

Gas Exchange (6.4)

Distinguish between (6.4.1)

Ventilation: The exchange of air between the lungs & the environment (*via act of breathing*)

Gas Exchange: The exchange of O_2 and CO_2 between the alveoli & bloodstream

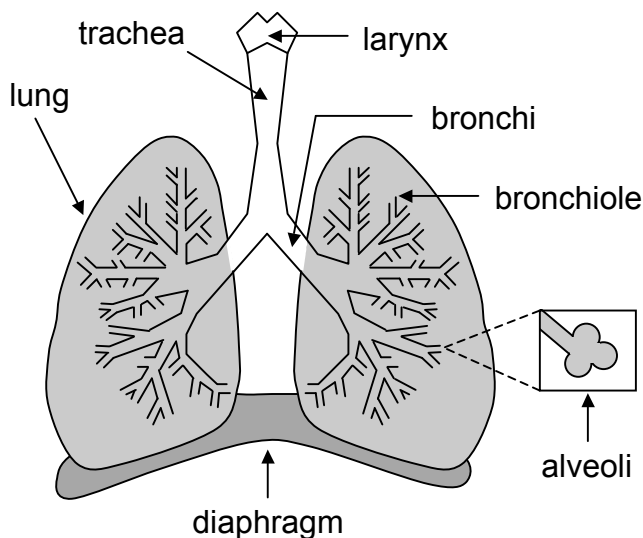
Cell Respiration: Release of energy from the breakdown of organic compounds (*aerobic = O_2*)

Features of alveoli (6.4.3)

Remember: TRIM

- **T**hin lining (*single cell layer = less diffusion*)
- **R**ich capillary network (*for gas exchange*)
- **I**ncreased SA:Vol ratio (*↑ gas exchange*)
- **M**oist (*dissolves gases; prevents collapsing*)

Diagram of the lungs (6.4.4)



Explain ventilation systems (6.4.2)

- A ventilation system maintains a concentration gradient of gases between alveoli and the blood
- The body needs O_2 for cell respiration and produces CO_2 as waste, which must be removed
- The alveoli must have high levels of O_2 and low levels of CO_2 to promote diffusion of gases (O_2 in ; CO_2 out)
- The ventilation system removes CO_2 and replenishes O_2 from the atmosphere to maintain the gradient
- It also has a large surface area

Explain the mechanism of ventilation (6.4.5)

Negative Pressure Breathing

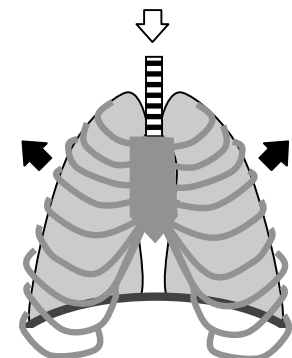
- Boyle's Law: Pressure is inversely proportional to volume
- The atmosphere has pressure (~101.3 kPa @ sea level)
- Ventilation involves changing the volume (and thus pressure) within the lungs so that air will flow along a pressure gradient

Inhalation

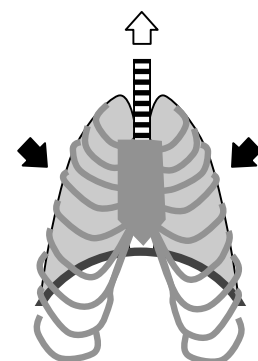
- Diaphragm contracts and flattens
- External intercostal muscles contract, raising ribs
- Volume in thoracic cavity is increased (pressure decreased)
- Pressure in lungs drops below atmospheric pressure
- Air flows into lungs along a pressure gradient

Exhalation

- Diaphragm relaxes and curves upwards
- Internal intercostal muscles contract, lowering ribs
- Abdominal muscles contract, pushing diaphragm up
- Volume in thoracic cavity is decreased (pressure increased)
- Pressure in lungs rises above atmospheric pressure
- Air flows out of lungs along a pressure gradient



Inhalation



Exhalation