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# BIOLOGY

## ORGANISMS EXCHANGE SUBSTANCES

Level & Board	AQA (A-LEVEL)
TOPIC:	GAS EXCHANGE
PAPER TYPE:	SOLUTION - 1
TOTAL QUESTIONS	6
TOTAL MARKS	36

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## Gas Exchange - 2

1.

(a) In a process called diffusion, oxygen moves from the alveoli to the blood through the capillaries (tiny blood vessels) lining the alveolar walls. Once in the bloodstream, oxygen gets picked up by the hemoglobin in red blood cells.

**OR**

Oxygen molecule diffuses across the alveolar epithelium and endothelium of capillary into the blood.

(b) Alveolar epithelium is one cell thick so there is a short diffusion pathway for gas exchange.

(c) High levels of carbon monoxide compared with no smoking with closed window. Carbon monoxide levels increasing will result in less oxygen diffusing in so it is harmful for children. However, there is no significant difference with open window as it could have been due to chance. There is also no data on breathing rates for children.

2.

(a) The human gas exchange system includes the trachea, the bronchioles and the alveoli. During inhalation (breathing in) the diaphragm contracts and the external intercostal muscles contract. This increases the volume and decreases the pressure in the thoracic cavity to lower than that of the atmosphere.

**OR**

Trachea, bronchi, bronchioles, alveoli

External intercostal muscles contract, diaphragm contracts opening chest cavity

Causes volume increase + pressure decrease in the thoracic cavity

Breathing out = diaphragm relaxes + internal intercostal muscles contract

Causes volume decrease + pressure increase

**3.**

**(a)**

Tracheoles have thin walls so short diffusion distance to cells

Large number of tracheoles so large surface area for gas exchange

Body can be moved by muscles to move air so maintains a concentration gradient for oxygen.

(Fluid in the end of the tracheoles moves out into tissues during exercise so larger surface area for gas exchange)

(Tracheae provide tubes full of air so fast diffusion into insect tissues)

**OR**

- Tracheoles have thin walls so short diffusion distance to cells;
- Highly branched / large number of tracheoles so short diffusion distance to cells;
- Highly branched / large number of tracheoles so large surface area (for gas exchange);
- Tracheae provide tubes full of air so fast diffusion (into insect tissues);
- Fluid in the end of the tracheoles that moves out (into tissues) during exercise so faster diffusion through the air to the gas exchange surface;
- Body can be moved (by muscles) to move air so maintains diffusion / concentration gradient for oxygen

**(b)** Damselfly have a higher respiratory rate so use more oxygen.

**(c)**

mean width 1.61 ( $\pm$  0.19)

mean width 6.12 ( $\pm$  0.41)

$1.61 \times 6.12 = 9.8532 \text{ mm}^2 \text{ units}$

$$(0.19 \div 1.61) \times 100 = 11.8$$

$$(0.41 \div 6.12) \times 100 = 6.7$$

$$11.8 + 6.7 = 18.5$$

**4.**

**(a)** The lamellae are designed for gas exchange with a large surface area and a thin epithelium surrounding a well-vascularized core of pillar cell capillaries. The lamellae are positioned for the blood flow to be counter-current to the water flow over the gills.

**OR**

- Many lamellae / filaments so large surface area
- Thin surface so short diffusion pathway

**(b)** Fish use gills for gas exchange. Gills have numerous folds that give them a very large surface area. The arrangement of water flowing past the gills in the opposite direction to the blood (called countercurrent flow) means that they can extract oxygen at 3 times the rate a human can.

**OR**

- Water and blood flow in opposite directions
- Blood always passing water with a higher oxygen concentration
- Diffusion gradient maintained throughout length of gill

**5.**

**(a)**

- Blood and water flow in opposite directions in the capillaries
- Concentration of oxygen in the blood is lower than in surrounding water, so oxygen diffuses into the blood
- Diffusion gradient maintained over full length of lamellae

**(b)**

- Thicker lamellae increase the diffusion distance from the water into the blood
- Fused lamellae reduce surface area

6.

(a) Simple diffusion

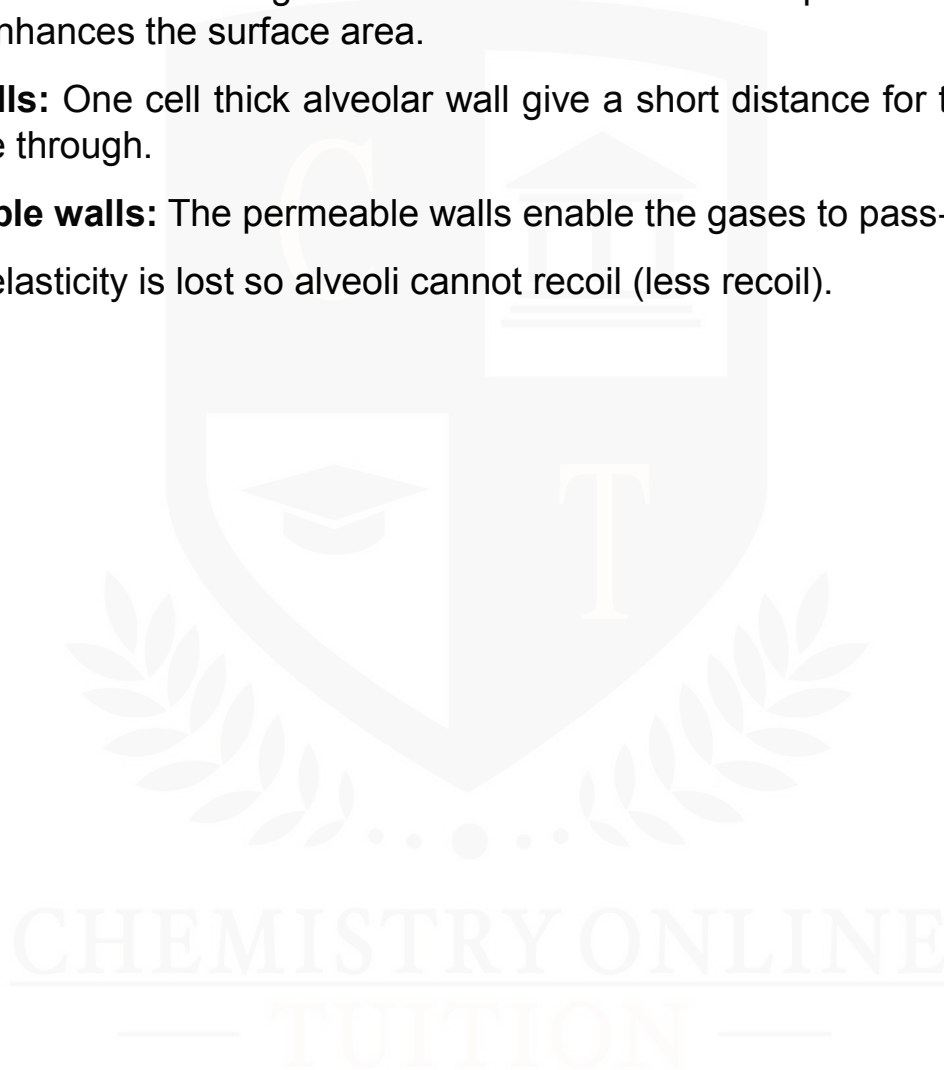
(b)

**Large surface area:** Lungs have several alveoli. The shape of these alveoli further enhances the surface area.

**Thin walls:** One cell thick alveolar wall give a short distance for the gases to diffuse through.

**Permeable walls:** The permeable walls enable the gases to pass-through.

(c) The elasticity is lost so alveoli cannot recoil (less recoil).



I am Sorry !!!!!



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