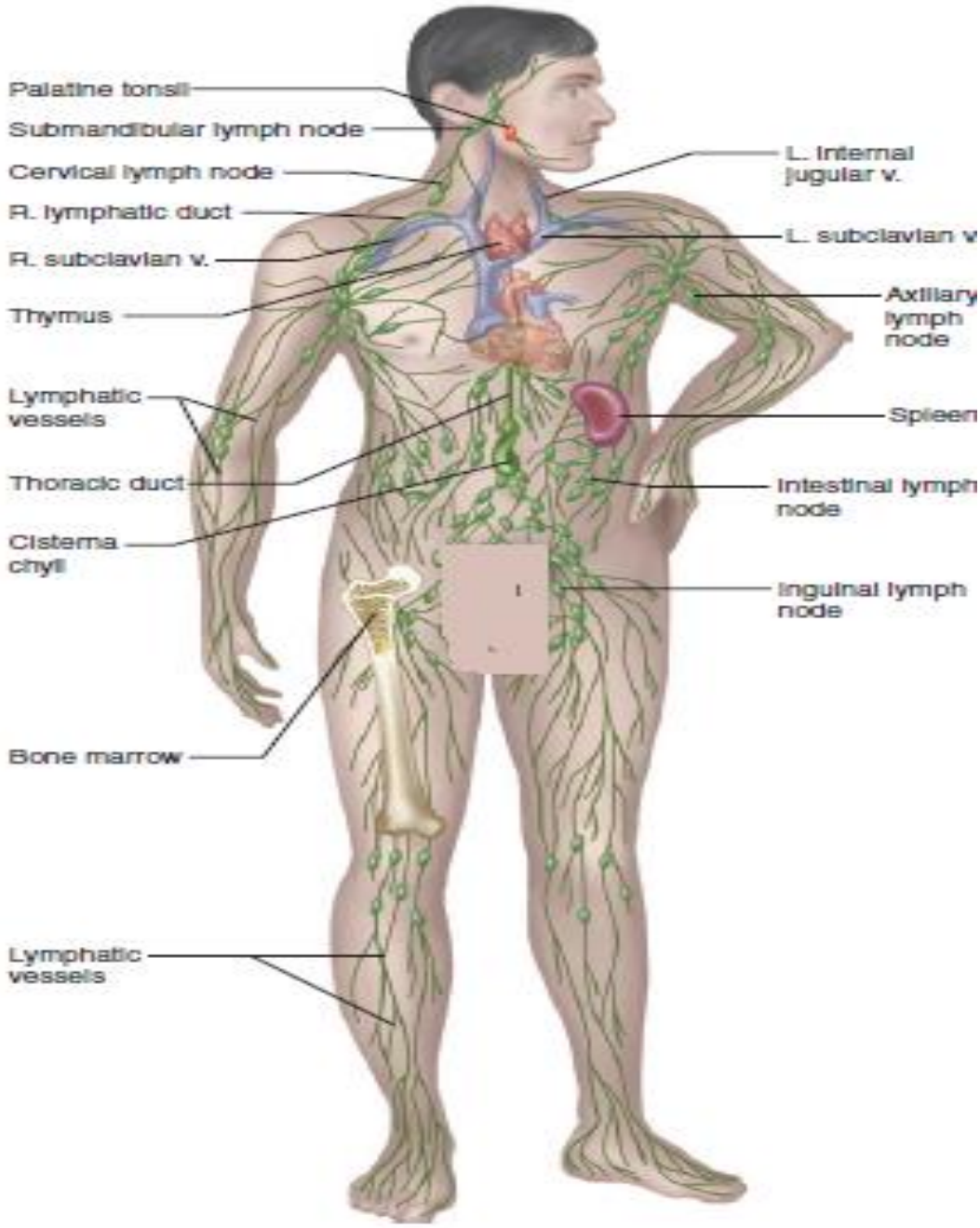
1-Lymph Nodes serve two functions: to cleanse the lymph and alert the immune system to pathogens. There are hundreds of lymph nodes in the body. They are especially concentrated in the cervical, axillary, and inguinal regions close to the body surface, and in thoracic, abdominal, and pelvic groups deep in the body cavities. Most of them are embedded in fat.

2-Tonsils

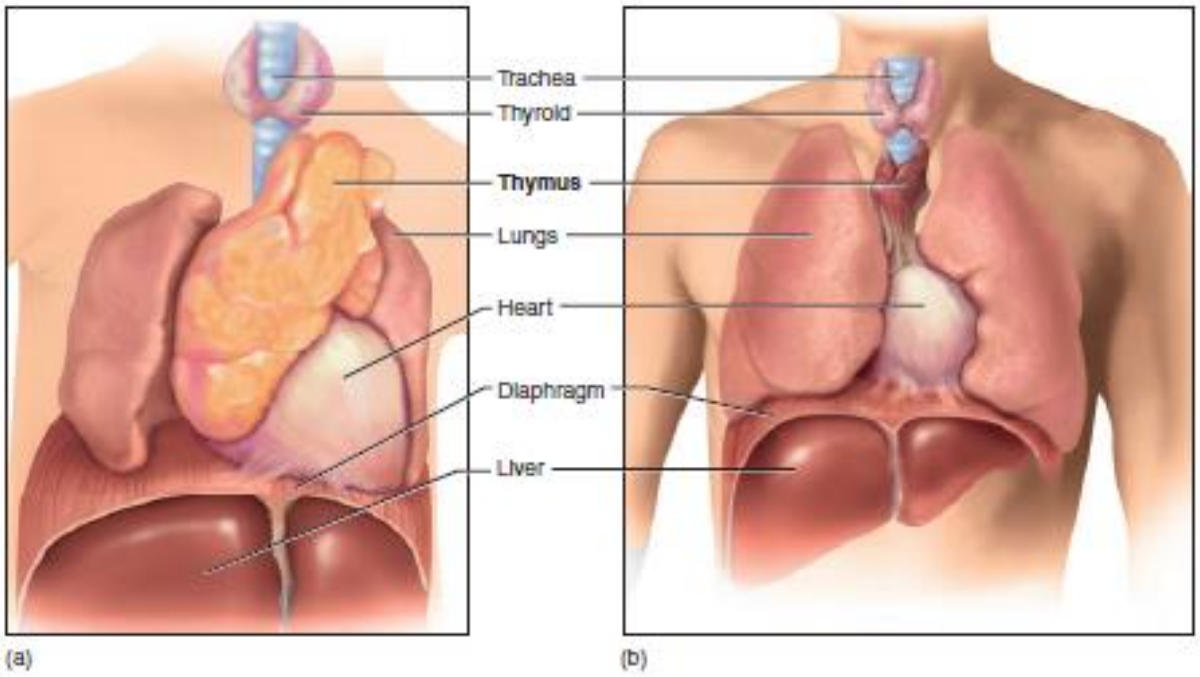
The **tonsils** are patches of lymphatic tissue located at the entrance to the pharynx, where they guard against ingested and inhaled pathogens. Each is covered by an
epithelium and has deep pits called **tonsillar crypts** lined by lymphatic nodules

3-Thymus

The **thymus** is a member of both the lymphatic and endocrine systems. It houses developing lymphocytes and secretes hormones that regulate their later activity. It is located between the sternum and aortic arch in the superior mediastinum. The thymus is very large in the fetus and grows slightly during childhood, when it is most active. After age 14, however, it begins to undergo involution
(shrinkage) so that it is quite small in adults


Palatine tonsil
Submandibular lymph node
Cervical lymph node
R. lymphatic duct
R. subclavian v.
Thymus
Lymphatic vessels
Thoracic duct
Cisterna chyli
Bone marrow
Lymphatic vessels
L. internal jugular v.
L. subclavian v
Axillary lymph node
Spleen
Intestinal lymph node
Inguinal lymph node

Dr.Wasfi



4-**Spleen**

The **spleen** is the body's largest lymphatic organ. It is located in the left hypochondriac region, just inferior to the diaphragm and dorsolateral to the stomach , It has a medial hilum penetrated by the splenic artery and vein and lymphatic vessels.

The urinary system

The urinary system thus has a very close physiological relationship with the endocrine, circulatory, and respiratory systems, Anatomically, the urinary system is closely associated with the reproductive system, Thus the urinary and reproductive systems are often collectively called the **urogenital (U-G) system**,.

Function of urinary system

1-Eliminating wastes from the body

2-Homeostasis

3-detoxify poisons,

4-Synthesize glucose,

5-Controlling electrolyte and acid-base balance,

6-Blood pressure, erythrocyte count

7- The PO2 and PCO2 of the blood.

The **urinary system** consists of six organs: two **kidneys,** two **ureters,** the **urinary bladder,** and the **urethra**

Gross Anatomy

The kidneys lie against the posterior abdominal wall at the level of vertebrae T12 to L3. The right kidney is slightly lower than the left because of the space occupied by the liver above it. Each kidney weighs about 160 g and measures about 12 cm long, 5 cm wide, and 2.5 cm thick—about the size of a bar of bath soap. The lateral surface is convex while the medial surface is concave and has a slit, the **hilum,** where it receives the renal nerves, blood vessels, lymphatic vessels, and ureter.

The left adrenal gland rests on the superior pole of that kidney, while the right adrenal gland is more medial, between the hilum and pole.

The kidney is protected by three layers of connective

tissue:

(1) a fibrous **renal fascia,**

(2) the **adipose capsule,**

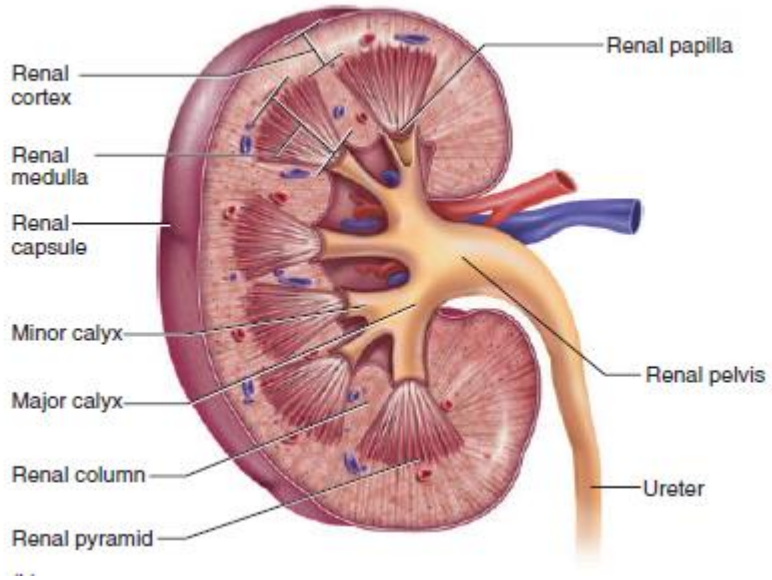
(3) the **renal capsule,**

The parenchyma is divided into two zones: an outer **renal cortex** about 1 cm thick and an inner **renal medulla** facing the sinus. Extensions of the cortex called **renal columns** project toward the sinus and divide the medulla into 6 to 10 **renal pyramids.** Each pyramid is conical, with a broad base facing the cortex and a blunt point called the **renal papilla.**

The papilla of each renal pyramid is nestled in a cup called a **minor calyx** .which collects its urine.

Two or three minor calices converge to form a **major calyx,** and two or three major calices convergein the sinus to form the funnel-like **renal pelvis.**

The **ureter** is a tubular continuation of the renal pelvis that drains the urine down to the urinary bladder.



The Nephron

Each kidney contains about 1.2 million functional units called **nephrons** the function of one nephron, A nephron consists of two principal parts: **a renal corpuscle** where the blood plasma is filtered and a long **renal tubule**
that processes this filtrate into urine.

The Renal Corpuscle

The **renal corpuscle** ,consists of a ball of capillaries called a enclosed in a two-layered **glomerular (Bowman) capsule.** The parietal (outer) layer of the capsule is a simple squamous epithelium, while the visceral layer consists of elaborate cells called **podocytes** wrapped around the capillaries.

The Renal Tubule

The **renal (uriniferous) tubule** is a duct that leads away from the glomerular capsule and ends at the tip of a medullary pyramid. It is about 3 cm long and divided into four major regions:

1-The proximal convoluted tubule,

2-Nephron loop,

3- Distal convoluted tubule,

4-Collecting duct).

The Proximal Convoluted Tubule (PCT) arises from the glomerular capsule. It is the longest and most coiled of the four regions **,**has a simple cuboidal epithelium with prominent microvilli (a brush border

The Nephron Loop After coiling extensively near the renal corpuscle, the PCT straightens out and forms a long U-shaped **nephron loop (loop of Henle).**

The Distal Convoluted Tubule When the nephron loop returns to the cortex, it coils again and forms the **distal convoluted tubule (DCT).** This is shorter and less convoluted than the PCT, DCT is the end of the nephron.

The Collecting Duct The DCTs of several nephrons drain into a straight tubule called the **collecting duct,** which passes down into the medulla. Near the papilla, several collecting ducts merge to form a larger **papillary duct;**

Renal circulation

The kidneys account for only 0.4% of the body weight, they receive about 21% of the cardiac output (the *renal fraction*).

Each kidney is supplied by a **renal artery** (occasionally two or more) arising from the aorta.

The renal artery divides and eventually gives rise to a few **interlobar arteries.**

One interlobar artery penetrates each renal column

and travels between the pyramids it branches again to form the **arcuate arteries,**

Each arcuate artery gives rise to several **interlobular arteries,** which pass upward into the cortex.

The finer branches of the renal circulation

As an interlobular artery ascends through the cortex, a series of **afferent arterioles** arise from it like the limbs of a pine tree. Each afferent arteriole supplies

blood to one nephron and ends in the glomerulus

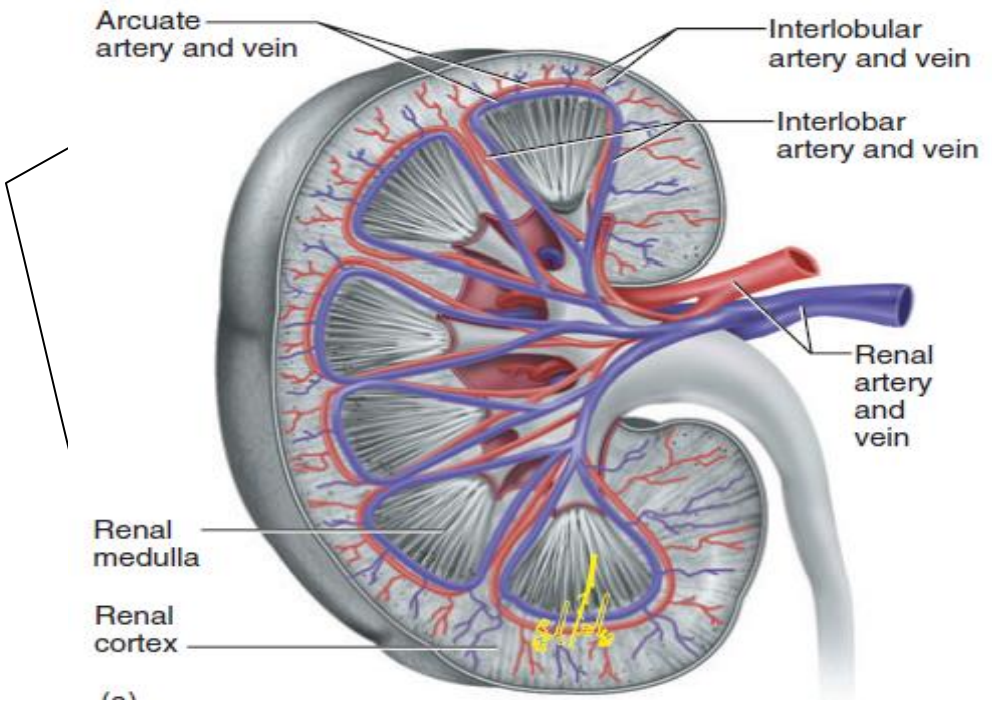
described earlier. The glomerulus is drained by an **efferent arteriole.**

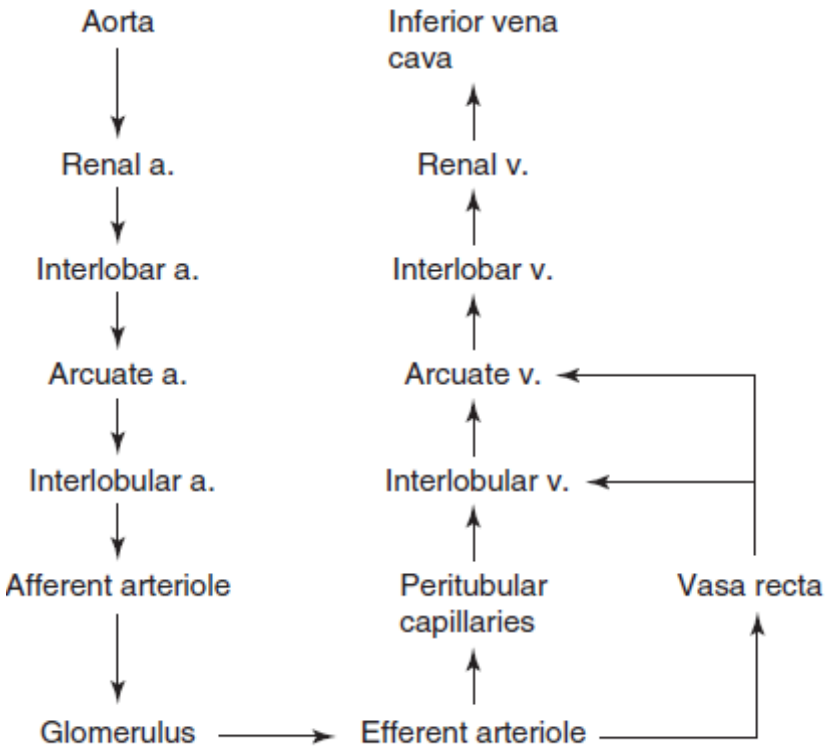
The afferent and efferent arterioles penetrate one side of the glomerular capsule together. Just outside the capsule, they contact the first part of the distal convoluted tubule and with it, form a **juxtaglomerular** (

apparatus. This is a device **monitor and stabilize blood pressure**.

The efferent arteriole leads next to a plexus of **peritubular capillaries,** named for the fact that they form a network around the renal tubules. Blood flows from the peritubular capillaries to, in order, the **interlobular veins, arcuate veins, interlobar veins,** and **renal vein,** which travel parallel to the arteries of the same names.

The renal vein leaves the hilum and drains into the inferior vena cava.



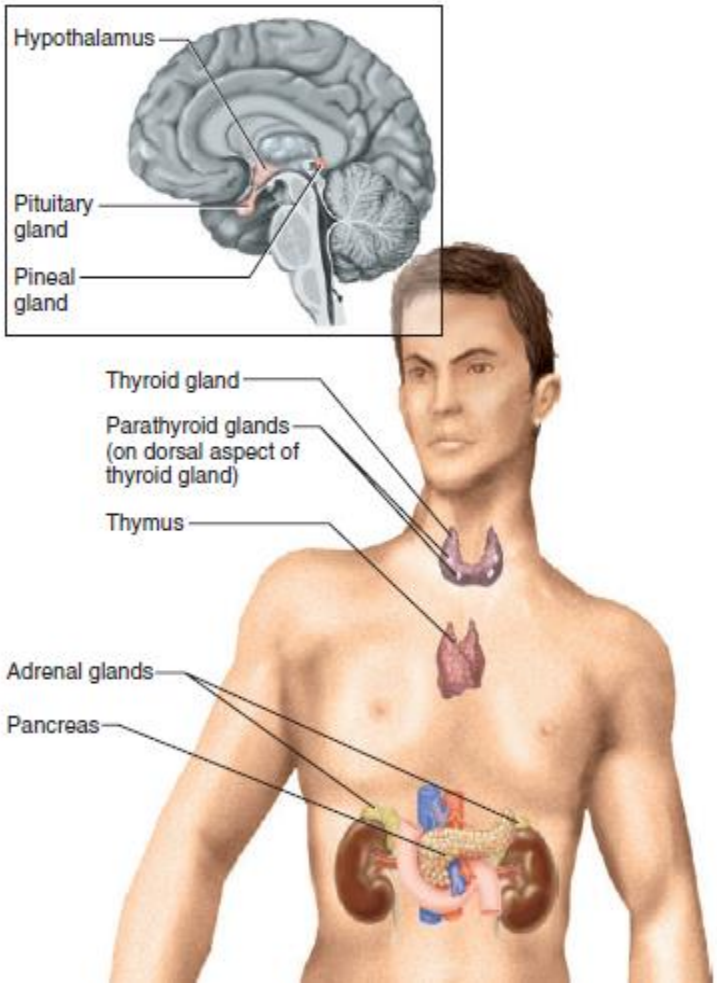

Aorta
Renal a.
Interlobar a.
Arcuate a.
Interlobular a.
Afferent arteriole
Glomerulus
Efferent arteriole
Peritubular capillaries
Vasa recta
Interlobular v.
Arcuate v.
Interlobar v.
Renal v.
Inferior vena cava

Endocrine system

Endocrinology

The study of the endocrine system and the diagnosis and treatment of its dysfunctions . endocrine system composed of glands that secrete it's products(**hormones**) directly to blood stream,(**ductless**).

Hormones are chemical messengers that are secreted into the bloodstream and stimulate the physiology of cells in another tissue or organ.



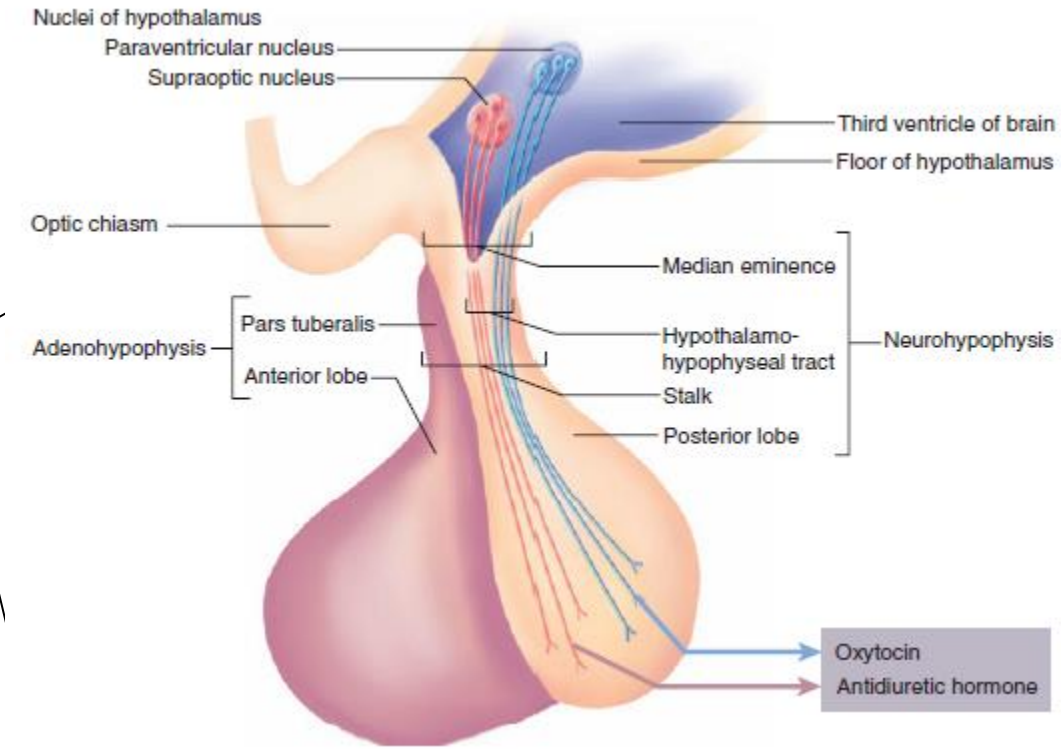
Endocrine glands

1-The hypothalamus forms the floor and walls of the third ventricle of the brain It regulates primitive functions of the body ranging from water balance to sex drive.

2-The pituitary gland (hypophysis) is suspended from the hypothalamus by a stalk .It is usually about 1.3 cm in diameter, but grows about 50% larger in pregnancy. It is actually composed of two structures

a- The adenohypophysis and neurohypophysis

b- The adenohypophysis .



3-The Pineal Gland

The **pineal gland** is a pine cone–shaped growth on the roof of the third ventricle of the brain, beneath the posterior end of the corpus callosum mm long and 5 mm wide, It produces **serotonin** by day and **melatonin** at night. In animals with seasonal breeding,

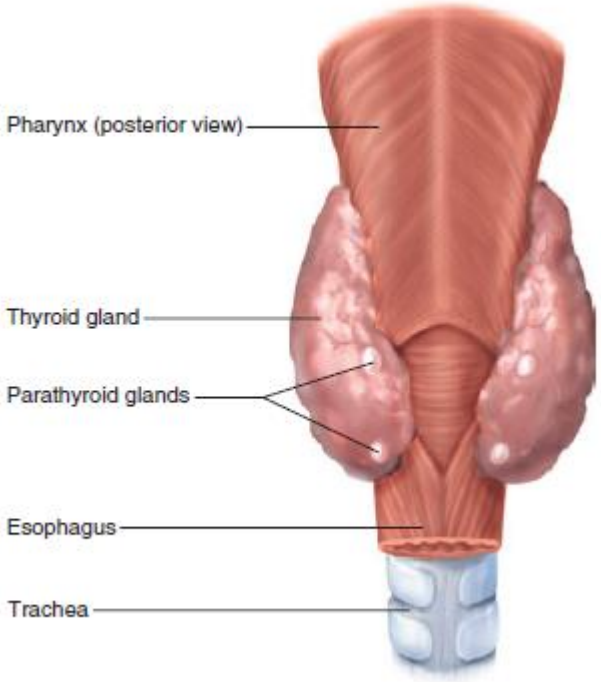
4-The Thymus

The **thymus** is located in the mediastinum superior to the heart .Like the pineal, it is large in infants and children but involutes after puberty. In elderly people.The thymus secretes ***thymopoietin* and *thymosins,*** hormones that regulate the development and later activation of disease-fighting blood cells called T lymphocytes (*T* for*thymus*).

5-The Thyroid Gland

The **thyroid gland** is the largest endocrine gland; it weighs 20 to 25 g and receives one of the body's highest rates of blood flow per gram of tissue. It is wrapped around the anterior and lateral aspects of the trachea, immediately below the larynx. It consists of two large lobes, one on each side of the trachea, connected by a narrow anterior *isthmus*

Histologically, the thyroid is composed mostly of sacs called **thyroid follicles** Each is filled with a protein-rich colloid and lined by a simple cuboidal epithelium of **follicular cells.** These cells secrete two main thyroid hormones—**T3**, or **triiodothyronine** ,and **thyroxine,** also known as **T4** or **tetraiodothyronine** .



6-The Parathyroid Glands

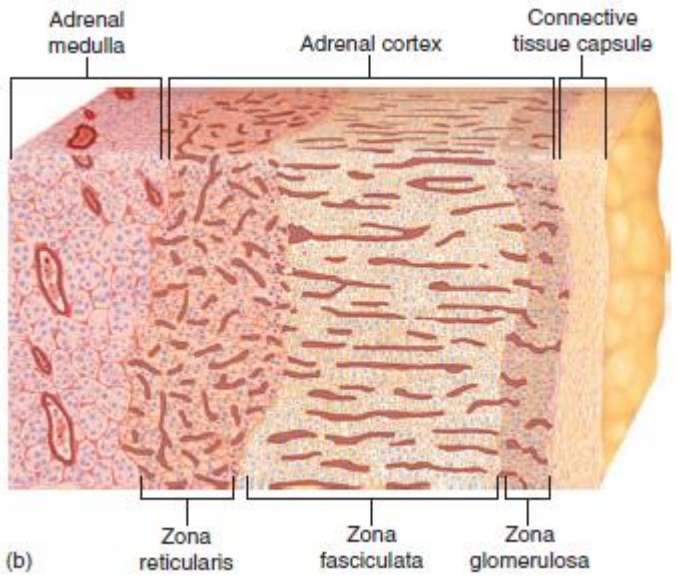
The **parathyroid glands** are partially embedded in the posterior surface of the thyroid There are usually four, each about 3 to 8 mm long and 2 to 5 mm wide.

They secrete **parathyroid hormone (PTH)** in response to hypocalcemia. PTH raises blood calcium levels by promoting the synthesis of calcitriol.

7-The Adrenal Glands

An **adrenal (suprarenal) gland** sits like a cap on the superior pole of each kidney In adults, the adrenal is about 5 cm (2 in.) long, 3 cm (1.2 in.) wide, and weighs about 4 g; it weighs about twice this much at birth.

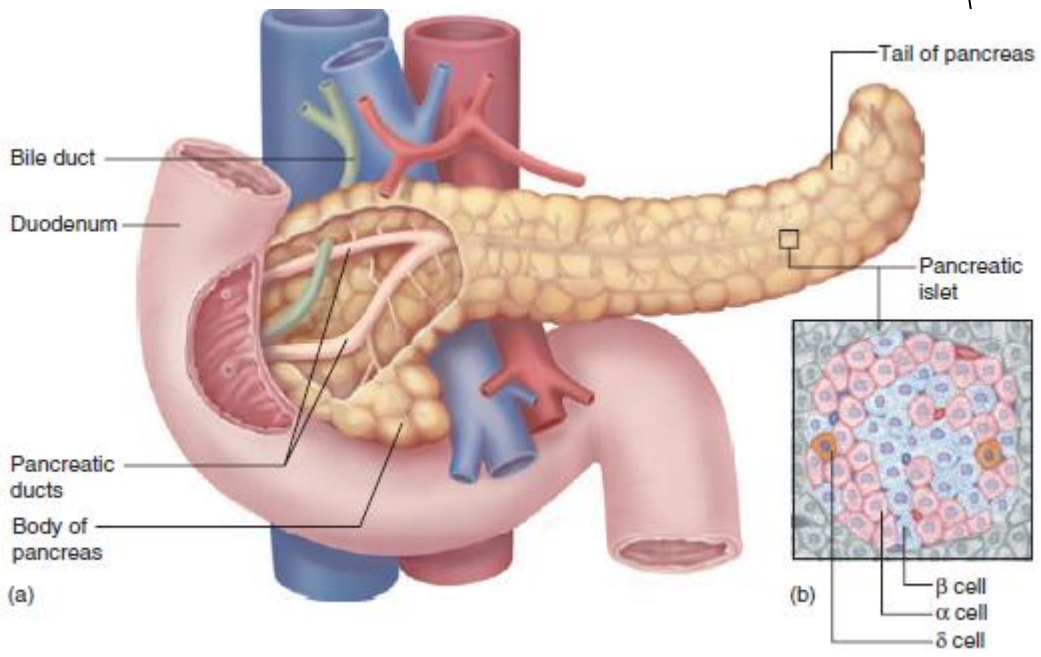
Its inner core, the **adrenal medulla**, **produce epinephrine and nor epinephrine** is a small portion of the total gland. Surrounding it is a much thicker **adrenal cortex** produce **,(cortisone ,cortisol ,and aldosterone)**



8-The Pancreas

The elongated spongy **pancreas** is located retroperitoneally, inferior and dorsal to the stomach It is approximately 15 cm long and 2.5 cm thick. Most of it

is an exocrine digestive gland, but scattered through the exocrine tissue are endocrine cell clusters called **pancreatic islets (islets of Langerhans**).



9-**The Gonads**

The **gonads** are both endocrine and exocrine. Their exocrine products are eggs and sperm, and their endocrine products are the gonadal hormones, most of which are steroids. Each follicle of the ovary contains an egg cell surrounded by a wall of **granulosa cells** .

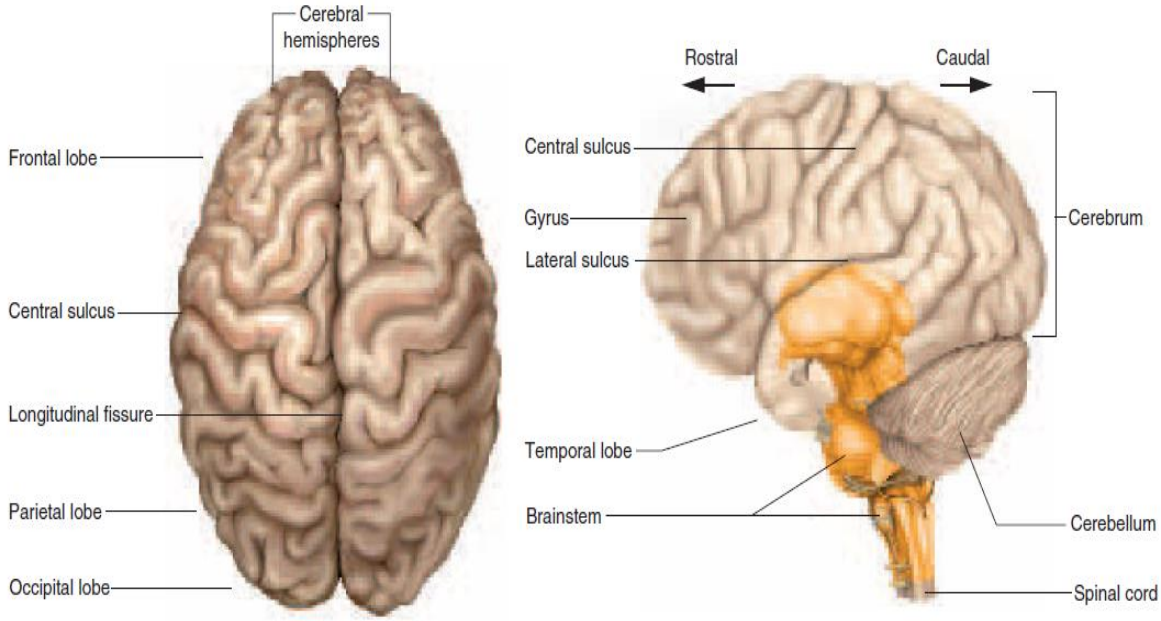
After ovulation, the corpusluteum secretes estradiol and **progesterone** for 12 days or so, or for 8 to 12 weeks in the event of pregnancy.

The testis consists mainly of microscopic *seminiferous tubules* that produce sperm. Nestled between them are clusters of **interstitial cells** which produce testosterone and lesser amounts of weaker androgens and estrogen. Testosterone stimulates development of the male

central nervous system

The brain and spinal cord are referred to as the central nervous system (CNS), the nerves connected with the brain are the cranial nerves whilst the nerves connecting the spinal cord to the body are referred to as the peripheral nervous system (PNS).

In human brain anatomy, one structure is rostral to another if it is closer to the forehead and caudal to another if it is closer to the spinal cord . The average adult brain weighs about 1,600 g (3.5 lb) in men and 1,450 g in women. Its size is proportional to body size, not intelligence—the Neanderthal people had larger brains than modern human



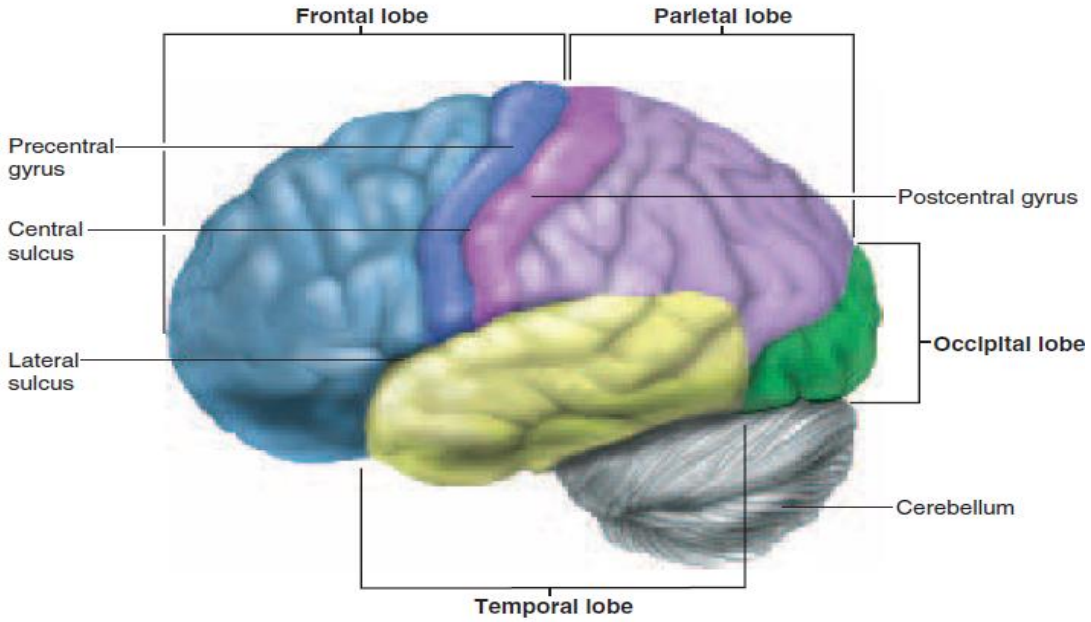
The brain is divided into three major portions

1-The **cerebrum**

constitutes about 83% ofits volume and consists of a pair of **cerebral hemispheres.** Each hemisphere is marked by thick folds called **gyri** separated by shallow grooves called **sulci** (singular, *sulcus*). A very deep groove, the **longitudinal fissure,** separates the right and left hemispheres from each other. At the bottom of this fissure, the hemispheres are connected by a thick bundle of nerve fibers called the **corpus callosum**.

Lobs of cerebrum

1. The **frontal lobe** lies immediately behind the frontal bone, superior to the orbits.
2. The **parietal lobe** forms the uppermost part of the nipple brain and underlies the parietal bone.
3. The **occipital lobe** is at the rear of the head underlying the occipital bone. It is the principal visual center of the brain.
4. The **temporal lobe** is a lateral, horizontal lobe deep to the temporal bone, separated from the parietallobe above it by a deep **lateral sulcus.**



2-The cerebellum (SER-eh-BEL-um)

lies inferior to the cerebrum and occupies the posterior cranial fossa. It is also marked by gyri, sulci, and fissures. The cerebellum is the second-largest region of the brain; it constitutes about10% of its volume but contains over 50% of its neurons.

3-The brainstem

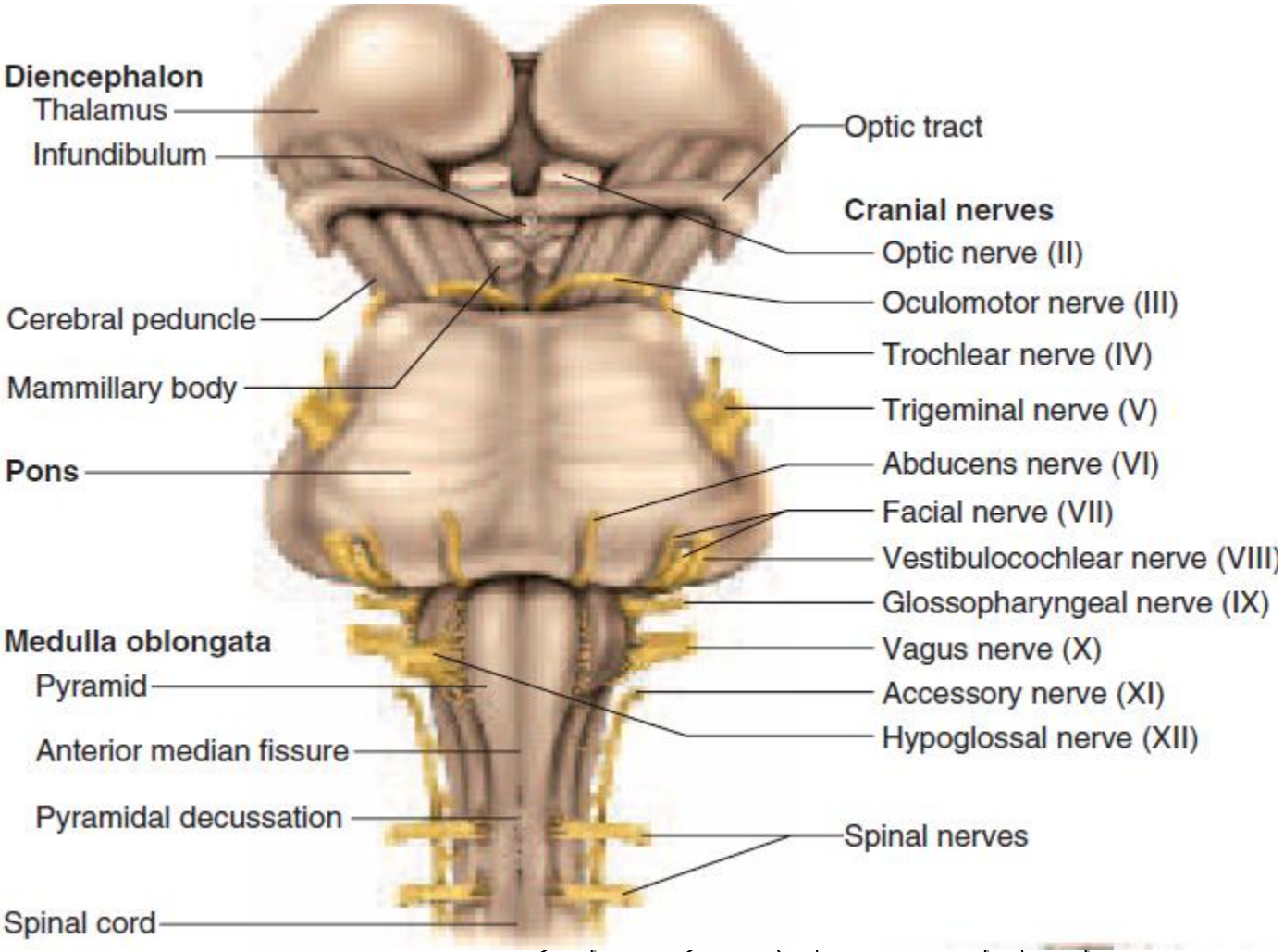
It is oriented like a vertical stalk with the cerebrum perched on top of it like a mushroom cap. Postmortem changes give it a more oblique angle in the cadaver and consequently in many medical illustrations. The major components of the brainstem.

a- The *diencephalon*

b- Midbrain.

c- Pons.

d- medulla oblongata. The brainstem ends at the foramen magnum of the skull and the central nervous system (CNS) continues below this as the spinal cord.



Gray and White Matter

The brain, like the spinal cord, is composed of gray and white matter. Gray matter—the seat of the neuron cell bodies, dendrites, and synapses—forms a surface layer called the **cortex** over the cerebrum and cerebellum, and deeper masses called **nuclei** surrounded by white matter.

Meninges

The meninges of the brain are basically the same as those of the spinal cord:

1-dura mater.

2- arachnoid mater

3-pia mater

In the cranial cavity, it consists of two layers—an outer *periosteal layer,* equivalent to the periosteum of the cranial bone, and an inner *meningeal layer.*

spinal cord. In some places, the two layers are separated by **dural sinuses,**

Ventricles and Cerebrospinal Fluid

The brain has four internal chambers called **ventricles**

1- **lateral ventricles**

Form a large arc in each cerebral hemisphere. Through a tiny passage called the **interventricular foramen,**.

2- The **third ventricle,**

A narrow medial space inferior to the corpus callosum. From here, a canal called the **cerebral aqueduct** passes down the core of the midbrain and leads to the

3-Fourth ventricle, a small chamber between the pons and cerebellum. caudally, this space narrows and forms a **central canal** that extends through the medulla oblongata into the spinal cord.

A clear, colorless liquid called **cerebrospinal fluid (CSF)** fills the ventricles and canals of the CNS and bathes its external surface. The brain produces about 500 mL of CSF per day.

Cerebrospinal fluid serves three purposes:

1. **Buoyancy.** Because the brain and CSF are very similar in density, the brain neither sinks nor floats in the CSF but remains suspended in it—that is, thebrain has *neutral buoyancy.*

2. **Protection.** CSF also protects the brain from striking the cranium when the head is jolted. If the jolt issevere, however, the brain still may strike the inside

of the cranium or suffer shearing injury from contact with the angular surfaces of the cranial floor.

2. **Chemical stability.** CSF is secreted into each ventricle of the brain and is ultimately absorbed into the bloodstream.
3.

Spinal Cord anatomy

The spinal cord is connected to the brain and is about the diameter of a human finger. From the brain the spinal cord descends down the middle of the back and is surrounded and protected by the bony vertebral column. The spinal cord is surrounded by a clear fluid called cerebral spinal fluid (CSF), that acts as a cushion to protect the delicate nerve tissues against damage from banging against the inside of the vertebrae. The anatomy of the spinal cord itself, consists of millions of nerve fibres which transmit electrical information to and from the limbs, trunk and organs of the body, back to and from the brain. The nerves which exit the spinal cord in the upper section, the neck, control breathing and the arms. The nerves which exit the spinal cord in the mid and lower section of the back, control the trunk and legs, as well as bladder, bowel and sexual function.

The nerves which carry information from the brain to muscles are called motor neurones. The nerves which carry information from the body back to the brain are called sensory neurones. Sensory neurones carry information to the brain about skin temperature, touch, pain and joint position.

Spinal Nerves

Nerves called the spinal nerves or nerve roots, branch off the spinal cord and pass out through a hole in each of the vertebrae called the foramen. These nerves carry information from the spinal cord to the rest of the body, and from the body back up to the brain.

There are four main groups of spinal nerves, which exit different levels of the spinal cord.

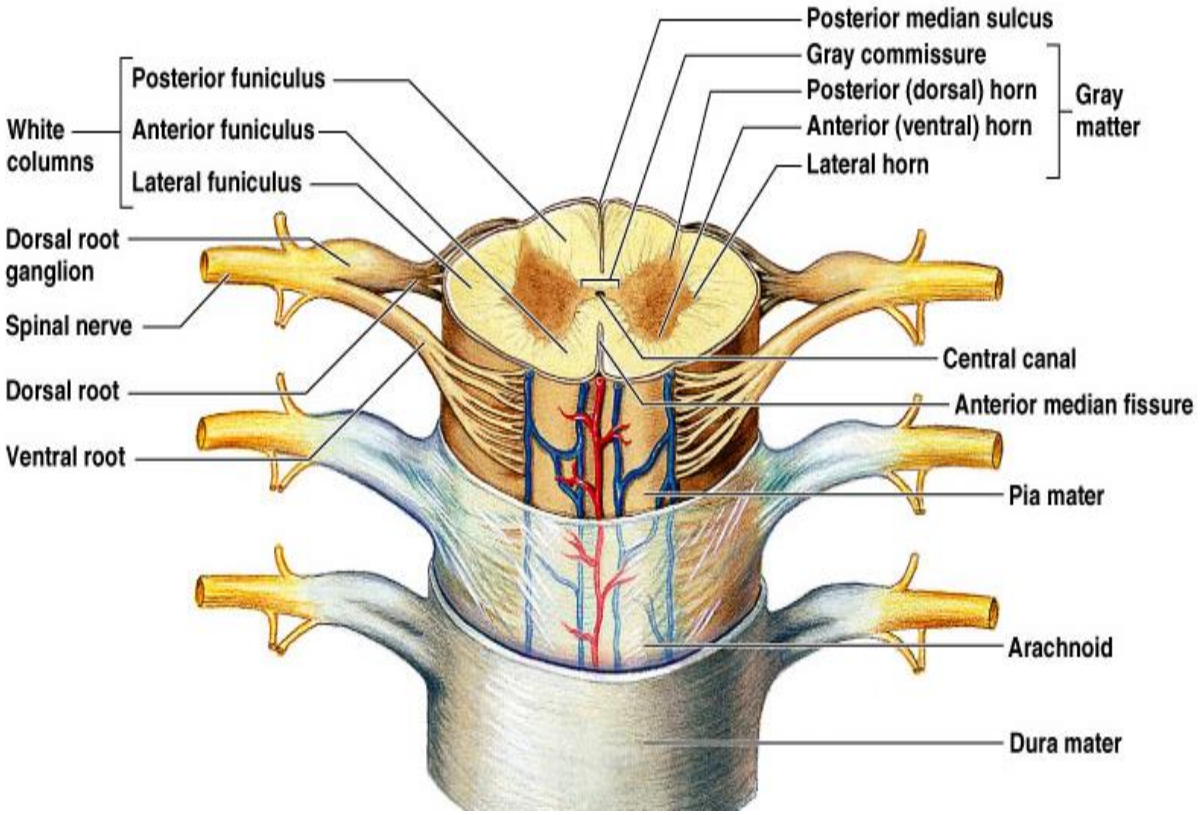
These are in descending order down the vertebral column:

1-Cervical Nerves "C" : (nerves in the neck) supply movement and feeling to the arms, neck and upper trunk. Also control breathing.

2-Thoracic Nerves "T" : (nerves in the upper back) supply the trunk and abdomen.

3-Lumbar Nerves "L"

4- Sacral Nerves "S" : (nerves in the lower back) supply the legs, the bladder, bowel and sexual organs.



Dr Mosfi

Top ten endocrine glands and master hormones

gland	location	hormones	Target organs
hypothalamus	Brain	GnRH,CTRH,TRH,PRH,PIH ,GHRH,GHIH	Pituitary gland(Secrete releasing hormones, produce oxytocin and ADH)
pituitary	Brain	GH(growth hormone) FSH(follicles stimulating hormone ,LH(luteinizing hormone) Prolactin Thyroid S.H(Thyroid stimulating hormone) ACTH(Adrenocorticotrophic hormone Parathyroid S.H(parathyroid stimulating hormone)	Muscle and bone Ovary(maturation and releasing ova) Mammary gland(milk secreation) Thyroid gland Adrenal gland Parathyroid gland
penial	Brain	Melatonin serotonin	Synchronized body day/night rhythm
Thyroid	neck	Thyroxin and calcitonin	Tissue cells(metabolism) Increase blood calcium(bone)
parathyroid	neck	Parathyroid hormone	Lower blood calcium(bone)
Adrenal *Medulla *Cortex	Over kidney	 Epinephrine and norepinephrine Cortisone Aldosterone	 Nervous system(Fight and flight Inflammatory cells Renal tubule
Pancreas	Duodenum fold	Insulin glucagon	Tissue cells(regulate blood sugar
ovary	pelvis	Estrogen, progesterone. inhibin	Female characteristics
testes	scrotum	testosterone	male characteristics
thymus	mediastinum	thymosin	Immune functions

Skeletal system

Grand
Total: 206
Axial Skeleton
Skull Total 22
Cranial bones
Frontal bone (1)
Parietal bone (2)
Occipital bone (1)
Temporal bone (2)
Sphenoid bone (1)
Ethmoid bone (1)
Facial bones
Maxilla (2)
Palatine bone (2)
Zygomatic bone (2)
Lacrimal bone (2)
Nasal bone (2)
Vomer (1)
Inferior nasal conchae (2)
Mandible (1)

AppendicularSkeleton
Pectoral Girdle Total 4
Scapula (2)
Clavicle (2)
Upper Limb Total 60
Humerus (2)
Radius (2)

Phalanges (28)

Ulna (2)
Carpals (16)
Metacarpals (10)
Phalanges (28)
Auditory Ossicles Total 6
Malleus (2), Incus (2)
Stapes (2)
Hyoid Bone (1) Total 1
Vertebral Column Total 26
Cervical vertebrae (7)
Thoracic vertebrae (12)
Lumbar vertebrae (5)
Sacrum (1)
Coccyx (1)
Thoracic Cage Total 25
Ribs (24)
Sternum (1)
Pelvic Girdle Total 2
Os coxae (2)
Lower Limb Total 60
Femur (2)
Patella (2)
Tibia (2)
Fibula (2)
Tarsals (14)
Metatarsals (10)

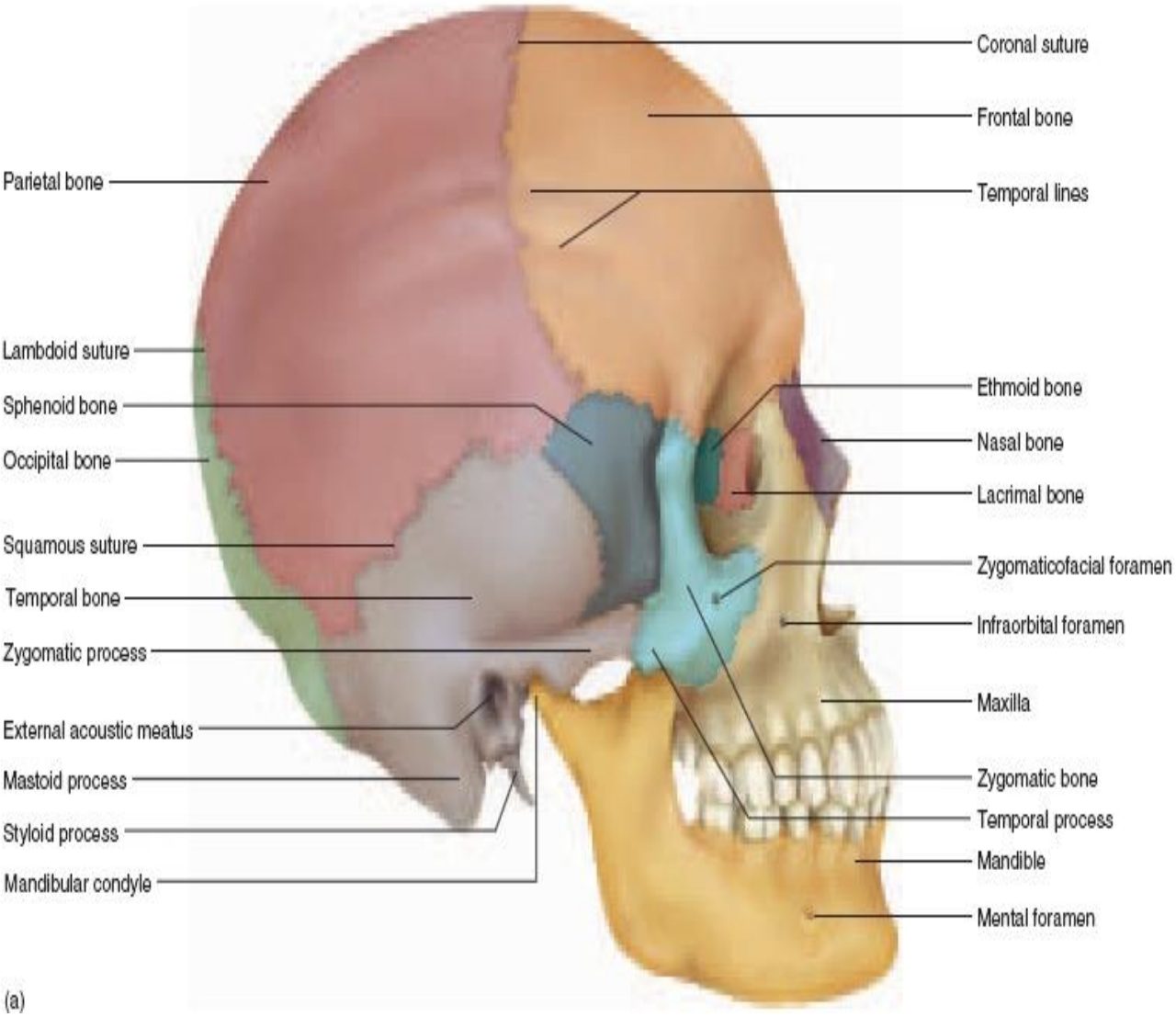
Foramina

- *Infraorbital foramen*
- *Lacrimal foramen*
- *Greater palatine foramen* Palatine nerves
- *Mental foramen* Mental nerve and vessels
- *Foramen magnam*
- *Supraorbital foramen*

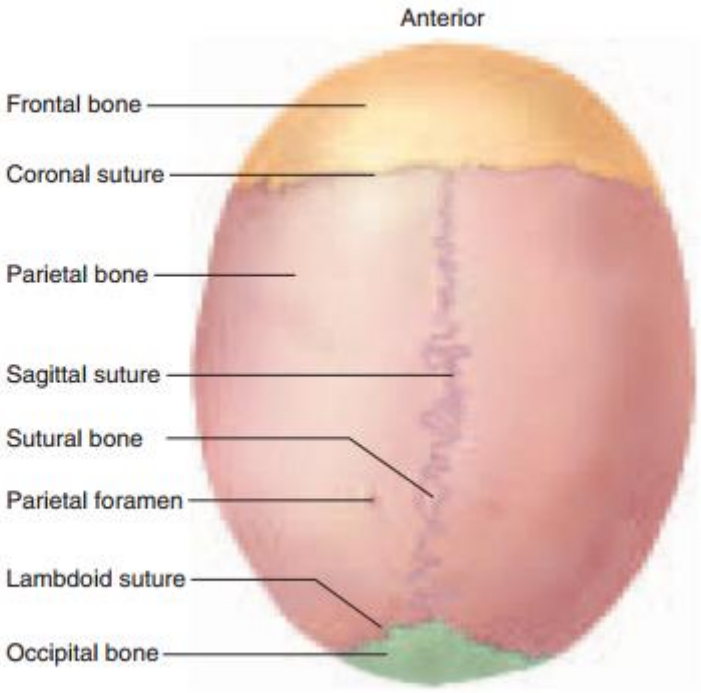
Bones Associated with the Skull
Auditory Ossicles
Malleus (hammer)
Incus (anvil)
Stapes (stirrup

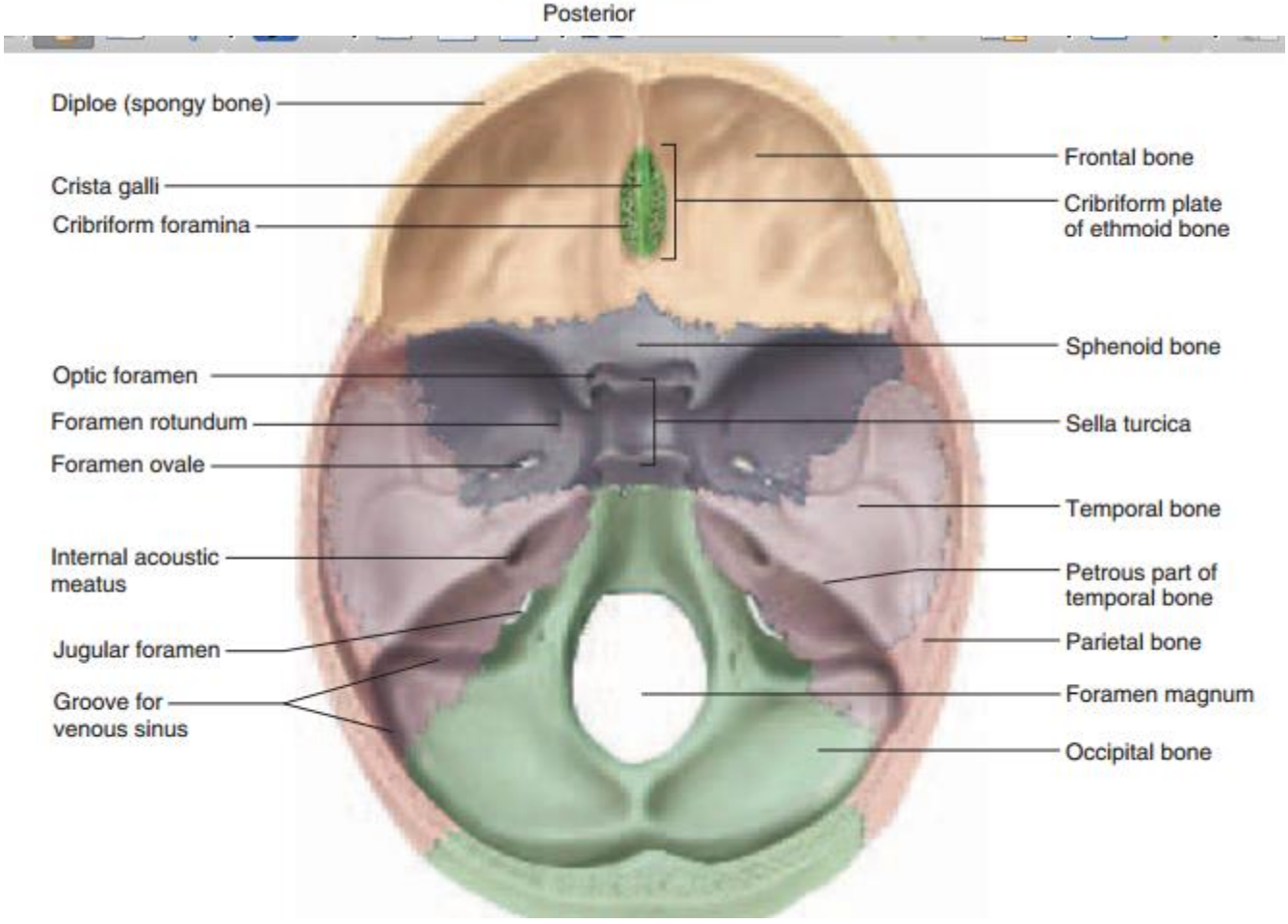
Comparison between male and female pelvis

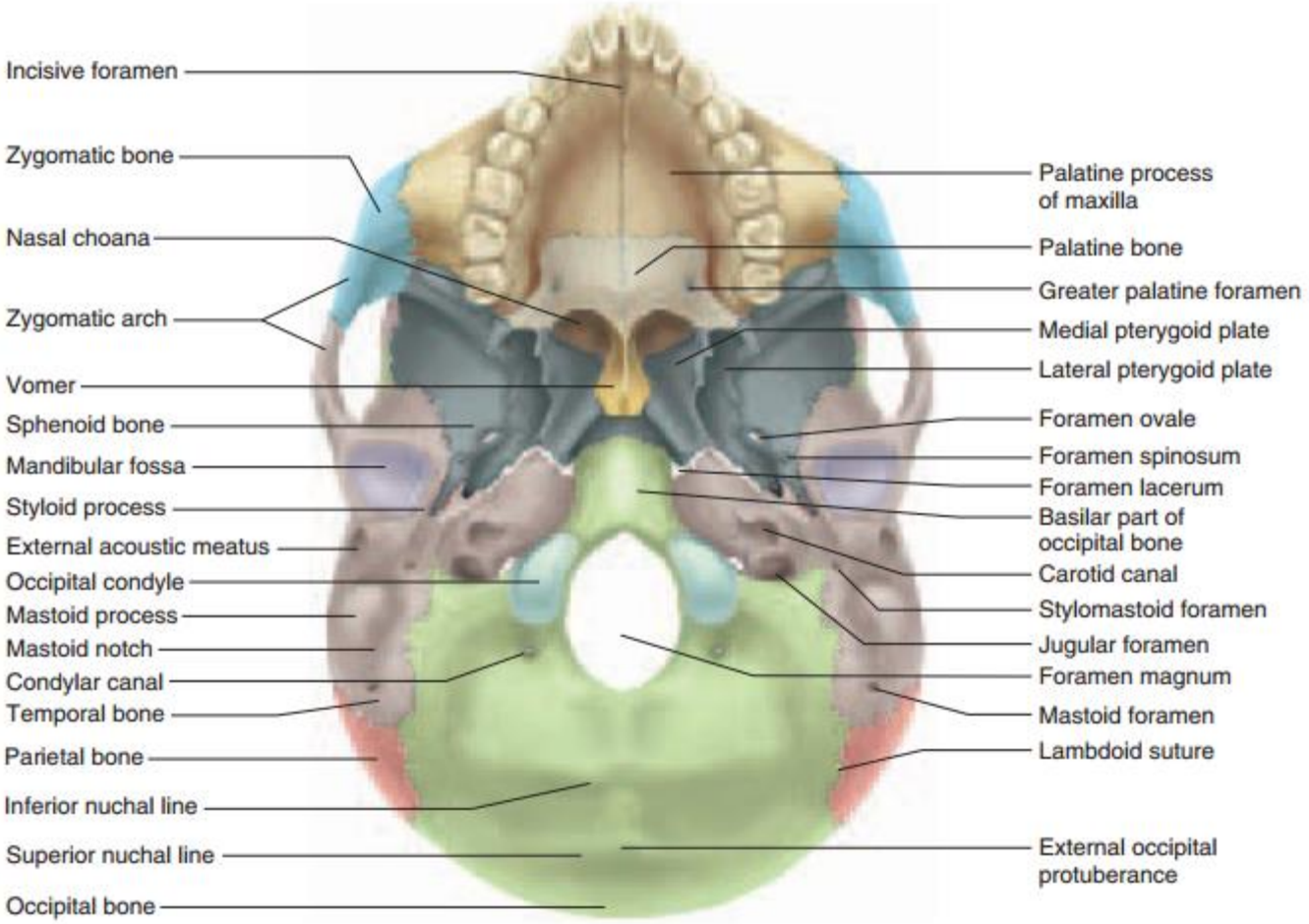
	Male	female
General Appearance	More massive; rougher; heavier processes	Less massive; smoother;
Tilt	Upper end of pelvis relatively vertical	Upper end of pelvis tilted forward
Ilium, greater pelvis	Deeper; projects farther above sacroiliac joint	Shallower; Wider and shallower
Lesser Pelvis	Narrower and deeper	Shorter and wider
Sacrum	Narrower and longer	More movable; tilted dorsally
Coccyx	Less movable; more verticalAnterior superior spines closer together, hips less flared	Anterior superior spines farther apart; Round or oval
Width of Greater Pelvis	Heart-shaped	Larger
Pelvic Inlet	Smaller	Wider
Pelvic Outlet	Narrower	Triangular to oval
Greater Sciatic Notch	RoundFaces more laterally, larger	Faces slightly ventrally,smaller
Obturator Foramen	Usually 90° or less	Usually greater than 100
Acetabulum		
Pubic arch		

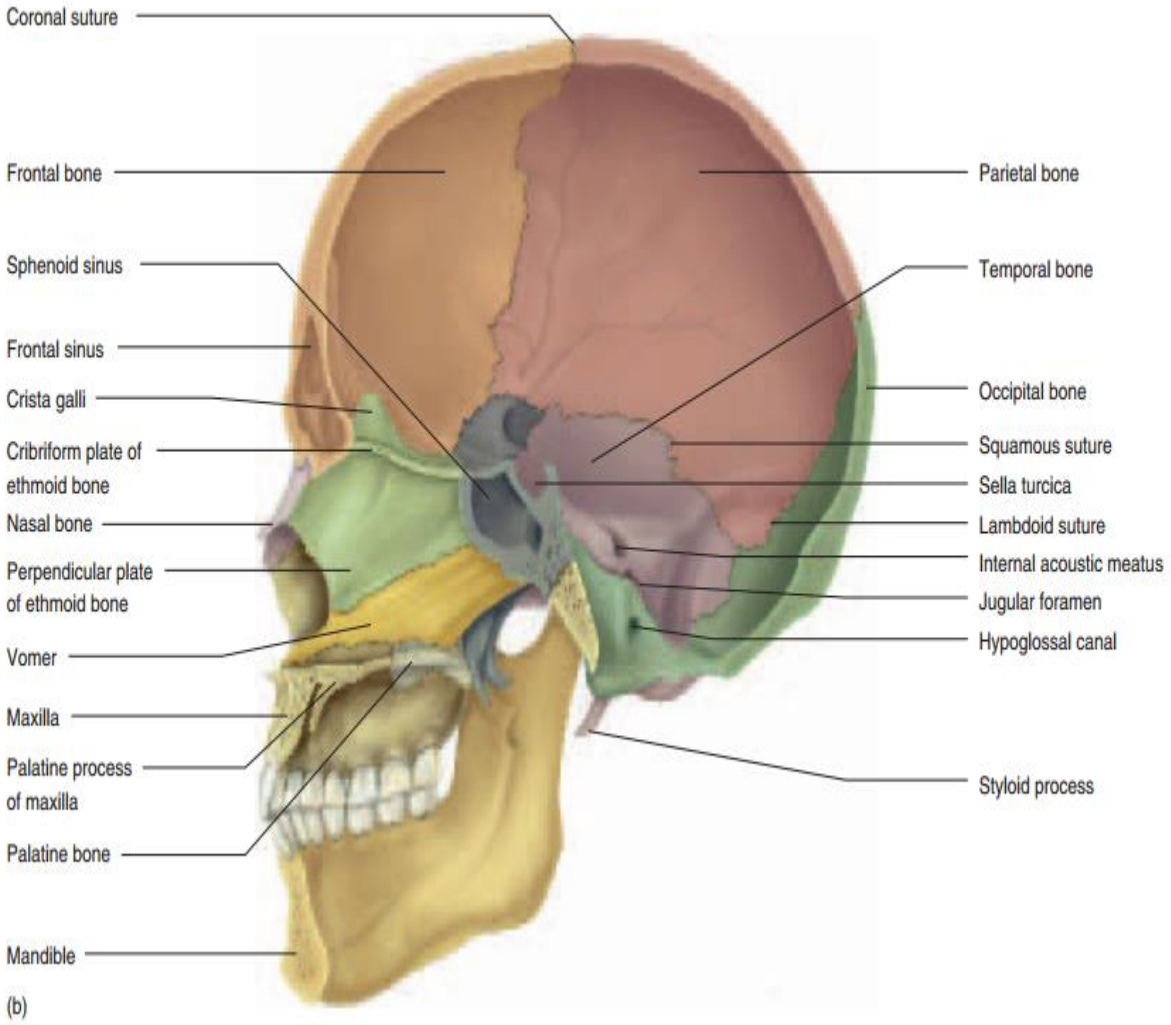

Coronal suture
Frontal bone
Parietal bone
Temporal lines
Lambdoid suture
Sphenoid bone
Occipital bone
Squamous suture
Temporal bone
Zygomatic process
External acoustic meatus
Mastoid process
Styloid process
Mandibular condyle
Ethmoid bone
Nasal bone
Lacrimal bone
Zygomaticofacial foramen
Infraorbital foramen
Maxilla
Zygomatic bone
Temporal process
Mandible
Mental foramen

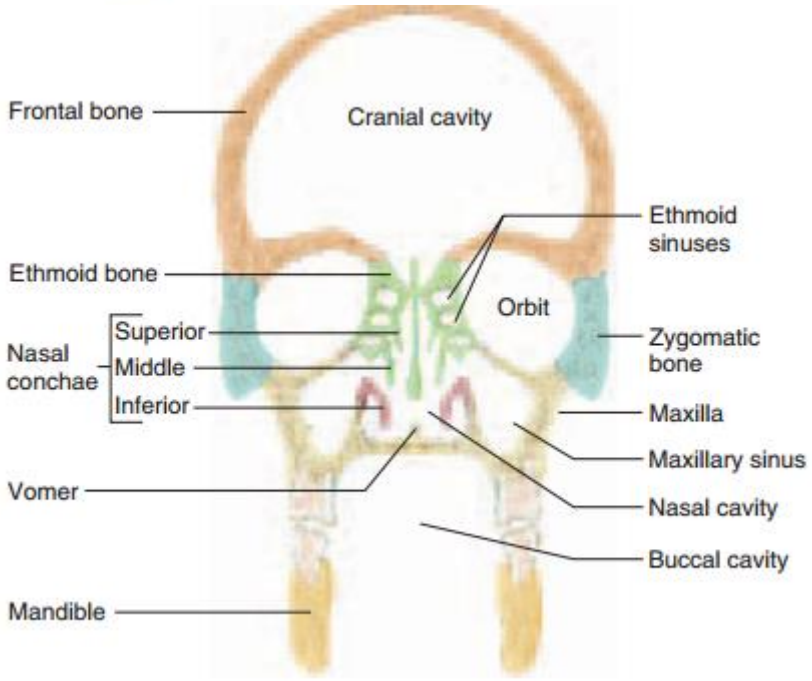
(a)

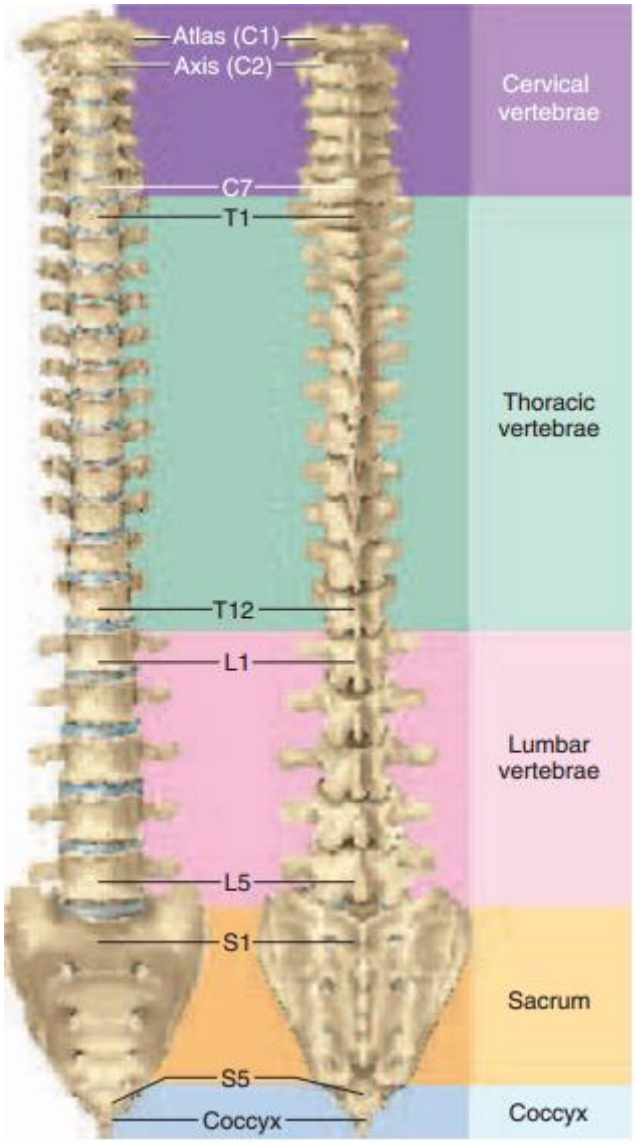

Anterior
Frontal bone
Coronal suture
Parietal bone
Sagittal suture
Sutural bone
Parietal foramen
Lambdoid suture
Occipital bone

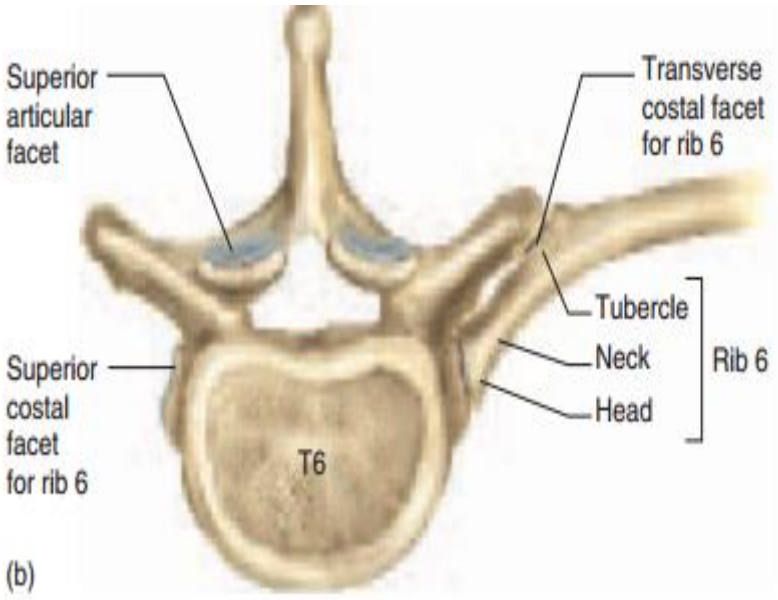

Posterior
Diploe (spongy bone)
Crista galli
Cribriform foramina
Optic foramen
Foramen rotundum
Foramen ovale
Internal acoustic meatus
Jugular foramen
Groove for venous sinus
Frontal bone
Cribriform plate of ethmoid bone
Sphenoid bone
Sella turcica
Temporal bone
Petrous part of temporal bone
Parietal bone
Foramen magnum
Occipital bone

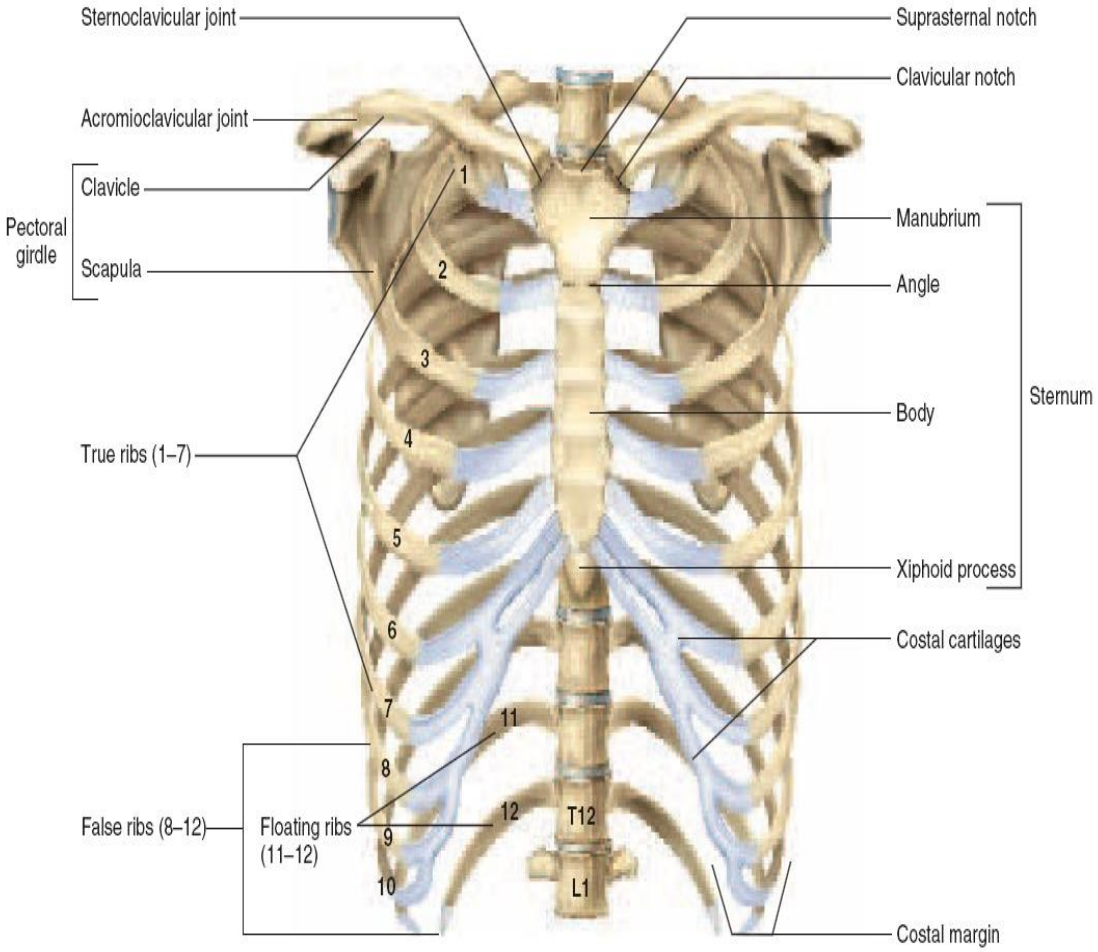

Incisive foramen
Zygomatic bone
Nasal choana
Zygomatic arch
Vomer
Sphenoid bone
Mandibular fossa
Styloid process
External acoustic meatus
Occipital condyle
Mastoid process
Mastoid notch
Condylar canal
Temporal bone
Parietal bone
Inferior nuchal line
Superior nuchal line
Occipital bone
Palatine process of maxilla
Palatine bone
Greater palatine foramen
Medial pterygoid plate
Lateral pterygoid plate
Foramen ovale
Foramen spinosum
Foramen lacerum
Basilar part of occipital bone
Carotid canal
Stylomastoid foramen
Jugular foramen
Foramen magnum
Mastoid foramen
Lambdoid suture
External occipital protuberance

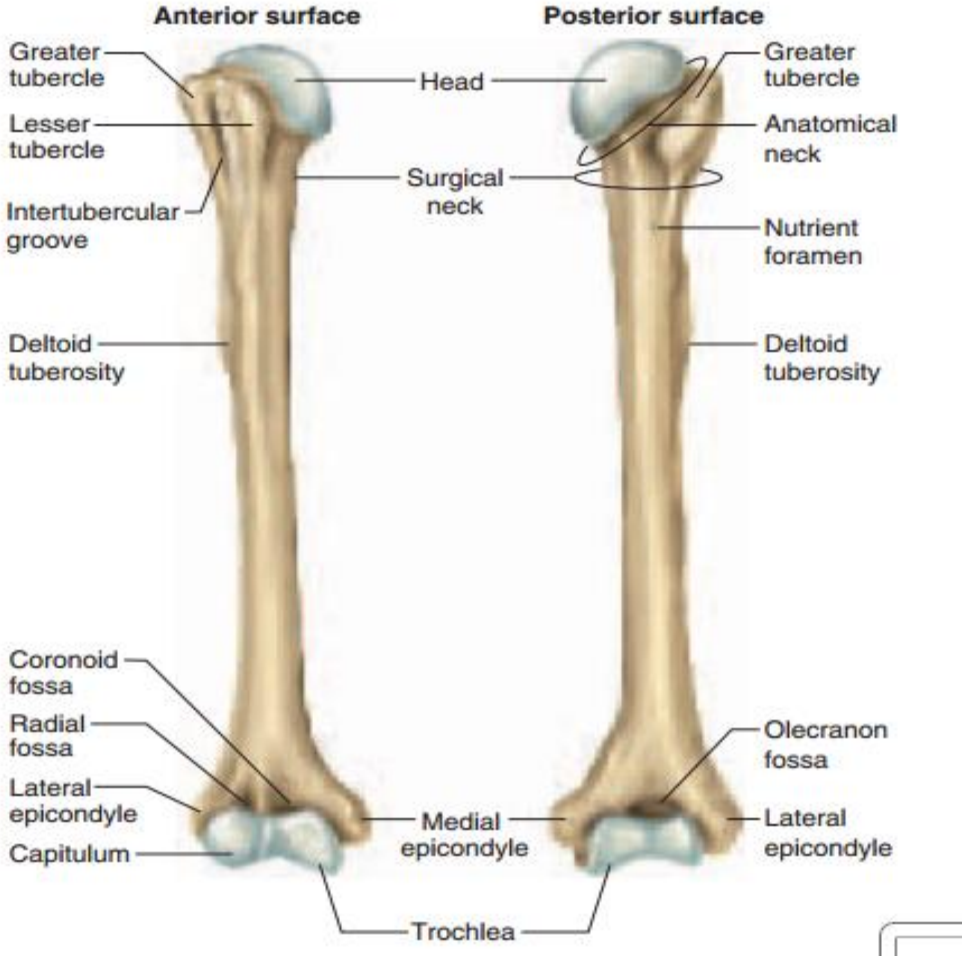

Coronal suture
Frontal bone
Sphenoid sinus
Frontal sinus
Crista galli
Cribriform plate of ethmoid bone
Nasal bone
Perpendicular plate of ethmoid bone
Vomer
Maxilla
Palatine process of maxilla
Palatine bone
Mandible
(b)
Parietal bone
Temporal bone
Occipital bone
Squamous suture
Sella turcica
Lambdoid suture
Internal acoustic meatus
Jugular foramen
Hypoglossal canal
Styloid process

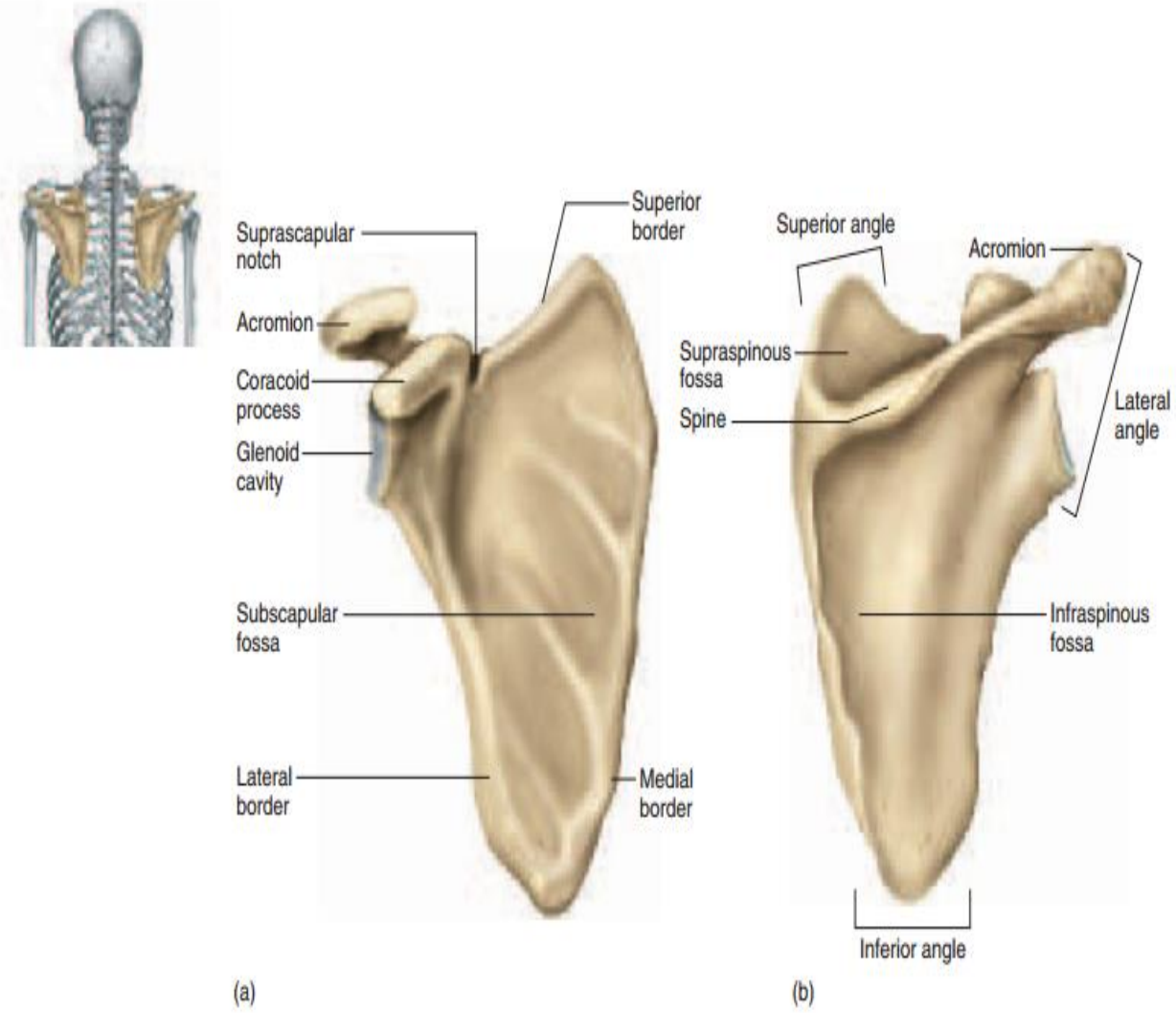

Frontal bone
Cranial cavity
Ethmoid sinuses
Ethmoid bone
Orbit
Nasal conchae
Superior
Middle
Inferior
Zygomatic bone
Maxilla
Maxillary sinus
Vomer
Nasal cavity
Buccal cavity
Mandible

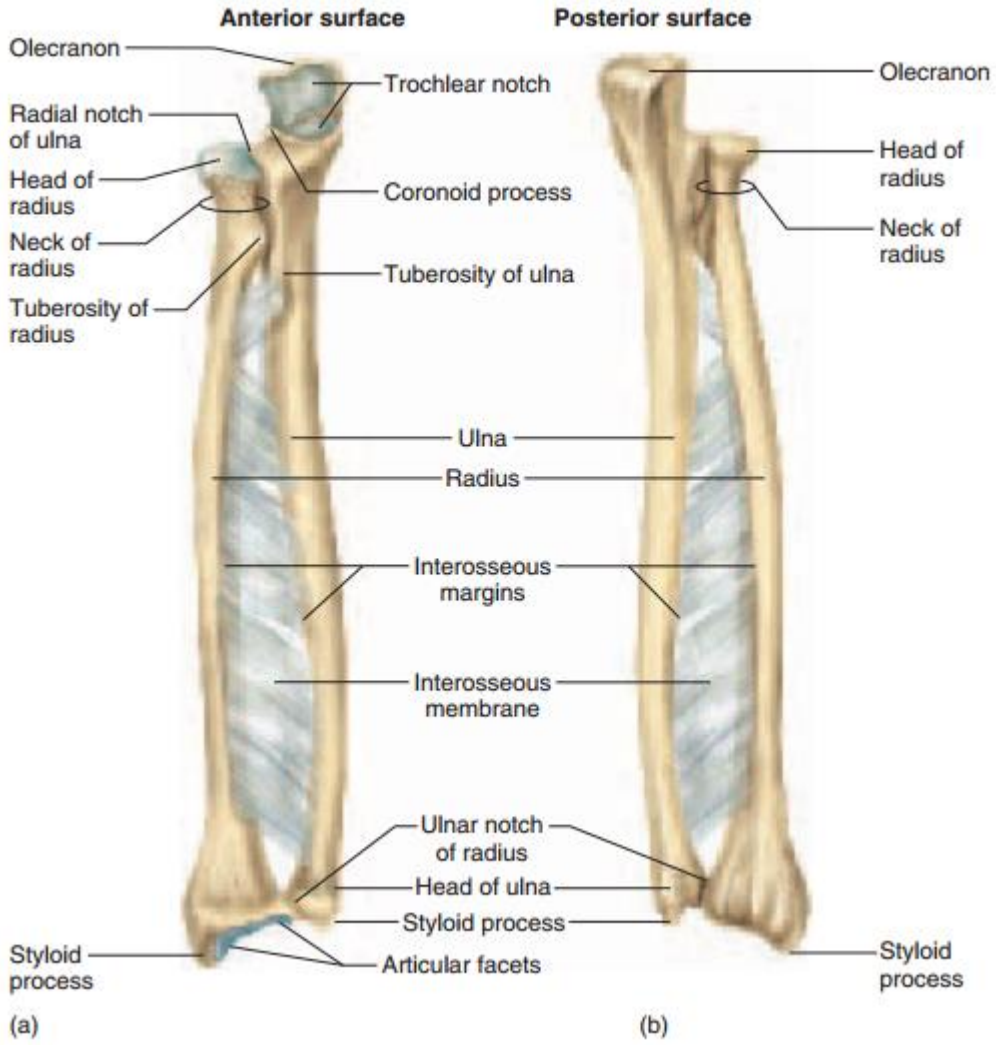

Atlas (C1)
Axis (C2)
Cervical vertebrae
C7
T1
Thoracic vertebrae
T12
L1
Lumbar vertebrae
L5
S1
Sacrum
S5
Coccyx
Coccyx

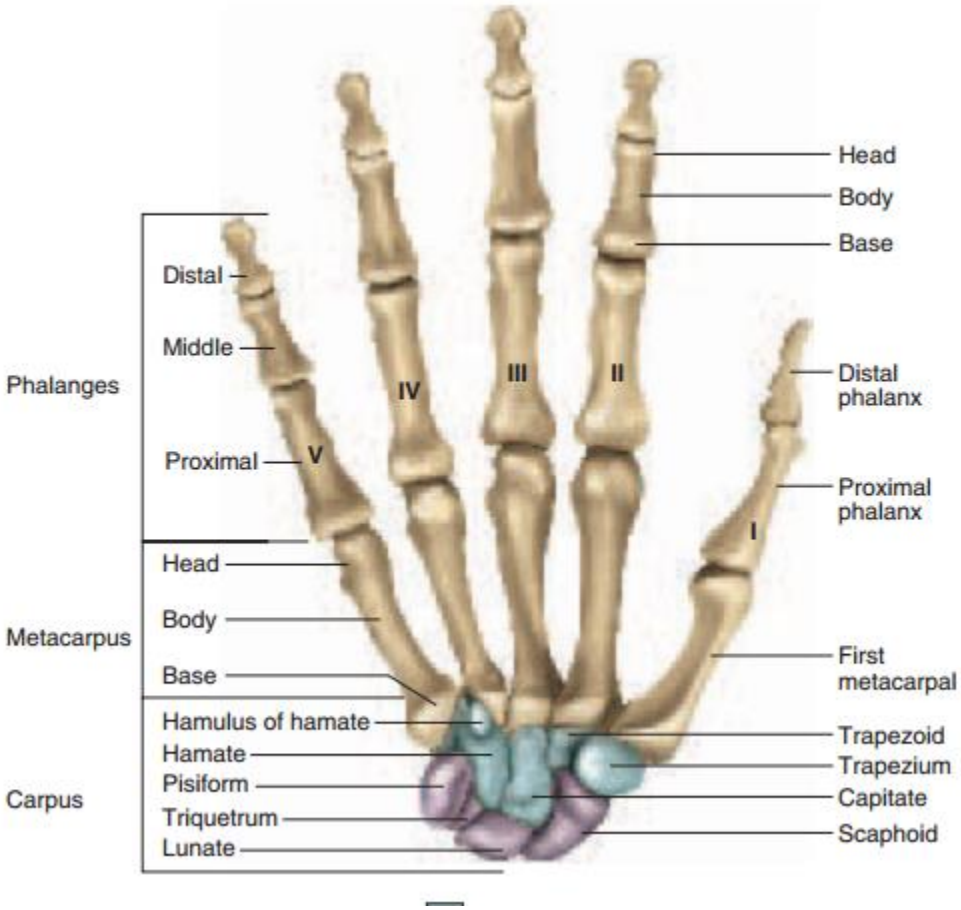

Superior articular facet
Transverse costal facet for rib 6
Tubercle
Neck
Head
Rib 6
Superior costal facet for rib 6
T6
(b)

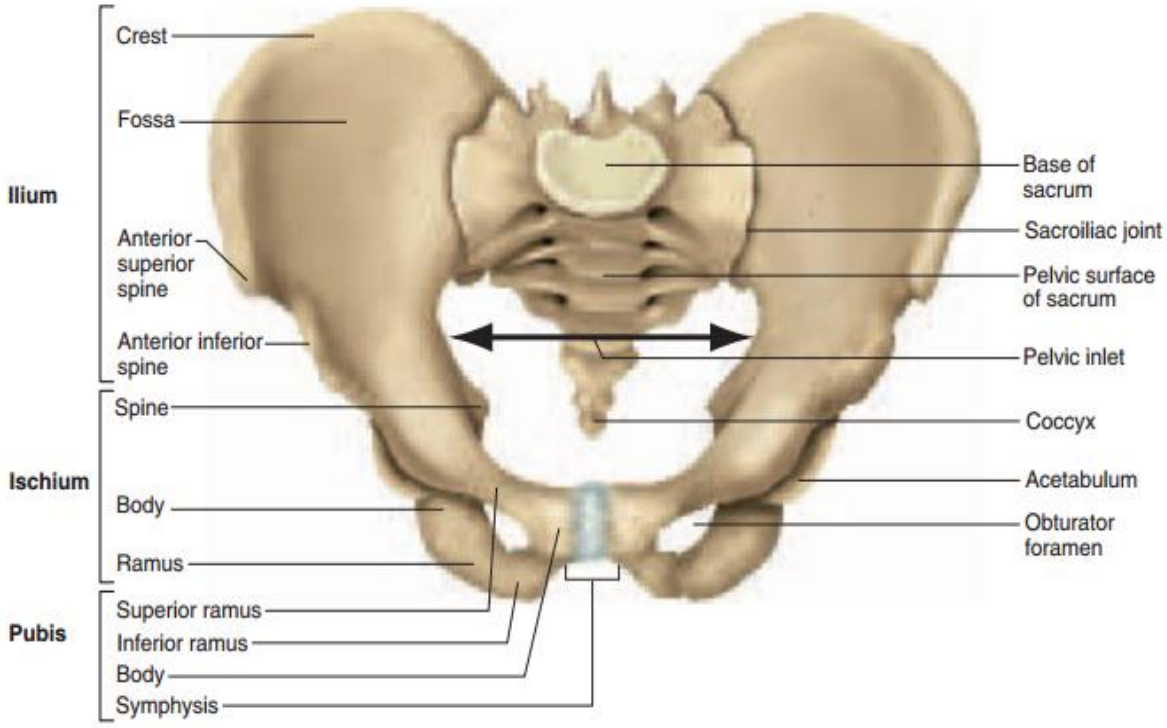

Sternoclavicular joint
Acromioclavicular joint
Pectoral girdle
Clavicle
Scapula
True ribs (1–7)
False ribs (8–12)
Floating ribs (11–12)
Suprasternal notch
Clavicular notch
Manubrium
Angle
Body
Xiphoid process
Sternum
Costal cartilages
Costal margin
1
2
3
4
5
6
7
8
9
10
11
12
T12
L1


Anterior surface
Posterior surface
Greater tubercle
Lesser tubercle
Intertubercular groove
Deltoid tuberosity
Coronoid fossa
Radial fossa
Lateral epicondyle
Capitulum
Head
Surgical neck
Medial epicondyle
Trochlea
Greater tubercle
Anatomical neck
Nutrient foramen
Deltoid tuberosity
Olecranon fossa
Lateral epicondyle

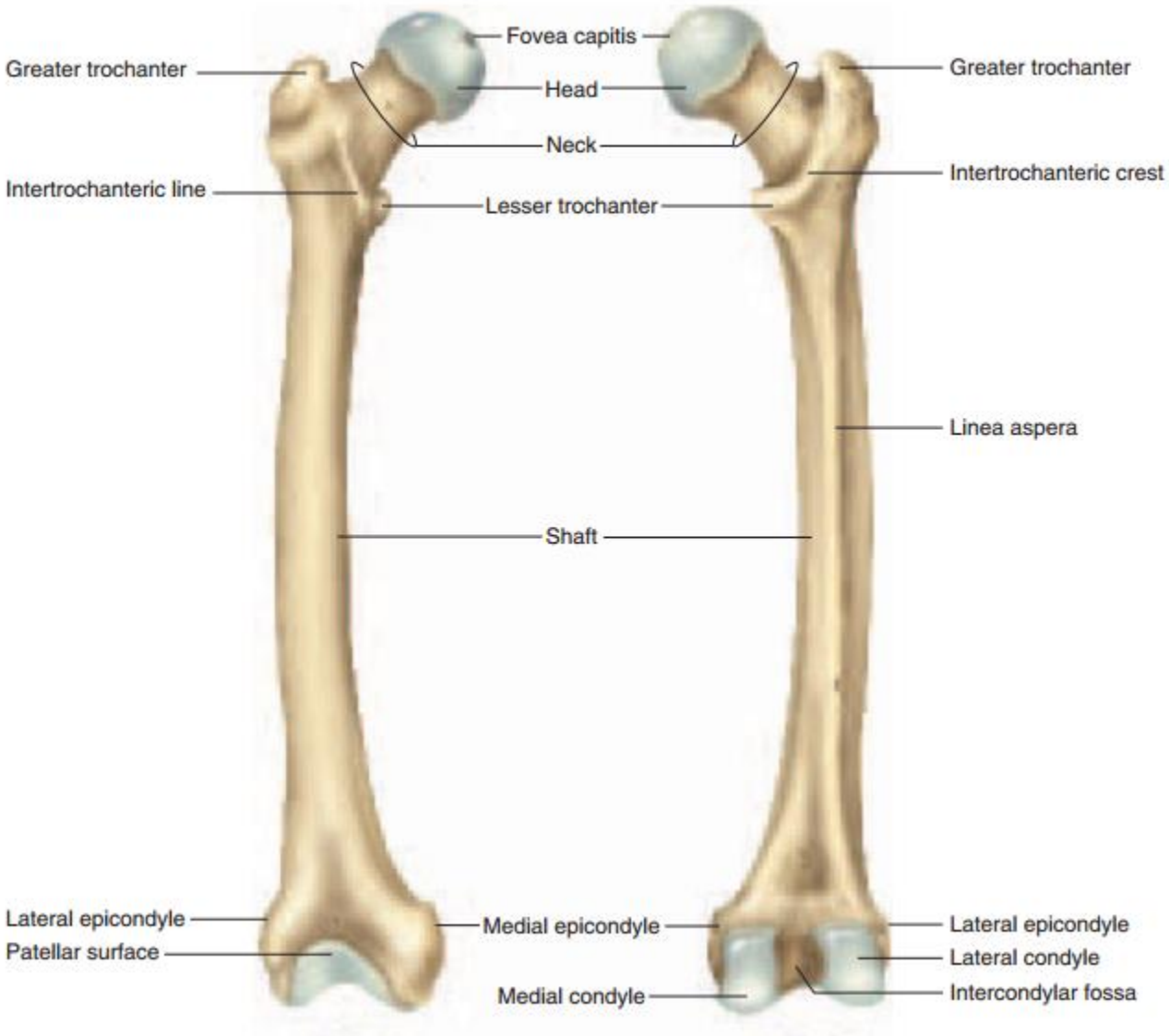

Suprascapular notch
Superior border
Acromion
Coracoid process
Glenoid cavity
Subscapular fossa
Lateral border
Medial border
(a)
Superior angle
Acromion
Supraspinous fossa
Spine
Lateral angle
Infraspinous fossa
Inferior angle
(b)

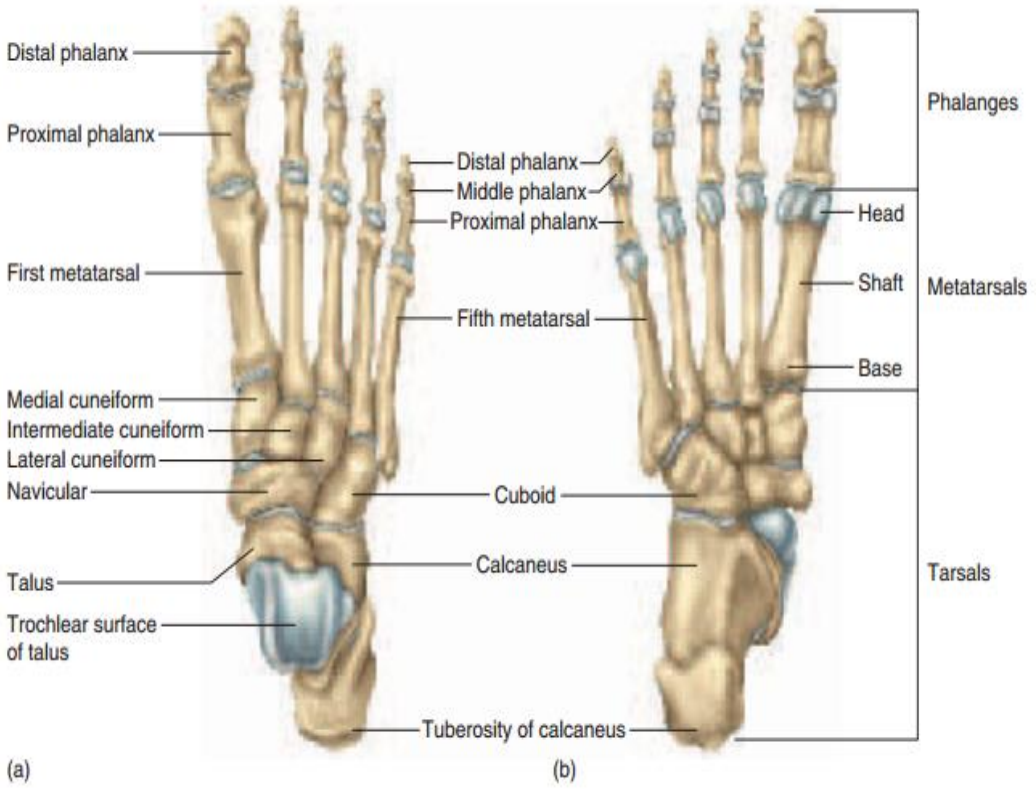

Anterior surface
Posterior surface
Olecranon
Trochlear notch
Radial notch of ulna
Head of radius
Coronoid process
Neck of radius
Tuberosity of ulna
Tuberosity of radius
Olecranon
Head of radius
Neck of radius
Ulna
Radius
Interosseous margins
Interosseous membrane
Ulnar notch of radius
Head of ulna
Styloid process
Articular facets
Styloid process
Styloid process
(a)
(b)


Phalanges
Distal
Middle
Proximal
Metacarpus
Head
Body
Base
Carpus
Hamulus of hamate
Hamate
Pisiform
Triquetrum
Lunate
V
IV
III
II
I
Head
Body
Base
Distal phalanx
Proximal phalanx
First metacarpal
Trapezoid
Trapezium
Capitate
Scaphoid



The Pelvic Girdle, Anterosuperior View. The pelvic girdle consists of the os coxae, sacrum, and coccyx.


Fovea capitis
Greater trochanter
Head
Greater trochanter
Neck
Intertrochanteric crest
Intertrochanteric line
Lesser trochanter
Linea aspera
Shaft
Lateral epicondyle
Medial epicondyle
Lateral epicondyle
Patellar surface
Lateral condyle
Medial condyle
Intercondylar fossa


Distal phalanx
Proximal phalanx
First metatarsal
Medial cuneiform
Intermediate cuneiform
Lateral cuneiform
Navicular
Talus
Trochlear surface of talus
Distal phalanx
Middle phalanx
Proximal phalanx
Fifth metatarsal
Cuboid
Calcaneus
Tuberosity of calcaneus
(a)
(b)
Phalanges
Head
Shaft
Base
Metatarsals
Tarsals