

Anatomy theory / Lec 2

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Emergency Medicine and First Aid Techniques

Anatomy skeletal system.

Functions of the Skeletal System

skeleton acts as a scaffold by providing support and protection for the soft tissues that make up the rest of the body

the skeletal system provide attachment point for muscle to allow movement at the joint

- New blood cells are produced by the red bone marrow inside of our bones.
- Bone act as body warehouse for calcium, iron, and energy in form of fat
- The skeleton grows throughout childhood and provides a framework for the rest of the body to grow along with it.

Skeletal System Anatomy

The skeletal system in an adult body is made up of 206 individual bones. These bones are arranged into two major divisions: **the axial skeleton and the appendicular skeleton.**

-The axial skeleton runs along the body's midline axis and is made up of 80 bones in the following regions:

Skull

Hyoid

Auditory ossicles

Ribs

Sternum

Vertebral column

Skeletal System Anatomy

-The appendicular skeleton is made up of 126 bones in the following regions:

Upper limbs

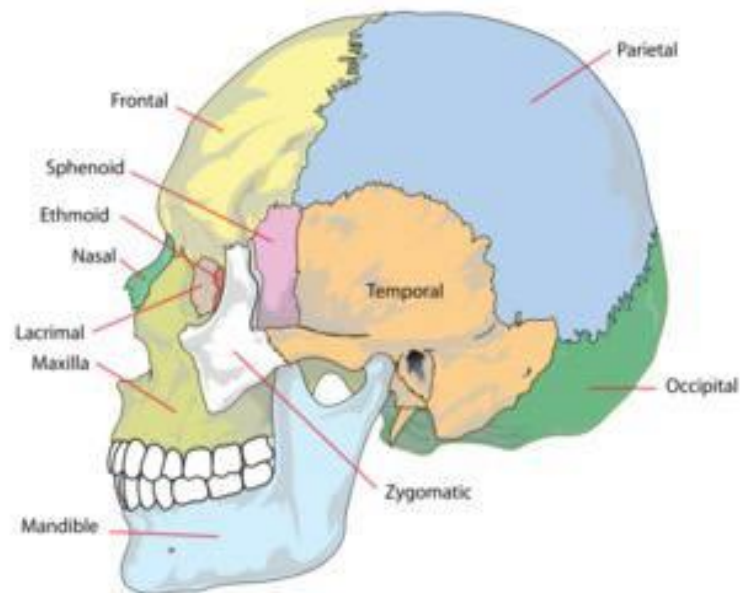
Lower limbs

Pelvic girdle

Pectoral (shoulder) girdle

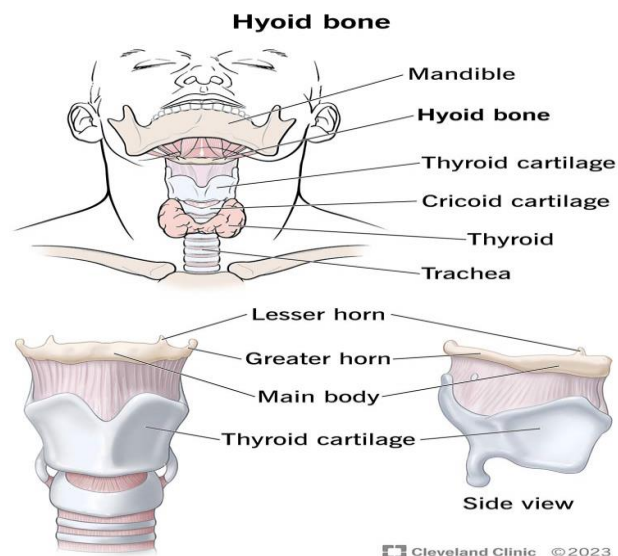
Skull

- The skull is composed of 22 bones that are fused together except for the mandible.
- These 21 fused bones are separate in children to allow the skull and brain to grow, but fuse to give added strength and protection as an adult.
- The mandible remains as a movable jaw bone and forms the only movable joint in the skull with the temporal bone
- The bones of the superior portion of the skull are known as the cranium and protect the brain from damage.
- The bones of the inferior and anterior portion of the skull are known as facial bones and support the eyes, nose, and mouth.



Hyoid bone

- The hyoid is a small, U-shaped
- bone found just inferior to the mandible. The hyoid is the only bone in the body
- that does not form a joint with any other bone— it is a floating bone.
- The hyoid's function is to help hold the trachea open and to form a bony connection for the tongue muscles

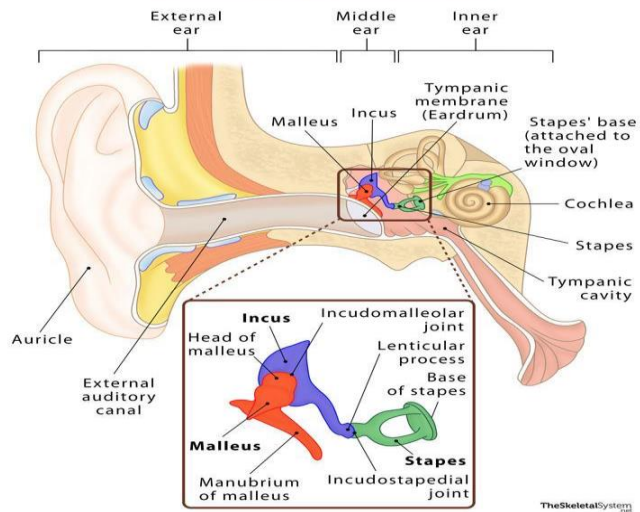


Auditory Ossicles

The malleus, incus, and stapes—known collectively as the auditory ossicles—are the smallest bones in the body.

Found in a small cavity inside of the temporal bone, they serve to transmit and amplify sound from the eardrum to the inner ear.

Auditory Ossicles



Vertebrae

Twenty-six vertebrae form the vertebral column of the human body.

They are named by region:

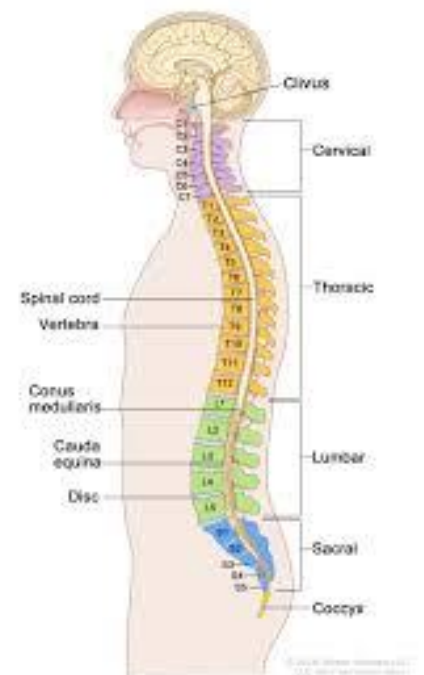
Cervical (neck) - 7 vertebrae

Thoracic (chest) - 12 vertebrae

Lumbar (lower back) - 5 vertebrae

Sacrum 1 vertebra

Coccyx (tailbone) - 1 vertebra



Ribs and Sternum

The sternum, or breastbone, is a thin, knife-shaped bone located along the midline of the anterior side of the thoracic region of the skeleton

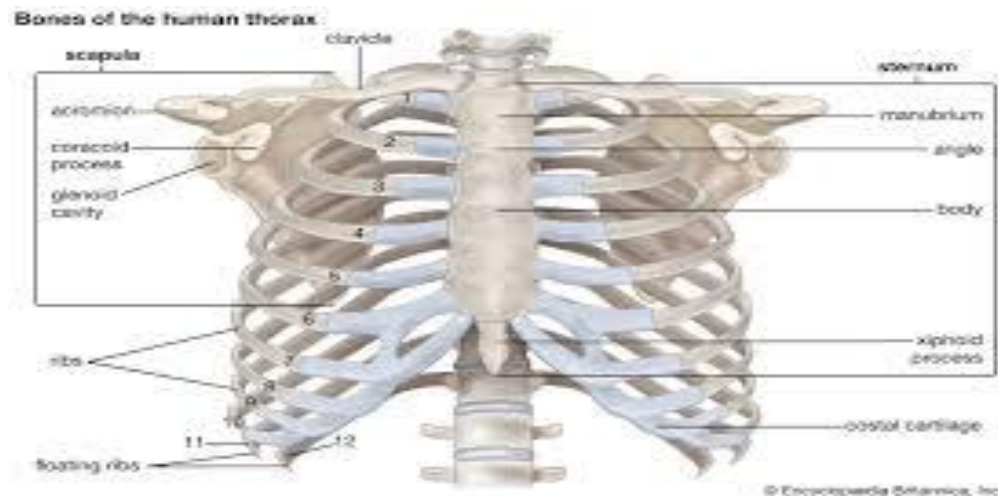
The sternum connects to the ribs by thin bands of cartilage called the costal cartilage.

There are 12 pairs of ribs that together with the sternum form the ribcage of the thoracic region.

The first seven ribs are known as "true ribs" because they connect the thoracic vertebrae directly to the sternum through their own band of costal cartilage.

Ribs 8, 9, and 10 all connect to the sternum through cartilage that is connected to the cartilage of the seventh rib, so we consider these to be "false ribs."

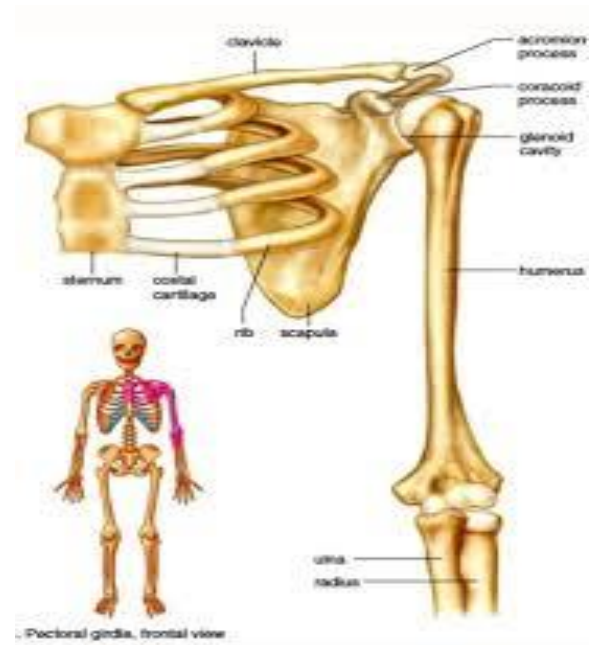
Ribs 11 and 12 are also false ribs, but are also considered to be "floating ribs" because they do not have any cartilage attachment to the sternum at all.



Pectoral Girdle and Upper Limb

- The pectoral girdle connects the upper limb (arm) bones to the axial skeleton and consists of the left and right clavicles and left and right scapulae.
- The humerus is the bone of the upper arm. It forms the ball and socket joint of the shoulder with the scapula and forms the elbow joint with the lower arm bones.

- The radius and ulna are the two bones of the forearm.
- The ulna is on the medial side of the forearm and forms a hinge joint with the humerus at the elbow. The radius allows the forearm and hand to turn over at the wrist joint.
- The lower arm bones form the wrist joint with the carpals, a group of eight small bones that give added flexibility to the wrist.
- The carpals are connected to the five metacarpals that form the bones of the hand and connect to each of the fingers. Each finger has three bones known as phalanges, except for the thumb, which only has two phalanges.



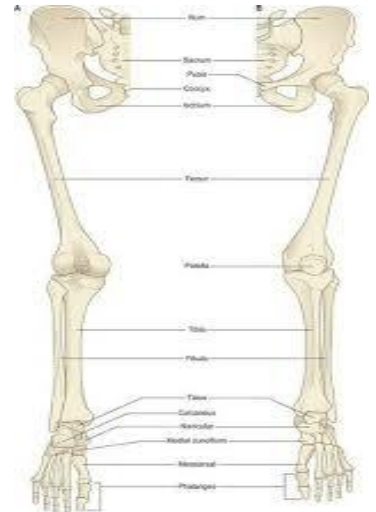
Pelvic Girdle and Lower Limb

- Formed by the left and right hip bones, the pelvic girdle connects the lower limb (leg) bones to the axial skeleton.
- The femur is the largest bone in the body and the only bone of the thigh (femoral) region.
- The femur forms the ball and socket hip joint with the hip bone and forms the knee joint with the tibia and patella. Commonly called the kneecap, the patella is special because it is one of the few bones that are not present at birth.
- The patella forms in early childhood to support the knee for walking and crawling.
- The tibia and fibula are the bones of the lower leg. The tibia is much larger than the fibula and bears almost all of the body's weight. The fibula is mainly a muscle attachment point and is used to help maintain balance.

The tibia and fibula form the ankle joint with the talus, one of the seven tarsal bones in the foot

The tarsals are a group of seven small bones that form the posterior end of the foot and heel. The tarsals form joints with the five long metatarsals of the foot.

Then each of the metatarsals forms a joint with one of the set of phalanges in the toes. Each toe has three phalanges, except for the big toe, which only has two phalanges.



Types of Bones

All of the bones of the body can be broken down into five types:

long,

Examples of long bones include the femur, tibia, fibula, metatarsals, and phalanges.

Short

The carpal bones of the wrist and the tarsal bones of the foot are examples of short bones.

Flat

The frontal, parietal, and occipital bones of the cranium —along with the ribs and hip bones —are all examples of flat bones.

Irregular

The vertebrae, sacrum, and coccyx of the spine— as well as the sphenoid, ethmoid, and zygomatic bones of the skull—are all irregular bones.

Sesamoid The patella and the pisiform bone of the carpals are the only sesamoid bones

Anatomy theoretical

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Department of emergency Medicine and frist aid

Anatomy: the study of the structure and shape of the body and body parts & their relationship ston one another.

The term anatomy comes from the Greek words meaning to cut (tomy) apart (ana).

* **Gross anatomy(macroscopic anatomy)** : the study of large, easily observable structures (by naked eye), such as the heart or bone.

* **Microscopic anatomy (cytology, histology)** : the study of very small structures, where a magnifying lens or microscope is needed.

Levels of Structural Organization The human body exhibits 6 levels of structural complexity :

1-Chemical level the simplest level of structural ladder .At this level atoms combine to form molecules such as water, sugar, & proteins

2-Cellular level the smallest units of living things .

3-Tissue level groups of similar cells that have a common function (4 basic types)

4-Organ level an organ is a structure composed of 2 or more tissue types that performs a specific function .

5-Organ System is a group of organs that work together to accomplish a common purpose (each organ has its own job to do)

6-Organismal level represents the highest level of structural organization(total of 11 organ systems)

The human body has 11 systems

1-INTEGUMENTARY

ORGANS

1- Skin

FUNCTIONS

- * Waterproofs, protects deeper tissue
- * Excretes salts & urea; pain, pressure
- * Regulates body temp; synthesizes vitamin D

2-SKELETAL SYSTEM

ORGANS

- * **Bones, cartilages, ligaments, joints**

FUNCTIONS

- * Protects & supports body organs
- * Framework for muscles & movement
- * Hematopoiesis; store minerals

3- MUSCULAR

ORGANS

- * **Skeletal muscle (attached to bone)**

FUNCTIONS

- * Contraction & mobility (locomotion)
- * Facial expression, posture
- * Produce body heat

4- NERVOUS ORGANS

- * **Brain, spinal cord, nerves, & sensory receptors**

FUNCTIONS

- * Fast-acting central control system
- * Responds to external/internal stimuli via nerve impulses (electrical messages)

5- ENDOCRINE ORGANS

* Pituitary, thyroid, parathyroids, adrenals, thymus, pancreas, pineal, ovaries, testes.....etc.

FUNCTIONS

- * Slow -acting control system
- * Glands produce hormones that regulate growth, reproduction, metabolism,.... etc.

6- Circulatory ORGANS

* Heart, blood vessels, capillaries & blood

FUNCTIONS

- * Carries O₂ nutrients, hormones, & other substances to and from tissue cells
- * White blood cells protect against bacteria, toxins, tumors

7- LYMPHATIC ORGANS

* Lymphatic vessels, lymph nodes, spleen, tonsils

FUNCTIONS

- * Complements circulatory system by returning leaked fluid back to blood vessels
- * Cleanses the blood; involved in immunity

8- RESPIRATORY ORGANS

* Nasal cavity, pharynx, larynx, trachea, bronchi, & lungs

FUNCTIONS

- * Keeps blood supplied with O₂ & removes CO₂
- * Carries out gas exchanges through air sacs in lungs

9- DIGESTIVE ORGANS

* Oral cavity, esophagus, stomach, small intestine, large intestine, rectum, anus (liver & pancreas)

FUNCTIONS

* Breaks food down into absorbable units that enter the blood; indigestible food eliminated as feces

10 - URINARY (EXCRETORY)

* Kidney, ureter, urinary bladder, urethra

FUNCTIONS

* Eliminates nitrogenous waste from the body (urea & uric acid)

* Regulates water, electrolytes, & acidbase balance of the blood

11- REPRODUCTIVE ORGANS

* Male :

* Seminal vesicles, prostate, penis, vas deferens, testis, scrotum

* Female :

* Ovaries, mammary glands, uterus, vagina, uterine tube

FUNCTIONS

* Primary function for both sexes is to produce offspring

* Male – testes produce sperm & male sex hormones

* Female – ovaries produce eggs & female sex hormones; mammary glands for nourishment

Anatomical Position

* Standing erect

* Feet parallel

* Arms hanging at the sides

* Palms facing forward

Anatomical position – body is erect with the feet parallel and the arms hanging at the sides with the palms facing forward

Directional terms

* Superior (cranial or cephalad) – toward the head end or upper part of a structure or body; above

* Inferior (caudal) – away from the head end or toward the lower part of a structure or body; below

* Anterior (ventral) – toward or at the front of the body; in front of

* Posterior (dorsal) – toward or at the backside of the body; behind

* Medial – toward or at the midline of the body; on the inner side of

* Lateral – away from the midline of the body; on the outer side of

* Proximal – close to the origin of the body part or the point of attachment of a limb to the body trunk.

* Distal – farther from the origin of a body or the point of attachment of a limb to the body trunk.

* Superficial (external) – toward or at the body surface.

* Deep (internal) – away from the body surface; more internal.

Examples:

* The navel is inferior to the breastbone

* The heart is posterior to the breastbone

* The arms are lateral to the chest

* The elbow is proximal to the wrist

* The skin is superficial to the skeleton

* The forehead is superior to the nose

* The breastbone is anterior to the spine

* The heart is medial to the arm

* The armpit is intermediate between the breastbone and the shoulder

* The knee is distal to the thigh

* The lungs are deep to the rib cage

1. The navel is -----to the breastbone

2. The heart is ----- to the breastbone

3. The arms are ----- to the chest

4. The elbow is ----- to the wrist

5. The skin is ----- to the skeleton

6. The forehead is ----- to the nose

7. The breastbone is----- to the spine

8. The heart is -----to the arm

9. The armpit is -----between the breastbone and the shoulder

10. The knee is -----to the thigh

11. The lungs are -----to the rib cage

Body planes and sections

A section is a cut made along a plane

* **Sagittal** – cut made along the lengthwise or longitudinal plane of the body dividing it into left and right parts

* **Midsagittal** (median) plane – right and left parts are of equal size

* **Frontal (coronal) plane** – cut made along a lengthwise plane that divides the body into anterior and posterior parts

* **Transverse plane (cross section)** – cut made along a horizontal plane dividing the body or organ into superior and inferior parts
Planes

- Anterior body landmarks

- Posterior body landmarks Body Cavities

There are two sets of internal body cavities called the dorsal and ventral body cavities.

These cavities are closed to the outside.

1-Dorsal Body Cavity Which protects the fragile nervous system organs has two subdivisions.

The cranial cavity, in the skull, encases the brain.

The vertebral, or spinal, cavity, which runs within the bony vertebral column, encloses the delicate spinal cord.

The cranial and spinal cavities are continuous with one another

2- Ventral Body Cavity The more anterior and larger of the closed body cavities is the ventral body cavity

.It has two major subdivisions,

the thoracic and the abdominopelvic cavities. It houses internal organs collectively called the viscera .

The inferior part, the pelvic cavity, lies in the bony pelvis.

A simpler scheme to localize the abdominopelvic cavity organs is to imagine one transverse and one median sagittal plane pass through the umbilicus at right angles.

The resulting quadrants are named according to their positions from the subject's point of view:

right upper quadrant (RUQ),

left upper quadrant (LUQ),

right lower quadrant (RLQ),

and left lower quadrant (LLQ).

Abdominopelvic Quadrants

Mosul Technical Medical Institute
Department of Emergency Medicine and First Aid

Techniques

anatomy / Theoretical

The first stage

Digestive system

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Gastro-intestinal tract (digestive tract , alimentary tract):

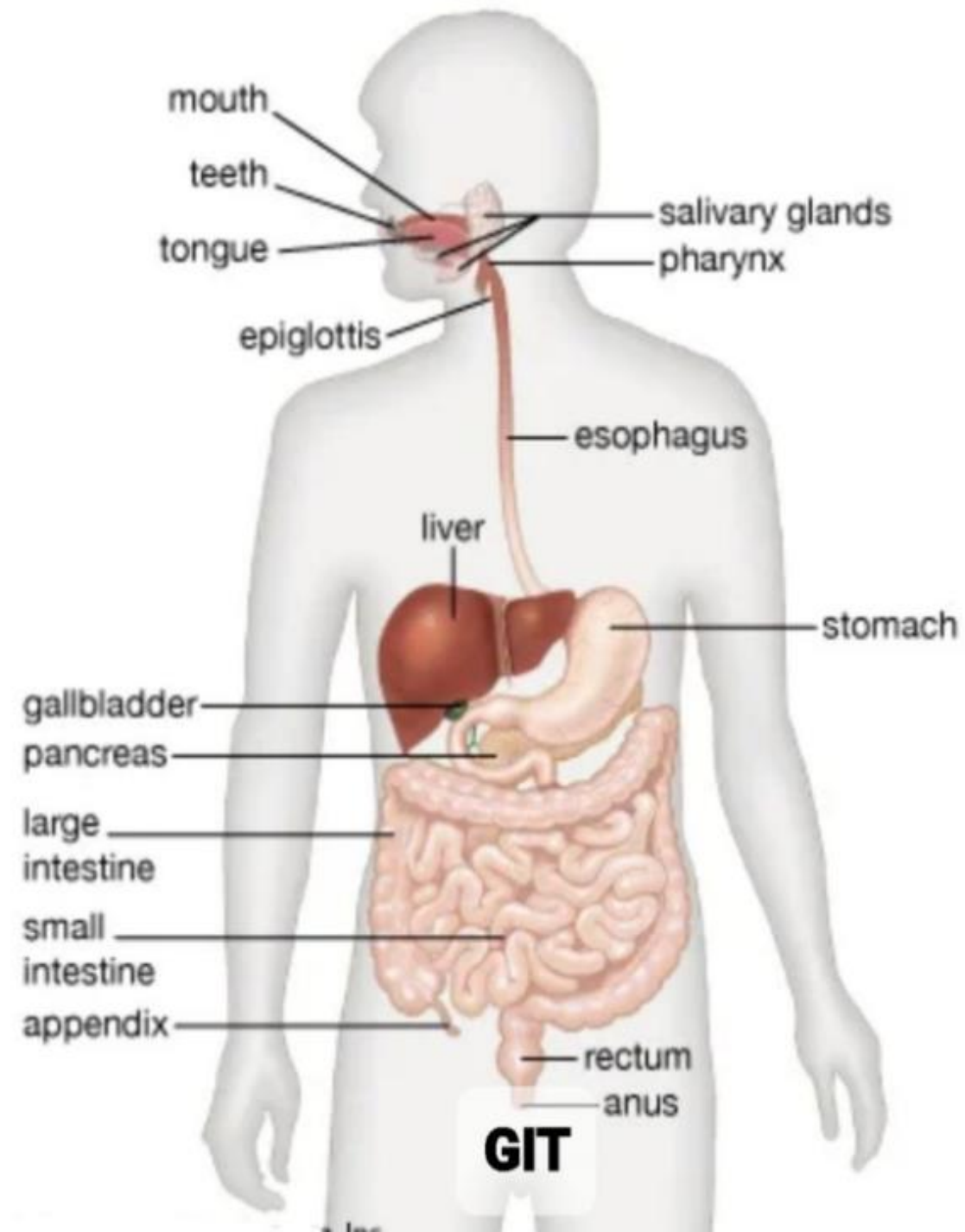
Is a muscular tube starting from the oral cavity where food enters , continue through the pharynx , esophagus , stomach and intestine to the rectum and anal canal where food is expelled .

-Its about 9 meters in length .

- The main **functions** of GIT : * digest and absorb ingested food
* Excrete waste products of digestion

- **GIT** include mouth , esophagus , stomach , small intestine , large intestine (cecum, colon) rectum and anal canal .

- Supporting organs of GIT are : - **teeth**
- **tongue**
- **salivary glands**
- **liver and gall bladder**
- **pancreas**

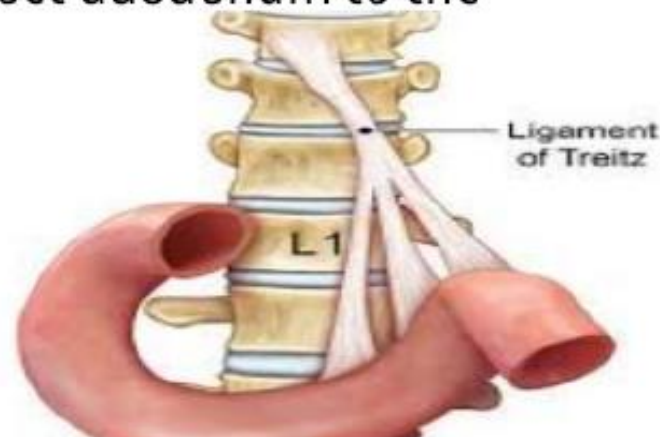


Gastro intestinal tract is divided into upper and lower GIT

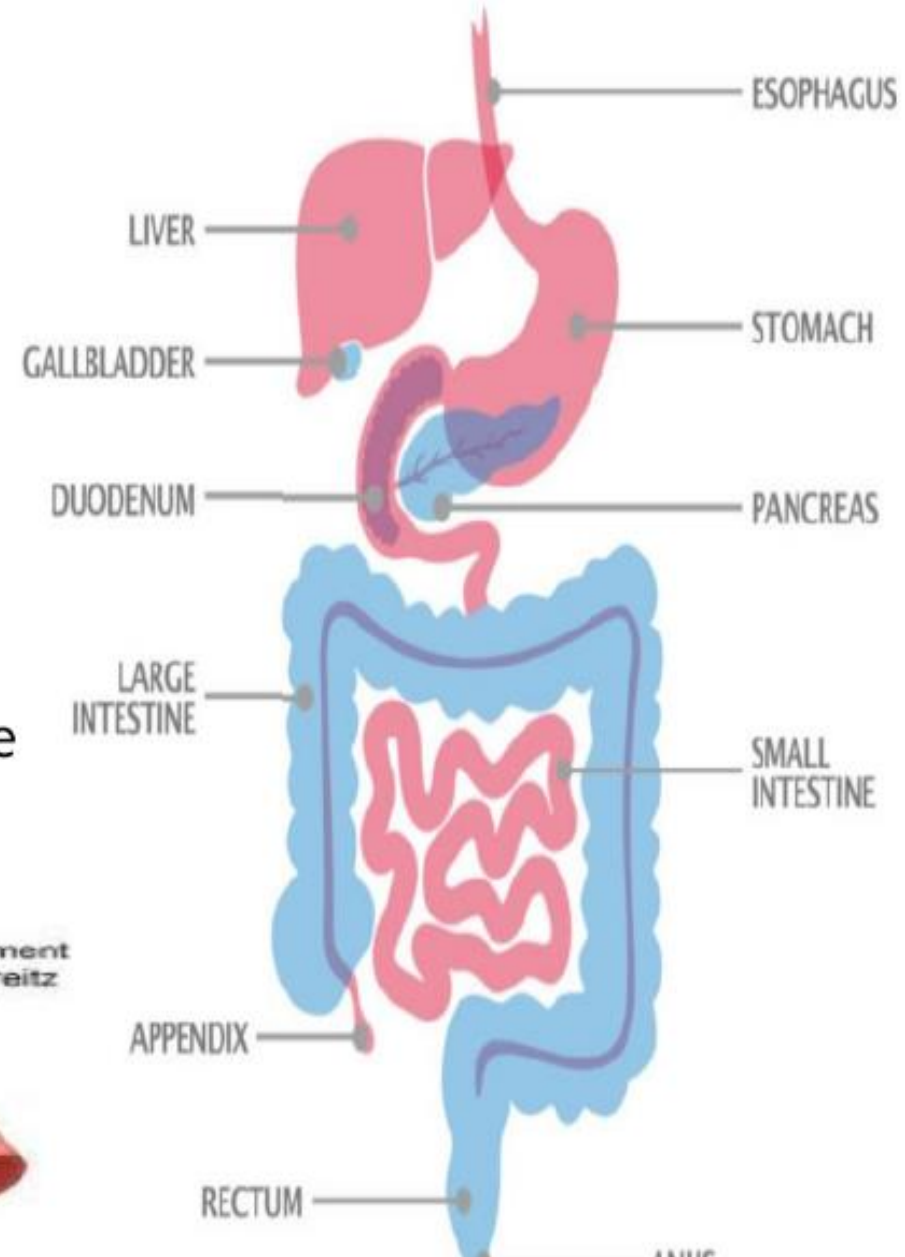
- Upper GIT consist of –Mouth
 - Pharynx
 - Esophagus
 - Stomach
 - Duodenum

- Lower GIT consist include – Small intestine :-Jejunum
 - Ileum
 - Large intestine :- Cecum
 - Ascending colon
 - Transverse colon
 - Descending colon
 - Rectum and anal canal

= line of separation between upper and lower GIT is suspensory muscle of duodenum(**ligament of Treitz**) which connect duodenum to the diaphragm .



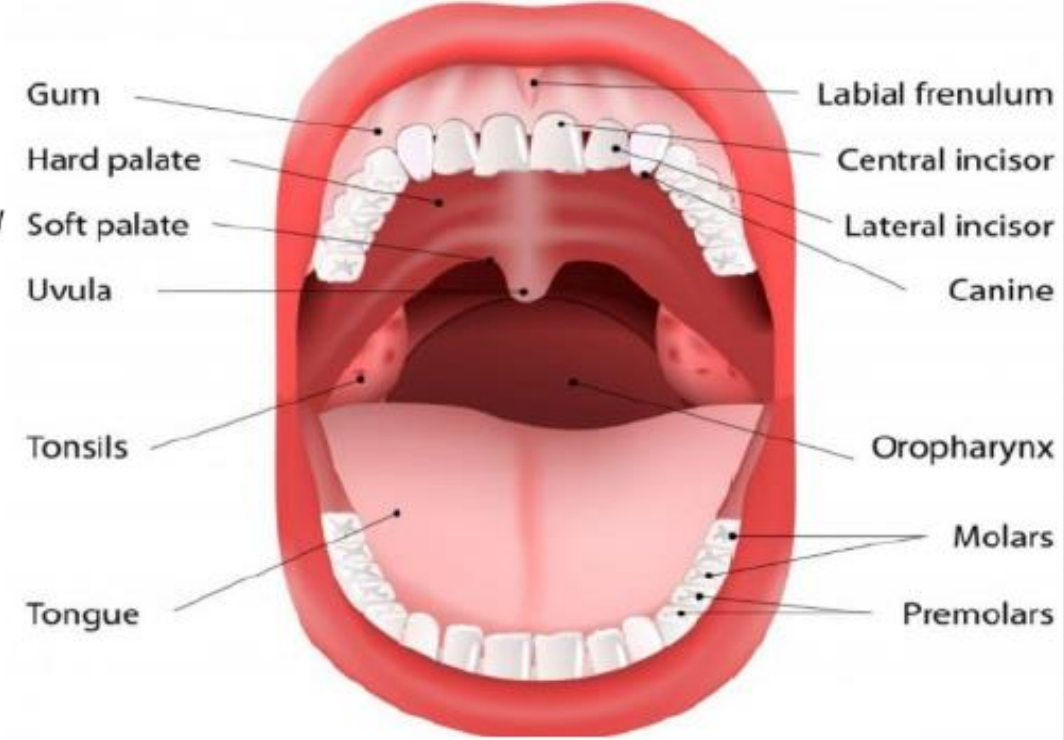
UPPER & LOWER GASTROINTESTINAL TRACTS



Mouth :

The 1st part of upper GIT , saliva (**contain amylase enzyme , breakdown carbohydrate**) mix with food ,makes food soft to swallow into the pharynx.

-Mouth contain lips ,mouth cavity(oral cavity) ,gum , teeth , hard and soft palate , tongue and minor salivary glands. .

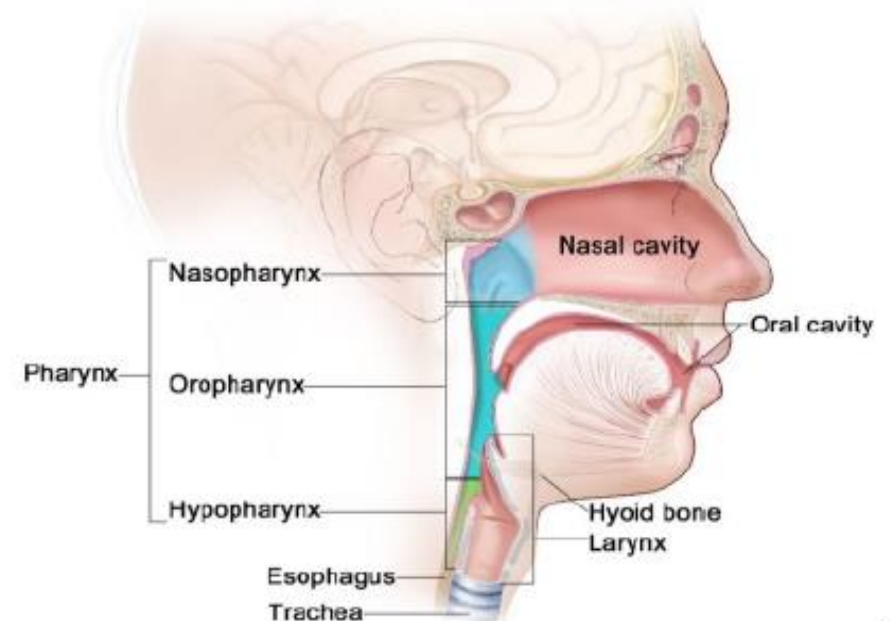


Anatomy of the Pharynx

Pharynx: (throat)

A muscular tube of 5 inches length , connecting nasal cavity and oral cavity to the larynx and esophagus . 3 parts of pharynx : **nasopharynx ,oropharynx and laryngopharynx.**

Oropharynx and laryngopharynx are common passages for both food and air .



Esophagus :

-Fibromuscular tube ,25 cm in length , transport food from pharynx to the stomach. It starts from **cricoid cartilage of larynx (C6 vertebra)** to the **cardiac orifice of stomach (T11 vertebra)**.

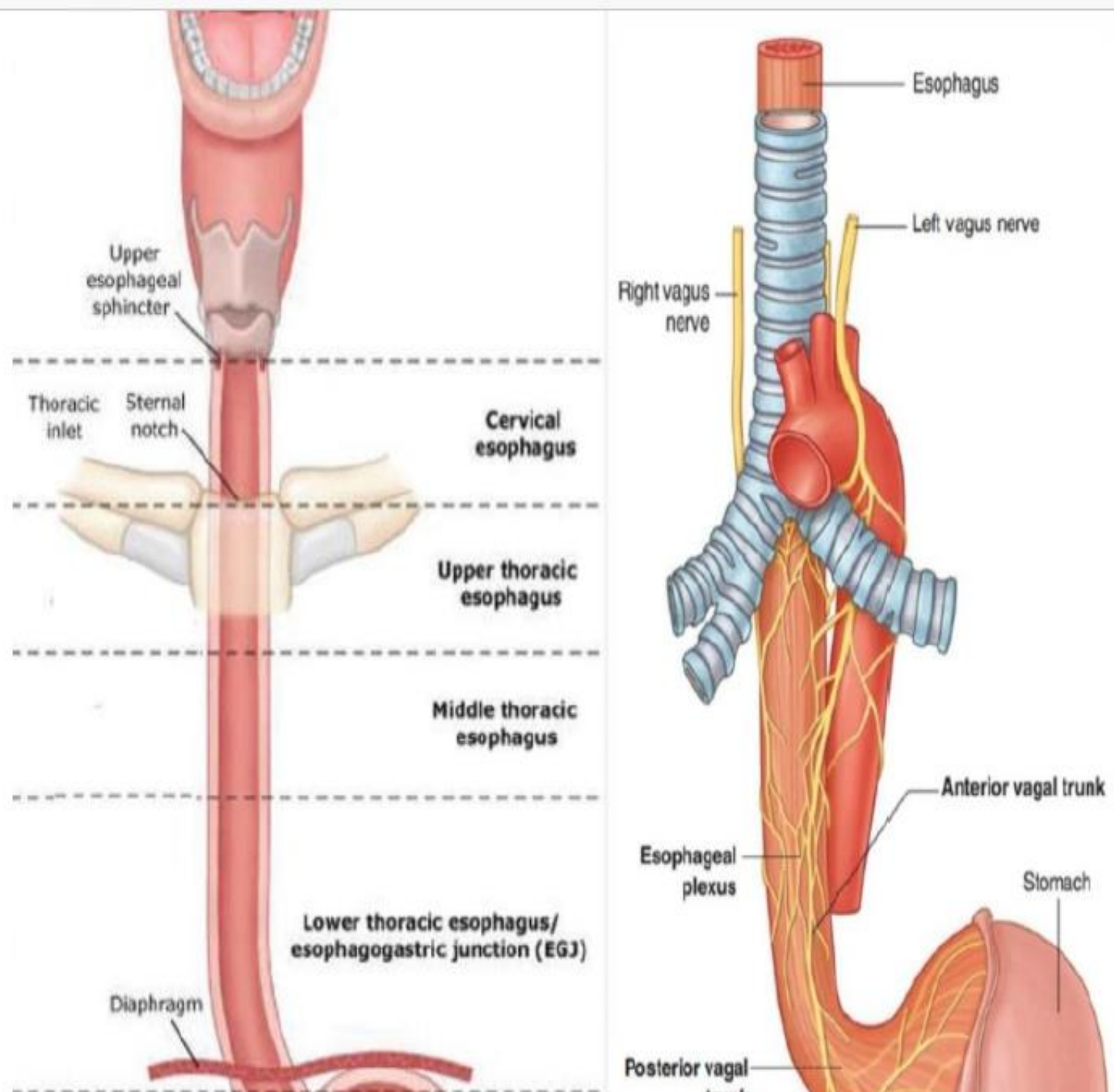
-3 parts of esophagus : **cervical**
thoracic
abdominal part .

-It Descends downward **between trachea and vertebral column** , enters the abdomen via **esophageal opening** of diaphragm.

-Abdominal part of esophagus is about 1.25cm .

- 2 Esophageal **sphincters** (valves):

***upper** and ***lower esophageal sphincters**



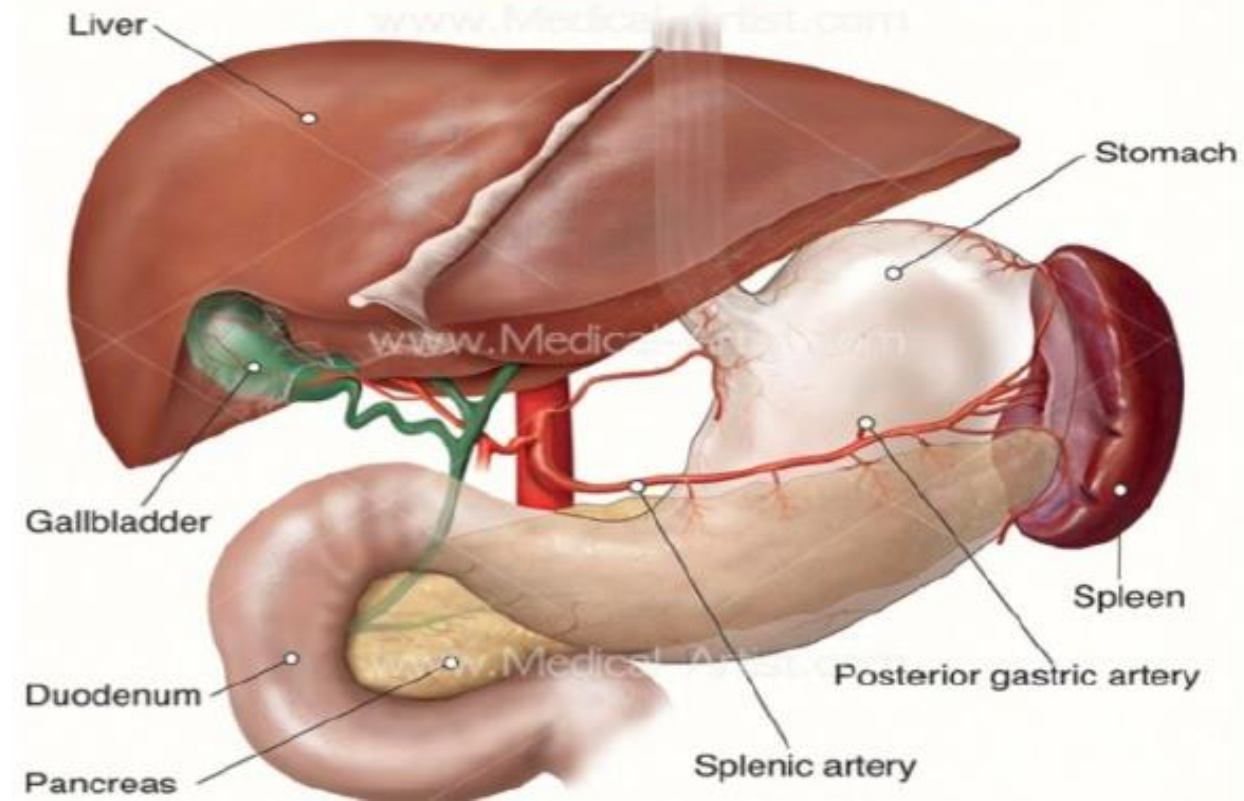
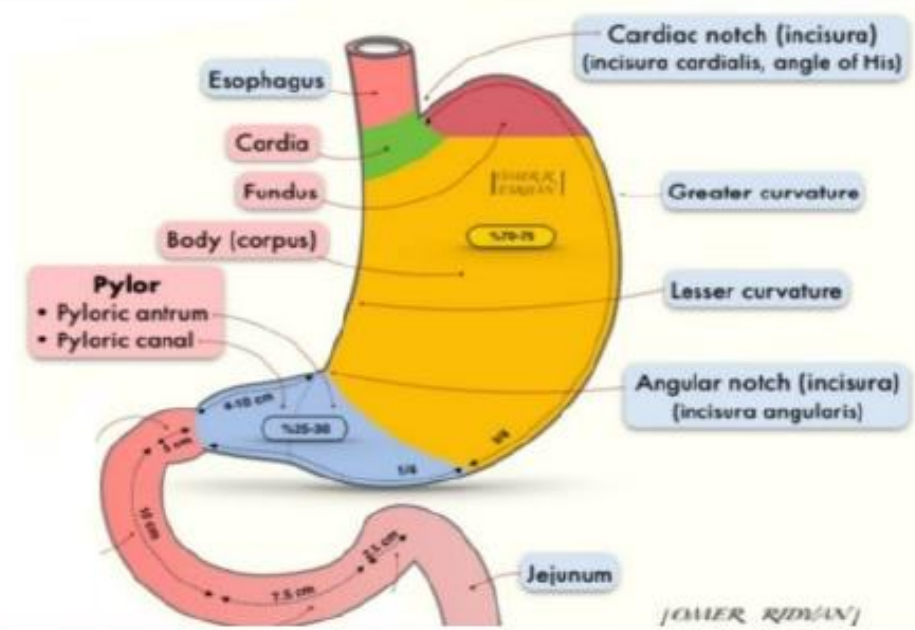
Stomach :

Is a j-shaped intraperitoneal organ that digests food, connects esophagus to the duodenum.

- Has 4 parts - **cardia**
 - fundus
 - body
 - pylorus
- Has **2 sphincters** : -**inferior esophageal sphincter** (functional sphincter)
 - Pyloric sphincter** : (anatomical sphincter) between stomach and 1st part of duodenum.

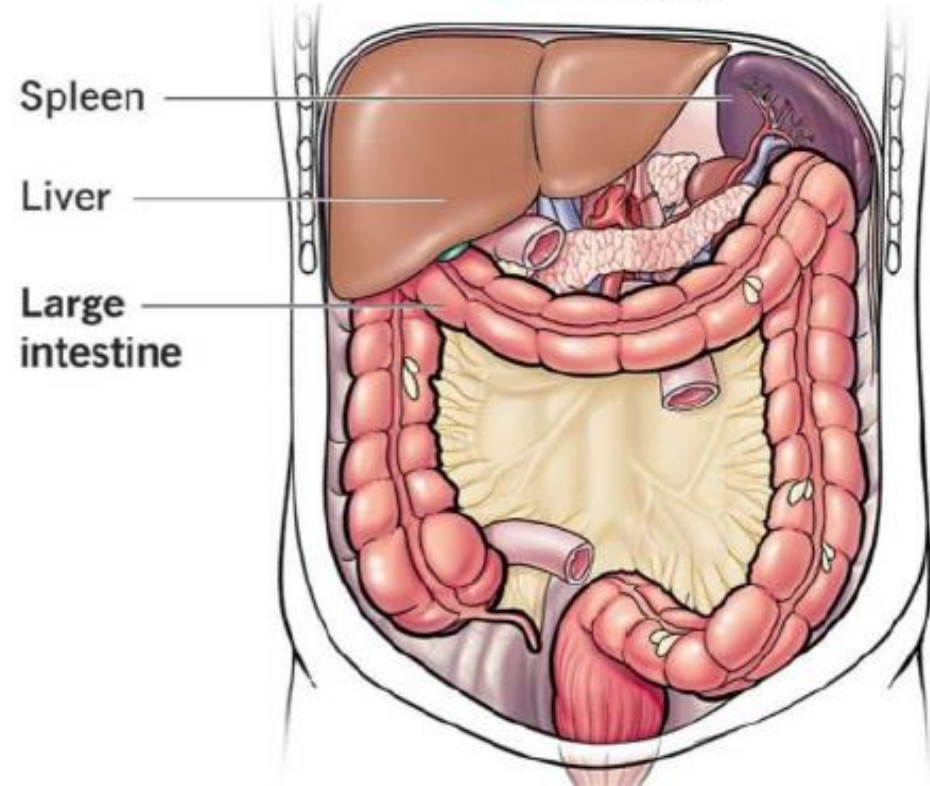
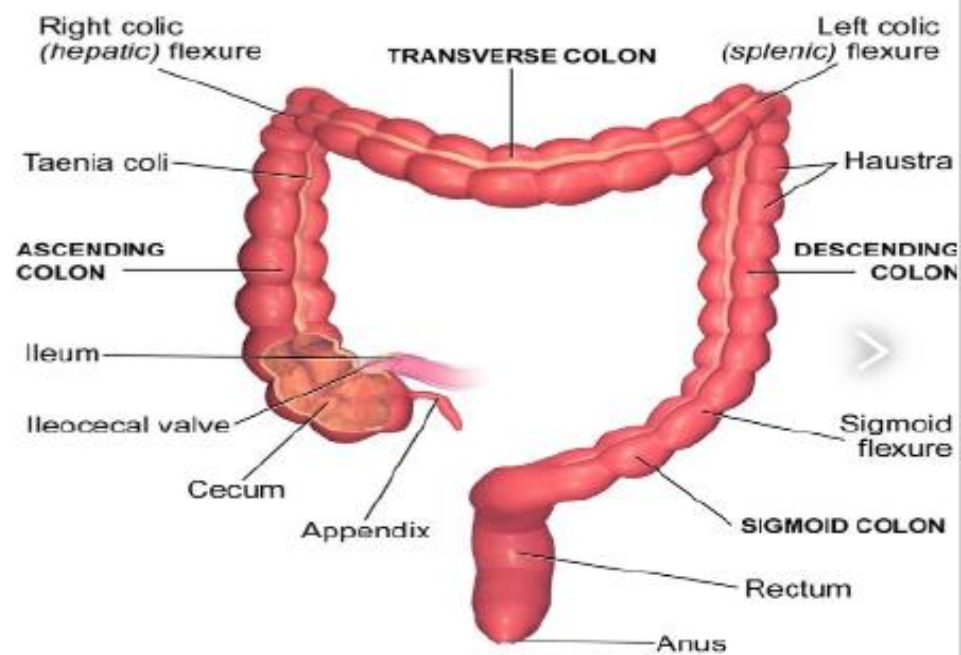
Relations:

- Anterior** : liver and gall bladder
- Posterior** : pancreas, Lt kidney and spleen
- Blood supply** : -Rt gastric artery
 - Lt gastric artery (from abdominal Aorta)
- Nerve supply** : -Sympathetic nerves : spinal nerves T6-T9
 - Parasympathetic nerves: Vagus nerve



Large intestine : (bowel)

- **8 parts** : cecum , appendix , ascending colon , transverse colon , descending colon , sigmoid colon , rectum and anal canal .
- Large intestine begin in the Rt iliac region as cecum joins to the ileum , continue as ascending , transverse and descending colon which join the rectum and anal canal.
- Its about 1.5m .
- **FUNCTION:** - absorption of water and salts
- expel waste material to the outside .
- Blood supply:** branches of – superior mesenteric artery .
- inferior mesenteric artery .
- Nerve supply :**
 - Sympathetic supply : via superior and inferior mesenteric ganglia .
 - Parasympathetic supply: - Vagus nerve (X- CN)
- Sacral spinal nerve (S2,3,4)



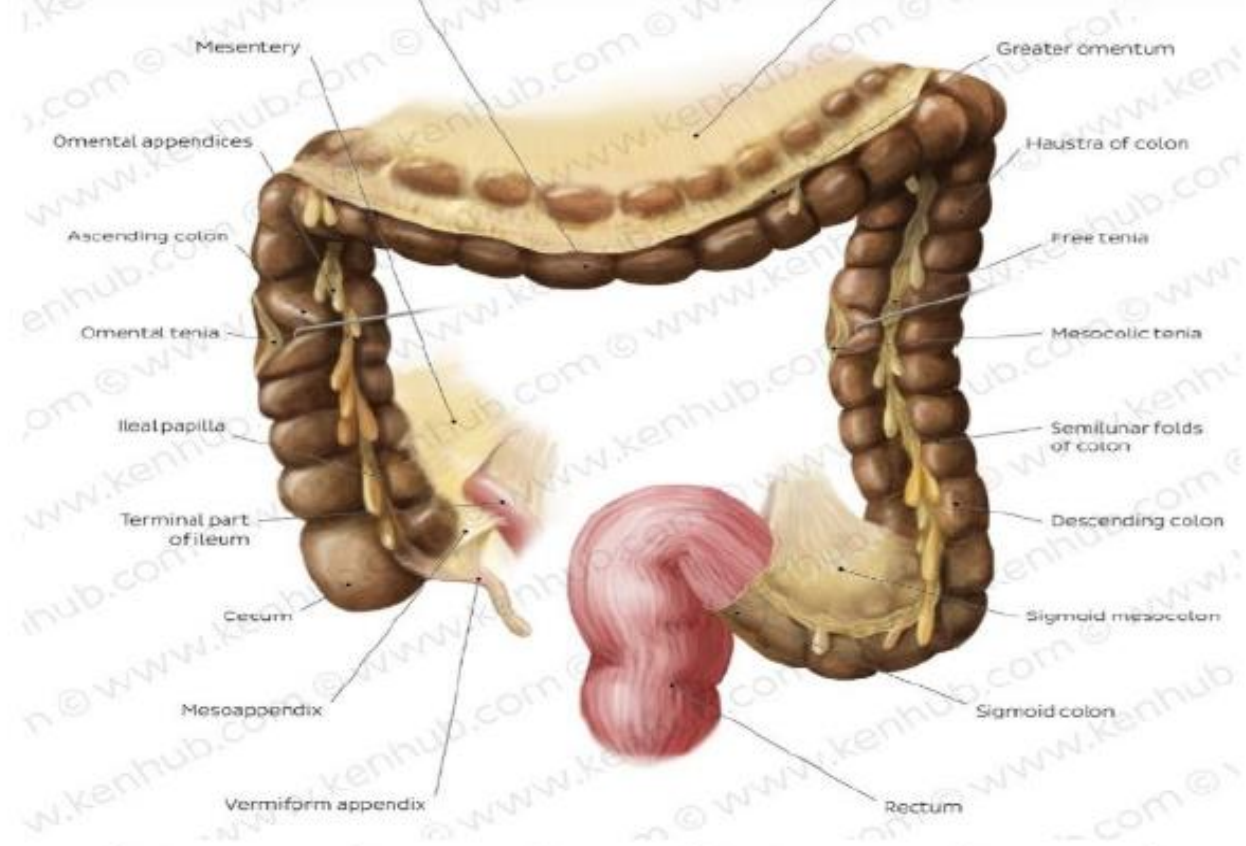
Intraperitoneal / retroperitoneal GIT

- **Retroperitoneal** organs do not have a complete coverings of peritoneum, so they are fixed in location .

- **Intraperitoneal** organs are completely surrounded by peritoneum and are therefore mobile .

*Stomach , 1st part of duodenum , jejunum , ileum , cecum , appendix , transverse colon and sigmoid colon are **intra peritoneal parts** .

*Duodenum(2nd,3rd,4th) , ascending colon , descending colon and rectum are **retroperitoneal parts**



Intraperitoneal vs. Retroperitoneal

- Stomach
- Part 1 of duodenum
- Jejunum, Ileum
- Cecum, Appendix
- Transverse colon
- Sigmoid colon
- Liver, Gallbladder
- Tail of pancreas
- Spleen

- Parts 2,3,4 duodenum
- Ascending, Descending colon
- Rectum
- Head, neck, body of pancreas
- Kidneys, ureters
- Suprarenal gland
- Abdominal Aorta
- Inferior vena cava

*****Rule of Thumb:**

If it has a mesentery or mesogastrium component => **Intraperitoneal**



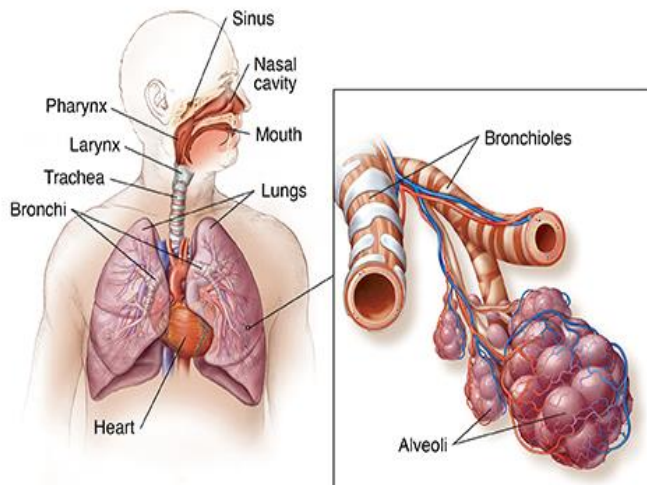
Human Respiratory System

الجامعة التقنية الشمالية
المعهد الطبي الموصل
تسريح عملي / المحاضرة الرابعة

Respiratory system

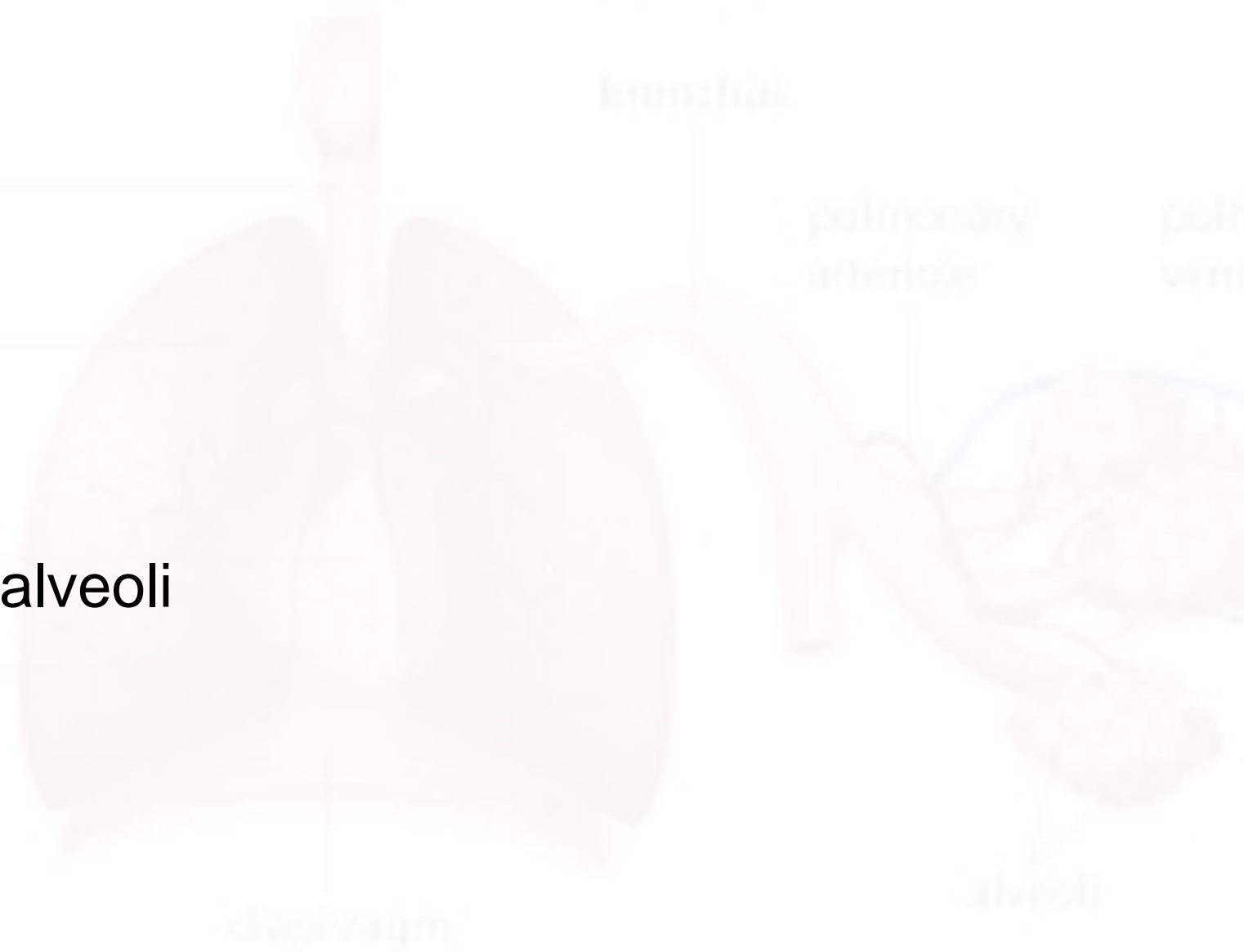
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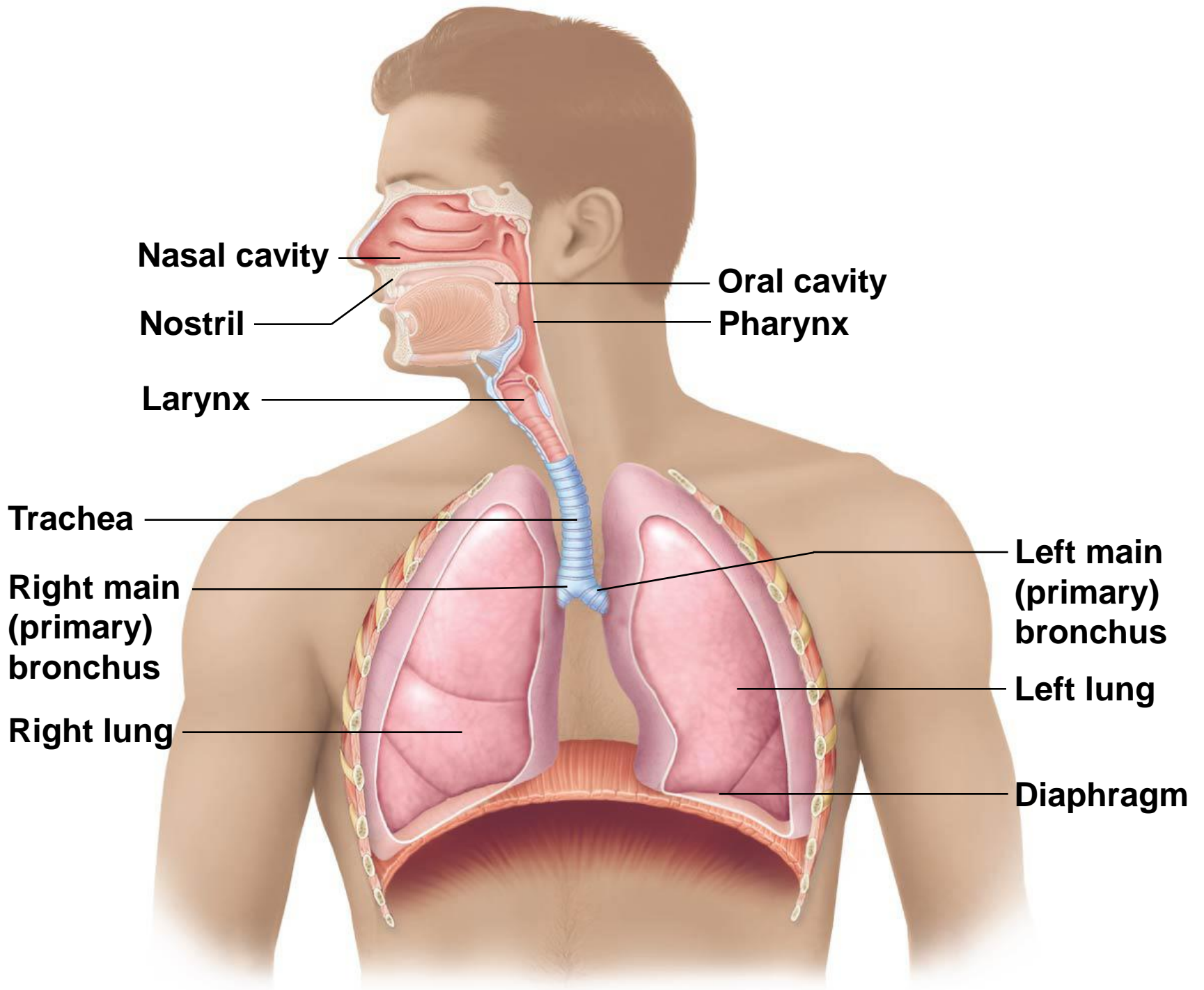
A.L. Aomnea mohammed abdulazeez



Organs of the Respiratory System

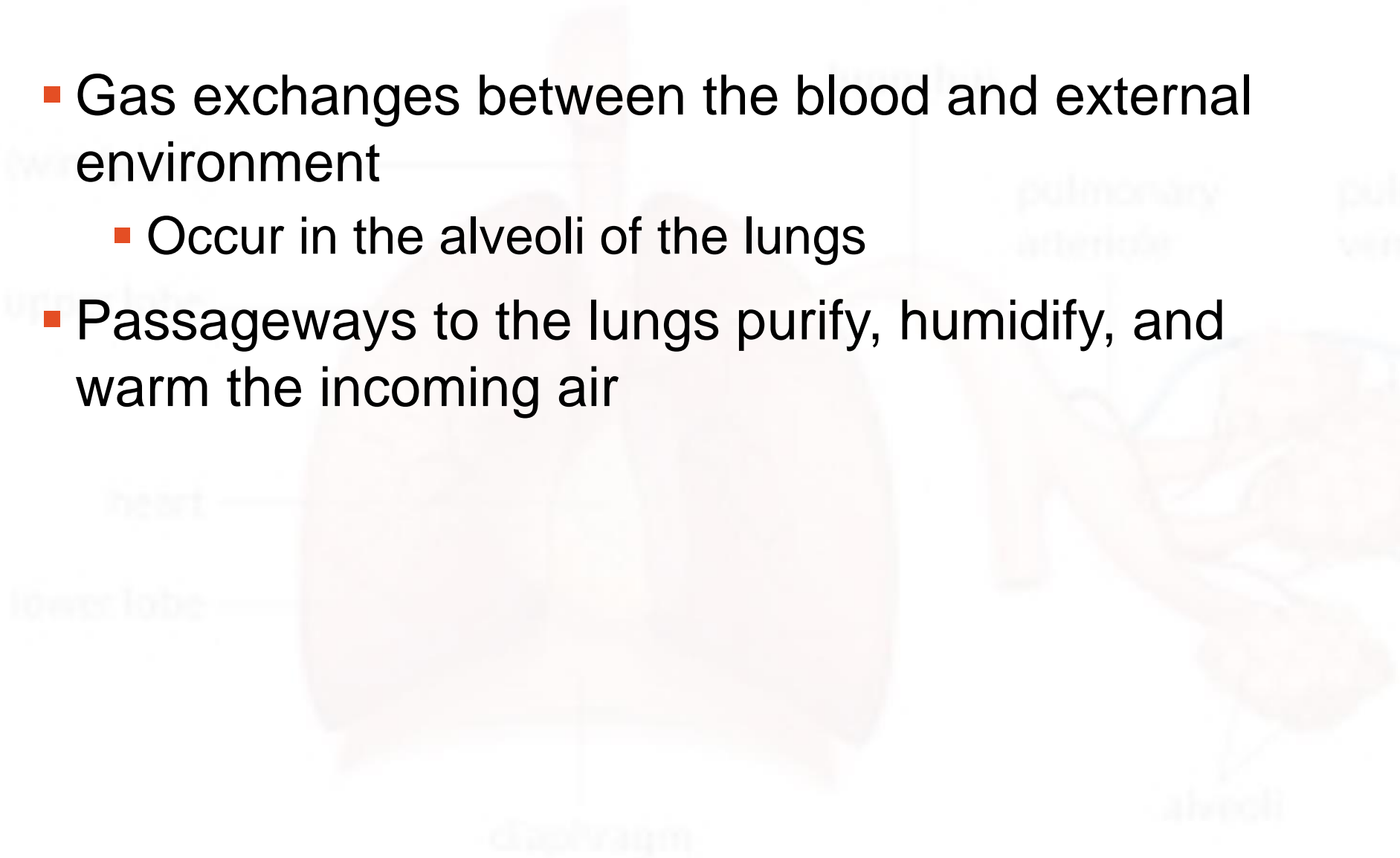
- Nose
- Pharynx
- Larynx
- Trachea
- Bronchi
- Lungs—alveoli





Functions of the Respiratory System

- Gas exchanges between the blood and external environment
 - Occur in the alveoli of the lungs
- Passageways to the lungs purify, humidify, and warm the incoming air

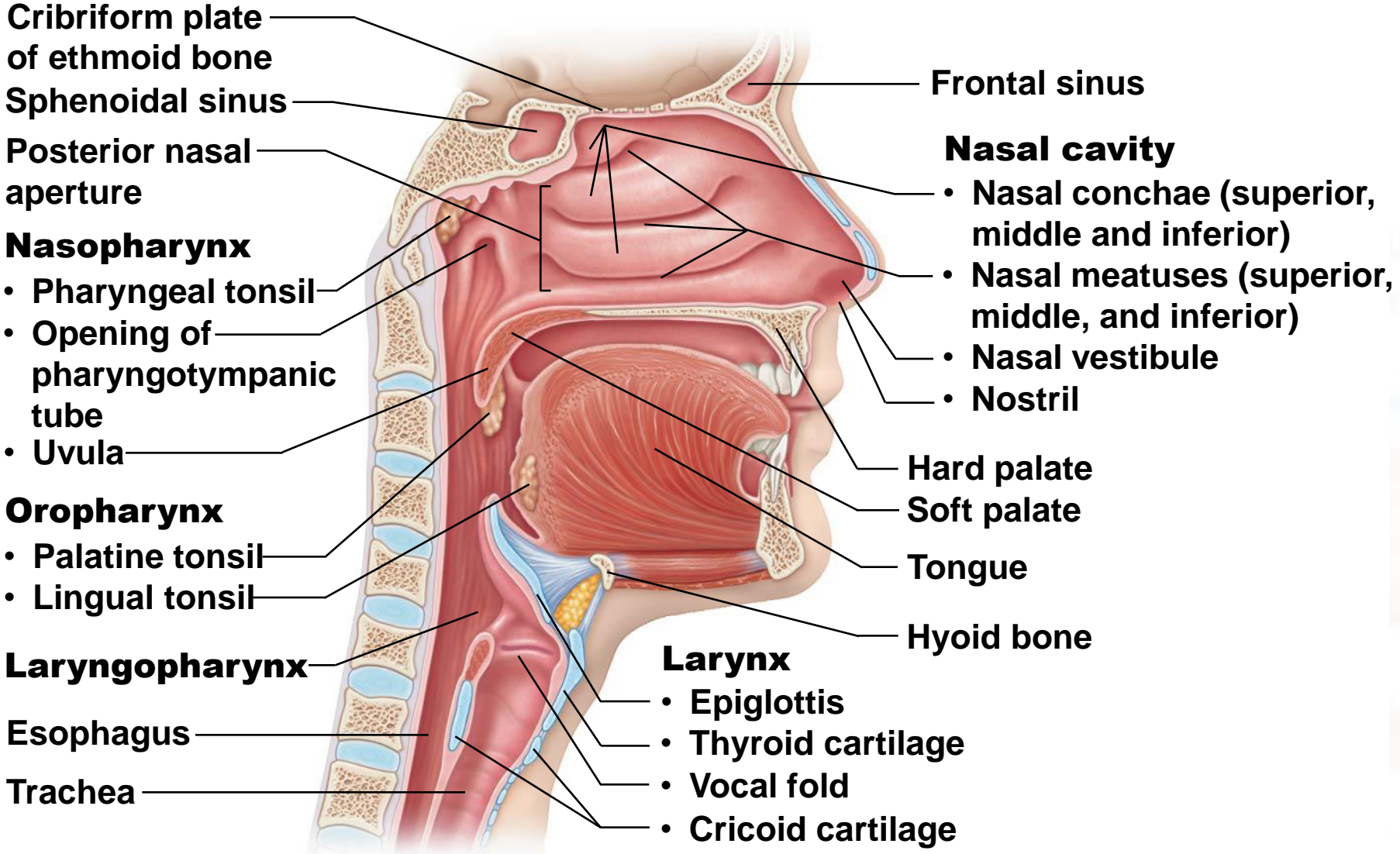


The Nose

- The only externally visible part of the respiratory system
- Air enters the nose through the external nostrils (nares)
- Interior of the nose consists of a nasal cavity divided by a nasal septum

Figure 13.2b Basic anatomy of the upper respiratory tract, sagittal section.

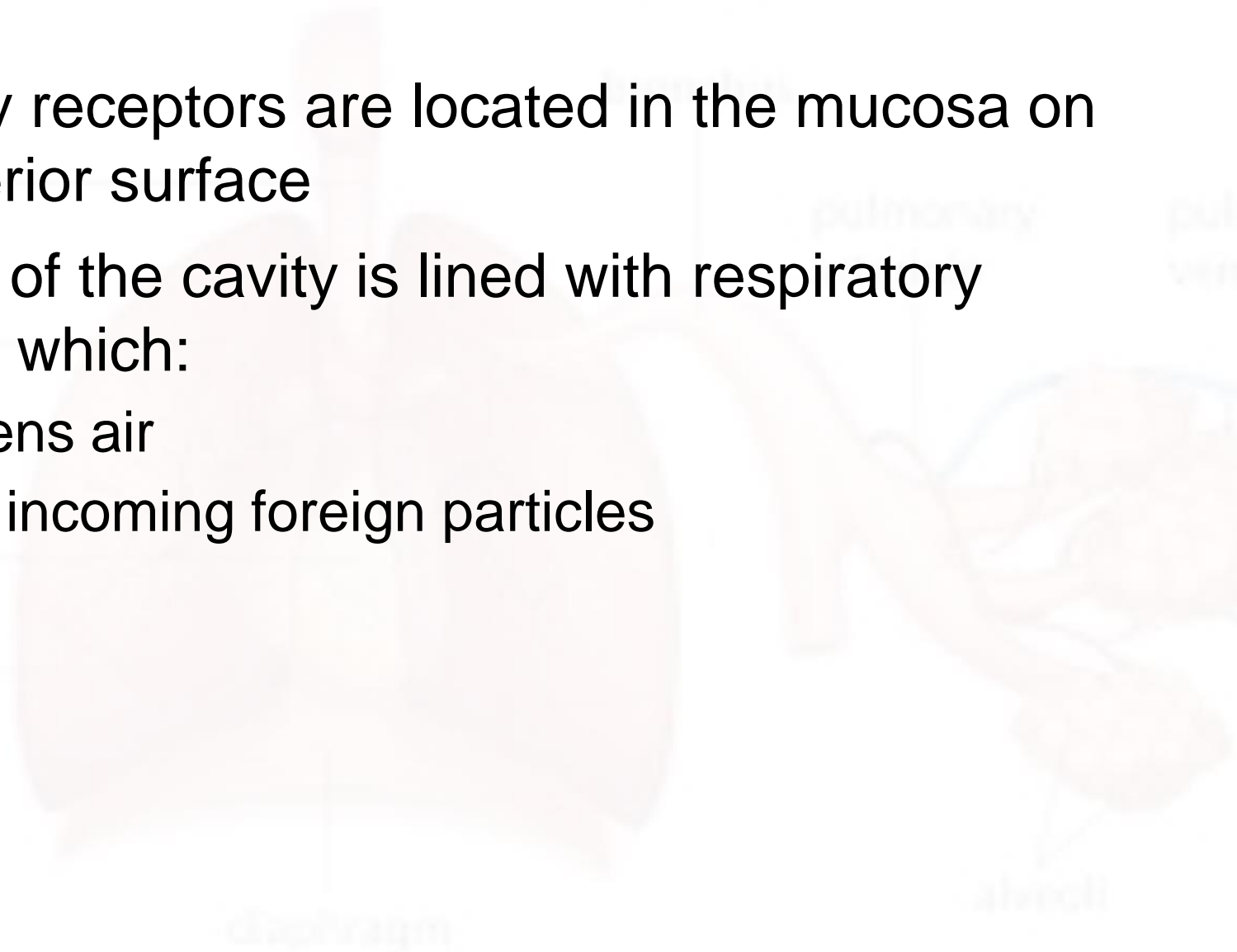
Human Respiratory System



(b) Detailed anatomy of the upper respiratory tract

The Nose

- Olfactory receptors are located in the mucosa on the superior surface
- The rest of the cavity is lined with respiratory mucosa, which:
 - Moistens air
 - Traps incoming foreign particles



The Nose

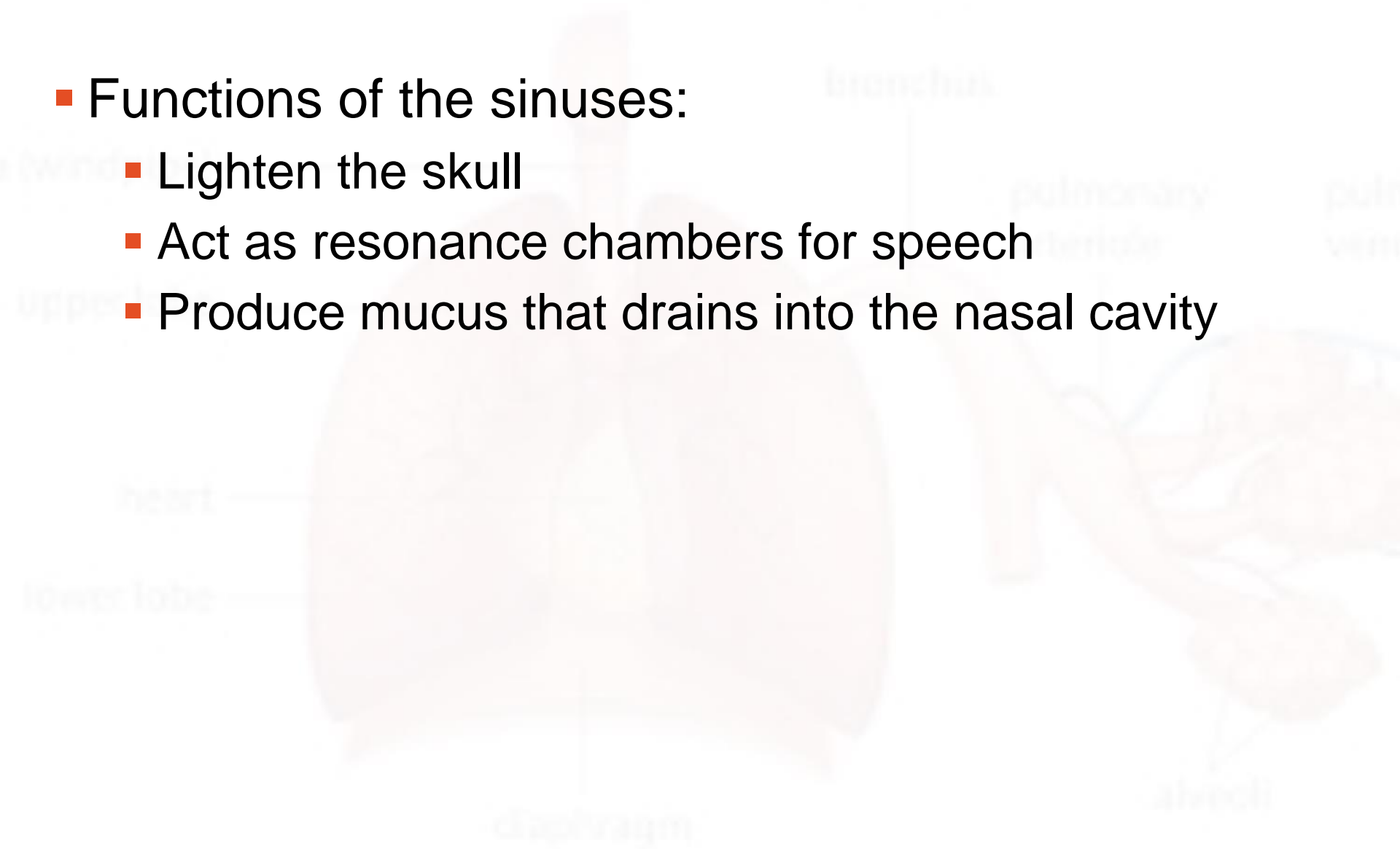
- Lateral walls have projections called *conchae*
 - Increase surface area
 - Increase air turbulence within the nasal cavity
- The nasal cavity is separated from the oral cavity by the palate
 - Anterior hard palate (bone)
 - Posterior soft palate (unsupported)

Paranasal Sinuses

- Cavities within bones surrounding the nasal cavity are called *sinuses*
- Sinuses are located in the following bones:
 - Frontal
 - Sphenoid
 - Ethmoid
 - Maxillary

Paranasal Sinuses

- Functions of the sinuses:
 - Lighten the skull
 - Act as resonance chambers for speech
 - Produce mucus that drains into the nasal cavity



Pharynx (Throat) Respiratory System

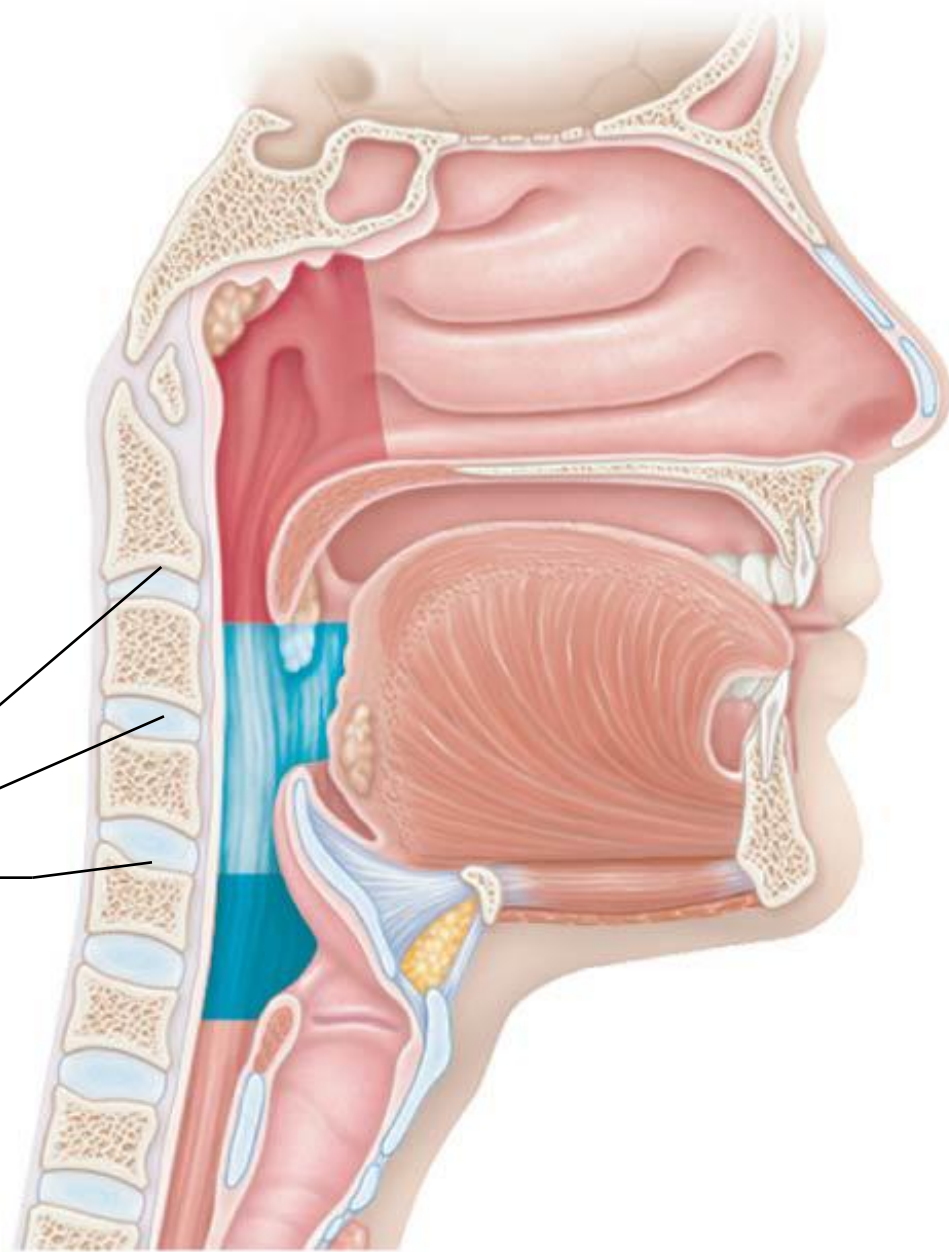
- Muscular passage from nasal cavity to larynx
- Three regions of the pharynx:
 1. Nasopharynx—superior region behind nasal cavity
 2. Oropharynx—middle region behind mouth
 3. Laryngopharynx—inferior region attached to larynx
- The oropharynx and laryngopharynx are common passageways for air and food

Pharynx

- **Nasopharynx**
- **Oropharynx**
- **Laryngopharynx**

(a)

Regions of the pharynx

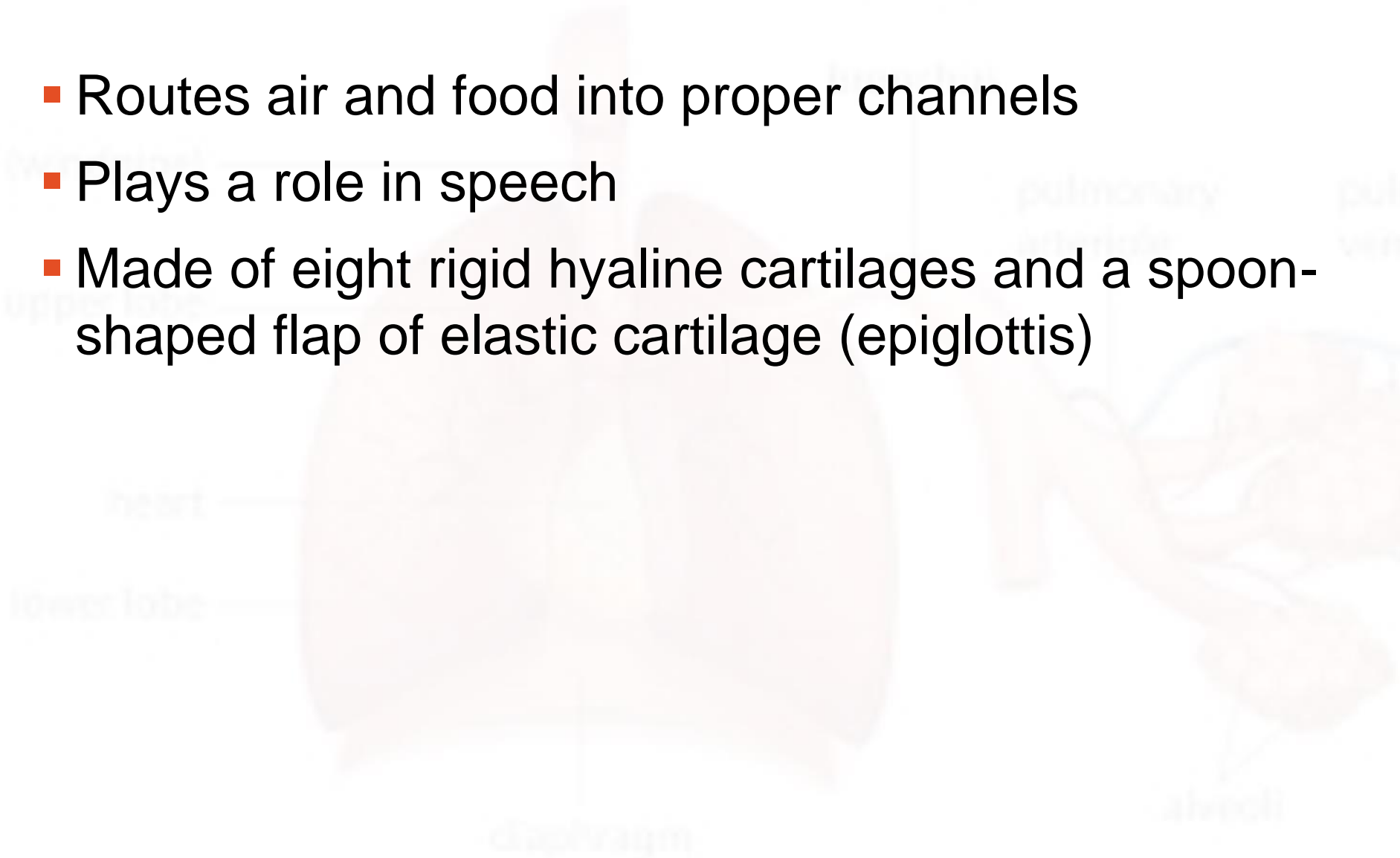


Pharynx (Throat) Respiratory System

- Pharyngotympanic tubes open into the nasopharynx
- Tonsils of the pharynx
 - Pharyngeal tonsil (adenoid) is located in the nasopharynx
 - Palatine tonsils are located in the oropharynx
 - Lingual tonsils are found at the base of the tongue

Larynx (Voice Box)

- Routes air and food into proper channels
- Plays a role in speech
- Made of eight rigid hyaline cartilages and a spoon-shaped flap of elastic cartilage (epiglottis)

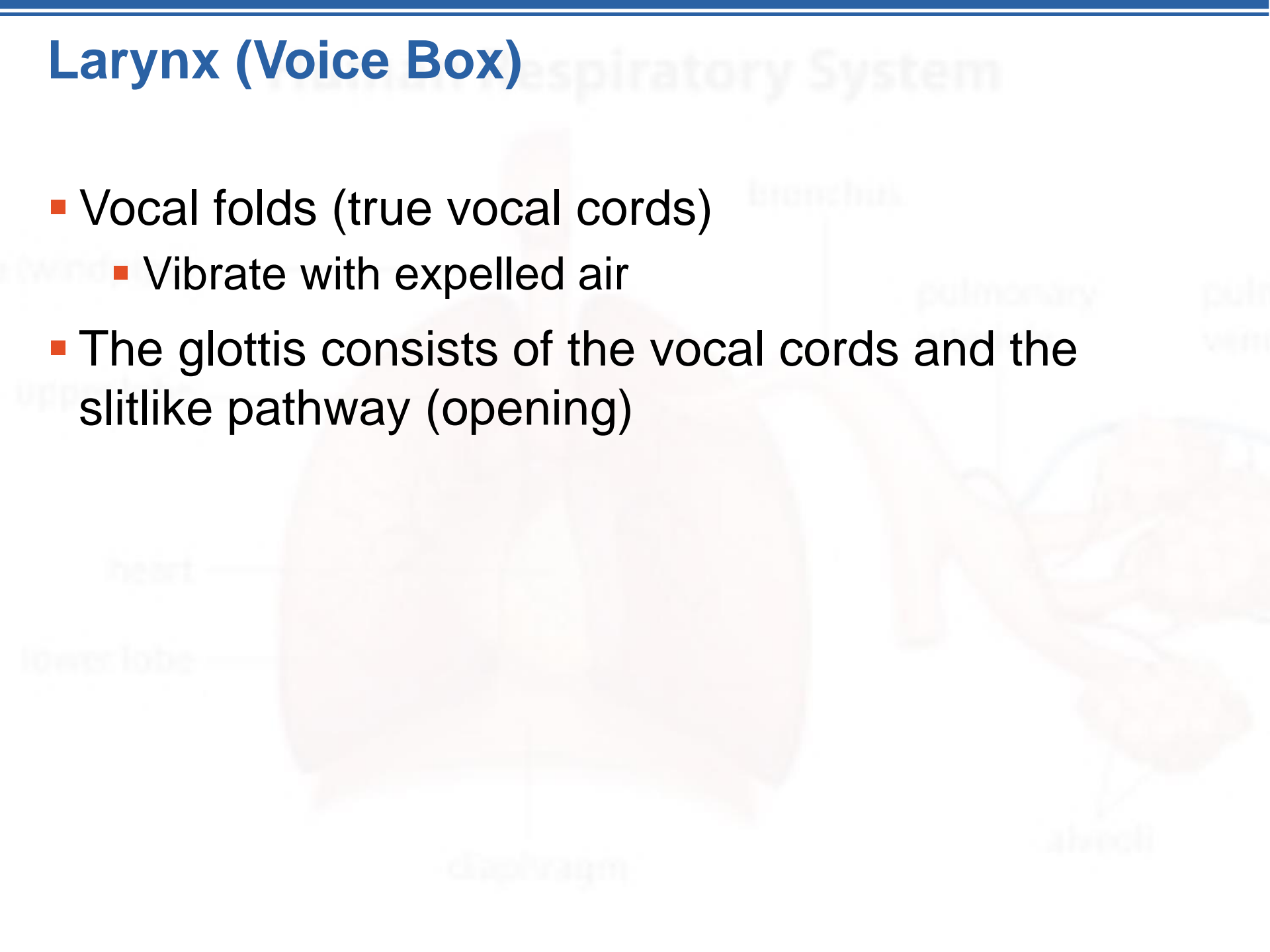


Larynx (Voice Box)

- Thyroid cartilage
 - Largest of the hyaline cartilages
 - Protrudes anteriorly (Adam's apple)
- Epiglottis
 - Protects the superior opening of the larynx
 - Routes food to the posteriorly situated esophagus and routes air toward the trachea
 - When swallowing, the epiglottis rises and forms a lid over the opening of the larynx

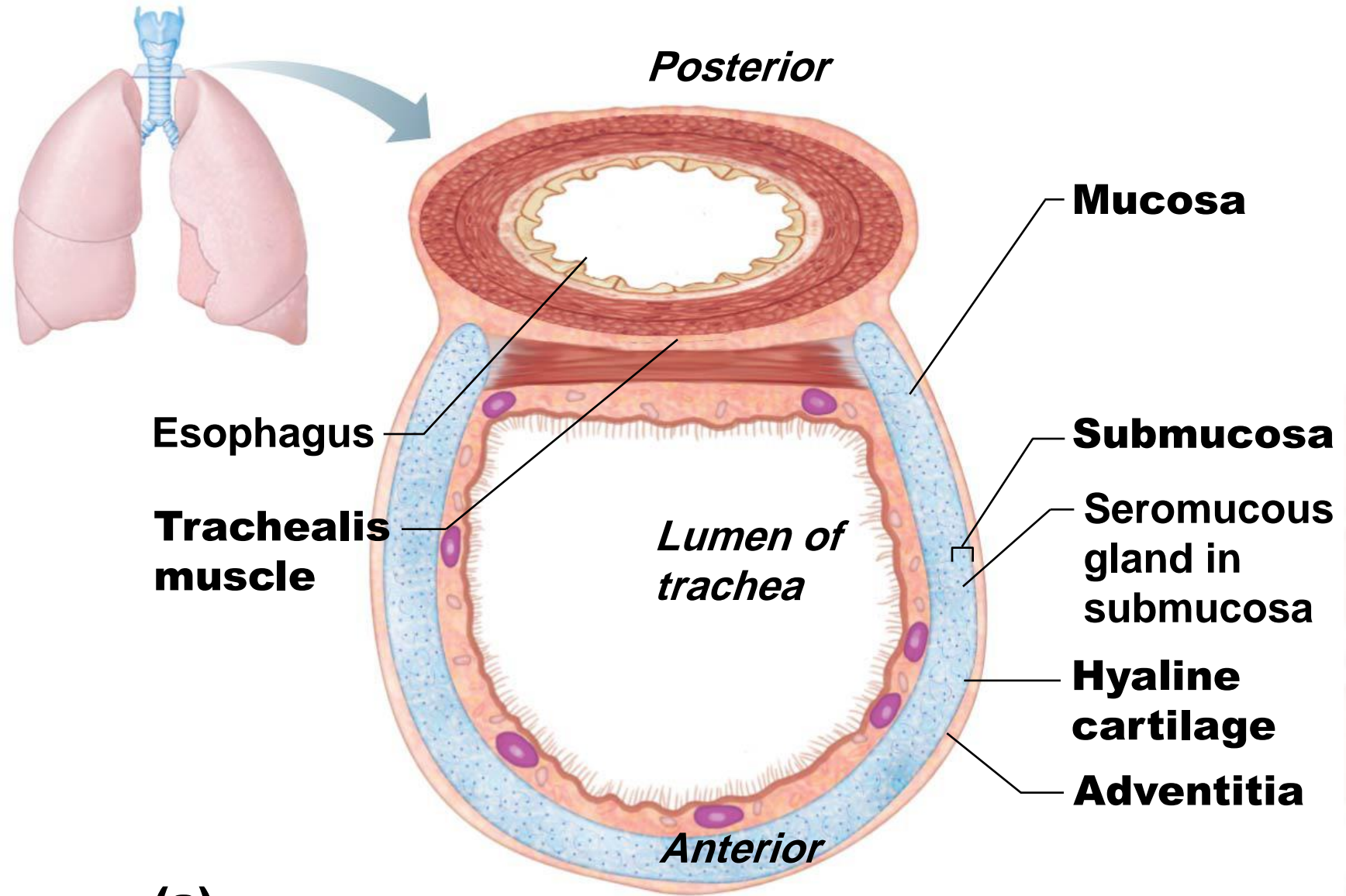
Larynx (Voice Box)

- Vocal folds (true vocal cords)
 - Vibrate with expelled air
- The glottis consists of the vocal cords and the slitlike pathway (opening)

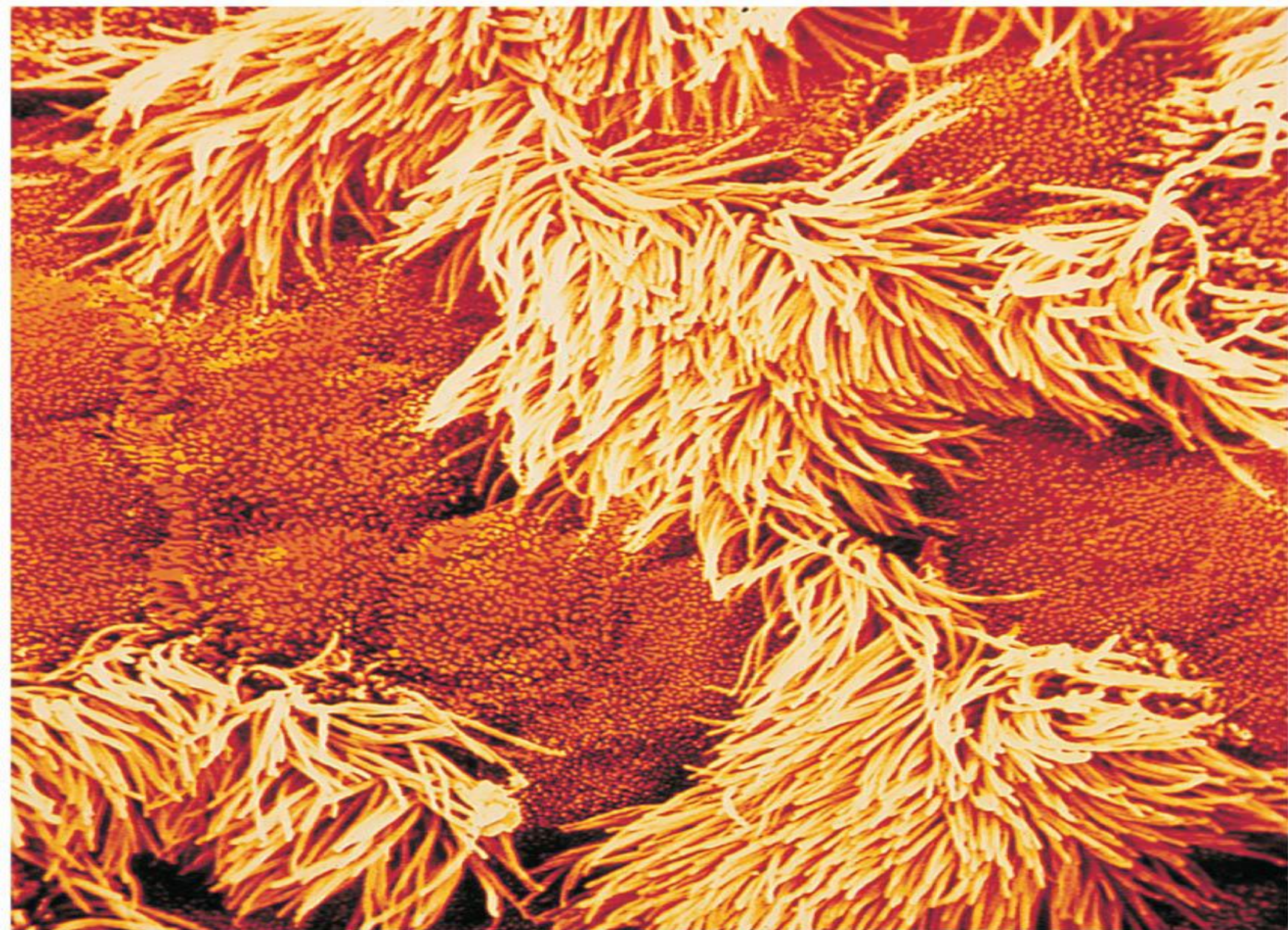


Trachea (Windpipe)

- 4-inch-long tube that connects larynx with bronchi
- Walls are reinforced with C-shaped hyaline cartilage, which keeps the trachea patent
- Lined with ciliated mucosa
 - Cilia beat continuously in the opposite direction of incoming air
 - Expel mucus loaded with dust and other debris away from lungs



(a)



(b)

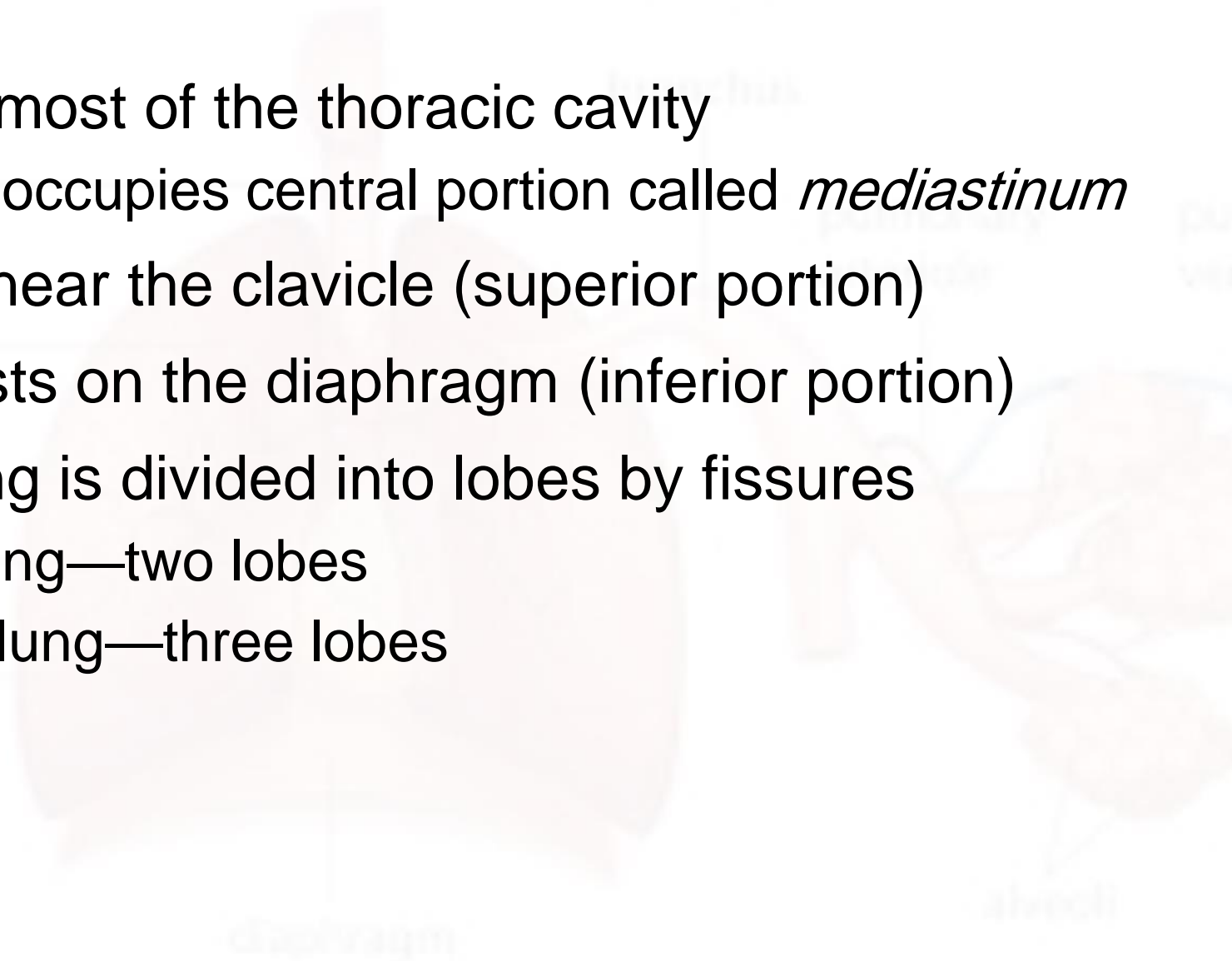
Main (Primary) Bronchi

- Formed by division of the trachea
- Each bronchus enters the lung at the hilum (medial depression)
- Right bronchus is wider, shorter, and straighter than left
- Bronchi subdivide into smaller and smaller branches

Lungs

Human Respiratory System

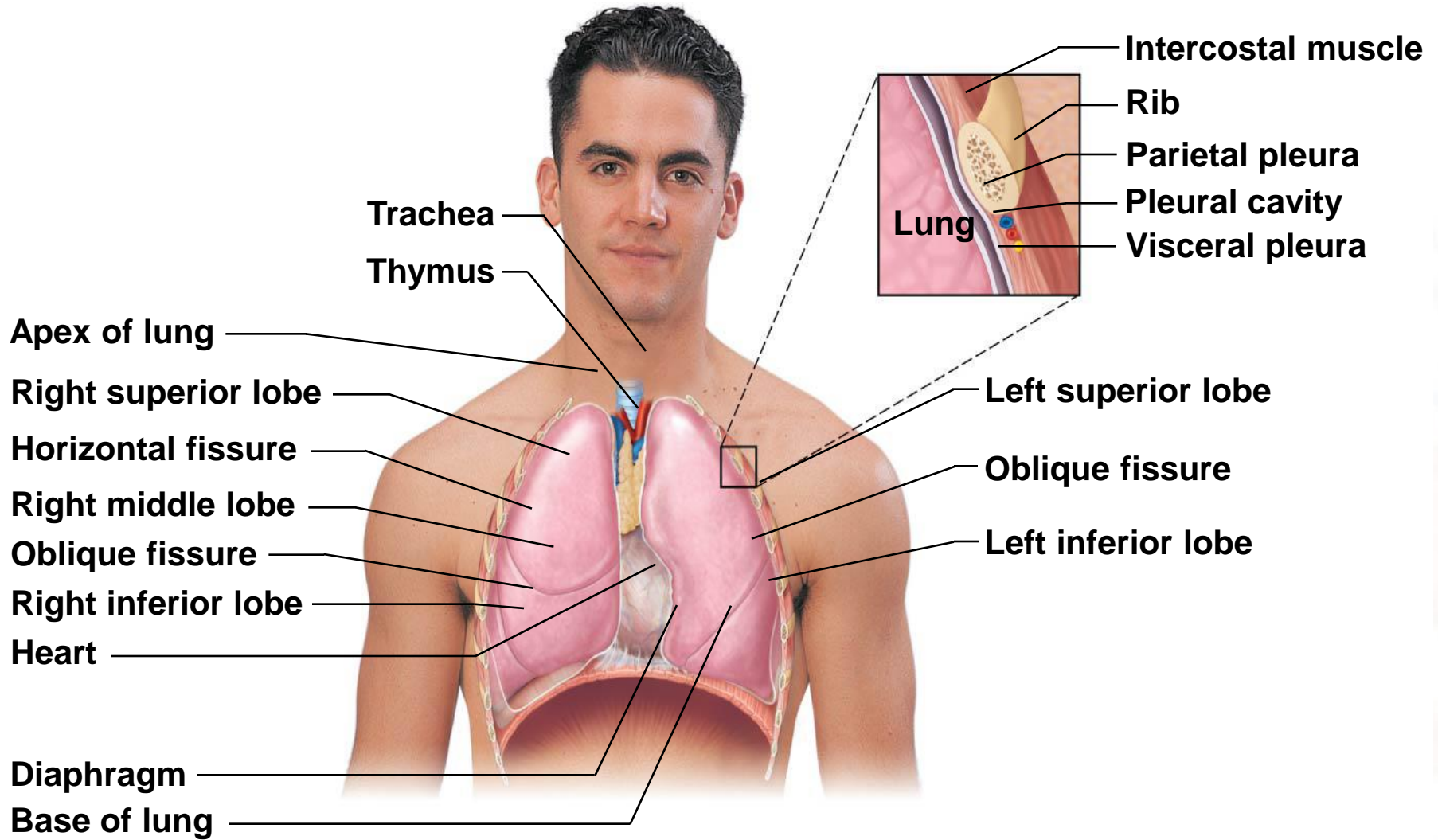
- Occupy most of the thoracic cavity
 - Heart occupies central portion called *mediastinum*
- Apex is near the clavicle (superior portion)
- Base rests on the diaphragm (inferior portion)
- Each lung is divided into lobes by fissures
 - Left lung—two lobes
 - Right lung—three lobes



Coverings of the Lungs

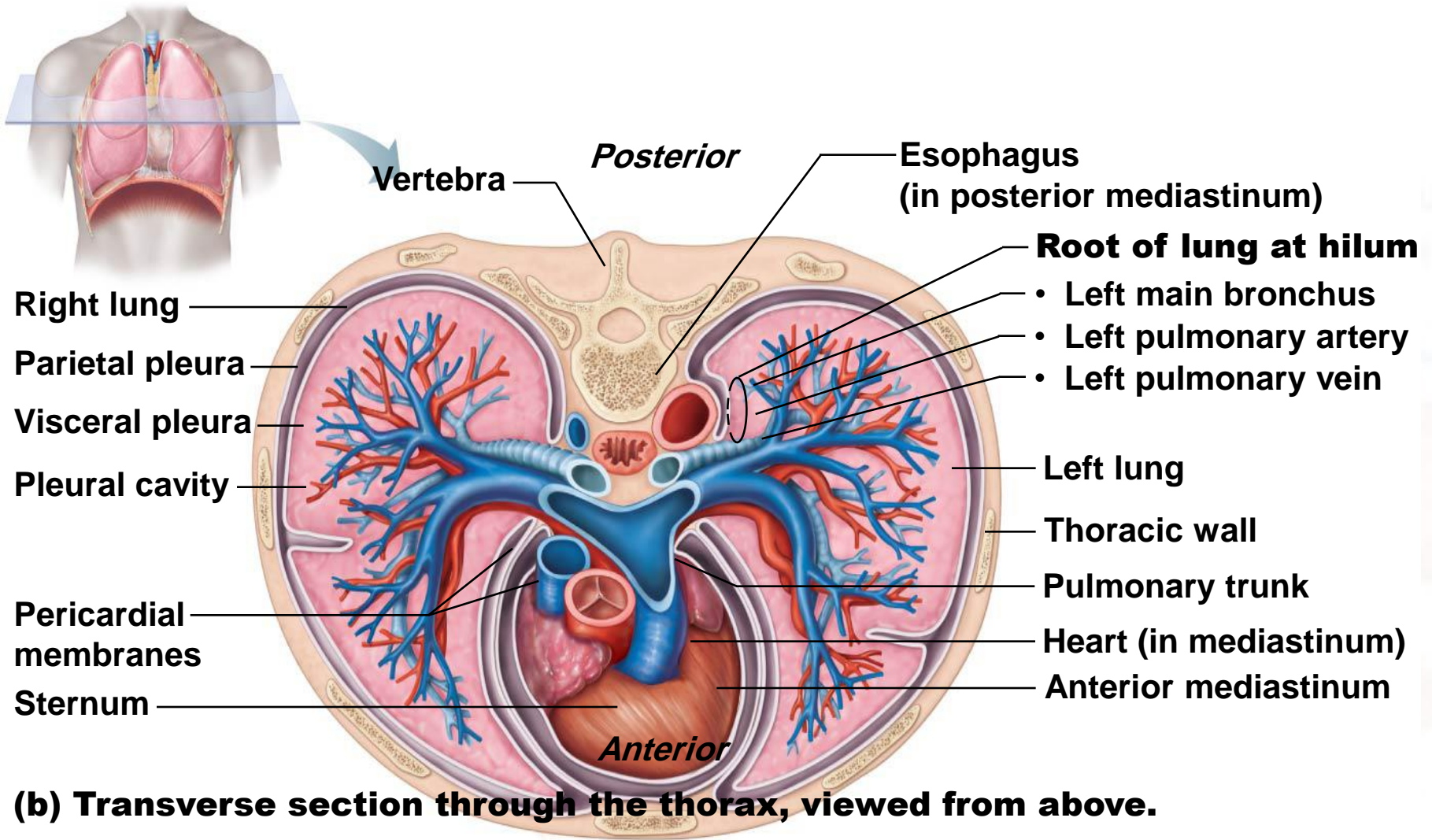
- Serosa covers the outer surface of the lungs
 - Pulmonary (visceral) pleura covers the lung surface
 - Parietal pleura lines the walls of the thoracic cavity
- Pleural fluid fills the area between layers to allow gliding and decrease friction during breathing
- Pleural space (between the layers) is more of a potential space

Human Respiratory System



(a) Anterior view. The lungs flank mediastinal structures laterally.

Human Respiratory System

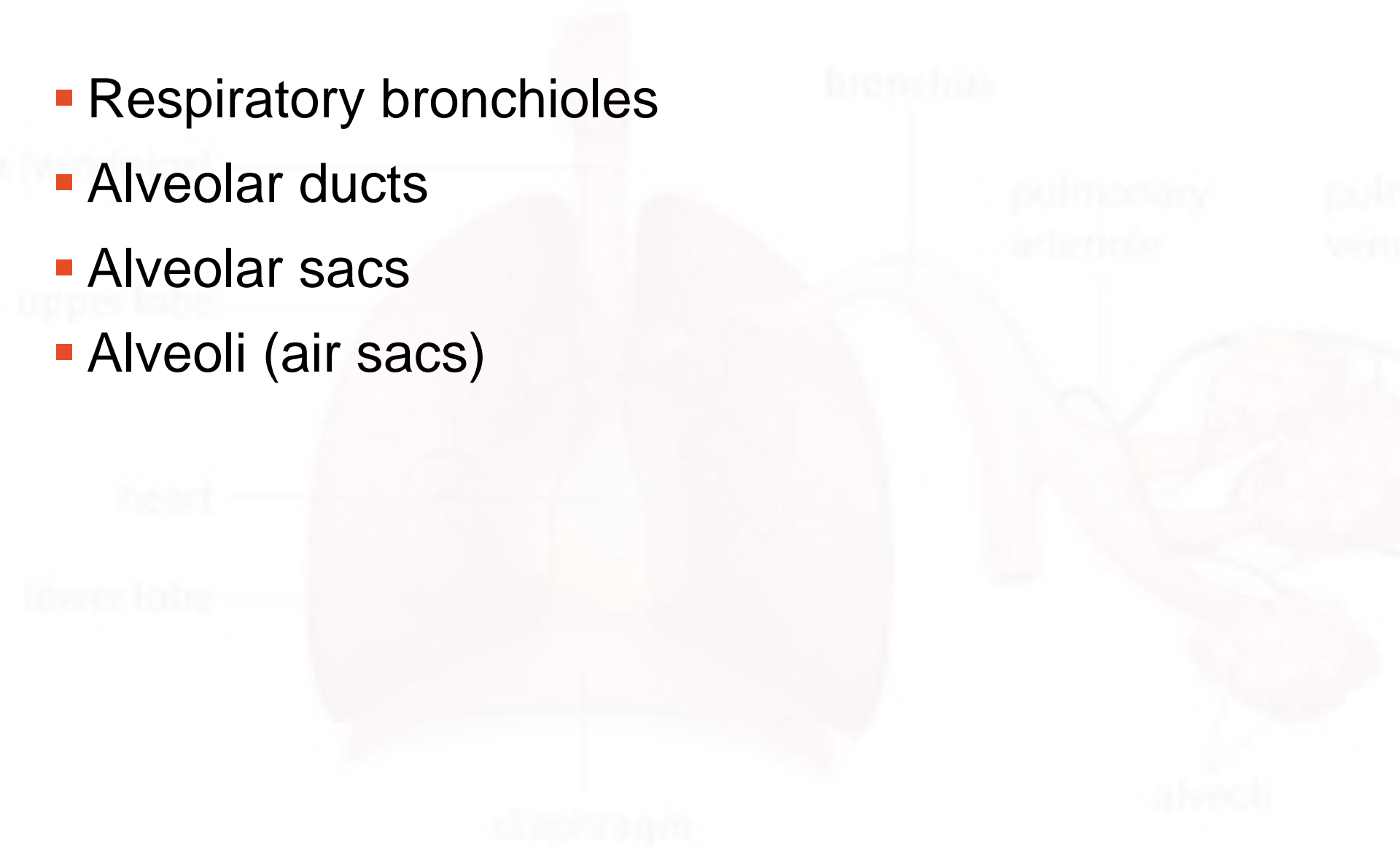


Bronchial (Respiratory) Tree Divisions

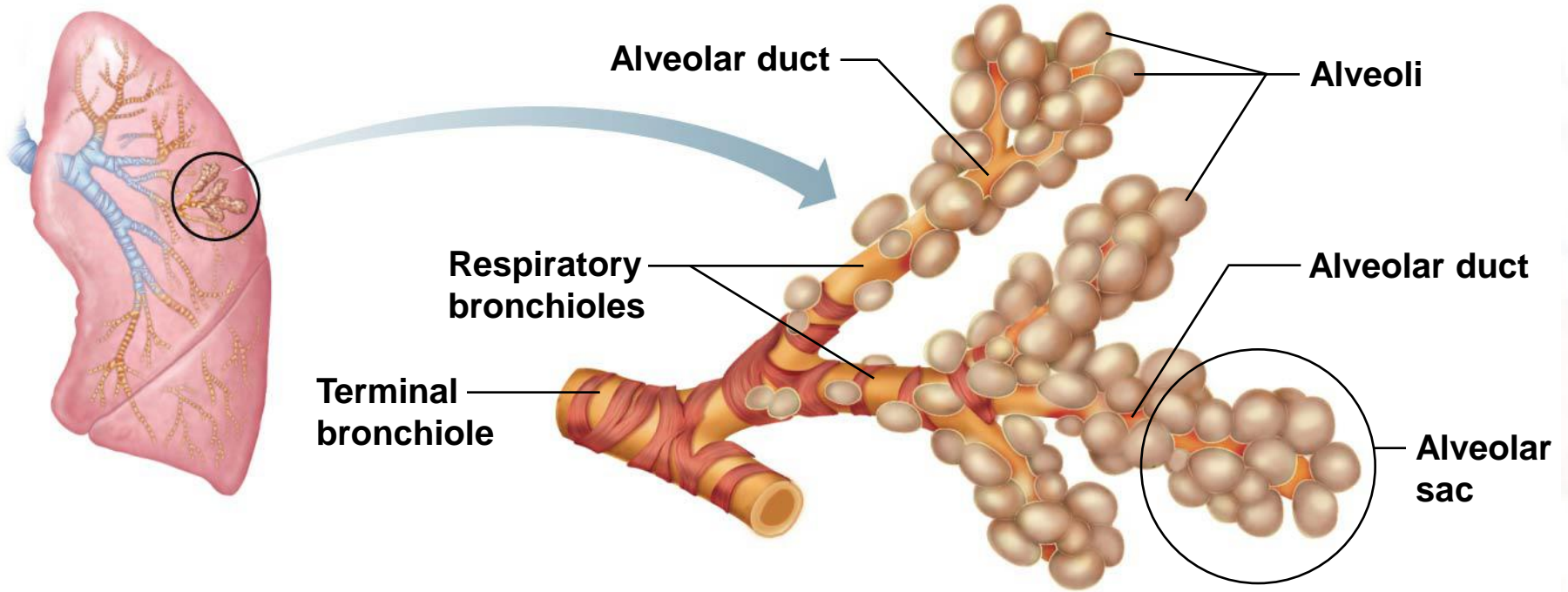
- All but the smallest of these passageways have reinforcing cartilage in their walls
- Conduits to and from the respiratory zone
 - Primary bronchi
 - Secondary bronchi
 - Tertiary bronchi
 - Bronchioles
 - Terminal bronchioles

Respiratory Zone Structures

- Respiratory bronchioles
- Alveolar ducts
- Alveolar sacs
- Alveoli (air sacs)

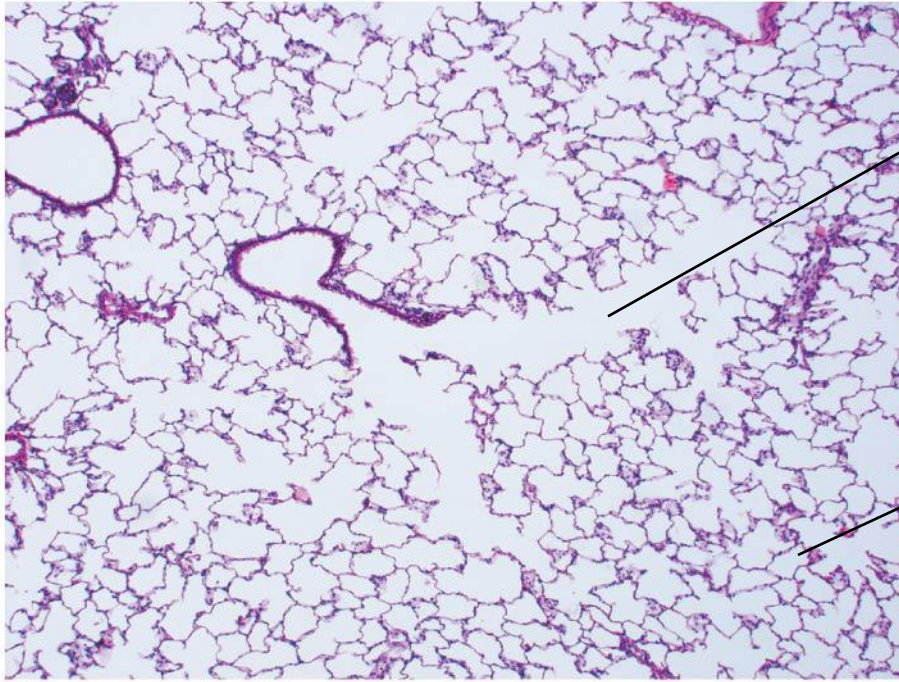


Human Respiratory System



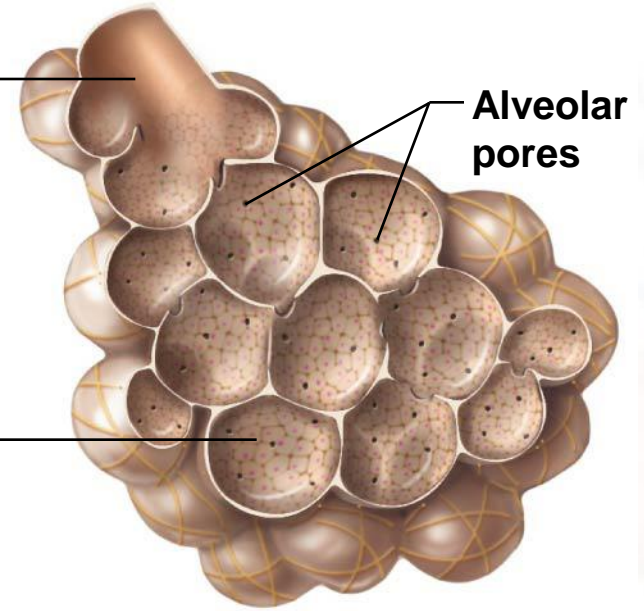
(a) Diagrammatic view of respiratory bronchioles, alveolar ducts, and alveoli

Human Respiratory System



Alveolar duct

Alveolus



Alveolar pores

(b) Light micrograph of human lung tissue, showing the final divisions of the respiratory tree (120 ×)

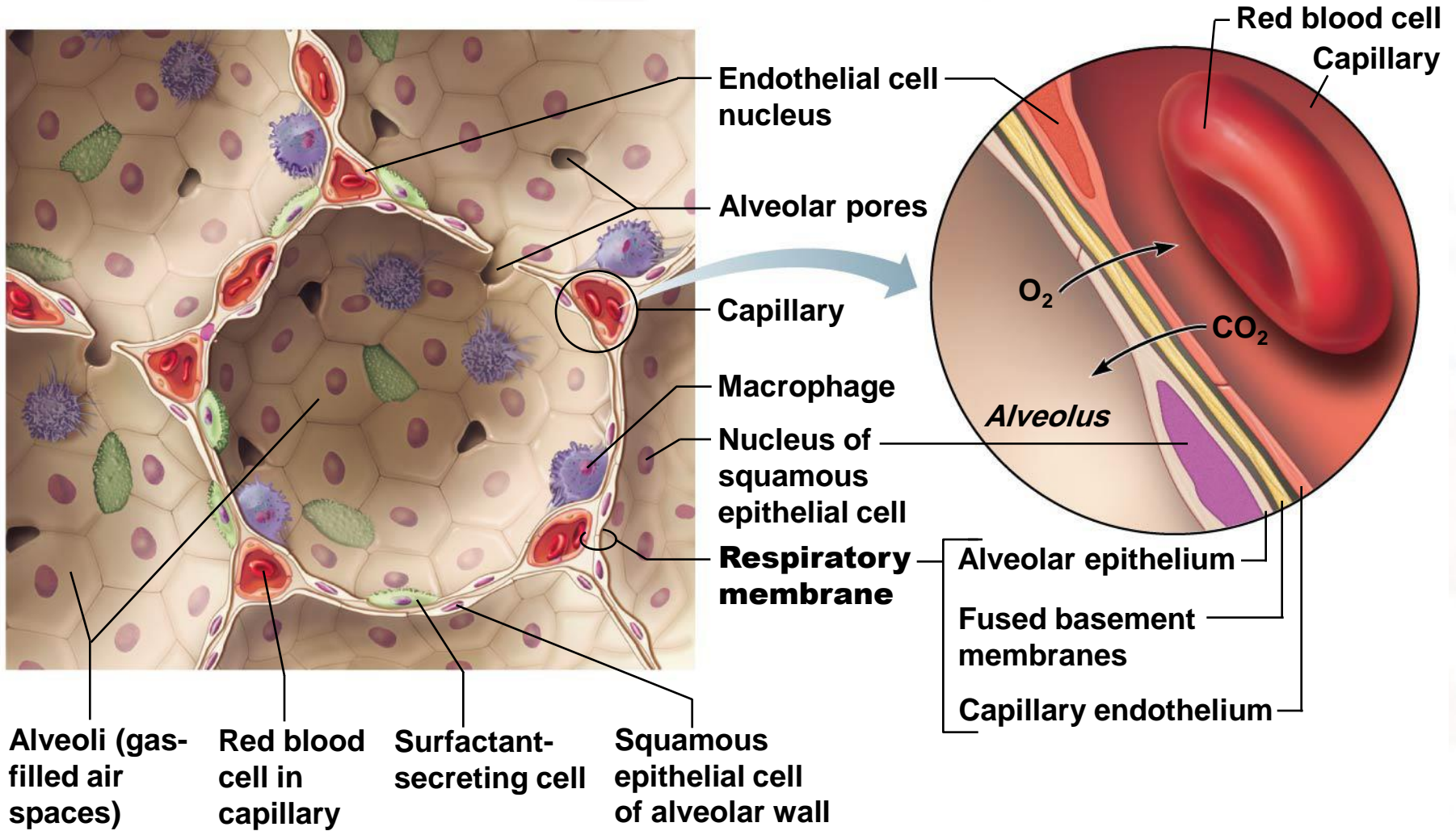
The Respiratory Membrane

- Thin squamous epithelial layer lines alveolar walls
- Alveolar pores connect neighboring air sacs
- Pulmonary capillaries cover external surfaces of alveoli
- Respiratory membrane (air-blood barrier)
 - On one side of the membrane is air, and on the other side is blood flowing past
 - Formed by alveolar and capillary walls

The Respiratory Membrane

- Gas crosses the respiratory membrane by diffusion
 - Oxygen enters the blood
 - Carbon dioxide enters the alveoli
- Alveolar macrophages (“dust cells”) add protection by picking up bacteria, carbon particles, and other debris
- Surfactant (a lipid molecule) coats gas-exposed alveolar surfaces

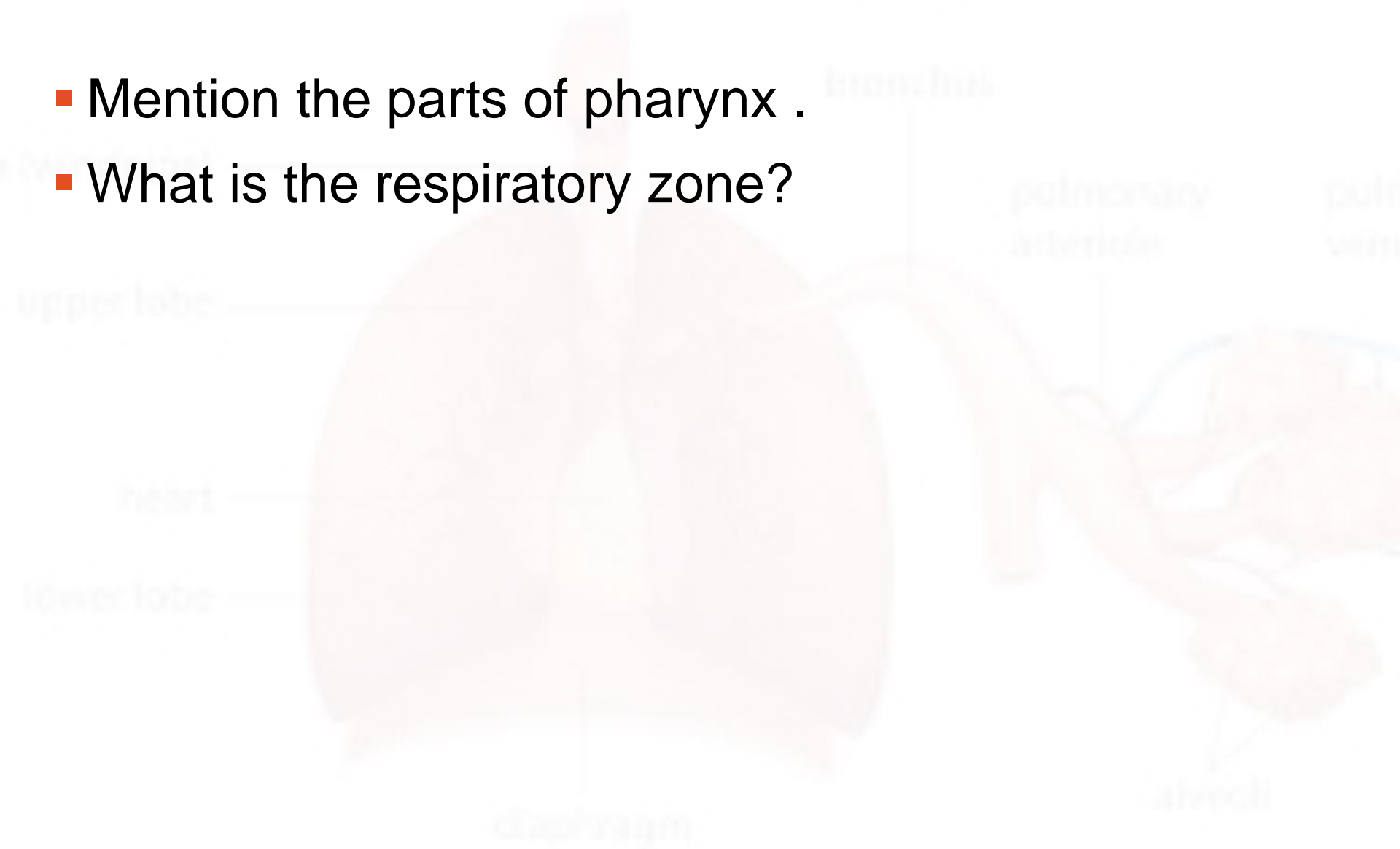
Human Respiratory System



Review

Human Respiratory System

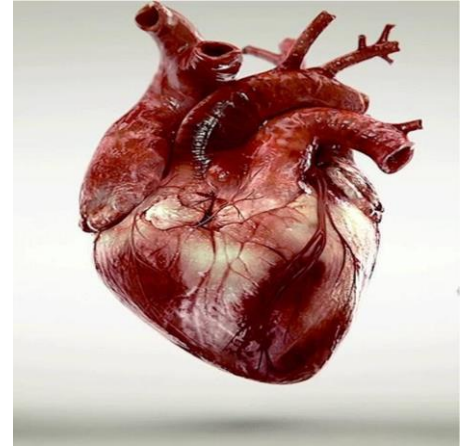
- Mention the parts of pharynx .
- What is the respiratory zone?



The Heart

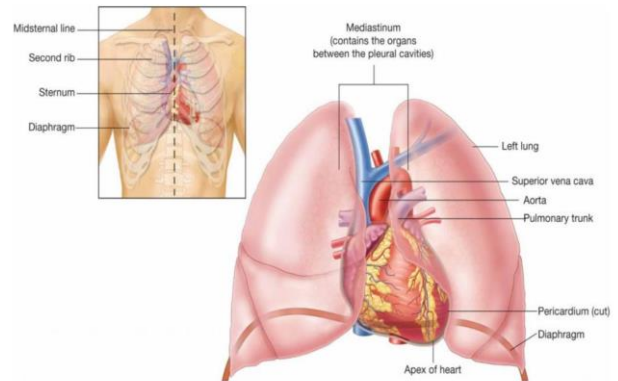
1. Definition

The heart is a muscular organ in the circulatory system responsible for pumping blood through blood vessels to the entire body.



2. Size and Location

- Size: Approximately the size of a person's fist.
- Location:
 - In the thorax, between the lungs.
 - Superior surface of the diaphragm.
 - Left of the midline.
 - Anterior to the vertebral column, posterior to the sternum.



3. Coverings of the Heart

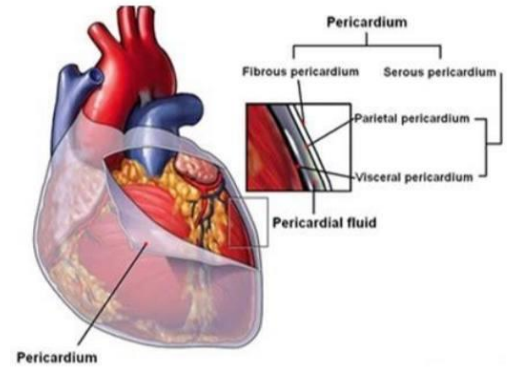
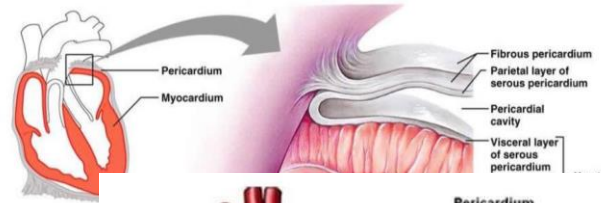
The heart is enclosed in a double-walled sac called the pericardium, which consists of:

1. Superficial fibrous pericardium
2. Deep two-layer serous pericardium:
 - a. Parietal layer
 - b. Visceral layer (also known as the epicardium)

❖ These layers are separated by a fluid-filled pericardial cavity.

• **Functions of the pericardium:**

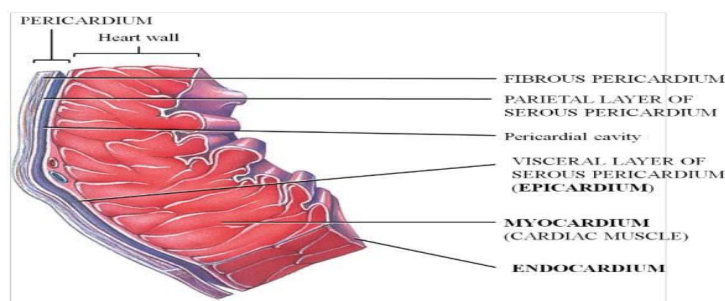
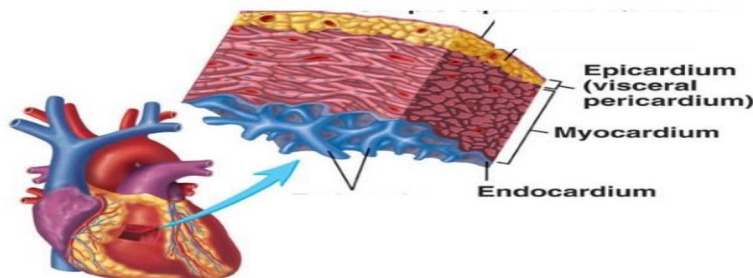
- Protects the heart.
- Prevents overfilling with blood.
- Reduces friction while the heart beats.



4. Wall of the Heart

The heart wall is composed of three layers:

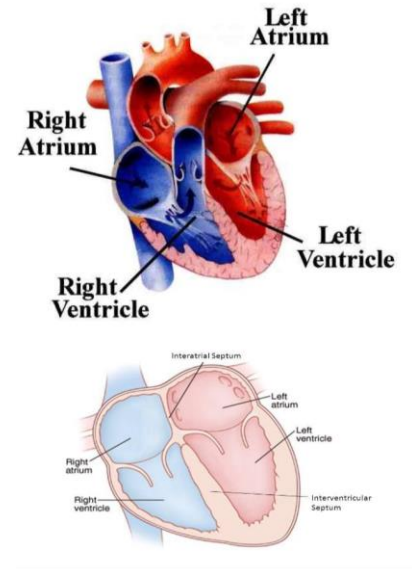
- Epicardium: The outer layer (visceral pericardium).
- Myocardium: The middle layer made of cardiac muscle; responsible for contraction.
- Endocardium: The smooth inner lining of the heart chambers.



5. Chambers of the Heart

The heart has four chambers:

- Two atria (right and left): Receiving chambers.
- Two ventricles (right and left): Discharging chambers.
- Right and left atria are separated by the interatrial septum.
- Right and left ventricles are separated by the interventricular septum.



6. Heart Valves

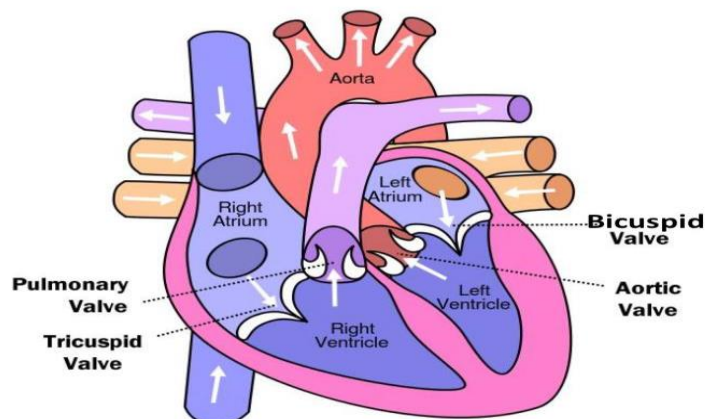
The heart contains four valves that ensure unidirectional blood flow:

A. Atrioventricular (AV) valves:

- Tricuspid valve: Between right atrium and right ventricle.
- Bicuspid (mitral) valve: Between left atrium and left ventricle.

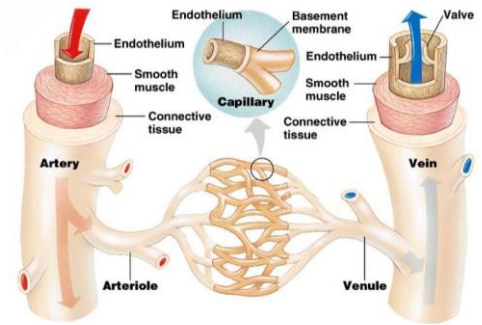
B. Semilunar valves:

- Pulmonary valve: Between right ventricle and pulmonary artery.
- Aortic valve: Between left ventricle and aorta.



7. Blood Vessels

- Arteries → Arterioles: Carry oxygen-rich blood from the heart to the body.
- Veins → Venules: Carry oxygen-poor blood from the body to the heart.
- Capillaries: The smallest vessels where gas exchange occurs.



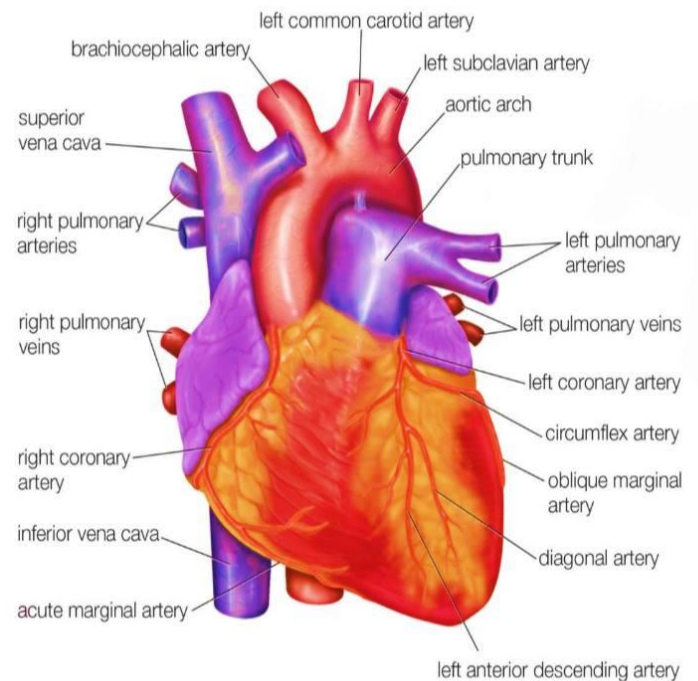
8. Major Vessels of the Heart

Vessels returning blood to the heart:

1. Superior vena cava
2. Inferior vena cava
3. Right pulmonary veins
4. Left pulmonary veins

Vessels carrying blood away from the heart:

1. Pulmonary trunk (splits into right and left pulmonary arteries)
2. Aorta and its branches:
 - a. Brachiocephalic artery
 - b. Left common carotid artery

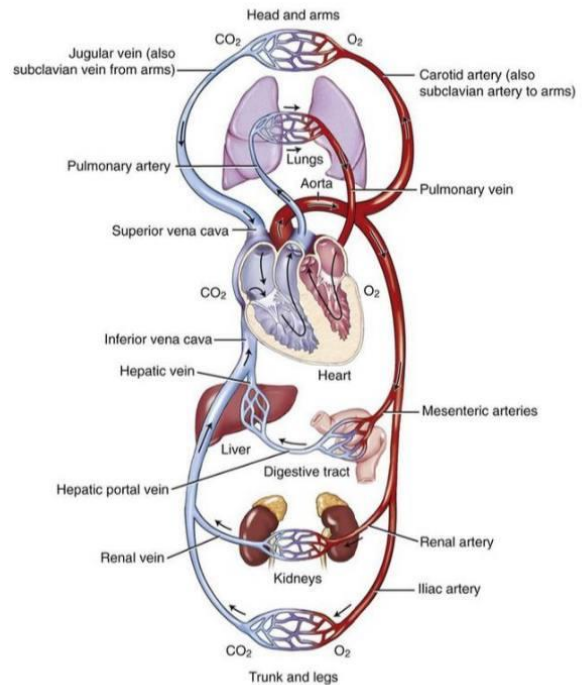


c. Left subclavian artery

9. Systemic Circulation

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

Path: Left ventricle → Aorta → Systemic arteries → Systemic capillaries → Systemic veins → Superior and inferior vena cava → Right atrium.



10. Pulmonary Circulation

Pulmonary circulation carries deoxygenated blood from the heart to the lungs and returns oxygenated blood back to the heart.

Path: Right ventricle → Pulmonary trunk → Pulmonary arteries → Pulmonary capillaries → Pulmonary veins → Left atrium.

11. Path of Blood Through the Heart

1. Vena cava (Deoxygenated blood)
2. Right atrium
3. Right ventricle
4. Pulmonary artery
5. Lungs (Gas exchange)
6. Pulmonary veins (Oxygenated blood)
7. Left atrium
8. Left ventricle

9. Aorta

10. Body capillaries