

Respiratory System

Organs and structures

DHO 7.10

CREATED BY A. BERRYHILL & D. CASHION

Respiratory System

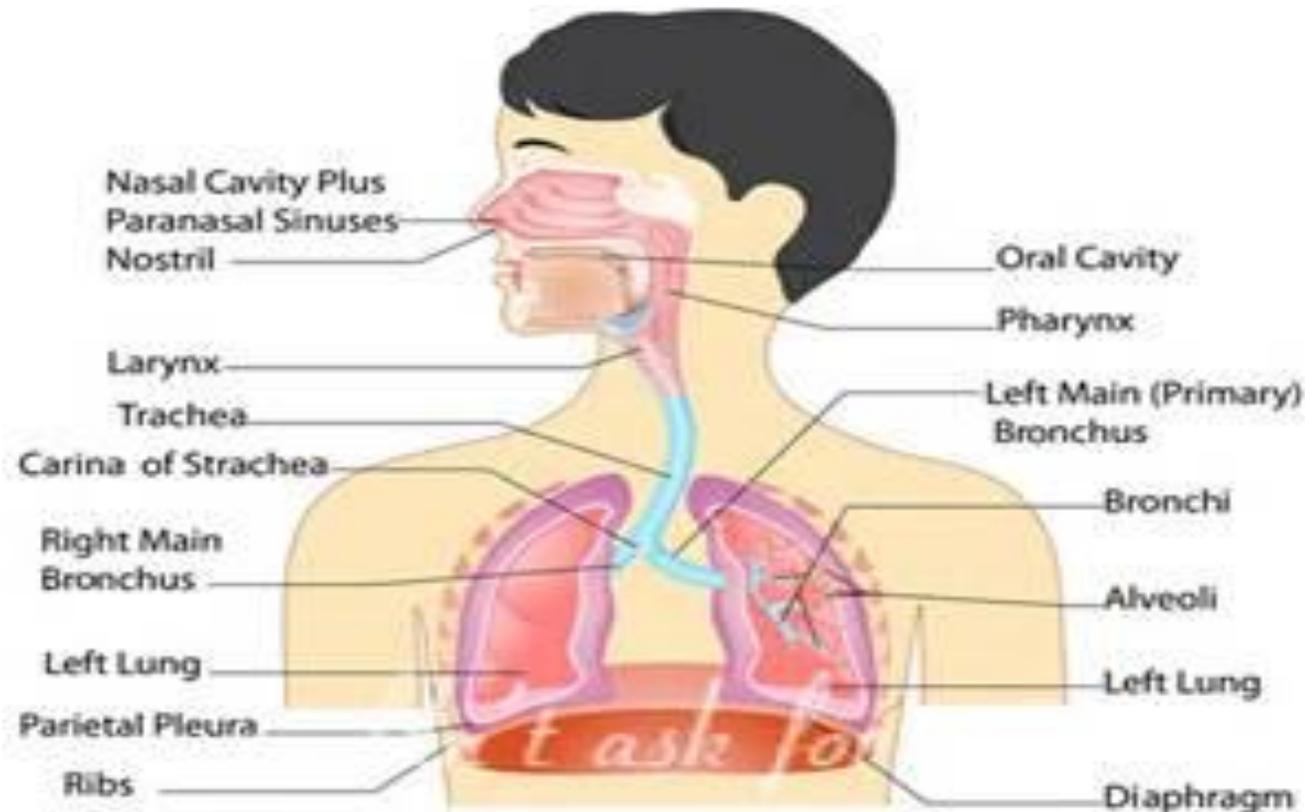
DHO 7.10, pg 197

- Resp system made up of lungs & air passages
- Functions of resp system=taking in O₂, removing CO₂
- O₂=gas needed by all body cells
- CO₂=gas that is a metabolic waste product produced by cells when they convert food into energy



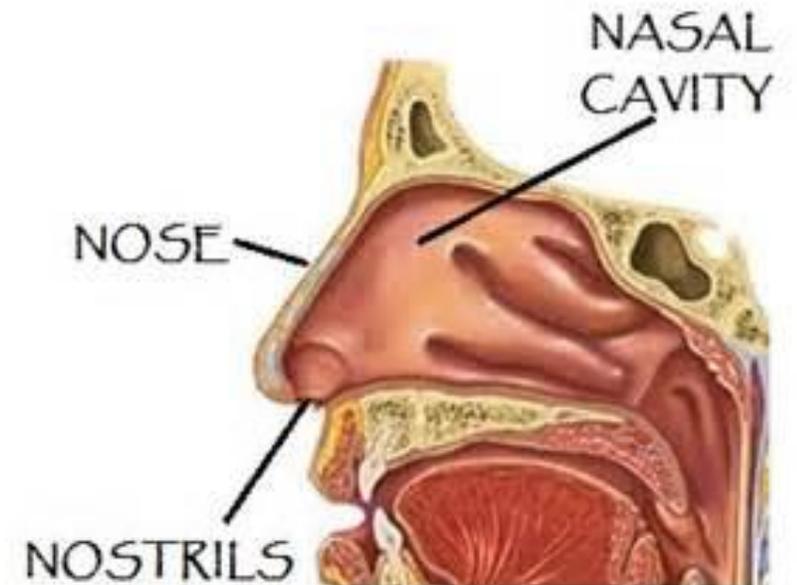
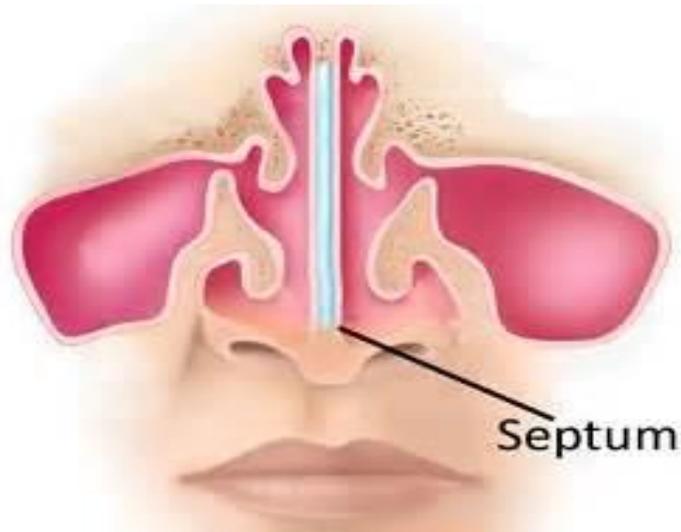
Respiratory System

- Body has 4-6 minute supply of O₂ so resp system works continuously to prevent death
- Parts of resp system: nose, pharynx, larynx, trachea, bronchi, alveoli, lungs



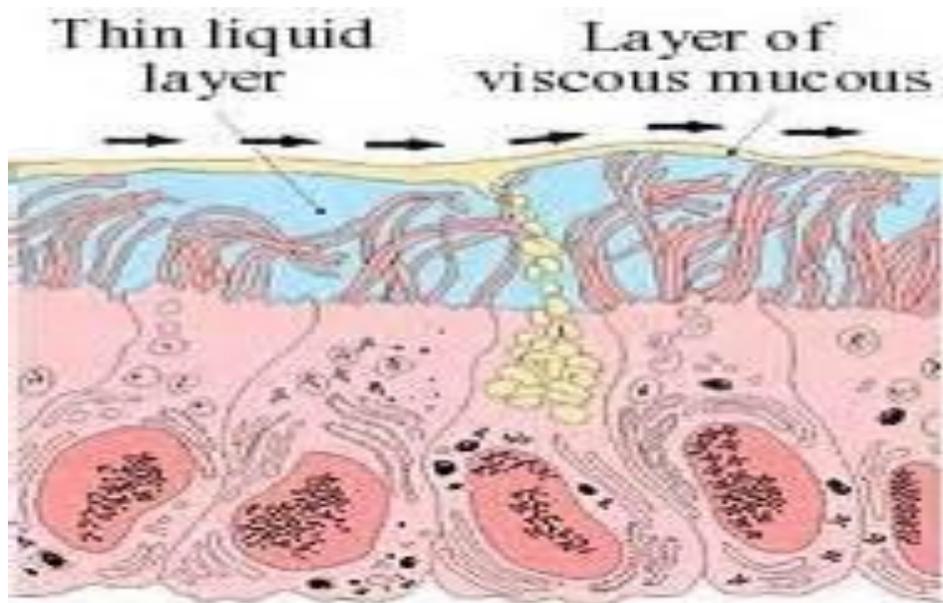
Nose

- Nostrils (nares)=2 openings through which air enters
- Nasal septum=wall of cartilage that divides the nose into 2 hollow spaces
- Nasal cavities=hollow spaces, lined with mucous membrane & have rich blood supply
 - As air enters cavities it is warmed, filtered, & moistened
 - Mucus moistens the air & helps trap pathogens & dirt



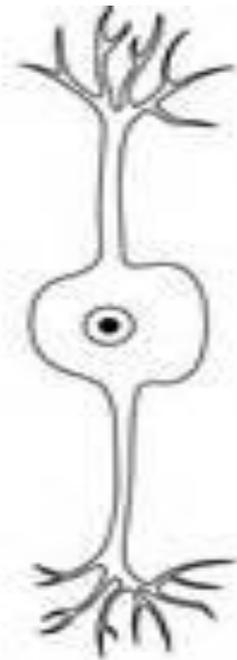
Nose

- Cilia=tiny hairlike structures in nasal cavities that filter air to trap dust & other particles
 - They help move the mucous layer lining the airway to push trapped particles toward the esophagus where they can be swallowed



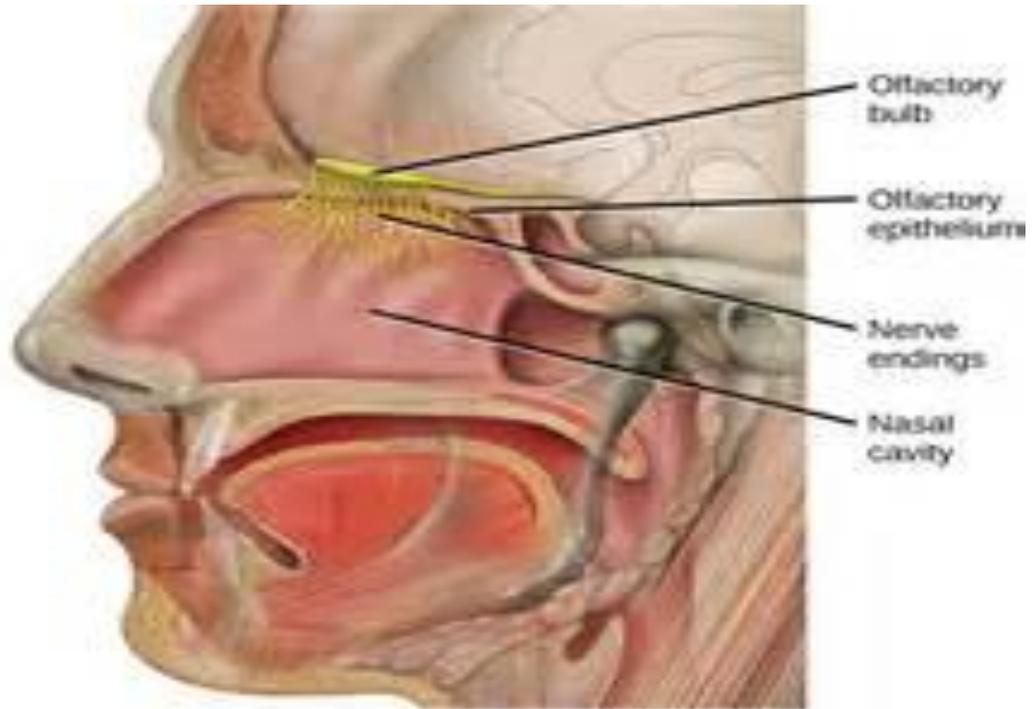
Nose

- Olfactory receptors=provide for the sense of smell



Bipolar neuron

(a)

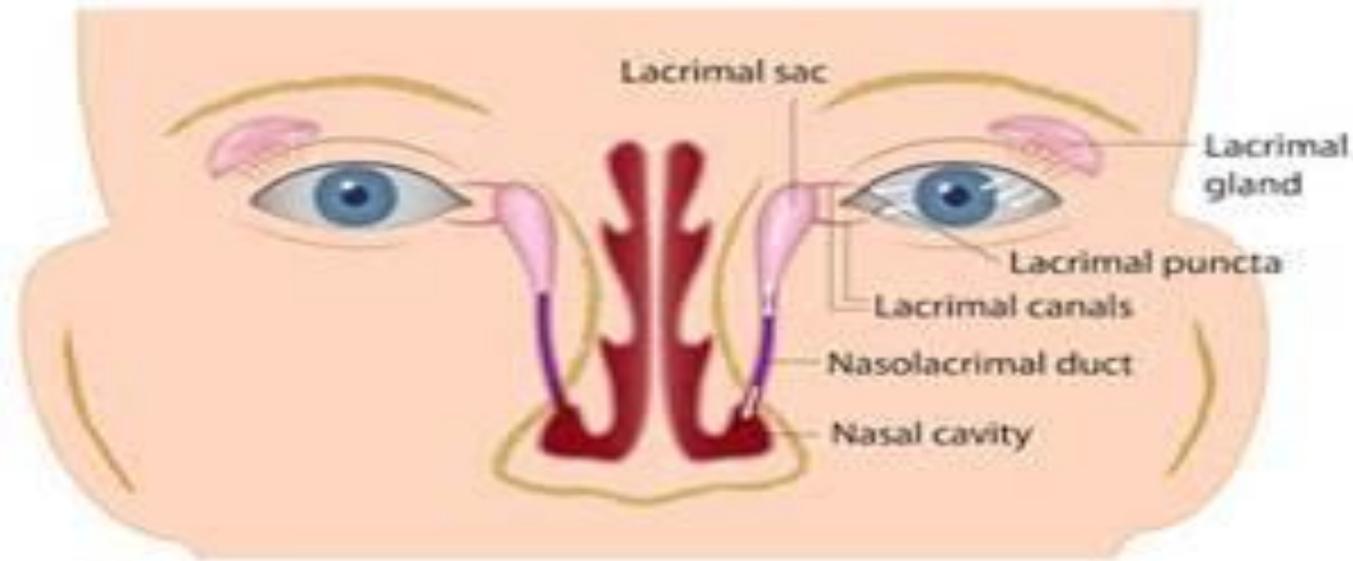


(b)

Nose

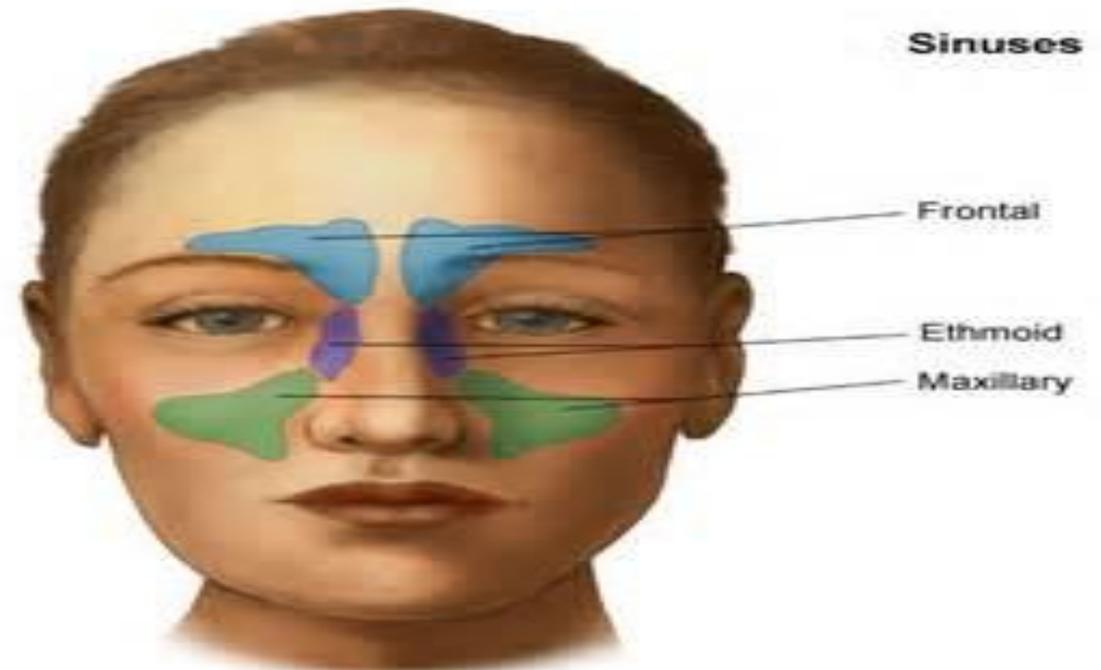
- Nasolacrimal ducts=drain tears from eye into nose to provide additional moisture for the air

The Lacrimal Apparatus



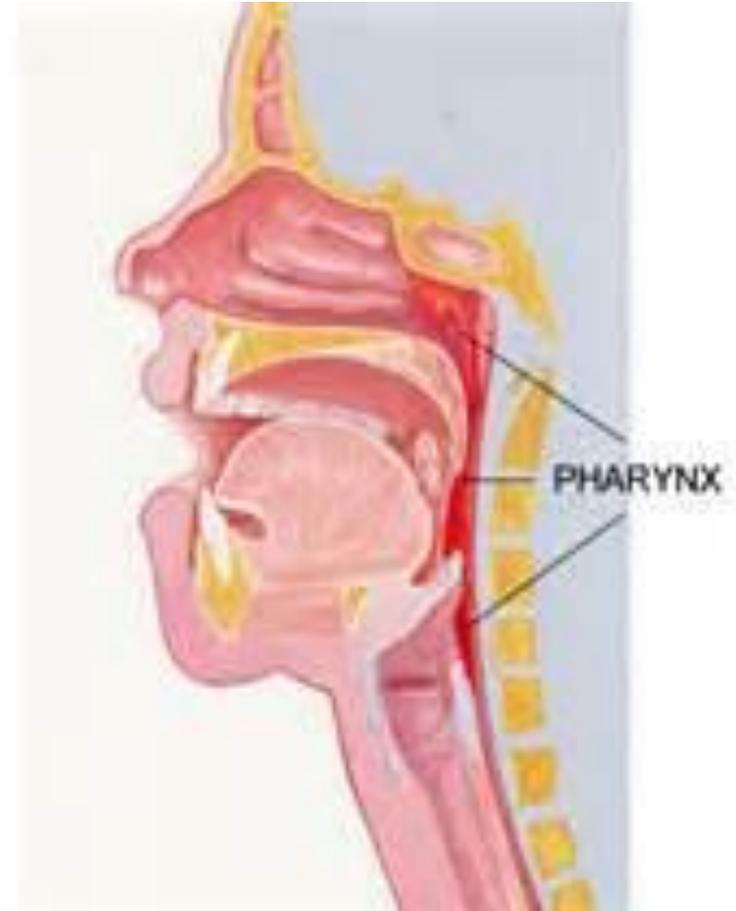
Nose

- Sinuses=cavities in skull that surround nasal area
 - Connected to nasal cavity by short ducts
 - Lined with mucous membrane that warms & moistens air
 - Provide resonance for voice (vibration for sound)



Pharynx

- AKA throat
- Lies behind nasal cavities
- As air leaves nose it enters pharynx
- Divided into 3 sections:
nasopharynx
oropharynx
laryngopharynx

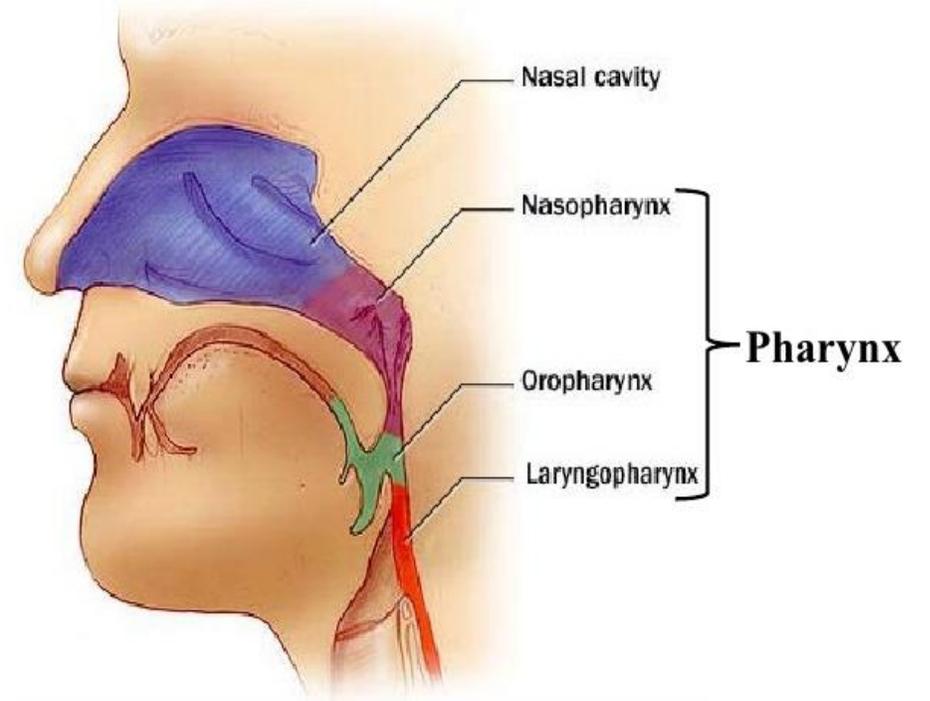


Pharynx

Nasopharynx:

- Upper portion of pharynx
- Located behind nasal cavities
- Contains pharyngeal tonsils (adenoids)
- Contains eustachian tube openings

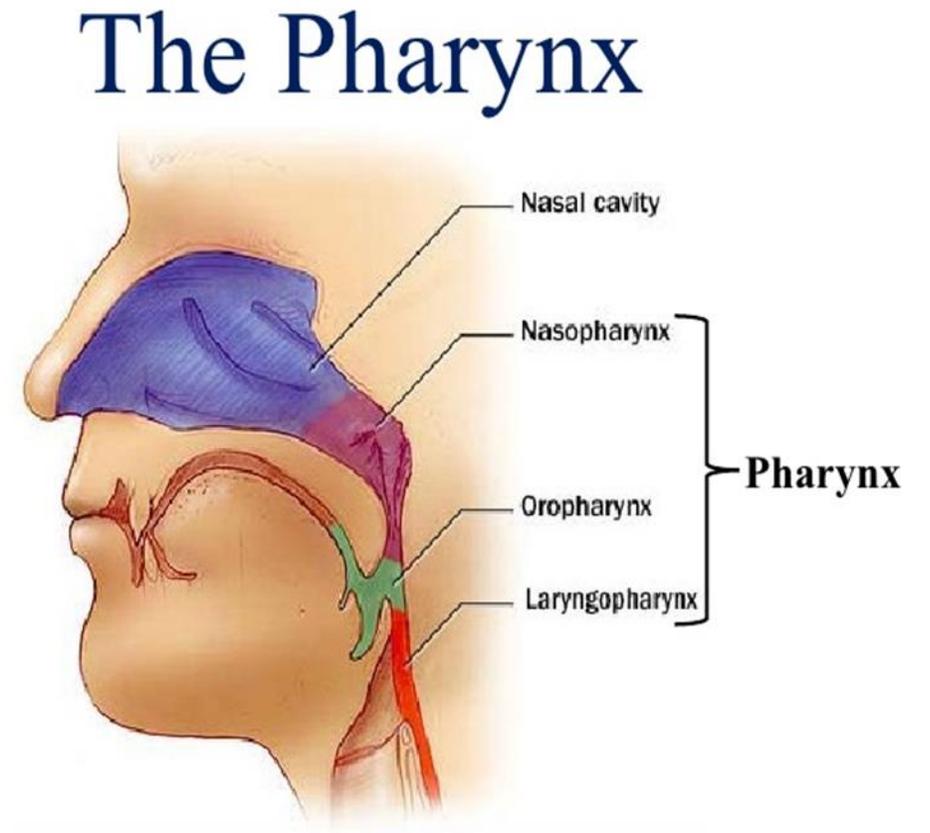
The Pharynx



Pharynx

Oropharynx:

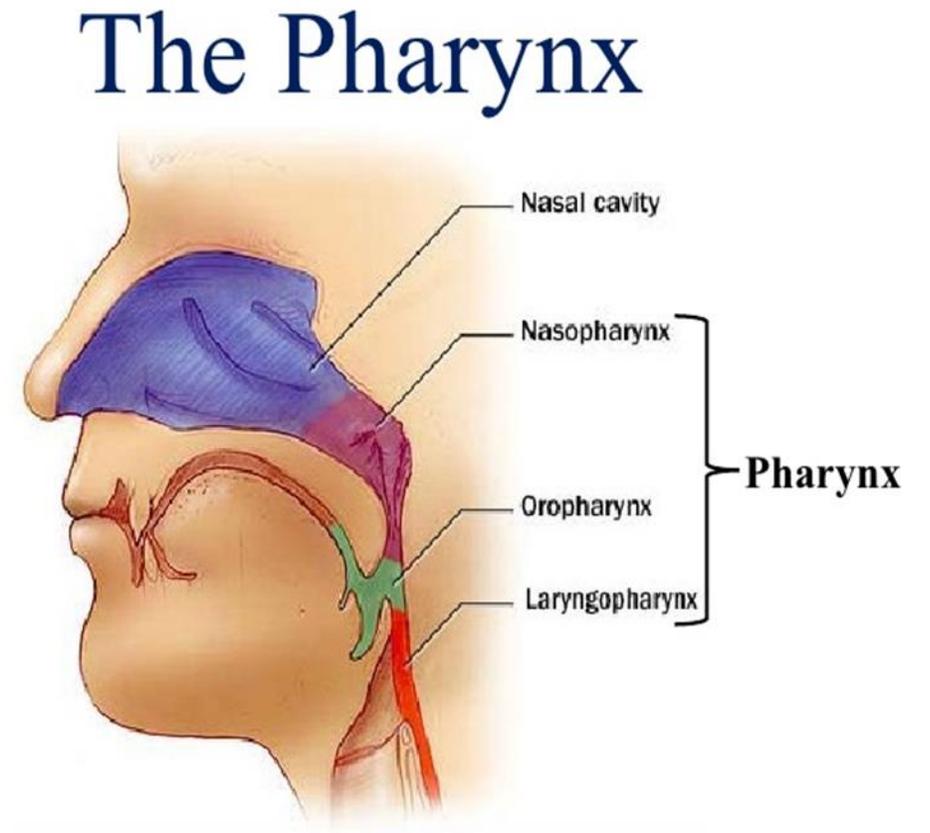
- Middle portion of pharynx
- Located behind oral cavity
- Receives air from nasopharynx
- Receives air & food from mouth



Pharynx

Laryngopharynx:

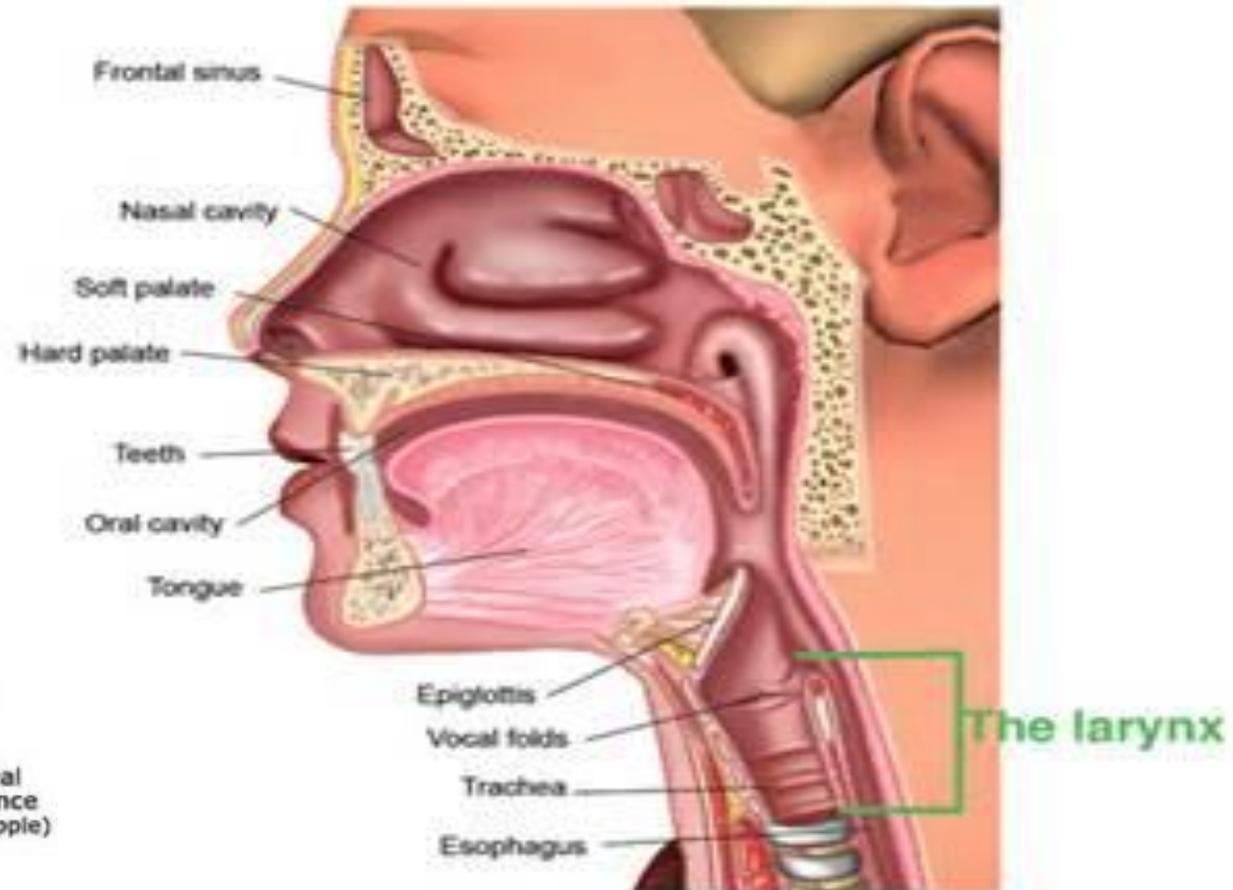
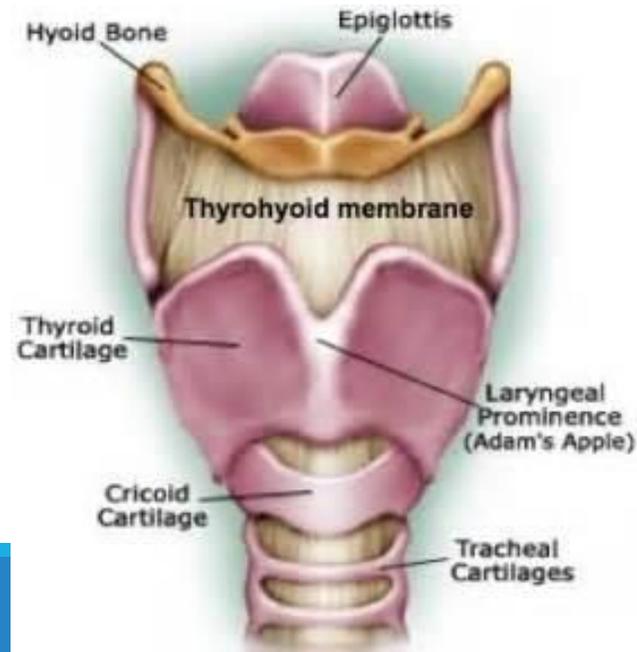
- Bottom section of pharynx
- Esophagus & trachea branch off here



Larynx

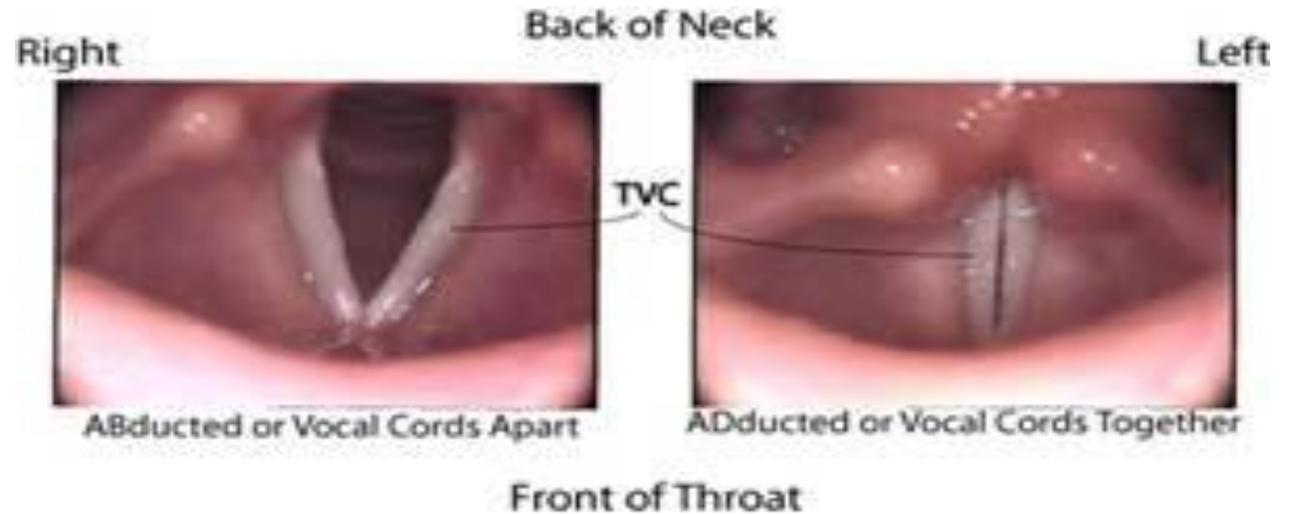
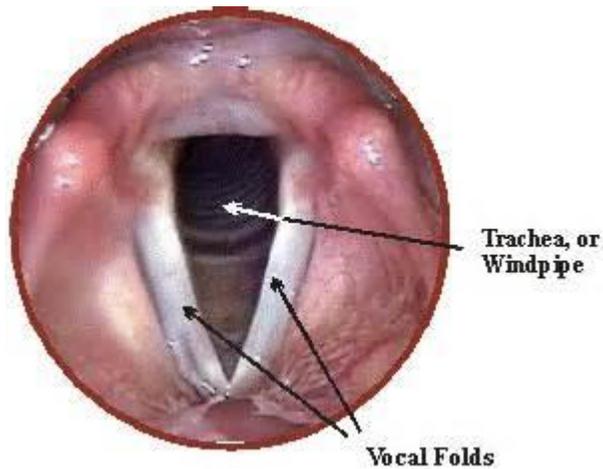
- AKA voice box
- Lies between pharynx and trachea
- Has 9 layers of cartilage
- Largest cartilage (thyroid cartilage)

AKA Adam's apple



Larynx

- Contains 2 folds=vocal cords
- Glottis=opening between vocal cords
- Vocal cords vibrate & produce sound when air leaves the lungs
- Tongue & lips act on the sound to produce speech



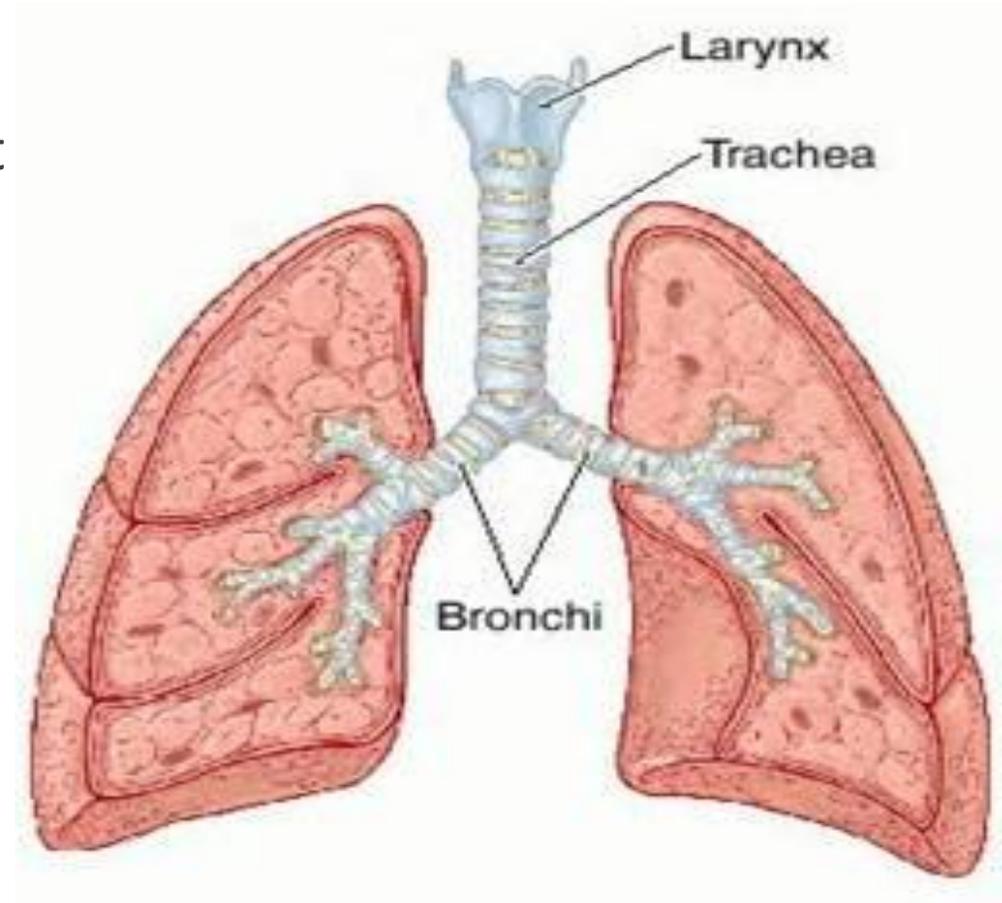
Larynx

- Epiglottis=leaflike piece of cartilage that closes the opening into the larynx during swallowing to prevent food & liquids from entering resp tract



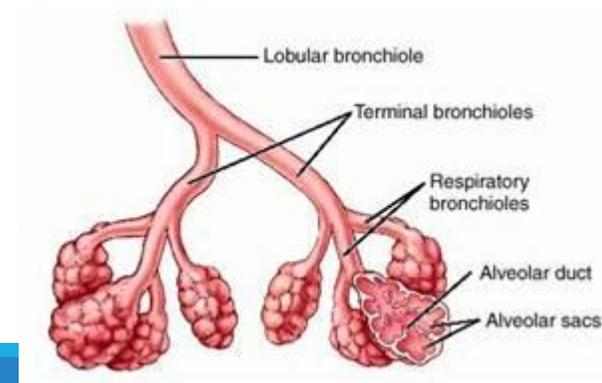
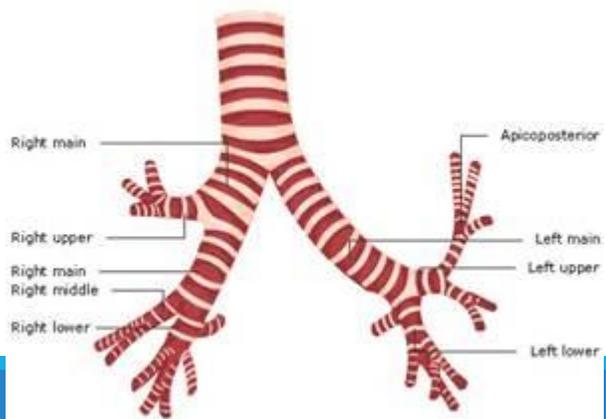
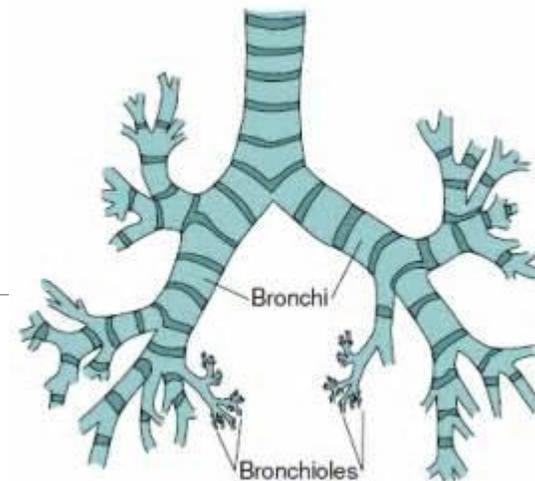
Trachea

- AKA windpipe
- Tube that extends from larynx to center of chest
- Carries air between pharynx and bronchi
- Series of C-shaped cartilages (which are open on dorsal surfaces) help keep trachea open



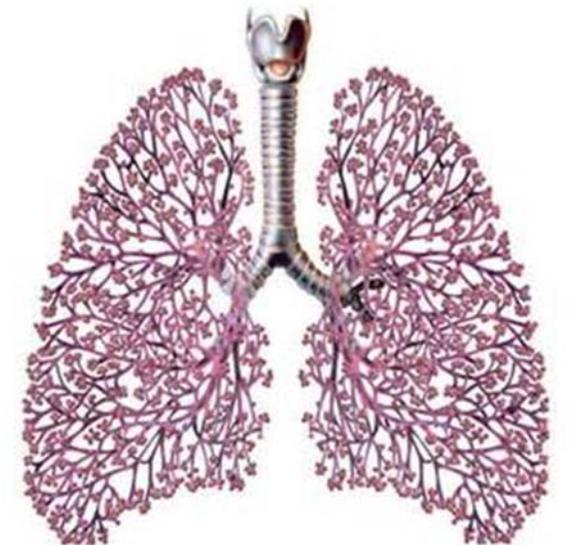
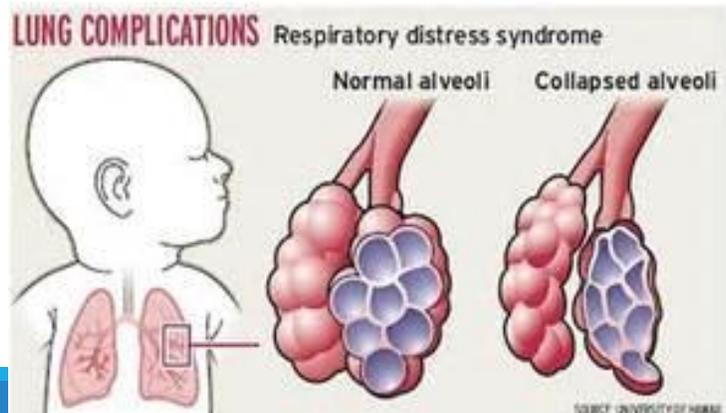
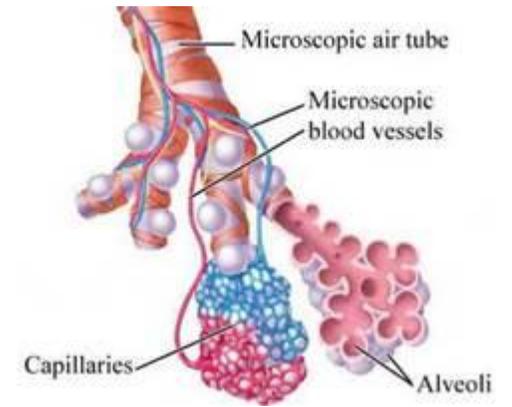
Bronchi

- Right and Left bronchus branch from the trachea near the center of the chest
- Right bronchus is shorter, wider, and extends more vertically than left
- Each bronchus enters a lung and carries air from trachea to lung
- Each bronchus continues to divide into smaller and smaller bronchi in the lungs
- Smallest branches of the bronchi are bronchioles
- Smallest bronchioles called terminal bronchioles end in air sacs (alveoli)



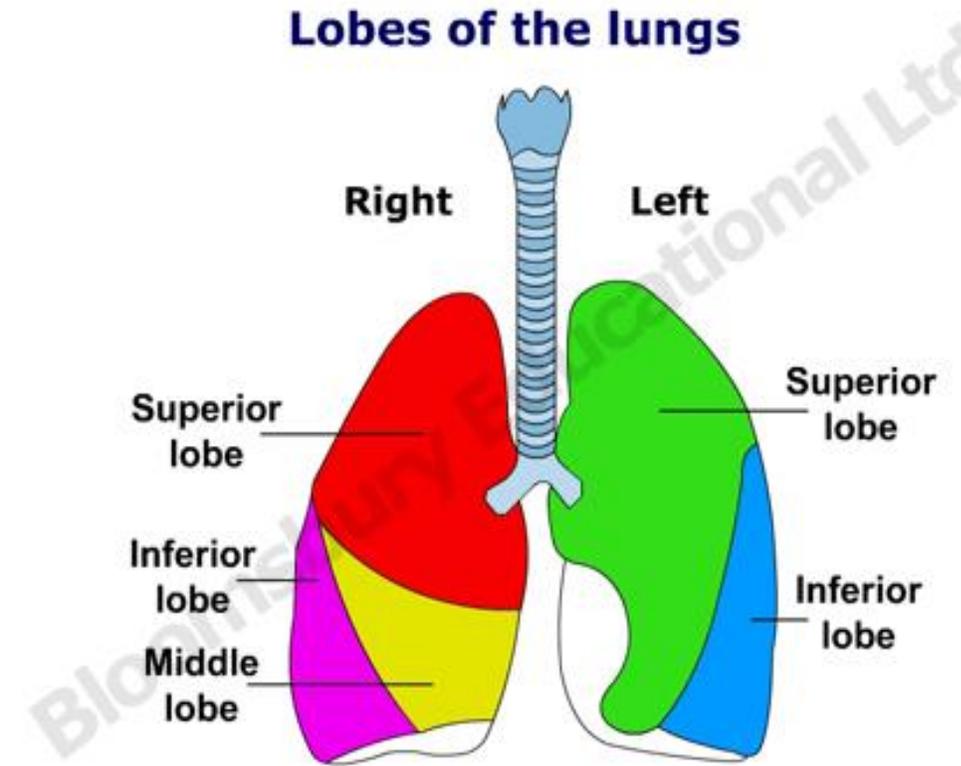
Alveoli

- Alveoli resemble bunch of grapes
- Adult lung has about 500 million alveoli
- Made up of one layer of squamous epithelial tissue and network of blood capillaries
- Capillaries allow O₂ and CO₂ exchange between blood and lungs
- Inner surfaces are covered with lipid (fatty) substance called surfactant
- Surfactant helps prevent alveoli from collapsing



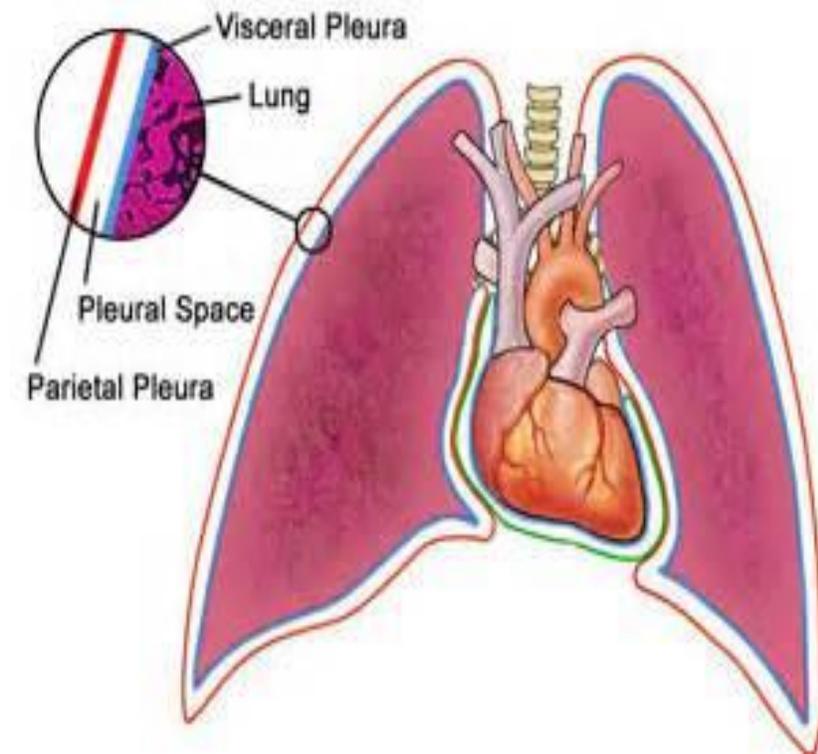
Lungs

- Located in thoracic cavity
- Right lung has 3 sections or lobes:
 - superior, middle, inferior
- Left lung has 2 sections or lobes:
 - superior, inferior
- Why does left lung only have 2 sections?
- The heart is located toward the left side of the chest



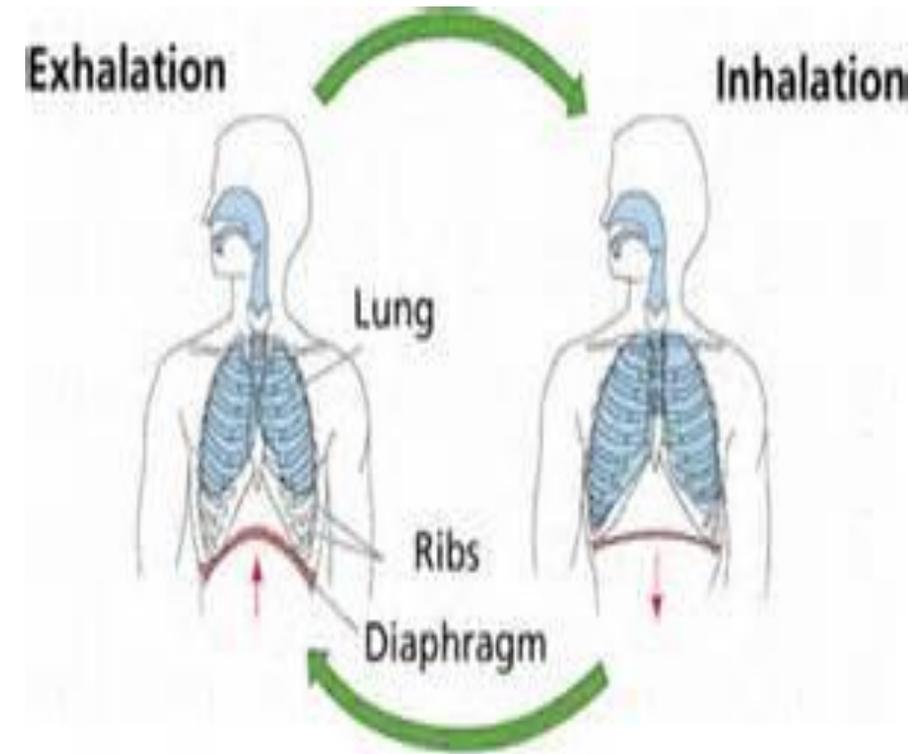
Pleura

- Each lung is enclosed in a membrane or sac called the pleura
- Pleura has 2 layers of serous membrane:
 - visceral and parietal
- Visceral pleura=attached to the surface of the lung
- Parietal pleura=attached to the chest wall
- Pleural space is located between the 2 layers and is filled with thin layer of pleural fluid
- Pleural fluid=lubricates the membranes & prevents friction as lungs expand during breathing

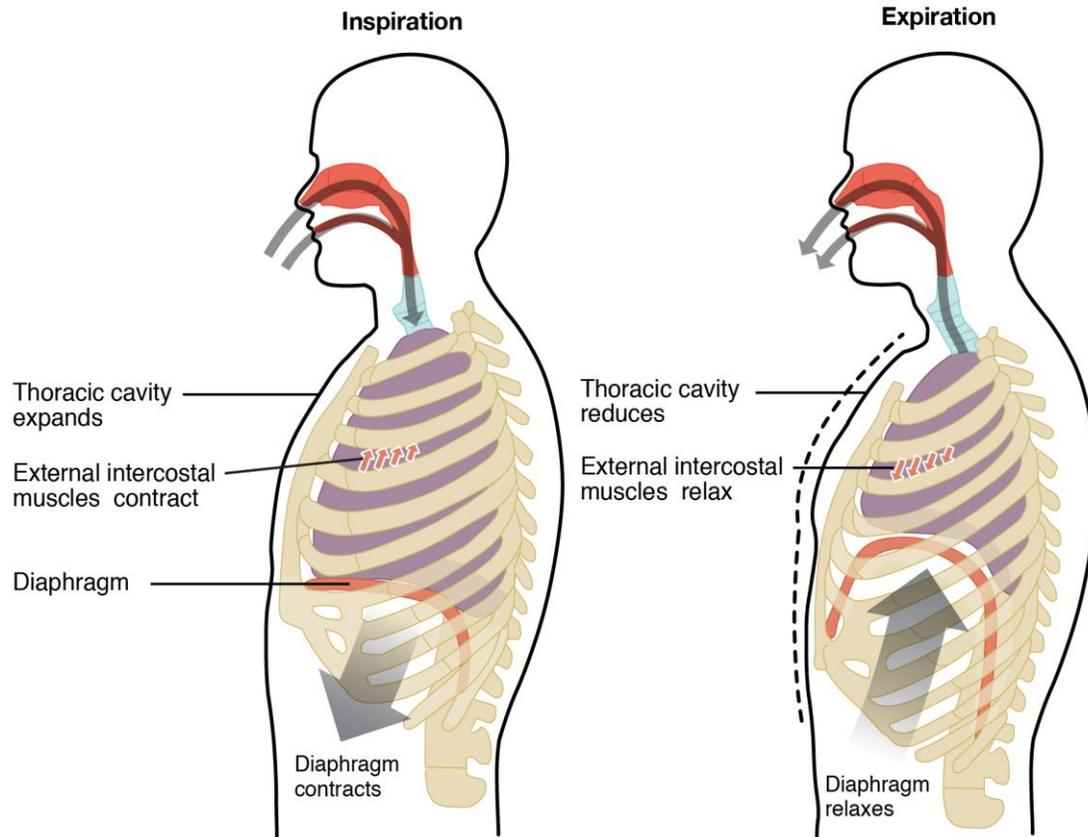


Process of Breathing, DHO 7.10, pg 199

- Ventilation=process of breathing
- Breathing is the physical process of moving air in and out of the lungs.
- Ventilation has 2 phases: inspiration and expiration
- Inspiration=inhalation; process of breathing air IN
- Expiration=exhalation; process of breathing OUT



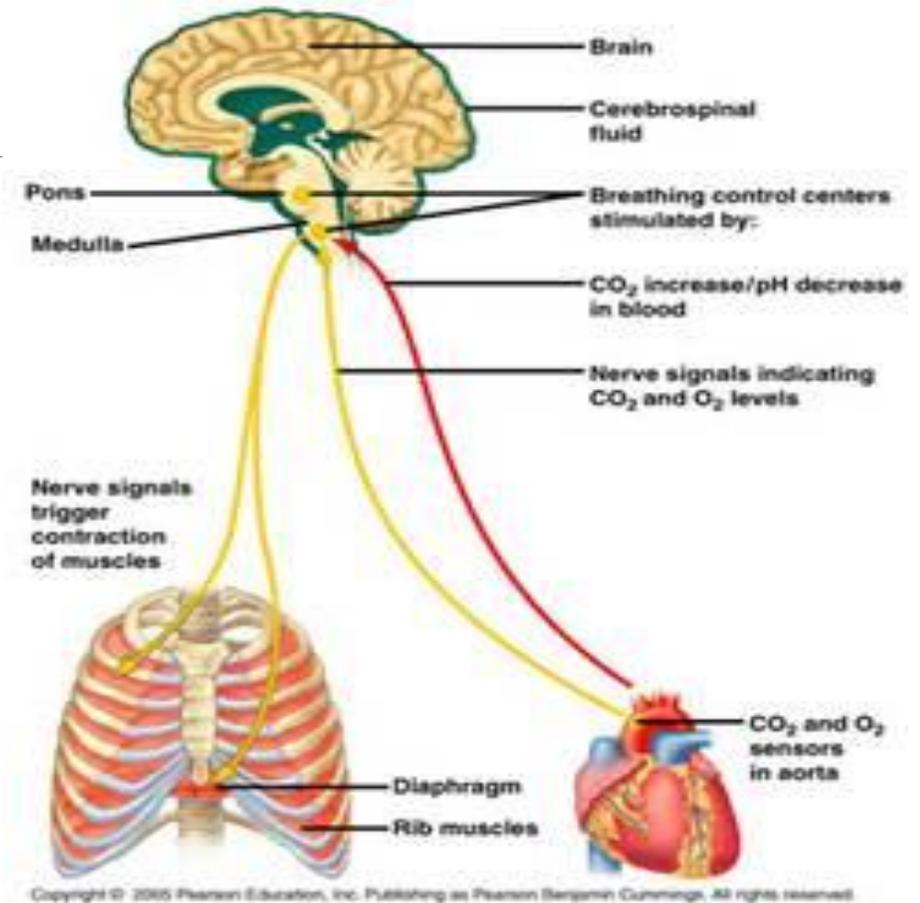
Inspiration & Expiration



- Diaphragm=dome-shaped muscle between thoracic and abdominal cavities
- For inspiration the diaphragm & intercostal muscles contract and enlarge the thoracic cavity to create a vacuum. Air rushes in through the airways to the alveoli where gas exchange happens.
- When diaphragm & intercostal muscles relax, expiration happens as air is forced out of lungs & air passages.

Respiration

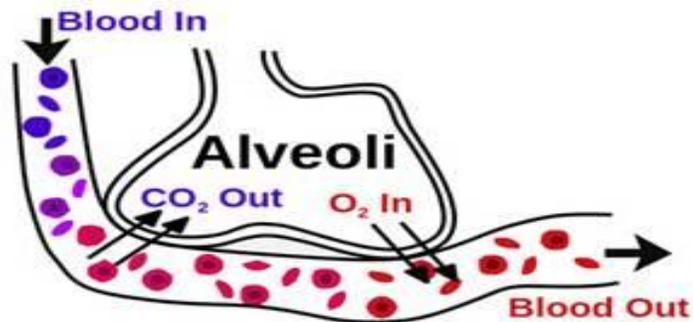
- Respiration=process of inspiration and expiration
- Respiration is controlled by respiratory center in medulla oblongata of brain
- An increased amount of CO₂ in blood or decreased amount of O₂ as seen in some diseases causes the respiratory center to increase RR
- Respiration is usually involuntary but you can control rate by breathing faster or slower



Stages of Respiration: External & Internal

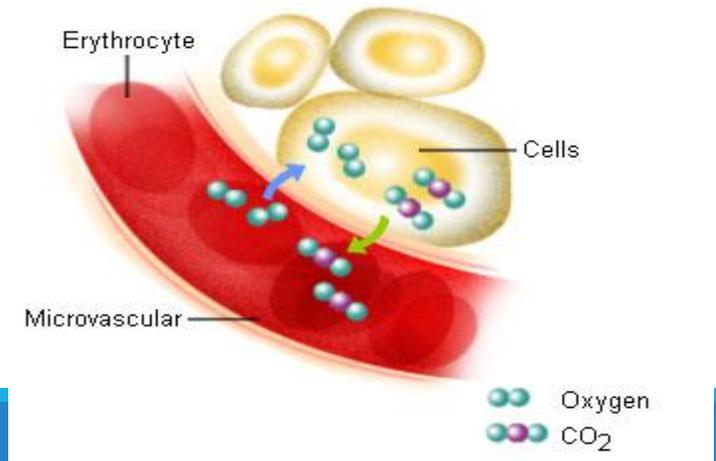
EXTERNAL

- External respiration=exchange of O₂ and CO₂ between **lungs and bloodstream**
- Due to the concentration levels, O₂ in alveoli enters capillary blood then CO₂ carried in capillary blood moves to alveoli where it is expelled during exhalation
- Cellular respiration= process of cells using O₂ and nutrients to produce energy, water, & CO₂



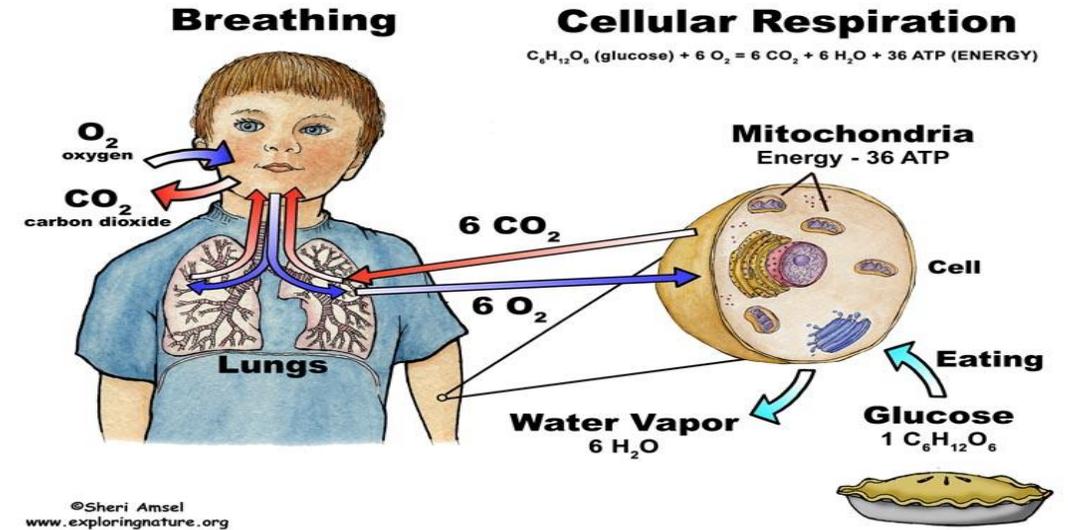
INTERNAL

- Internal respiration=exchange of CO₂ and O₂ between **tissue cells and bloodstream**
- Due to the concentration levels, O₂ carried in blood leaves the capillaries and enters tissue cells & CO₂ leaves cells and enters blood to be transported back to lungs for external respiration



Cellular Respiration

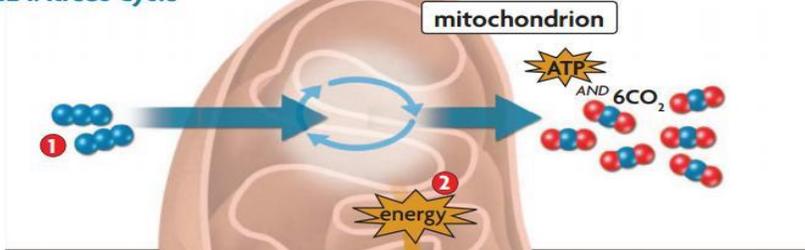
- Cellular respiration=the systemic cells use the delivered O₂ to make energy, water, and CO₂.
- Then, CO₂ leaves the cells and enters the bloodstream (because CO₂ concentration is higher in the cells than bloodstream) to be transported back to the lungs, for external respiration to take place!!
- Everything has come full circle at this point, and it starts all over again!



Cells and Energy

Cellular Respiration

STAGE 1: Krebs Cycle



STAGE 2: Electron Transport

