

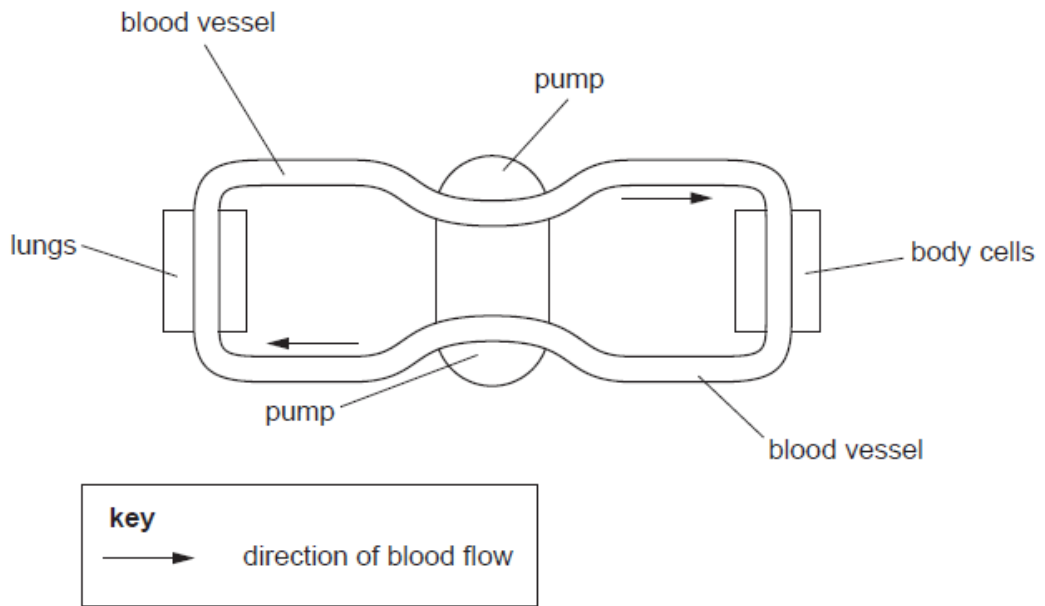
GCSE Biology A (Gateway)

J247/01 B1-B3 and B7 Foundation (Foundation Tier)

Question Set 23

1

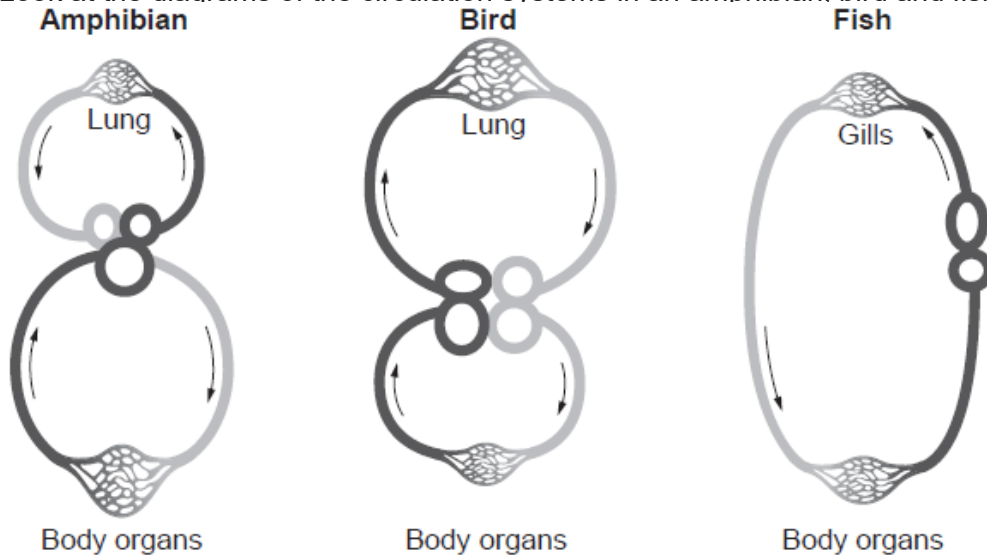
Look at the diagram. It represents the human circulatory system.



- (a) Describe how the diagram shows that humans have a double circulatory system. [2]

Blood travels through the heart twice. It consists of two distinct circuits, the pulmonary circuit which pumps deoxygenated blood from the heart to the lungs, and the systemic circuit which moves oxygenated blood from the heart to body cells.

- (b) Look at the diagrams of the circulation systems in an amphibian, bird and fish.



Which of these has a circulatory system most similar to humans?

Tick (✓) **one** box.

Amphibian

Bird

Fish

Explain your choice.

[3]

The bird heart consists of four chambers, two atria and two ventricles, as in humans, whereas the fish heart only has two chambers and the amphibian has three. It also has a double circulatory system similarly to humans whereas fish have a single circulatory system.

(c)

Scientists investigate how exercise affects blood flow to different organs in the body.

This is their method.

- Ask a healthy person to sit in a room at 20°C
- Measure the blood flow to different organs in the person's body
- Repeat this with the person exercising at a constant speed on a treadmill in the same room.

The table shows the scientists' results.

Organ	Rate of blood flow (ml per minute)	
	Sitting	Doing exercise
Brain	750	750
Heart muscle	250	1000
Muscles	1200	22000
Skin	500	600
Other organs	3100	650
Total	5800	25000

(i)

By how many times has the **total** blood flow increased by doing exercise?

Give your answer to the **nearest whole number**.

Number of times the total blood flow has increased = **4**

[2]

$$\frac{25000}{5800} = 4.3 = 4$$

- (ii) The table shows that blood flow to other organs has decreased by nearly 5 times when a person is **doing exercise**.

The blood flow to the muscles has increased by more than eighteen times.

Explain these changes to blood flow rate.

[2]

During exercise, blood flow to skeletal muscles increases to supply a greater amount of oxygen to muscle cells for aerobic respiration and to remove waste products. Blood is redirected from less active areas, such as digestive organs, via vascular shunting, so the rate of blood flow to such areas (i.e. other organs) decreases. Blood flow also increases to heart muscle as cardiac output increases. Vasoconstriction occurs in less active organs and vasodilation occurs in more active organs.

Total Marks for Question Set 23: 9

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