

## 2.2 THE CHALLENGE OF SIZE

### Multicellular organisms

Need additional exchange system to meet metabolic needs

Small surface area to volume ratio

Exchange system adaptations...

Thin membrane

Fast diffusion

Large surface area

Good blood supply

Good ventilation

Maximises gaseous exchange

Maintains steep concentration gradient

### Human circulatory system

#### Heart

Double circulatory system: right ventricle to lungs, left ventricle to body

Main blood vessels of the heart: pulmonary vein, pulmonary artery, aorta, vena cava, coronary arteries

Valves to prevent backflow

Blood vessels; arteries, capillaries & veins

#### Blood

Plasma, white blood cells, red blood cells and platelets

### Plant exchange systems

#### Root hair cell

Adapted for exchange: thin wall, large surface area, lots of mitochondria

#### Guard cells

Control opening/closing of stomata

#### Transpiration

Water evaporates and leaves plant via stomata

Rate depends on: temperature, humidity, wind speed and light intensity

#### Translocation

##### Xylem

Dead, hollow cells, strengthened with lignin

Sugar transported around plant via phloem

##### Phloem

Made of elongated living cells

Sieve plates & companion cells

OCR (A)