



# 3.2 GAS EXCHANGE

## Single-celled organisms

Diffusion adequate for gas exchange

Small

Large SA:Vol ratio

Contraction of muscles

## Insects

Network of tubes - tracheae and tracheoles

Compromise between gas exchange and water loss

Can be opened and closed

Spiracles

Mass transport of air

Short diffusion distance to cells

Fluid-filled ends of tracheoles

Diffusion is faster

Waterproof covering

Size of organism limited by diffusion

## Fish

Gill filaments

Gill lamellae at right angles to filaments

Countercurrent mechanism

More oxygen diffusion

Blood and water flow in opposite directions

Oxygen diffusion gradient maintained over whole length of lamellae

## Plants

Compromise between gas exchange and water loss

Waterproof coverings to reduce water loss

Air spaces increase surface area for exchange

Stomata and guard cells

## Xerophytes

Short diffusion pathway

Hairy or rolled up leaves

Thick waxy cuticle

Inspiration and expiration

Stomata in pits/grooves

## Structures

Lungs supported by ribcage

Trachea

Bronchi

Bronchioles

Alveoli

Thin walls

Large SA

Gas exchange membrane

RBCs slow and flatten against wall of capillary

Steep concentration gradient

## Human gas exchange system

## Ventilation

Antagonistic intercostal muscles - internal and external

Movement of ribs

Contraction or relaxation of diaphragm

Changes in thoracic volume and pressure, movement of air out or in

AQA