1. **Fig. 24.1** shows a vertical section through a mammalian heart.

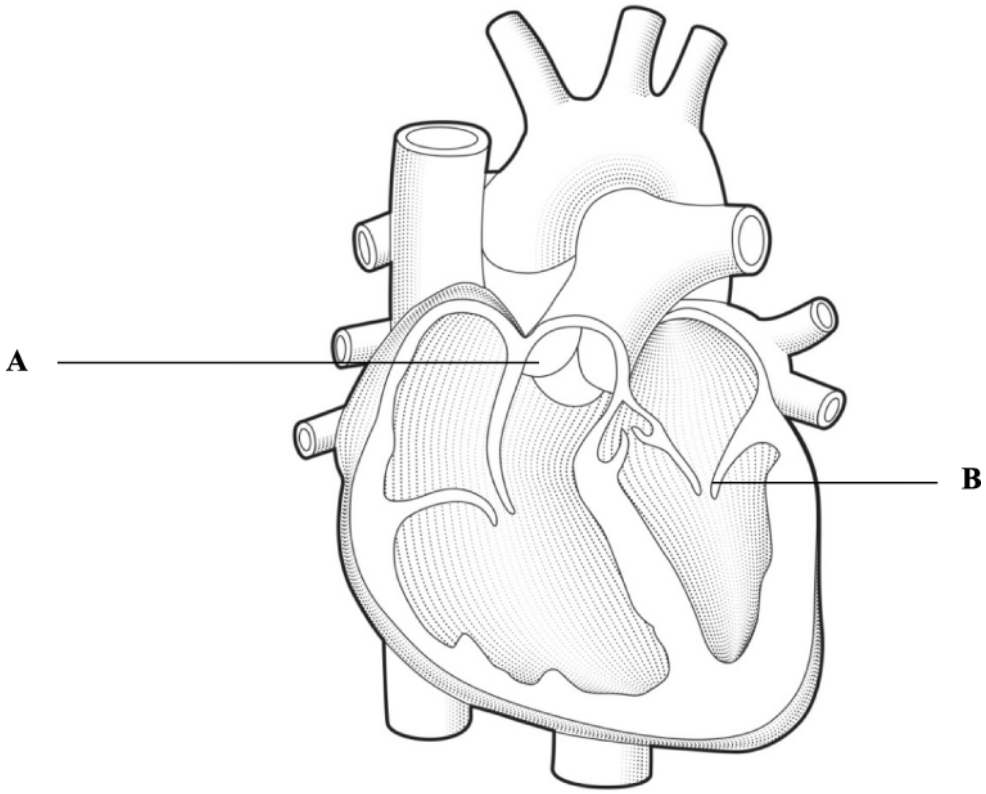

Fig. 24.1

State the roles of structure **A** and structure **B** during the cardiac cycle.

A

B

---

[2]

2. Plasma LDH concentrations were used to diagnose and monitor heart attacks.

The concentration of other molecules within the plasma is now more commonly used. One of these molecules is cardiac troponin (troponin T).

(i) Describe the role of troponin T in cardiac muscle **cells** during diastole.

---

[2]

(ii) **Table 33.1** shows the results from an investigation comparing troponin T plasma concentrations in three different groups.

Group	Number of subjects	Concentration of plasma troponin T (μg dm^{-3})	
		Median	Interquartile range
Normal subjects	100	0.20	0.16–0.30
Subjects where a heart attack was confirmed using an ECG	72	15.30	9.60–22.70
Subjects with other injuries but no heart attack occurred as confirmed using an ECG	13	0.29	0.23–0.43

Table 33.1

Evaluate the evidence that the use of troponin T concentration in plasma is a useful diagnostic test to confirm a heart attack.

You should use information from **Table 33.1** to support your argument.

---

[3]

3(a). During the cardiac cycle, the pressure inside the heart varies. **Fig. 37.1** shows the pressure changes on the right and left sides of the heart during one cardiac cycle.

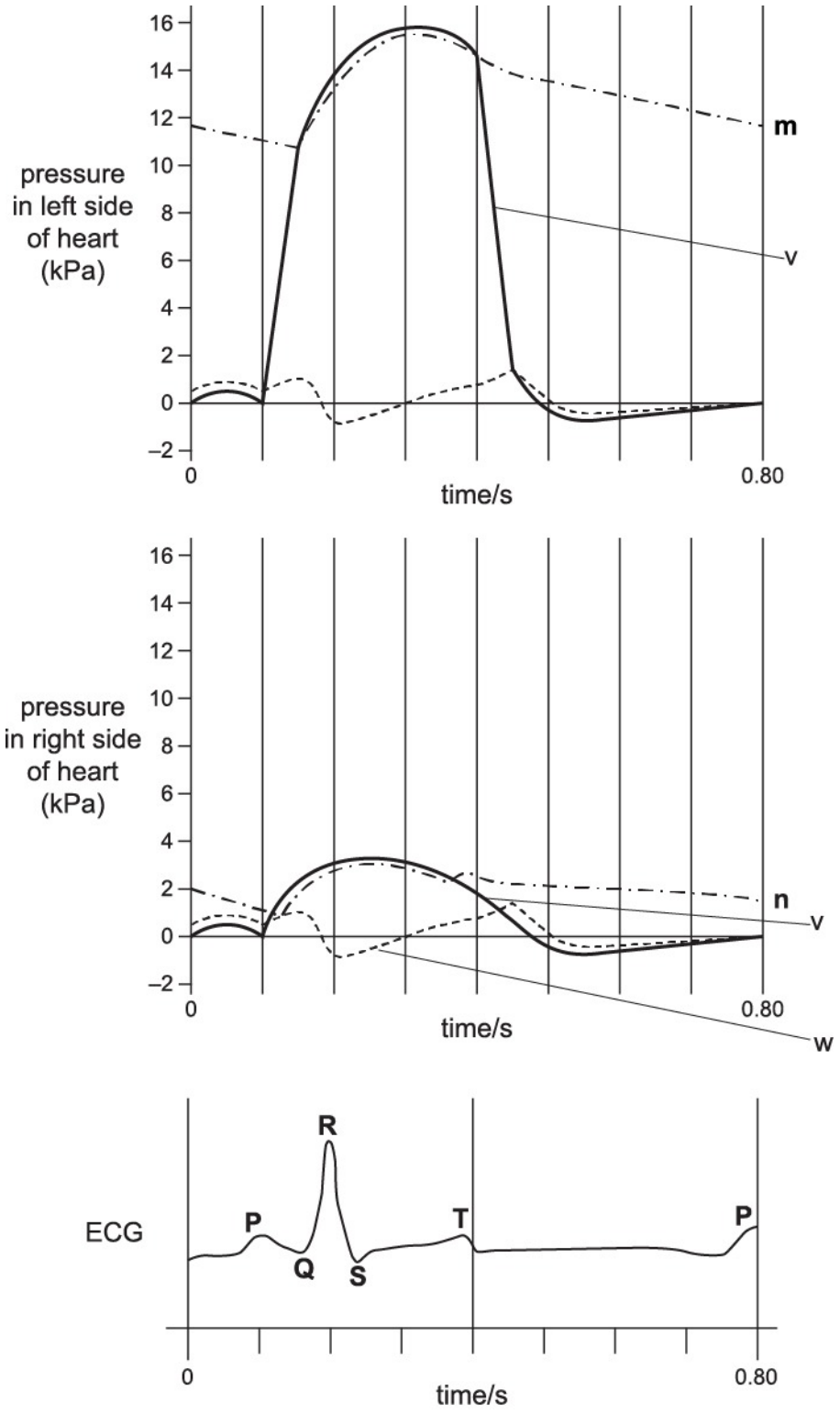

Fig. 37.1

Identify the vessels represented by the labels **m** and **n** in **Fig. 37.1**.

m _____

n _____ **[2]**

(b). The lines labelled **w** and **v** in **Fig. 37.1** show the pressure changes in the ventricles and atria during one cardiac cycle.

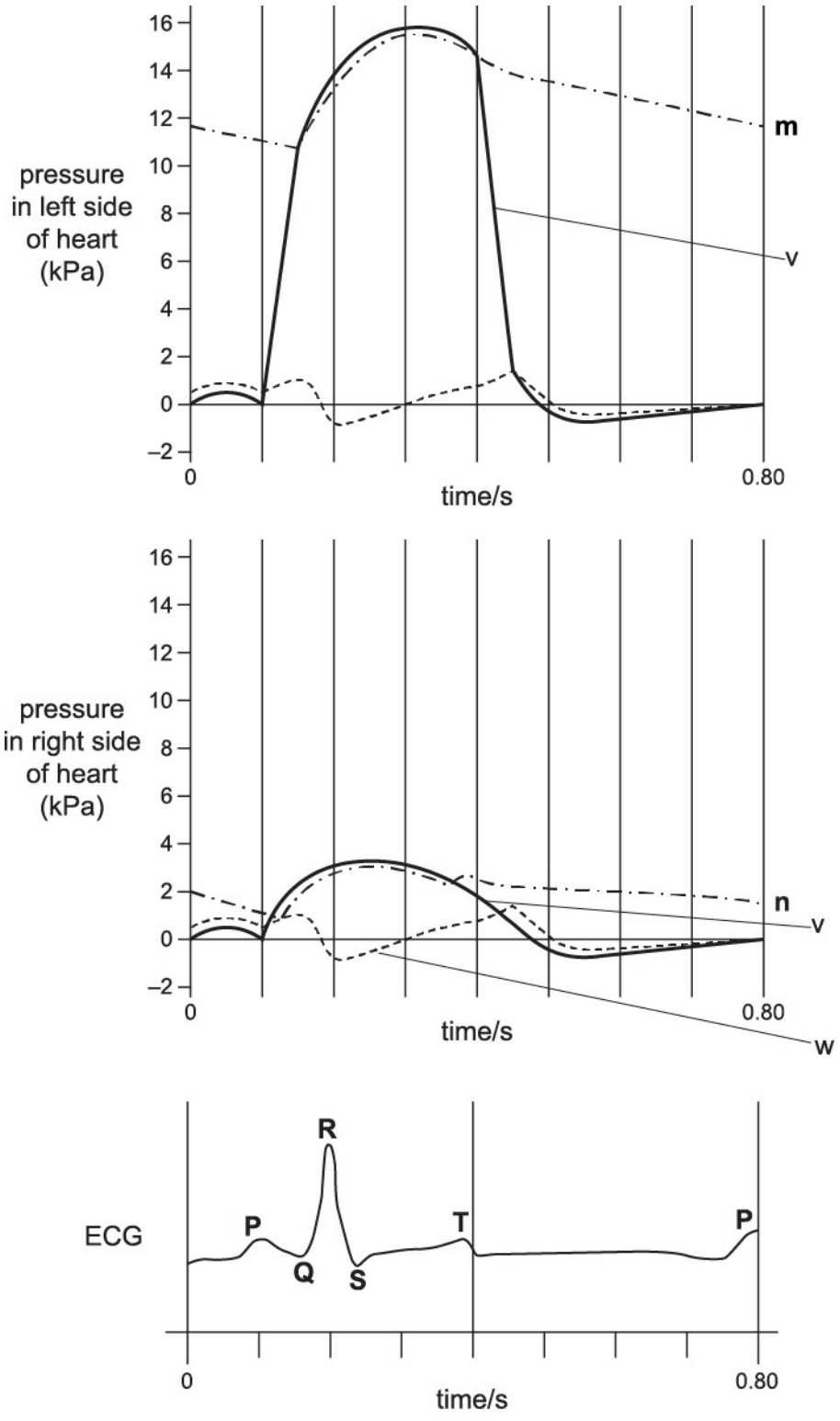

Fig. 37.1

(i) The line labelled **w** shows the pressure changes in the right atrium.

What can be concluded about the structure of the right atrium?

You should use data to support your conclusion.

---

[2]

(ii) The lines labelled **v** show the pressure changes in the left and right ventricles.

Express the **maximum** pressures in the left and right ventricles as a simple ratio.

ratio _____ :1 **[1]**

(iii) Assuming the thickness of the left ventricle wall is 8 mm, use the ratio calculated in part (**ii**) to estimate the thickness of the right ventricle wall.

Give your answer to one decimal place.

right ventricle wall thickness _____ **[2]**

(c). In addition to changes in pressure, **Fig. 37.1** also shows an ECG trace.

The part of the trace labelled T represents the repolarisation of the ventricles. Until this has happened, it is not possible for another heartbeat to occur.

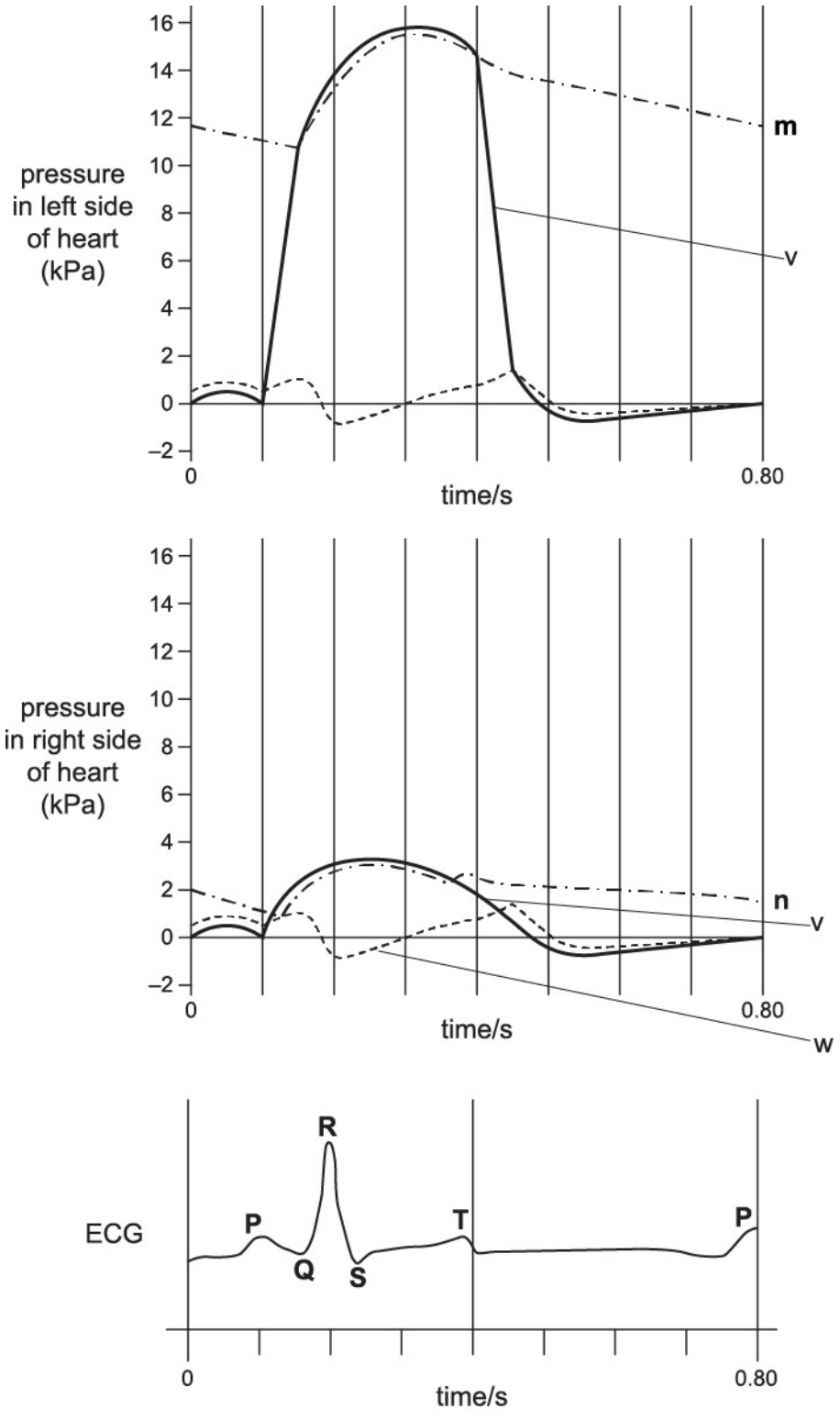

Fig. 37.1

(i) As the heart rate increases, what happens to the time between the **T** wave and the **P** wave which signals the start of the next heartbeat?

_____

_____ **[1]**

(ii) It can be dangerous in some circumstances to exercise at a level where the heart rate approaches its maximum possible.

Using the information in **Fig. 37.1**, calculate the maximum heart rate possible for the person from whom this trace was obtained.

Maximum heart rate _____ **[2]**

4(a). A group of AS level students were planning a pilot study before investigating the effect of exercise intensity on heart rate. They were hoping to obtain data by measuring the heart rates of ten students in the group.

The following factors for investigation were suggested by the students:

- age
- environmental temperature.

The teacher advised the students that these factors were not suitable for their investigation.

For each factor, suggest why it is not suitable for this investigation.

age _____

_____

environmental temperature _____

_____

[1]

(b). The students' pulse rates were measured using electronic monitors while sitting down (resting rate).

The students then exercised for five minutes.

A second pulse rate measurement was taken exactly four minutes into the exercise period (heart rate during exercise).

The investigation was repeated after giving all students enough time for their pulse rates to return to resting rates.

The results of their pilot study are shown in Table 25.

Student	Resting heart rate (bpm)		Heart rate during exercise (bpm)	
	1	2	1	2
1	56	54	82	84
2	68	66	92	98
3	74	72	102	98
4	72	74	104	102
5	70	72	100	98
6	58	60	88	90
7	66	64	94	94
8	68	66	94	(72)
9	68	64	92	96
10	62	62	90	92

Table 25

(i) During the repeat investigation, it was noticed that **Student 8** had a lower than expected heart rate during exercise. This anomaly was circled in the results table.

The students agreed that the anomaly was most probably caused by human error.

Suggest **one** human error that could have resulted in this anomaly.

---

[1]

(ii) The students highlighted the results of **Student 1** who appeared to have heart rates that were much lower

than those of the other students.

Suggest **one** explanation for this lower heart rate.

---

[1]

(iii) The students made the following conclusion about resting heart rates:

'All resting heart rates were in the normal range within **one** standard deviation.'

Variance can be calculated using the following formula and this can then be used to calculate the standard deviation.

$$s^2 = \frac{\Sigma(x - \bar{x})^2}{n - 1}$$

where s^2 = variance

n = number of data values

Standard deviation can then be calculated using the following formula:

$$s = \sqrt{s^2}$$

where s = standard deviation

s^2 = variance

Complete the missing calculations in the table below and use the equations given to find the variance ($\boldsymbol{s^2}$) and standard deviation ($\boldsymbol{s}$) for the students' results.

Student	Heart rate (x)	Heart rate – mean heart rate $(x - \bar{x})$	$(x - \bar{x})^2$
1	55	−11	121
2	67	1	
3	73	7	
4	73	7	
5	71	5	
6	59	−7	
7	65	−1	
8	67	1	
9	66	0	
10	62	−4	

Variance (s^2) = ...

Standard deviation (s) = ...

[3]

(iv) Do the results calculated in **(b)(iii)** support the conclusion made by the students?

Justify your answer.

---

[1]

5. The structure of the heart can be better understood through dissection.

Fig. 3.1 shows a cross-sectional photograph of a dissected mammalian heart.

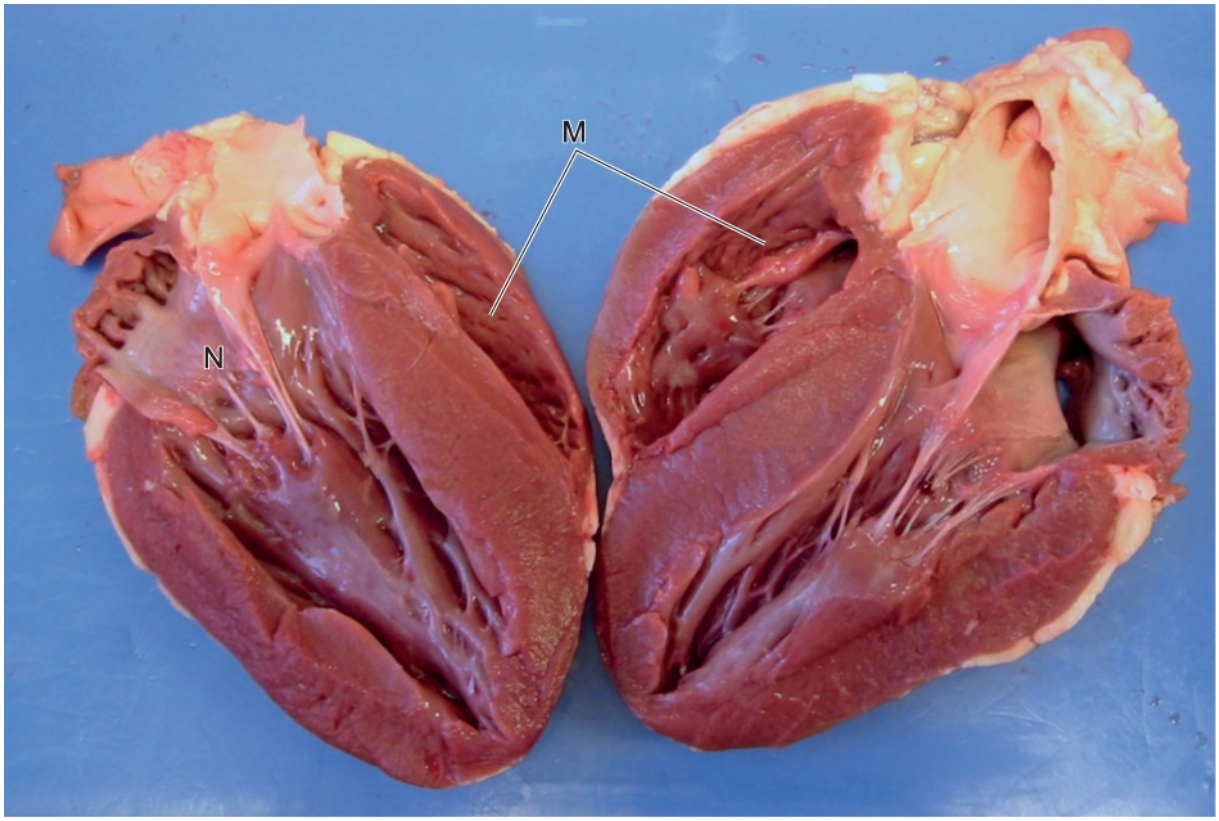

Fig. 3.1

(i) Name the parts of the heart labelled in **Fig. 3.1**.

M

N

---

[2]

(ii) Fig. 3.2 shows a drawing of one side of the dissected heart.

Fig. 3.2

State **two** pieces of advice that could be given to improve the drawing in Fig. 3.2.

---

[2]

6(a). Valves help to regulate the flow of blood through the heart.

Valve stenosis is a heart condition caused by a narrowing of the opening between the atrium and ventricle.

Fig. 4.1 is a diagram that shows the flow of blood through one side of heart **Y**, a normal heart, and one side of heart **Z**, a heart with valve stenosis.

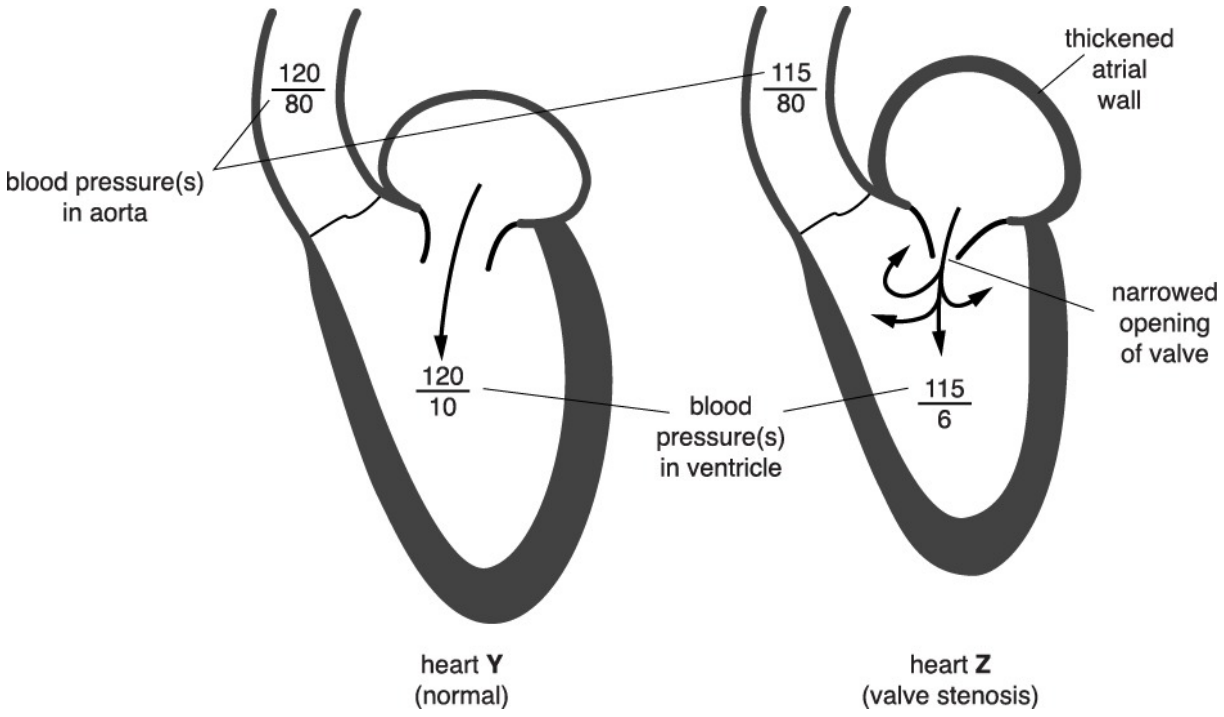

Fig. 4.1

(i) Name the valve shown in Fig. 4.1 that is affected by valve stenosis.

---

[1]

(ii) Using the information in Fig. 4.1, compare the blood pressure within heart **Y** and heart **Z**.

---

[1]

(iii) Suggest why the atrial wall becomes thickened in heart **Z**.

[1]

(b). Valve stenosis increases the turbulence within the heart as blood flows through the valve.
This causes a heart murmur.

Heart murmurs can be detected and monitored by health professionals using a stethoscope.

Other than using a stethoscope, outline a procedure that can be used by health professionals for monitoring heart function.

[3]

7. The shape of cells is important to their function. For example, squamous epithelial cells are thin and flat, which increases the rate of gaseous exchange in the alveoli.

Fig. 5.1 shows how the surface area and volume of two differently shaped cells change as they increase in size.

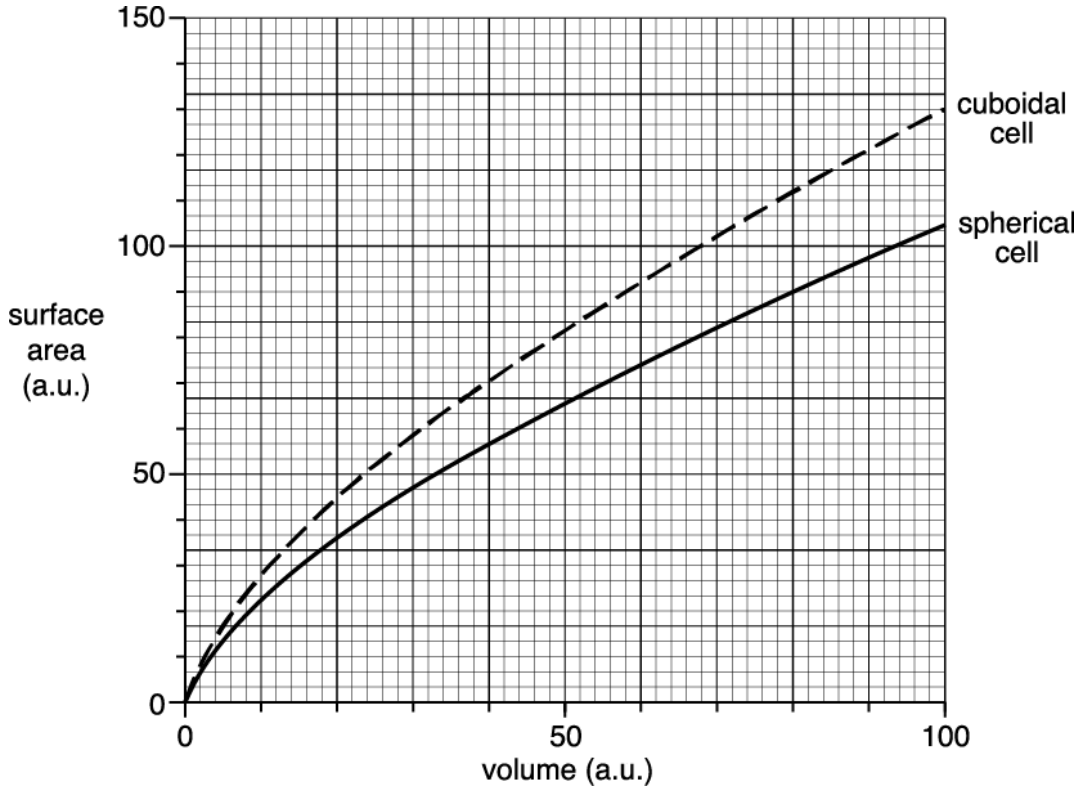

Fig. 5.1

(i) Using Fig. 5.1, compare the changes in surface area and volume as the two differently shaped cells increase in size.

---

[3]

(ii) Draw, **on the graph in Fig. 5.1**, the expected line or curve for a thin, flat cell, such as a squamous epithelial cell.

This answer should be drawn on Fig. 5.1.

[2]

8. In humans, the blood is the medium for transporting substances such as oxygen around the body by mass transport.

Define the term *mass transport*.

[1]

9(a). In humans, a circulatory system is needed to transport substances around the body by mass transport.

Explain why humans need a mass transport system.

---[2]

(b). Pressure must be maintained as blood flows through organs and vessels of the circulatory system.

Describe **two** features of the circulatory system that could affect blood pressure.

1

2

---[2]

10. A low concentration of potassium ions in the blood is known as hypokalaemia. Hypokalaemia may cause an abnormal heart beat.

This abnormal heart beat or arrhythmia can be detected using an electrocardiogram (ECG). An ECG represents the electrical activity of the heart during the cardiac cycle.

Fig. 6.1 is a diagram that shows part of the ECGs of a person with a normal heart beat and a person with hypokalaemia.

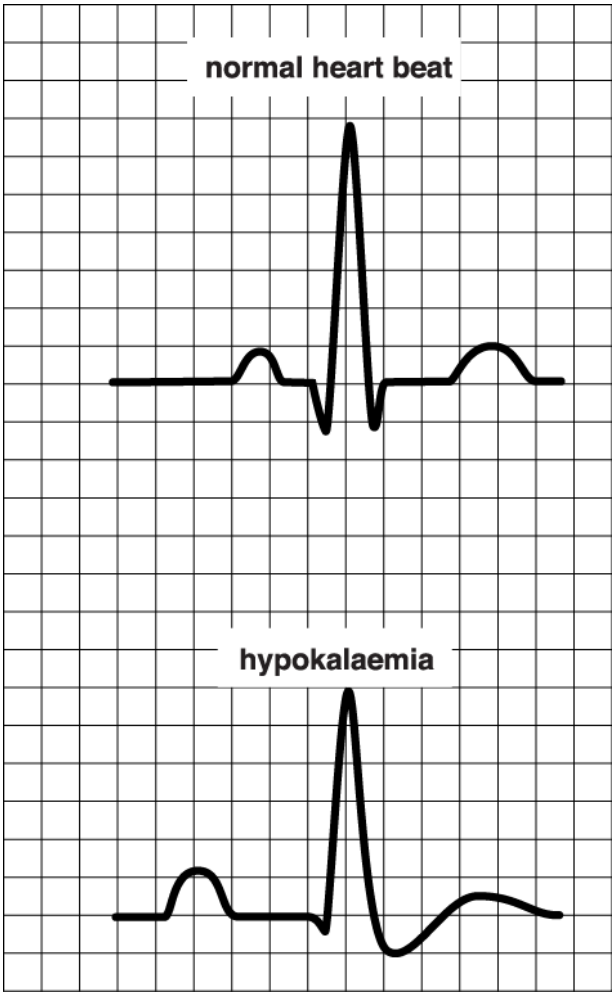

Fig. 6.1

Describe the differences between the two waves shown in Fig. 6.1.

---------- [2]

11(a). Heart attacks can be recognised by a number of symptoms, including sweating and pale skin. Prompt action by trained first-aiders increases a person's chances of survival.

State **two** actions that can be taken when a **conscious** person is recognised as having a heart attack.

---

[2]

(b). Cardiopulmonary resuscitation (CPR) is performed on people who have suffered cardiac arrest and are no longer conscious.

A Japanese study compared the effectiveness of two forms of CPR:

- CPR with chest compressions only
- conventional CPR (with chest compressions and rescue breaths).

Patients who had suffered cardiac arrest were given one of the two treatments.

Successful outcomes were judged as the percentage of patients who survived for one month and did not have brain damage.

Fig. 6.1 shows the results.

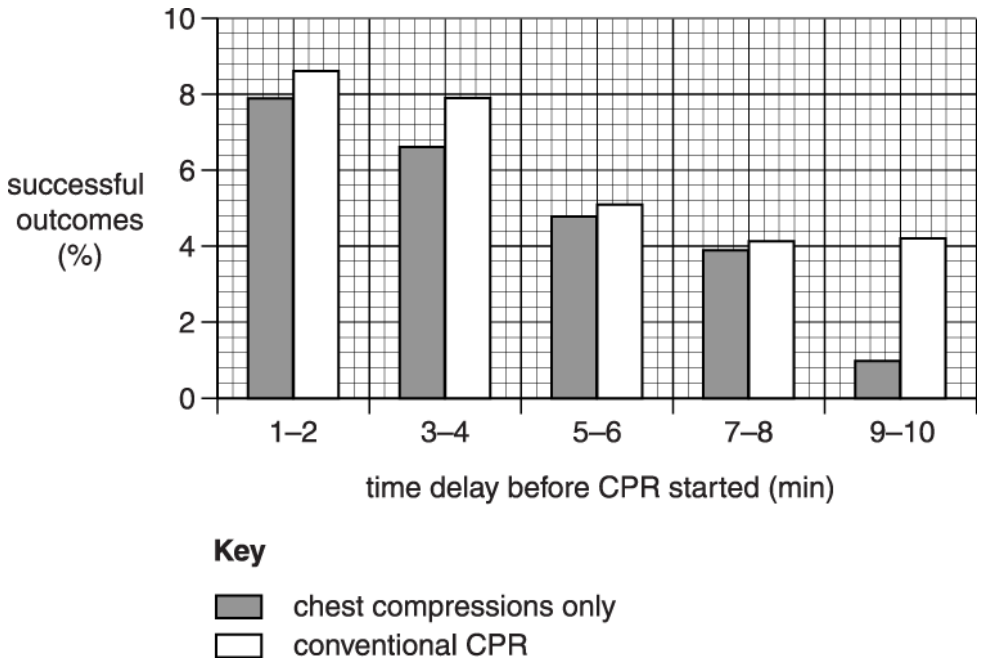

Fig. 6.1

(i) Using the information in Fig. 6.1, compare the effect on successful outcomes of 'CPR with chest compressions only' and 'conventional CPR'.

---[3]

(ii) The British Heart Foundation encourages untrained individuals to use 'CPR with chest compressions only'.

Use the information in Fig. 6.1 to suggest why the British Heart Foundation promotes this form of CPR as a first aid treatment to be used by untrained individuals.

---[1]

(c). A person who is recovering from cardiac arrest may be given coronary bypass surgery.

When coronary bypass surgery is ineffective, however, a heart transplant may be carried out.

Suggest **one** potential **disadvantage** for a patient who receives a heart transplant rather than coronary bypass surgery.

---[1]

12(a) Technicians can use electrocardiograms (ECGs) to monitor the electrical activity of the heart.

.

Fig. 2 is an ECG trace of person with healthy heart.

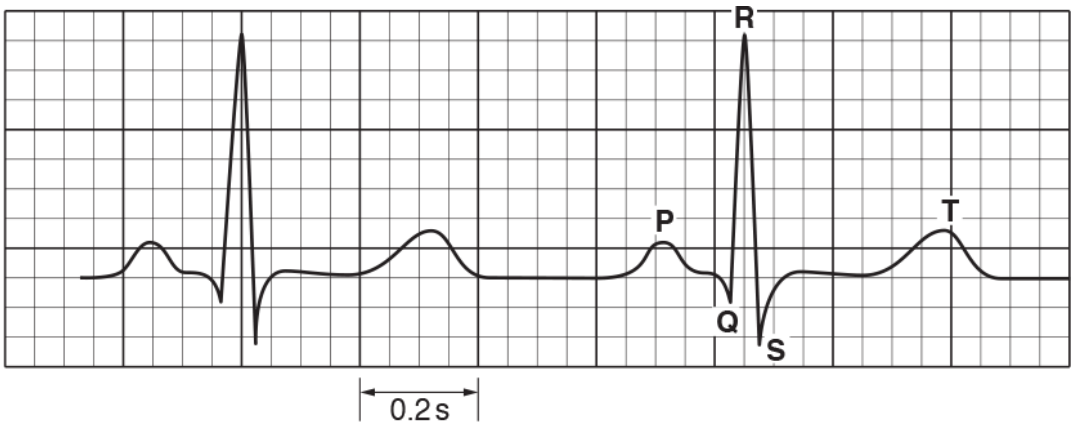

Fig. 2

Using Fig. 2, calculate the heart rate to **two** significant figures.

Answer = ---------- bpm **[2]**

(b). Supraventricular tachycardia (SVT) is a medical condition affecting the heart resulting in an abnormal heart rhythm.

One of the signs of SVT is that the atria do not contract correctly.

Using this information, describe how the ECG trace of a patient with SVT would differ from the trace shown in Fig. 2.

[2]

(c).

Patients suffering from SVT for a prolonged period of time may suffer a heart attack and can go into cardiac arrest.

Describe the first aid procedure used to treat a patient suffering a heart attack **and** how the procedure would change if they later suffered a cardiac arrest.

[4]

13(a). A rapid heart rate reduces the volume of oxygen reaching the cardiac muscle of the heart. This can lead to chest pain known as angina.

Digoxin is a drug that can be used to treat angina by reducing the resting heart rate.

A study into the effect of digoxin on heart rate was carried out on a group of patients being treated for angina.

The resting heart rates of these patients were recorded before starting treatment and then again after eight weeks of treatment with digoxin.

(i) Explain why it is important to record the resting heart rates of patients before starting treatment with digoxin.

---

[1]

(ii) State one variable that would need to be taken into account when conducting this study.

---

[1]

Fig. 2 shows the results for one of the patients in this study.

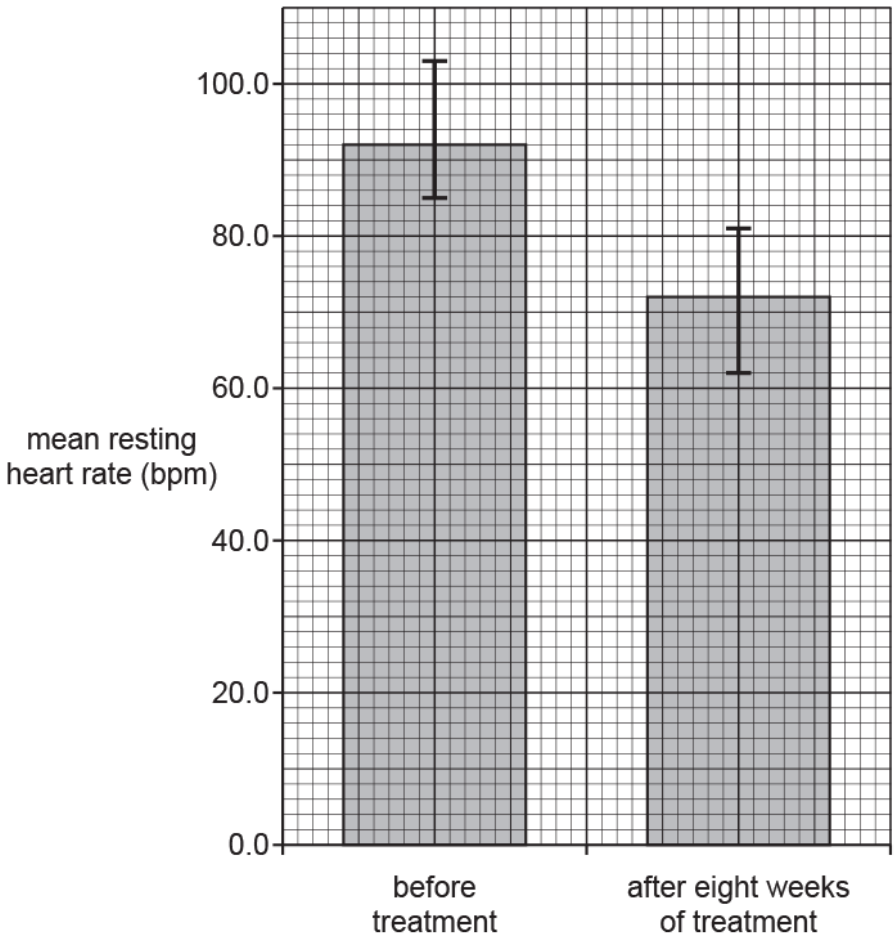

Fig. 2

(iii) Using Fig. 2, state the range in the resting heart rates for this patient before **and** after eight weeks of treatment with digoxin.

Before treatment ----------

After eight weeks of treatment ----------

[1]

(iv) Calculate the percentage change in the **mean** resting heart rates of this patient.

---------- [2]

(b). Digoxin may reduce resting heart rate by acting on the atrioventricular node (AVN).

(i) What is the role of the AVN in coordinating the heart action?

---[2]

(ii) Suggest how the action of digoxin on the AVN could lead to a decrease in resting heart rate and how this could affect cardiac function.

---[2]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1			A prevents the backflow of blood into the (right) ventricle during diastole (1) B prevents the backflow of blood into the (left) atrium during ventricular systole (1)	2	
			Total	2	
2		i	troponin, binds to / AW, tropomyosin myosin binding site is blocked (by tropomysin) / *idea that* myosin is prevented from binding to actin	2	
		ii	comparison of median values in support of a statement / comparison of interquartile range values in support of a statement *plus any two from the following marks up to a maximum of 3* *idea that* (very) high concentrations are only seen where a heart attack is confirmed / heart attack subject have significantly higher median values than other groups *idea that* bottom of interquartile range for confirmed heart attacks is significantly higher than other groups / top of interquartile range of other groups is significantly below bottom of range for group with heart attack *idea that* unlikely to get 'false positives' or 'false negatives' *idea that* sample sizes are very different in the three groups and could affect the validity of the data	3	DO NOT ALLOW a simple description of the concentrations for each group – look for a clear statement that the high levels are specific to a heart attack or that they are significantly higher for this group.
			Total	5	
3	a		m – aorta n – pulmonary artery	2	
	b	i	wall must be thinner than right ventricle wall figures in support	2	ALLOW manipulated figures e.g. right ventricle pressure is 6 x higher, ratio is 3 : 0.5 or 6 : 1
		ii	ratio = 5 : 1	1	ALLOW 5.3 : 1

Question			Answer/Indicative content	Marks	Guidance
		iii	1.5 mm	2	Award 1 mark if units are incorrect or omitted. If an alternative answer is given with units and to one decimal place, **ALLOW** 2 marks for 1 divided by ratio obtained from (ii) multiplied by 8 as error carried forward
	c	i	Time between them gets less / AW	1	
		ii	**Any 2 from:** Minimum time for 1 beat = 0.3 seconds (distance from first P to T wave) 60 ÷ 0.3 Answer = 200 bpm / beats per minute	2	
			Total	**10**	

Question			Answer/Indicative content	Marks	Guidance
4	a		*age* students (in AS class) would not provide a big enough range **AND** *environmental temperature* *idea that* it would be, unsafe / unethical, to test temperature on humans / AW **OR** *idea that* could not get a wide enough range of temperatures (in the classroom) ✓	1	**ACCEPT** students (in AS class) would be same age **IGNORE** reference to homeostasis **IGNORE** same environment **CREDIT** *idea that* environmental temperature is difficult to measure or control (in a classroom) **Examiner's Comments** In this question **AO2** and **AO3** were being tested and as in **Q21**, candidates were required to draw on practical experience. There was also a standard deviation calculation but this was well scaffolded and accessible to candidates across the ability range. Many candidates could offer a suggestion as to why 'age' was an unsuitable factor for investigation but few went on to do the same for 'environmental temperature'. Both were needed for one mark.
	b	i	*credit examples of*: *human error in timing* e.g.took the heart rate measurement after exercise ✓ *human error in exercise* e.g.did not jog as quickly / AW ✓ *human error in equipment* e.g. electronic bands became loose ✓	1 max	**IGNORE** counting errors as heart rate was measured electronically *Other examples* e.g. read it wrong e.g. wasn't taken exactly 4 minutes into exercise e.g. allowed to recover before taking heart rate e.g. didn't try as hard (during exercise)

Question			Answer/Indicative content	Marks	Guidance
		ii	(student) was, fitter / undertaking athletic training ✓ (student) had a higher stroke volume ✓ (student) had **correctly named** heart condition ✓ genetic reasons ✓	1 max	CREDIT *idea that* they had an exercise programme **Examiner's Comments** In this question AO2 and AO3 were being tested and as in Q21, candidates were required to draw on practical experience. There was also a standard deviation calculation but this was well scaffolded and accessible to candidates across the ability range. Many candidates were generally well answered by the majority of candidates.
		iii	column for $(x- \bar{x})^2$ completed correctly ✓ variance = 35 **or** 34.7 ✓ SD = 6 **or** 5.9 **or** 5.89 ✓	3	DO NOT CREDIT minus numbers in column | Student	heart rate (x)	(x- x̄)	(x- x̄) ^{2}
---	---	---	---
1	55	-11	121
2	67	1	1
3	73	7	49
4	73	7	49
5	71	5	25
6	59	-7	49
7	65	-1	1
8	67	1	1
9	66	0	0
10	62	-4	16	 ECF mp 2 if mp 1 incorrect mp3 if mp2 incorrect Figures should be no more than 1dp different between mps. **Examiner's Comments** In this question AO2 and AO3 were being tested and as in Q21, candidates were required to draw on practical experience. There was also a standard deviation calculation but this was well scaffolded and accessible to candidates across the ability range. The scaffolding provided for the standard deviation calculation enabled the majority

Question			Answer/Indicative content	Marks	Guidance
					of candidates to score at least one mark. However, it was a concern that some candidates placed a negative sign in front of a squared number e.g. -7^2 became – 49 which was not credited. An inappropriate number of decimal places were also not credited but this was only penalised once which meant that candidates could gain credit for responses further in the calculation. Some candidates failed to include the first row in their calculation but once again 'error carried forward' was applied which enabled them to gain marks despite this initial error. Stronger candidates had the clear idea that some heart rates were more than one standard deviation from the mean with some candidates showing evidence that they had calculated the mean heart rate at 66bpm to answer.
		iv	no / conclusion rejected AND *reason* *idea that* some students have heart rates that fall outside one SD of the mean ✓	1	CREDIT *idea that* a given heart rate (from results) is more than one SD away from mean heart rate e.g. 59 is more than one SD away from 66 Examiner's Comments In this question AO2 and AO3 were being tested and candidates were required to draw on practical experience. There was also a standard deviation calculation but this was well scaffolded and accessible to candidates across the ability range. However, there were misconceptions with the meaning of standard deviation evident; the most common being that one SD meant that it should be equal to 1.
			Total	7	

Question			Answer/Indicative content	Marks	Guidance
5		i	**chamber M** (right) ventricle ✓ **valve N** bicuspid valve / (left) AV valve ✓	2	ACCEPT mitral valve Examiner's Comments Quite a few students lost a mark for (i) by incorrectly stating right or left for either the valve or the chamber. The most common incorrect responses were atria and semi lunar valve. It should be noted that heart strings are not actual anatomical structures.
		ii	no shading ✓ use a sharp pencil ✓ continuous lines ✓ add label(s) / title / description(s) ✓ add scale ✓	2 Max	Examiner's Comments There was a wide range of responses for (ii) with some candidates obviously well trained in scientific drawing while others didn't directly address the question, suggesting that other structures should be included or the heart should be looked at from different angles.
			Total	4	

Question			Answer/Indicative content	Marks	Guidance
6	a	i	bicuspid OR left, atrioventricular / AV;	1	Examiner's Comments Very few candidates picked up on the 'clue' in the diagram which showed the aorta indicating this was the left side of the heart. Hence, although most could identify the atrioventricular valve, few specified it was the left valve.
		ii	systolic AND diastolic pressure is lower in heart Z;	1	CREDIT ora for heart Y ACCEPT 'BP is lower in Z' if statement supported by correct figures for systolic and diastolic pressure e.g systolic has dropped by 5 and diastolic by 4 OR Z 115/6 and Y 120/10. DO NOT CREDIT reference to aortic pressure figures (120/80 and 115/80) Examiner's Comments In (ii) good responses referred to correct data for systolic and diastolic pressure in the chambers of the heart while weaker candidates simply referred to 'blood pressure' or used data from the aorta.

Question			Answer/Indicative content	Marks	Guidance
		iii	*idea that* needs to generate higher pressure or more force to overcome the resistance (caused by narrower opening);	1	**e.g.** valve does not open so far so more pressure has to be applied to make sure the same volume of blood is moved into the ventricles needs to be stronger to push blood through the narrowed opening IGNORE reference to the atrium working harder Examiner's Comments Part (iii) was well answered although some candidates did imply that the change in the wall was a cause of the heart defect rather than a consequence of it.
	b		electrocardiogram / ECG; detail e.g. remove clothing; electrodes placed on arms, legs and chest; OR ultrasound / echocardiogram; detail e.g. remove clothing / application of gel; idea of placing transducer in several locations;	3 max	**e.g.** description of using an ECG trace IGNORE 'sphygmomanometer or taking a pulse' If sphygmomanometer or taking a pulse are given as techniques, allow up to **2 MARKS maximum for procedures**. e.g. (sphygmomanometer) cuff placed appropriately cuff inflated and deflated details of Korotkov sounds (pulse) fingers on suitable location count for appropriate time convert to bpm. Examiner's Comments The description of the procedure for an ECG was generally well done. Some candidates did not pick up that the question was about monitoring heart function and described blood pressure readings and pulse rate measurement.

Question			Answer/Indicative content	Marks	Guidance
			Total	6	

<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>7</td><td></td><td>i</td><td>Similarity
1. As volume increases, surface area increases / surface area to volume ratio decreases;

Differences

2. idea that the spherical cell always has a lower surface area than the cuboidal cell;

3. SA:V greater in cuboidal cell;

4. idea of difference between surface areas gets bigger
4. / SA:V difference gets bigger , as volume increases;

5. correct comparative figures;</td><td>3</td><td>CREDIT reverse argument throughout

as volume increases the surface area of the cuboidal cell increases more than the spherical cell' – gets mp 1 and 4

<table>
<tr><th rowspan="2">VOL (a.u)</th><th colspan="2">Surface area (au)</th><th rowspan="2">Difference
± 2</th></tr>
<tr><th>Spherical cell
± 1</th><th>Cuboidal cell
± 1</th></tr>
<tr><td>10</td><td>23</td><td>27</td><td>4</td></tr>
<tr><td>20</td><td>35</td><td>45</td><td>10</td></tr>
<tr><td>30</td><td>46</td><td>59</td><td>13</td></tr>
<tr><td>40</td><td>56</td><td>70</td><td>14</td></tr>
<tr><td>50</td><td>65</td><td>82</td><td>17</td></tr>
<tr><td>60</td><td>73</td><td>93</td><td>20</td></tr>
<tr><td>70</td><td>82</td><td>103</td><td>21</td></tr>
<tr><td>80</td><td>90</td><td>112</td><td>22</td></tr>
<tr><td>90</td><td>97</td><td>120</td><td>23</td></tr>
<tr><td>100</td><td>105</td><td>130</td><td>25</td></tr>
</table>

Examiner's Comments

Part (i) was a good discriminator with weaker candidates confusing the relationship between the axes (‘as surface area increases the volume increases’). The scale on the graph was challenging and allowances were made for this in the mark scheme but too many candidates did not read figures correctly from the graph. Some candidates answered incorrectly in terms of rates of change.</td></tr>
</table>

Question			Answer/Indicative content	Marks	Guidance
		ii	*curve drawn on Fig.5.1* to be above **both** that of cuboidal and spherical cells; to start at 0 for both SA and V **AND** be a smooth curve of similar shape to other two curves **AND** (if going off scale) terminates after 50 a.u. volume;	2	**Examiner's Comments** Part (ii) was far more accessible although some candidates failed to notice this question and omitted it despite the mark tariff being visible and clear italicised instructions being given.
			Total	**5**	
8			*idea that* everything is moving in one direction;	1	**Examiner's Comments** This part was very accessible.
			Total	**1**	

Question			Answer/Indicative content	Marks	Guidance
9	a		(humans are) large / multicellular, organisms; (humans have) low SA:Vol; *idea of* a longer diffusion distance (so) substances needed could not be supplied quickly enough;	2 max	ACCEPT humans have many cells Examiner's Comments In this question, the context of blood pressure measurements provided candidates with the opportunity to demonstrate their knowledge of the circulatory system and respond to 'How Science Works' style questions involving the sphygmomanometer. This part surprisingly saw few candidates refer to humans as being 'large' or having a 'small SA:V' and examiners noted that 'why humans need a mass transport system' appeared to be a poorly understood concept.
	b		force of ventricular contractions; strength of elastic recoil (of blood vessels); resistance to blood flow / AW;	2 max	ACCEPT lumen diameter of blood vessels qualified e.g. narrower lumen would increase pressure CREDIT *idea of* vasodilation or vasoconstriction occurring IGNORE reference to cardiovascular disease Examiner's Comments In this question, the context of blood pressure measurements provided candidates with the opportunity to demonstrate their knowledge of the circulatory system and respond to 'How Science Works' style questions involving the sphygmomanometer. A wide range of responses were seen in this part. Some candidates identified a factor, for example, lumen size of a vessel, but did not qualify their response with a description to gain credit for the marking point.
			Total	4	

Question			Answer/Indicative content	Marks	Guidance
10			*For hypokalaemia trace* 1 P wave is (slightly) taller / AW; 2 interval between P and Q(RS) is bigger / AW; 3 Q / R, smaller / AW; 4 S(T) depression elongated / AW; 5 T wave is not clear / AW;	2 max	CREDIT ORA IGNORE explanations for differences Examiner's Comments Despite two challenging AO2 style questions in **(i)** and **(ii)**, there were still few 'no response' questions at the end of the paper suggesting that candidates had managed their time effectively during the examination. The question assessed the ability of candidates to demonstrate application of their knowledge and understanding of electrolytes, water potential and ECG interpretation in the context of conditions that would affect potassium ion concentration. For this part, candidates offered good comparative descriptions for the two ECG traces and many candidates were able to gain both marks for this part of the question. There were some candidates, however, who endeavoured to explain what was happening at each stage in the traces, so could not be awarded any of the marking points.
			Total	2	

Question			Answer/Indicative content	Marks	Guidance
11	a		(make the person comfortable by) sitting them, with their knees bent / ref W position; call, 999 / ambulance / emergency services; check if the person takes medication for a heart condition / give aspirin (if available and person not allergic); monitor, consciousness; monitor, heart / breathing, rate;	2	IGNORE ref to CPR since the question refers to a conscious person IGNORE Recovery position Examiner's Comments This question mainly addressed AO3 but had some elements of AO1 and AO2. Most candidates gained marks for referring to 'calling 999'. Some were not specific about sitting the person down with knees bent (W position), and wrote about lying them down or putting in the recovery position. Whilst candidates did comment on about checking if the person had medication, they did not specify that the medication was for a heart condition. A minority of candidates wanted to give CPR or defibrillate, and clearly had not read the question correctly.

Question			Answer/Indicative content	Marks	Guidance
	b	i	*Idea of* conventional CPR, (always) more successful; *Idea of* difference being small up to 8 minutes / at 7-8 minutes; *Idea of* for 9-10 minute time delay conventional CPR has much better success / ORA ; successful outcomes decrease with time delay for both forms of CPR; pair of correct comparative figures with units (% and minutes / mins) (allow calculated differences);	3	IGNORE if referring to a single time delay as this applies in every case ACCEPT 'similar at 7-8 minutes' ACCEPT 'about' related to a figure within the range DO NOT CREDIT 'above' or 'below' Time delay CC CPR 1-2 7.8 – 7.9 8.5 – 8.7 3-4 6.5 – 6.7 7.8 – 7.9 5-6 4.8 4.9 – 5.1 7-8 3.8 – 3.9 4.1 – 4.2 9-10 1.0 4.2 Examiner's Comments This question mainly addressed AO3 but had some elements of AO1 and AO2. The graph presented the data on a grid and it is therefore expected that candidates should quote the data with a reasonable degree of accuracy, including correct units. Candidates failed to gain credit for data quotes which began 'around …' or 'just above (or below) ....'. The figures quoted by candidates were often inaccurate or imprecise.
		ii	will save some lives / better than doing nothing; easier to do / less likely to put people off doing it / more likely to try it; success rate for both similar / nearly as high (most of the time);	1	Examiner's Comments This question mainly addressed AO3 but had some elements of AO1 and AO2. This question was accessible to most candidates.

Question			Answer/Indicative content	Marks	Guidance
	c		rejection; (constant) use of immunosuppressants (in patient);	1	IGNORE ref to waiting lists Examiner's Comments This question mainly addressed AO3 but had some elements of AO1 and AO2. This was well answered by the majority of candidates, although some did not read the question carefully (set in the context of after the transplant had occurred), and wrote about waiting times or lack of donors.
			Total	7	

Question			Answer/Indicative content	Marks	Guidance
12	a		67–75 ✓✓	2	If answer not given to two significant figures allow one mark for correct working i.e. 60 divided by, 0.80 – 0.90 OR 75.00 – 66.67 Examiner' Comments Candidates were asked to consider an ECG trace in this question and use it to calculate heart rate and describe the trace of a patient with SVT. They were then asked to describe the first aid procedure used for a heart attack and cardiac arrest. Candidates often answered with 0.8 x 60 instead of 60/0.8. This resulted in very low heart rate. Candidates should be encouraged to consider whether the answers they give are reasonable and then if not, perhaps try again.
	b		*idea that* there is no clear P-wave S idea that there is ✓ *idea that* there is increased frequency ✓	2	Examiner' Comments Descriptions of the p-wave in (b) were often given but fewer mentioned the frequency increasing. A lot of vague answers referred to random change.
	c		Heart attack treatment sit patient, down with support / in W position ✓ call 999 / emergency services✓ reassure / calm then down ✓ *idea* of monitoring vital signs ✓ *3 max* Cardiac arrest treatment lie patient down ✓ CPR / description of CPR ✓ (request) defibrillator (if in public space) ✓	Max 4	Examiner' Comments Candidates often lost potential marks for (c) by not making it clear whether their answers referred to heart attack or cardiac arrest; they often then only scored the first mark point about calling the emergency services.
			Total	8	

Question			Answer/Indicative content	Marks	Guidance
13	a	i	allows a comparison to be made ✓	1	Allow baseline, show effect of digoxin Examiner's Comments Most candidates had the right idea that this was a baseline from which they needed to determine any changes due to the administration of digoxin.
		ii	Any **one** from age gender fitness stress level of patients ✓	1	Allow ref to mass, other treatment
		iii	*Before treatment* 85 to 103 (18) **AND** *Eight weeks after* treatment 62 to 81 (19) ✓	1	**Both** ranges needed for 1 mark. Must be in correct order. Examiner's Comments This question was well answered, but some candidates stated 0-92 and 0-72. This suggested that they did not fully understand the term 'range'.
		iv	22% **OR** 21.7% ✓✓	2	Correct answer = 2 marks **ALLOW** one mark for $\frac{92-72}{92}$
	b	i	(AVN) delays impulse ✓ (so) allows time for , atria to empty / ventricles to fill ✓ (AVN) transmits impulse on to , ventricles / bundle of His / Purkinje tissue ✓	Max 2	**ALLOW** prevents impulse from passing on immediately to ventricles Examiner's Comments Only a few candidates seemed to know that the AVN delays the impulse. Most candidates who received credit did so for 'transmitting impulse down bundle of His'.

Question			Answer/Indicative content	Marks	Guidance
		ii	*idea that* AVN delays impulse for longer than normal ✓ allows more time for ventricles to fill with blood ✓ increases , stroke volume / cardiac output ✓	Max 2	ALLOW idea of more blood ejected from heart per beat Examiner's Comments A number of candidates thought that the AVN controlled the opening of the AV valves. This wasn't an isolated case. MP1 and MP3 were often credited but few candidates identified 'more time to fill ventricles'.
			Total	9	