

Breathing

Structure

Air passes through **Nose** → **Trachea** → **Bronchus** → **Bronchioles** → **Alveoli**

Cleaned in trachea and bronchi, by **mucus** trapping muck and **cilia** → to throat.

Warmed and **moistened** on the way too.

Alveoli: The site of **gas exchange**: **only some of the air** reaches them – the rest is ‘**dead space**’; air stuck in the ‘tubes’ is unchanged; hence **expired air is a mixture of lung air and outside air**.

Pleural sacs surround each lung; produce **pleural fluid**; this **lubricates** and ‘sticks’ lungs to ribs.

Alveoli: have **large SA**; **thin walls**; **good blood supply**; **moist walls** (O₂ dissolves before diffusing)

Intercostal muscles: Two sets: **External = inspiration**; internal = **forced** expiration.

Diaphragm: **contracts to inhale**; contracting abdominal wall muscles raises it for exhaling

Mechanism – Lungs cannot move themselves!

Breathing in: **External intercostals and diaphragm contract**; volume ↑, pressure ↓; air sucked in

Breathing out: **Elastic lungs collapse; internal intercostals contract;**
abdominal wall muscles contract; volume ↓, pressure ↑, air expelled

Control

Breathing centre: in **Medulla** of brain (subconscious, but can be over-ridden).

Receptors: **Chemical** (aorta, carotid artery) measure [CO₂] in blood;

Stretch receptors in alveoli walls; allow co-ordination of breathing movements

Nerves: **Vagus nerve** goes to both intercostals and diaphragm

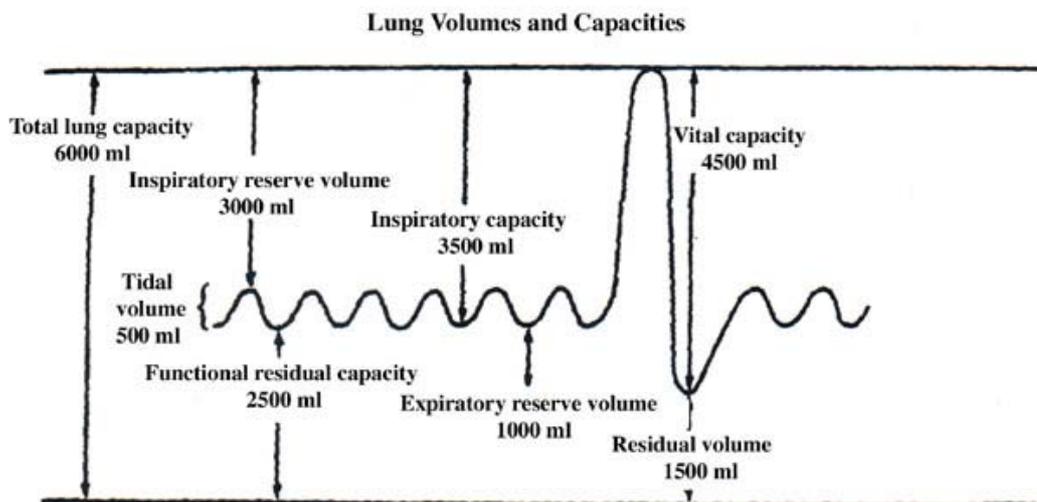


Figure 16

Partial Pressure: A measure of how much O₂ is available in the air; (↑ altitude, pp O₂ ↓)

Normal pp O₂ is 200 kPa, so O₂ **always fully saturates blood** in lungs.

Efficiency: Mammal lungs not good at **about 25% O₂ extracted**; birds better; gills better still (80%)

Blood colour: **deoxygenated dull red**; **oxygenated bright red** (= **oxyhaemoglobin**)

Blood vessels: **Pulmonary Artery** → lungs (deoxygenated blood);

Pulmonary Vein → heart (oxygenated blood)

Carbon monoxide: binds to **haemoglobin**– displaces O₂ and changes colour of blood (cherry red)

Fick's Law applies: **Surface Area x Concentration Difference**
Distance

Also **Boyles Law** applies too: **↑ volume, ↓ pressure** (and vice-versa)