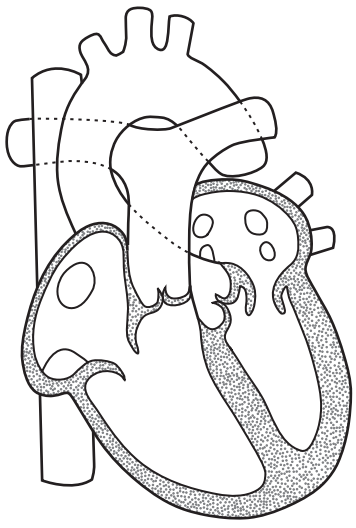
1 (a) Read through the following passage about the heart and its major blood vessels, then write on the dotted lines the most appropriate word or words to complete the passage.

(5)

The mammalian heart consists of four chambers, two upper chambers called ..... and two lower chambers called ventricles.

The ..... carries oxygenated blood away from the ..... ventricle to the cells of the body and the pulmonary ..... carries deoxygenated blood to the lungs. The ..... returns deoxygenated blood back to the heart from the body.

(b) The diagram below shows the structure of the heart.



Suggest which stage of the cardiac cycle is shown in the diagram and give a reason for your answer.

(2)

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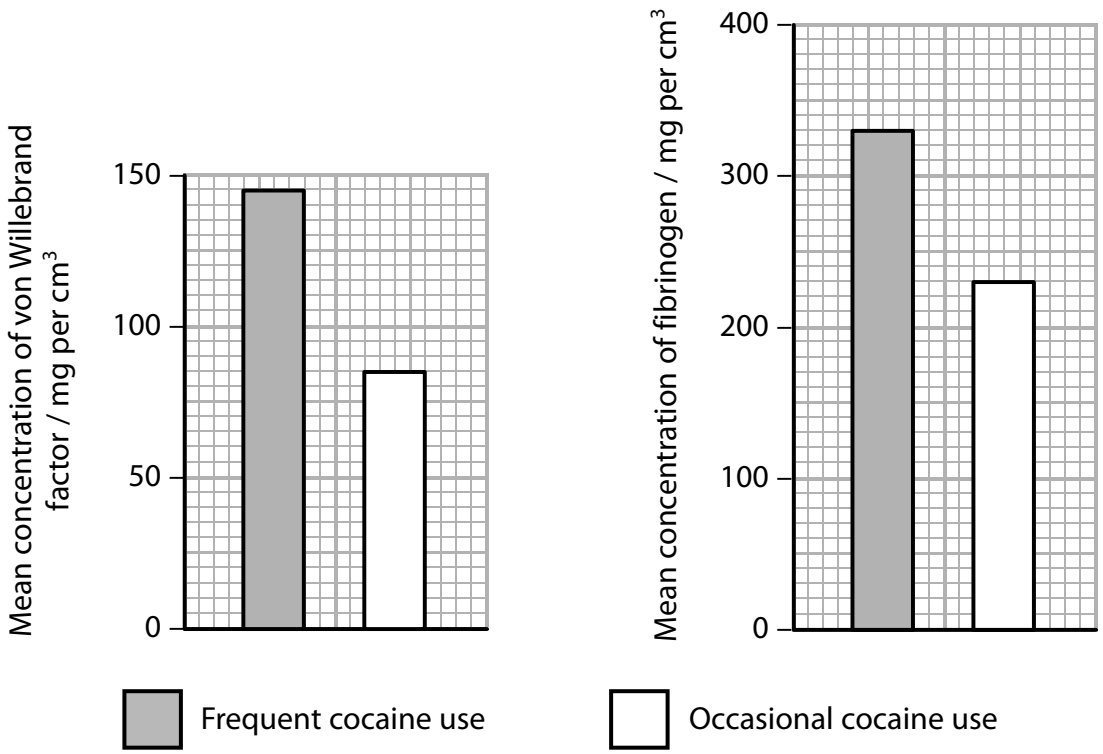
(Total for Question 1 = 7 marks)

2 Cocaine use increases the risk of a heart attack.
Cocaine also affects the levels of a number of blood components, including von Willebrand factor and fibrinogen. These two components are involved in blood clotting.

(a) The normal range for von Willebrand factor is 50 to 150 mg per cm^3 and for fibrinogen is 150 to 300 mg per cm^3.
The graphs below show the effects of frequent and occasional cocaine use on the mean concentration of von Willebrand factor and fibrinogen in the blood.



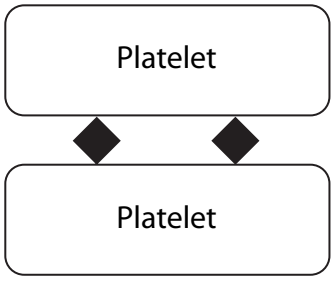
(i) Describe the effects of frequent and occasional cocaine use on the mean concentrations of von Willebrand factor and fibrinogen in the blood.

(3)

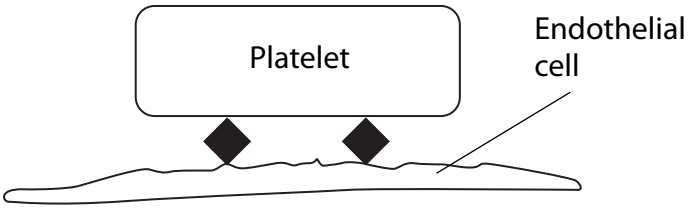
(ii) Using the information given, explain why conclusions cannot be made about the effect of occasional cocaine use on the concentrations of these blood components.

(1)

*(b) The diagram below shows two functions of von Willebrand factor.



Platelets stick together



Platelets stick to endothelial cells lining blood vessels

von Willebrand factor

Using the information in this diagram and your own knowledge of the blood clotting process, suggest why frequent cocaine use could increase the risk of a blood clot forming.

(4)

(c) It has been suggested that there is a correlation between the change in the concentrations of fibrinogen in the blood and the increased risk of heart disease due to cocaine use. Explain why this suggestion is valid.

(2)

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(Total for Question 2 = 10 marks)

3 Plant statins are used in the treatment of cardiovascular disease (CVD). Some fungi can produce chemicals that can be used as statins. One example is a chemical referred to as drug S.

One study into the effect of drug S on the health of people taking it involved 20 000 people and ran for a period of 5 years. One group of people was given drug S and the other group was given a placebo. Each group had 10 000 people in it.

The table below shows some of the findings from this study.

Event	Percentage of people (%)	
	Taking drug S	Taking the placebo
Death	12.9	14.7
CVD	8.7	11.8
Stroke	4.3	5.7

(a) (i) Name **two** factors that increase the risk of CVD.

(1)

1 .....

2 .....

(ii) Suggest why it was necessary to have so many people involved in this study.

(2)

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(b) Suggest what the placebo could be in this study.

(1)

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(c) Suggest why this study had to run for a number of years.

(1)

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(d) Using the data in the table, what is the evidence that drug S is safe for people to take?

(2)

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(e) (i) Calculate how many more people given the placebo had CVD compared with those given drug S.

(3)

Answer .....

(ii) Explain why drug S could be a potential statin.

(1)

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(Total for Question 3 = 11 marks)

4 Electrical activity in heartbeats can be recorded using electrocardiograms (ECG). An ECG includes recording of the activity of the sinoatrial node (SAN).

(a) Describe the role of the SAN in controlling heartbeats.

(2)

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(b) Describe how the cardiovascular centre, in the medulla oblongata, affects the SAN during exercise.

(2)

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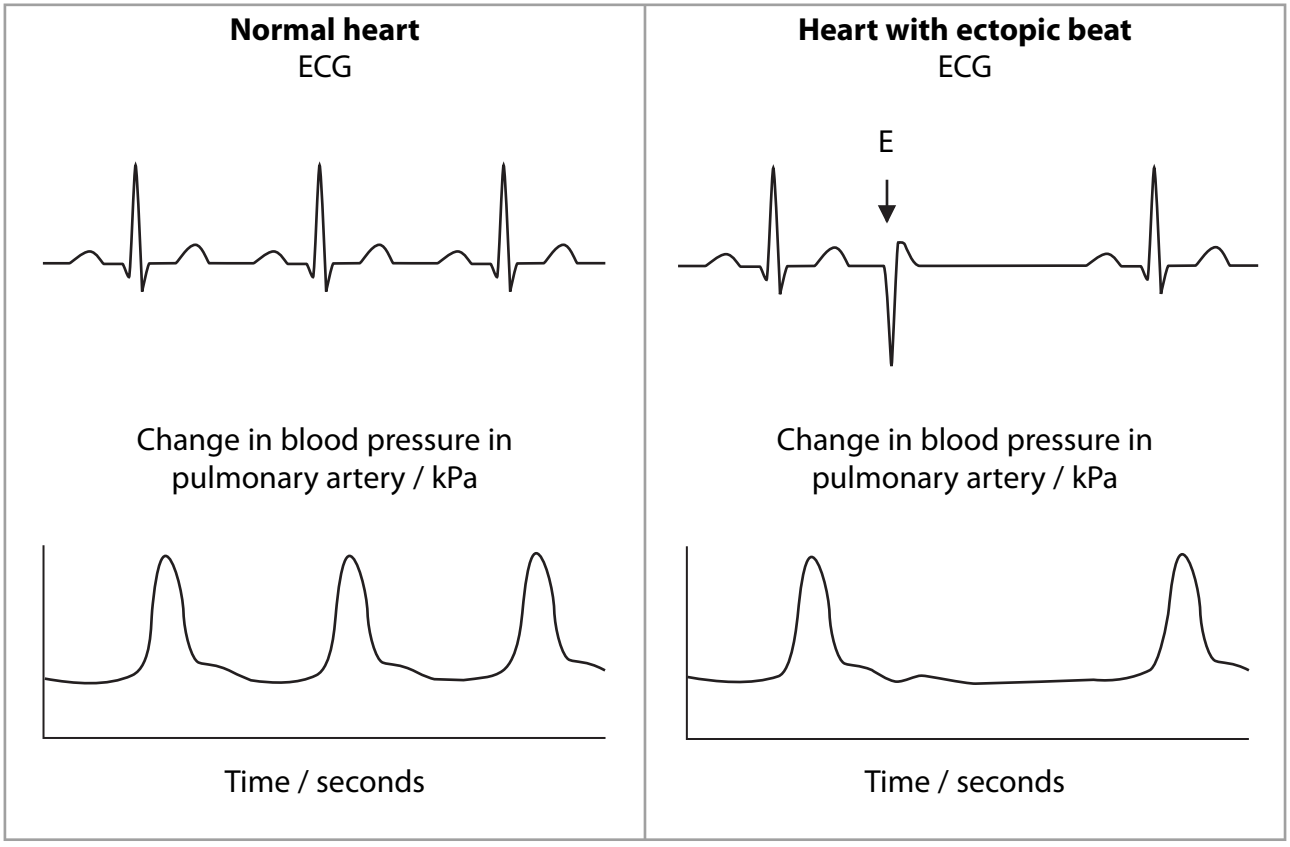
(c) ECGs can be used to diagnose abnormalities in the heartbeat. One such abnormality is a ventricular ectopic beat. This occurs when a region of the ventricle has a similar effect on the heart as the sinoatrial node (SAN).

The diagrams below show a normal ECG trace and a trace that shows a ventricular ectopic beat, labelled E. The traces were recorded from left to right. Changes in blood pressure in the pulmonary artery are shown over the same period of time.



*Describe the effect of the ectopic beat on heart activity and suggest an explanation for this effect.

(5)

(d) Performance-enhancing drugs may affect heart activity. Outline **one** ethical position relating to whether these drugs should be banned.

(2)

(Total for Question 4 = 11 marks)

5 Many animals have hearts that pump blood through a network of blood vessels.

(a) The table below refers to blood flow in the four major blood vessels of the human heart. If the statement is correct, place a tick (✓) in the appropriate box and if the statement is incorrect, place a cross (✗) in the appropriate box.

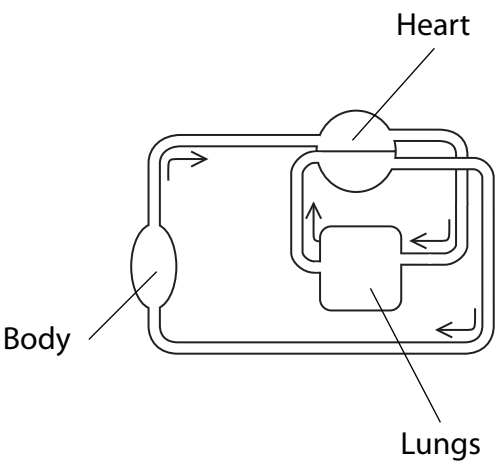
(4)

Name of blood vessel	Carries blood away from the heart	Carries oxygenated blood
Aorta		
Vena cava		
Pulmonary artery		
Pulmonary vein		

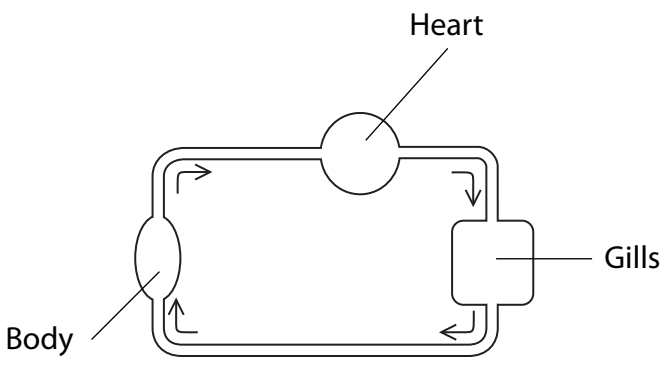
(b) Humans and fish are both animals that have a heart and a network of blood vessels. However, there are some differences in their circulatory systems.

The diagrams below illustrate a human circulatory system and the circulatory system in a fish.

Human circulatory system



ish circulatory system



The arrows show the direction of blood flow.

(i) Using the information in the diagram, describe the circulation of blood in a fish.

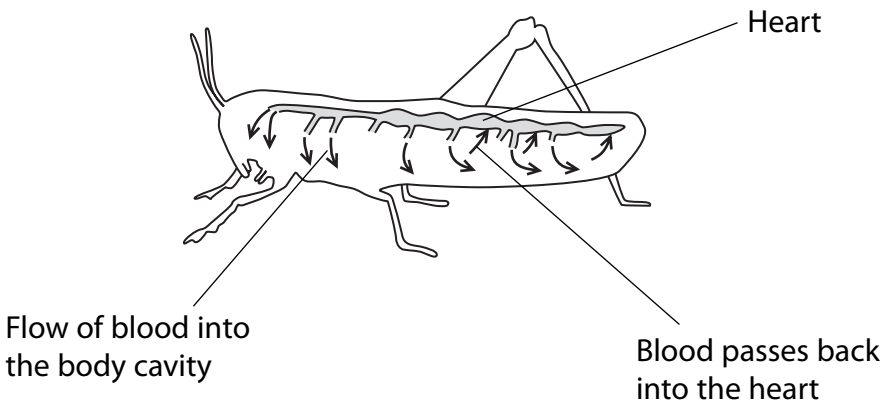
(3)

(ii) Using the information in both diagrams, suggest the advantages that the human circulatory system has compared with that of a fish.

(2)

(c) The heart of an insect is a long tube. It pumps blood into the body cavity so that blood surrounds the cells. The blood then passes back into the heart from the body cavity.

The diagram below illustrates the circulatory system of an insect.



Suggest why the insect does not need blood vessels to transport its blood around the body.

(2)

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(Total for Question 5 = 11 marks)