



**CHEMISTRY ONLINE**  
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# BIOLOGY

## ORGANISMS EXCHANGE SUBSTANCES

Level & Board	AQA (A-LEVEL)
TOPIC:	MASS TRANSPORT IN ANIMALS
PAPER TYPE:	SOLUTION - 1 PAPER 1
TOTAL QUESTIONS	6
TOTAL MARKS	47

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## **Mass Transport in Animals - 1**

1.

(a) The path of blood flow through the kidney begins with the renal artery, which carries oxygenated blood into the kidney. From there, the blood flows into smaller and smaller vessels until it reaches the nephrons, which are the functional units of the kidney. In the nephrons, blood is filtered to remove waste and excess substances, and then the filtered blood exits the kidney through the renal vein, carrying newly cleaned blood back to the rest of the body.

**OR**

- Renal vein
- Vena cava to right atrium
- Right ventricle to pulmonary artery

(b)

**Type of blood vessel:** Vein

**Explanation:** wider lumen / thinner wall

(c) The water in the tissue fluid moves back into the capillary by osmosis due to a water potential gradient between the tissue fluid and the blood. Any remaining tissue fluid is called lymph which is drained into the lymphatic system and is eventually returned to the blood.

**OR**

- Plasma proteins remain in capillary
- Reduces water potential (osmotic pressure) of blood / creates water potential (osmotic pressure) gradient
- Water moves to blood via osmosis
- Returns to blood by lymphatic system

2.

(a) To improve the quality of a scientific drawing of blood vessels in a dissection, the student should use clear lines to highlight important structures and add labels or annotations to provide additional information.

**OR**

- Only use single lines
- Add labels/title
- Add magnification/scale bar
- Draw all parts to same scale/relative size
- Do not use shading

**(b)**

**Blood vessel X:** artery/arteriole

**Blood vessel Y:** vein/venule

**Feature:** Difference in lumen size

**(c)**

Carry/wash sharp instruments by holding handle

Disinfect instruments

Disinfect hands

**3.**

**(a)** Arterioles that give rise directly to capillaries regulate flow through their cognate capillaries by constriction or dilation. The capillaries form an interconnecting network of tubes of different lengths, with an average length of 0.5 to 1 mm.

**(b)**

**(1) Ventricles and arteries**

Ventricle muscles relaxed but arteries recoiled

No blood backflow into ventricles and no blood movement from arteries

**(2)**

**Atria and ventricles**

Atria muscle contracted

Blood movement from atria into ventricles

(c) Vena cava

(d)  $130 \text{ beats min}^{-1}$

4.

(a)

- At P, the semi-lunar valve is about to open but is still closed as ventricular pressure hasn't yet reached the threshold required to open the valve (blood is still entering from the atrium so ventricular pressure is increasing)
- At P, blood isn't flowing into the aorta from the ventricles yet, so rate of blood flow in aorta isn't increasing yet

(b)

- At Q, the semi-lunar valve has closed
- Wall of aorta contains elastic tissue => recoils when pressure ↓ after the SL valve closes
- ↓ vol aorta near heart = ↑ pressure and rate of blood flow.
- important to ensure blood pressure in arteries remains high = blood can be constantly delivered to the tissues

(c)

**Similarity:** same general shape

**Difference:** increase in pressure lower

(d)

time of one cycle = 0.36s

= 0.006 min

beats per minute =  $1/0.006 = 166.67 \text{ beats minute}^{-1}$

5.

(a) The shift in the hemoglobin saturation curve that results from a change in pH. It helps because one produces  $\text{H}^+$  during anaerobic metabolism during exercise, and at a lower pH, hemoglobin's affinity for  $\text{O}_2$  decreases, so  $\text{O}_2$  is more easily released in tissues that need it.

**OR**

- Increases dissociation of oxygen
- Anaerobic respiration delayed at the tissues

**(b)**

**Time:** 10 minutes

**Ratio:** 1.6875:1

**(c)**

- Increase in breathing rate
- Same  $p\text{CO}_2$  per breath, but more breaths

**(d)**

EPO causes blood to thicken

The thickened blood could block the coronary arteries

**(e)**

- Some cyclists will gain a bigger increase.
- There are health risks associated with taking EPO

**6.**

**(a)** Since carbon dioxide reacts with water to form carbonic acid, an increase in carbon dioxide results in a decrease in blood pH, resulting in hemoglobin proteins releasing their load of oxygen. Conversely, a decrease in carbon dioxide leads to an increase in pH, which results in hemoglobin picking up more oxygen.

**OR**

- More oxygen unloading.
- By increasing acidity.

**(b)**

- Higher affinity for  $\text{O}_2$  than hemoglobin.
- Allows aerobic respiration when diving at lower  $\text{PPO}_2$ .

(c)

$$= 190 \times 5.2 = 988 \text{ per minute}$$

$$= 1.07 \times 10^4 / 988 = 10.8$$



I am Sorry !!!!!



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- Founder & CEO of Chemistry Online Tuition Ltd.
- Completed Medicine (M.B.B.S) in 2007
- Tutoring students in UK and worldwide since 2008
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