Circulatory system

Question Paper

Level	Pre U
Subject	Biology
Exam Board	Cambridge International Examinations
Topic	Animal physiology
Sub Topic	Circulatory system
Booklet	Question Paper

Time Allowed: **87 minutes**

Score: **/72**

Percentage: **/100**

Part - B

1 Table 2.1 presents the results of an experiment comparing rates of glucose production by a group of people with type 2 diabetes and a control group without the condition, during 23 hours of fasting.

Table 2.1

	rate of glucose production per unit body mass / μmol kg^{-1} min^{-1}		significance level
	patients with type 2 diabetes	control group	
total glucose production	11.1 ± 0.6	8.9 ± 0.5	$p < 0.05$
glucose from hydrolysis of glycogen in the liver	1.3 ± 0.2	2.8 ± 0.7	$p < 0.05$
glucose from gluconeogenesis	9.8 ± 0.7	6.1 ± 0.5	$p < 0.01$

(a) Discuss the conclusions which can be drawn from the data in Table 2.1.

[6]

(b) In individuals without diabetes, the blood glucose concentration in the renal vein is only slightly lower than in the renal artery.

Explain why one might expect the glucose concentration of the blood in the renal vein to be much **lower** than in the renal artery **and** suggest why, in fact, the concentrations are almost identical.

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[Total: 10]

2 Why do people get heart disease and what should be done about it?

Your answer should draw from a wide range of syllabus material and also demonstrate evidence of reading around the subject. [30]

[Total: 30]

3 A large scale international study was carried out into the effectiveness of a type of statin in reducing the risk of major cardiovascular events, including stroke. The people taking part in the study were given either the statin or a placebo (a pill with no statin). The percentage of those who subsequently had a stroke or other major cardiovascular event was recorded. The results are shown in Table 1.1.

Table 1.1

	percentage of people having a stroke or other major cardiovascular event		significance
	placebo	statin	
stroke	6	4	p <0.05
other major cardiovascular events	25	20	p <0.05

(a) Explain how statins are thought to reduce the risk of cardiovascular disease.

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(b) Explain the importance of using a placebo in this study.

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(c) Discuss any conclusions that may be drawn from this study.

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[Total: 8]

4 Fig. 4.1 shows a vertical section through the human heart.
The structures labelled **X**, **Y** and **Z** are each involved with an aspect of the control and coordination of the heart beat.

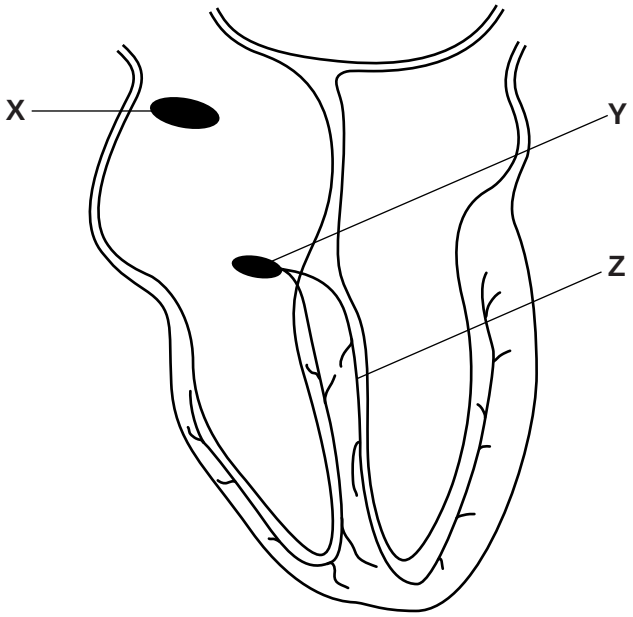

Fig. 4.1

(a) Name the structures labelled **Y** and **Z**.

Y .....

Z .....
[2]

(b) Structure **X** is often referred to as the 'pacemaker'. Explain why it is so called by describing the role it takes in controlling heart beat.

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(c) Explain the role of structure **Y** in the control and coordination of the heart beat.

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(d) The electrical activity of heart muscle can be recorded using electrodes placed at various positions on a person's body. The resulting trace is called an electrocardiogram (ECG) and is a useful diagnostic tool in assessing the functioning of the heart.

On an ECG

- P corresponds to the atria filling and then contracting,
- QRS corresponds to the ventricles contracting,
- T corresponds to the recovery phase.

Fig. 4.2 shows ECGs for two people.

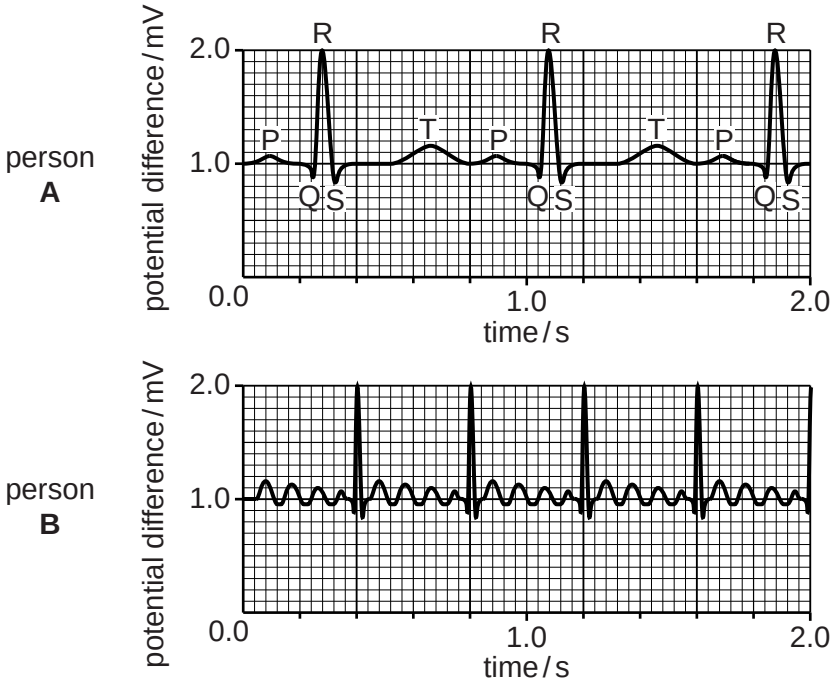

Fig. 4.2

(i) Person **A** in Fig. 4.2 has a normal ECG. Calculate the heart rate from this ECG.

Show your working.

Answer = ... [2]

(ii) Suggest the likely effects on the control and coordination of heart beat of person **B**, indicated by the ECG shown in Fig. 4.2.

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[Total: 14]

5 Fig. 3.1 shows diagrams of the circulatory systems of three groups of vertebrate: fish, amphibians and mammals.

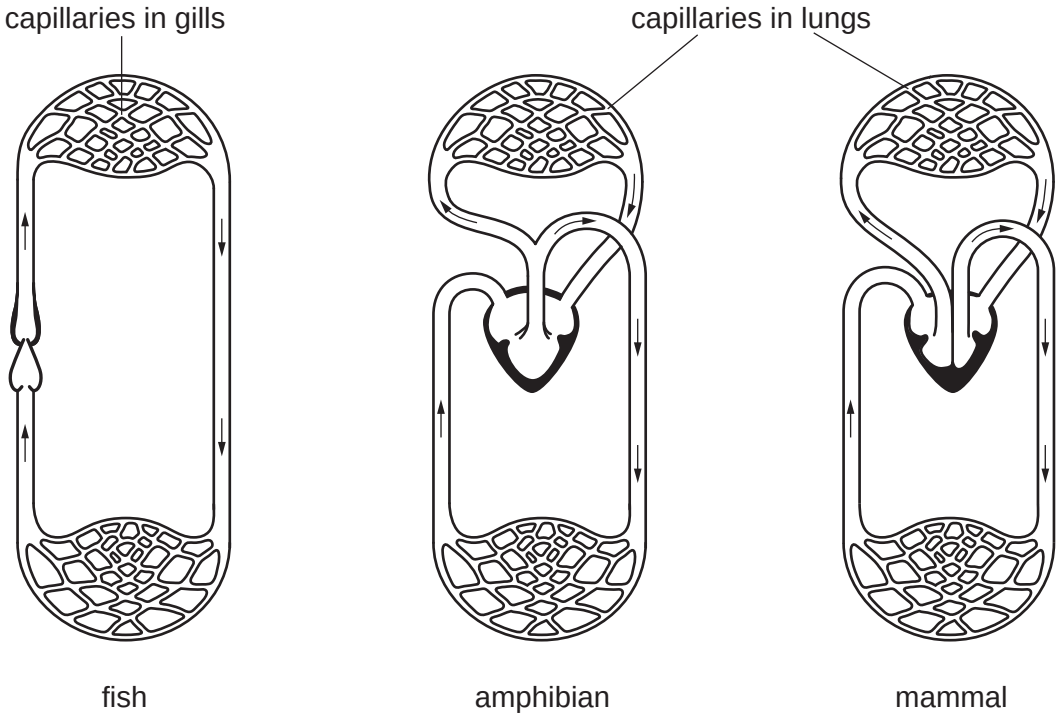

Fig. 3.1

(a) State three ways in which the circulatory systems shown in Fig. 3.1 are similar.

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(b) State **and** explain the advantages to a mammal of the circulatory system shown in Fig. 3.1 in comparison to the circulatory systems of fish and amphibians.

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[Total: 10]