EDEXCEL GCSE Exchange and Transport in Animals Part 1

Multicellular organisms require transport systems e.g. capillaries in animals xylem/phloem in plants because distances are too great for diffusion to be effective.

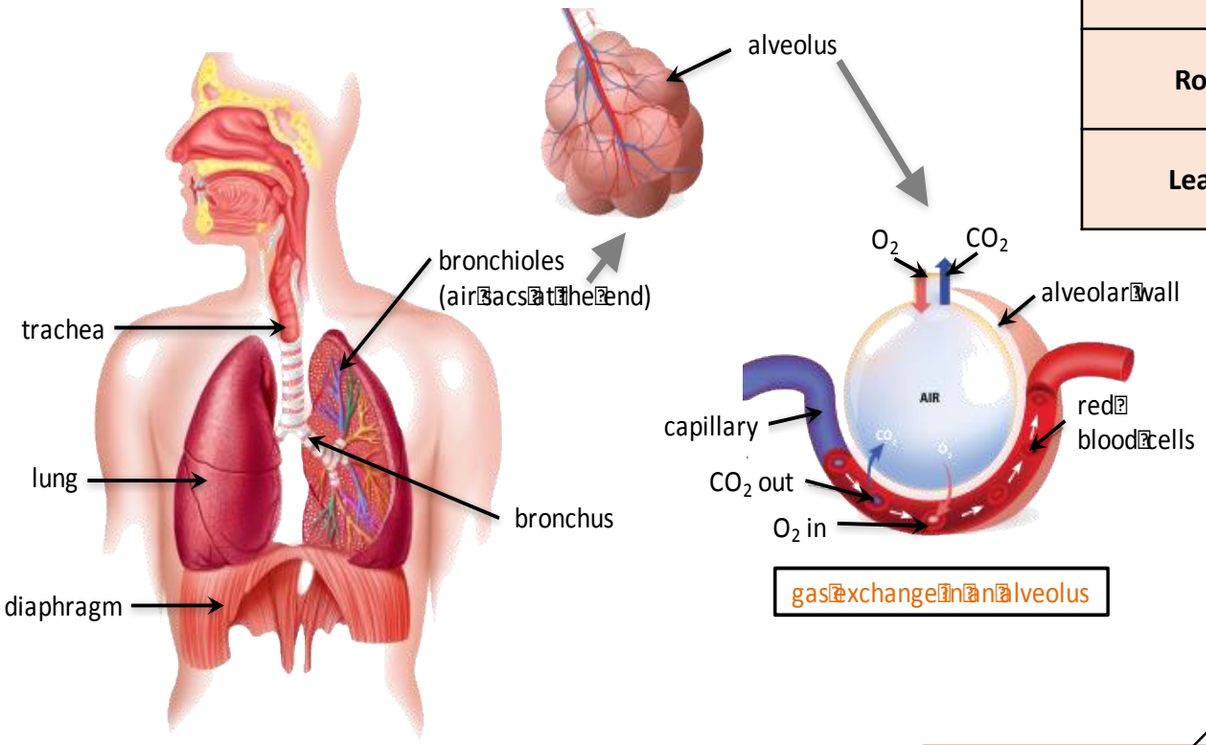
Organisms need to transport substances into and out of their structures and cells e.g. oxygen, carbon dioxide, water, dissolved food molecules, mineral ions and urea.

Exchange surfaces and adaptations for diffusion.

Small intestines	*Villi – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Lungs	*Alveoli– increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Gills in fish	*Gill filaments and lamella – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.*
Roots	*Root hair cells - increase surface area.*
Leaves	*Large surface area, thin leaves for short diffusion path, stomata on the lower surface to let O_2 and CO_2 in and out.*

Surface area to volume ratio

Large surface areas mean a large surface area to volume ratio is maintained in larger organisms e.g. alveoli in the lungs mean that the surface area is 250 times bigger than the volume.



gas exchange in an alveolus

Factors affecting rate of diffusion (Biology only)		
Surface area	*Concentration gradient*	*Diffusion distance*
Increased surface area on exchange surface increases diffusion.	Diffusion is from area of high concentration to low concentration. A large difference in concentration will increase rate f diffusion.	The smaller the diffusion distance to faster the rate of diffusion,

Fick's law (Biology only)

Calculate the rate of diffusion

$$rate\ of\ diffusion\ \alpha\ \frac{sufrace\ area\ \times concentration\ difference}{thickness\ of\ membrane}$$

Lungs and gas exchange

The heart pumps low oxygen/high carbon dioxide blood to the lungs

Trachea	*Carries air to/from the lungs*	Rings of cartilage protect the airway.
Bronchioles	*Carries air to/from the air sacs (alveoli)*	Splits into multiple pathways to reach all the air sacs.
Alveoli	*Site of gas exchange in the lungs*	Maximises surface area for efficient gas exchange.
Capillaries	*Allows gas exchange between into/out of blood*	Oxygen diffuses into the blood and carbon dioxide diffuses out.

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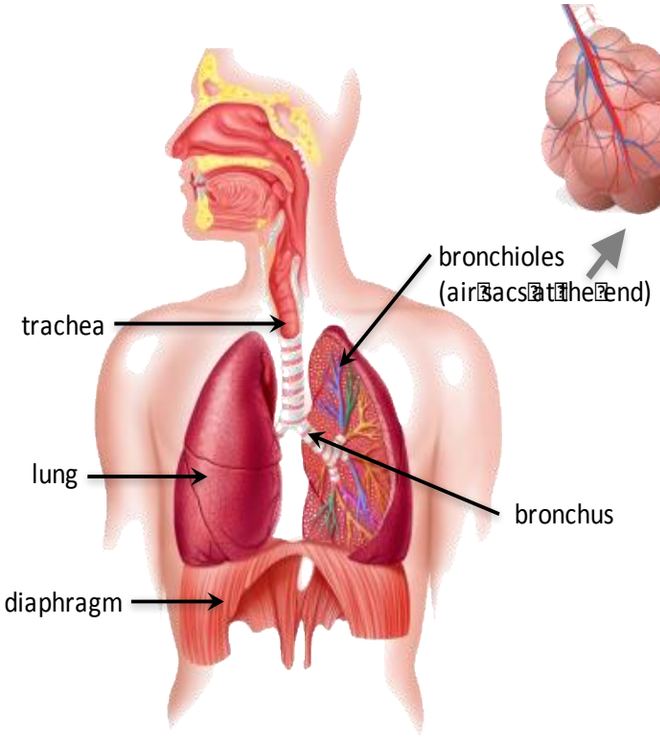

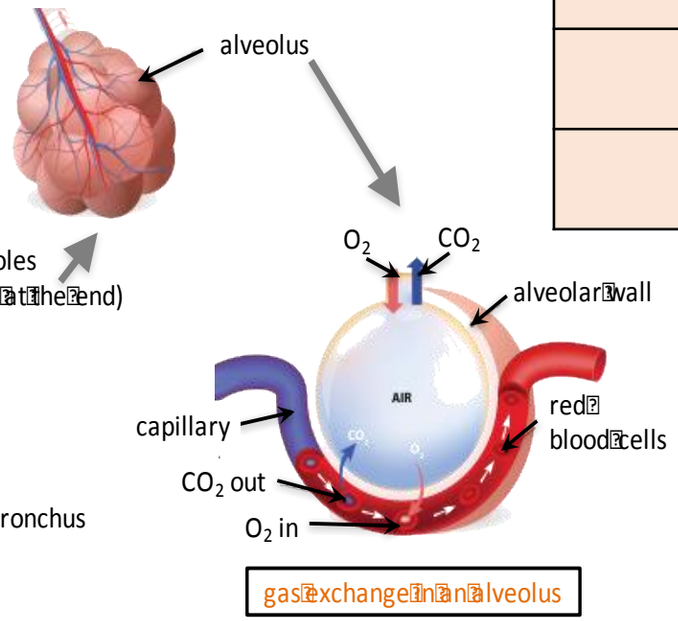

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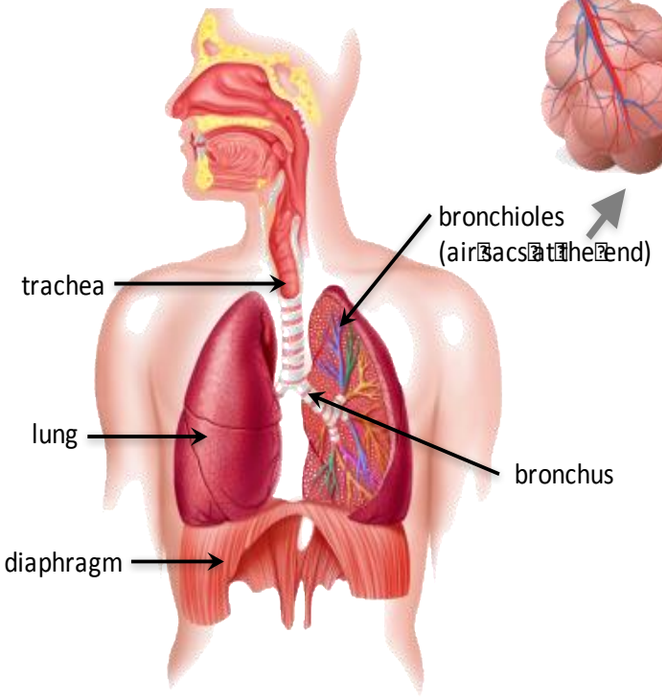

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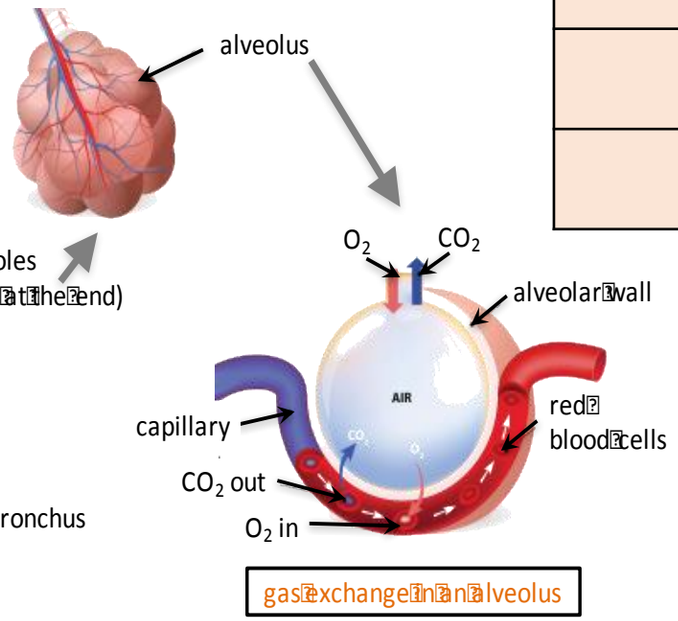

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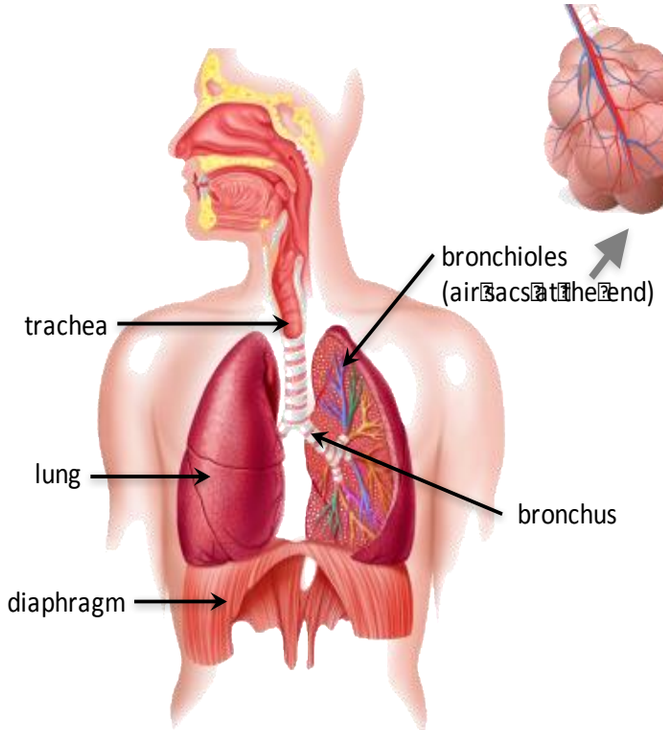

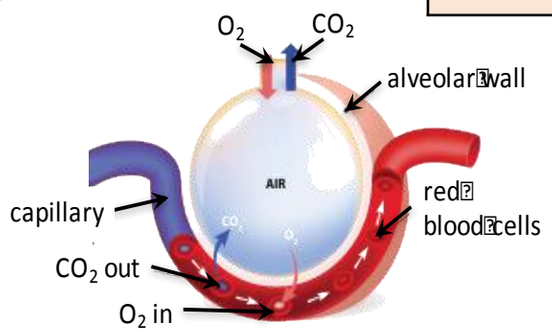

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