AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.2.2

The heart and blood vessels

Past-paper questions

Tier	**Foundation**
Question groups	**8**
Available paper years	**2018–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.2.2 The heart and blood vessels

Question 01

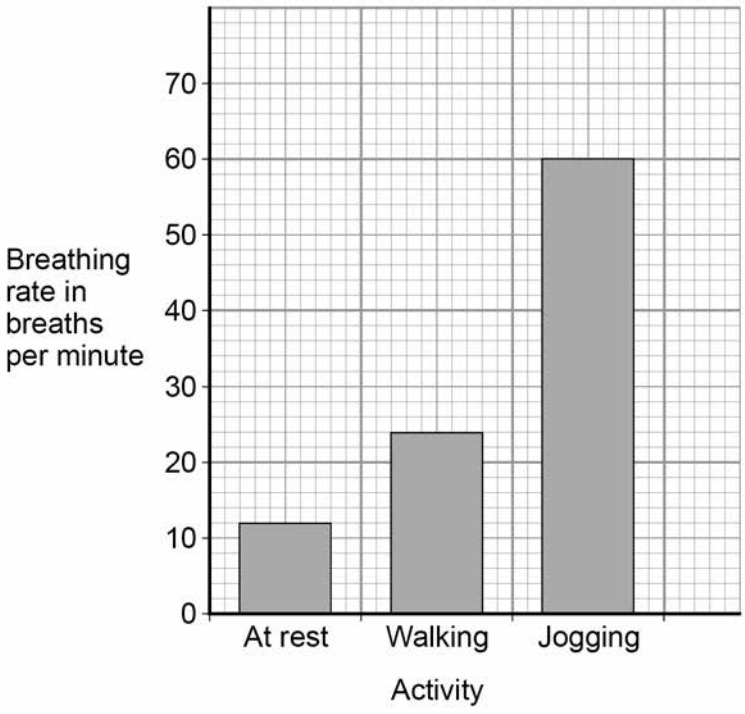
June 2018 | 8464/B/1F | Original Q4

0 4 Exercise can improve health.

A student measured her breathing rate at rest, when walking and when jogging.

Figure 8 shows her results.

Figure 8



0 4 . 1 Compare the breathing rates when doing the **three** different activities.

Use values from **Figure 8** in your answer.

[3 marks]

Question 4 continues on the next page

4.2.2.2 The heart and blood vessels

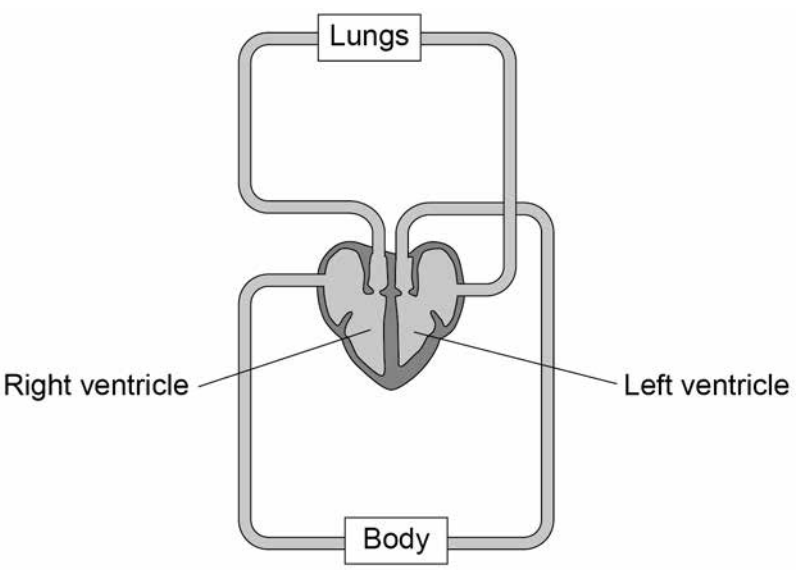
Question 01 · continued

0 4 . 2 Explain why the breathing rate changes when doing different activities.

[3 marks]

Figure 9 shows the heart in the circulatory system.

Figure 9



0 4 . 3 The heart is a double pump.

Describe what this means.

Use **Figure 9** to help you.

[2 marks]

4.2.2.2 The heart and blood vessels

Question 01 · continued

June 2018 | 8464/B/1F | Original Q4

0 4 . 4 The wall of the left ventricle is much thicker than the wall of the right ventricle.

Suggest **one** reason for this.

[1 mark]

0 4 . 5 People are encouraged to exercise after recovering from a heart attack.

Suggest **one** reason why.

[1 mark]

10

4.2.2.2 The heart and blood vessels

Question 02

June 2018 | 8464/B/1F | Original Q7

0 7 Coronary heart disease (CHD) is a non-communicable disease.

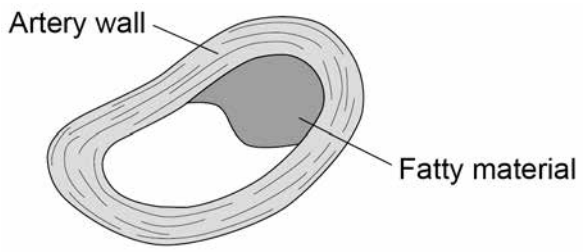
CHD is caused when fatty material builds up in the coronary arteries.

0 7 . 1 Explain what a non-communicable disease is.

[2 marks]

Figure 14 shows a coronary artery of someone with CHD.

Figure 14



0 7 . 2 Explain how CHD can cause a heart attack.

[3 marks]

Question 7 continues on the next page

4.2.2.2 The heart and blood vessels

Question 02 · continued

June 2018 | 8464/B/1F | Original Q7

0 7 . 3 Explain how lifestyle and medical risk factors increase the chance of developing CHD.

[6 marks]

11

4.2.2.2 The heart and blood vessels

Question 03

June 2019 | 8464/B/1F | Original Q2

0 2 A single-celled organism has a large surface area to volume ratio.

0 2 . 1 How does oxygen enter a single-celled organism?

[1 mark]

Tick (✓) **one** box.

- Active transport ☐
- Diffusion ☐
- Osmosis ☐

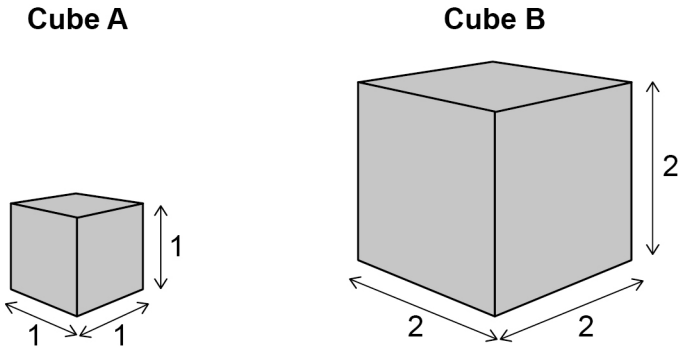
4.2.2.2 The heart and blood vessels

Question 03 · continued

Figure 3 shows two cubes.

The surface area to volume ratio for cube **A** is 6:1

Figure 3



0 2 . 2 Calculate the surface area to volume ratio of cube **B**.

[4 marks]

Surface area of one face of cube **B** _____

_____

Surface area of one face = _____

Total surface area of cube **B** _____

_____

Total surface area = _____

Volume of cube **B** _____

_____

Volume = _____

Surface area to volume ratio = _____ : _____

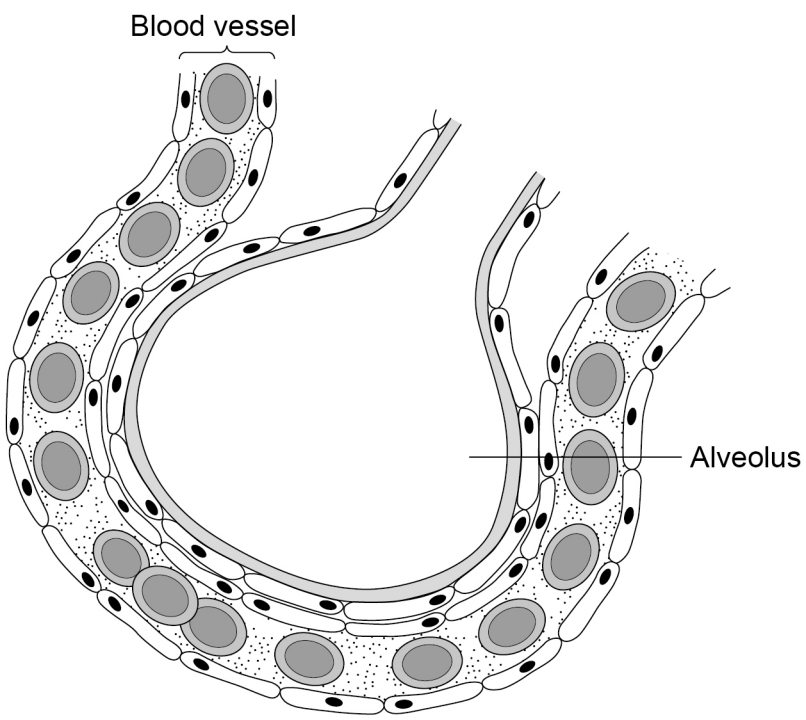
4.2.2.2 The heart and blood vessels

Question 03 · continued

Multicellular organisms have exchange surfaces to absorb substances.

Figure 4 shows part of the exchange surface in the lungs.

Figure 4



0 2 . 3 Oxygen passes from the alveolus into the blood.

Name the part of the blood that carries the most oxygen.

[1 mark]

0 2 . 4 Name the gas that passes out of the blood into the alveolus.

[1 mark]

4.2.2.2 The heart and blood vessels

Question 03 · continued

0 2 . 5 Alveoli provide a large surface area for gas exchange.

Give **two** other ways the lungs are adapted for efficient gas exchange.

[2 marks]

1 _____

_____

2 _____

_____

9

Turn over for the next question

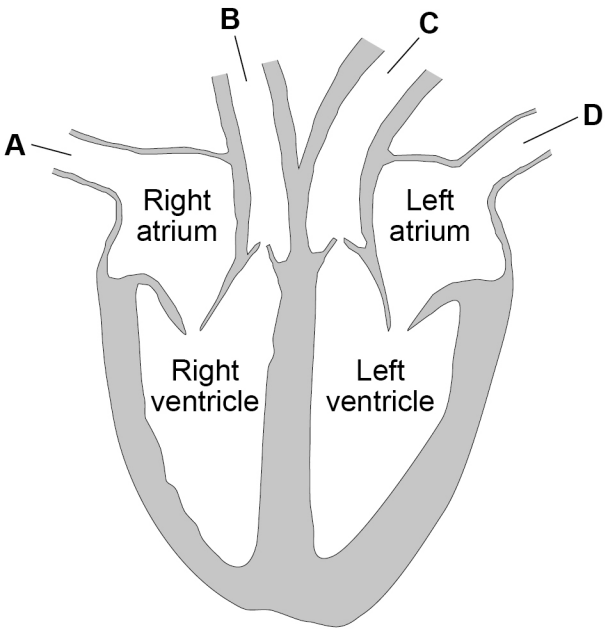
4.2.2.2 The heart and blood vessels

Question 04

June 2019 | 8464/B/1F | Original Q6

0 6 **Figure 10** shows a human heart.

Figure 10



0 6 . 1 Which blood vessel carries deoxygenated blood away from the heart to the lungs?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 6 . 2 The natural resting heart rate is controlled by a group of cells that act as a pacemaker.

Where in the heart are 'pacemaker cells' found?

[1 mark]

Tick (✓) **one** box.

Left atrium ☐

Left ventricle ☐

Right atrium ☐

Right ventricle ☐

4.2.2.2 The heart and blood vessels

Question 04 · continued

Some people may be treated with a drug to slow their heart rate.

0 6 . 3 Digitalis is a drug that slows the heart rate.

Where does the drug digitalis originate from?

[1 mark]

Tick (✓) **one** box.

- Bacteria ☐
- Foxgloves ☐
- Mould ☐
- Willow ☐

Question 6 continues on the next page

Question 04 · continued

Beta blockers are another type of drug that slows the heart rate.

Table 2 shows information for people who do not take beta blockers and for people who do take beta blockers.

- Stroke volume is the volume of blood pumped out of the heart each time it beats.
- Cardiac output is the total volume of blood pumped out of the heart each minute.

Table 2

	No beta blockers taken		Taking beta blockers	
	At rest	**During exercise**	**At rest**	**During exercise**
Heart rate in beats per minute	68	150	52	88
Stroke volume in cm^3	80	120	**X**	98
Cardiac output in cm^3 per minute	5440	18 000	2800	8624

0 6 . 4 Calculate stroke volume **X** in **Table 2**.

Use the equation:

cardiac output = stroke volume × heart rate

Give your answer to 2 significant figures.

[3 marks]

Stroke volume **X** = _____ cm^3

4.2.2.2 The heart and blood vessels

Question 04 · continued

0 6 . 5 Some people who take beta blockers get out of breath when they exercise.

Explain why beta blockers can have this effect during exercise.

You should refer to information given in **Table 2**.

[6 marks]

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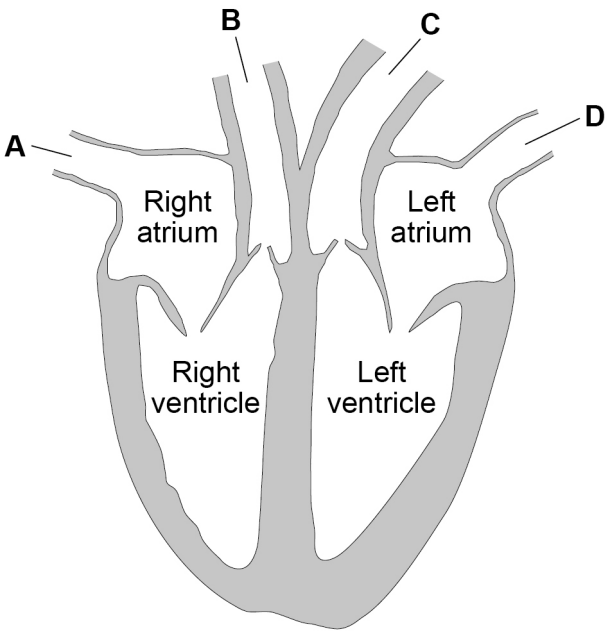
4.2.2.2 The heart and blood vessels

Question 05

June 2023 | 8464/B/1F | Original Q4

0 4 **Figure 6** shows a human heart.

Figure 6



0 4 . 1 The vena cava carries blood into the heart from the body.

Which blood vessel in **Figure 6** is the vena cava?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.2.2.2 The heart and blood vessels

Question 05 · continued

0 4 . 2 Which chamber of the heart pumps blood to the body?

[1 mark]

Tick (✓) **one** box.

- Left atrium ☐
- Left ventricle ☐
- Right atrium ☐
- Right ventricle ☐

0 4 . 3 What is the name of the blood vessel that carries blood to the heart muscle?

[1 mark]

Tick (✓) **one** box.

- Aorta ☐
- Coronary artery ☐
- Pulmonary artery ☐

Question 4 continues on the next page

4.2.2.2 The heart and blood vessels

Question 05 · continued

The heart and some blood vessels contain valves.

0 4 . 4 Which type of blood vessel has valves?

[1 mark]

Tick (✓) **one** box.

- Artery ☐
- Capillary ☐
- Vein ☐

0 4 . 5 What is the function of valves?

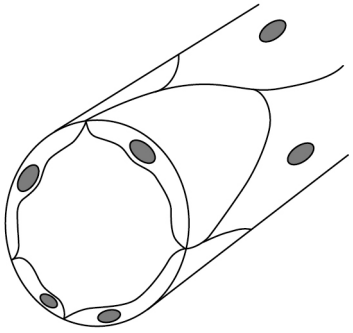
[1 mark]

4.2.2.2 The heart and blood vessels

Question 05 · continued

Figure 7 shows a blood capillary.

Figure 7



0 4 . 6 Explain **one** way the capillary is adapted for its function.

[2 marks]

Question 4 continues on the next page

Question 05 · continued

Table 2 shows information about the blood of four people.

Table 2

Person	Concentration of blood component in number/mm^3		
	Red blood cells	White blood cells	Platelets
W	5 000 000	15 000	200 000
X	4 700 000	5 500	20 000
Y	8 000 000	7 200	250 000
Z	4 900 000	6 400	225 000

0 4 . 7 Person **W** has 5 000 000 red blood cells in 1 mm^3 of blood.

What is 5 000 000 written in standard form?

[1 mark]

Tick (✓) **one** box.

5 × 1 000 000 ☐

5 × 10^6 ☐

5 × 10^7 ☐

50 × 10^5 ☐

4.2.2.2 The heart and blood vessels

Question 05 · continued

0 4 . 8 Draw **one** line from each description to the person in **Table 2** it describes.

[2 marks]

Description	Person in Table 2
	Person **W**
Person most likely to have an infection	Person **X**
Person whose blood will **not** clot properly	Person **Y**
	Person **Z**

Question 4 continues on the next page

4.2.2.2 The heart and blood vessels

Question 05 · continued

0 4 . 9 The greater the height above sea level, the less oxygen there is in the air.

People who live high above sea level have more red blood cells than people who live at sea level.

Some athletes train in mountains high above sea level.

Explain why having more red blood cells will improve an athlete's performance.

[3 marks]

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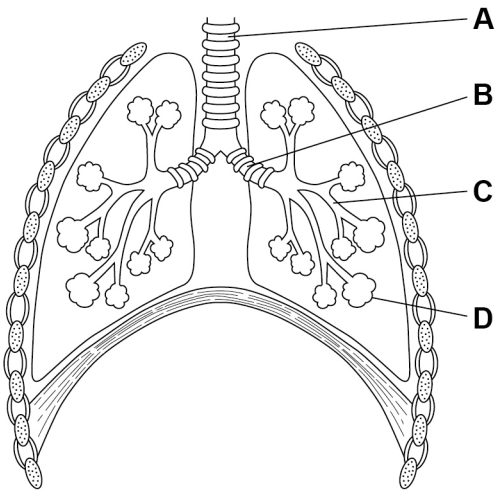
4.2.2.2 The heart and blood vessels

Question 06

June 2023 | 8464/B/1F | Original Q5

0 5 **Figure 8** shows the human breathing system.

Figure 8



0 5 . 1 Name parts **A** and **B**.

Choose answers from the box.

[2 marks]

alveolus	**bronchus**	**capillary**	**trachea**

A _____

B _____

0 5 . 2 Where does gas exchange happen in the breathing system?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 5 . 3 Give **two** ways that the lungs are adapted for efficient gas exchange.

[2 marks]

1 _____

_____

2 _____

_____

Table 3 shows the percentage of gases in air breathed into the lungs and air breathed out of the lungs.

Table 3

Gas	Percentage (%) in air breathed in	Percentage (%) in air breathed out
Oxygen	21	16
Carbon dioxide	0.04	4
Nitrogen	78	78

4.2.2.2 The heart and blood vessels

Question 06 · continued

0 5 . 4 Explain the **differences** in the air breathed into the lungs and the air breathed out of the lungs.

[4 marks]

0 5 . 5 The percentages given in each column of **Table 3** do **not** add up to 100%.

Suggest **one** reason why.

[1 mark]

10

4.2.2.2 The heart and blood vessels

Question 07

June 2024 | 8464/B/1F | Original Q4

0 4 This question is about disease.

Gonorrhoea is a sexually transmitted disease.

0 4 . 1 Which is a symptom of gonorrhoea?

[1 mark]

Tick (✓) **one** box.

Damaged immune system ☐

Pain when urinating ☐

Reduced body temperature ☐

Table 2 shows the number of reported cases of gonorrhoea for 5 cities.

Table 2

City	Number of reported cases of gonorrhoea per 100 000 of the population
A	124
B	118
C	40
D	130
E	40

0 4 . 2 The number of cases of gonorrhoea in each city might **not** be accurate.

Suggest **one** reason why.

[1 mark]

0 4 . 3 Which is the best way to present the data from **Table 2**?

[1 mark]

Tick (✓) **one** box.

Bar chart ☐

Line graph ☐

Scatter diagram ☐

0 4 . 4 The data is given as per 100 000 of the population and **not** as the total number of people with gonorrhoea.

Suggest why.

[1 mark]

Question 4 continues on the next page

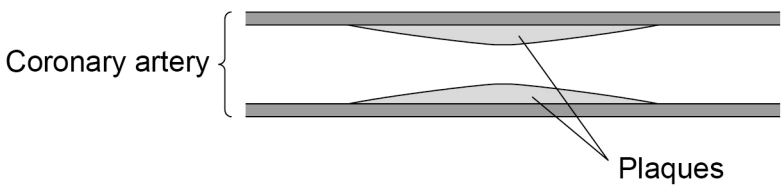
Deposits can form in coronary arteries.

The deposits are called plaques.

Plaques cause damage to the arteries.

Figure 6 shows plaques in a coronary artery.

Figure 6



0 4 . 5 Which **two** factors **increase** the risk of plaques forming in the coronary artery?

[2 marks]

Tick (✓) **two** boxes.

- High fat diet ☐
- Low blood glucose ☐
- Regular exercise ☐
- Smoking ☐
- Taking statins ☐

4.2.2.2 The heart and blood vessels

Question 07 · continued

0 4 . 6 Which treatment can be used for the plaques in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

- A placebo ☐
- A stent ☐
- An antibiotic ☐

0 4 . 7 A heart attack can happen when plaques block a coronary artery.

During a heart attack muscle cells in the heart die.

Explain how the blockage can lead to the death of muscle cells in the heart.

[3 marks]

10

4.2.2.2 The heart and blood vessels

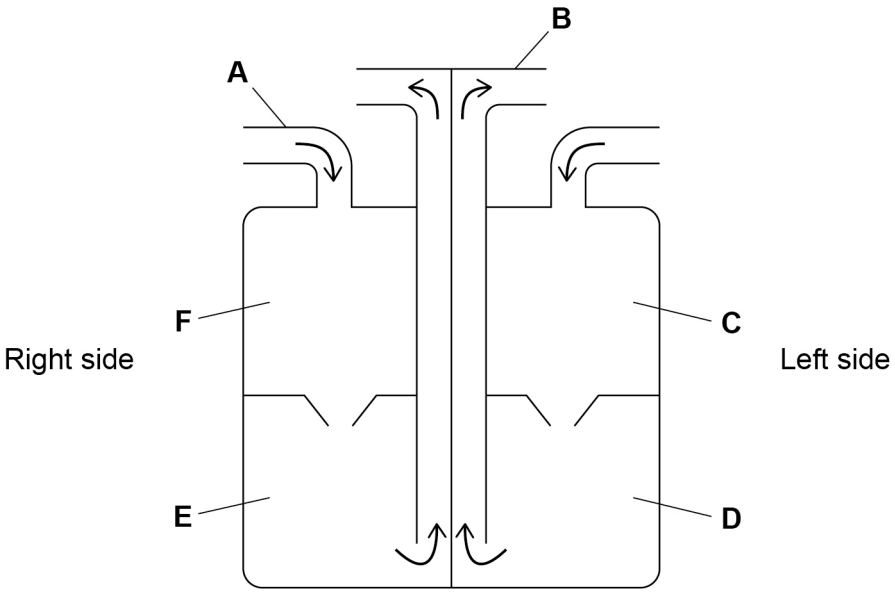
Question 08

June 2025 | 8464/B/1F | Original Q5

0 5 The heart is an organ that pumps blood around the body.

Figure 10 is a model of the heart and shows the direction of blood flow.

Figure 10



0 5 . 1 Draw **one** line from each blood vessel shown in **Figure 10** to the name of the blood vessel.

[2 marks]

Blood vessel	Name
	Aorta
A	Pulmonary artery
B	Pulmonary vein
	Vena cava

4.2.2.2 The heart and blood vessels

Question 08 · continued

0 5 . 2 Heart rate is controlled by a group of cells.

The group of cells acts as a pacemaker.

Where would the pacemaker be located in **Figure 10**?

[1 mark]

Tick (✓) **one** box.

C ☐ **D** ☐ **E** ☐ **F** ☐

0 5 . 3 Heart muscle cells contain many mitochondria.

Explain why heart muscle cells contain many mitochondria.

[3 marks]

Question 5 continues on the next page

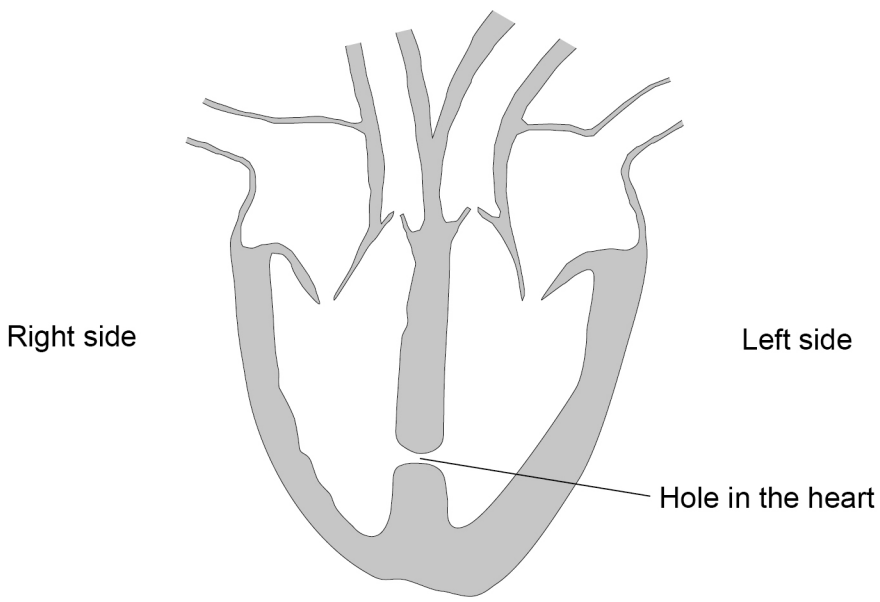
4.2.2.2 The heart and blood vessels

Question 08 · continued

A small number of people are born with a 'hole in the heart'.

Figure 11 shows the position of a hole in the heart.

Figure 11



0 5 . 4 The hole allows some blood from the right side of the heart to mix with blood in the left side of the heart.

Suggest **two** symptoms of having a hole in the heart.

[2 marks]

1 _____

_____

2 _____

_____

4.2.2.2 The heart and blood vessels

Question 08 · continued

0 5 . 5 In an operation to repair a hole in the heart:

- a flexible tube is inserted into a blood vessel and guided to the heart
- a mesh patch is passed down the tube
- the mesh patch covers the hole.

Heart tissue grows around the mesh and closes the hole.

Suggest **two** possible risks of this operation to repair a hole in the heart.

[2 marks]

1 _____

_____

2 _____

_____

10

Turn over for the next question