Heart & Circulation

Question Paper 2

Level	International A Level
Subject	Biology
Exam Board	Edexcel
Topic	Molecules, Transport and Health
Sub-Topic	Heart & Circulation
Booklet	Question paper 2

Time Allowed: **65 minutes**

Score: **/54**

Percentage: **/100**

Grade Boundaries:

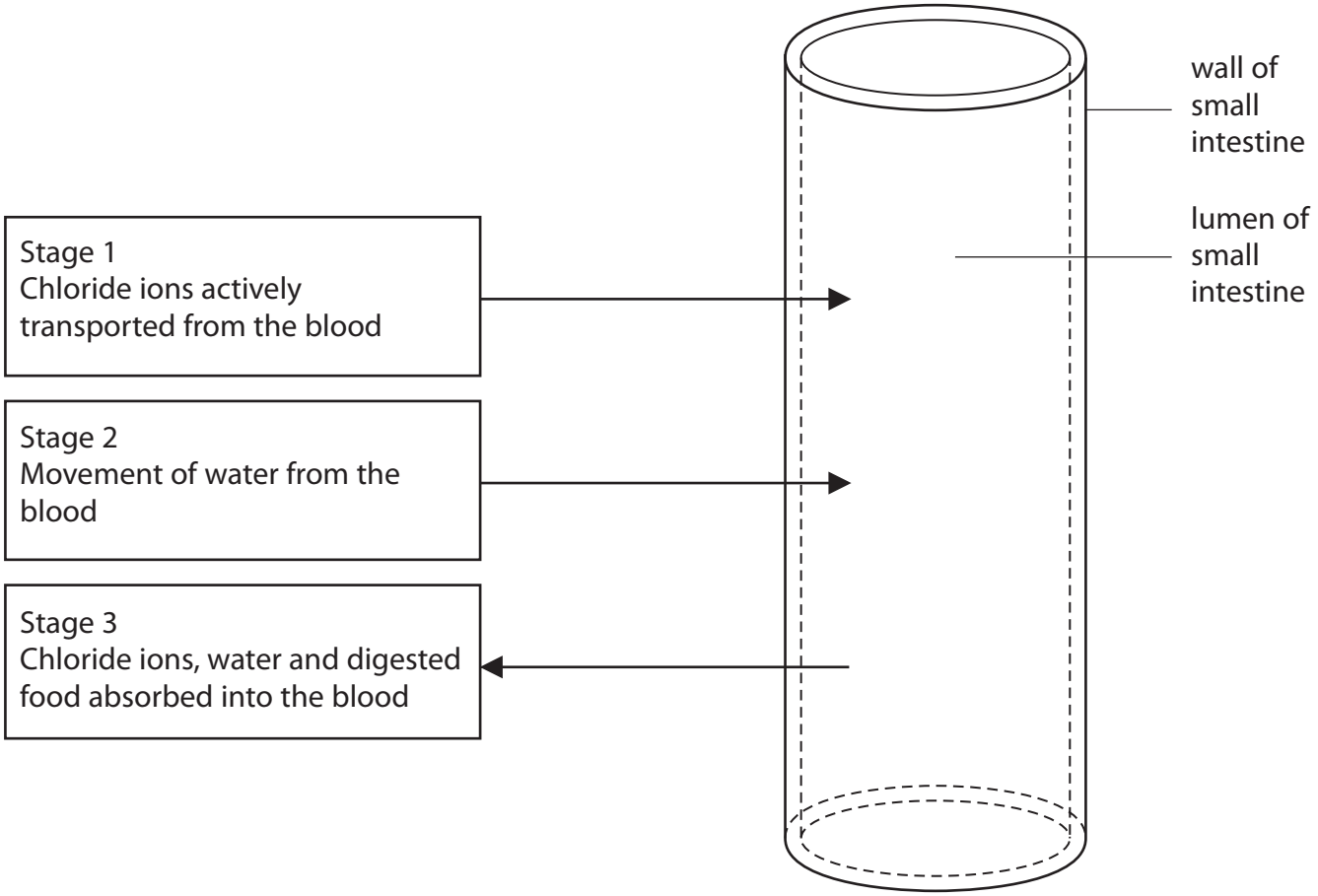
A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1 Cholera is a disease caused by the bacterium *Vibrio cholerae*.

This bacterium produces a toxin (choleragen) that binds to the cell surface membranes of the cells lining the intestine. This stimulates an increase in the active transport of chloride ions into the lumen of the intestine.

This results in diarrhoea and the loss of large volumes of fluid from the body.

(a) The diagram below shows the movement of chloride ions, water and digested food through the wall of the small intestine during digestion in a healthy person.



(i) Explain why ATP is needed for the active transport of chloride ions into the lumen of the small intestine.

(2)

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(ii) Using the information given in the question, suggest why a person with cholera loses large volumes of fluid as diarrhoea.

(4)

(iii) Some of the chloride ions are reabsorbed into the blood by facilitated diffusion.

Compare the processes of facilitated diffusion and active transport.

(2)

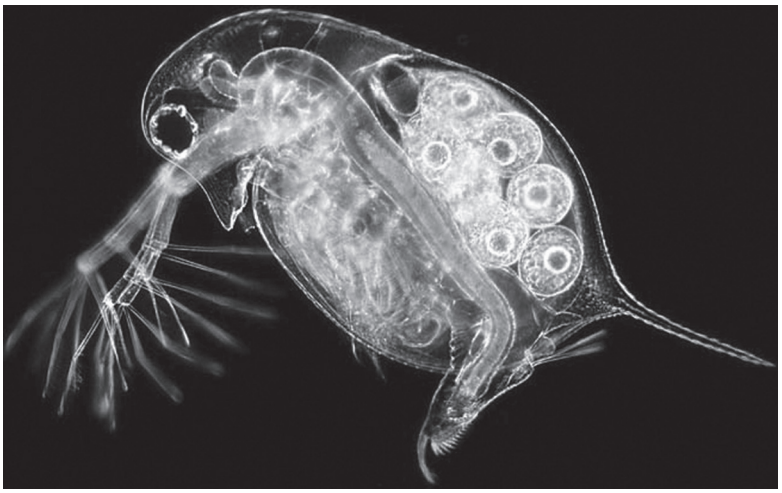
(b) One way of treating diarrhoea is to use a food-based oral rehydration therapy that contains a lot of starch and water.

Suggest why this therapy is effective in the treatment of cholera.

(4)

(Total for Question 1 = 12 marks)

2 The photograph below shows *Daphnia* (a water flea). *Daphnia* can be used to investigate the effect of chemicals on heart rate.



Magnification ×30

(a) (i) Give **two** reasons why *Daphnia* is a suitable organism for investigating the effect of chemicals on heart rate.

(2)

1 .....

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.....

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2 .....

.....

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(ii) State **two** variables that you would need to control for a valid investigation into the effect of caffeine on the heart rate of *Daphnia*.

Describe how to control each of these variables.

(4)

1. Variabl .....

How to control .....

.....

.....

.....

2. Variabl .....

How to control .....

.....

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(b) Explain why many small animals, such as *Daphnia,* have a heart.

(3)

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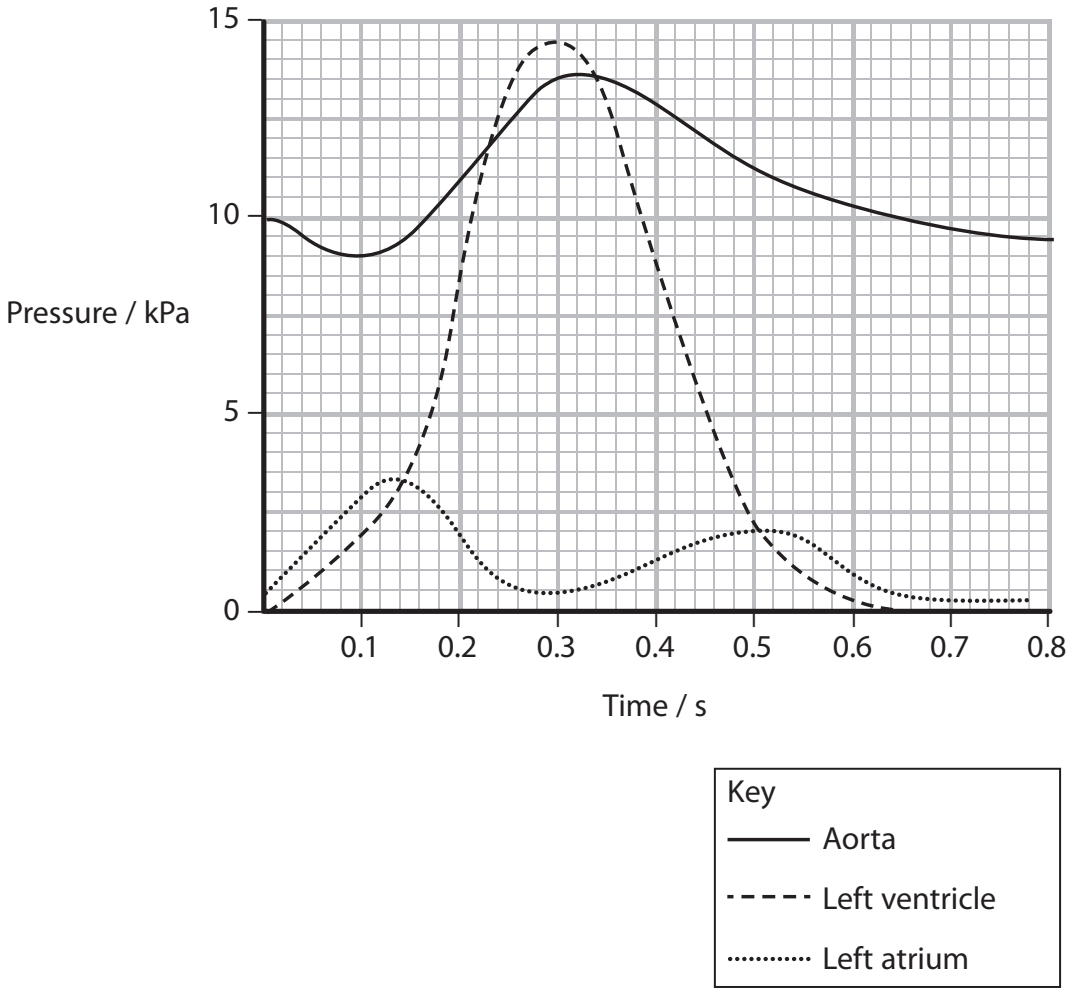
(Total for Question 2 = 9 marks)

3 During the cardiac cycle, muscles in the walls of the atria and ventricles contract and relax.

The graph below shows the changes in pressure that occur in the left side of the mammalian heart during one cardiac cycle.



(a) Use the graph to identify the following.

(i) The time at which the bicuspid (left atrioventricular) valve closes.

(1)

..... seconds

(ii) The pressure in the aorta when the semilunar (aortic) valve closes.

(1)

..... kPa

(b) Using the information in the graph, describe the pressure changes that take place in the left ventricle during each stage of this cardiac cycle.

(3)

*(c) During this cardiac cycle, the changes in pressure that occur in the left atrium and in the left ventricle are different.

Using the information in the graph and your own knowledge, explain these differences.

(5)

(Total for Question 3 = 10 marks)

4 (a) Read through the following passage about the structure of the heart. Write on the dotted lines the most appropriate word or words to complete the passage.

(5)

The heart muscle in the walls of the heart is called ..... muscle.

The ..... valves control the flow of blood between the chambers of the heart.

The chamber of the heart that receives oxygenated blood from the lungs is named the

..... .

Deoxygenated blood is transported back to the lungs in the ..... .

Backflow of blood into the heart is prevented by ..... valves.

(b) Arteries and capillaries are blood vessel adapted for specific roles in the circulatory system.

Give **two** differences between the structure of an artery and a capillary.

(2)

1 .....

.....

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2 .....

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(c) Anticoagulants, such as warfarin, are used to treat cardiovascular disease (CVD).

(i) Explain how anticoagulants can help reduce the effects of CVD.

(2)

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(ii) State **one** risk associated with the use of anticoagulants.

(1)

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(Total for Question 4 = 10 marks)

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

5 Mammals have a heart and circulation.

(a) The heart pumps blood.

(i) Place a cross in the box that gives the position of the heart valves during ventricular diastole.

(1)

	Atrioventricular valves	Semilunar valves
☒ **A**	closed	closed
☒ **B**	closed	open
☒ **C**	open	closed
☒ **D**	open	open

(ii) Place a cross in the box that identifies when the pressure in the left ventricle will be highest.

(1)

☒ **A** at the end of systole

☒ **B** at the start of systole

☒ **C** in the middle of diastole

☒ **D** in the middle of systole

(iii) Place a cross in the box that gives the relative concentrations of carbon dioxide in the blood.

(1)

	Highest concentration	Lowest concentration
☒ **A**	aorta	pulmonary vein
☒ **B**	aorta	vena cava
☒ **C**	vena cava	pulmonary artery
☒ **D**	vena cava	pulmonary vein

(b) The diagram shows a cross section of an aorta.

Magnification ×3

(i) Measure the maximum and minimum diameters of the lumen.

Use these measurements to calculate a mean value.

(1)

Mean diameter ..... mm

(ii) Use the mean diameter to calculate the area of the lumen, using the formula

$a = \pi r^2$ where π is 3.14

(2)

Area ..... mm^2

(iii) Explain how the structure of an artery is related to its function.

(3)

(c) Explain why mammals need a blood circulation system.

(4)

(Total for Question 5 = 13 marks)