AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.2.2

The heart and blood vessels

Past-paper questions

Tier	**Foundation**
Question groups	**21**
Available paper years	**2008–2025**

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:** _____

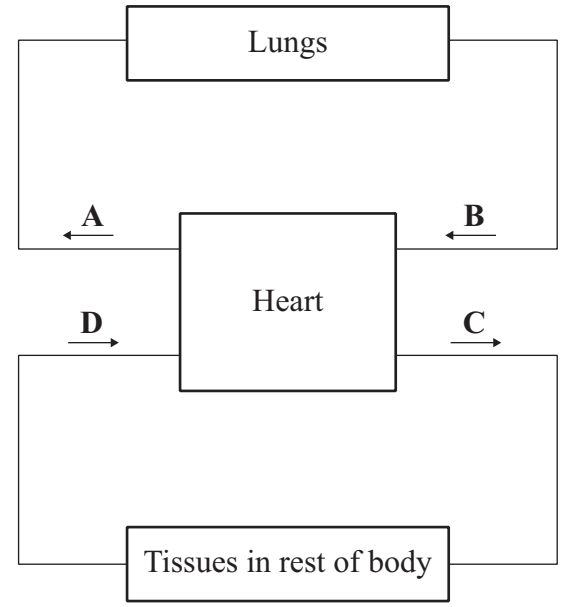
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.2.2 The heart and blood vessels

Question 01

January 2008 | BLY3F | Original Q2 | Legacy

2 The diagram represents the human blood circulation system.



Key: ⟶ Direction in which blood flows

(a) **A**, **B**, **C** and **D** are blood vessels.

(i) Give the letter of **one** blood vessel that is an artery. .....

(1 mark)

(ii) Give the letter of **one** blood vessel that is a vein. .....

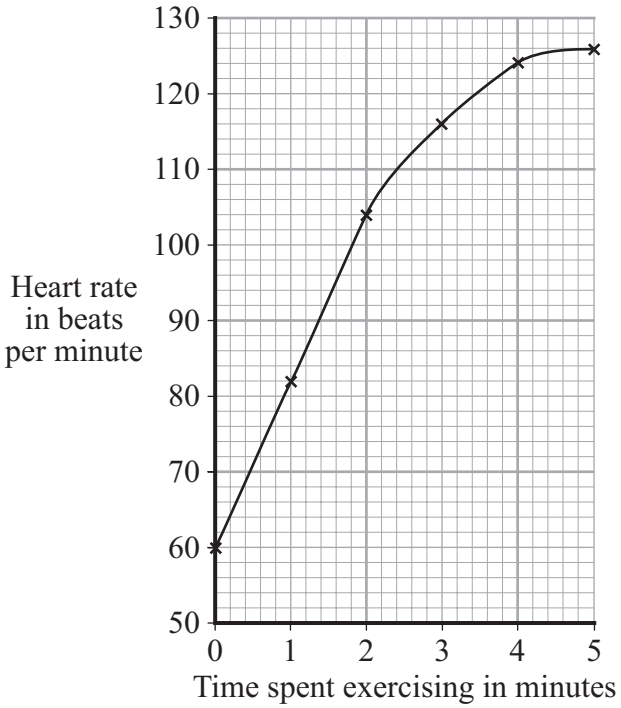
(1 mark)

4.2.2.2 The heart and blood vessels

Question 01 · continued

BLANK

(b) A student pedalled an exercise cycle at constant speed for 5 minutes. The student's heart rate was recorded at one-minute intervals during the exercise.
The results are shown in the graph.



(i) What was the student's heart rate before the exercise began?

..... per minute
(1 mark)

(ii) How long was it before the student's heart rate reached 124 beats per minute?

..... minutes
(1 mark)

(c) Which of the following parts of the blood carries most oxygen?

Draw a circle around **one** answer.

plasma **red blood cells** **white blood cells**

(1 mark)

5

4.2.2.2 The heart and blood vessels

Question 02

January 2009 | BLY3F | Original Q1 | Legacy

1 (a) Draw a ring around **one** word to answer each of the following questions.

1 (a) (i) Which type of blood vessel carries blood out of the heart?

artery **capillary** **vein**

(1 mark)

1 (a) (ii) Which type of blood vessel allows substances to enter and leave the blood?

artery **capillary** **vein**

(1 mark)

1 (b) Use words from the box to complete the sentences.

alveoli	**cell membrane**	**nucleus**
plasma	**red blood cells**	**villi**

Oxygen enters the blood through the walls of the ..... .

Most of the oxygen transported by the blood is carried in the

..... .

A red blood cell is different from other body cells because it does not have a

..... .

(3 marks)

5

4.2.2.2 The heart and blood vessels

Question 03

June 2009 | BLY3F | Original Q5 | Legacy

5 The table gives information about the growth of different types of organism.
The figures were obtained during the period of fastest growth for each organism.

Organism	Time taken to double in mass
Bacteria	40 minutes
Yeasts	2 hours
Fusarium	4 hours
Algae	5 hours
Soybeans	1 week
Cattle	8 weeks

5 (a) (i) Which type of organism grows the fastest? .....

(1 mark)

5 (a) (ii) How many times faster than cattle do soybeans double in mass?

.....

(1 mark)

5 (a) (iii) *Fusarium* grows at its fastest rate in a fermenter.
Some scientists put **one tonne** of *Fusarium* into a fermenter.

Use data from the table to calculate how much *Fusarium* there would be in the fermenter after 8 hours.

Draw a ring around **one** answer.

2 tonnes **4 tonnes** **8 tonnes**

(1 mark)

Question 03 · continued

for mark

5 (b) *Fusarium* is used to make mycoprotein.

Read the information about substances found in mycoprotein.

- Protein – can be used for making cells, enzymes and antibodies.
- Fats – are rich in energy but large amounts in the diet can cause circulatory problems.
- Dietary fibre – helps to reduce the risk of colon cancer.

The table compares the composition of mycoprotein and beef.

Substance	Percentage of dry mass	
	Mycoprotein	Beef
Protein	47.2	68.3
Fat	13.5	30.1
Dietary fibre	19.2	0.0

Use the information above to answer the questions.

5 (b) (i) Give **two** reasons why it would be better to eat mycoprotein instead of beef.

1 .....

.....

2 .....

.....

(2 marks)

(Extra space) .....

5 (b) (ii) Give **one** reason why it would be better to eat beef instead of mycoprotein.

.....

.....

(1 mark)

(Extra space) .....

6

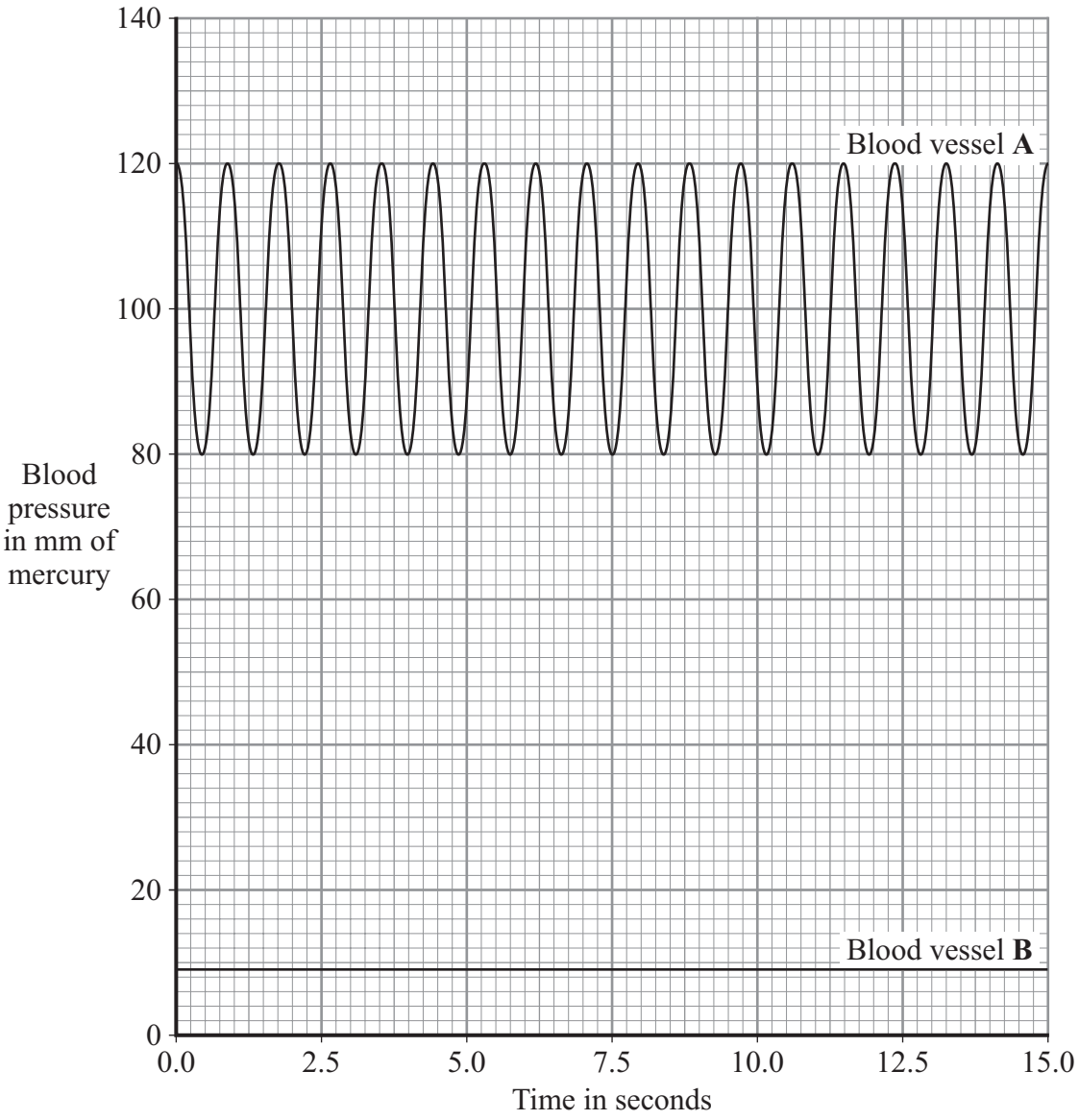
4.2.2.2 The heart and blood vessels

Question 04

June 2009 | BLY3F | Original Q6 | Legacy

6 The heart pumps blood around the body. This causes blood to leave the heart at high pressure.

The graph shows blood pressure measurements for a person at rest.
The blood pressure was measured in an artery and in a vein.



4.2.2.2 The heart and blood vessels

Question 04 · continued

for mark

6 (a) Which blood vessel, **A** or **B**, is the artery?

Blood vessel .....

Give **two** reasons for your answer.

Reason 1 .....

.....

Reason 2 .....

.....

(2 marks)

6 (b) Use information from the graph to answer these questions.

6 (b) (i) How many times did the heart beat in 15 seconds? .....

(1 mark)

6 (b) (ii) Use your answer from part (b)(i) to calculate the person's heart rate per minute.

.....

.....

Heart rate = ... beats per minute

(1 mark)

6 (c) During exercise, the heart rate increases. This supplies useful substances to the muscles and removes waste materials from the muscles at a faster rate.

6 (c) (i) Name **two** useful substances that must be supplied to the muscles at a faster rate during exercise.

1 .....

2 .....

(2 marks)

6 (c) (ii) Name **one** waste substance that must be removed from the muscles at a faster rate during exercise.

.....

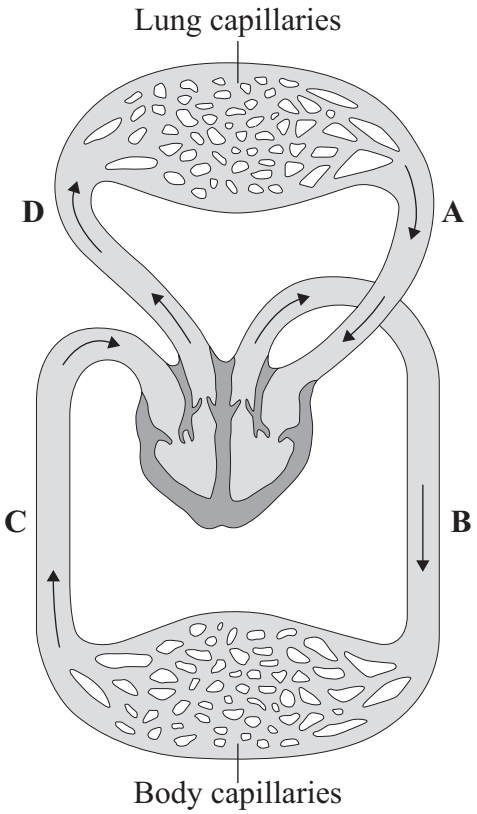
(1 mark)

7

4.2.2.2 The heart and blood vessels

Question 05

7 The diagram shows the human circulation system.



7 (a) (i) Give the letter of **one** blood vessel that is an artery.

(1 mark)

7 (a) (ii) Give the letter of **one** blood vessel that carries oxygenated blood.

(1 mark)

4.2.2.2 The heart and blood vessels

Question 05 · continued

for mark

7 (b) During exercise, the heart rate increases.

Explain, as fully as you can, why this increase is necessary.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

6

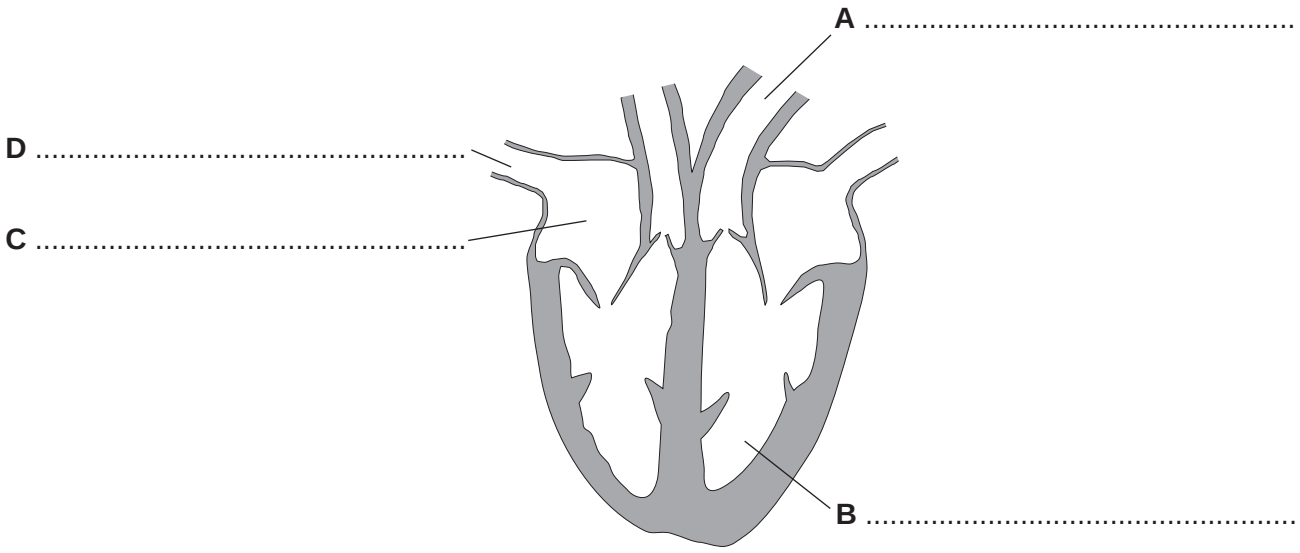
4.2.2.2 The heart and blood vessels

Question 06

June 2013 | BL3FP | Original Q5 | Legacy

5 **Diagram 1** shows a section through the heart.

Diagram 1



5 (a) Use words from the box to label parts **A**, **B**, **C** and **D**.

artery	**atrium**	**capillary**	**platelet**	**vein**	**ventricle**

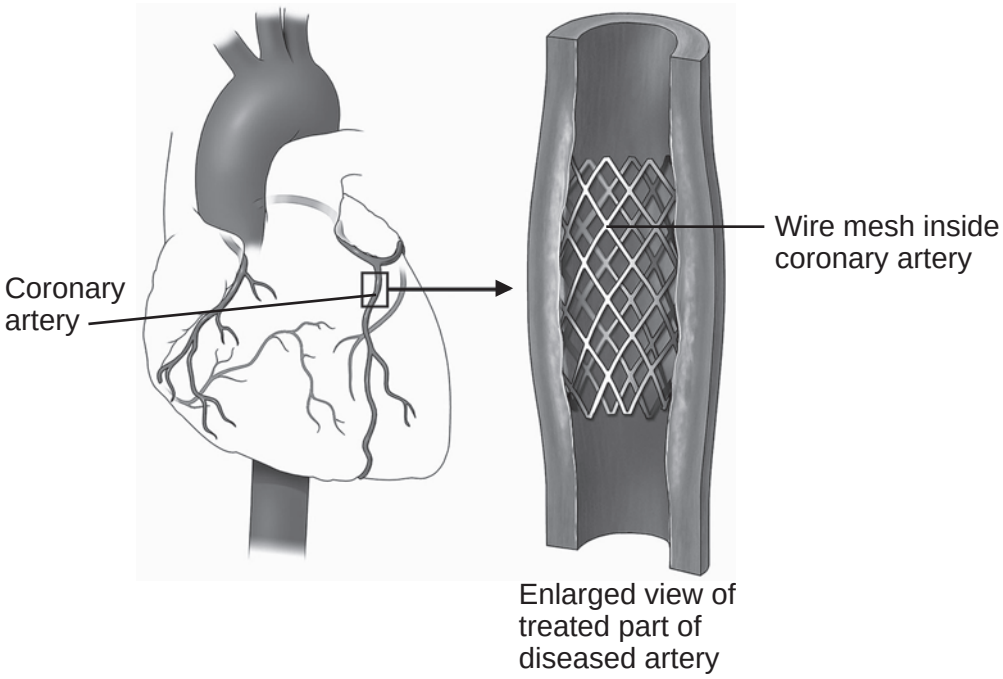
(4 marks)

4.2.2.2 The heart and blood vessels

Question 06 · continued

5 (b) **Diagram 2** shows one treatment for a diseased coronary artery.

Diagram 2



5 (b) (i) Name the treatment shown in **Diagram 2**.

.....

(1 mark)

5 (b) (ii) Explain how the treatment works.

.....

.....

.....

.....

(2 marks)

7

4.2.2.2 The heart and blood vessels

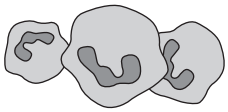
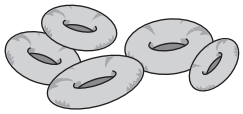
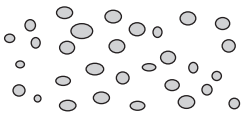
Question 07

June 2014 | BL3FP | Original Q1 | Legacy

1 (a) (i) Blood is part of the circulatory system.

Draw **one** line from each part of the blood to its correct function.

[3 marks]

Part of the blood	Function
 White blood cells	carry glucose around the body
 Red blood cells	carry oxygen around the body
 Platelets	help the blood to clot
	destroy microorganisms

1 (a) (ii) Name **one** waste product that is transported by the blood plasma.

[1 mark]

.....

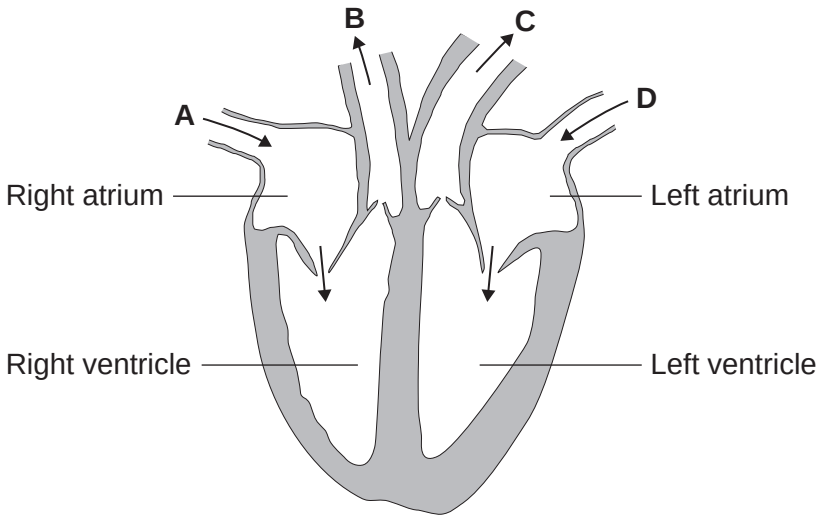
4.2.2.2 The heart and blood vessels

Question 07 · continued

1 (b) The heart is also part of the circulatory system.

Figure 1 shows a section through the human heart.

Figure 1



1 (b) (i) Which arrow, **A**, **B**, **C** or **D**, shows blood leaving the heart in the pulmonary artery to go to the lungs? ☐

[1 mark]

1 (b) (ii) Which arrow, **A**, **B**, **C** or **D**, shows blood from the lungs entering the heart in the pulmonary vein? ☐

[1 mark]

1 (b) (iii) Valves in the circulatory system make sure blood only travels in one direction.

Name the type of blood vessel that has valves.

[1 mark]

.....

Question 1 continues on the next page

4.2.2.2 The heart and blood vessels

Question 07 · continued

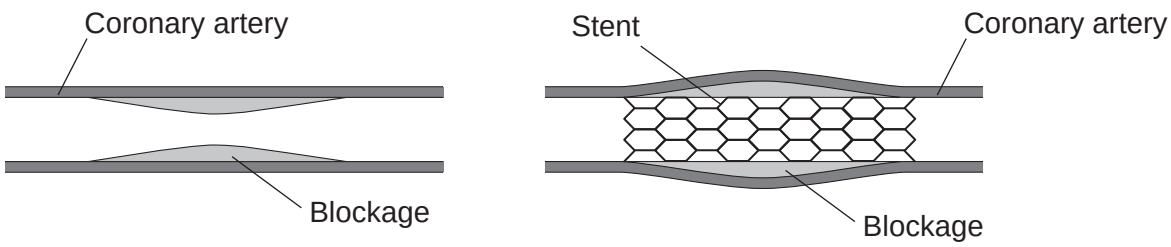
1 (c) A person's coronary artery has become narrower.

The person has a heart attack.

A doctor puts a stent into the person's coronary artery.

Figure 2 shows a stent inside a coronary artery.

Figure 2



1 (c) (i) How does the stent help to prevent another heart attack?

Give **one** way.

[1 mark]

.....

.....

4.2.2.2 The heart and blood vessels

Question 07 · continued

1 (c) (ii) **Figure 3** shows a surgeon putting a stent into a patient.

Figure 3



The surgeon puts the stent into an artery in the leg. He moves the stent through the artery to the coronary artery.

Suggest **two** possible risks of this operation.

[2 marks]

1 .....

.....

2 .....

.....

10

4.2.2.2 The heart and blood vessels

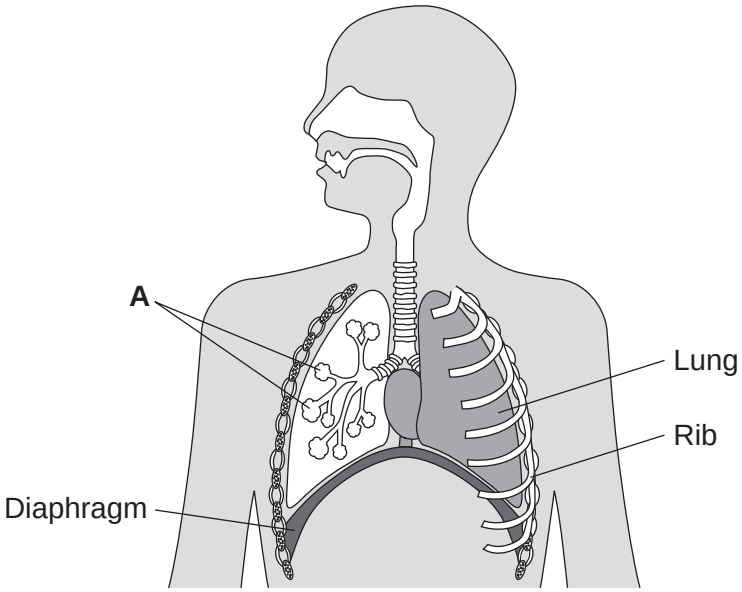
Question 08

June 2015 | BL3FP | Original Q1 | Legacy

1 Our lungs help us to breathe.

Figure 1 shows the human breathing system.

Figure 1



1 (a) (i) Name part **A** in **Figure 1**.

[1 mark]

.....

1 (a) (ii) Give **one** function of the ribs.

[1 mark]

.....

1 (b) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

active transport	**diffusion**	**osmosis**

Oxygen moves from the air inside the lungs into the blood by the process of ..... .

4.2.2.2 The heart and blood vessels

Question 08 · continued

1 (b) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

arteries	capillaries	veins

Oxygen moves from the lungs into the blood through the walls

of the ..... .

1 (b) (iii) Inside the lungs, oxygen is absorbed from the air into the blood.

Give **two** adaptations of the lungs that help the rapid absorption of oxygen into the blood.

[2 marks]

1 .....

.....

2 .....

.....

6

4.2.2.2 The heart and blood vessels

Question 09

June 2015 | BL3FP | Original Q8 | Legacy

8 The circulatory system transports substances such as glucose and oxygen around the body.

8 (a) Name **two** other substances that the circulatory system transports around the body.

[2 marks]

1 .....

2 .....

8 (b) (i) Blood is a tissue. Blood contains red blood cells and white blood cells.

Name **two** other components of blood.

[2 marks]

1 .....

2 .....

8 (b) (ii) The heart is part of the circulatory system.

What type of tissue is the wall of the heart made of?

[1 mark]

.....

Question 8 continues on the next page

4.2.2.2 The heart and blood vessels

Question 09 · continued

8 (c) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Every year, many patients need to have heart valve replacements.

Figure 9 gives information about two types of heart valve.

Figure 9

Living human heart valve	Cow tissue heart valve
• It has been used for transplants for more than 12 years. • It can take many years to find a suitable human donor. • It is transplanted during an operation after a donor has been found. • During the operation, the patient's chest is opened and the old valve is removed before the new valve is transplanted.	• It has been used since 2011. • It is made from the artery tissue of a cow. • It is attached to a stent and inserted inside the existing faulty valve. • A doctor inserts the stent into a blood vessel in the leg and pushes it through the blood vessel to the heart.

A patient needs a heart valve replacement. A doctor recommends the use of a cow tissue heart valve.

Give the advantages and disadvantages of using a cow tissue heart valve compared with using a living human heart valve.

Use information from **Figure 9** and your own knowledge in your answer.

[6 marks]

.....

.....

.....

.....

.....

.....

.....

.....

4.2.2.2 The heart and blood vessels

Question 10

June 2016 | BL3FP | Original Q3 | Legacy

3 The heart is part of the circulatory system.

3 (a) (i) Name **one** substance transported by the blood in the circulatory system.

[1 mark]

_____

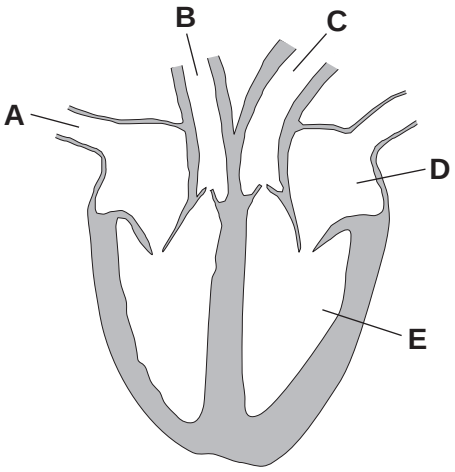
3 (a) (ii) What is the main type of tissue in the heart wall?

[1 mark]

_____

3 (b) **Figure 4** shows the human heart.

Figure 4



3 (b) (i) Which blood vessel, **A**, **B** or **C**, takes blood to the lungs?

[1 mark]

3 (b) (ii) Name parts **D** and **E** shown in **Figure 4**.

[2 marks]

D _____

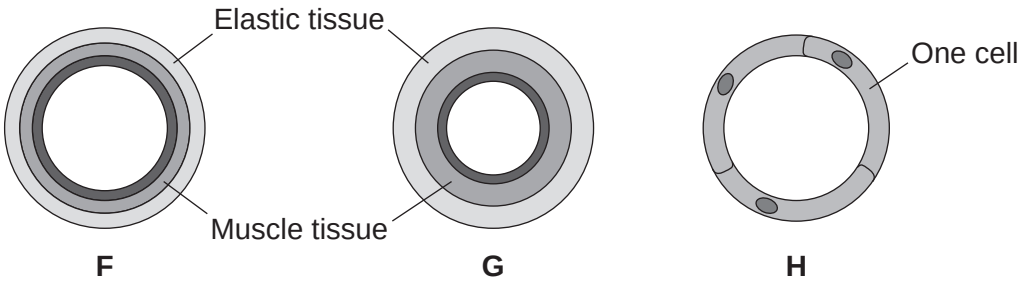
E _____

4.2.2.2 The heart and blood vessels

Question 10 · continued

3 (c) **Figure 5** shows three types of blood vessel, **F**, **G** and **H**.

Figure 5



Not to scale

3 (c) (i) What type of blood vessel is **F**?

[1 mark]

Tick (✓) **one** box.

an artery ☐

a capillary ☐

a vein ☐

3 (c) (ii) A man needs to have a stent fitted to prevent a heart attack.

In which type of blood vessel would the stent be placed?

[1 mark]

Tick (✓) **one** box.

an artery ☐

a capillary ☐

a vein ☐

3 (c) (iii) Explain how a stent helps to prevent a heart attack.

[2 marks]

9

4.2.2.2 The heart and blood vessels

Question 11

June 2017 | BL3FP | Original Q5 | Legacy

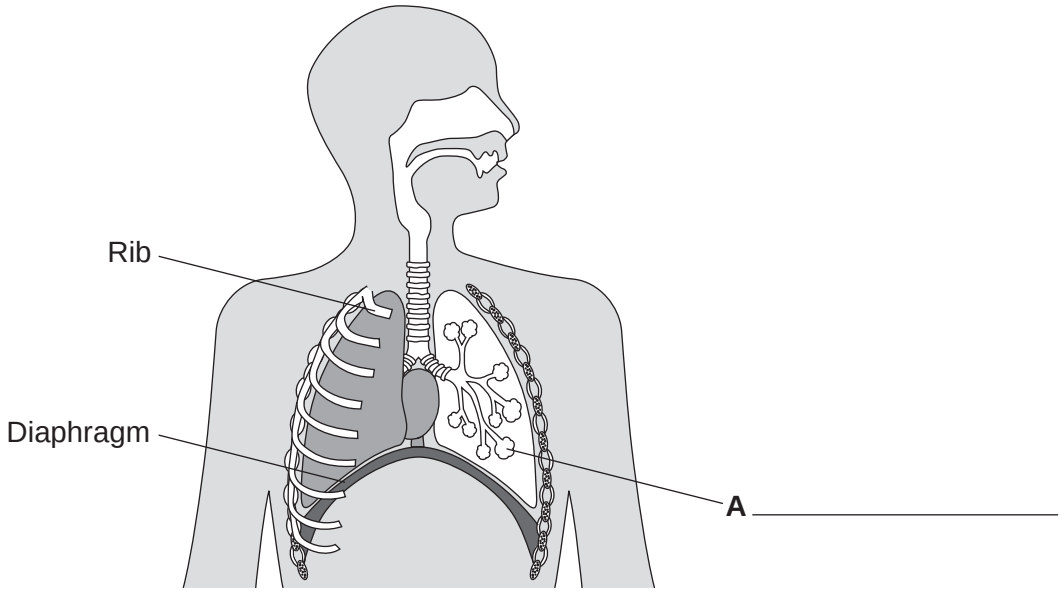
5 Some organs in the human body are adapted to exchange materials.

5 (a) **Figure 6** shows the human breathing system and heart.

5 (a) (i) Label part **A** in **Figure 6**.

[1 mark]

Figure 6



5 (a) (ii) Complete the sentences about breathing in.

[4 marks]

To make air move **into** the lungs the ribs move up and _____

and the diaphragm moves _____ .

These movements are caused when muscles between the ribs and muscles in the diaphragm _____ .

The increase in volume in the thorax causes the pressure in the thorax to _____ .

5 (a) (iii) In the lungs, which type of blood vessel does oxygen pass into?

[1 mark]

_____

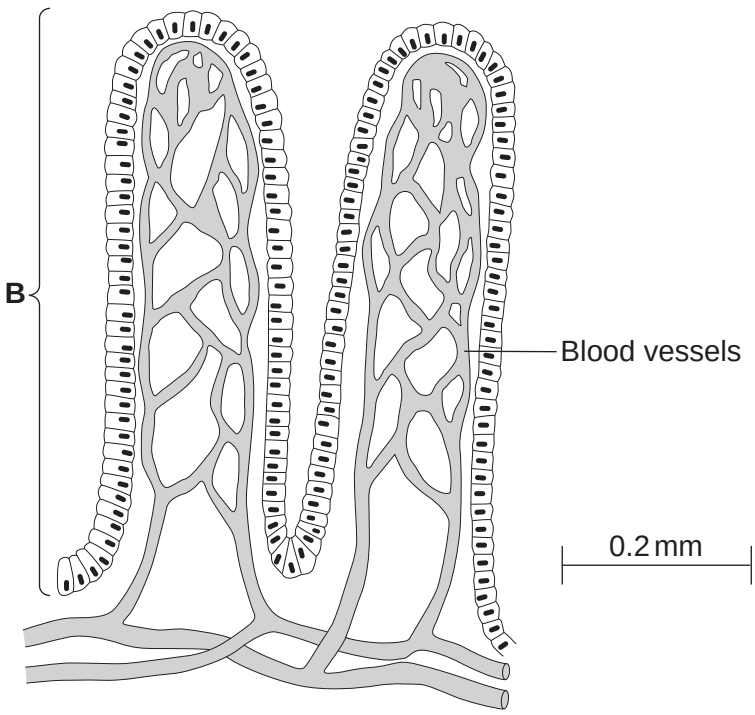
Question 5 continues on the next page

Question 11 · continued

5 (b) The small intestine is adapted to absorb digested food.

Figure 7 shows the lining of the small intestine.

Figure 7



5 (b) (i) Name part **B** shown in **Figure 7**.

[1 mark]

_____

5 (b) (ii) Give **two** ways that part **B** in **Figure 7** is adapted to help the small intestine absorb digested food quickly.

[2 marks]

1 _____

_____

2 _____

_____

9

4.2.2.2 The heart and blood vessels

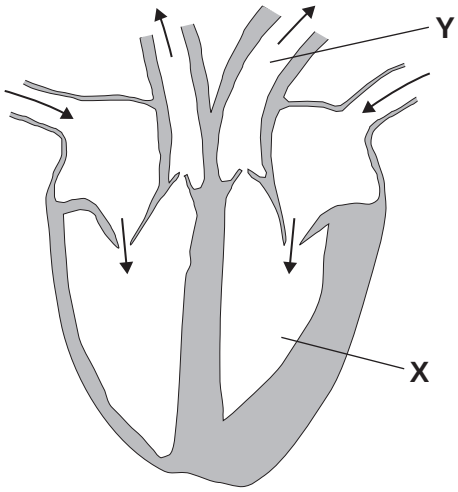
Question 12

June 2017 | BL3FP | Original Q6 | Legacy

6 Each year people need to have treatment for heart problems.

Figure 8 shows a human heart.

Figure 8



6 (a) (i) Name part **X** in **Figure 8**.

[1 mark]

_____

6 (a) (ii) Name part **Y** in **Figure 8**.

[1 mark]

_____

6 (a) (iii) There are valves inside the heart.

What is the function of these valves?

[1 mark]

_____

_____

Question 6 continues on the next page

Question 12 · continued

6 (b) Some patients need to have their heart valves replaced.

Table 3 shows the percentage of patients who died from different causes after having heart valve replacements.

Two types of heart valve were used:

- mechanical – made of metal and plastic
- pig tissue – made from pig heart tissue on a metal frame.

The data was collected over 15 years and 400 patients were involved.

Table 3

Cause of death	Percentage of patients who died	
	Mechanical valve	Pig tissue valve
Blood clots blocking coronary arteries	9	9
Bleeding	26	15
Second operation	5	15
Bacterial heart infection	4	8
Heart valves stopped working	0	12

Use information from **Table 3** and your own knowledge to answer the following question.

A patient decides to have a mechanical valve replacement rather than a pig tissue valve replacement.

Suggest reasons for **and** against choosing a mechanical valve.

[4 marks]

4.2.2.2 The heart and blood vessels

Question 12 · continued

6 (c) Some people have narrowed arteries.

Describe how stents can be used to prevent a heart attack in a person with narrowed arteries.

[2 marks]

9

4.2.2.2 The heart and blood vessels

Question 13

June 2018 | 8461/1F | Original Q4

0 4 This question is about the circulatory system.

0 4 . 1 Draw **one** line from each blood component to its function.

[3 marks]

Blood component	Function
Platelet	Destroys microorganisms
Red blood cell	Helps the blood to clot
White blood cell	Transports glucose around the body
	Transports oxygen around the body
	Transports urea

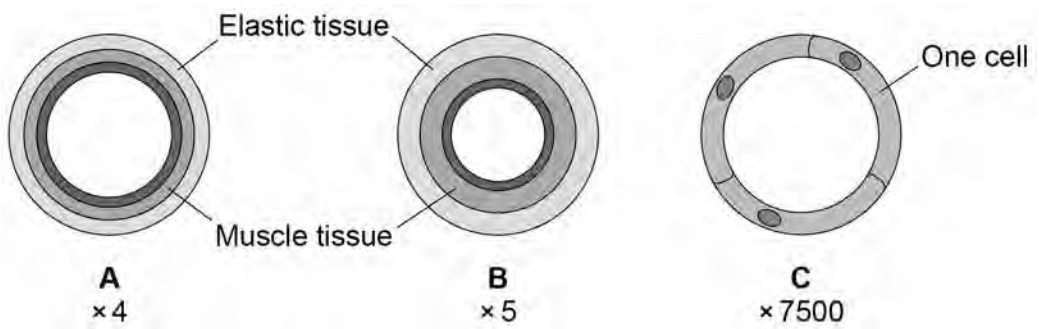
Question 4 continues on the next page

4.2.2.2 The heart and blood vessels

Question 13 · continued

0 4 . 2 **Figure 6** shows cross sections of the three main types of blood vessel found in the human body. Each blood vessel is drawn to the scale shown.

Figure 6



Which blood vessel has the smallest diameter?

[1 mark]

Tick **one** box.

A		B		C	

0 4 . 3 Which blood vessel in **Figure 6** is an artery?

Give **one** reason for your answer.

[2 marks]

Blood vessel: _____

Reason: _____

_____

4.2.2.2 The heart and blood vessels

Question 13 · continued

Table 1 gives information about the blood flow in two people.

Table 1

Person	Blood flow through the coronary arteries in cm^3/minute
A - does **not** have coronary heart disease	250
B - has coronary heart disease	155

0 4 . 4 Calculate the difference in blood flow between person **A** and person **B**.

[1 mark]

Difference = _____ cm^3/minute

0 4 . 5 Suggest why blood flow through the coronary arteries is lower in people with coronary heart disease.

[1 mark]

0 4 . 6 Calculate the volume of blood flowing through the coronary arteries of person **A** in 1 hour.

Give your answer in dm^3.

[2 marks]

Volume of blood in 1 hour = _____ dm^3

Question 13 · continued

Coronary heart disease can be treated by:

- inserting a stent
- using a Coronary Artery Bypass Graft (CABG).

Table 2 gives information about each method.

Table 2

	Stent	CABG
Procedure	The patient is awake during the procedure. A small cut is made in the skin. A wire mesh is inserted into the coronary artery via a blood vessel in the arm or leg.	The patient is not awake during the procedure. The chest is cut open. A section of blood vessel from the arm or leg is removed. It is used to create a new channel for blood to bypass the blockage in the coronary artery.
When procedure is recommended	When only one blockage is present	When multiple blockages are present
Time spent in hospital after procedure	2-3 hours	at least 7 days
Recovery time after procedure	7 days	12 weeks
Risk of heart attack during procedure	1%	2%
Chance of failure within one year	40%	5%

0 4 . 7 Give **two** advantages of using a stent instead of CABG.

[2 marks]

1 _____

_____

2 _____

_____

4.2.2.2 The heart and blood vessels

Question 13 · continued

0 4 . 8 Give **two** advantages of using CABG instead of a stent.

[2 marks]

1 _____

_____

2 _____

_____

14

Turn over for the next question

4.2.2.2 The heart and blood vessels

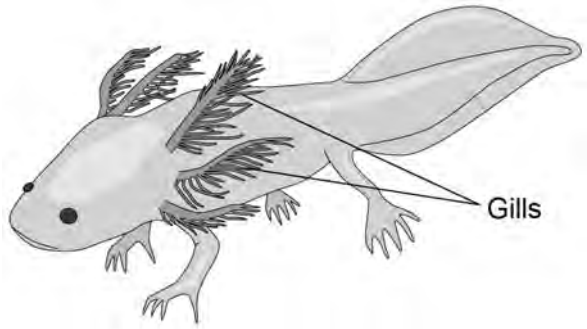
Question 14

June 2019 | 8461/1F | Original Q2

0 2 An animal called an axolotl lives in water.

Figure 3 shows an axolotl.

Figure 3



Oxygen enters the axolotl's bloodstream through the gills by diffusion.

0 2 . 1 What is diffusion?

[1 mark]

Tick (✓) **one** box.

- The movement of particles from a high concentration to a low concentration ☐
- The movement of particles from a low concentration to a high concentration ☐
- The movement of water from a concentrated solution to a more dilute solution ☐

0 2 . 2 Describe how **one** feature of the axolotl's gills increases the rate of diffusion of oxygen.

Use information from **Figure 3**.

[2 marks]

Feature _____

Description _____

_____

_____

4.2.2.2 The heart and blood vessels

Question 14 · continued

If a gill of an axolotl is removed, stem cells in the damaged area will divide and a new gill will grow.

0 2 . 3 Complete the sentence.

[1 mark]

Choose the answer from the box.

adaptation	**differentiation**	**evolution**	**variation**

When stem cells specialise to produce gill cells, this process is

known as _____.

0 2 . 4 Complete the sentence.

[1 mark]

Choose the answer from the box.

binary fission	**mitosis**	**mutation**

To grow a new gill the stem cells divide by _____.

0 2 . 5 Which **one** of the following does **not** contain stem cells?

[1 mark]

Tick (✓) **one** box.

- Bone marrow ☐
- Embryos ☐
- Hair ☐
- Meristem tissue ☐

4.2.2.2 The heart and blood vessels

Question 14 · continued

0 2 . 6 Axolotls are small animals. Axolotls are used in stem cell research.

What are **two** advantages of using axolotls in stem cell research?

[2 marks]

Tick (✓) **two** boxes.

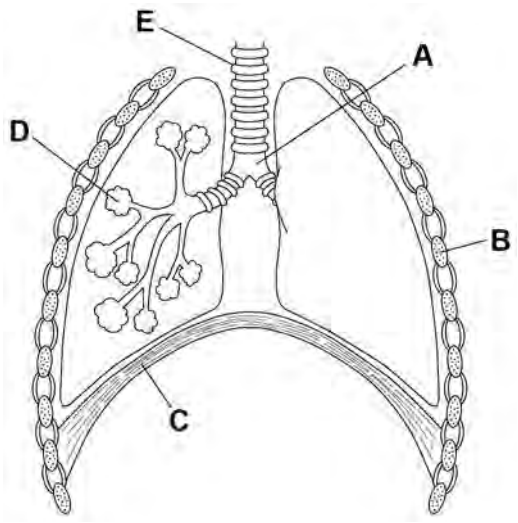
- Axolotls are cheap to feed. ☐
- Axolotls are easy to breed. ☐
- Axolotls are endangered. ☐
- Axolotls live in water. ☐
- Axolotl research is cruel. ☐

Question 14 · continued

Oxygen uptake in humans takes place in the lungs.

Figure 4 shows the human breathing system.

Figure 4



0 2 . 7 Where does oxygen enter the bloodstream?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 8 Name part **E** on **Figure 4**.

[1 mark]

0 2 . 9 Which blood vessel carries blood to the lungs?

[1 mark]

Tick (✓) **one** box.

Aorta ☐

Pulmonary artery ☐

Vena cava ☐

11

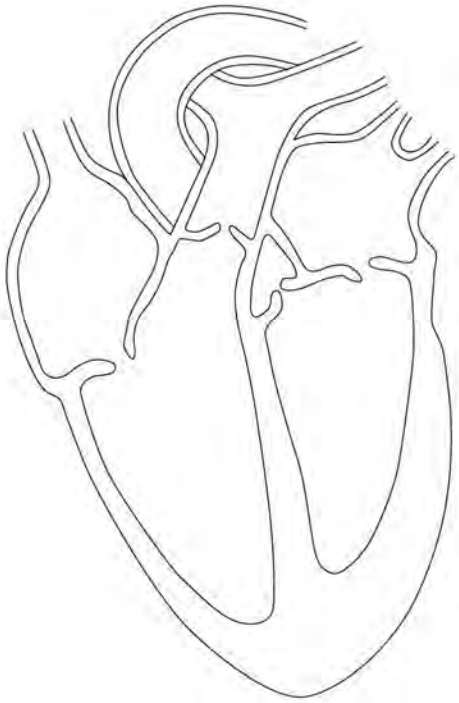
4.2.2.2 The heart and blood vessels

Question 15

June 2019 | 8461/1F | Original Q6

0 6 **Figure 11** shows the internal structure of the human heart.

Figure 11



0 6 . 1 Which organ system is the heart a part of?

[1 mark]

_____

0 6 . 2 Draw a ring around **one** valve on **Figure 11**.

[1 mark]

0 6 . 3 What is the function of the valves in the heart?

[1 mark]

_____

_____

Question 6 continues on the next page

Question 15 · continued

0 6 . 4 Valves are also found inside some blood vessels.

Which type of blood vessel contains valves?

[1 mark]

Sometimes a valve in the heart can begin to leak.

A leaking heart valve may be replaced with either:

- a mechanical valve
- a biological valve from a pig.

Table 6 shows information about the replacement valves.

Table 6

Mechanical valve	Biological valve from a pig
Made of plastic or metal	Made from living tissue
Can cause the blood to clot around the valve	No risk of blood clotting around the valve
No need for another replacement valve after 5 years	Sometimes another replacement valve is needed after 5 years

0 6 . 5 Suggest **two** reasons why a patient may choose a mechanical valve and **not** a biological valve from a pig.

[2 marks]

1

2

4.2.2.2 The heart and blood vessels

Question 15 · continued

0 6 . 6 Suggest **one** reason why a patient may choose a biological valve from a pig and **not** a mechanical valve.

[1 mark]

0 6 . 7 A person may develop other medical conditions.

Draw **one** line from each medical condition to the correct treatment.

[2 marks]

Medical condition	Treatment
High blood cholesterol	Antibiotics
	Artificial pacemaker
Irregular heart rate	Insulin
	Statins

9

4.2.2.2 The heart and blood vessels

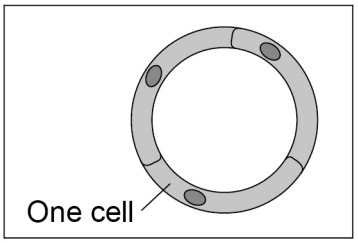
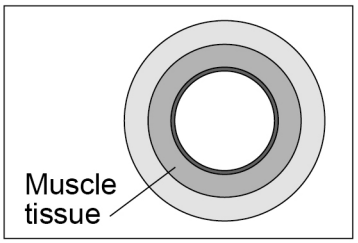
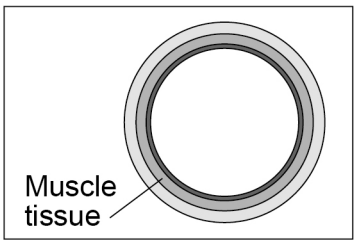
Question 16

November 2020 | 8461/1F | Original Q6

0 6 Blood is transported around the body in blood vessels.

0 6 . 1 Draw **one** line from each type of blood vessel to the structure of the blood vessel.

[2 marks]

Type of blood vessel	Structure of blood vessel
Artery	
Capillary	
Vein	

0 6 . 2 Explain how the structure of an artery is related to its function.

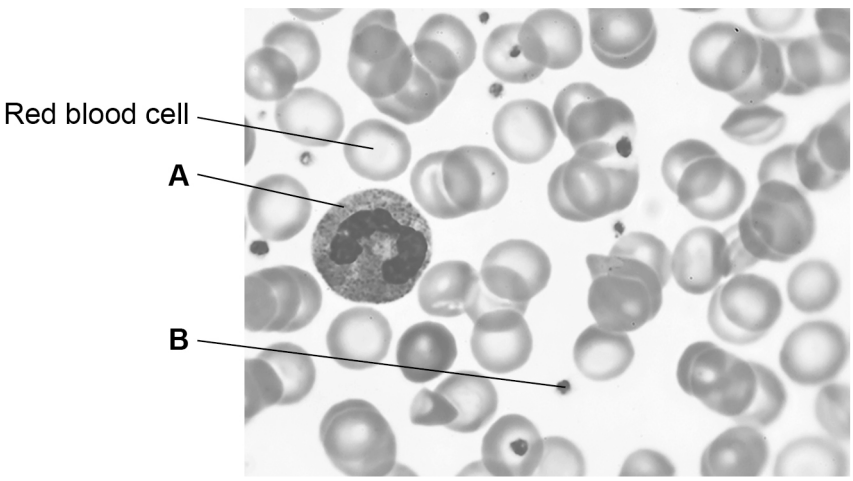
[2 marks]

4.2.2.2 The heart and blood vessels

Question 16 · continued

Figure 9 shows blood viewed through a microscope.

Figure 9



0 6 . 3 Name **A** and **B** in **Figure 9**.

[2 marks]

A _____

B _____

0 6 . 4 A red blood cell:

- has no nucleus
- contains a red pigment called haemoglobin.

Suggest how these adaptations help the red blood cell carry out its function.

[2 marks]

No nucleus _____

_____

Haemoglobin _____

_____

4.2.2.2 The heart and blood vessels

Question 16 · continued

0 6 . 5 The blood components are carried around the body in the liquid part of the blood.

What is the liquid part of the blood called?

[1 mark]

Tick (✓) **one** box.

Cell sap ☐

Plasma ☐

Saliva ☐

Urine ☐

Table 2 shows the results of a man's blood test.

Table 2

Blood component	Patient results	Normal range
Red blood cells	4.8	4.5 to 6.5
Lymphocytes	2.6	1.0 to 4.0
Neutrophils	5.1	1.8 to 7.5
Platelets	50	140 to 400

0 6 . 6 Which component of the man's blood is **not** within the normal range?

[1 mark]

0 6 . 7 Suggest a symptom the man might show.

[1 mark]

11

4.2.2.2 The heart and blood vessels

Question 17

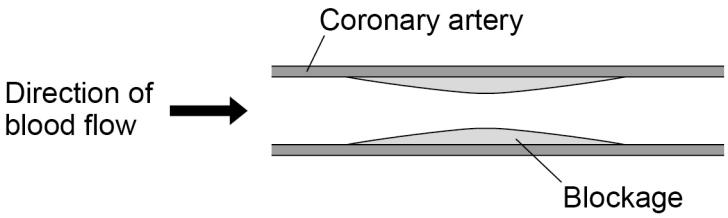
November 2021 | 8461/1F | Original Q5

0 5 A high cholesterol concentration in the blood can lead to blockages inside arteries.

The coronary arteries supply blood to the heart muscle.

Figure 9 shows a coronary artery with a blockage.

Figure 9



0 5 . 1 Why could the blockage in **Figure 9** cause cells in the heart to die?

[2 marks]

Question 5 continues on the next page

Question 17 · continued

Doctors can measure the concentration of cholesterol in the blood.

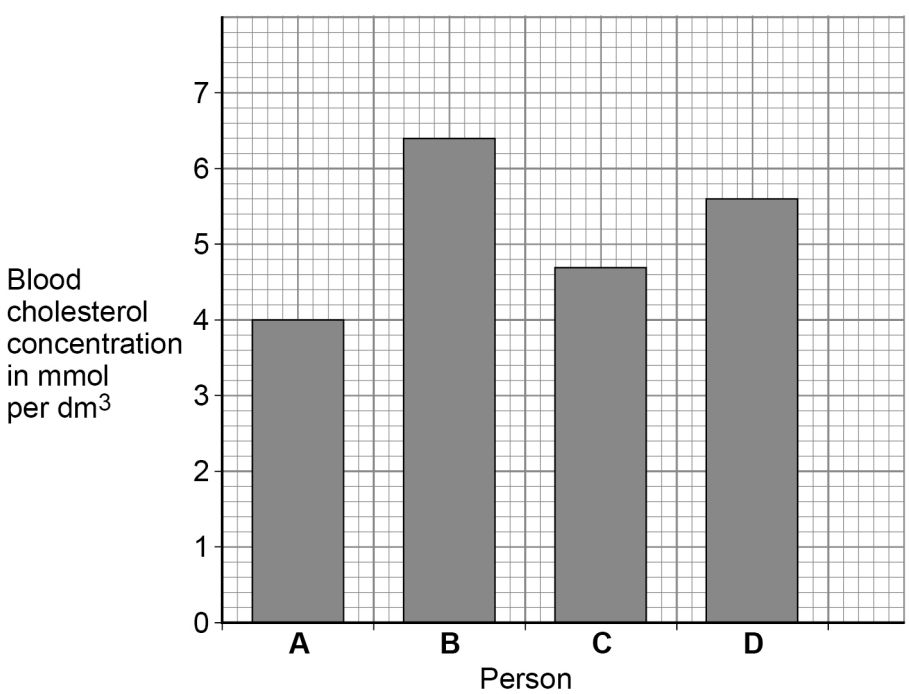
Table 3 shows four different blood cholesterol categories.

Table 3

Blood cholesterol concentration in mmol per dm^3	Cholesterol category
<4.6	Low
4.6–5.0	Normal
5.1–6.1	Medium
6.2 and above	High

Figure 10 shows the blood cholesterol concentration of four people.

Figure 10



4.2.2.2 The heart and blood vessels

Question 17 · continued

0 5 . 2 Which person is in the medium cholesterol category?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 5 . 3 Which person is most at risk of having a heart attack?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 5 . 4 Give a reason for your answer to Question **05.3**.

[1 mark]

_____

_____

0 5 . 5 The blood cholesterol concentration of person **D** is greater than the blood cholesterol concentration of person **A**.

Calculate how many times greater.

Use **Figure 10**.

[2 marks]

_____

_____

_____

_____

Number of times greater = _____

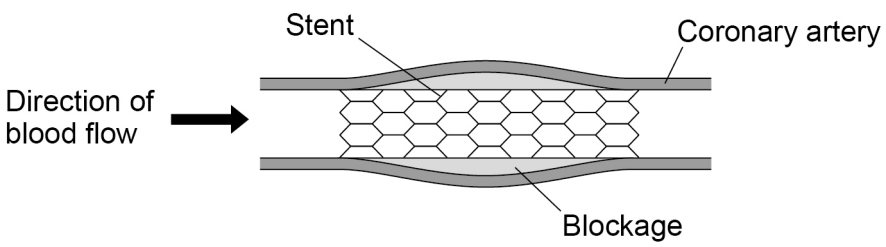
Question 5 continues on the next page

4.2.2.2 The heart and blood vessels

Question 17 · continued

Figure 11 shows how a stent can be used to treat a person with a blockage in a coronary artery.

Figure 11



0 5 . 6 Explain how a stent works as a treatment for a person with a blockage in a coronary artery.

[2 marks]

Patients are given anti-clotting drugs after they have a stent fitted.

The drugs help to prevent clots forming in the blood.

0 5 . 7 Which part of the blood starts the blood clotting process?

[1 mark]

Tick (✓) **one** box.

- Antibodies ☐
- Plasma ☐
- Platelets ☐
- Red blood cells ☐

4.2.2.2 The heart and blood vessels

Question 17 · continued

0 5 . 8 When a stent is fitted the doctor gives the patient an injection of anti-clotting drugs.

The patient then takes one anti-clotting tablet every day.

Anti-clotting drugs:

- are very effective
- can take a week to begin working fully
- have been used for over 60 years
- cost very little to make
- do **not** work effectively if the patient eats certain types of food.

The patient must have their blood tested every few weeks to check that the anti-clotting drugs are working.

Evaluate the use of anti-clotting drugs in patients who have had a stent fitted.

[4 marks]

14

4.2.2.2 The heart and blood vessels

Question 18

June 2022 | 8461/1F | Original Q6

0 6 **Table 4** shows information about four jellyfish.

The jellyfish are listed in order of increasing size.

Table 4

Jellyfish	Size of jellyfish	Surface area in mm^2	Volume in mm^3	Surface area to volume ratio
A	Smallest ↓	3 600	1 200	**X**:1
B		50 000	25 000	2:1
C		1 800 000	6 000 000	0.3:1
D	Largest	7 500 000	125 000 000	0.06:1

0 6 . 1 Calculate value **X** in **Table 4**.

[2 marks]

X = _____

0 6 . 2 Describe the relationship between the size of a jellyfish and its surface area to volume ratio.

Use **Table 4**.

[1 mark]

4.2.2.2 The heart and blood vessels

Question 18 · continued

June 2022 | 8461/1F | Original Q6

The jellyfish in **Table 4** take oxygen into their cells by diffusion.

0 6 . 3 Name **one** other substance that enters cells by diffusion.

Do **not** refer to oxygen in your answer.

[1 mark]

_____

0 6 . 4 Suggest **two** factors that affect the rate of diffusion of oxygen into a jellyfish.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 5 Some organisms take in oxygen using a respiratory system.

In humans, gas exchange takes place in the lungs.

Name the organs where gas exchange takes place in **fish**.

[1 mark]

_____

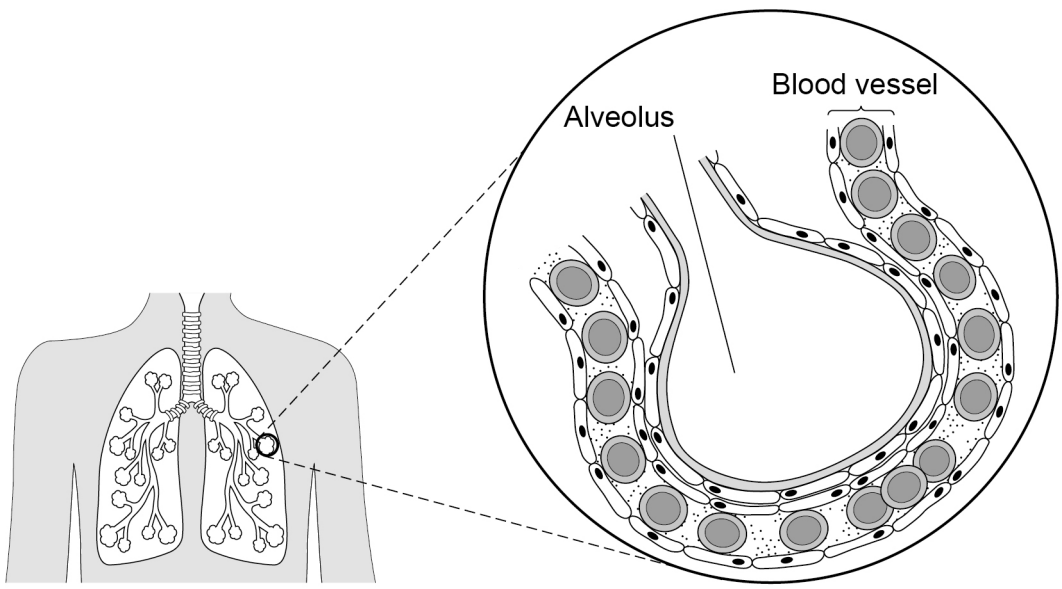
Question 6 continues on the next page

4.2.2.2 The heart and blood vessels

Question 18 · continued

0 6 . 6 **Figure 8** shows parts of the human breathing system.

Figure 8



Explain how the human breathing system is adapted to maximise the rate of gas exchange.

[6 marks]

13

4.2.2.2 The heart and blood vessels

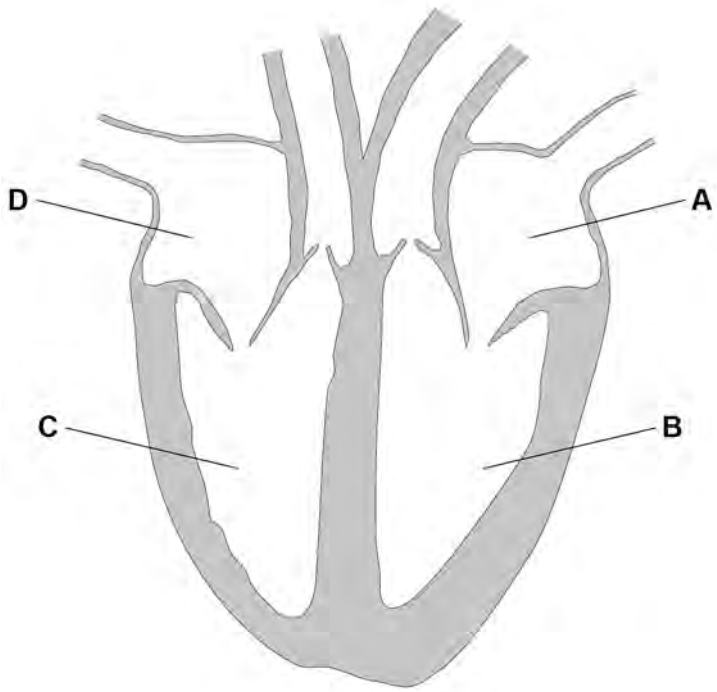
Question 19

June 2023 | 8461/1F | Original Q7

0 7 This question is about the circulatory system.

Figure 5 shows the human heart.

Figure 5



0 7 . 1 Which part of the heart receives oxygenated blood from the lungs?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 7 . 2 Which part of the heart pumps deoxygenated blood to the lungs?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.2.2.2 The heart and blood vessels

Question 19 · continued

0 7 . 3 A group of cells called the pacemaker controls the resting heart rate.

Where in the heart is the pacemaker found?

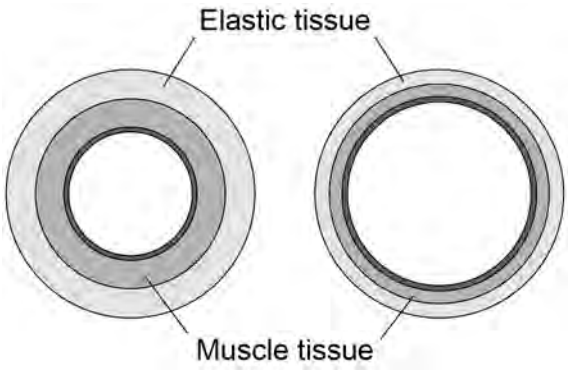
[1 mark]

Tick (✓) **one** box.

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

0 7 . 4 **Figure 6** shows a cross section of an artery and of a vein.

Figure 6



Describe **two** ways that the structure of an artery is different from the structure of a vein.

[2 marks]

1 _____

_____

2 _____

_____

Question 7 continues on the next page

4.2.2.2 The heart and blood vessels

Question 19 · continued

0 7 . 5 In coronary heart disease, the coronary arteries become narrower.

A build-up of fatty material can cause a blockage in a coronary artery.

Table 6 shows how a blockage in a coronary artery affects blood flow.

Table 6

Percentage (%) of coronary artery that is blocked	Blood flow in cm^3/minute
0	100
10	64
20	42
50	8
80	2

Describe the trend shown in **Table 6**.

[1 mark]

4.2.2.2 The heart and blood vessels

Question 19 · continued

June 2023 | 8461/1F | Original Q7

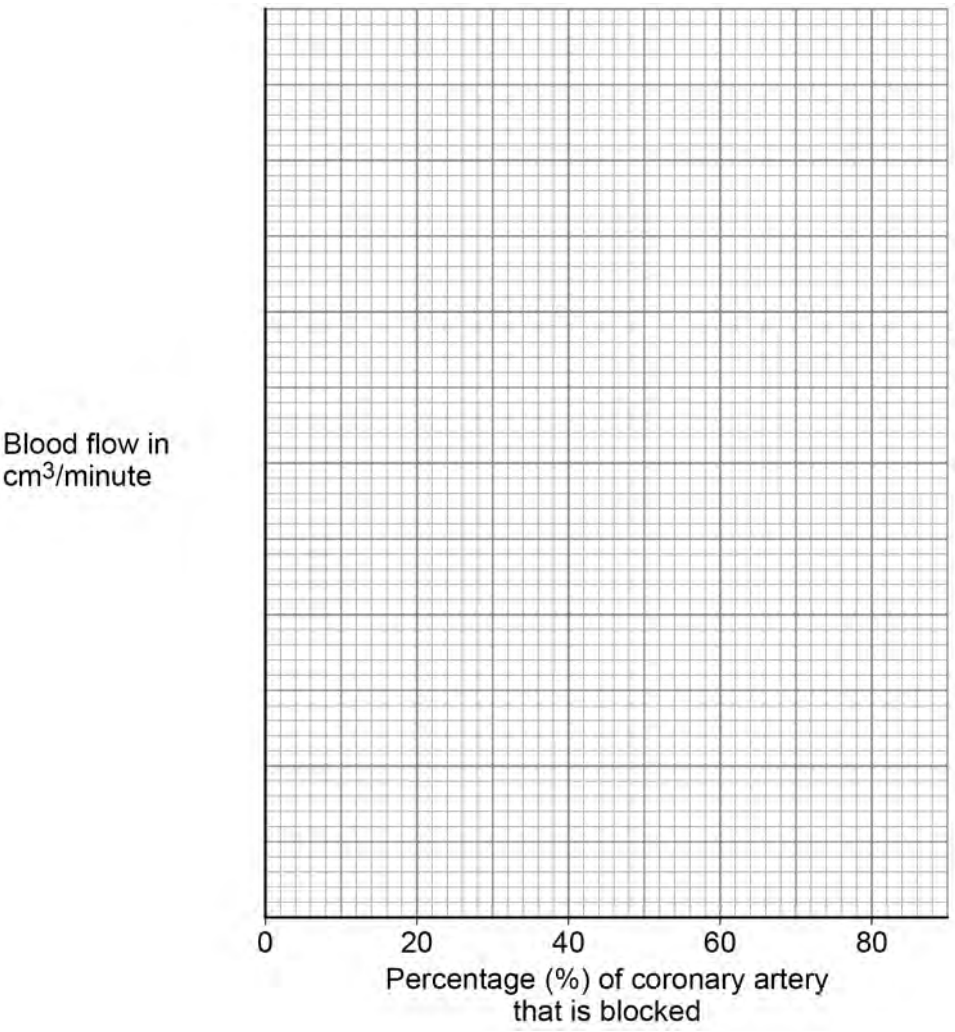
0 7 . 6 Complete **Figure 7**.

You should:

- use a suitable scale for the y-axis
- plot the data from **Table 6**
- draw a line of best fit.

[4 marks]

Figure 7



0 7 . 7 Predict the blood flow in a coronary artery with a 35% blockage.

Use **Figure 7**.

[1 mark]

Blood flow = _____ cm^3/minute

Question 7 continues on the next page

4.2.2.2 The heart and blood vessels

Question 19 · continued

June 2023 | 8461/1F | Original Q7

0 7 . 8 Explain the effect of a partly blocked coronary artery on the human body.

[6 marks]

0 7 . 9 There are different treatments for a blockage in a coronary artery.

Explain how **one** treatment for a blockage in a coronary artery works.

[2 marks]

19

4.2.2.2 The heart and blood vessels

Question 20

June 2024 | 8461/1F | Original Q7

0 7 A person has coronary heart disease.

0 7 . 1 Which blood vessels are affected by coronary heart disease?

[1 mark]

Tick (✓) **one** box.

- Arteries ☐
- Capillaries ☐
- Veins ☐

A person's heart stops beating.

The person stops breathing.

A first-aider pushes down on the person's chest.

Pushing down on the person's chest puts pressure on the heart.

0 7 . 2 Explain why putting pressure on the heart helps the person.

[2 marks]

4.2.2.2 The heart and blood vessels

Question 20 · continued

0 7 . 3 The first-aider also forces air into the person's lungs by blowing into their mouth.

Describe how forcing air into the person's lungs helps the person.

[1 mark]

0 7 . 4 The person's heart starts to beat again and the person starts breathing.

The person has a high level of cholesterol in their blood.

Name **one** type of drug that would decrease the level of cholesterol in the person's blood.

[1 mark]

0 7 . 5 A doctor decides that the person needs to have a stent fitted.

Explain how a stent works to treat coronary heart disease.

[2 marks]

Question 7 continues on the next page

Question 20 · continued

Table 5 shows the effect of smoking on the risk of developing different cardiovascular diseases.

Table 5

Cardiovascular disease	Percentage (%) increase in risk compared to people who have never smoked
E	14
F	20
G	29
H	70

0 7 . 6 Give **two** conclusions that can be made from the data in **Table 5**.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 7 Complete **Figure 6**.

You should:

- label the y-axis
- add the correct scale to the y-axis
- plot the data from **Table 5**
- label each bar.

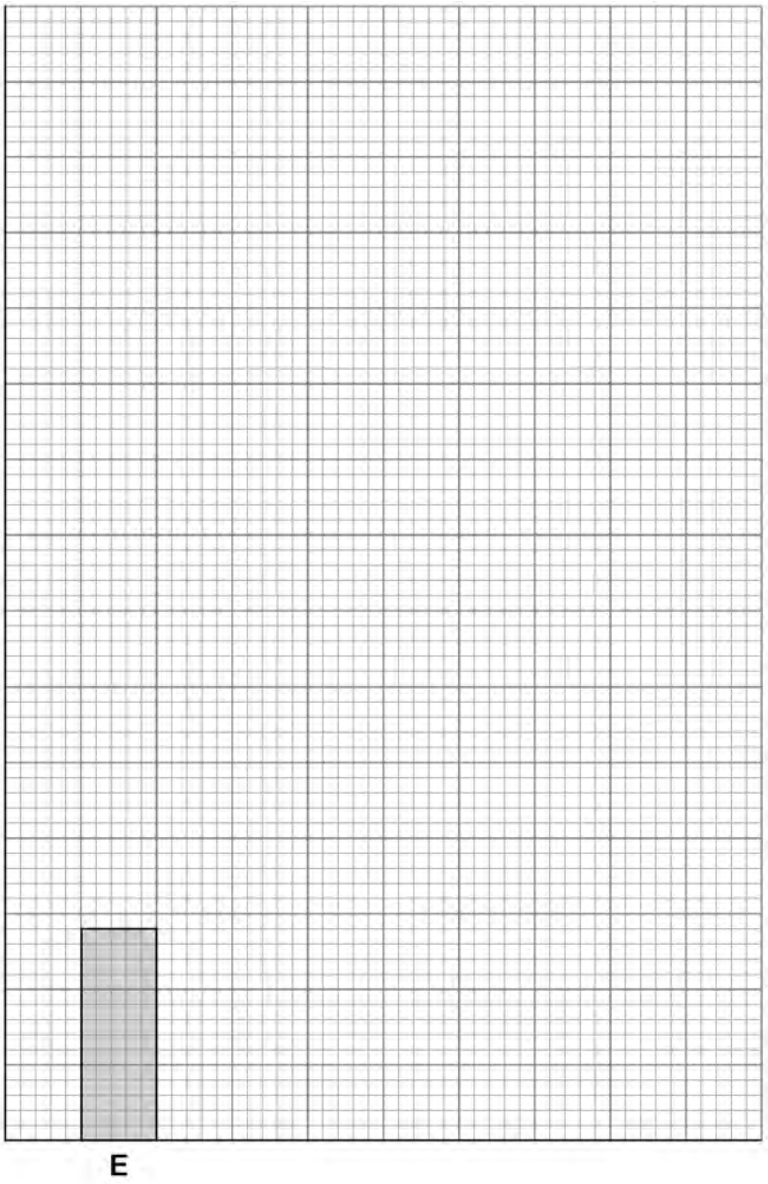
The bar for cardiovascular disease **E** has been plotted for you.

[4 marks]

4.2.2.2 The heart and blood vessels

Question 20 · continued

Figure 6



0 7 . 8 Describe **one** lifestyle factor that can increase the risk of cardiovascular disease.

Do **not** refer to smoking in your answer.

[1 mark]

14

4.2.2.2 The heart and blood vessels

Question 21

June 2025 | 8461/1F | Original Q3

0 3 Blood contains different types of cell.

0 3 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

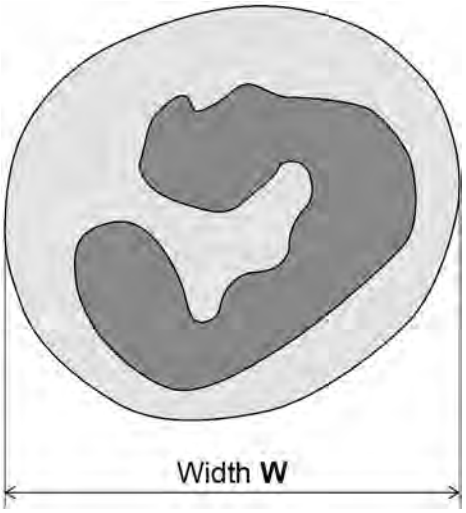
antibiotics	**antitoxins**	**painkillers**	**pathogens**

White blood cells defend the body against _____.

Some white blood cells release chemicals that neutralise toxins. These chemicals are called _____.

0 3 . 2 **Figure 3** shows a white blood cell.

Figure 3



The image of the white blood cell in **Figure 3** is magnified 4000 times.

4.2.2.2 The heart and blood vessels

Question 21 · continued

Calculate the real width of the white blood cell.

[4 marks]

Complete the following steps.

Measure width **W** in millimetres (mm).

Width **W** = _____ mm

Convert your measurement to micrometres (µm).

1 millimetre (mm) = 1000 micrometres (µm).

_____

_____

Width **W** in micrometres = _____ µm

Calculate the real width of the white blood cell.

Use the equation:

$$\text{real width} = \frac{\text{width } \mathbf{W} \text{ (µm)}}{\text{magnification}}$$

_____

_____

_____

_____

Real width = _____ µm

Question 21 · continued

Table 3 shows information about different types of blood vessel.

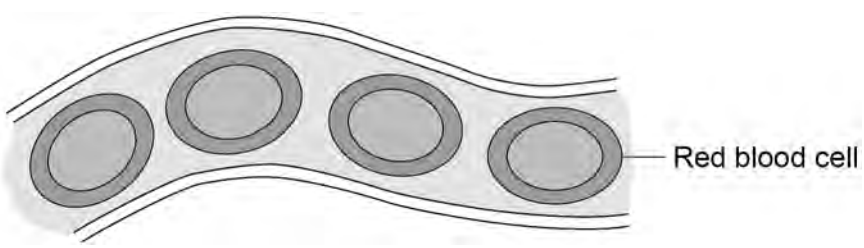
Table 3

Blood vessel	Width of blood vessel in micrometres (µm)	Pressure of blood travelling through the blood vessel
Artery	10 000	High
Capillary	10	Low
Vein	20 000	Very low

0 3 . 3 The width of a red blood cell is 8 µm.

Figure 4 shows red blood cells in one type of blood vessel.

Figure 4



Which type of blood vessel is shown in **Figure 4**?

Use **Table 3**.

[1 mark]

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

4.2.2.2 The heart and blood vessels

Question 21 · continued

0 3 . 4 Explain why arteries need to have thick walls.

Use **Table 3**.

[2 marks]

Coronary arteries in the heart can become narrowed.

0 3 . 5 What happens inside coronary arteries to cause them to become narrowed?

[1 mark]

0 3 . 6 Explain why narrowed coronary arteries can be dangerous.

[2 marks]

Question 3 continues on the next page

4.2.2.2 The heart and blood vessels

Question 21 · continued

0 3 . 7 Treatments are available for some cardiovascular diseases.

Draw **one** line from each cardiovascular disease to a treatment for the disease.

[3 marks]

Cardiovascular disease	Treatment
A blocked coronary artery	Antibiotics
Heart failure	Heart transplant
High blood cholesterol	Statins
	Stent

0 3 . 8 Why is coronary heart disease described as a 'non-communicable disease'?

[1 mark]

_____

_____

16