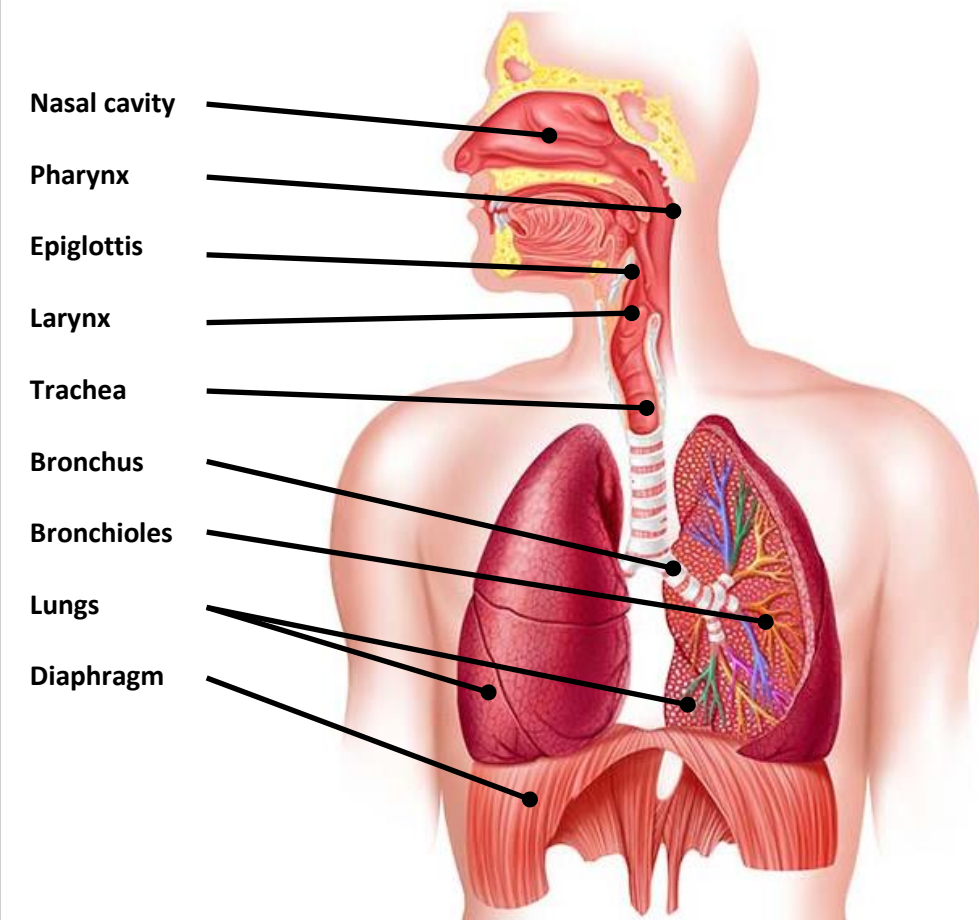
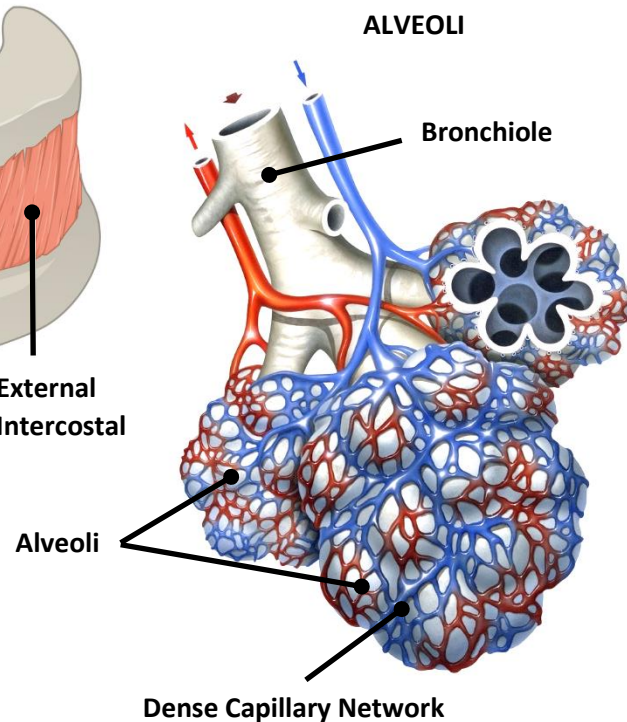
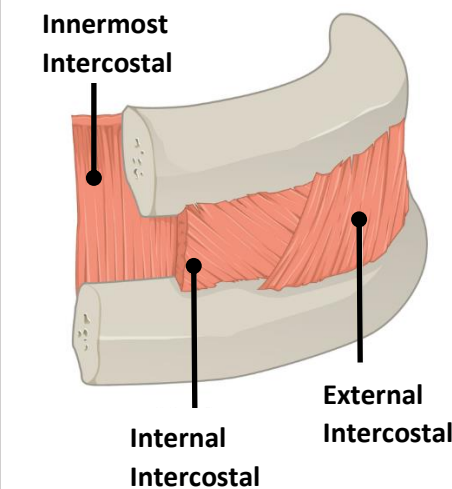


STRUCTURE



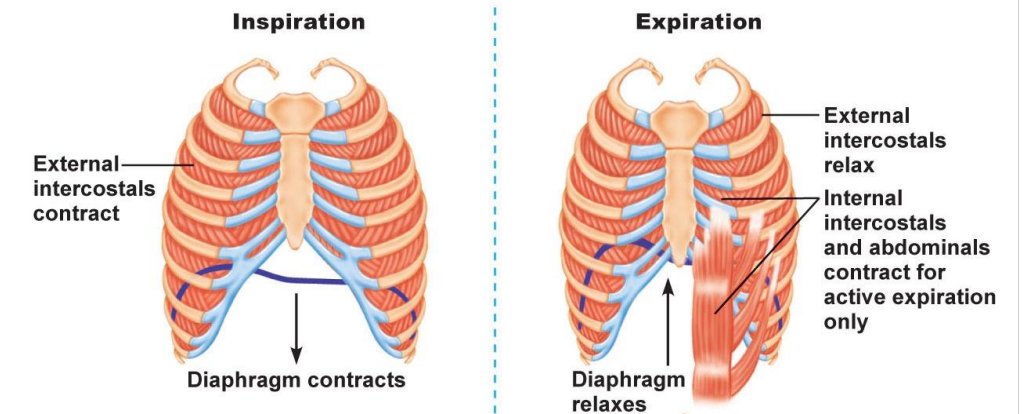
INTERCOSTAL MUSCLES



MECHANISMS OF BREATHING

	Inspiration	Expiration
<b>Diaphragm</b>	Contracts = Flattens	Relaxes = Domes
<b>External Intercostals</b>	Contract = Lifts rib cage	Relax = Rib cage drops *
<b>Chest cavity</b>	Increases	Decreases
<b>Thoracic Pressure</b>	Drops	Rises
<b>Air flows</b>	In	Out

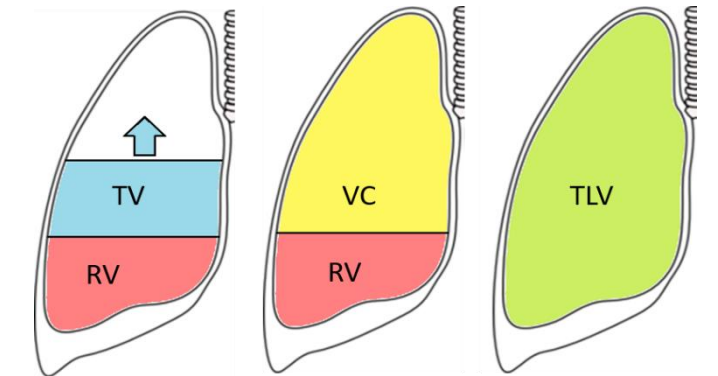
\*During exercise exhalation becomes an **active** process. The internal intercostal muscles contract to pull the rib cage down.



LUNG VOLUMES

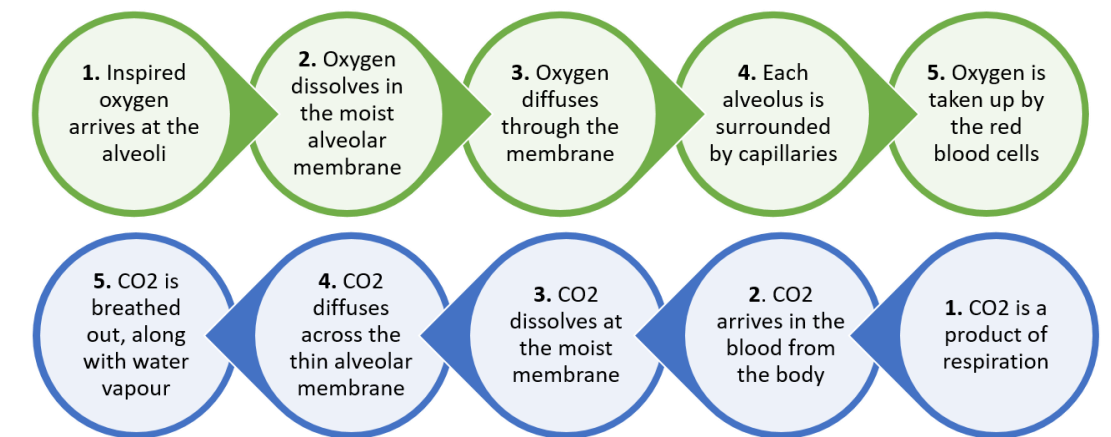
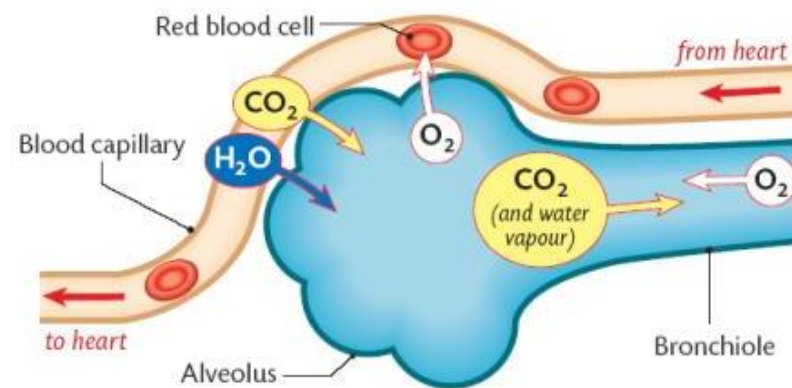
Lung Volume	Definition
<b>Tidal Volume</b>	Total air inhaled/exhaled in one breath under resting conditions*
<b>Vital Capacity</b>	Maximum amount of air that can be expired after a maximum inhalation
<b>Residual Volume</b>	Amount of air remaining in the lungs after a forced exhalation
<b>Total Lung Volume</b>	Maximum amount of air in the lungs after a maximum inspiration
<b>Pulmonary Ventilation (VE)</b>	Total amount of air inhaled / exhaled per minute

\*During exercise, **tidal volume** (TV) and **respiratory rate** (RR; breaths per minute) increase. Together these increase Pulmonary Ventilation (VE).  $TV \times RR = VE$

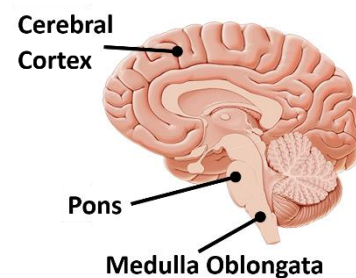


GASEOUS EXCHANGE

This is where the respiratory and cardiovascular systems meet.



CONTROL OF BREATHING



Neural Control

Involuntary Control

Breathing is controlled automatically by the respiratory control centre (the Medulla Oblongata and Pons)

Voluntary Control

Breathing can be controlled voluntarily by the cerebral cortex (e.g. holding your breath or deliberately hyperventilating)

Chemical Control

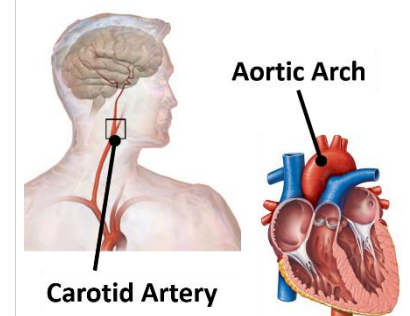
**Chemoreceptors** are located in the aorta, carotid artery & medulla oblongata. They...

Detect change in blood CO2 concentration

- Exercise means CO2 concentration goes up
- Breathing rate is increased
- CO2 removal speeds up

Detect change in pH (acidity)

- Exercise means blood lactate (acidic) builds up
- Breathing rate is increased
- Lactate breakdown speeds up



RESPONSES TO EXERCISE (Short Term)

1. Increase in breathing rate
2. Increased tidal volume

ADAPTATIONS TO EXERCISE (Long Term)

1. Increased vital capacity
2. Increased strength of the respiratory muscles
3. Increase in oxygen and carbon dioxide diffusion rates

ADDITIONAL FACTORS

1. Asthma
2. Effects of altitude/partial pressure on the respiratory system