

# Respiratory system

## Divisions of the Respiratory System

### Structurally

According to embryological origin

- Upper respiratory system  
Nose, pharynx and associated structures
- Lower respiratory system  
Larynx, trachea, bronchi and lungs

### Functionally

- Conducting zone - conducts air  
Nose, pharynx, larynx, trachea, bronchi, bronchioles and terminal bronchioles
- Respiratory zone - site of gas exchange  
Respiratory bronchioles, alveolar ducts, alveolar sacs, alveoli

## Functions:

- Provides for gas exchange (intake of O<sub>2</sub> for delivery to body cells and removal of CO<sub>2</sub> produced by body cells)
- Helps regulate blood pH
- Contains receptors for the sense of smell, filters inspired air, produces sounds (phonation), excretes small amounts of water and heat

## The Nose

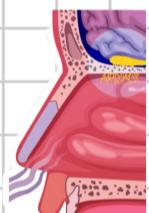
External nose - portion visible on face

- Formed of a small bony part - the nasal bones (bridge of the nose) and a larger cartilaginous part.
- All covered by muscles and skin.
- Its openings are called the external nares or nostrils.
- The area just inside the nostrils is called the vestibule. Its lower half is lined by skin.



Internal nose - large cavity beyond the vestibule mostly lined by respiratory epithelium.

- Extends from vestibule to the internal nares.
- Nasal cavity divided by nasal septum.
- The lateral wall has projections that increase the surface area called conchae. Between these conchae and the lateral wall are small passages called meatuses.
- Ducts from paranasal sinuses and nasolacrimal ducts open into the meatuses of the internal nose.
- Olfactory epithelium responsible for the sense of smell lines the roof of the nasal cavity.

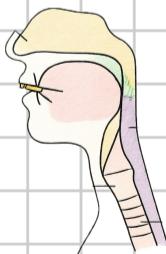


## The Pharynx

- Funnel shaped tube that starts at internal nares and extends to the level of the cricoid cartilage of larynx (C6 vertebra).
- Contraction of skeletal muscles assists in swallowing.

### Functions

- Passageway for air and food
- Resonating chamber
- Houses tonsils



## The Nasopharynx R.S

- Located posterior to the nasal cavities and above the soft palate and inferiorly opens into the oropharynx. It's a passageway for air.
- Its lateral walls exhibit the opening of the auditory (Eustachian) tubes.
- The posterior wall of the nasopharynx has a collection of lymphoid tissue called the pharyngeal Tonsil (adenoid)

## The Oropharynx R.S and GI

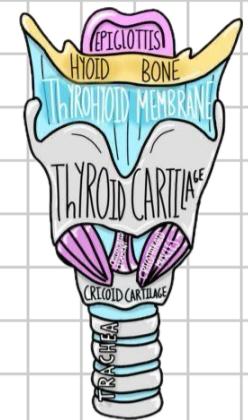
- Located posterior to the oral cavity with which it communicates. It allows passage of both air and food. Inferiorly, it extends to the level of the hyoid bone.
- Anteriorly, in the posterior aspect of the tongue, there's the lingual tonsil. Anterolaterally, we have the two palatine tonsils.

## The Laryngopharynx GI

- Located posterior to the larynx with which it communicates. It begins at the level of the hyoid bone and ends at the level of the cricoid cartilage (C6) where it becomes continuous with esophagus

# The Larynx

- Short passageway connecting laryngopharynx with trachea that's responsible for the production of sound. Its inlet also provides a protective cover for the airway passages.
- It lies in the midline of the neck opposite C4-C6 vertebrae.
- At the level of C6, it becomes continuous with the trachea.
- The larynx is formed of cartilages held together by ligaments and membranes and moved by muscles



## Cartilages of the Larynx

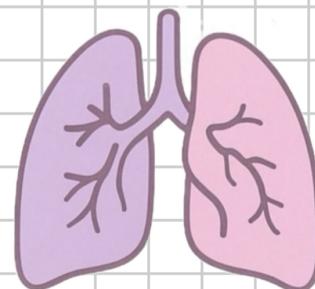
1. Thyroid: **Single**  
single V-shaped cartilage.   
The largest and forms prominence of the neck called Adam's Apple.
2. Cricoid: **Single**   
a single ring shaped cartilage.  
The lower boundary of the larynx
3. Epiglottis: **Single**   
a leaf-shaped single cartilage that's present at the inlet of the larynx. Closes the larynx when the person swallows
4. Arytenoid: **Pair**  
a pair of pyramidal cartilages to which the vocal cords are attached. Movement of these cartilages leads to movement of the cords.
5. Corniculate cartilages (pair).
6. Cuneiform cartilages (pair).

# The Trachea

- A Tubular passage of air that extends from the larynx to superior border of T5 where it divides into right and left primary bronchi. Between the two primary bronchi there's an angle called carina.
- 16-20 C-shaped hyaline cartilages are found in the wall to keep the trachea patent.
- The open part of the C faces posteriorly towards the esophagus.

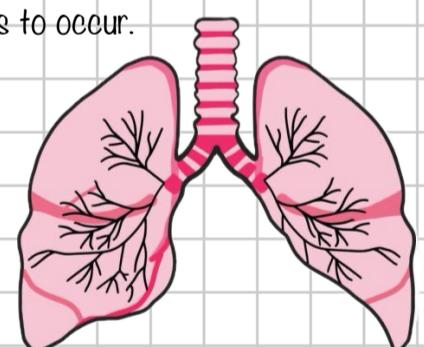
# The Lungs

- Two cone shaped organs separated from each other by the heart and other structures in the mediastinum.
- Each lung is enclosed by the double-layered pleura (serous membrane): Parietal pleura (lines wall of thoracic cavity) and visceral pleura (covers the lungs). A space between them called the pleural cavity contains pleural fluid to reduces friction.
- Lungs receive (1) deoxygenated blood from the pulmonary artery and (2) oxygenated blood from bronchial branches of the aorta.



## The Bronchial Tree

- Right and left primary bronchi pass to the corresponding lung.
- Divide to form bronchial tree:
  - Secondary lobar bronchi (one for each lobe), tertiary (segmental) bronchi, bronchioles, terminal bronchioles
- Structural changes with branching:
  - Changes in the epithelium.
  - Cartilage decreases. As it decreases, smooth muscle increases.
- Terminal bronchioles will form Respiratory bronchioles  
At this point gas exchange begins to occur.

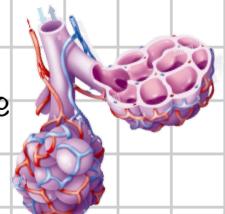


## Alveoli

- Cup-shaped outpouching

- Alveolar cells:

- Type I alveolar cells (simple squamous) – main site of gas exchange.
- Type II alveolar cells – secrete surfactant factor which reduces
- Macrophages



- Respiratory membrane: a very thin cellular membrane separating air from blood and across which gas exchange occurs.