Unit 1 Anatomy & Physiology: The Respiratory System

Nasal cavity Pharynx Epiglottis Larynx Trachea Bronchus Bronchioles Lungs Diaphragm

ALVEOLI

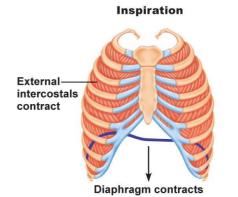
Dense Capillary Network

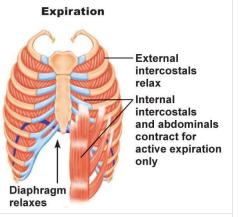
Bronchiole

MECHANISMS OF BREATHING

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

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

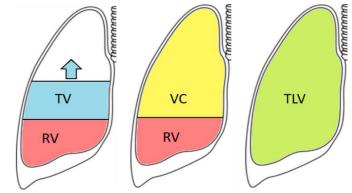




LUNG VOLUMES

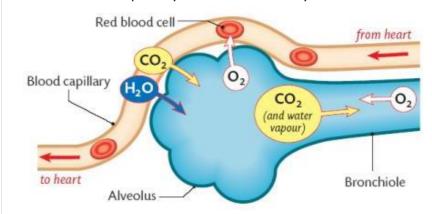
Lung Volume	Definition	
Tidal Volume	Total air inhaled/exhaled in one breath under resting conditions*	
Vital Capacity	Maximum amount of air that can be expired after a maximum inhalation	
Residual Volume	Amount of air remaining in the lungs after a forced exhalation	
Total Lung Volume	Maximum amount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



GASEOUS EXCHANGE

This is where the respiratory and cardiovascular systems meet.



1. Inspired oxygen arrives at the alveoli

2. Oxygen dissolves in the moist alveolar membrane

3. Oxygen diffuses through the membrane

4. Each alveolus is surrounded by capillaries

5. Oxygen is taken up by the red blood cells

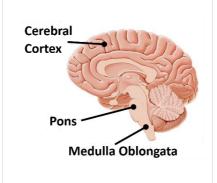
5. CO2 is breathed out, along with water vapour 4. CO2 diffuses across the thin alveolar membrane

3. CO2 dissolves at the moist membrane

2. CO2 arrives in the blood from the body

1. CO2 is a product of respiration

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

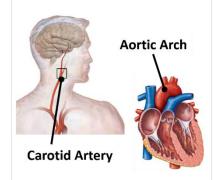
Chemoreceptors are located in the aorta, carotid artery & medulla oblongata. They...

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)

External

Intercostal

Alveoli

INTERCOSTAL MUSCLES

Innermost

Intercostal

- 1. Increase in breathing rate
- 2. Increased tidal volume

Internal

Intercostal

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