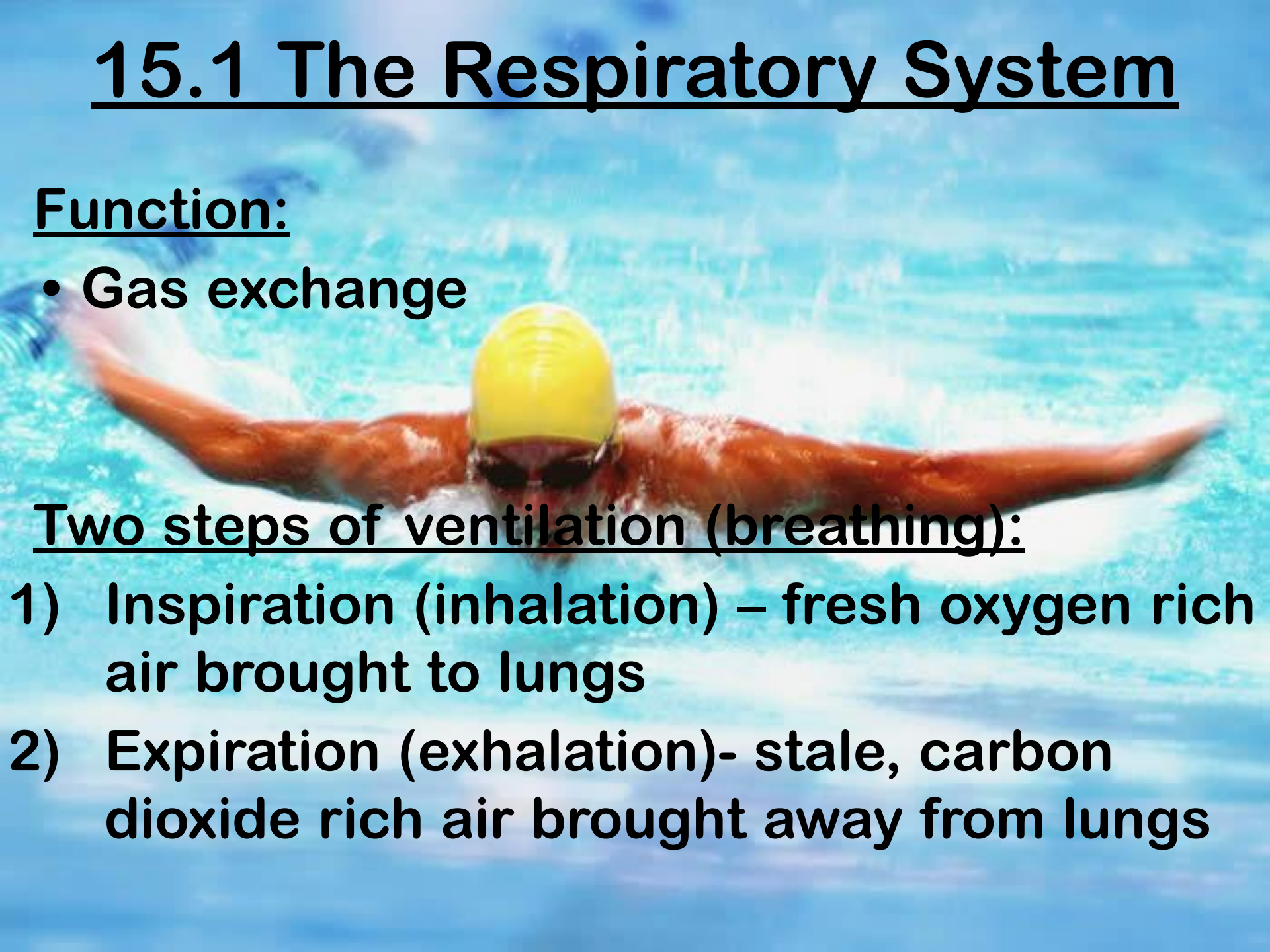
15.1 The Respiratory System



Function:

- Gas exchange

Two steps of ventilation (breathing):

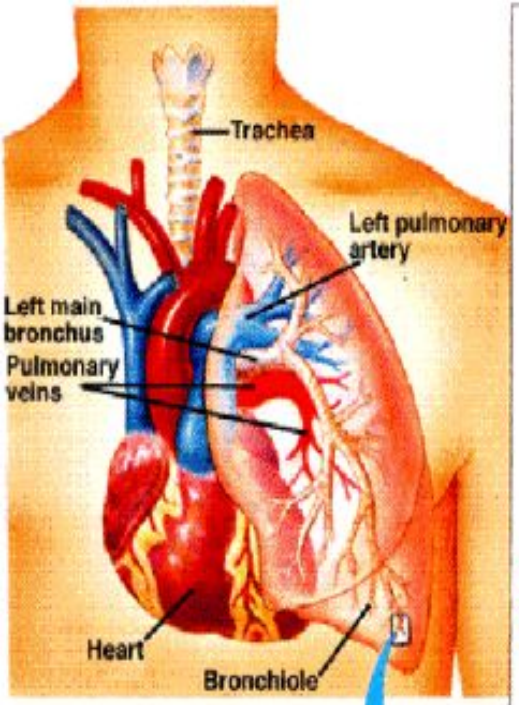
1) Inspiration (inhalation) – fresh oxygen rich air brought to lungs
2) Expiration (exhalation)- stale, carbon dioxide rich air brought away from lungs

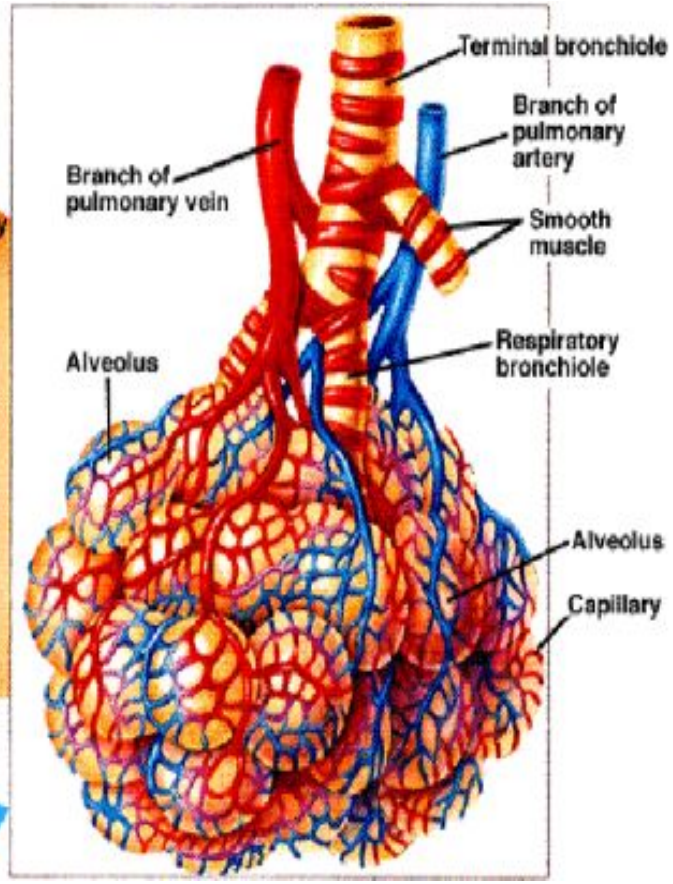
Types of Respiration

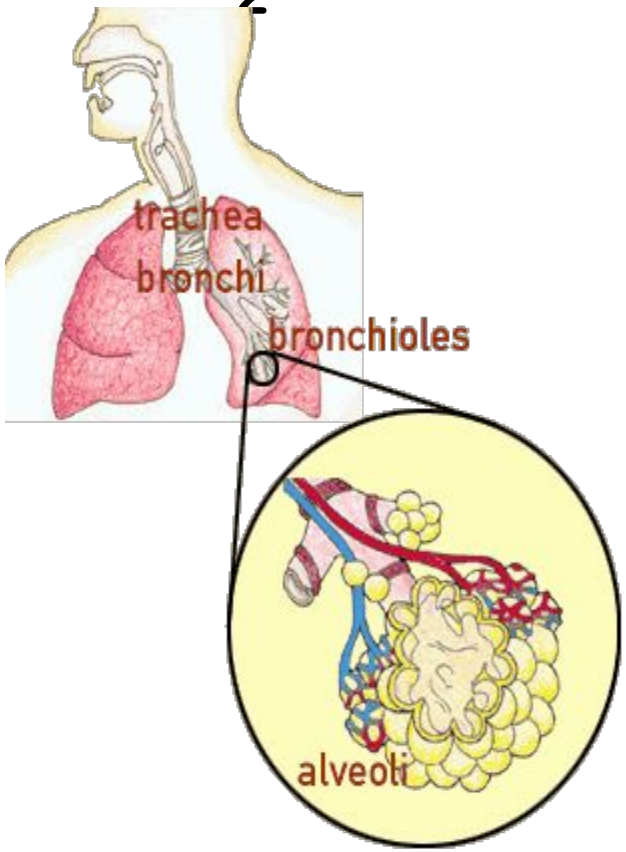
Notice that the respiratory system works with the cardiovascular system

1. **<u>Breathing:</u> mechanical movement of air in and out of lungs.**

2. <u>External Respiration:</u> exchange of gases between the lungs and the blood stream * O_2 in and * CO_2 out.

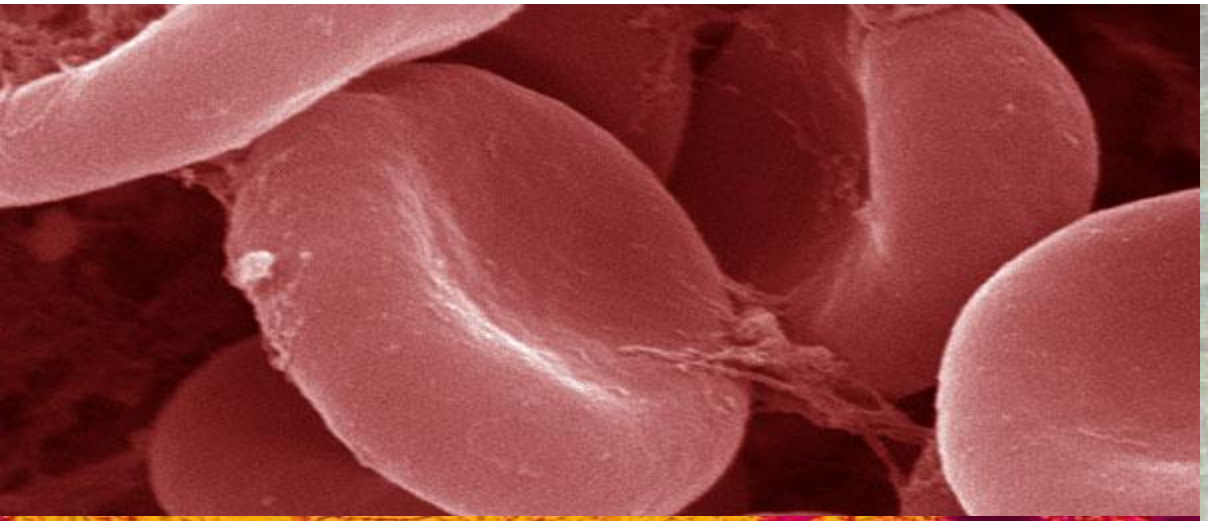


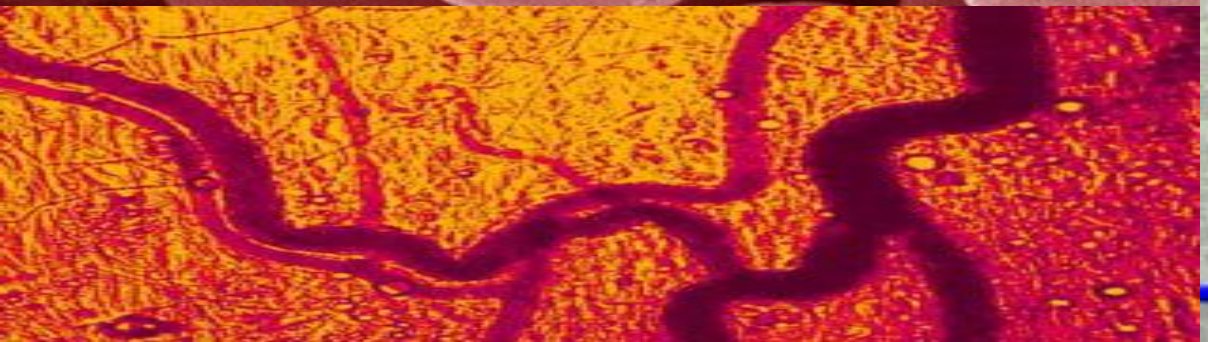


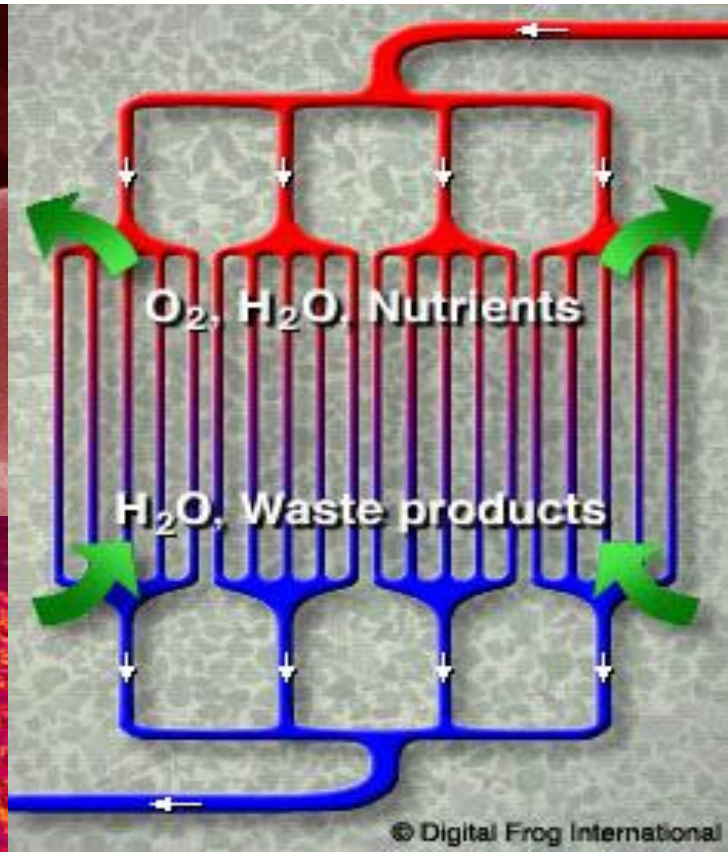


3. <u>Internal Respiration:</u> exchange of gases between the tissue capillaries and the cells of the body

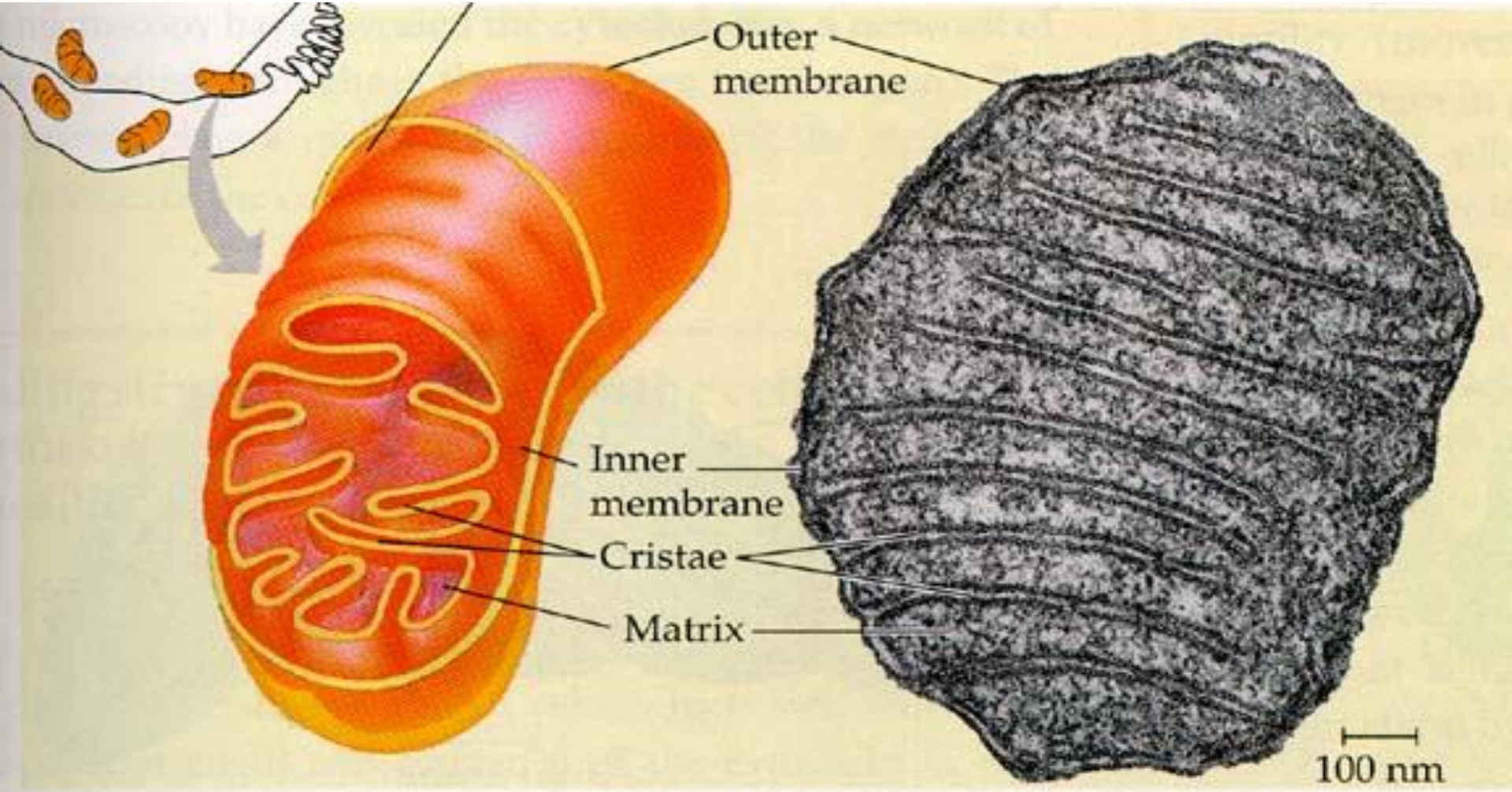
*O_2 from blood to cells and *CO_2 returned to the blood from cells.



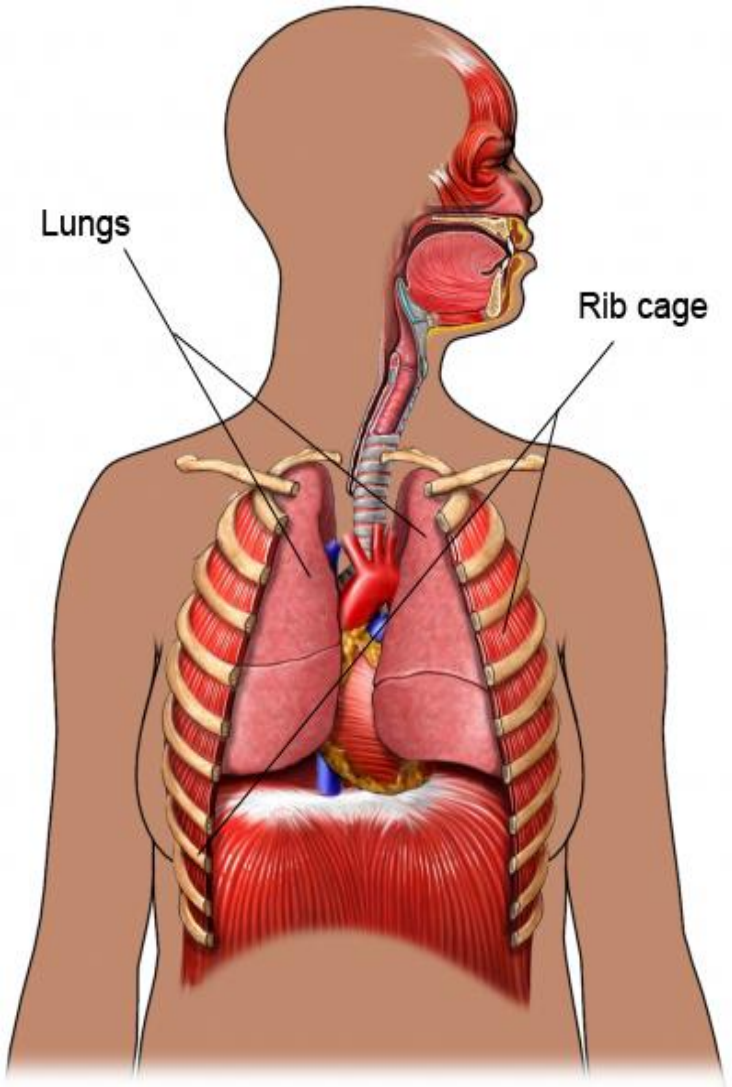


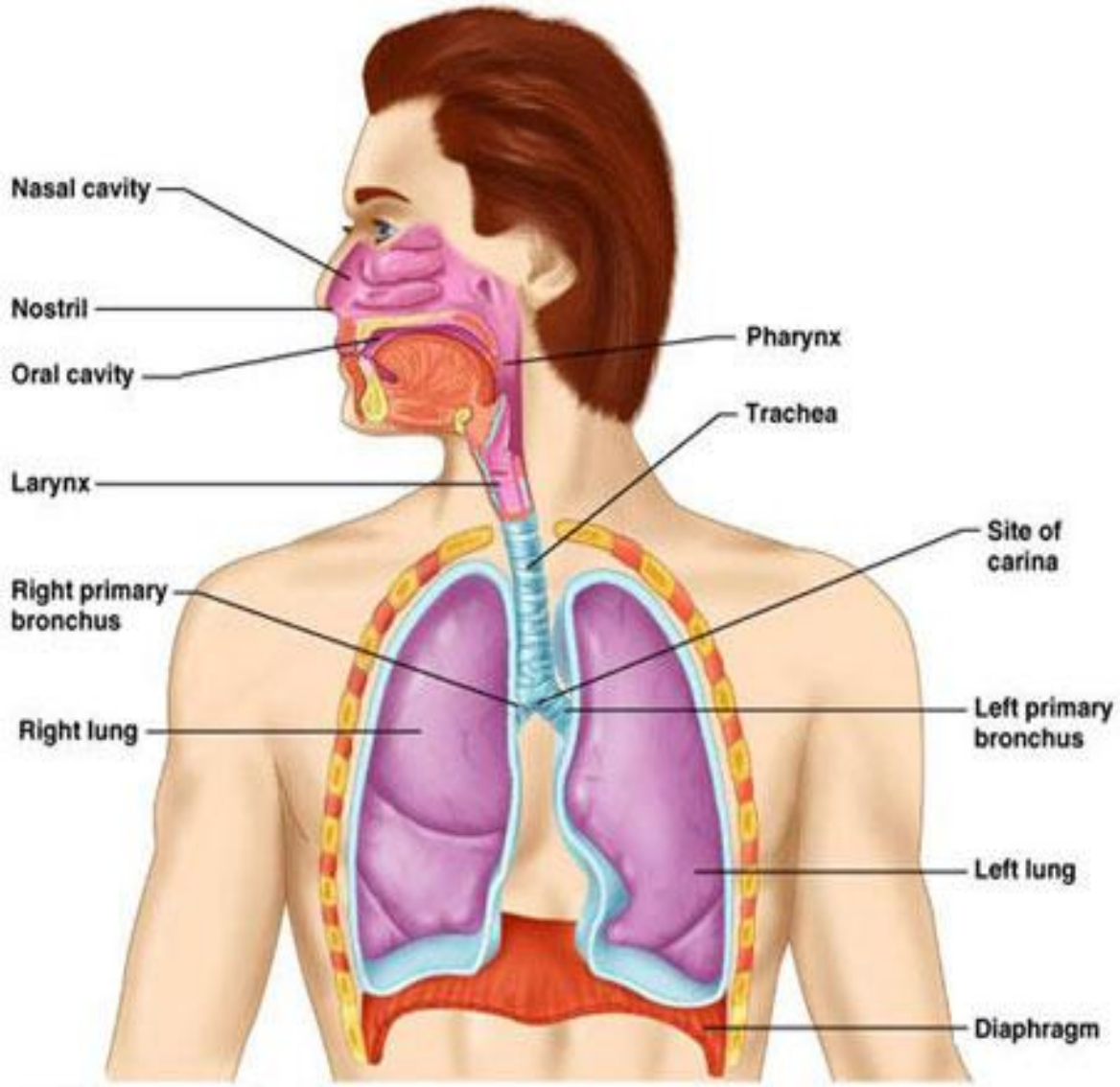


4. **Cellular Respiration:** biochemical reactions (metabolism) in the cells in which glucose is reacts with oxygen ATP (energy) with CO_2 and water as a by product .



Anatomy





Path of Air & Functions

a) Upper Respiratory Tract

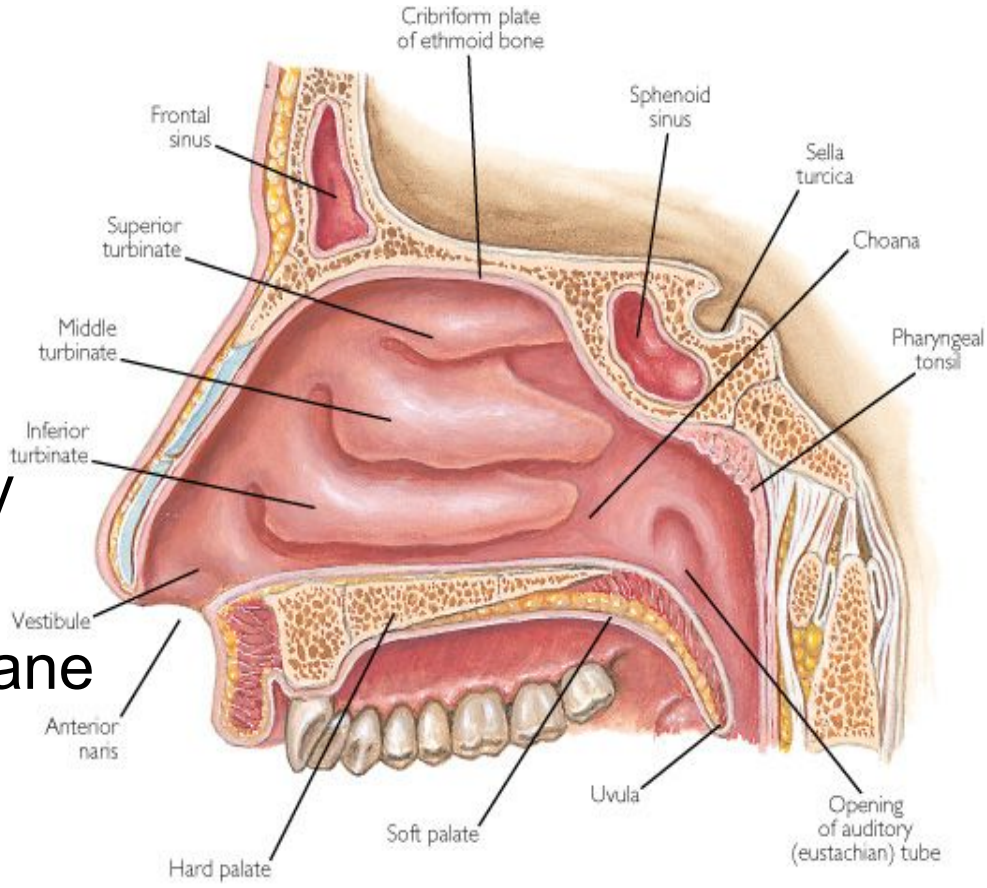
1) Nasal cavity

Structure:

Nostrils= opening to cavity

Two nasal cavities

Lined with mucous membrane



Function:

Main function is to **filter**, **warm** and **moisten** air as it enters the respiratory tract

2A) Pharynx

Structure:

An area at the back

Of the throat shared

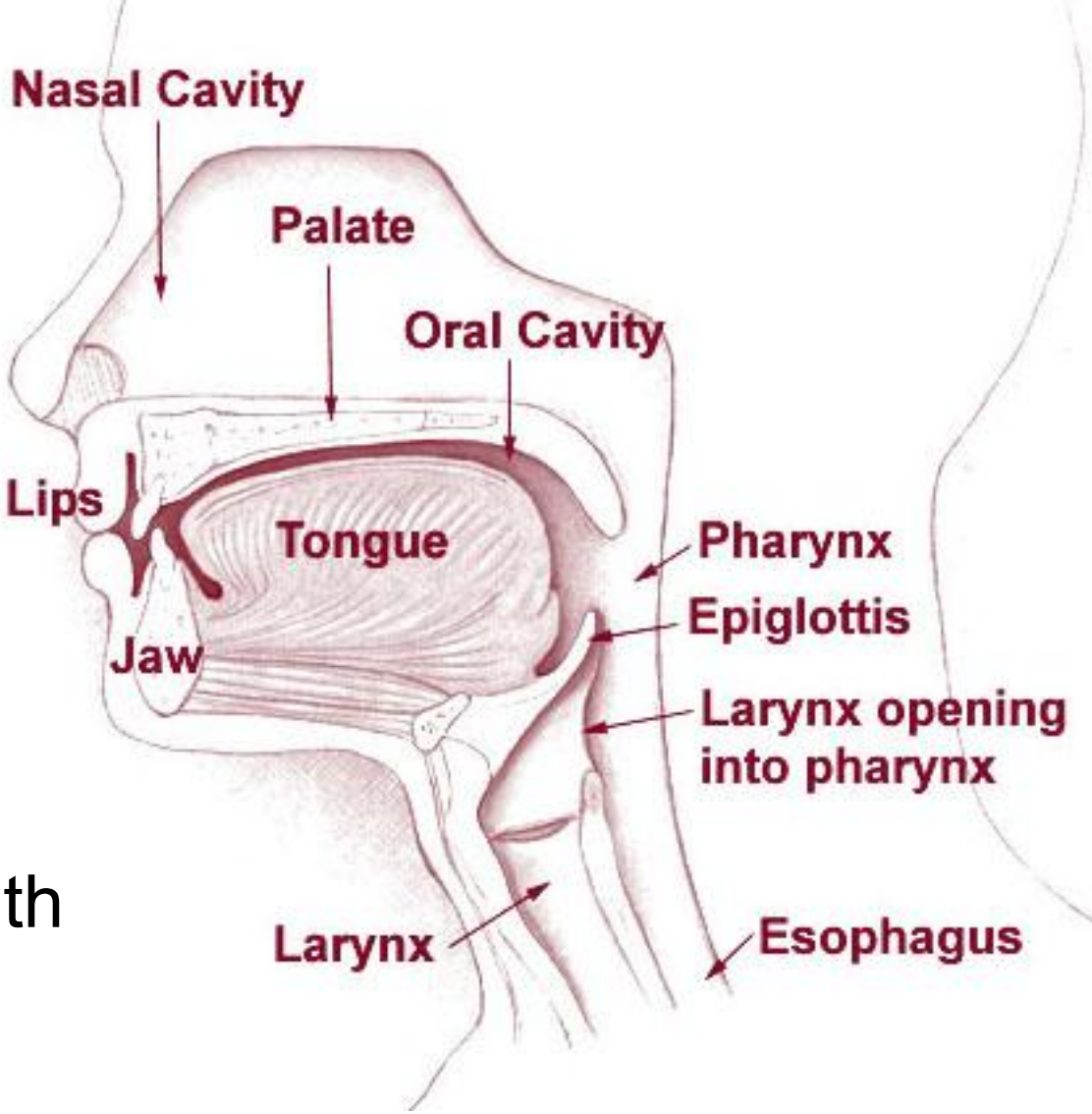
By both digestion and

respiration

Function:

connects nose and mouth

to the wind pipe



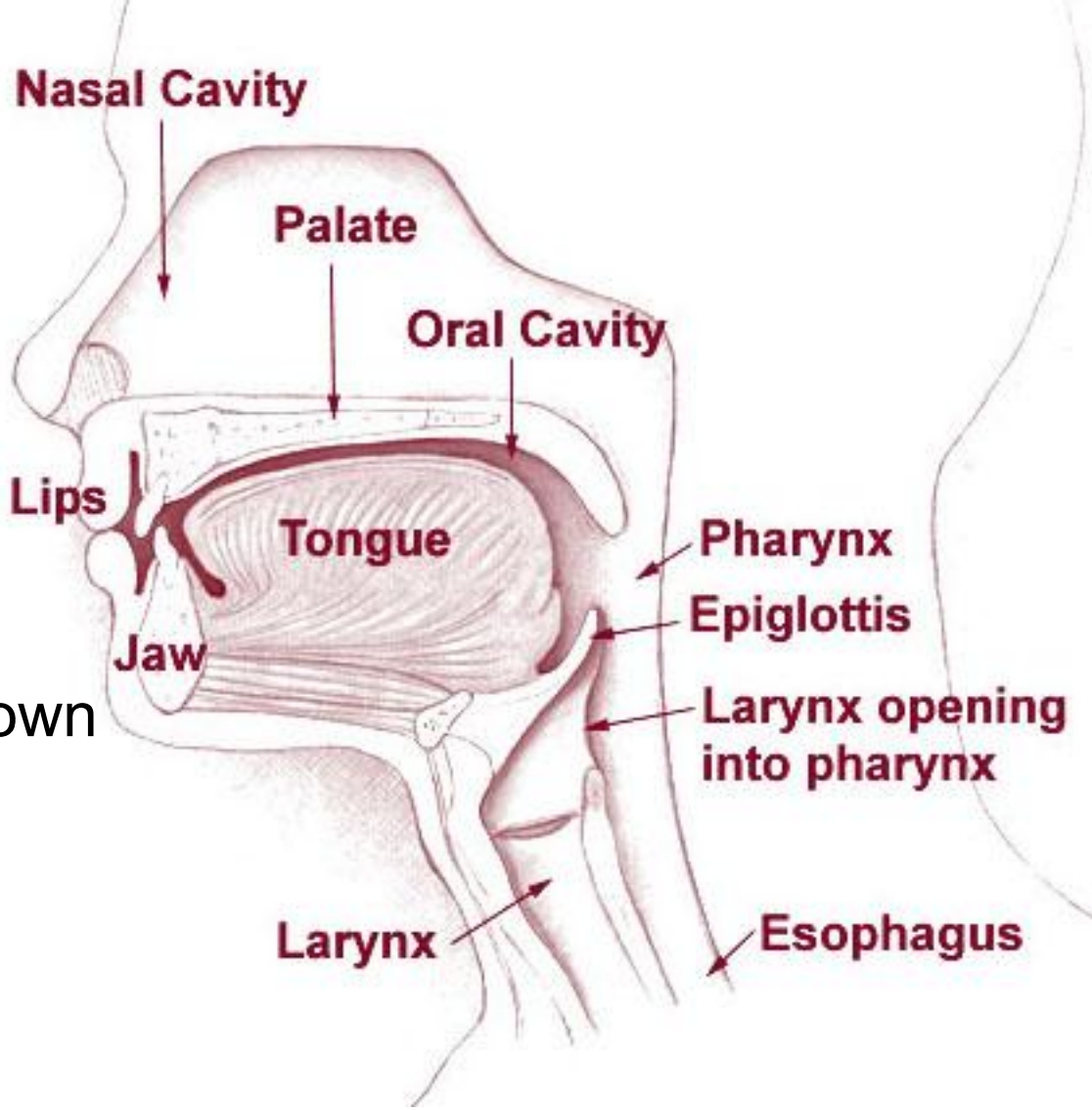
- **2B) Epiglottis**

flap of skin covering the Opening of the windpipe

- prevents food from going down the windpipe

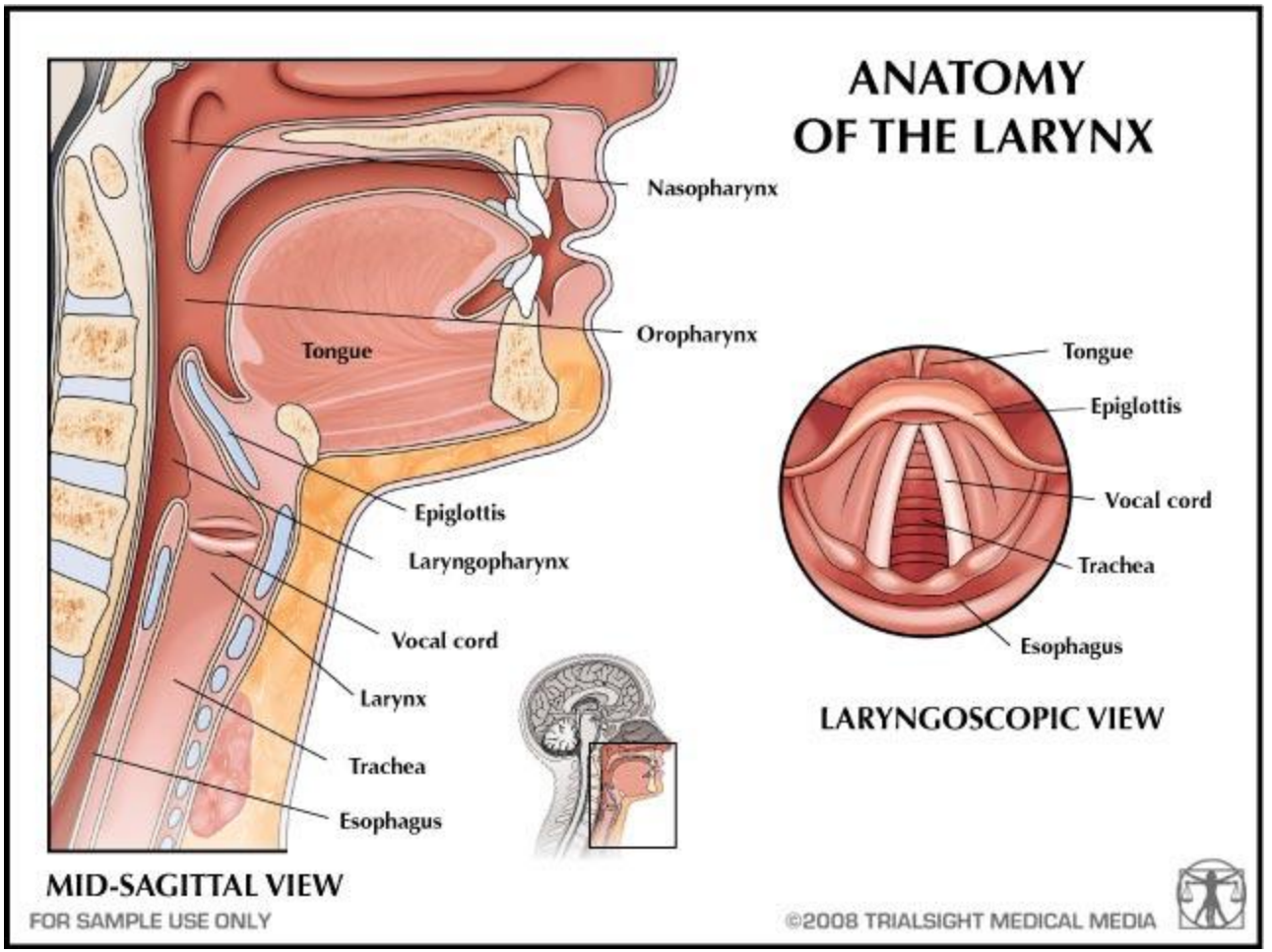
-closes when you swallow

Prevents food from going down The windpipe.



3) Larynx

Structure:
Cartilaginous; houses the vocal cords (voice box)



Function:
Sound production

b) Lower Respiratory Tract

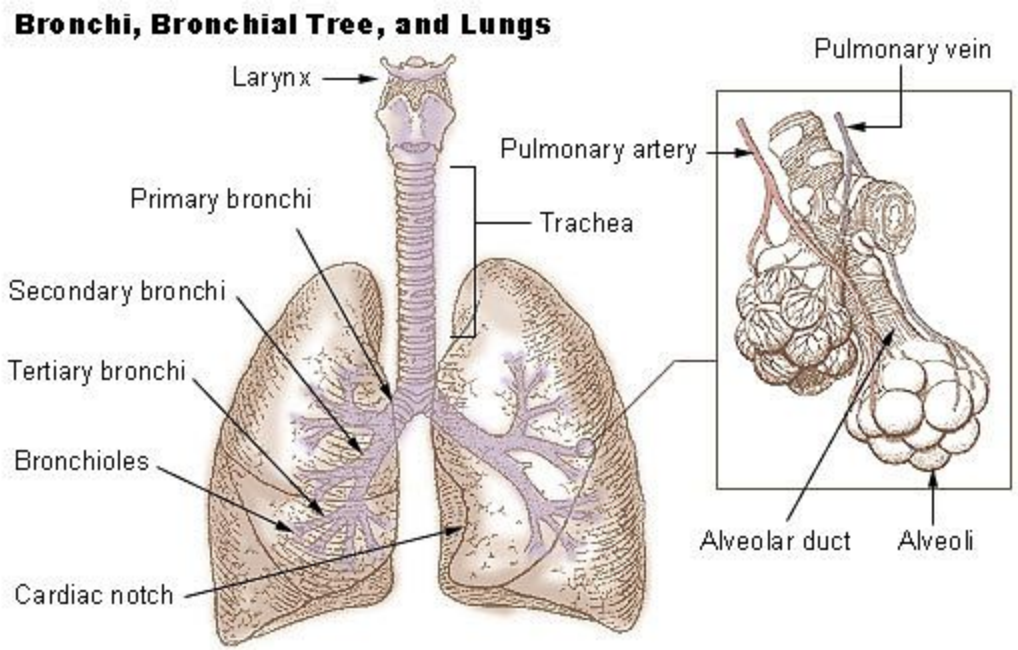
4) Trachea (windpipe)

Structure:

Flexible tube,

Alternating rings of cartilage and muscle

-connects pharynx /larynx with bronchi



Function:

Passage of air to bronchi

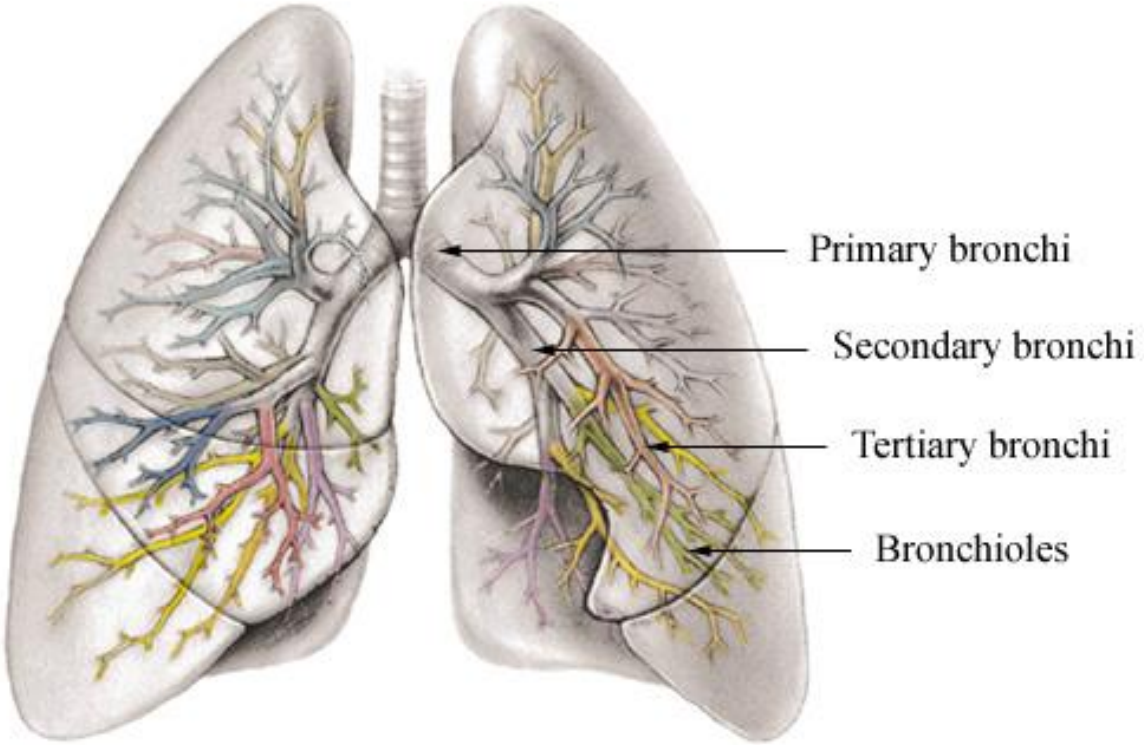
5) Bronchi

Structure:

Paired tubes below the trachea that enter the lungs

Function:

Passage of air to the lungs



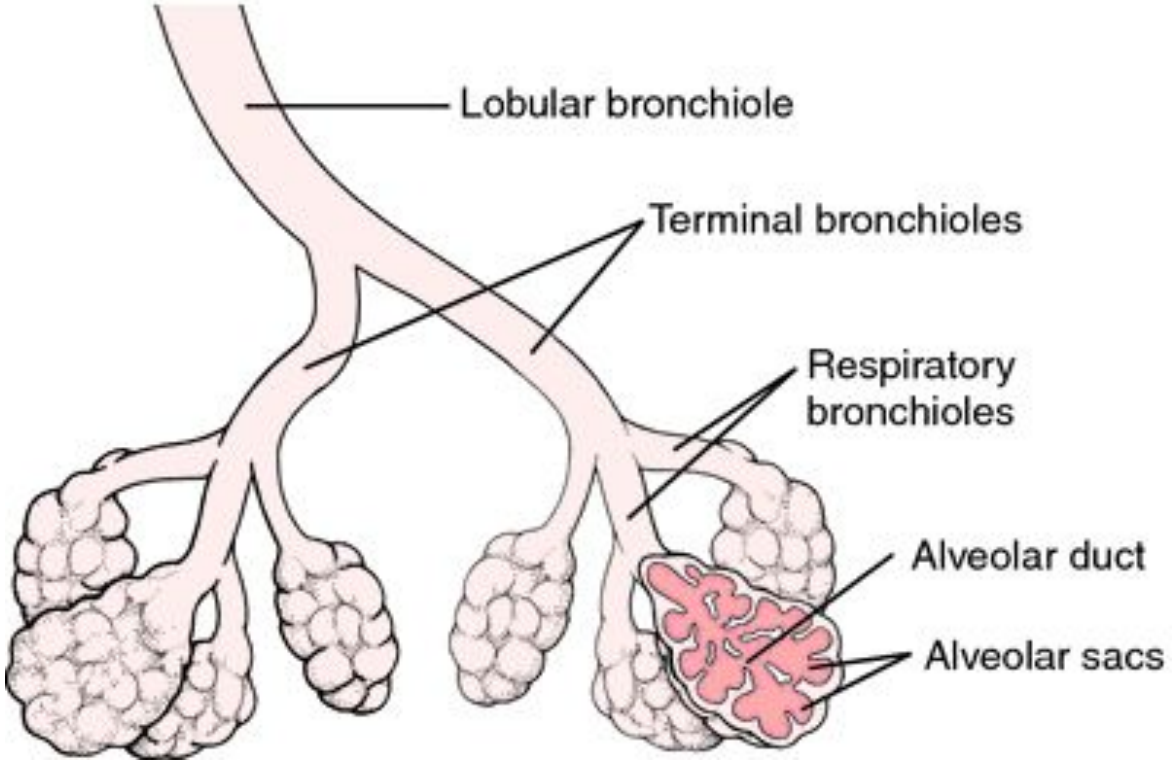
6) Bronchioles

Structure:

Branched tubes that lead from bronchi to alveoli

Function:

Passage of air to each alveolus



7) Lungs

Structure:

- Soft, cone-shaped organs that occupy thoracic (chest) cavity
- Enclosed by double layer membrane = **pleural membranes**

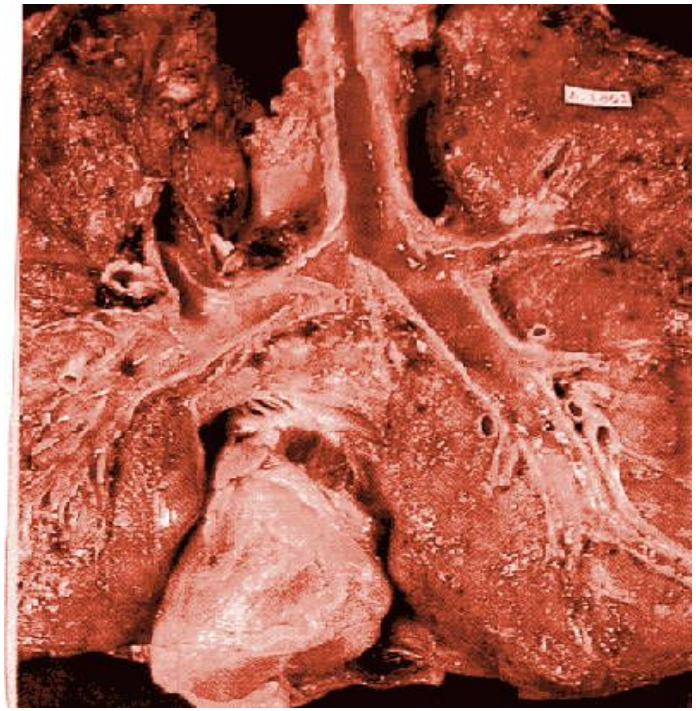
Function:

Contains alveoli and blood vessels

8) Alveoli

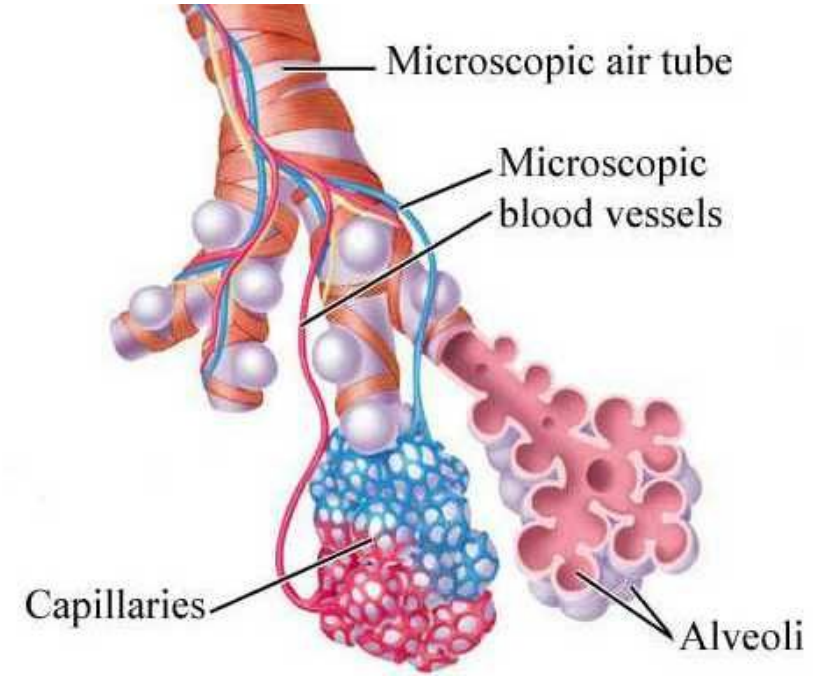
Structure:

- Thin-walled microscopic air sacs in lungs



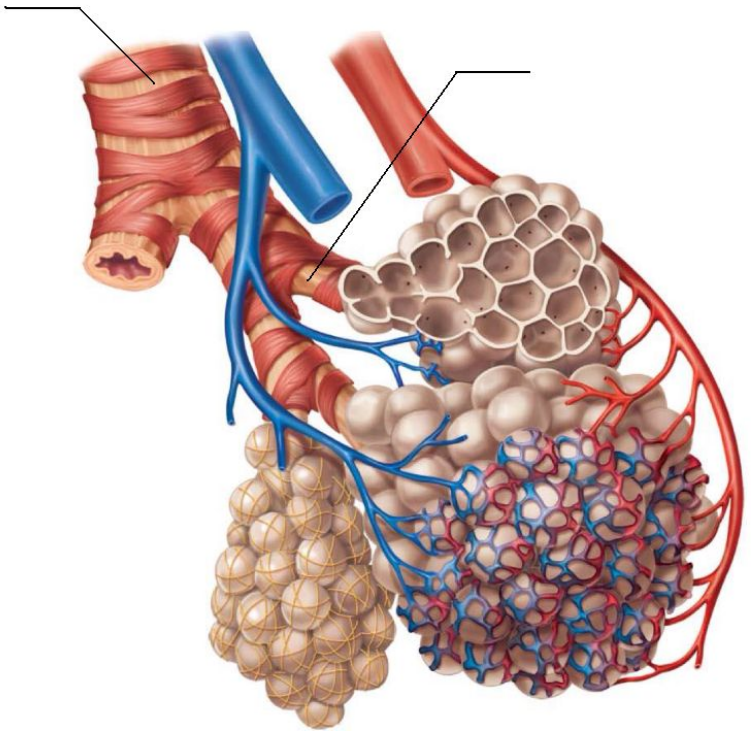
Function:

Gas exchange between air and blood



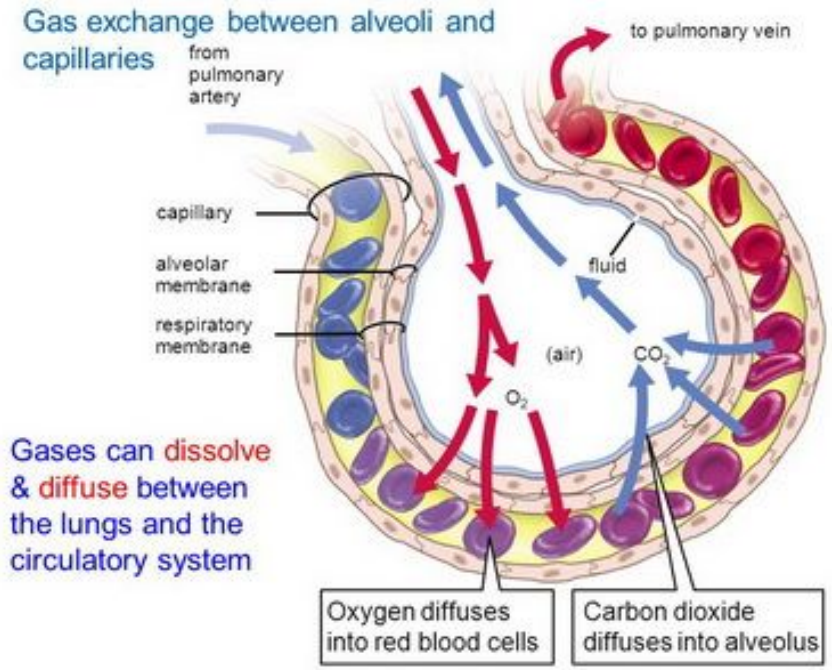
The structure of **alveoli** allow it to perform its functions:

1) Alveoli have Large Surface Area allows lots of place for gas exchange (Oxygen into the blood, carbon dioxide out of blood)



Alveoli have

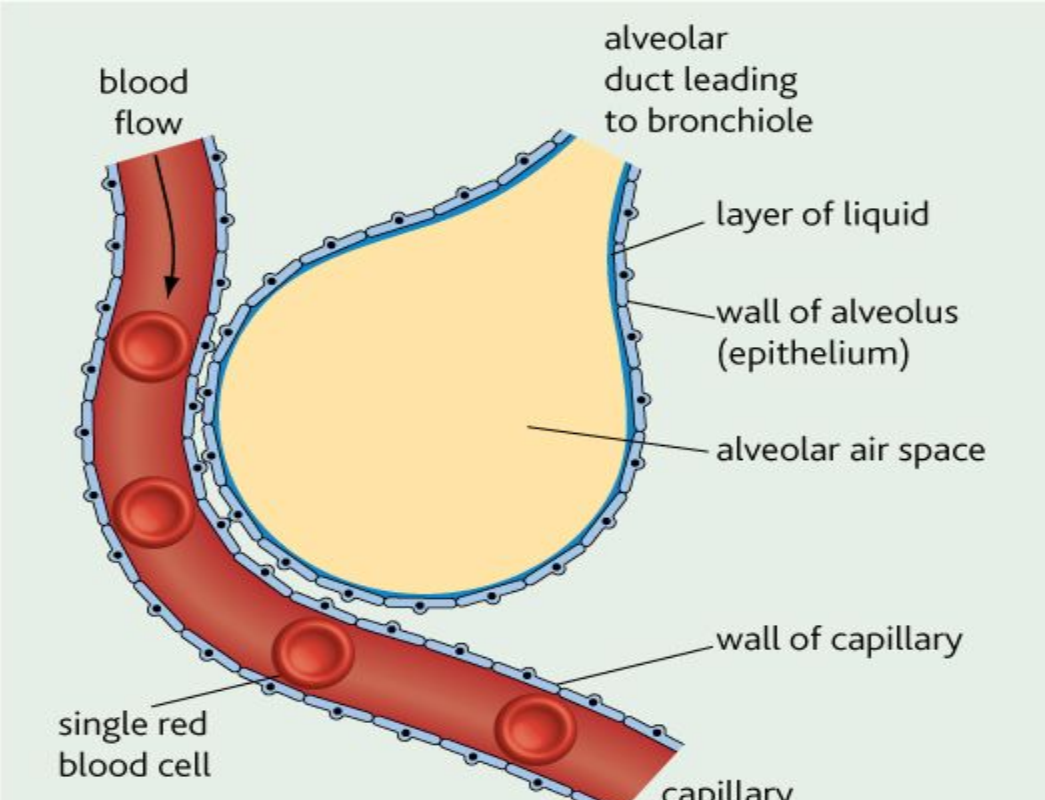
2. Thin walls increase diffusion rate (gases are close to blood)



Alveoli have

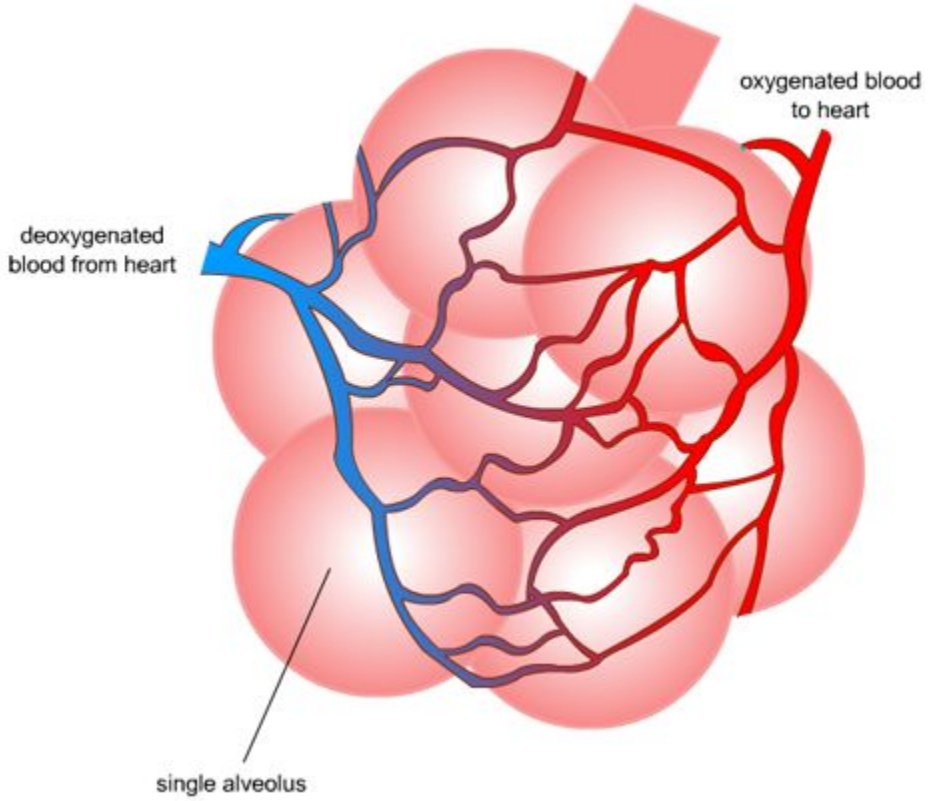
3. Moist surface gases diffuse (move) easier through a liquid environment

4.Surfactant (lipoprotein layer) lowers surface tension so alveoli do not collapse



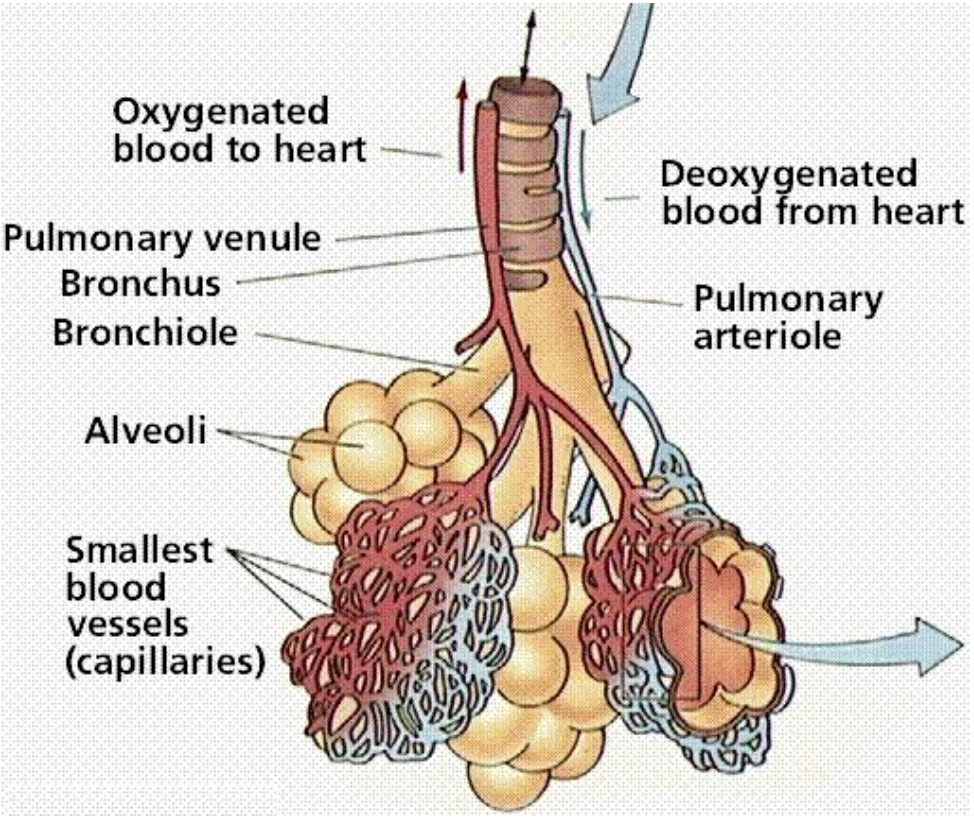
The alveoli are:

5. Highly Vascularized each alveolus is covered with capillary beds



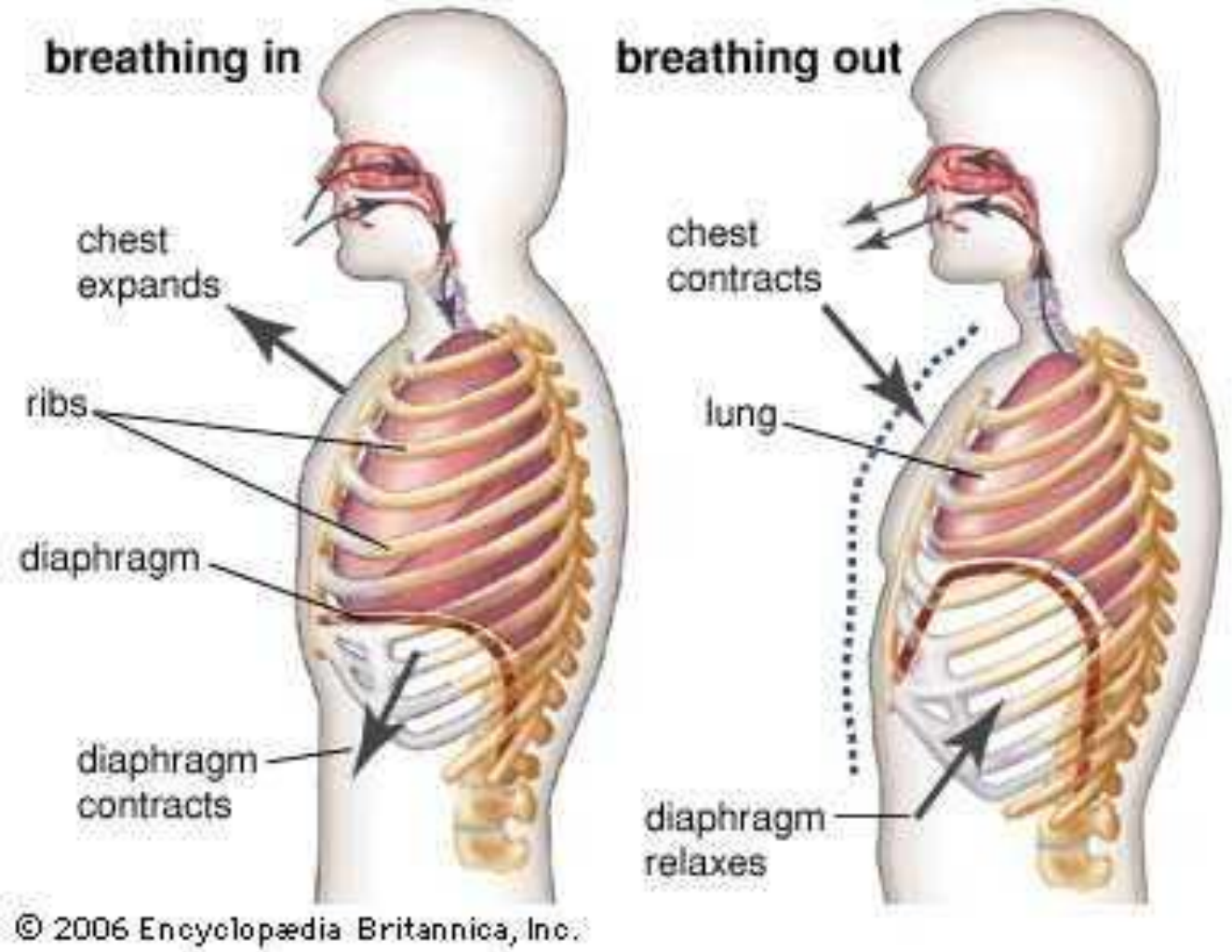
Blood Supply to and from Alveoli

- pulmonary arteries carry deoxygenated (low oxygen) blood from the right ventricle to the lungs



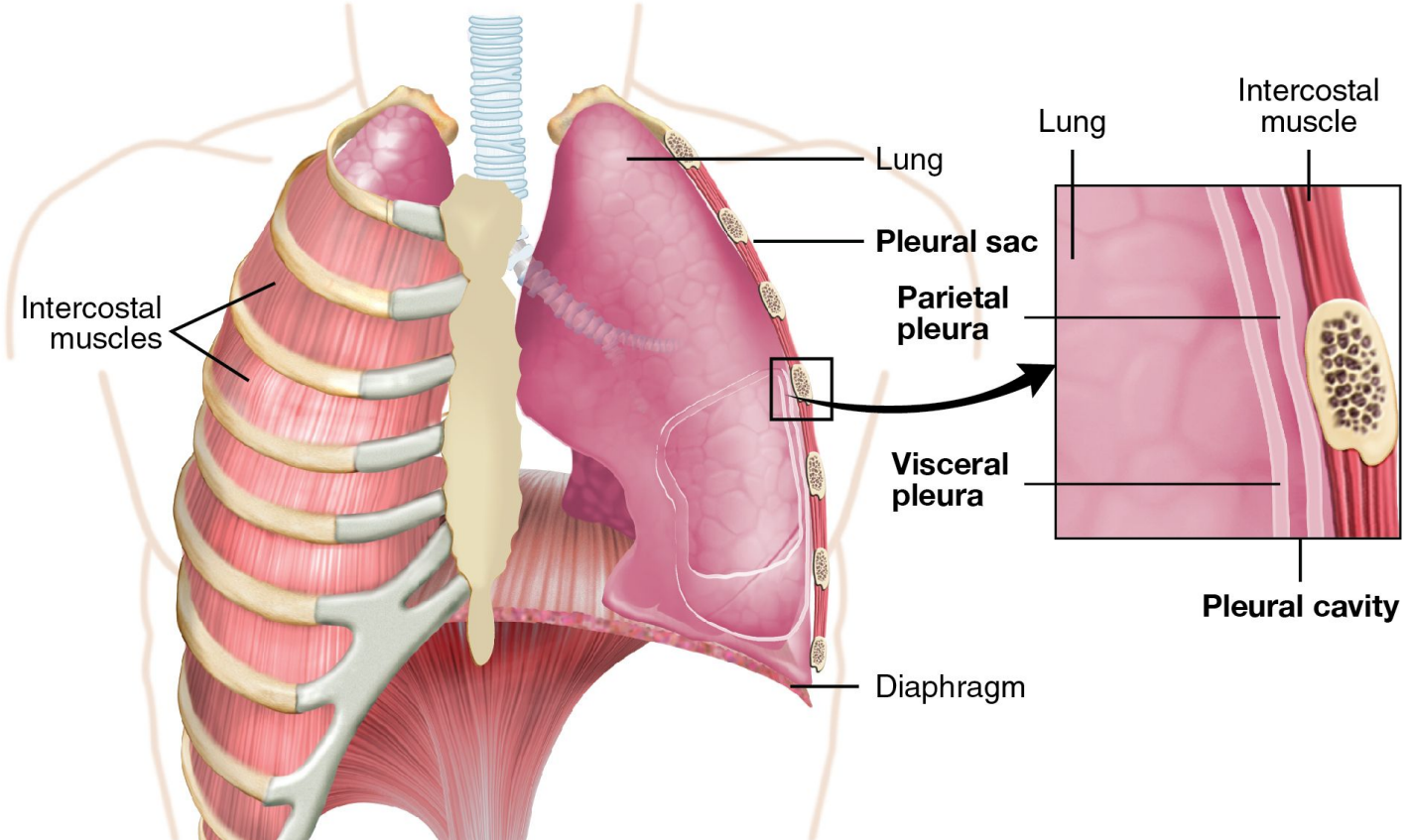
- pulmonary veins carry oxygen rich blood back to the heart from the lungs

15.2
Mechanisms of Breathing



Important Facts - **breathing**

1) Lungs lie in the <u>thoracic (chest cavity)</u>;
   - <u>rib cage</u> = top/sides of thoracic cavity
   - <u>diaphragm</u>= flood of thoracic cavity

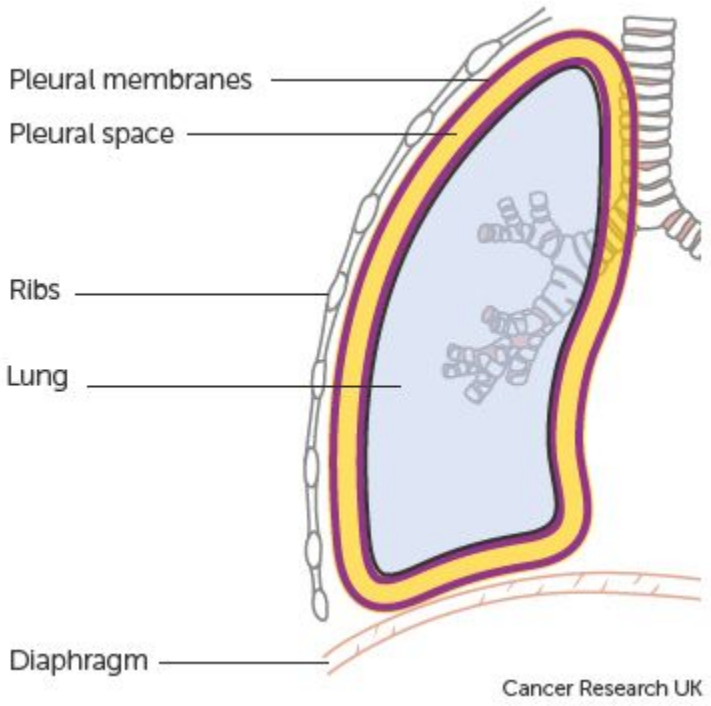


2) Pleural membranes

= surrounds the lungs

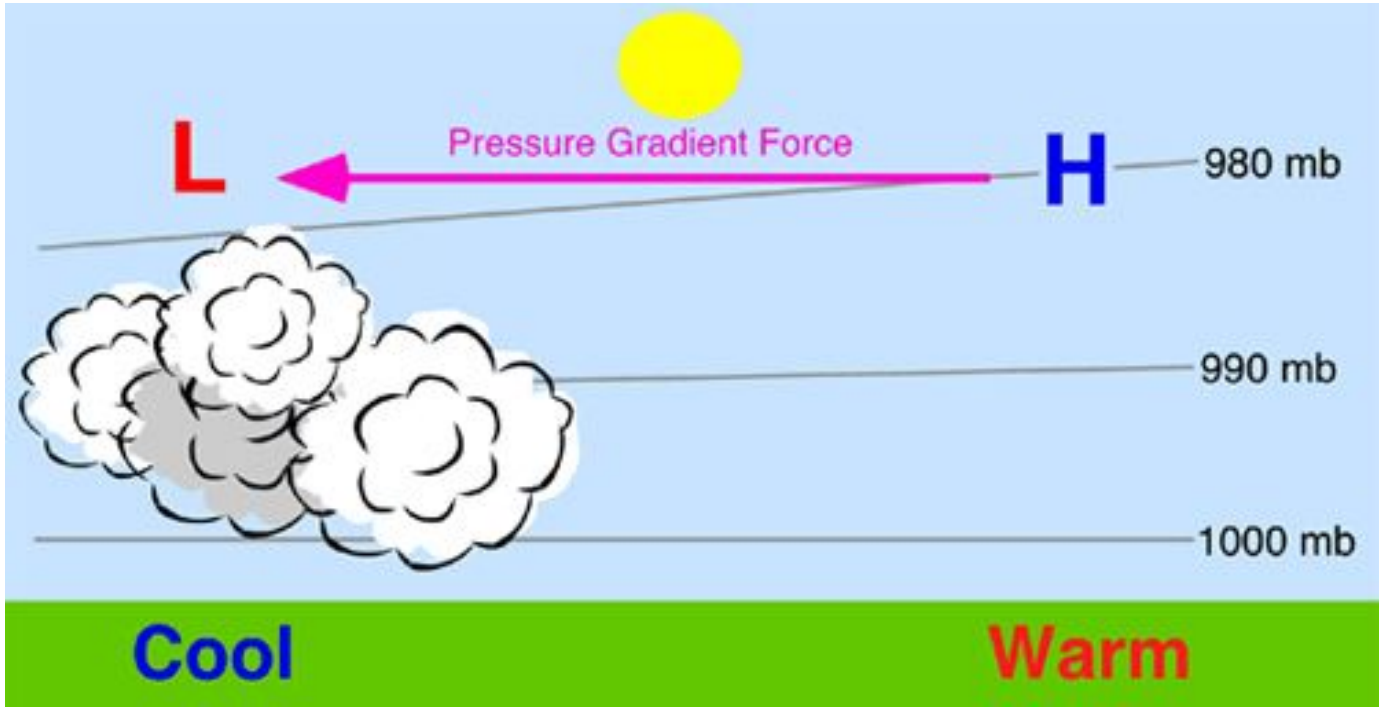
Functions:

- reduces friction between lungs and ribs
- Attaches the lungs to ribs, so when the ribs the lungs move



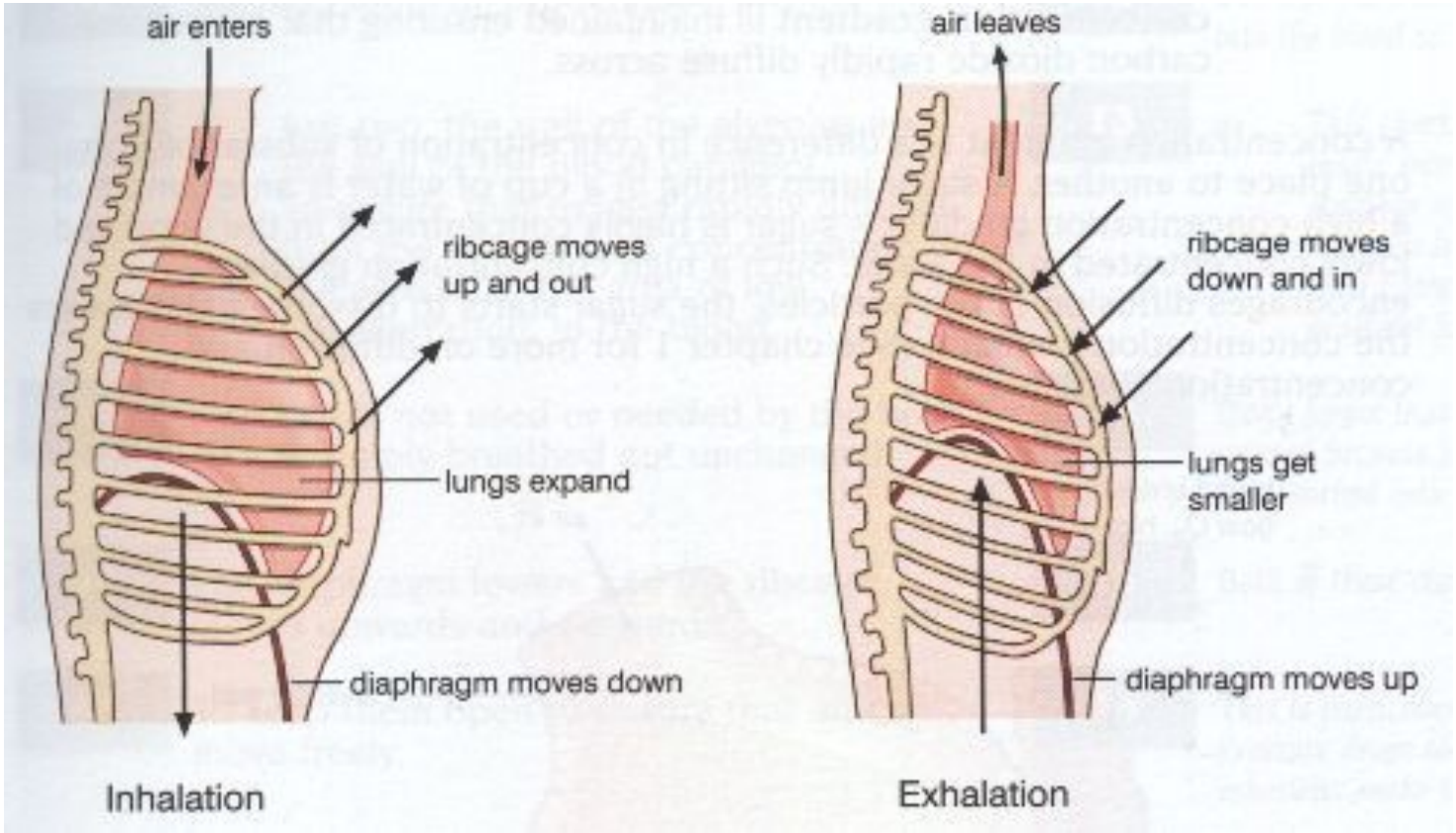
Breathing – in and out --works on air pressure

- Air always flows from high pressure zone to low pressure zone



Inspiration (breathing in)

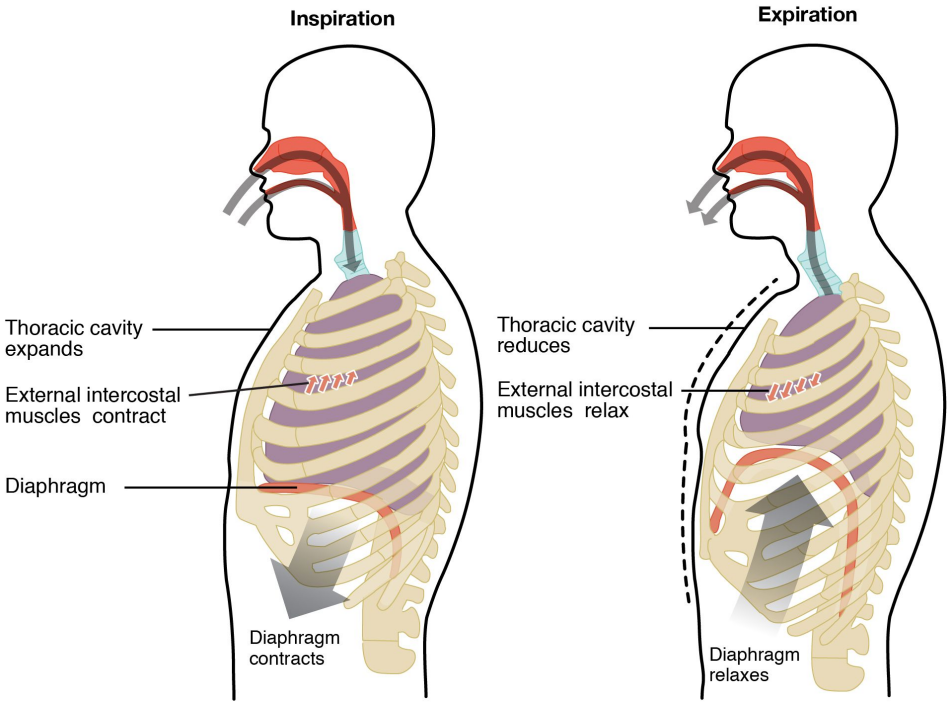
Creating a – bigger box (lower pressure) zone in your chest



Inspiration (breathing in)

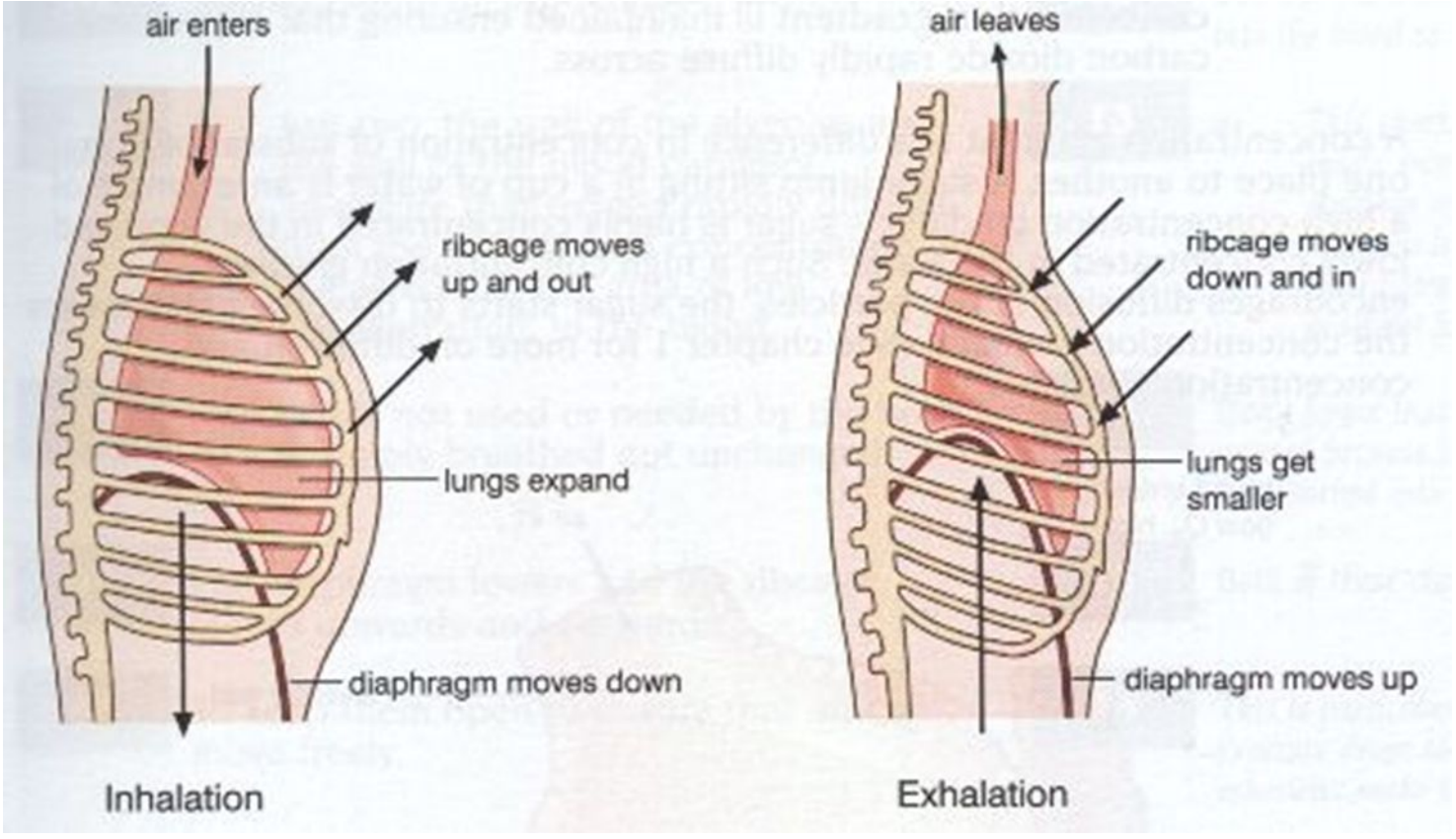
1) When CO_2 is high or oxygen is low - the brain (**medula oblongata)** sends signals to the **diaphragm** and **rib muscles** to contract
2) **Diaphragm goes down** (contracts) and **ribs come up**

and out

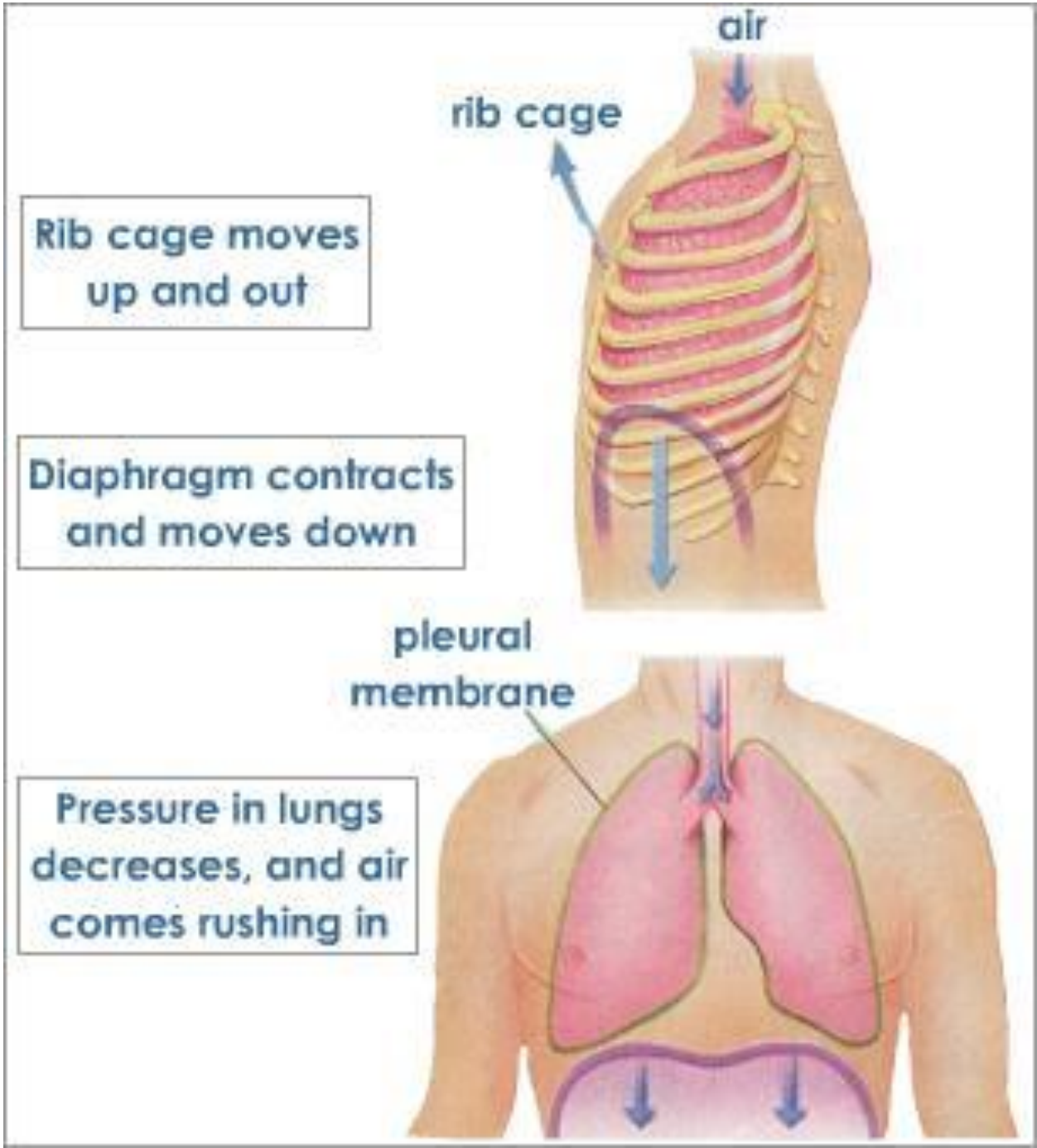


Inspiration (breathing in)

3. This **enlarges** thoracic (chest) cavity (makes a bigger box) creating **lower pressure** compared to atmospheric pressure
   air rushes in



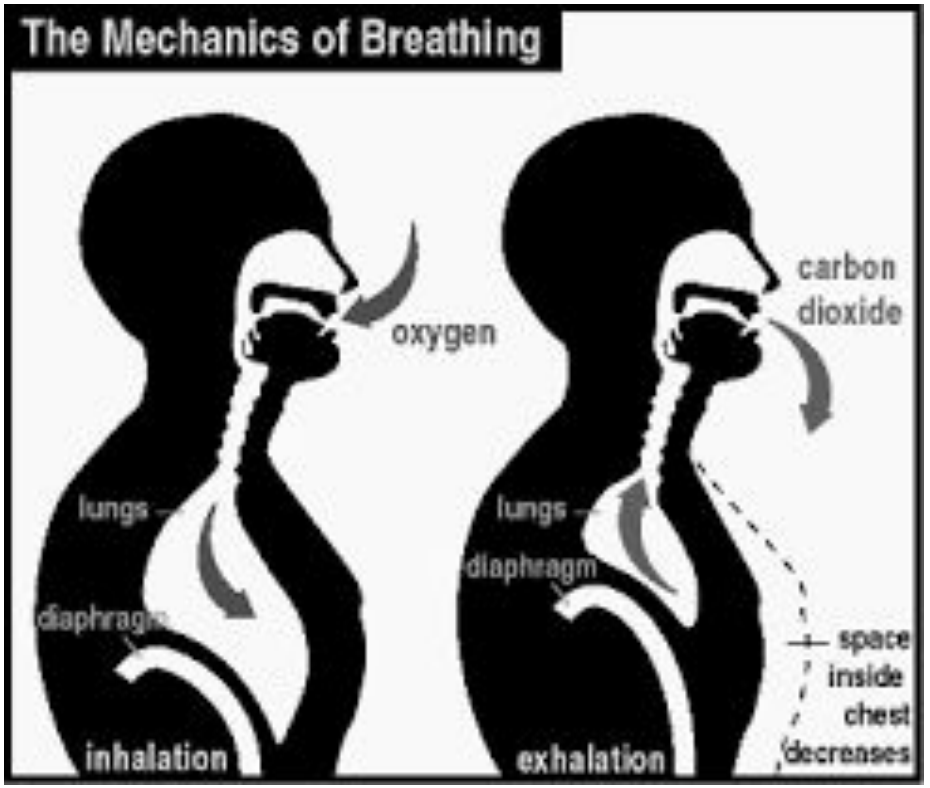
Inspiration



Expiration (breathing out)

1) Muscles relax -- **diaphragm domes up** and the rib cage moves down & in (smaller box)

2. Lungs return to normal size

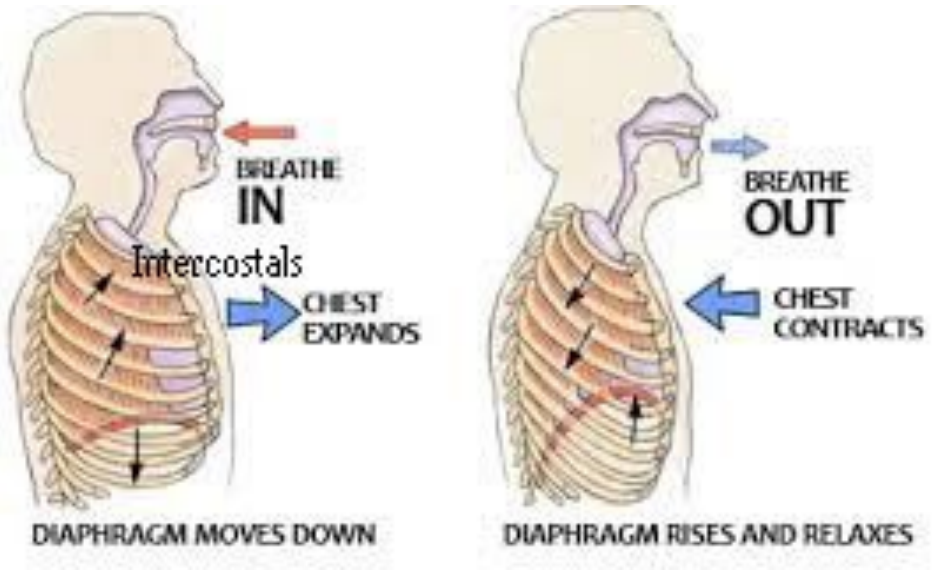


Expiration (breathing out)

3. Higher pressure in the lungs (compared to outside of the body)

4. Air flows out

5. Talking occurs as air moves over **vocal cords** in larynx



Expiration

Rib cage moves down and in

Diaphragm relaxes and moves up

Pressure in lungs increases, and air pushed out