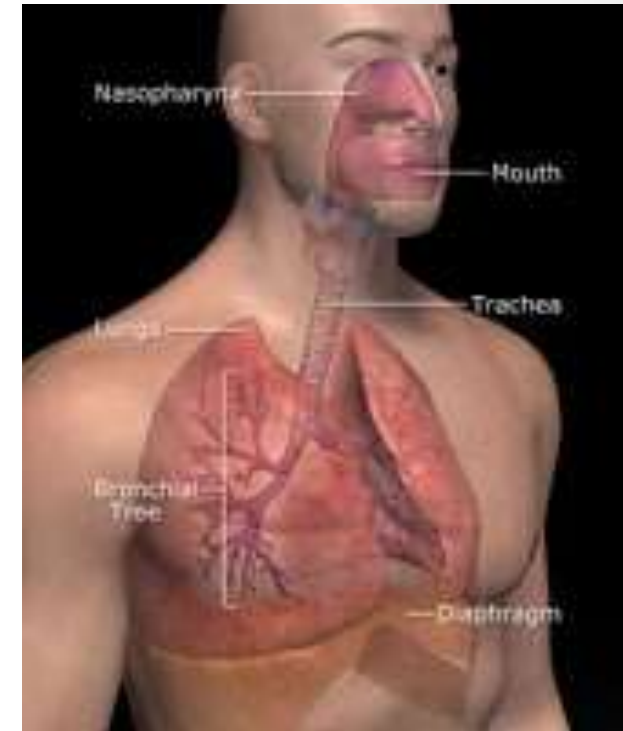


# RESPIRATORY SYSTEM



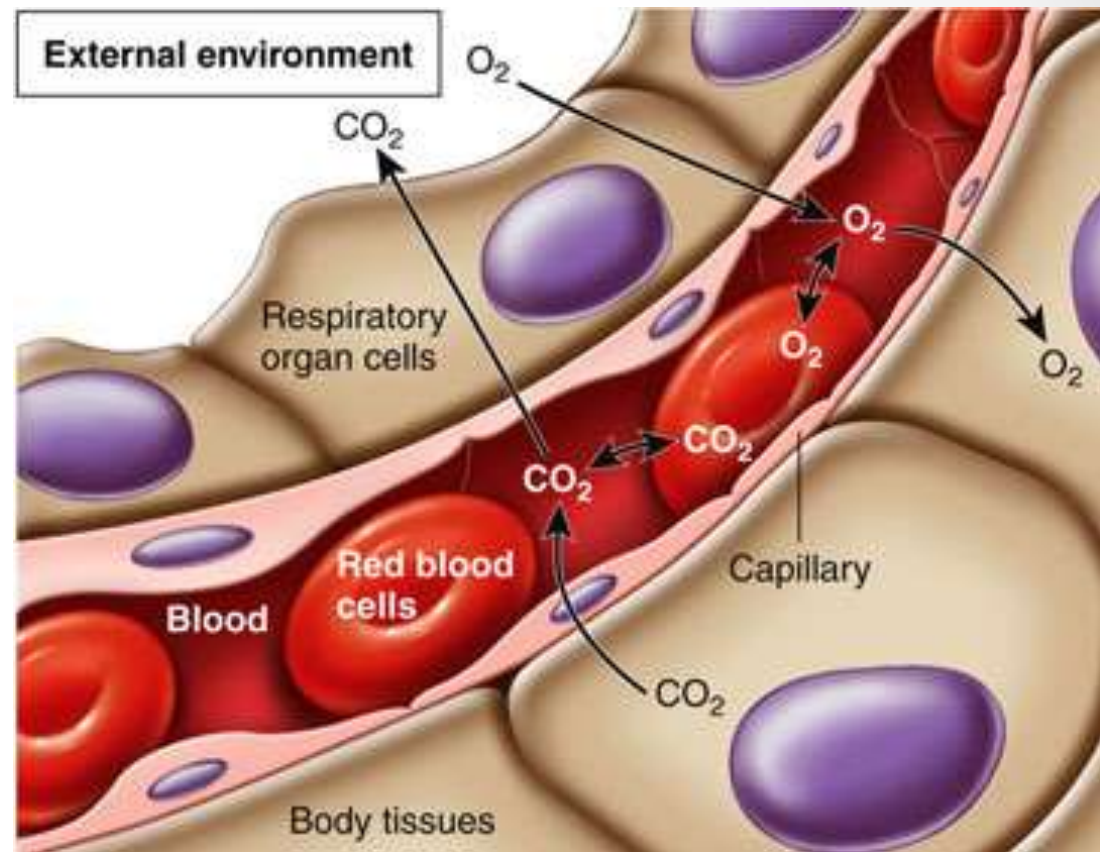
# Primary Functions

- Gas Exchange (oxygen and CO<sub>2</sub>)
- Voice Production
- Olfaction - Sense of smell
- Control blood pH (using CO<sub>2</sub>)



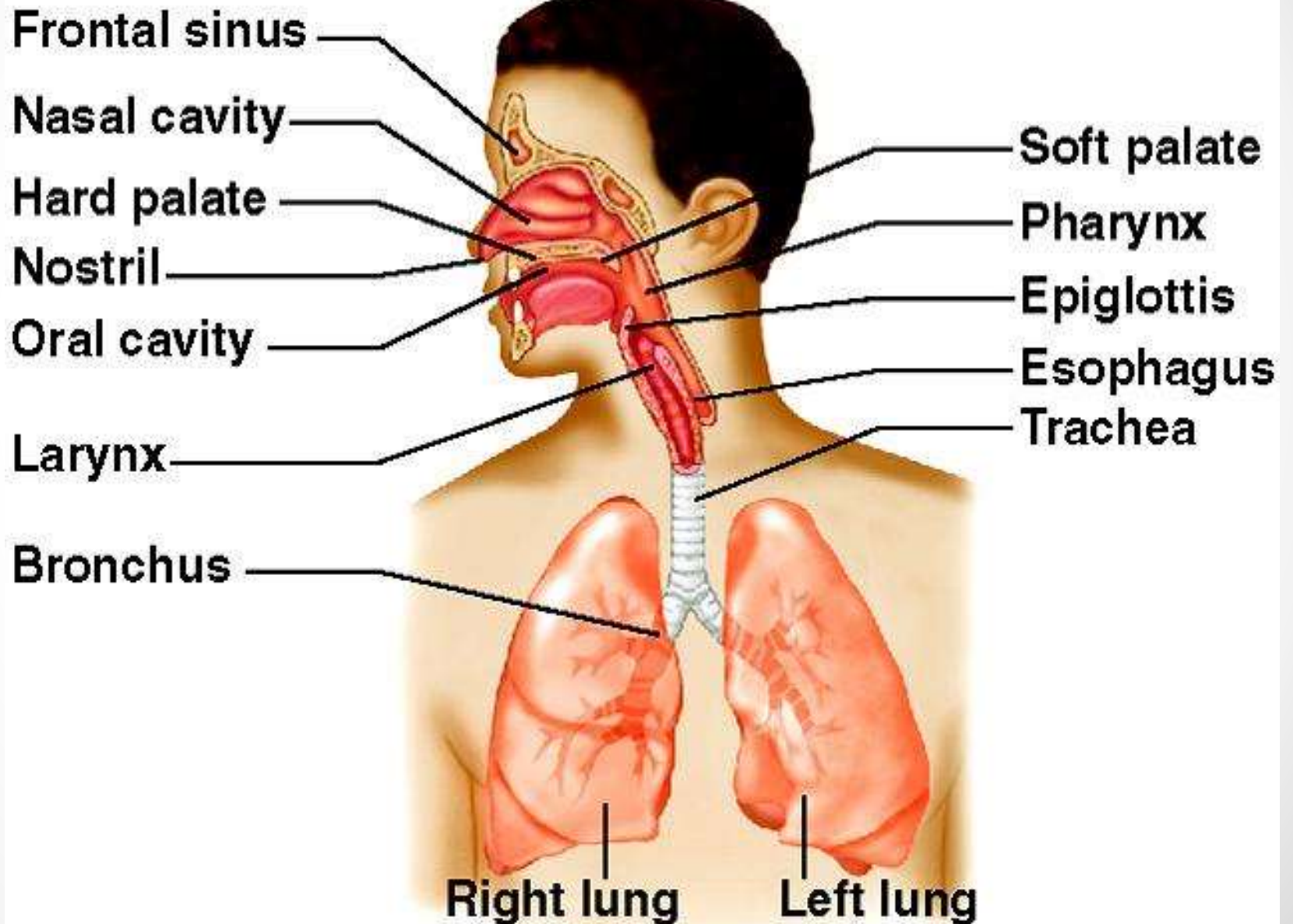
# Gas Exchange – Main Steps

- Move air into lungs
- External respiration – exchange  $O_2$  &  $CO_2$  with blood and air
- Move gases through blood flow
- Internal respiration – exchange  $O_2$  &  $CO_2$  with body cells and blood



# The Big Picture

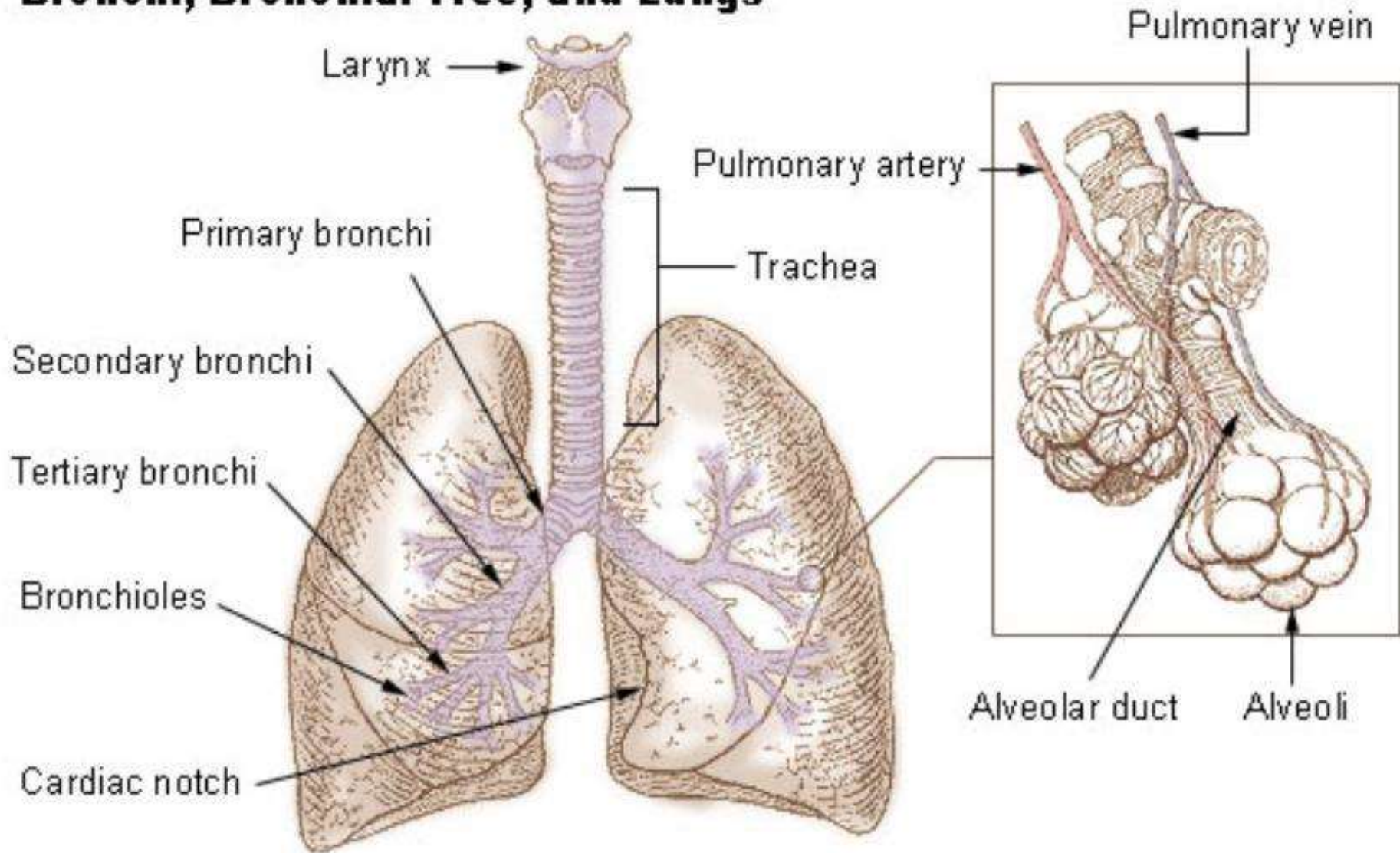
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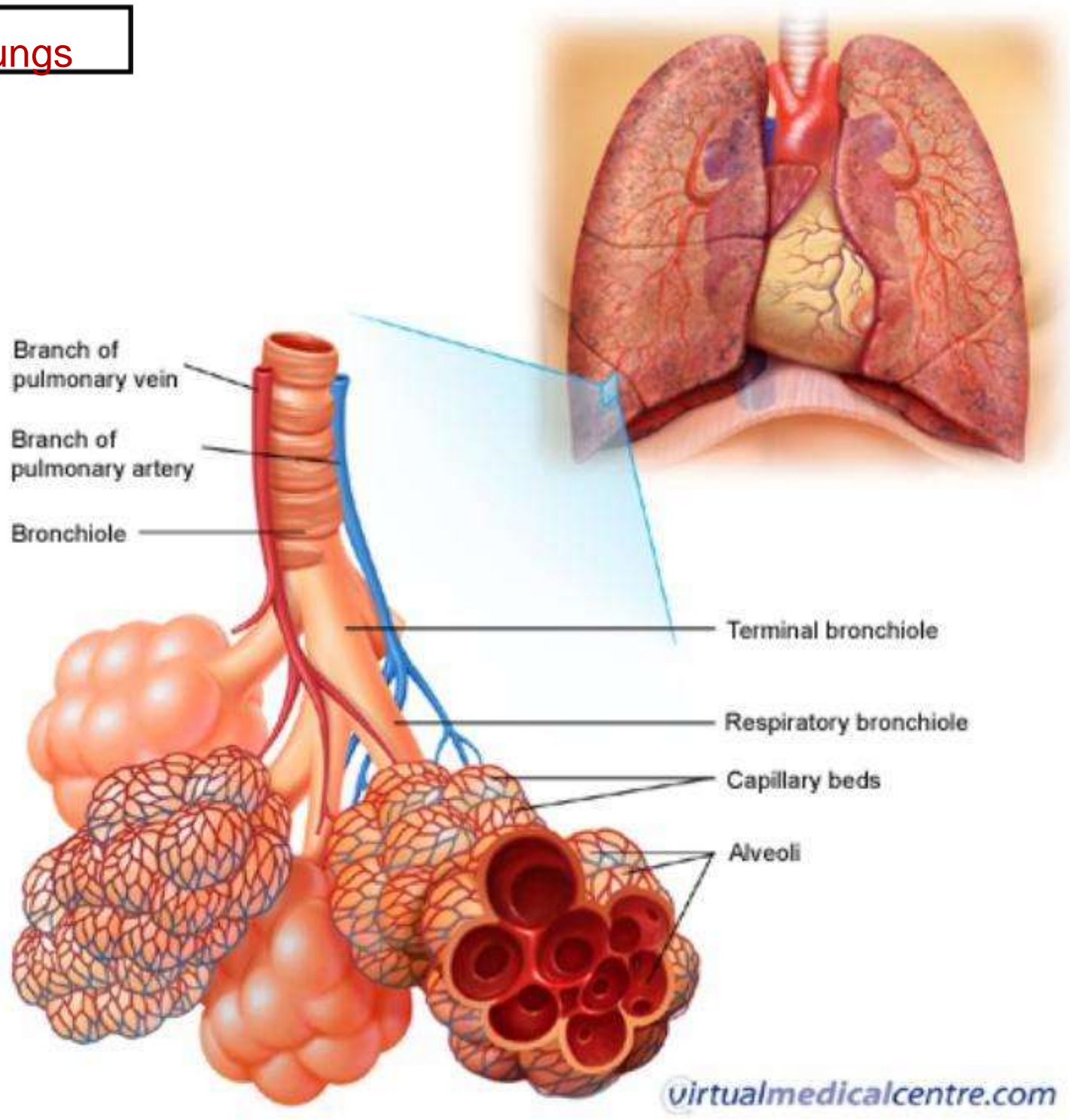


The Main Players: Trachea > Primary bronchi--> bronchioles --> alveolar ducts --> alveoli

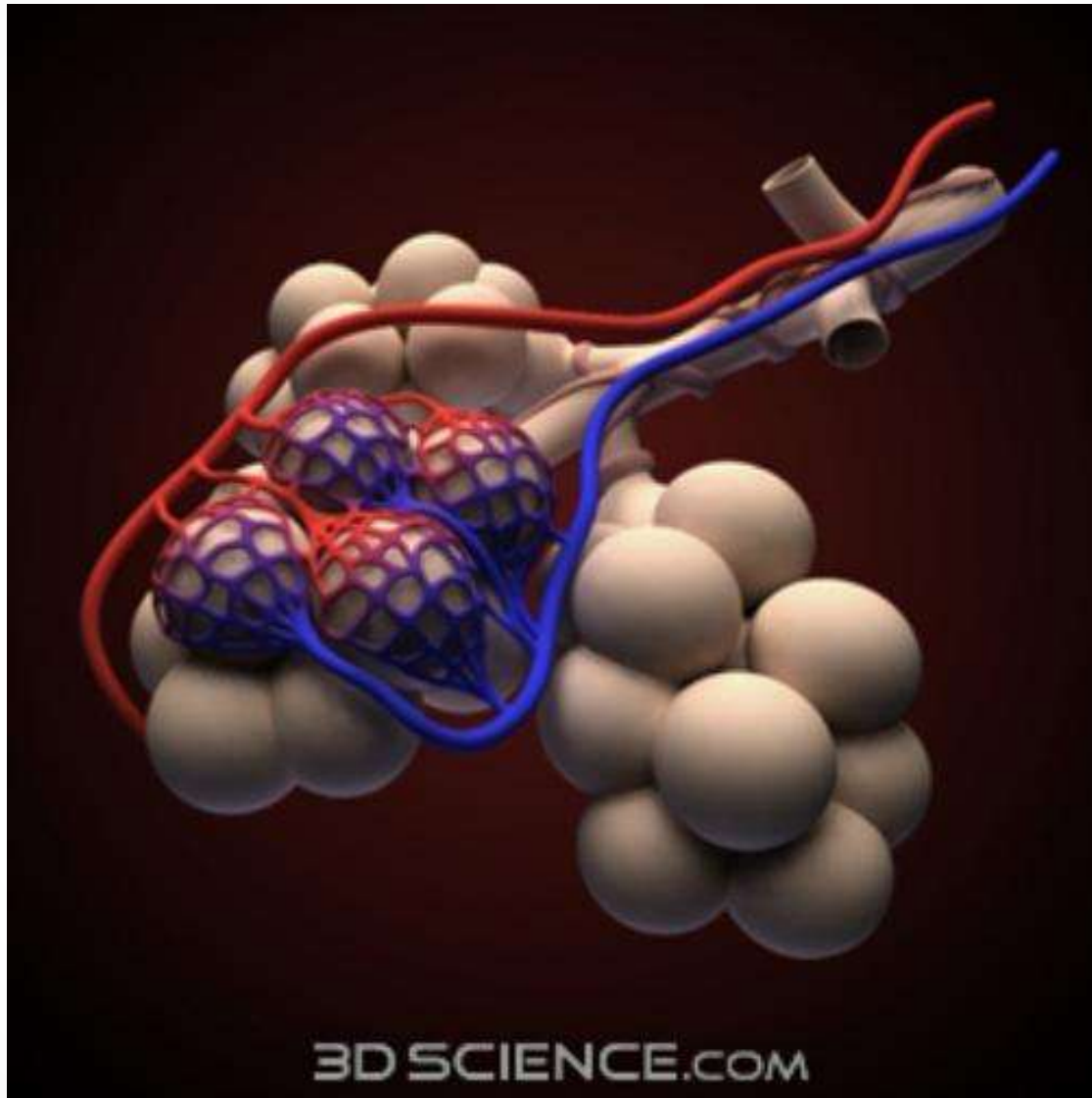
### Bronchi, Bronchial Tree, and Lungs



# Alveoli & Lungs

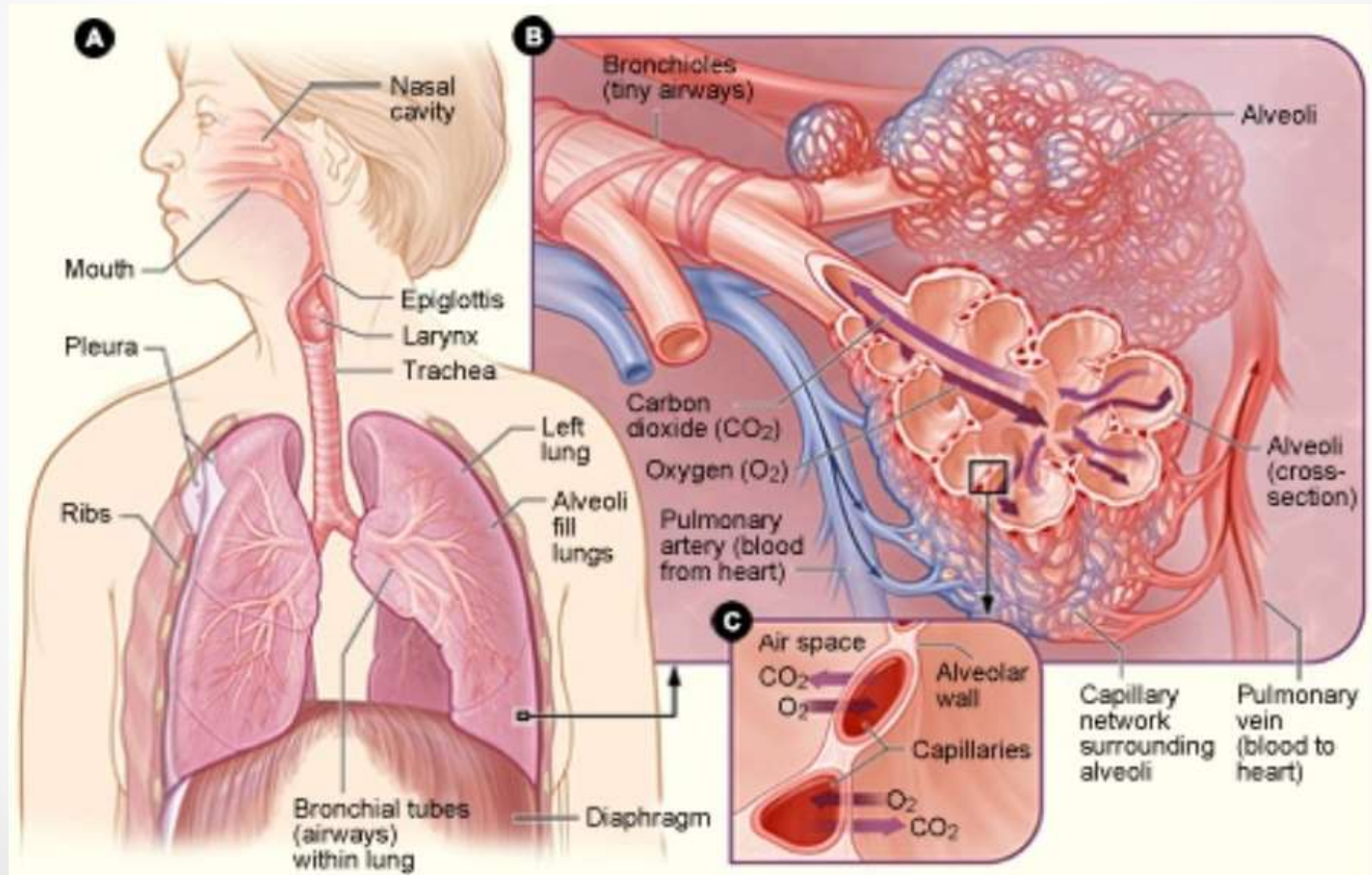


# ALVEOLI





# LUNGS - spongy tissue that sit within the pleural cavity

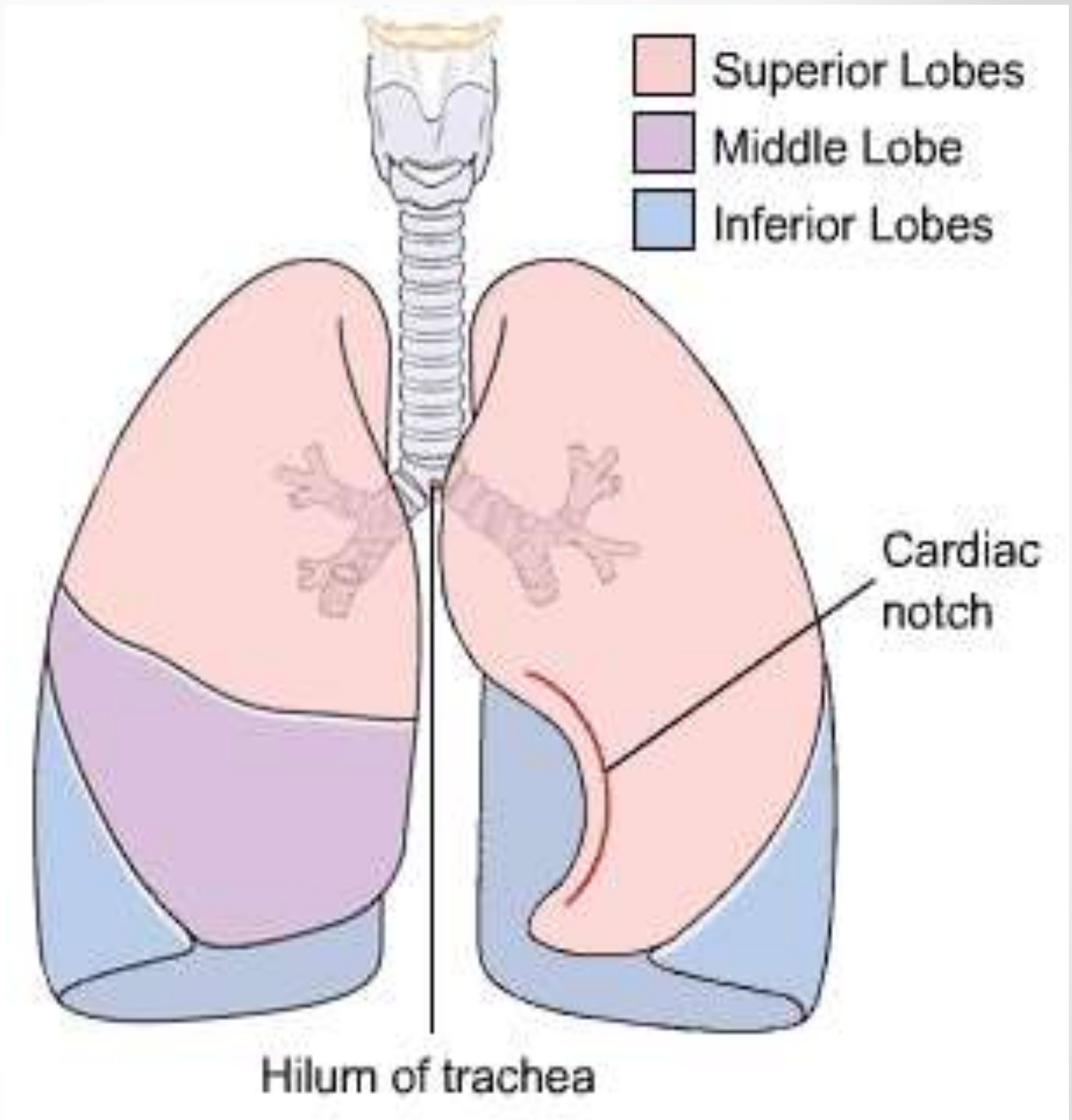




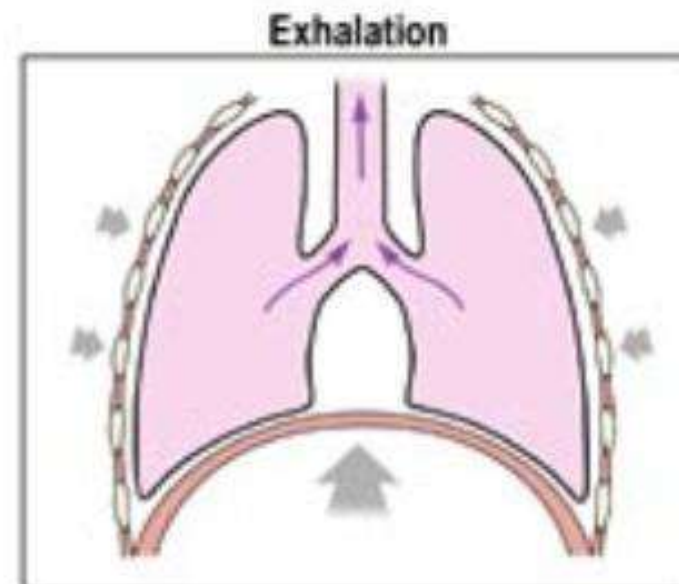
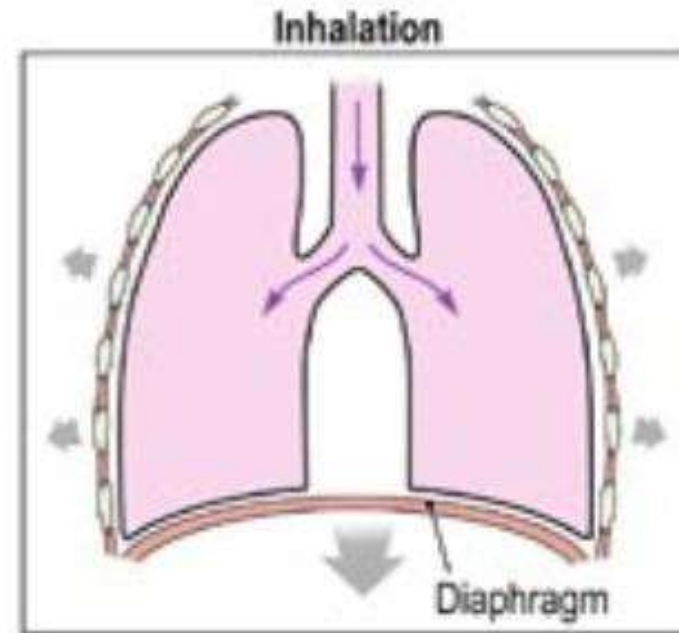
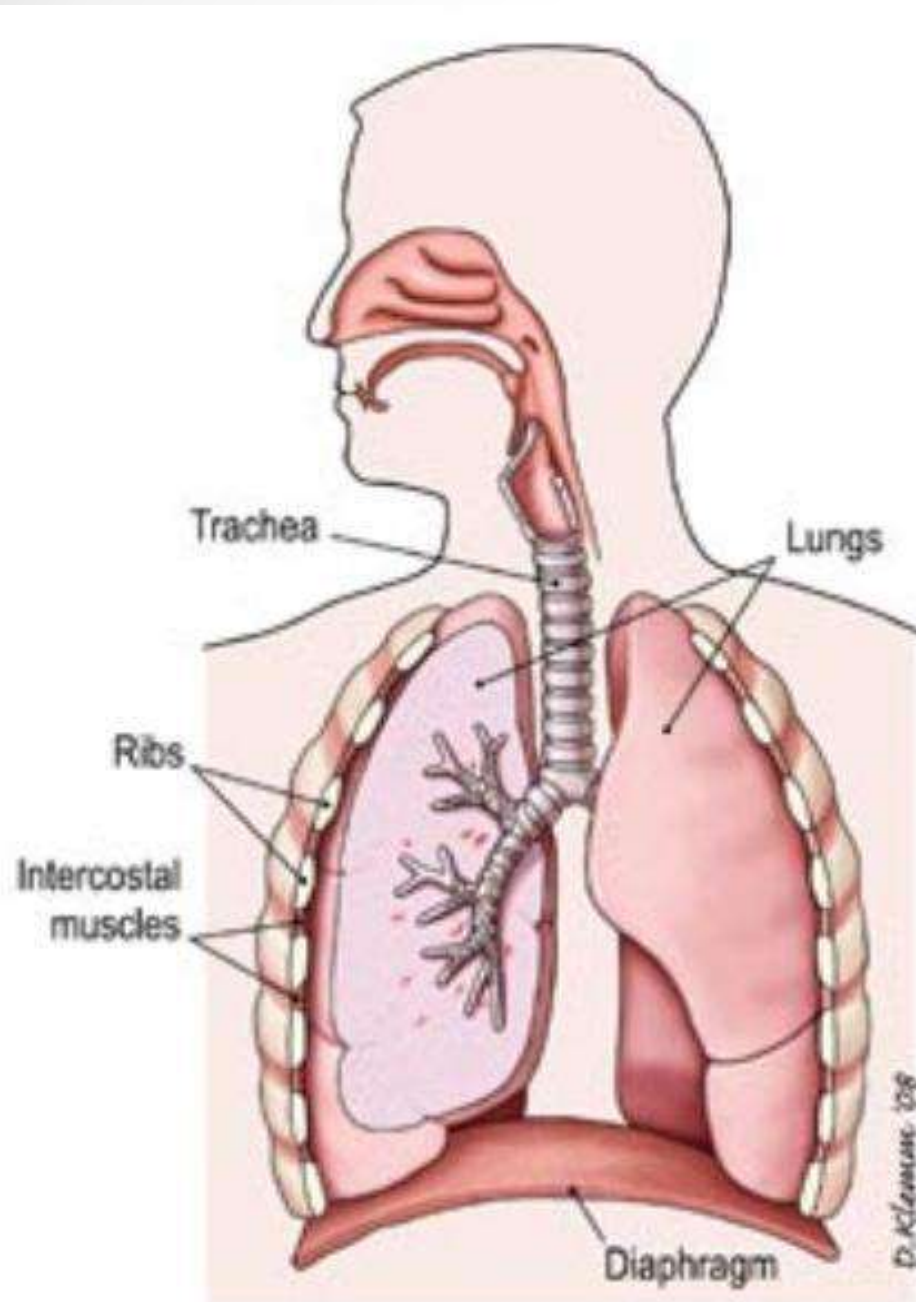
Right Lung  
= 3 lobes

Left Lung  
= 2 lobes

Serous fluid  
lubricates lungs  
during breathing



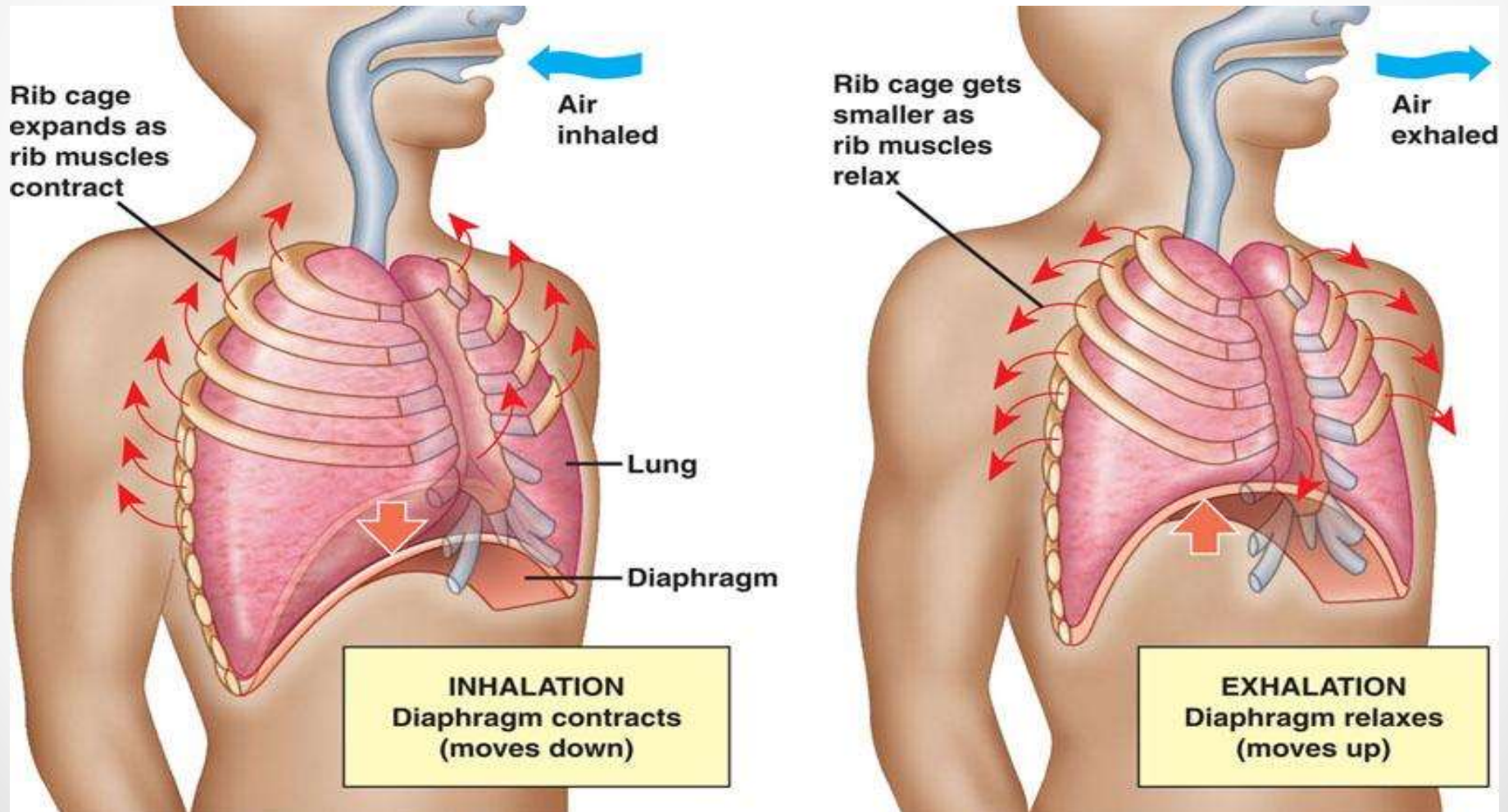
# BREATHING MECHANISM



# EXHALATION

As the diaphragm and other muscles relax, ELASTIC RECOIL from surface tension forces air out.

Muscles can force extra air out or in





1. Diaphragm moves down, forcing air into airways
2. Intercostals contract, enlarging cavity even more
3. Membranes move with the contractions
4. Surface tension in alveoli and surfactant keep them from collapsing
5. Other muscles (pectoralis minor and sternocleidomastoid) can force a deeper breath
6. The first breath in newborns is the hardest due to low surfactant



# NON RESPIRATORY MOVEMENTS

Coughing, sneezing,  
laughing, crying

Hiccup - spasm of the  
diaphragm

Yawn - possibly causes by  
low oxygen levels



**Resting Tidal Volume** -  
amount of air that enters  
the lungs during one cycle

\*take a normal breath



**Reserve volumes** - air that can be  
forced out or in

\*inhale normally, pause, and try to  
inhale more - that is your reserve  
inspiratory volume

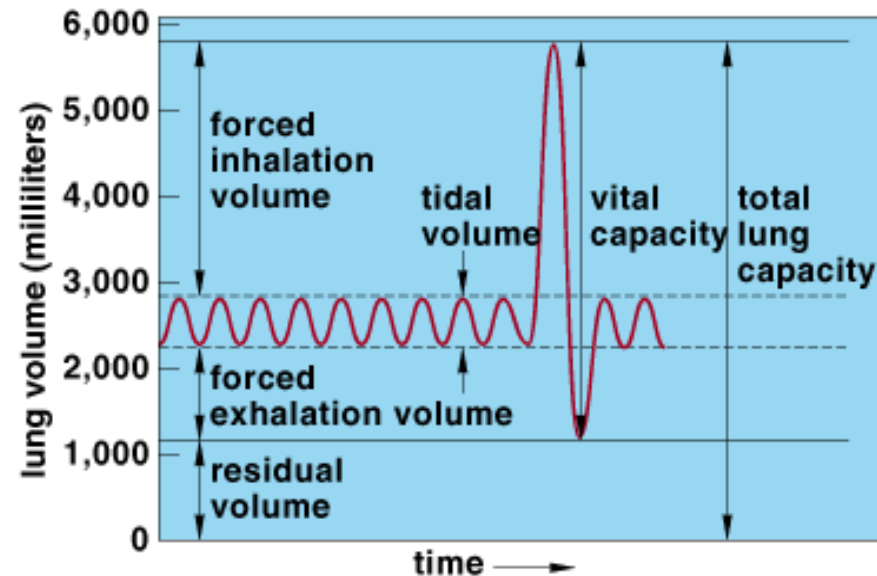


**VITAL CAPACITY** = Insp reserve + Exp reserve + Tidal Volume

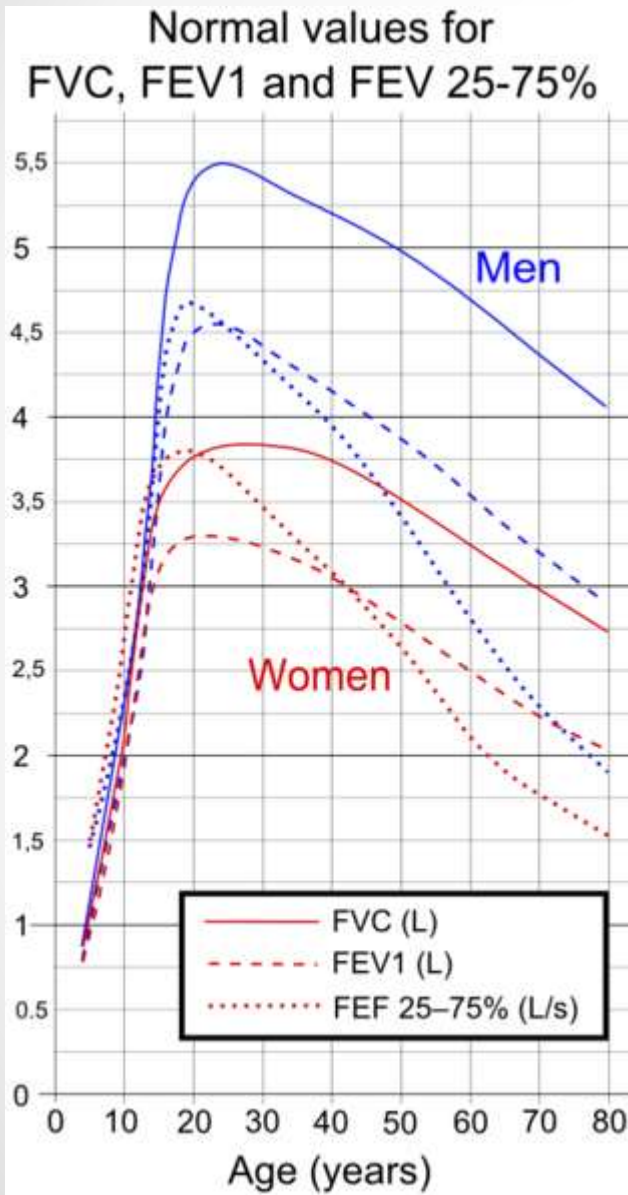
**INSPIRATORY CAPACITY** = Tidal Volume + Insp Reserve Volume

**FUNCTIONAL RESIDUAL CAPACITY** is the volume of air that remains in the lungs at rest

**TOTAL LUNG CAPACITY** varies by sex, age, body size, athletics



# Normal Lung Capacities

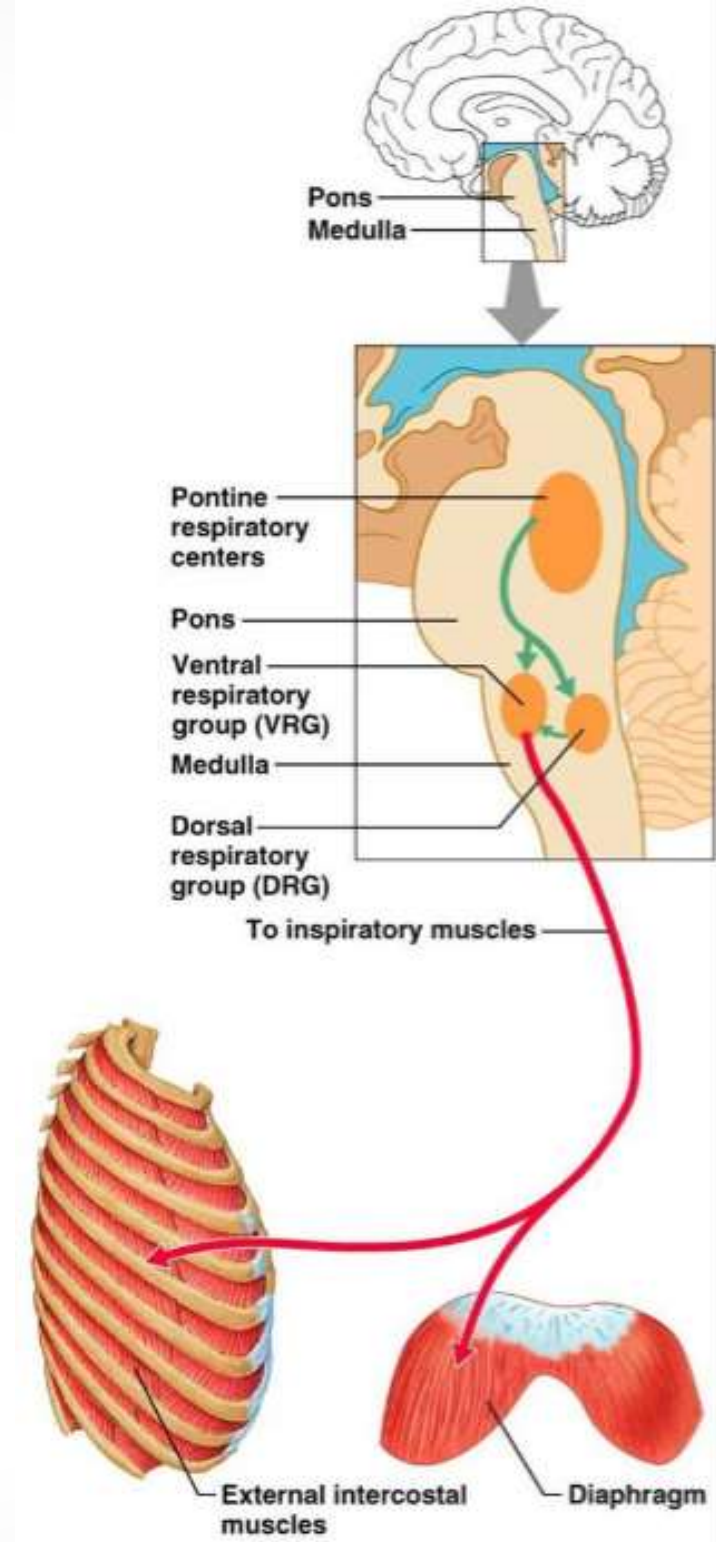


Measurement	Approximate value	
	Male	Female
Forced vital capacity (FVC)	4.8 L	3.7 L
Tidal volume (Vt)	500 mL	390 mL
Total lung capacity (TLC)	6.0 L	4.7 L

Breathing is involuntary, but muscles are under voluntary control

Respiratory Center – groups of neurons in the brain that control inspiration and expiration

(based in the medulla and the pons)





# Factors Affecting Breathing

\*Chemosensitive areas – detect concentrations of chemicals like carbon dioxide and hydrogen

1. Rise in CO<sub>2</sub>
2. Low blood oxygen (peripheral chemoreceptors, carotid and aortic bodies, sense changes)
3. Inflation reflex – regulates the depth of breathing, prevents overinflation of the lungs
4. Emotional upset, fear and pain

