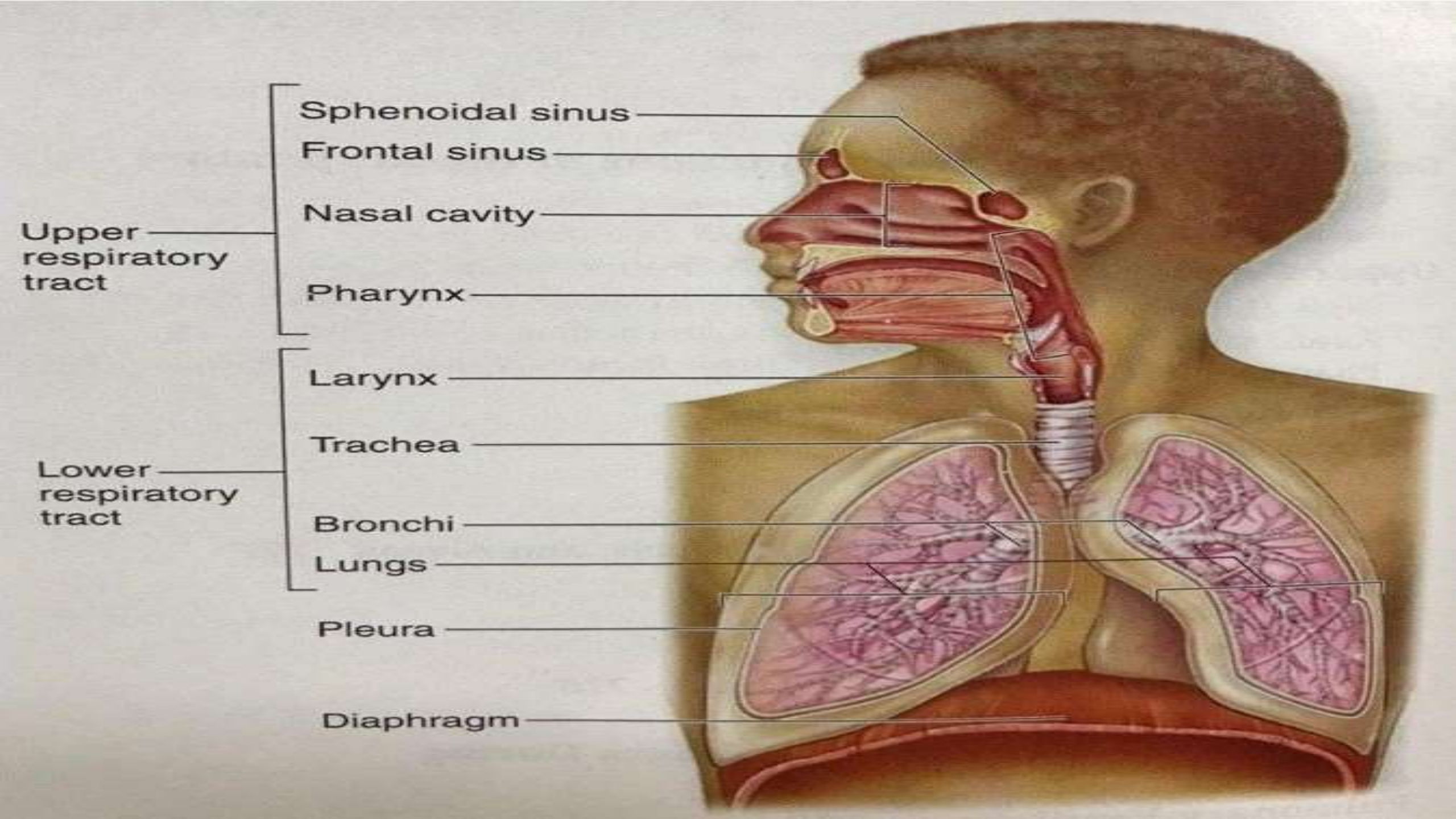
Anatomy

The Respiratory System

Respiratory system

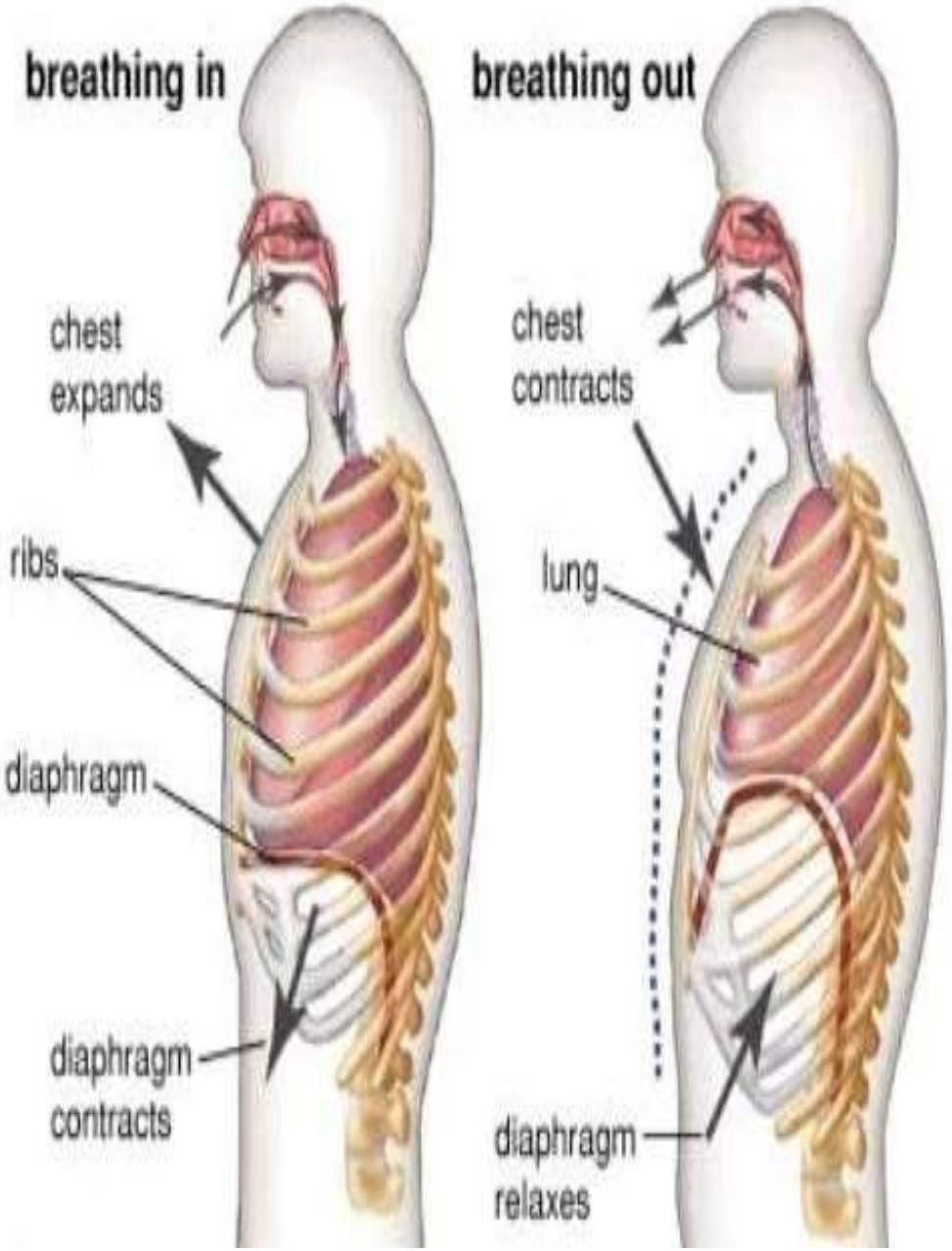
The respiratory and cardiovascular systems are inseparable partners. While the respiratory system exchanges gases between the atmosphere and the blood, the cardiovascular system transports those gases between the lungs and the body cells. **Anatomically**, the respiratory system consists of an upper respiratory tract and a lower respiratory tract. **Functionally**, it can be divided into a conducting portion, which transports air, and a respiratory portion, where gas exchange with blood occur.

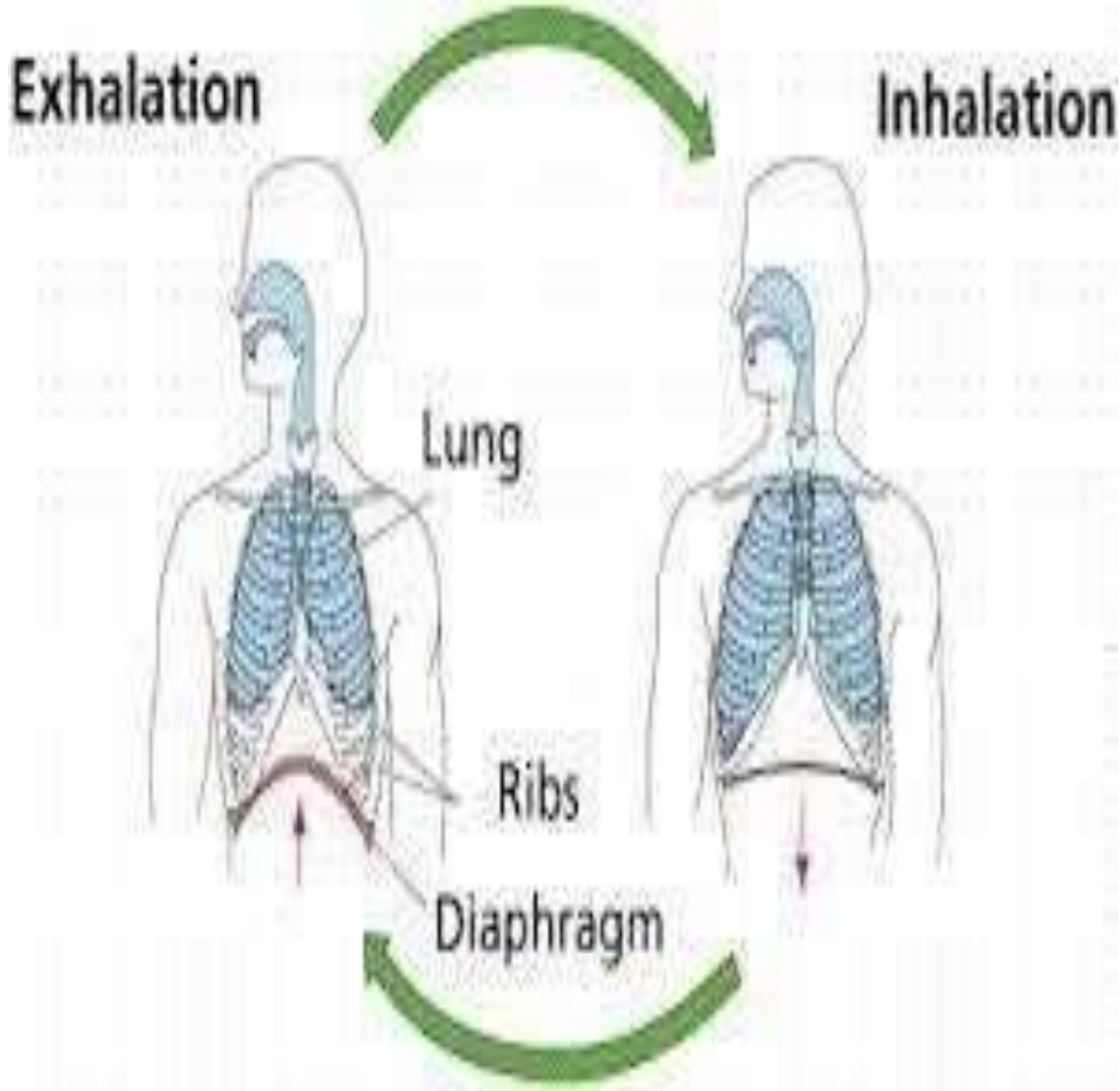

Upper respiratory tract
Sphenoidal sinus
Frontal sinus
Nasal cavity
Pharynx
Lower respiratory tract
Larynx
Trachea
Bronchi
Lungs
Pleura
Diaphragm

Respiratory system function :

The primary function most of us associated with respiratory system is breathing, also termed pulmonary ventilation. **Breathing** consists of two cyclic phases : inhalation ,also called inspiration , and exhalation and also called expiration .inhalation draws gases into the lung , and exhalation forces gas out of the lungs.

In addition to gas exchange, the respiratory system also function in gas conditioning, sound production and olfaction.


breathing in
chest expands
ribs
diaphragm
diaphragm contracts
breathing out
chest contracts
lung
diaphragm relaxes


Exhalation
Inhalation
Lung
Ribs
Diaphragm

Upper respiratory tract Is composed of :

- Nose
- Nasal cavity
- Paranasal sinuses
- Pharynx (throat)

These structures are all part of the conducting portion of the respiratory system.

The **nasal cavity** and **paranasal sinuses** are the primary structures that warm and humidify the air we inhale.

Nose

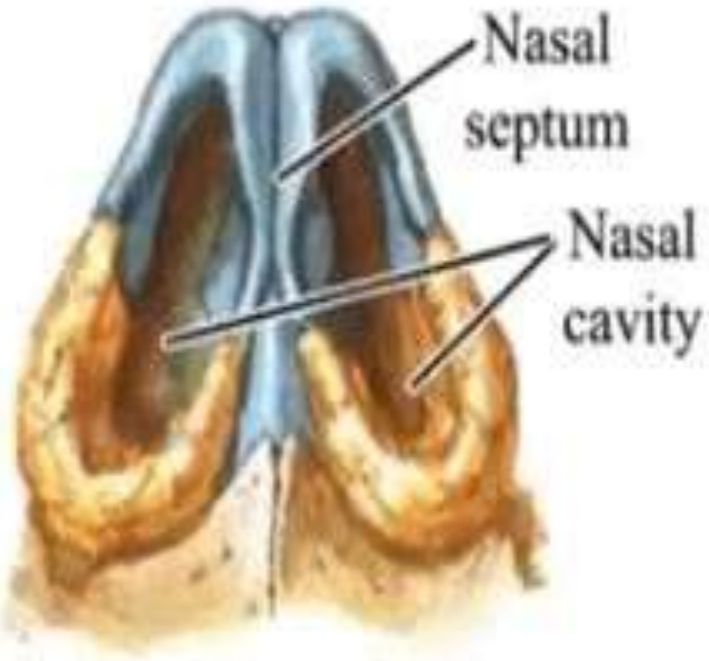
nose, the prominent structure between the eyes that serves as the entrance to the respiratory tract and contains the **olfactory organ**. It provides air for respiration, serves the sense of smell, conditions the air by filtering, warming, and moistening it, and cleans itself of foreign debris extracted from inhalations.

The nose has two cavities, separated from one another by a wall of cartilage called the **septum**.

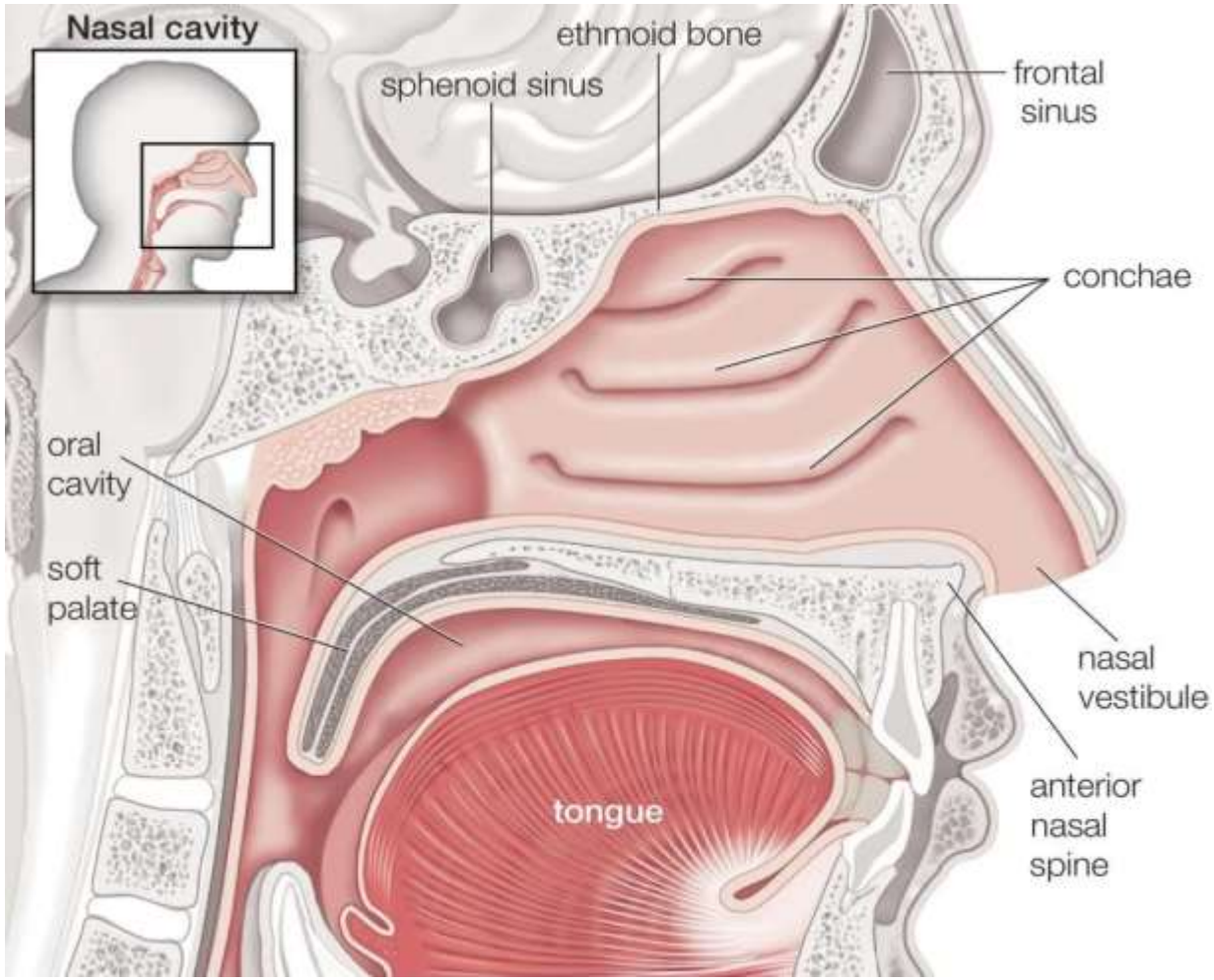
Nose

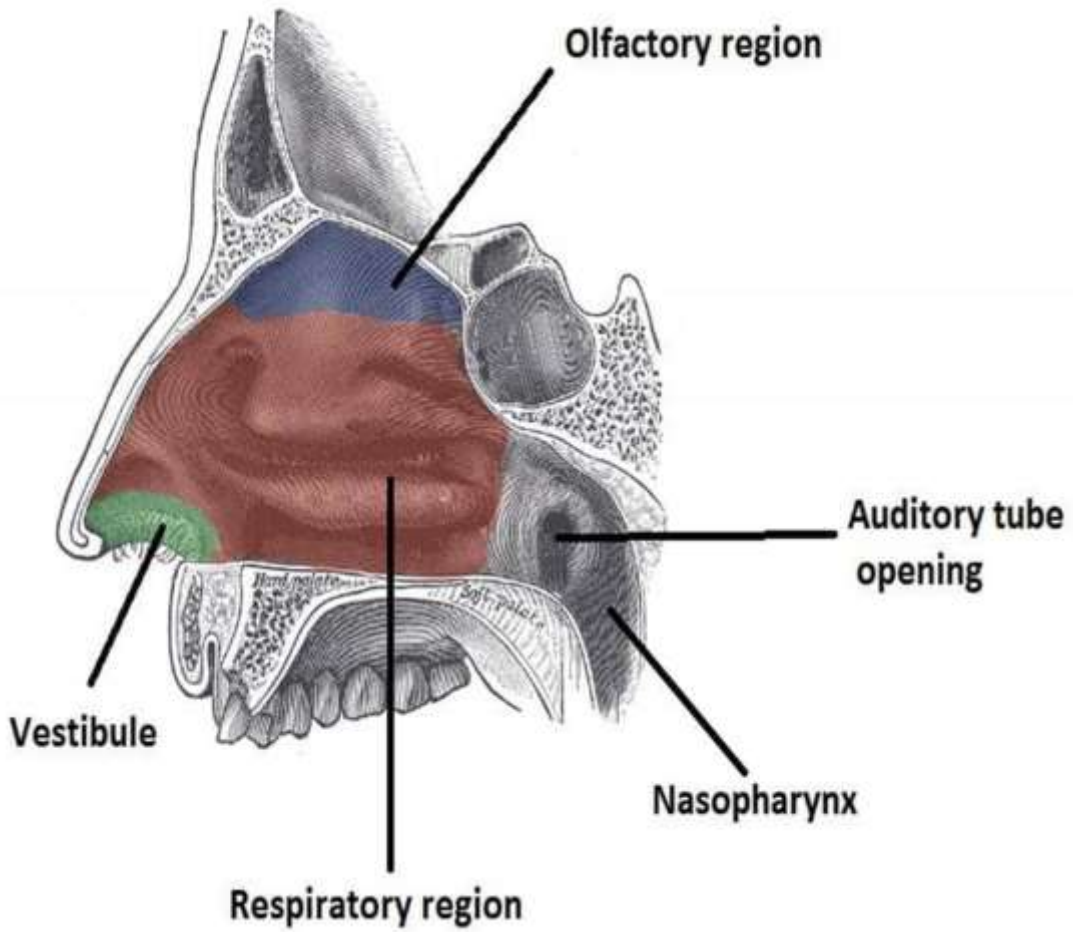

Nostrils


Frontal bone
Nasal bone
Nasal cartilage

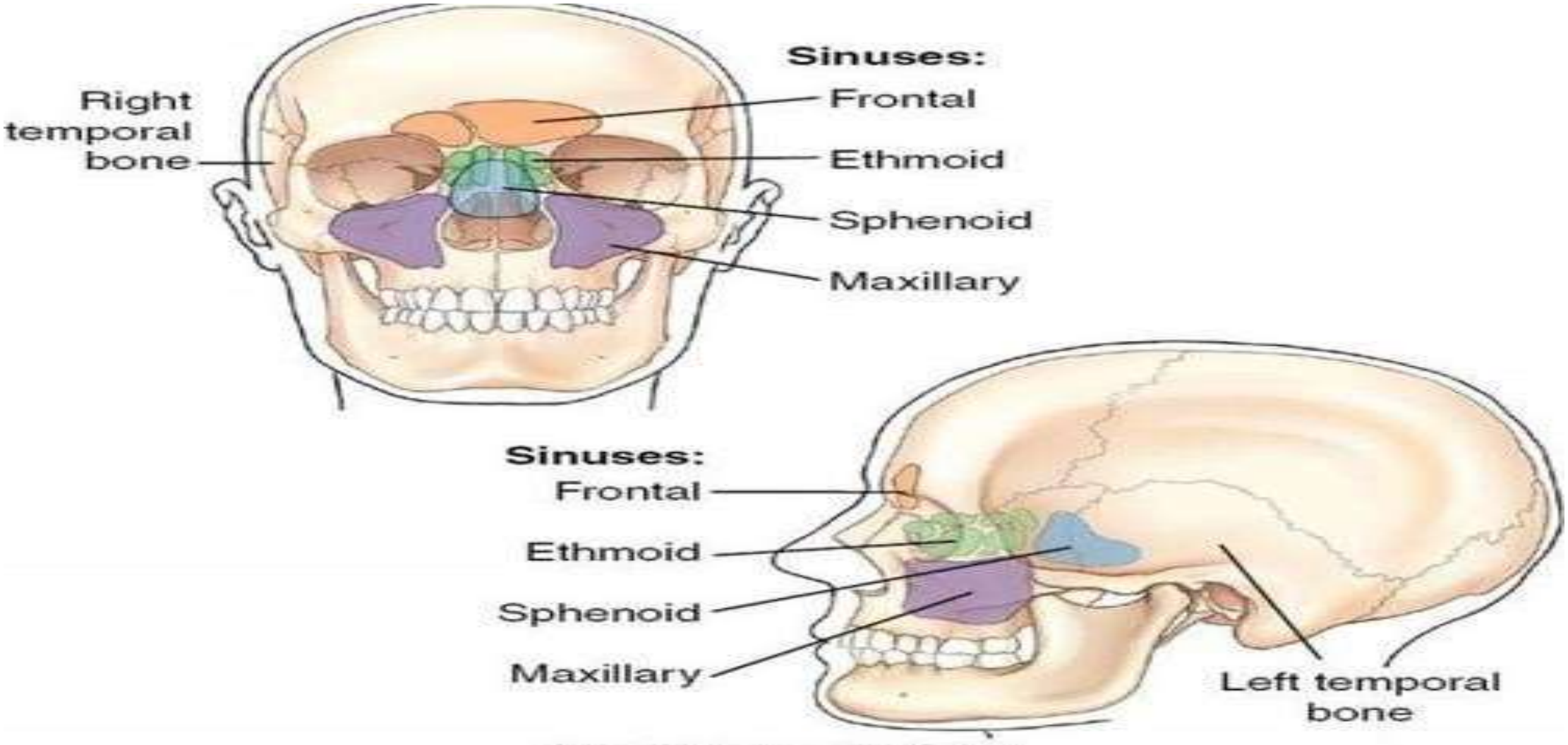

Nasal septum
Nasal cavity

Nasal cavity





Paranasal sinuses

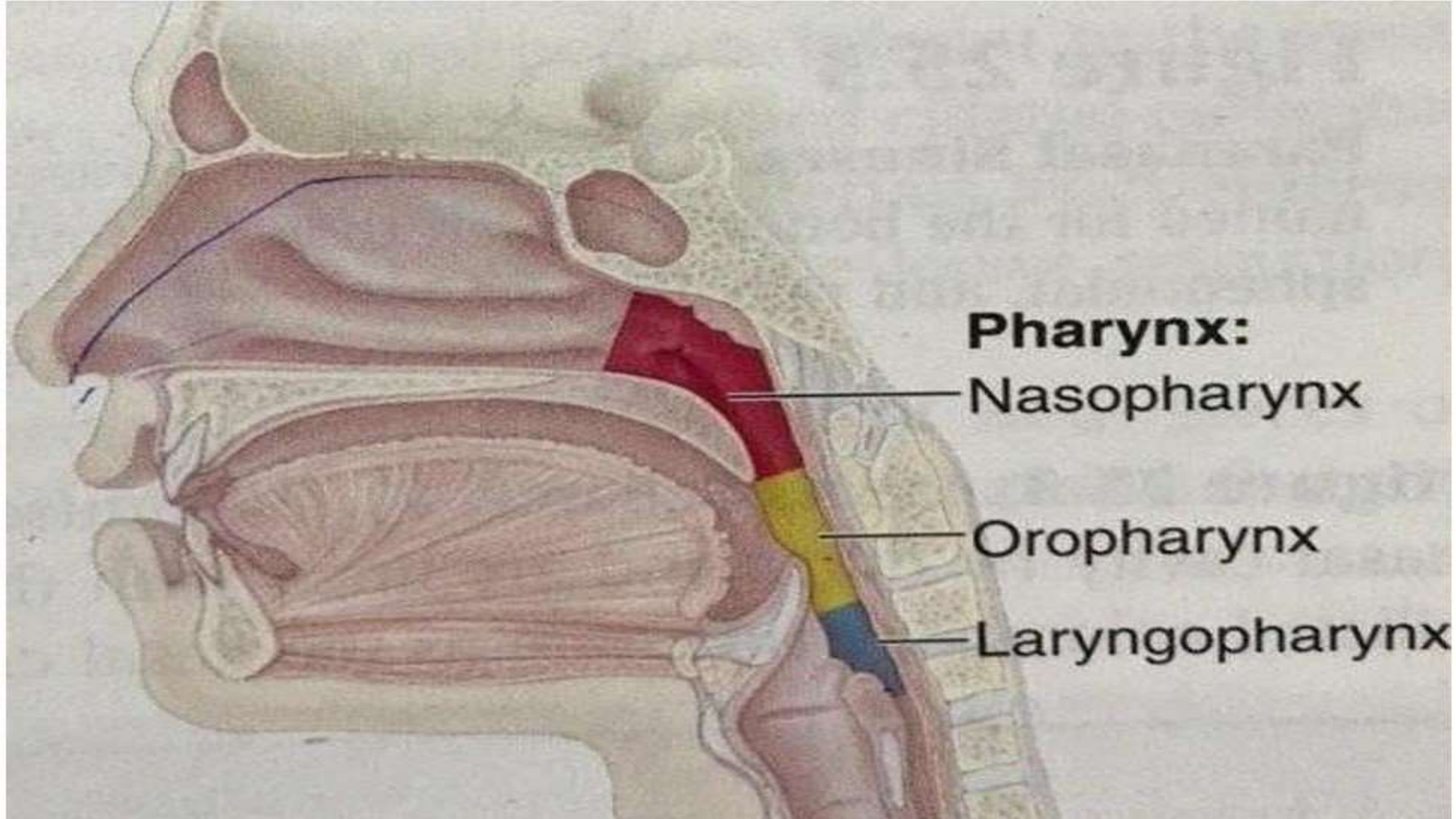


Pharynx :

It is the common space used by both respiratory and digestive system and commonly called the throat.

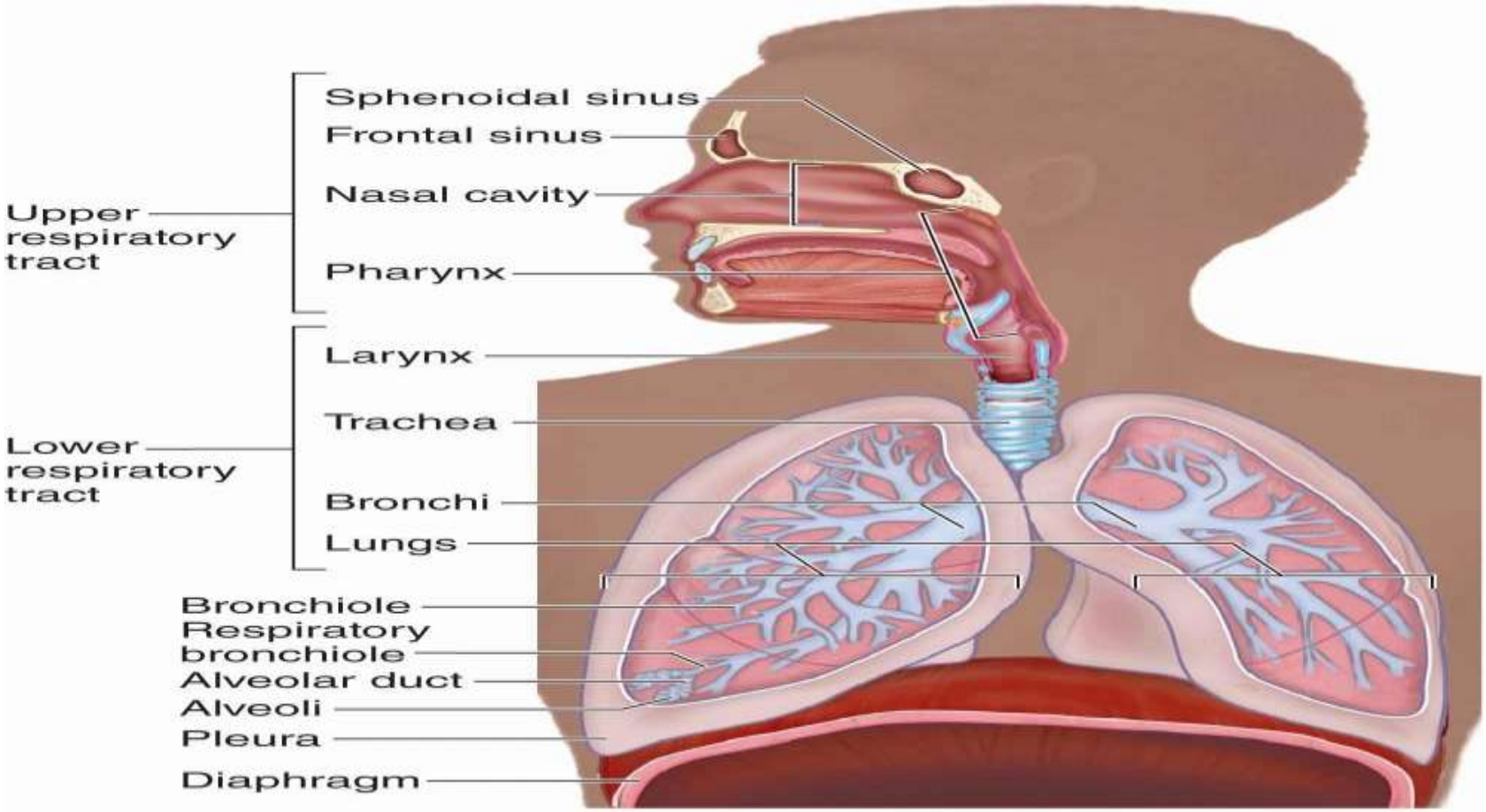
The pharynx is partitioned into three adjoining regions:

- **The nasopharynx :** superior most region of the pharynx
- **Oropharynx :** middle pharyngeal region
- **Laryngopharynx:** the inferior, narrowed region of the pharynx.


Pharynx:
Nasopharynx
Oropharynx
Laryngopharynx

Lower respiratory tract :

Is made up of conducting airways: larynx, trachea, bronchi, bronchioles, and their associated structures as well as alveoli.



Larynx

larynx is part of your respiratory system. It's a hollow tube that's about 4 to 5 centimeters (cm) in length and width. It lets air pass from your throat (pharynx) to your trachea on the way to your lungs. Your larynx is also the reason you're able to make sounds, so it's often called your voice box.

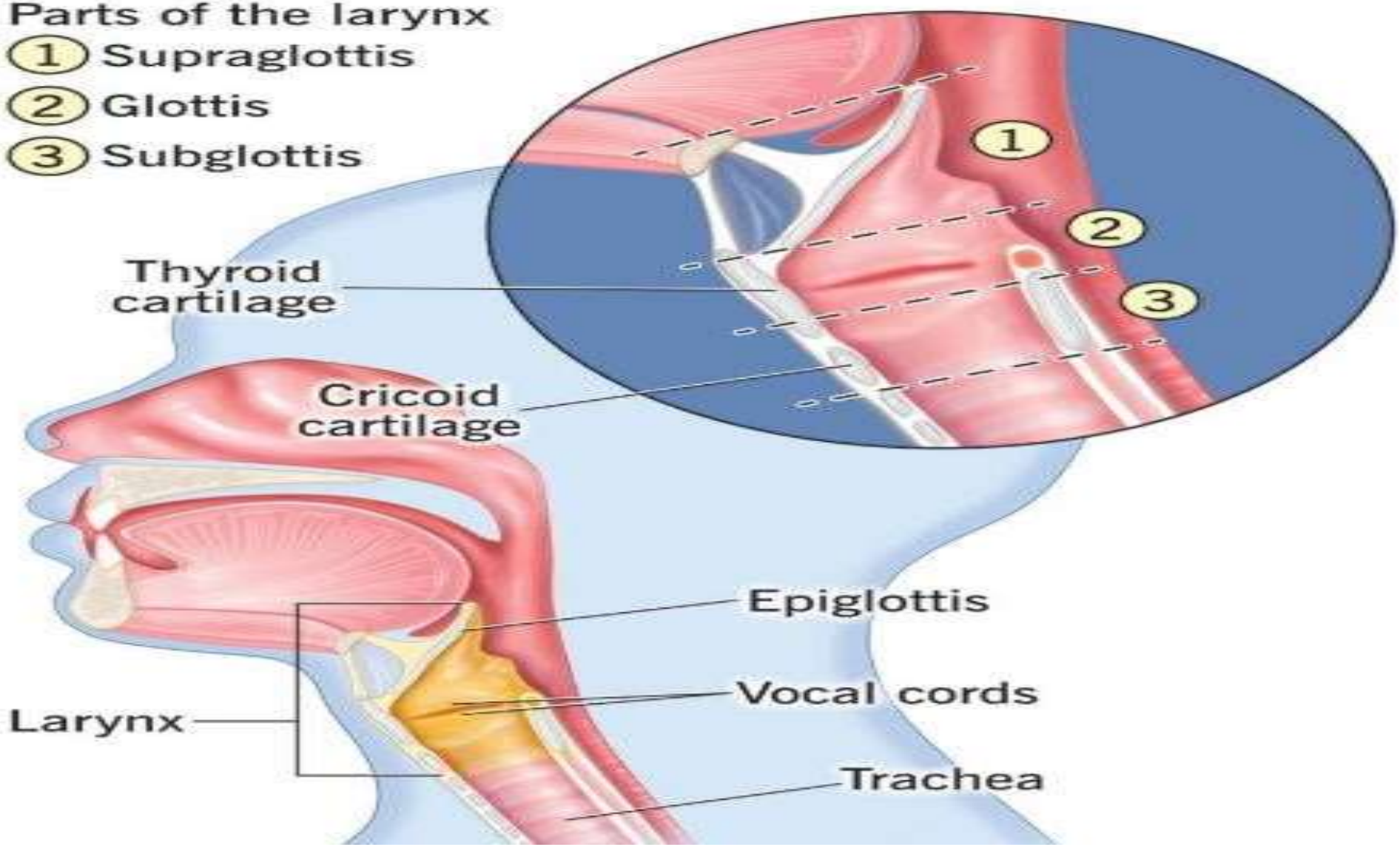
From **birth up until age 2**, your larynx was higher in your neck. **Over time**, your larynx moves down to the middle of your neck.

larynx is divided into three parts:

- The upper part (supraglottis).
- The middle part (glottis).
- The lower part (subglottis).

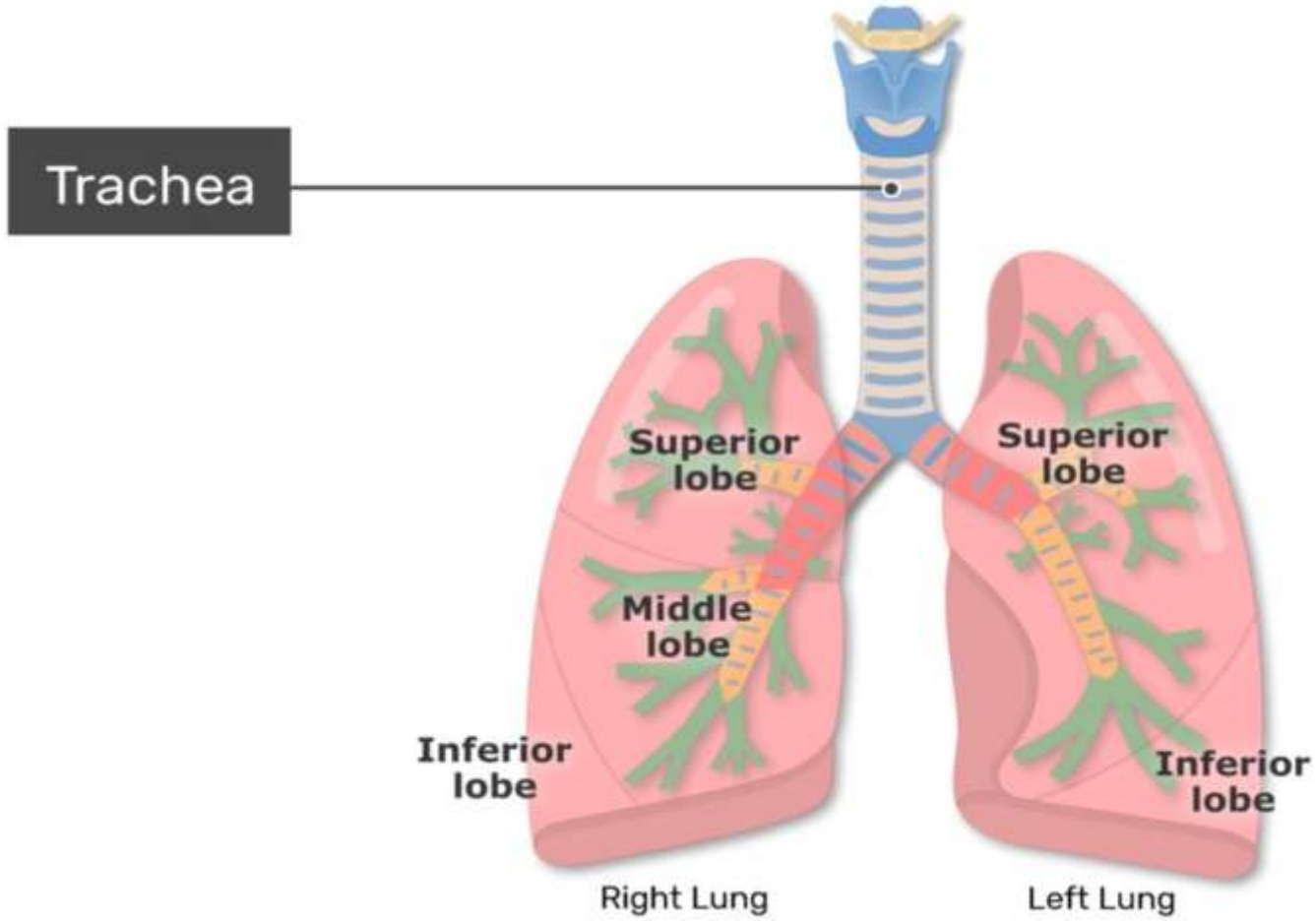
Larynx

"Voice box"



Trachea :

Is a flexible, slight rigid tubular organ (windpipe). Average 2.5 cm in diameter , 12-14 cm in length Has 15-20 c-shaped tracheal cartilages (rings).



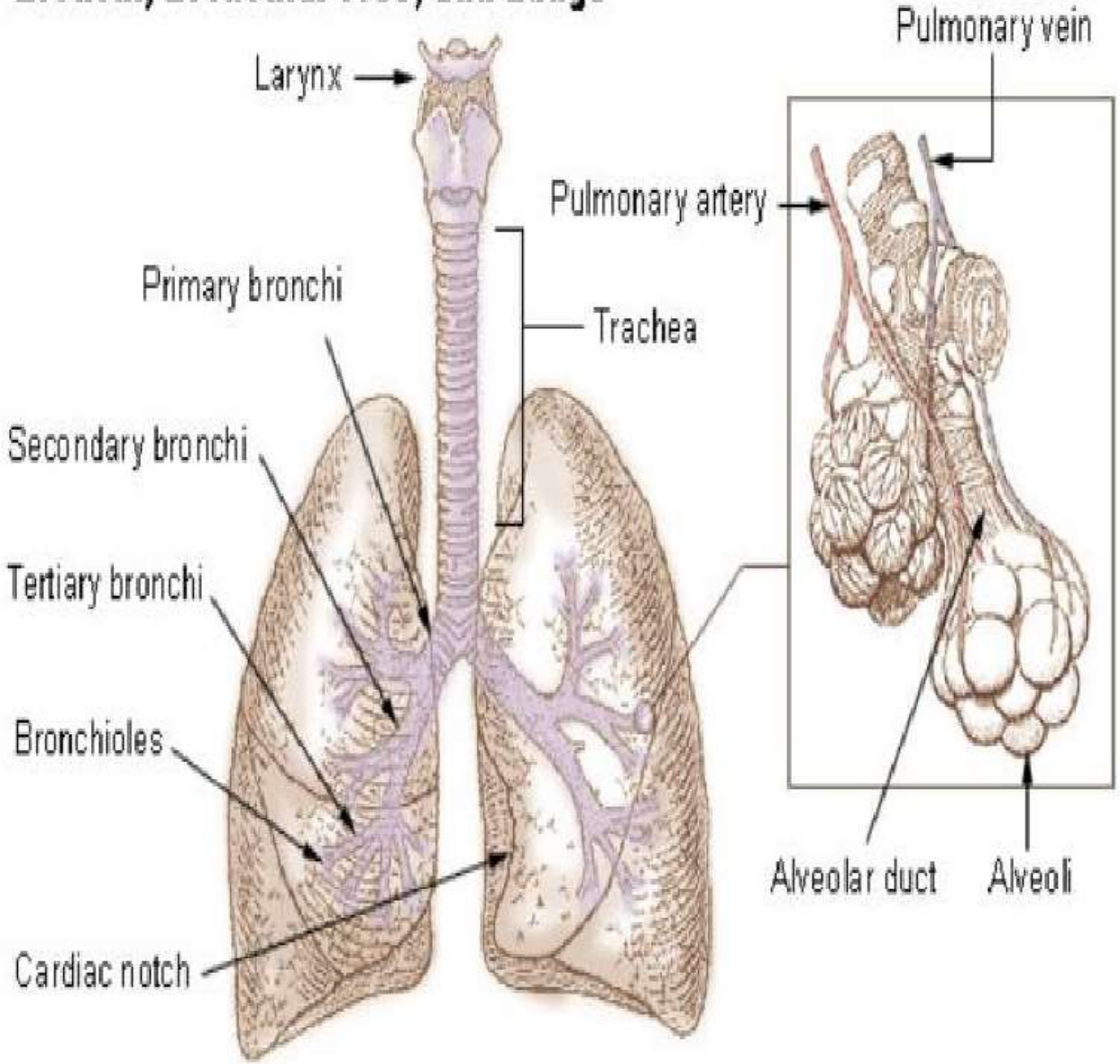
Bronchial tree:

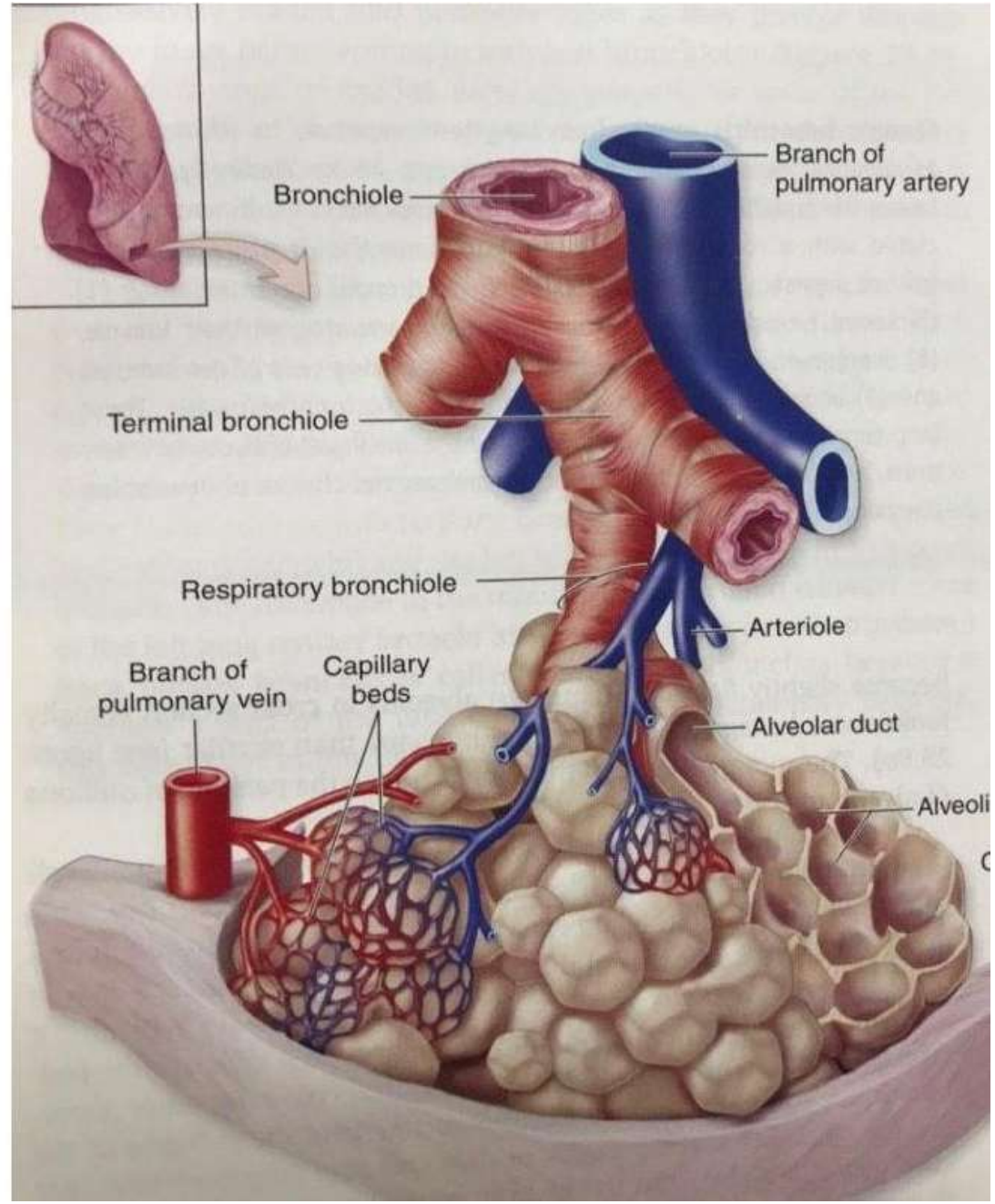
Is a highly branched system of air-conducting passages that originate from the left and right primary bronchi and progressively branch into narrower tubes as they diverge throughout the lungs before ending in terminal bronchioles.

Bronchioles and Alveoli:

Terminal bronchioles branch into respiratory bronchioles,which then branch into alveolar ducts and alveoli. The pulmonary capillaries wrap around the alveoli for gas exchange.

Bronchi, Bronchial Tree, and Lungs





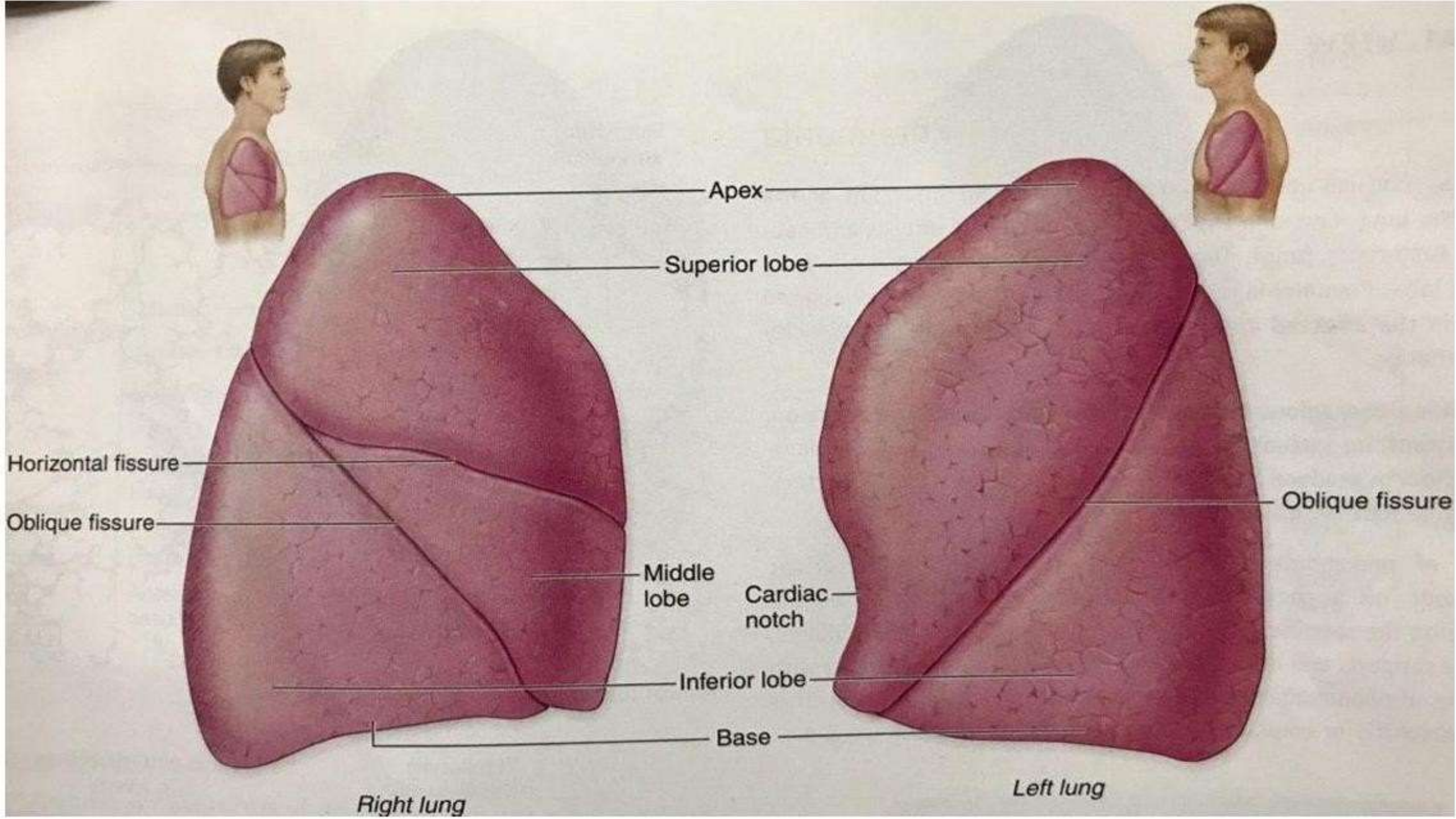
Lungs:

The paired, spongy lungs are the primary organs of respiration. Each lung has a conical shape. Its wide, concave base rests inferiorly upon the muscular diaphragm, and its relatively blunt superior region, called the apex, projects superiorly to a point that is slightly superior and posterior to clavicle.

The bronchi, pulmonary vessels, lymphatic vessels and nerves pass to the lungs through the hilum.

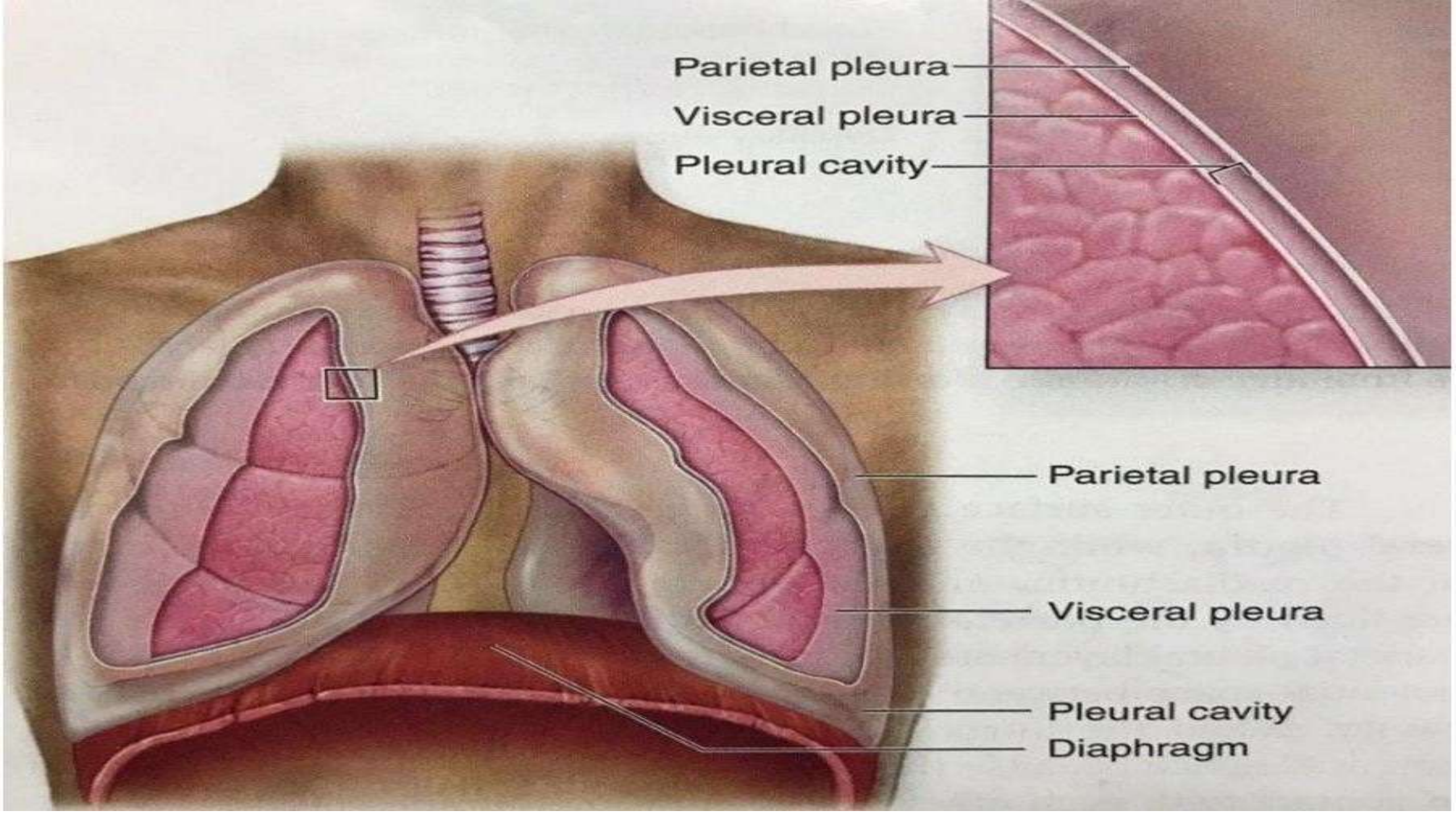
The right lung is subdivided into superior, middle and inferior lobes by two fissures (the horizontal and oblique fissures).

The left lung has only two lobes, superior and inferior, which are subdivided by an oblique fissure.

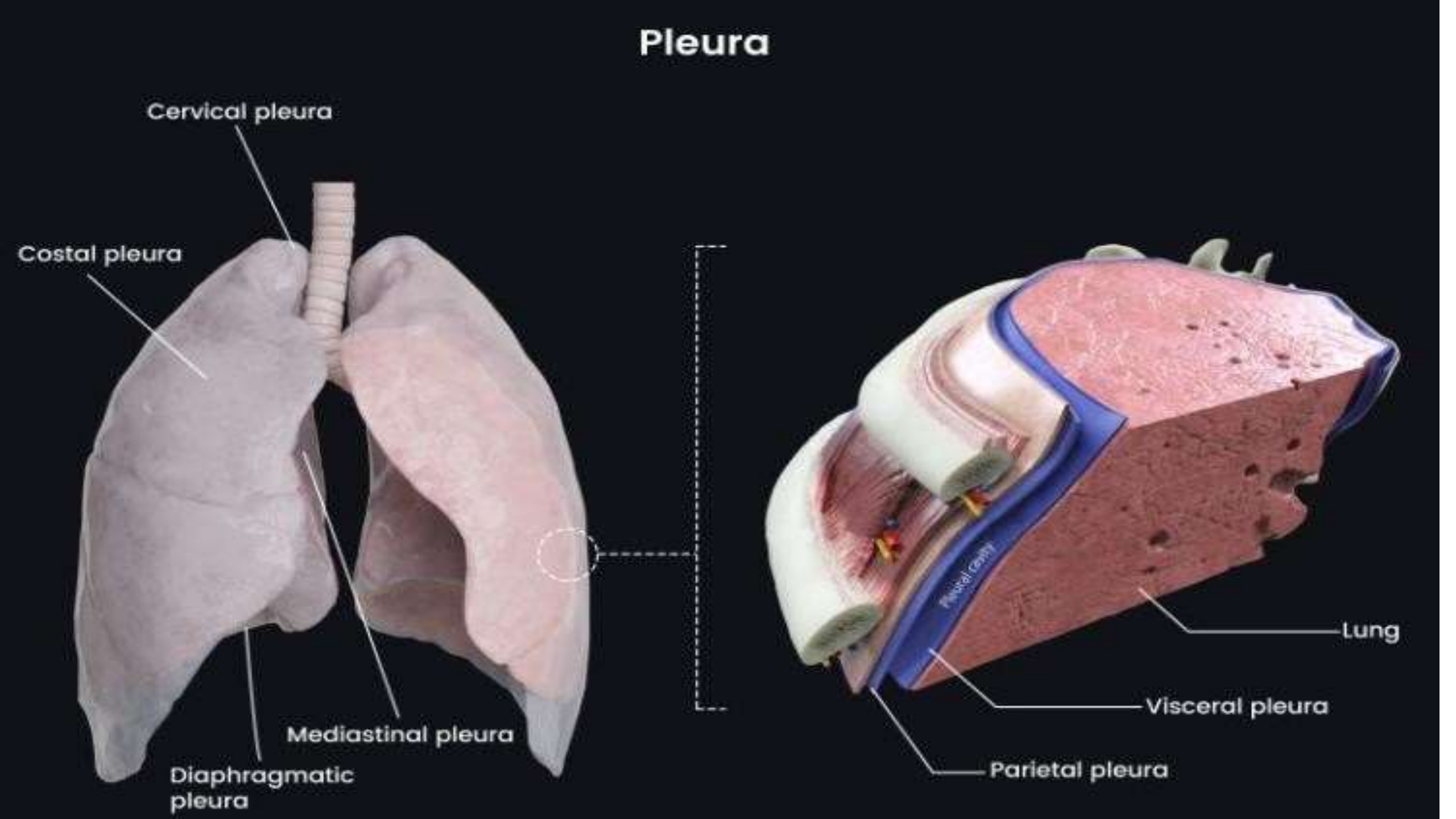

Apex
Superior lobe
Horizontal fissure
Oblique fissure
Middle lobe
Inferior lobe
Base
Right lung
Cardiac notch
Oblique fissure
Left lung

The pleura:

Lung outer surfaces and the adjacent internal thoracic wall are lined by a serous membrane called (pleura). The parietal pleura lines the inner surface of the thoracic cavity, and the visceral pleura covers the outer surface of the lungs. The thin space between these layers is called the pleural cavity.


Parietal pleura
Visceral pleura
Pleural cavity
Parietal pleura
Visceral pleura
Pleural cavity
Diaphragm

Pleura


Cervical pleura
Costal pleura
Mediastinal pleura
Diaphragmatic pleura
Pleural cavity
Lung
Visceral pleura
Parietal pleura

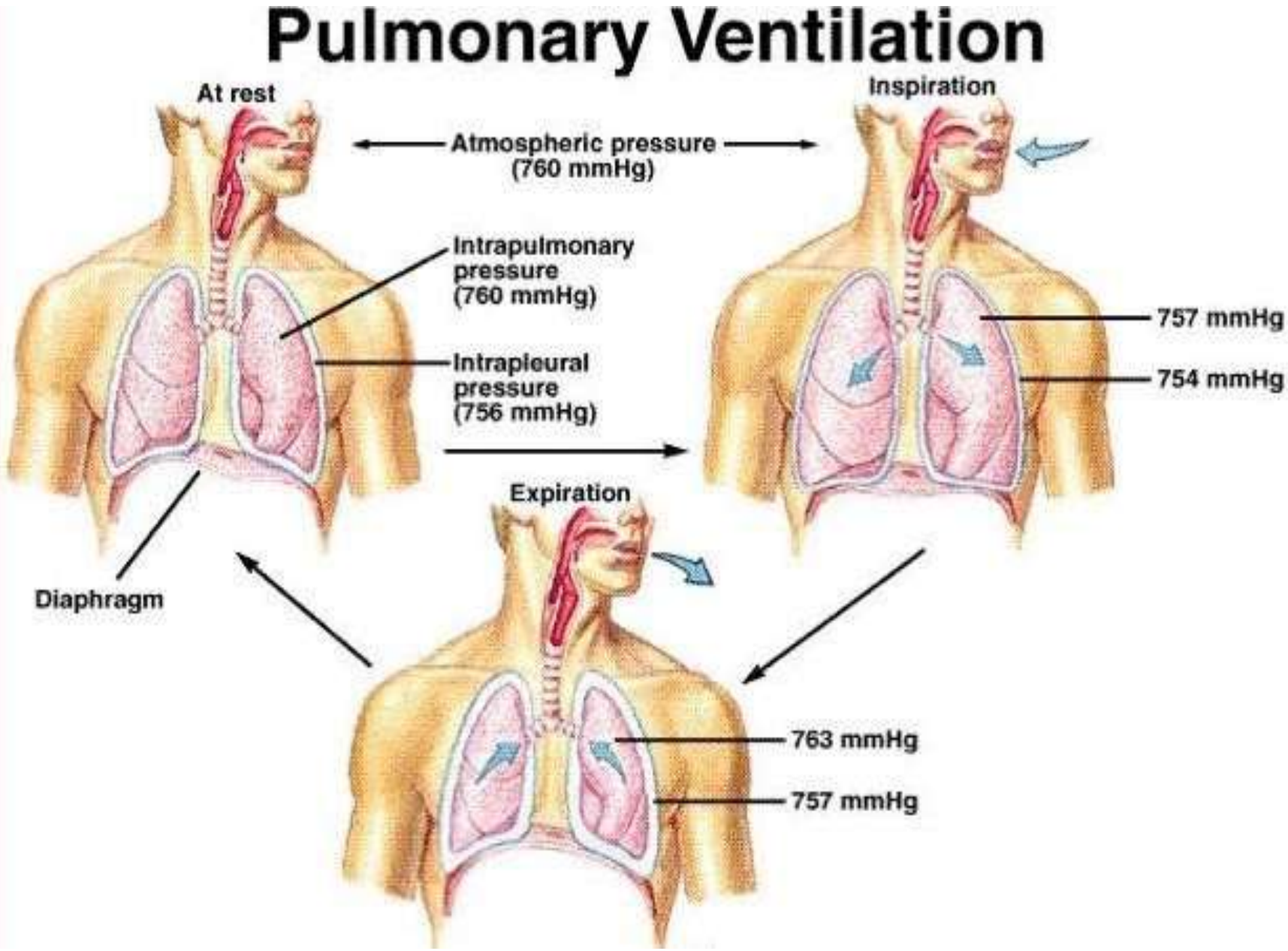
Pulmonary ventilation (Breathing):

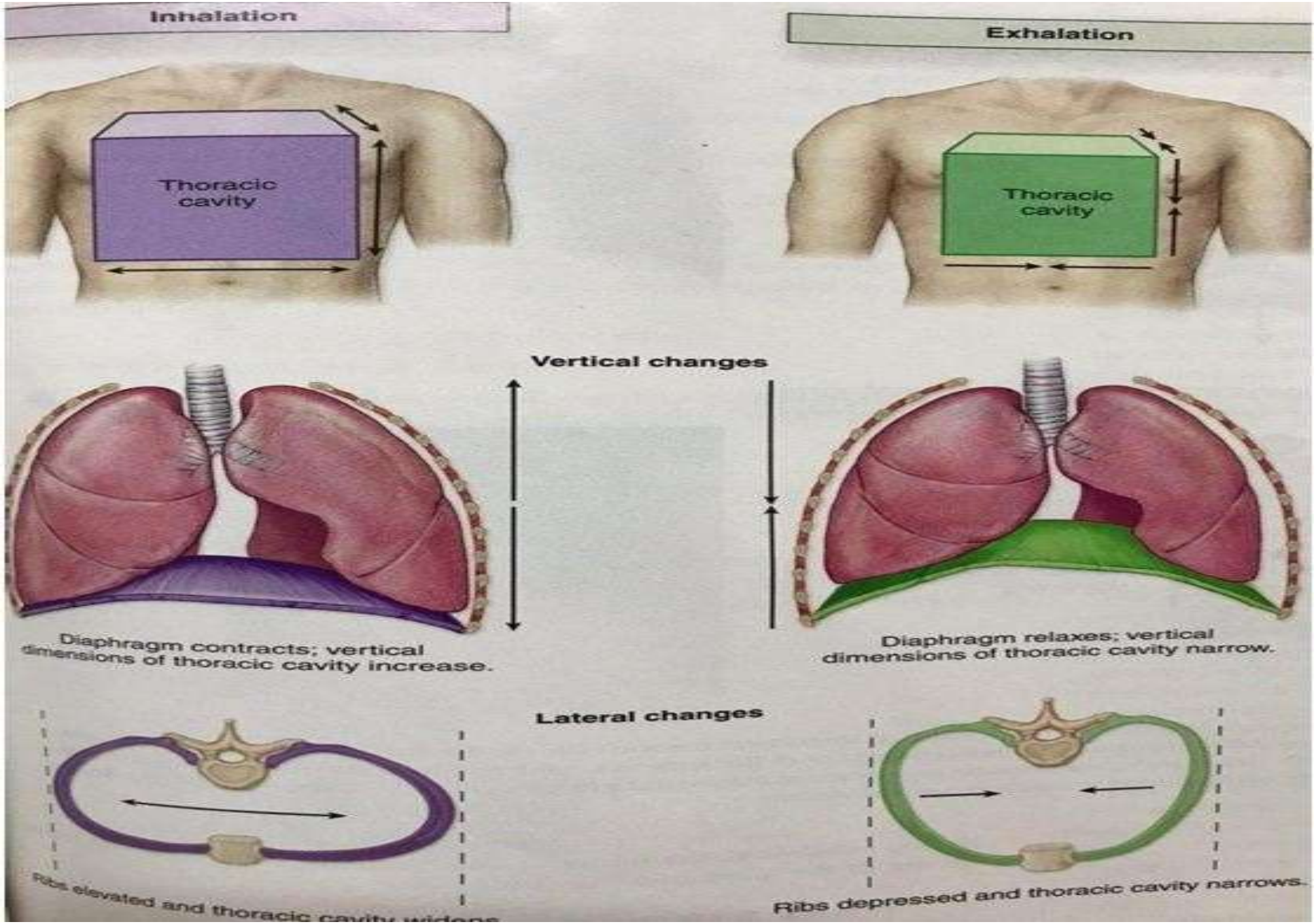
Is the movement of air into and out of the respiratory system. At rest, a normal adult breathes about 16 times per minute (respiratory rate = RR), and approximately 500 millilitres of air are exchanged with the atmosphere per breath.The airflow exchange is caused by the muscular action associated with inhalation and exhalation, as well as by difference in atmospheric air pressure and lung (intrapulmonary) air pressure. The movement of gases into and out of the respiratory system follows (Boyle's law), which states: "the pressure of a gas decreases if the volume of the container increases, and vice versa ". Thus, when the volume of the thoracic cavity increases even slightly during inhalation, the intrapulmonary pressure decreases slightly, and air flows into the lungs through the conducting airways.

Therefore, air flows from a region of higher pressure (the atmosphere) into a region of lower pressure within the lungs (the intrapulmonary region).

Similarly, when the volume of the thoracic cavity decrease during exhalation, the intrapulmonary pressure increases and forces air out of the lungs into the atmosphere.

Mechanics of Breathing (Pulmonary Ventilation)




Inhalation
Exhalation
Thoracic cavity
Thoracic cavity
Vertical changes
Diaphragm contracts; vertical dimensions of thoracic cavity increase.
Diaphragm relaxes; vertical dimensions of thoracic cavity narrow.
Lateral changes
Ribs elevated and thoracic cavity widens
Ribs depressed and thoracic cavity narrows.