Anatomy Lec 1

General Anatomy

Goals: The students can be able to understand:

1-General Goals

The students at the end of the Academic Year will have the ability to recognize all the parts of the human body anatomically

2-Special Goals :The students will be able to

a. Correlate between the functions and the anatomy of each part of the body.

b. Assist the medical doctor in diagnosis and treatment in some way, primarily and simply as necessary.

Anatomy / Lecture 1

Anatomy :- the study of the structures of an organism.

Types of Anatomy:

A. **Gross Anatomy** : structures as seen by eye.

B. Developmental Anatomy : study of the anatomy of the developing organism.

C. Histology (“tissues” “to study”) : structures that can be seen with the microscope such as cells and tissues.

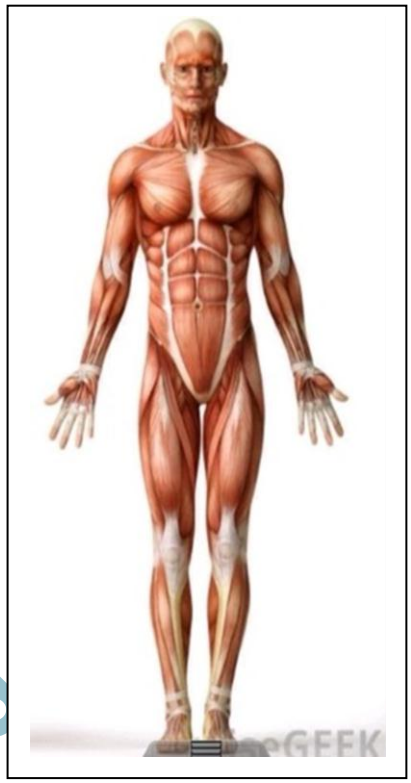
D. Systemic Anatomy : study of individual organ systems.

E. Regional Anatomy : study of structures in a particular area.

F. Pathology (“disease” “to study”) : study of changes in structure due to disease/injury.

Anatomy Lec 1

Anatomical Position:



1-The subject stands erect.

2-Upper limbs placed at sides with palms forward.

3-Feet flat on floor in natural forward direction.

Anatomical Terms:

Superior (cephalic) : Inferior (caudal)

Anterior (ventral) : Posterior (dorsal)

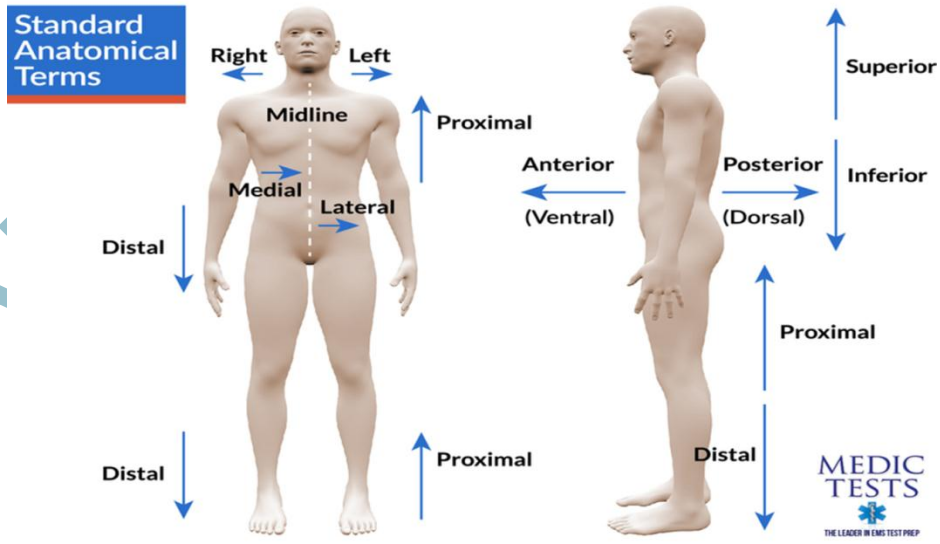
Medial : Lateral

Ipsilateral (same side) : Contralateral (opposite)

Proximal : Distal

Superficial : Deep

parietal : Visceral



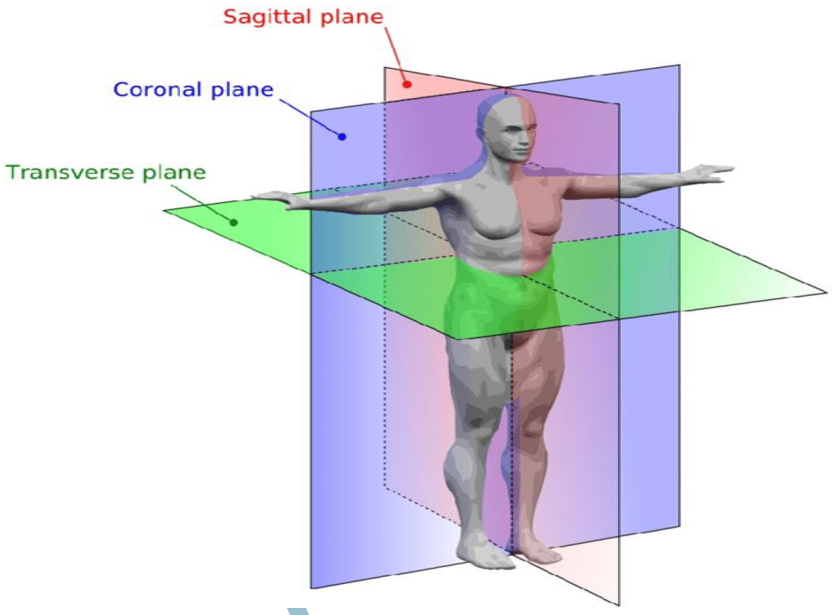
Planes and Sections:

1-Sagittal – divides into right and left parts .

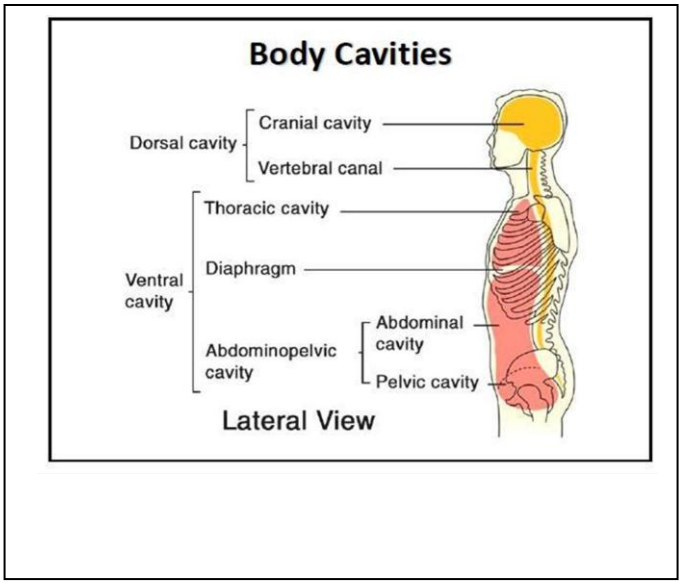
Parasagittal – away from the midline

2-Frontal (coronal) – divides anterior & posterior .

3-Horizontal (transverse) – divides superior & inferior .



Body Cavities:



1-Dorsal Body Cavity .

a. Cranial cavity (brain)

b. Vertebral cavity (spinal cord)

2-Ventral Body Cavity .

(Viscera – organs found here)

a. Thoracic cavity

i. Pleural cavity – space separating the parietal pleura and visceral pleura of **lungs.**

ii. Mediastinum – all contents of thoracic cavity **except the lungs** (e.g., heart).

b. Abdominopelvic cavity

i. Abdominal – stomach, spleen, liver, gallbladder, pancreas, small intestine

ii. Pelvic – urinary bladder, cecum, appendix, sigmoid colon, rectum, reproductive organ

3-Other Body Cavities .

a. Oral cavity (mouth)

b. Nasal cavity (sinuses for air passage)

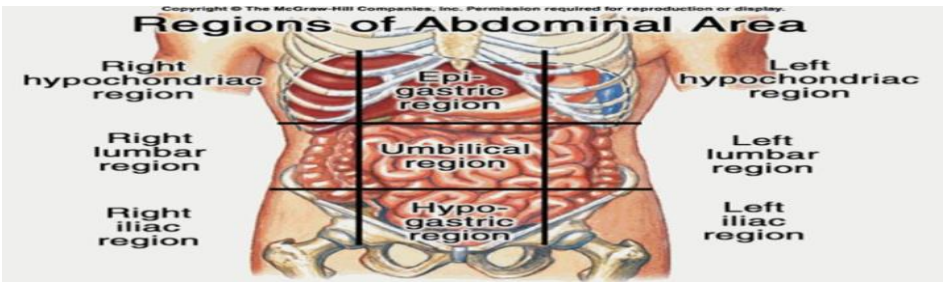
c. Orbital cavities (eyes)

d. Middle ear cavities (in temporal bone)

e. Synovial cavities (freely moveable joints)

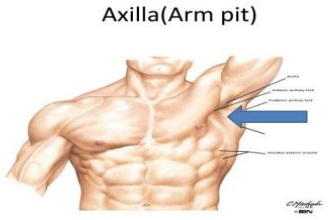
Regions (Nine Regions of the Abdomen)

Left Hypochondriac	**Epigastric**	**Right Hypochondriac**
Left Lumbar	**Umbilical**	**Right Lumbar**
Left Iliac	**Hypo gastric**	**(Suprapubic) Right Iliac**

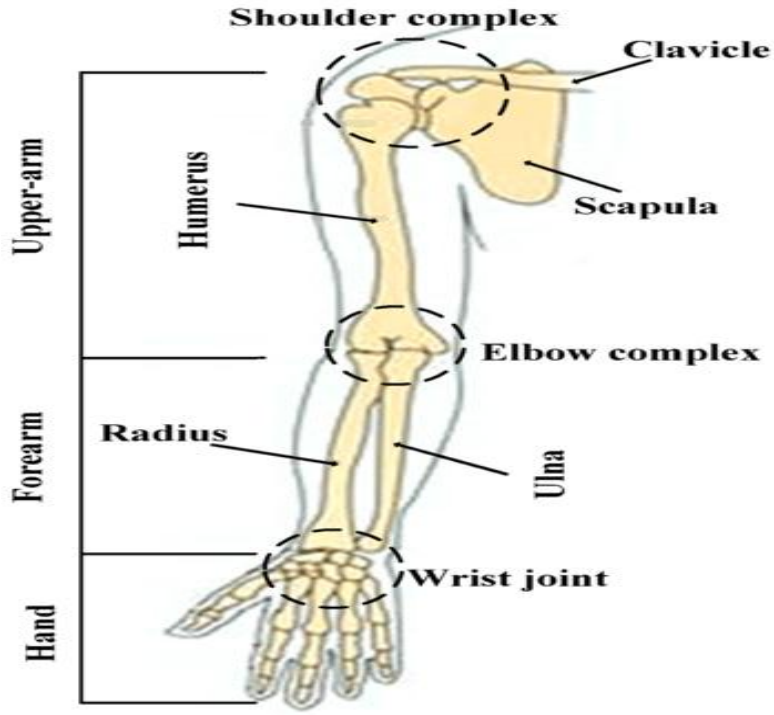


Examples of Regional Terms

1-Axillary – Armpit



2-Brachial – Upper arm 3-Antebrachial – Forearm 4- Carpal – Wrist.



5- Pubic – Around genitalia

6-Acromial – Point of shoulder

Lecture 2: Structure of the Cell

A. Plasma membrane

B. Cytoplasm

C. Major organelles:

1-nucleus

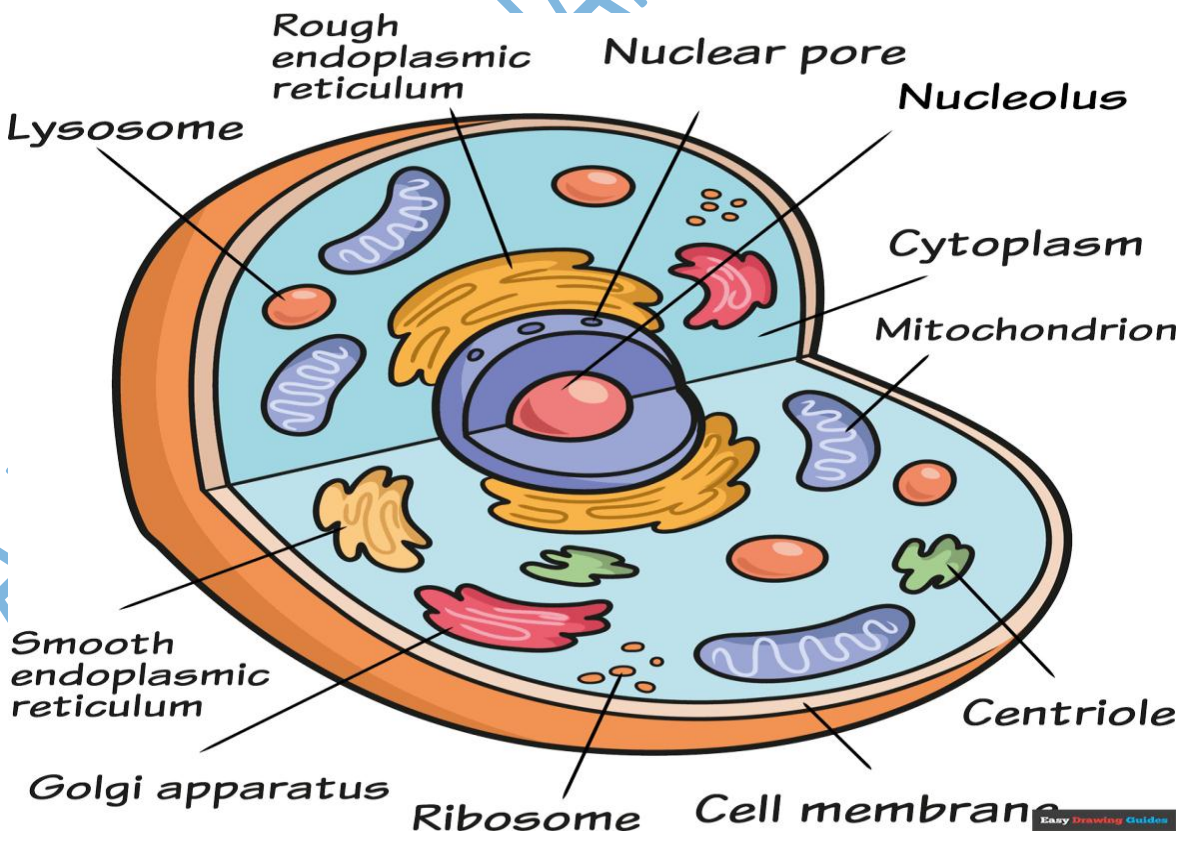
2-ribosomes

3-endoplasmic reticulum (ER)

4-Golgi complex(Apparatus)

5-mitochondria

6-lysosomes.



The Plasma Membrane:

1. 80% phospholipids
2. 10% proteins - peripheral and integral
3. 10% cholesterol, glycolipids, carbohydrates

Cytoplasm:

Composition and structure:

1. 90% water 10% protein, carbohydrate, lipid, salts
2. colloids - collections of organic molecules
3. jelly-like fluid surrounding the nucleus

Nucleus:

Primary functions:

1. house and protect hereditary material (DNA)
2. copy DNA to RNA so proteins can be manufactured
3. produce ribosomal RNA (rRNA) to make ribosomes

Ribosomes

Primary functions:

1. only site of protein synthesis
2. 'read' the messenger RNA sent out from nucleus
3. free ribosomes - scattered throughout cytoplasm
4. attached ribosomes - found on endoplasmic reticulum

Endoplasmic Reticulum (ER)

1-granular (rough) ER - have ribosomes attached

2-agranular (smooth) ER - no ribosomes

Functions: transport, storage, packaging of materials

Golgi Complex (Apparatus):

Primary functions:

1. process, sort, package, deliver proteins
2. cis - closest to ER, receives new proteins
3. medial - alters protein to functional form
4. trans - forms **secretory granules** for protein release

Mitochondria:

Structure:

1. two-membrane structure
   a. outer mitochondrial membrane
   b. inner mitochondrial membrane (cristae)
2. matrix - within the inner membrane

Lysosomes

1. single membrane enclosed spheres
2. primary lysosome - bud-off from Golgi complex
3. secondary lysosome - when fused with a **vacuole.**

Lecture 3: Tissue Organization

A. Epithelial tissue :

1-Simple Epithelium

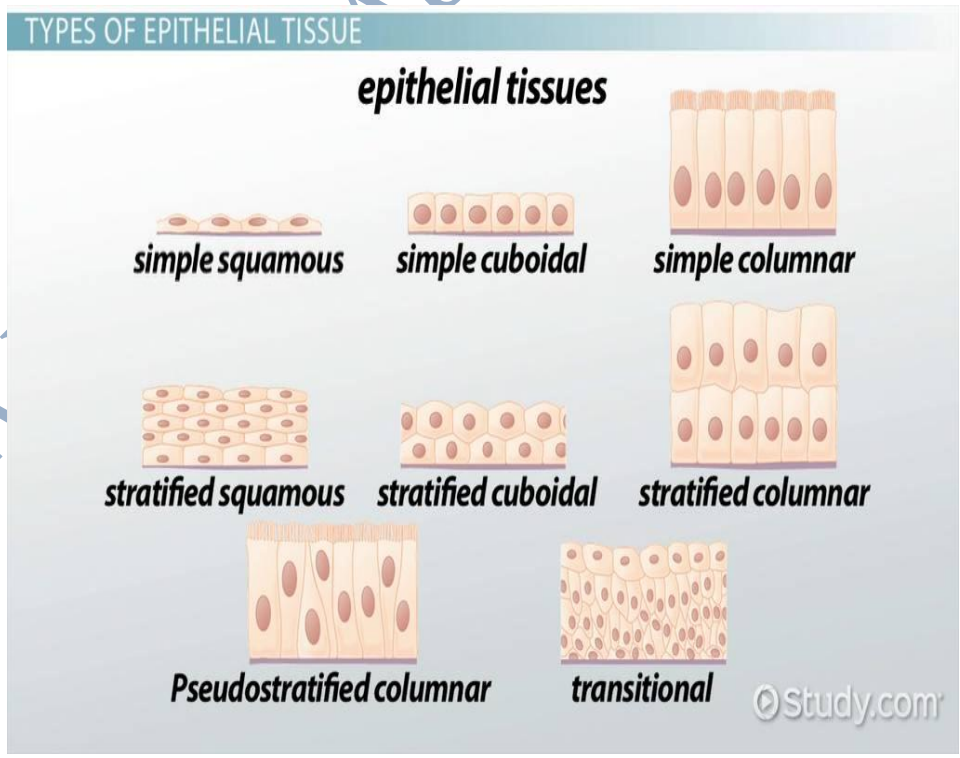
a. Squamous (endothelium and mesothelium).
b. Columnar (ciliated , non-ciliated).
c. Cuboidal.

2- Stratified Epithelium

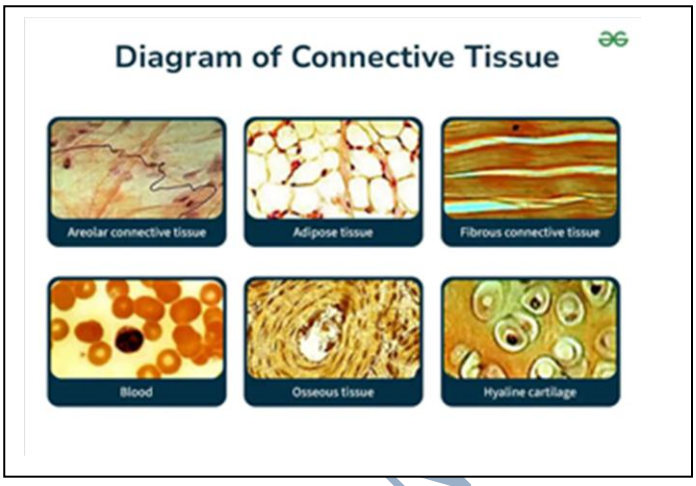
a. Stratified squamous (keratinized, nonkeratinized)
b. Stratified cuboidal
c. Stratified columnar

3- pseudostratified columnar epithelium

4-Transitional epithelium.



B. Connective Tissue

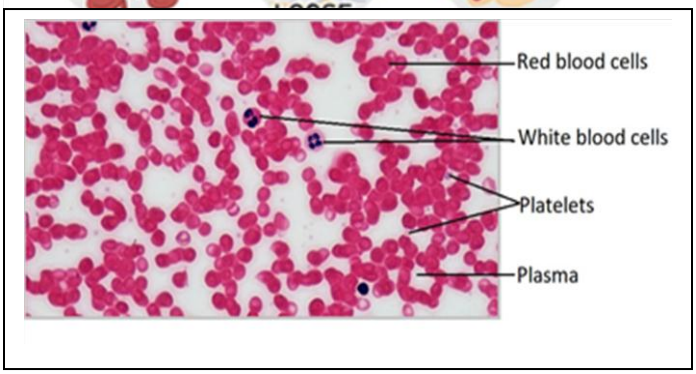


a. Connective Tissue Proper:

- Loose (areolar, ordinary)
- Adipose (fat)
- Dense (collagenous)
- Elastic
- Reticular

b. Cartilage Tissue:

- Hyaline Cartilage
- Fibrocartilage
- Elastic Cartilage

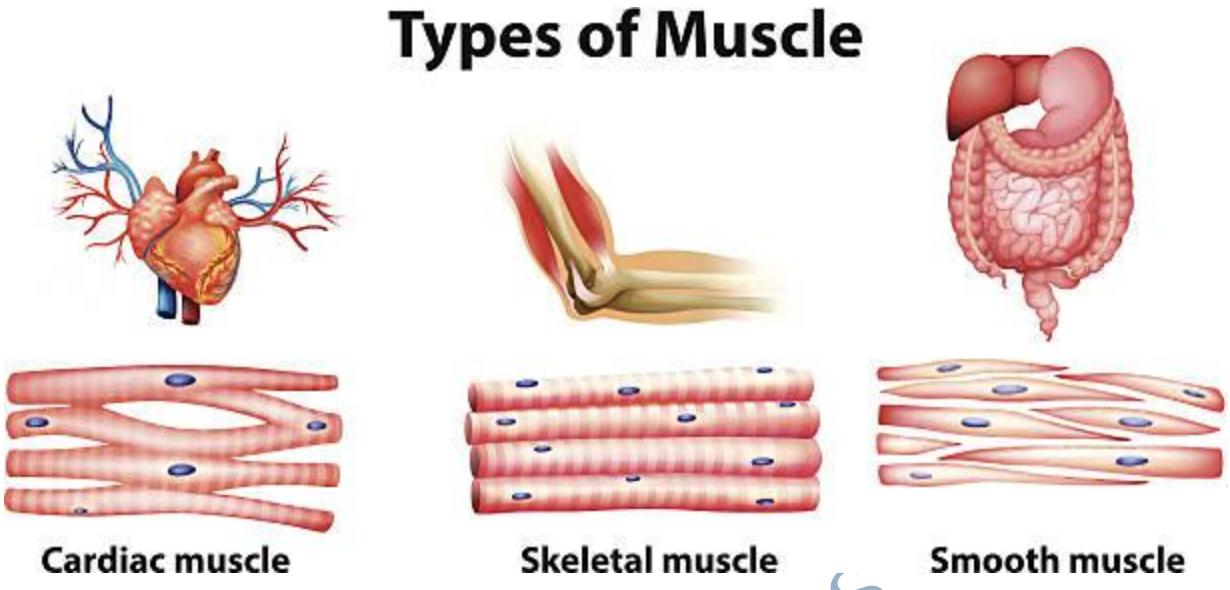


c. Osseous Tissue (Bone)

d. vascular tissue(blood)

C. Muscle Tissue

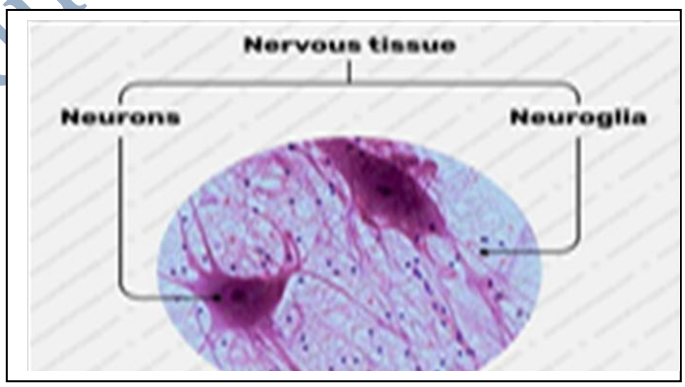
1. Skeletal Muscle (voluntary)
2. Smooth Muscle (involuntary, visceral)
3. Cardiac Muscle (heart)



D. Nervous Tissue

1. Neurons (nerve cells)

2. Neuroglia (supporting cells)



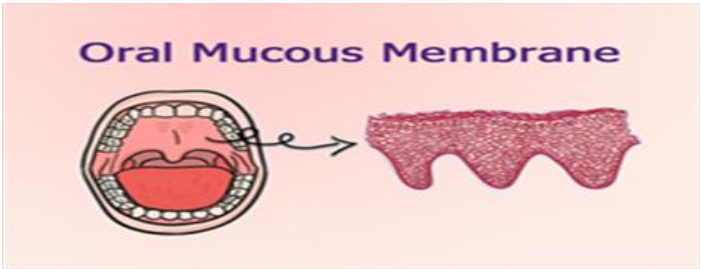
E. Organismal Membranes

1. Mucous Membranes (mucosa)

2. Serous Membranes (serosa)

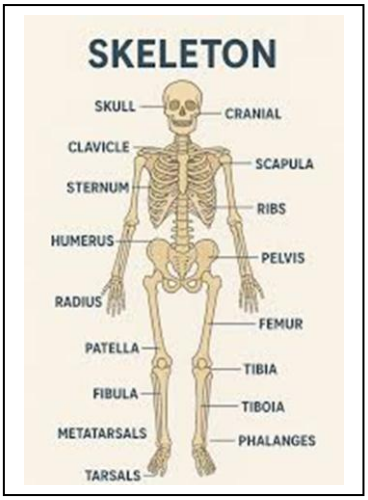
3. Cutaneous Membranes (skin)

4. Synovial Membranes



Lecture 4: Skeletal System

I. Functions of Skeletal System



A. Support

B. Protection

C. Movement

D. Mineral Storage (Calcium + Phosphorus)

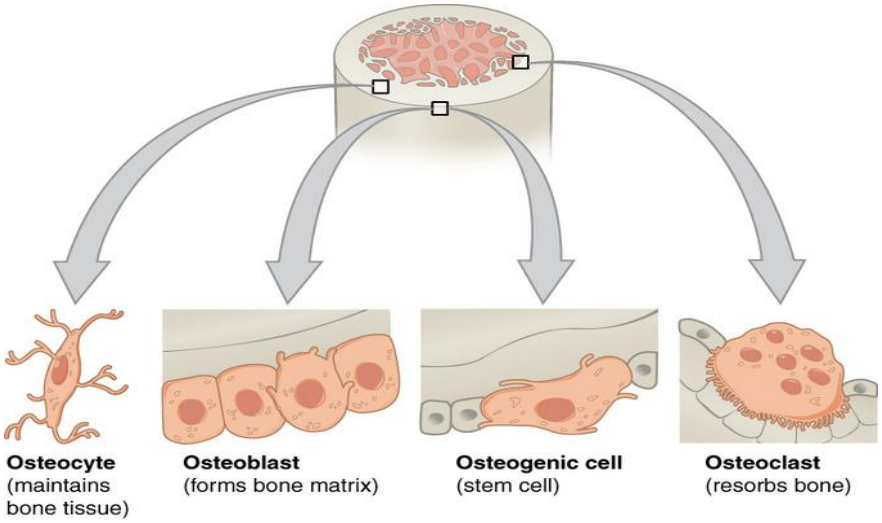
E. Hematopoiesis (blood cell formation in red marrow)

F. Energy Storage (lipids/fat stored in yellow marrow)

II. Histology of Skeletal Tissue (Osseous Tissue):

A. Different Cell Types:

1. Osteoprogenitor cells give rise to osteoblasts
2. Osteoblasts secrete proteins, Ca, P
3. Osteocytes maintain bone integrity
4. Osteoclasts degrade and absorb bone during growth

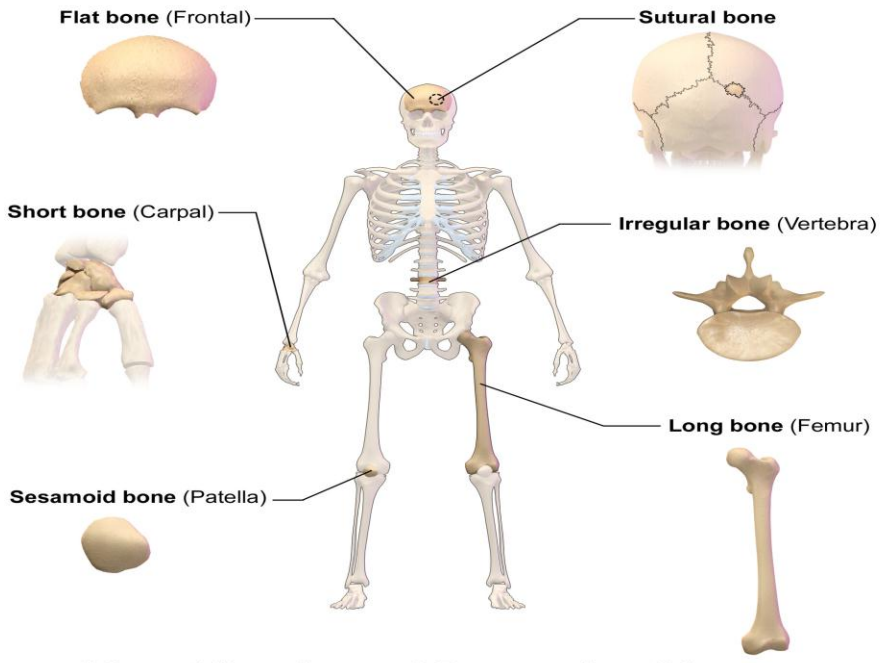


B. Chemical Composition:

1. 33% collagenous fibers as in connective tissue
2. 67% mineral salts - calcium phosphate + carbonate
3. Hardening depends on correct amount of each

C. Classification of Bones:

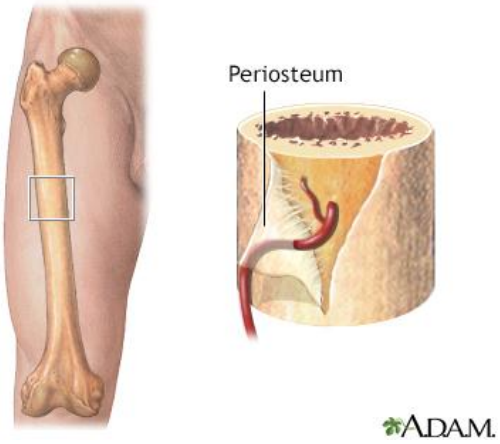
1. Long Bones – most limb bones, finger bones
2. Short Bones – wrist bones
3. Flat Bones – most cranial bones, ribs, sternum, and scapula
4. Irregular Bones – vertebrae, hip bones
5. Pneumatic Bones – sinuses in the skull.

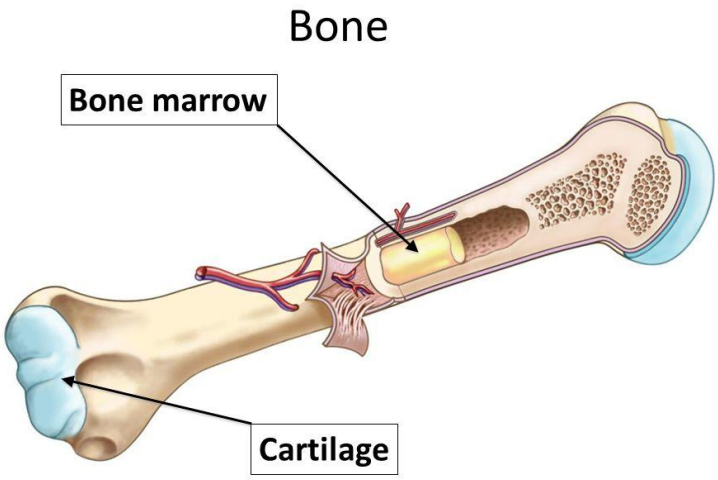


Classification of Bones by Shape

General Features of the Bone:

1. All bones are covered with periosteum which is rich in blood vessels.
2. Most bones are covered at their ends with cartilaginous layers.
3. Bones contain marrow inside them which is red in young age and then filled with fat to be yellow in old age.





Human Circulatory System:

The system in the body by which blood and lymph are circulated. The parts of the circulatory system include **the heart, along with all the arteries, veins, and capillaries.** The organs of the lymphatic system are also considered to be part of the circulatory system. Nutrients, oxygen, and other vital substances are carried throughout the body by the blood, which is pumped by rhythmic contractions of the heart.

Blood is pumped from the heart to the arteries, which branch into smaller and smaller vessels as they move away from the heart.

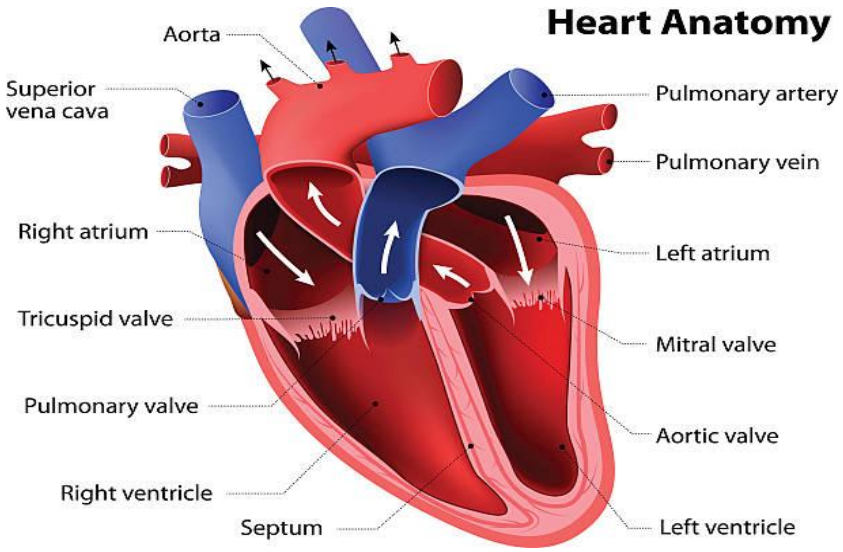
The circulatory system, also called the cardiovascular system or the vascular system.

This system is divided into two parts:

1. The cardio–vascular system.
2. Lymphatic system.

The cardio–vascular system consists of four major components:

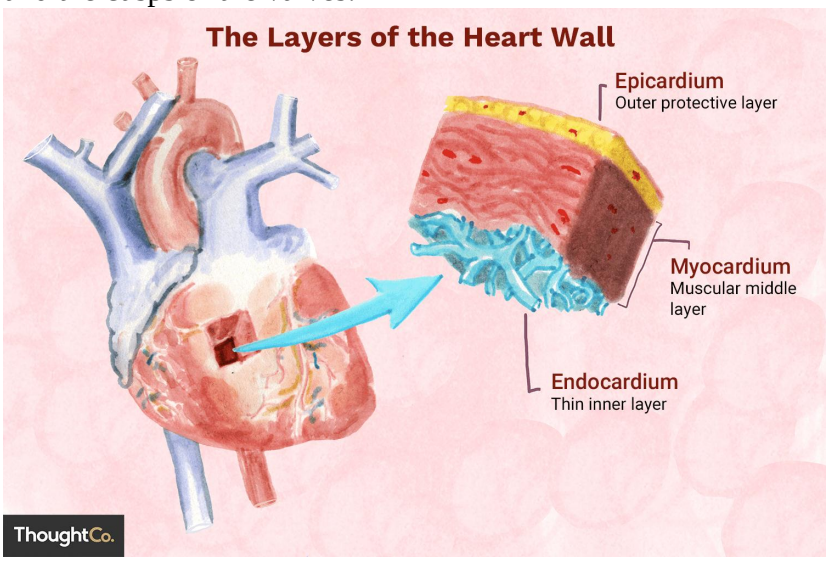
- **The Heart:** The heart keeps the circulatory system always working by pumping the blood.
- **Arteries:** Carry oxygen-rich blood away from the heart and where it needs to go.
- **Veins:** Carry deoxygenated blood to the lungs where they receive oxygen.
- **Blood:** Is the transport media of nearly everything within the body. It transports hormones, nutrients, oxygen, antibodies, and other important things needed to keep the body healthy.



Heart: Is a hollow muscular organ that lies in the chest behind the sternum, between the lungs and above the diaphragm, tilted to the left side. The heart has a pyramid shape, the apex directed upwards and the base downwards. The heart is divided into two cavities by a muscular septum. Each half has an atrium (upper) and a ventricle (lower), separated from the other by valves. The valves on the right are called the tricuspid valves, while those on the left side are called the mitral valve.

Structure of the Heart:

It consists of three layers:

1. **Pericardium:** It is an envelope that surrounds the heart and protects it from sudden dilatation..
2. **Myocardium:** The muscular layer of the heart wall, made of special muscle called cardiac muscle.
3. **Endocardium:** The inner layer (squamous epithelium) that lines the cavity of the heart and the cusps of the valves.
4. 

Blood Supply of the Heart

Blood supply of the heart is from the coronary arteries arising from the aorta; there are two, one right and one left.

Blood Vessels

There are three types of blood vessels:

1. Arteries
2. Capillaries
3. Veins

1. Arteries

The arteries are blood vessels with thick walls that carry the blood from the heart to the capillaries in different parts of the body, and consist of three layers:

- **a. Tunica adventitia:** Outer layer composed of fibrous tissue.
- **b. Tunica media:** Middle, muscular layer consisting of smooth muscle.
- **c. Tunica intimae:** Inner layer that lines the arteries.

The arteries are divided according to their diameter and function into:

1. **Elastic arteries:** Wide diameter, elastic wall. Example: aorta.
2. **Muscular arteries:** Intermediate diameter, muscular wall rich in smooth muscle tissue.
3. **Arterioles:** Small diameter, end in the capillary.

2. Capillaries

Capillaries are a network of blood vessels distributed in different tissues that carry blood from the arteries, pass through them, then transmit it to the venules. There are two types of capillaries:

1. Fenestrated capillaries.
2. Non-fenestrated capillaries.

3. Veins

Veins start at the end of capillaries, with the first type being venules that attach to each other to form the veins. These collect with each other until they end in two main veins:

- **Superior vena cava:** Collects blood from the head, neck, and upper limbs.
- **Inferior vena cava:** Collects blood from the other parts of the body.

Aorta

Aorta is the largest artery in the body. It starts from the left ventricle and then curves in the thoracic cavity (thoracic aorta), then enters the abdomen (abdominal aorta), then ends by dividing into two arteries: right iliac artery and left iliac artery.

1. **Thoracic aorta:**
    - a. Ascending aorta
    - b. Aortic arch
    - c. Descending aorta
2. **Abdominal aorta:**
    - a. Coeliac artery
    - b. Superior mesenteric artery
    - c. Inferior mesenteric artery
    - d. Right renal artery

- e. Left renal artery

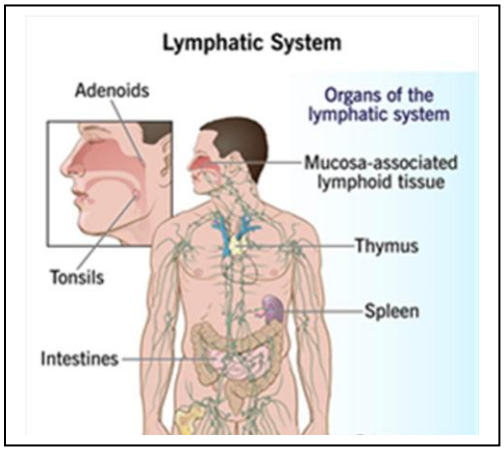
Lymphatic System

The lymphatic system is an open transport system that works in conjunction with the circulatory system.

- **Lymphatic vessels:** Collect tissue fluid, kill foreign organisms, and return it to the circulatory system.
- **Lymph capillaries:** Pick up the intercellular fluid, now called lymph, and carry it into large lymph vessels

Organs of the Lymphatic System

- The lymphatic system consists of:
  1. Lymphatic vessels
  2. Lymphoid tissues
  3. Lymphoid organs:
     - a. Lymph nodes
     - b. Spleen
     - c. Tonsils
     - d. Thymus



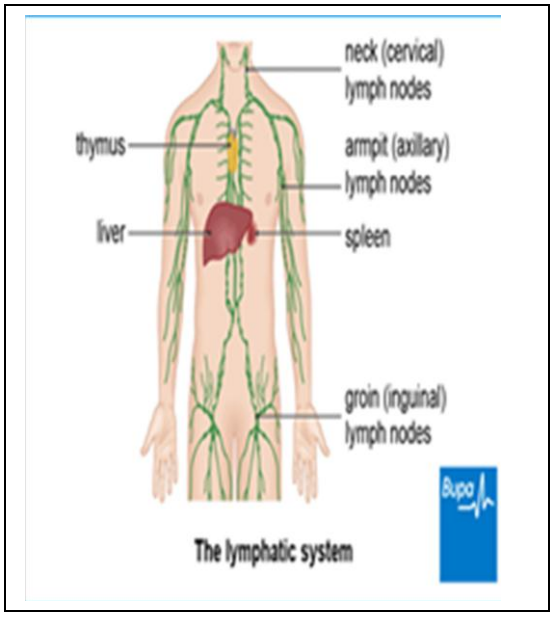
The spleen: Removes old blood cells, bacteria, and foreign particles from the blood.

Lymph Nodes

Lymph nodes are spherical-shaped and arranged in groups, either superficial or deep.

1. **Superficial lymph nodes:**
   - a. Cervical group
   - b. Auxiliary group
   - c. Inguinal group
2. **Deep lymph nodes:**
   -
     1. Iliac group
     2. Lumber group
     3. Thoracic group

     4-Mesenteric group



Digestive System

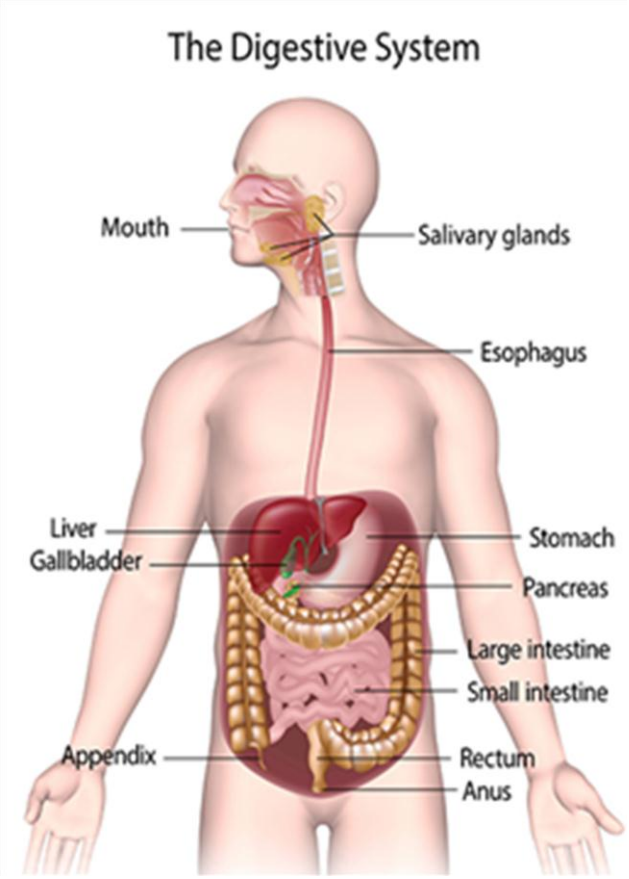
Gastrointestinal (GI) Tract (Alimentary canal)

A continuous muscular digestive tube. It is also called the alimentary canal, which is a long irregular canal with accessory parts.

Gastrointestinal functions are:

- **Digests**: breaks food into smaller fragments.
- **Absorbs**: digested material is moved through mucosa into the blood.
- **Eliminates**: unabsorbed & secreted wastes.

Digestive system:



A. The gastrointestinal tract includes:

1. Mouth cavity
2. Pharynx
3. Esophagus
4. Stomach
5. Small intestine
6. large intestine.

B. Accessory structure includes:

1. Accessory of mouth:

1. Salivary glands
2. Tongue
3. Teeth

2. Accessory of intestine:

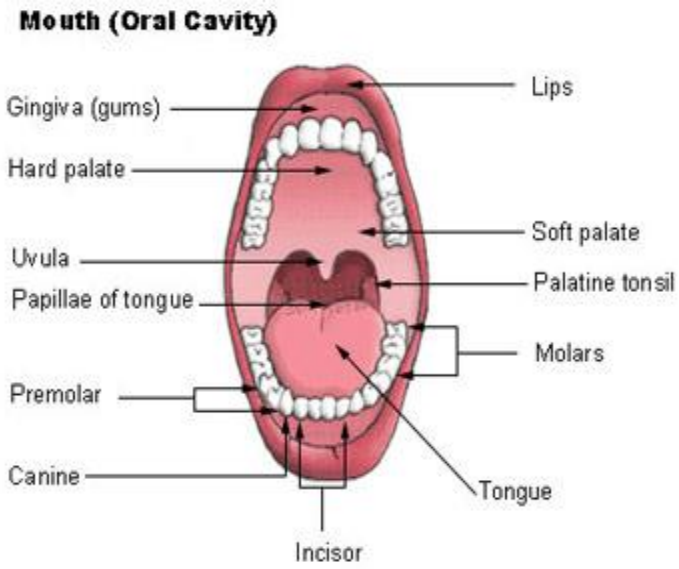
1. Liver
2. Gall bladder
3. Pancreas

1. Mouth cavity

Consists of two parts:
a. **Mouth cavity proper**: forms the largest part of the mouth, contains the tongue inside, surrounded by gum and teeth.

b. **Vestibule**: the outer part of mouth between the gum and teeth internally and the cheeks and lips externally.

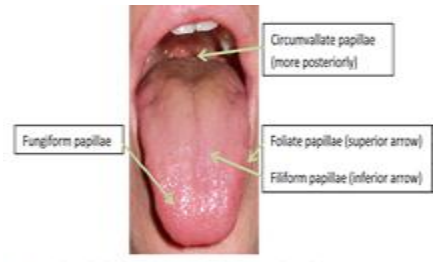
- **Lips**: two folds composed of the skin externally, mucous membrane internally, and the orbicularis oris muscle between them.
- **The roof of the mouth is composed of:**
    1. Hard palate: anterior
    2. Soft palate: posterior
    3. Uvula: conical shape forms the posterior part of soft palate
- The floor of the mouth is occupied by the tongue.

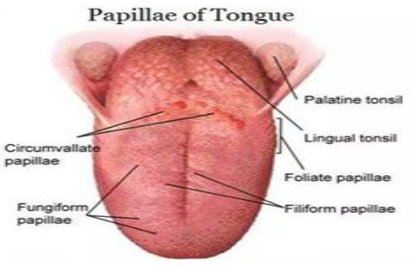


Accessory of mouth

Tongue

- Muscular organ composed of voluntary muscles, covered with mucous membrane.
- Upper surface and sides are rough due to papillae (taste buds):
    - **A. Circumvallate papillae**: arranged in v-shape in the posterior of the tongue.
    - **B. Fungiform papillae**: present at apex and along sides of the tongue.
    - **C. Filiform papillae**: distributed along sides of the tongue.
    - **D. Foliate papillae**: on two sides of the tongue.

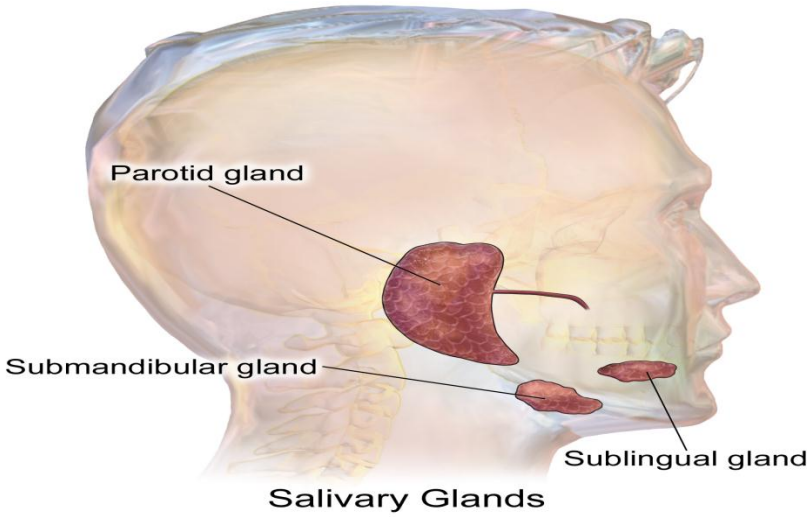




Salivary Glands

The accessory organ that secretes saliva.
There are three pairs:

- **a. Parotid gland**: located under and in front of the ears (right and left), has a duct that secretes saliva into the oral cavity and vestibule at upper second molar.
- **b. Submandibular gland**: found beneath the lower jaw in the anterior part of the floor of the mouth (right and left).
- **c. Sublingual gland**: found beneath the tongue near the midline.



Salivary Glands

Teeth

Bony structures of the digestive system located in the sockets of the alveolar process of the mandible and maxilla. Two main groups:

- **a. Primary teeth**: 20 teeth in number, appear from 6 months.
- **b. Secondary teeth**: 32 teeth in number, appear from 6 years.

There are:

1. Incisors: 4 for each jaw (2 right, 2 left)
2. Canines: 2 for each jaw (1 right, 1 left)
3. Premolars: 4 for each jaw (2 right, 2 left)
4. Molars: 6 for each jaw (3 right, 3 left)

2. Pharynx

Muscular tube consisting of three parts:
a. Naso–pharynx: posterior to the nasal cavity
b. Oro–pharynx: posterior to the oral cavity
c. Laryngo–pharynx: posterior to the larynx

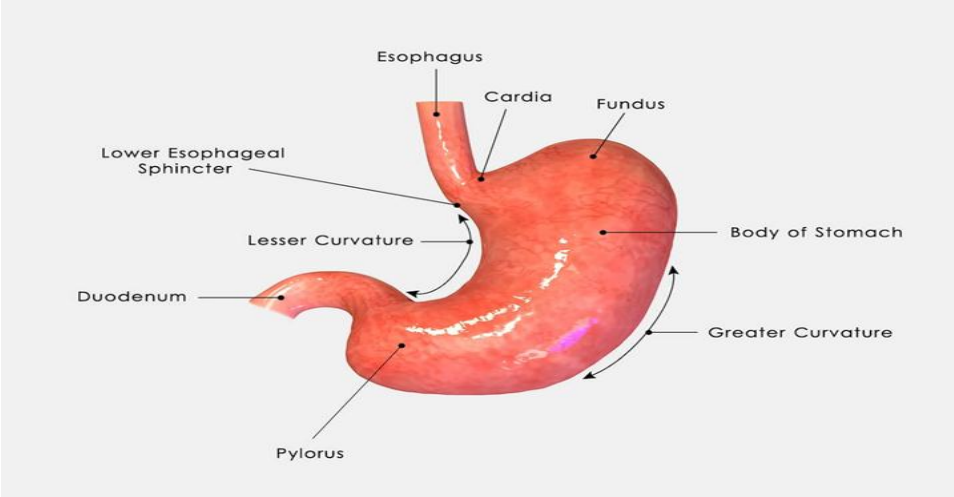
3. Esophagus

Tubular muscular structure, about 25 cm, anterior to the vertebral column, passes through diaphragm, terminates at the cardiac portion of the stomach.

4. Stomach

Enlarged part of GIT, under the diaphragm in the epigastric, umbilical, and left hypochondrial regions of the abdomen. Superior portion ends with esophagus, inferior connects with duodenum.

- **Divided into 3 parts:**
  a. Fundus
  b. Body
  c. Pylorus
- Two borders:
  a. Lesser curvature
  b. Greater curvature
- **Gastric sphincters**
- The stomach has two openings:
- a. Cardiac sphincter
- b. Pyloric sphincter
-



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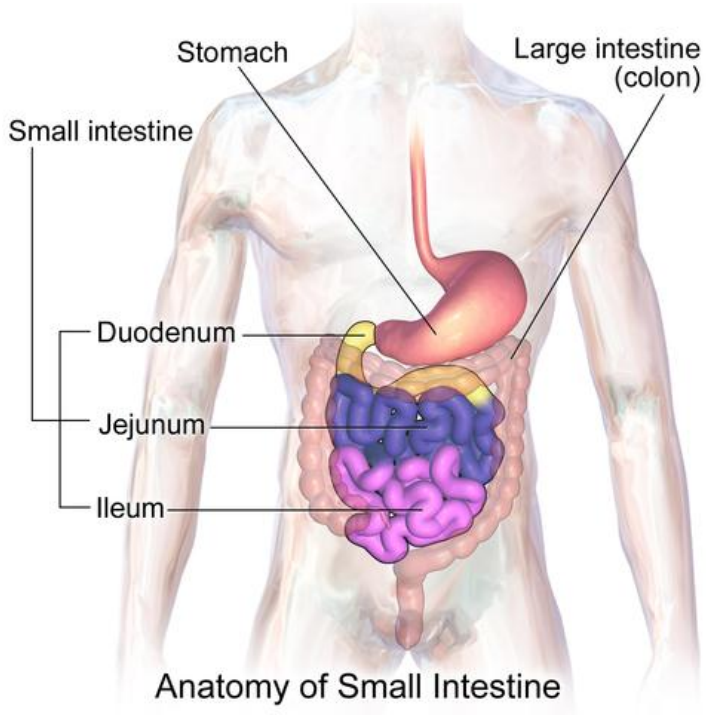
5. Small Intestine

Composed of 3 parts:
a. Duodenum: first part, about 30 cm, c-shaped loop
b. Jejunum: second part, continues from duodenum
c. Ileum: third part, terminal part joining with caecum (right side)



Anatomy of Small Intestine

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6. Large Intestine

Composed of:
1. Caecum
2. Vermiform appendix
3. colon: Ascending colon, Transverse colon, Descending colon and Sigmoid colon.
4. Rectum
5. Anal canal (anus)

Caecum

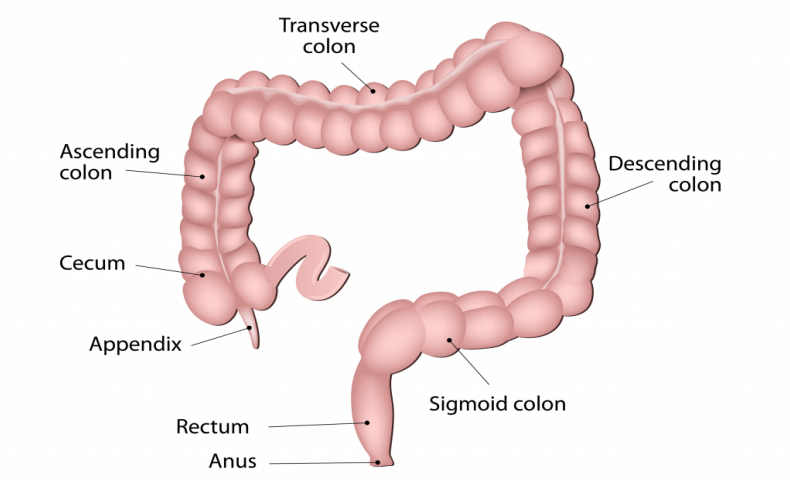
Part of the large intestine below the ileocaecal junction. Lower end is blind, about 6 cm high.

Vermiform appendix

Tube about 9 cm in length, looks like a roundworm, apex is blind, base is open.

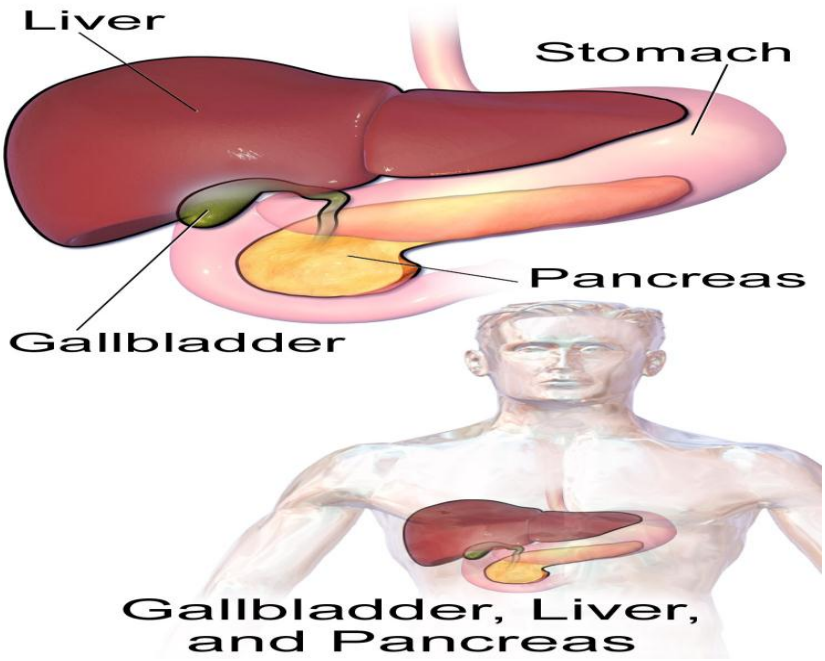
Colon

Ascending (right side, up), transverse (right to left), descending (left side, down), sigmoid, rectum (13 cm, wide), anal canal (3 cm, narrow).



Accessory of the large intestine

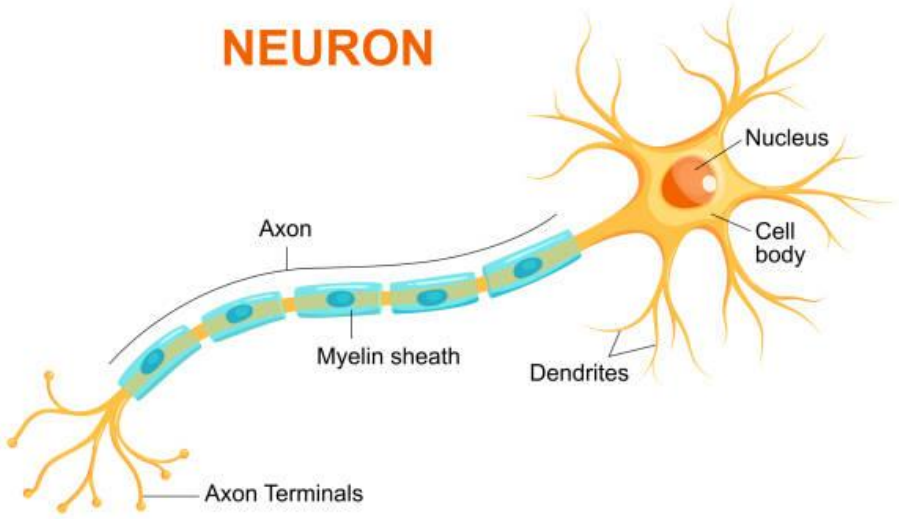
1. **Liver**: divided into right and left lobes, two surfaces (diaphragmatic and visceral).
2. **Gall bladder**: small sac attached to the visceral surface of the right lobe of liver
3. **Pancreas**: large gland close to the duodenum; right end enlarged (head), then body, then thin left end (tail).



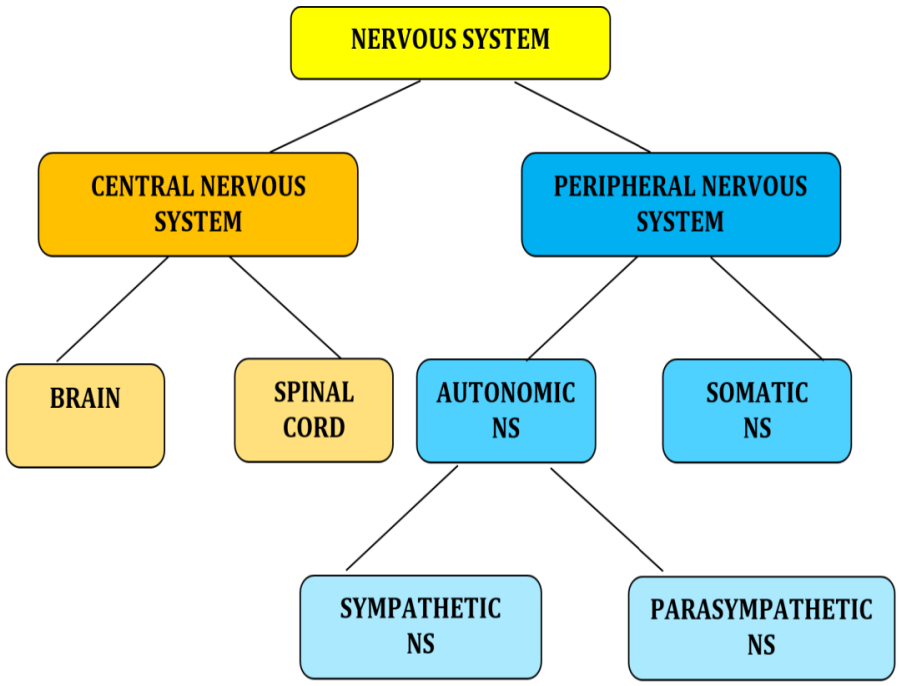
Nervous system

The nervous system consist of units called neurons.

Neuron: is nerve cell and its process which are axon and dendrites.



The nervous system divided into:



1-central nervous system: consist of

a. Brain

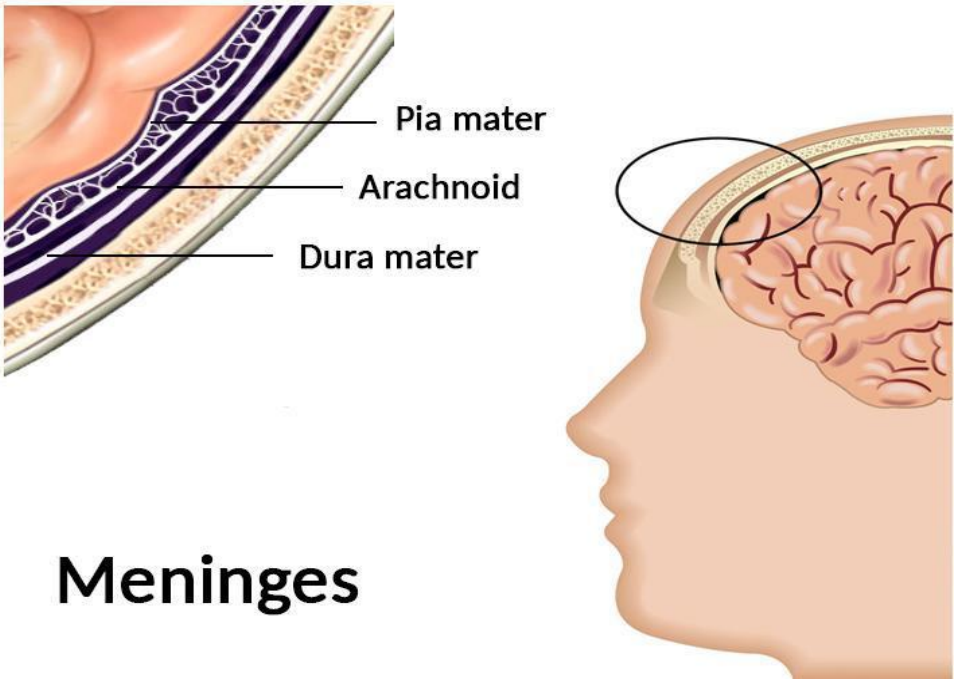
b. Spinal cord

the brain and spinal cord covered by 3 membranes called **meninges:**

1-Dura matter

2-Arachnoid mater

3-Pia mater.



The brain consist of :

a. Cerebrum:

It is consist of two half ball each one called cerebral hemisphere located in the anterior and middle cranial fossa.

Cerebrum consist of two layers:

1-Grey mater (cerebral cortex)outer layer consist of nerve cell

2-white mater (inner layer)contain nerve fiber .

b. cerebellum :

It is consist of two parts :Grey mate is outer layer also called cerebral cortex and white mater (inner layer).

c. Diencephalon :a-thalamus b- hypothalamus

d. Brainstem

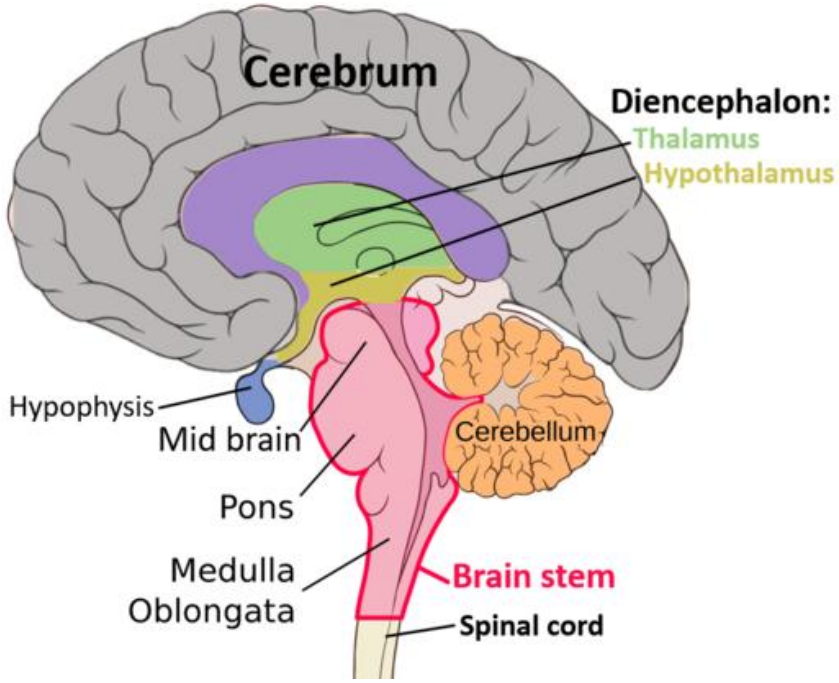
The brainstem includes midbrain, pons and medulla oblongata

Spinal cord :it is part of nervous system , the spinal cord transmit signals to and from brain and command reflex.

It is located in the vertebral canal and consist of segments called spinal segments.

Spinal cord is consist of four horns:

a.2 anterior: motor nerve cell b.2posterior :sensory nerve cell.



2-peripheral nervous system: it consist of :-

1-cranial nerve 2-spinal nerve.

1-cranial nerve: cranial nerves are:-

1-Olfactory nerve

2-Optic nerve

3-Oculomotor nerve

4-Trochlear nerve

5-Trigeminal nerve

6-Abducens nerve

7-Facial nerve

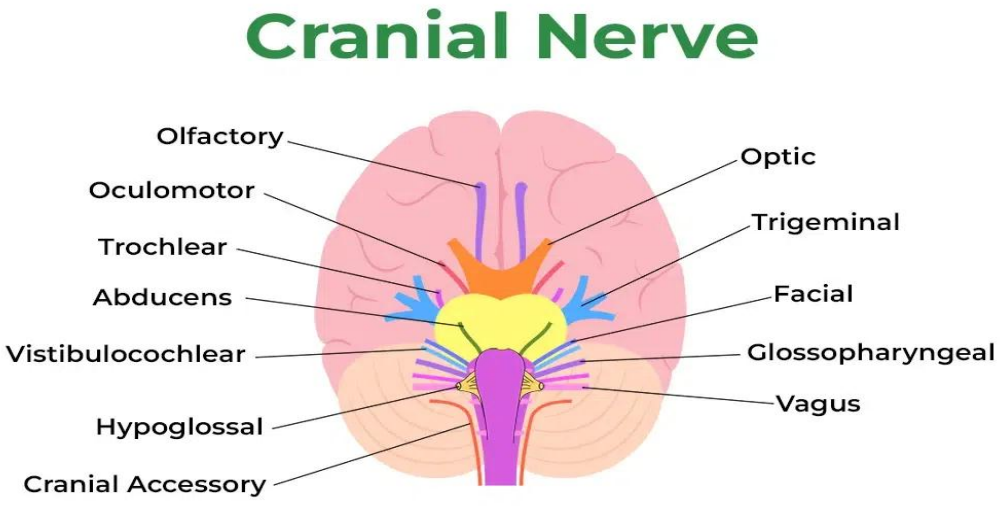
8-Vestibulocochlear nerve

9-Glossopharyngeal nerve

10-Vagus nerve

11-Accessory nerve

12-Hypoglossal nerve



2-Spinal nerve :

In humans there are 31 pairs from spinal nerve:

1- 8 pair cervical nerves :supply the upper limbs.

2- 12 pair thoracic nerves :supply thoracic and upper abdomen.

3- 5pair lumbar nerves: supply lower part of abdomen

4- 5pair sacral nerves : supply lower limb and muscles of pelvis.

5-1pair coccygeal nerves.

Nerve plexus:

1-Cervical plexus :upper 4 cervical nerves give branch called phrenic nerve.

2-Brachial plexus :lower 4 cervical nerves give the following branches: Axillary nerve, radial nerve , ulnar nerve and median nerve

3-Lumbosacral plexus :lumber and sacral nerve give the following branch: femoral nerve and sciatic nerve.

Autonomic nervous system :consist of sympathetic and parasympathetic .

	sympathetic nervous system	parasympathetic nervous system
heart rate	increase	decrease
gastrointestinal motility	decrease	increase
gastrointestinal secreation	decrease	increase
pupil	dilate	constrict
trachea	dilate	constrict
bladder	relax	contract