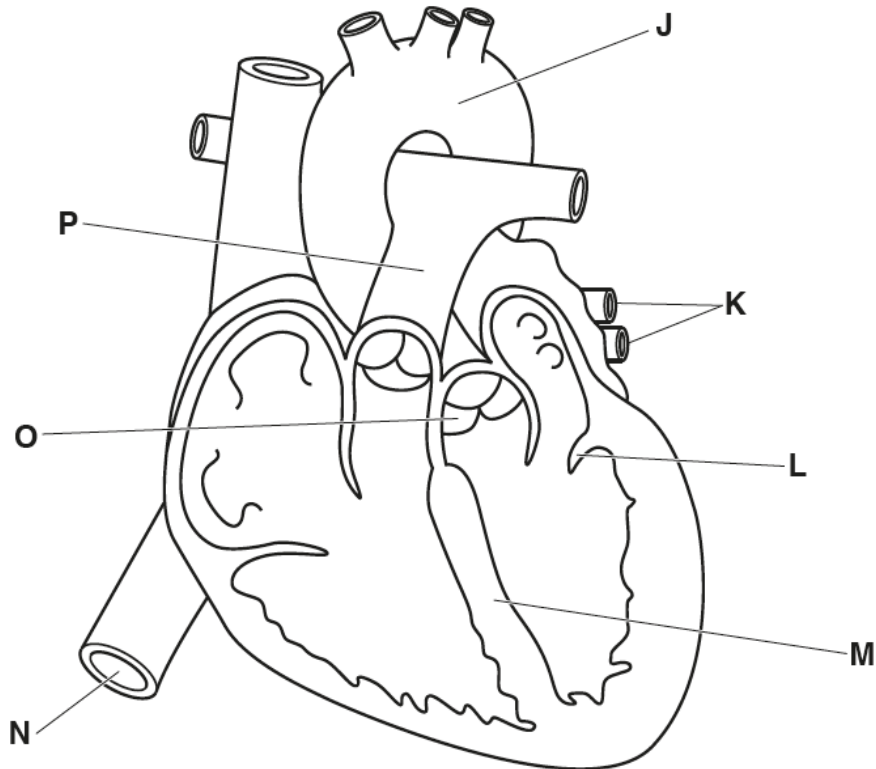




**Q1:** Figure shows a vertical section through a human heart and the major blood vessels.



(i) State the names of the structures labelled **L**, **M** and **O** as shown in Fig.

**L** .....

**M** .....

**O** .....

(ii) Identify a letter on Figure that represents a blood vessel that has:

blood with the highest concentration of carbon dioxide .....

blood with the highest concentration of oxygen .....

the highest pressure .....



**b.i):** Describe how blood is moved by the heart from blood vessel **K** to blood vessel **J**.

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**ii)** Explain why the wall of the left ventricle is thicker than the wall of the right ventricle.

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**2a)** Describe how too much fat in the diet may cause coronary heart disease.

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**b)** Describe **and** explain how coronary heart disease can be treated.

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**3a)** Lymphocytes produce antibodies.

Outline the role of antibodies in the defence of the body against pathogens.

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**b)** Fig. is a drawing made from an electron micrograph of a lymphocyte that produces antibodies.

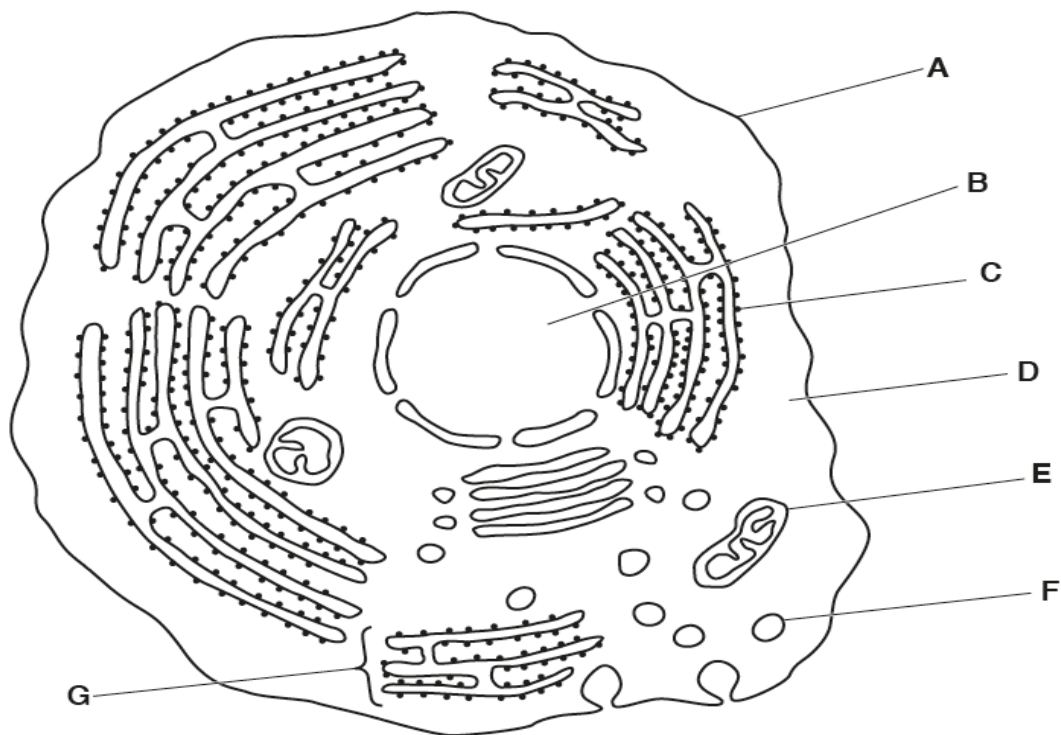




Table. contains statements about the structures visible in Fig.

Complete Table by

- naming the structure
- identifying the letter that labels the structure.

The first one has been done for you.

function	name of structure	letter from Fig. 2.1
absorption of amino acids used in making antibodies	cell membrane	<b>A</b>
stores genetic information as DNA		
provides energy for making antibodies		
site of production of antibodies		
transport of antibody molecules for release into blood		

c) State the name of **one** type of cell, other than a lymphocyte, that is involved in the defence of the body against pathogens and describe its role.

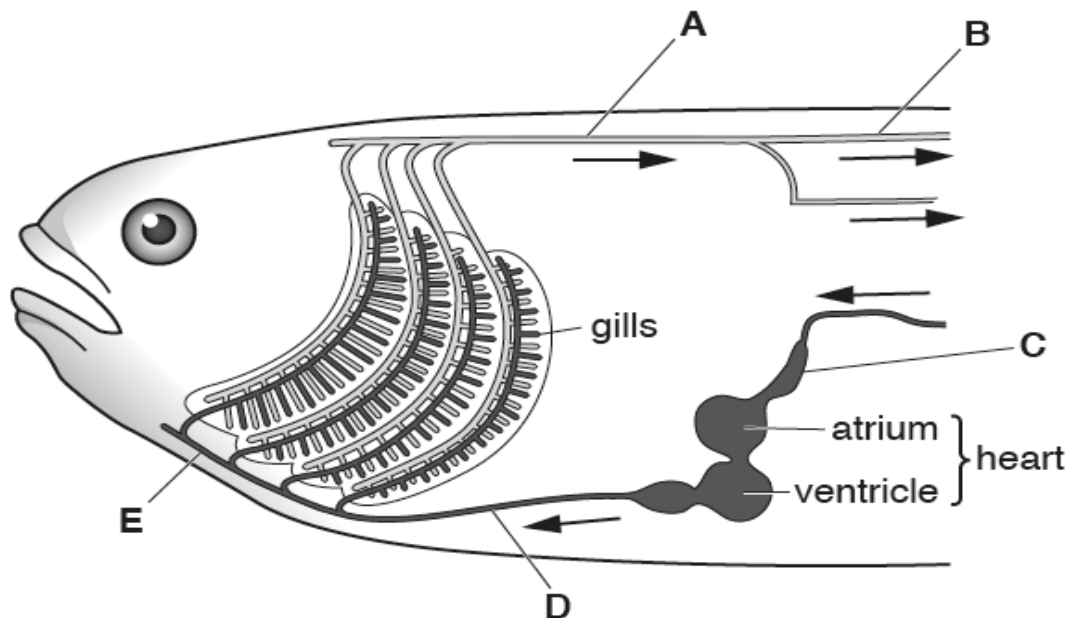
name.....

role .....  
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4a) Fig. shows part of the circulatory system of a fish.

The arrows show the direction of blood flow.



The circulatory system of fish is described as a single circulation.

State what is meant by a *single circulation*.

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b) State the letter of the blood vessel in Fig. that contains blood at the highest pressure.

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5) Proteins are also found in the blood.

State the names of **two** proteins found in the blood.

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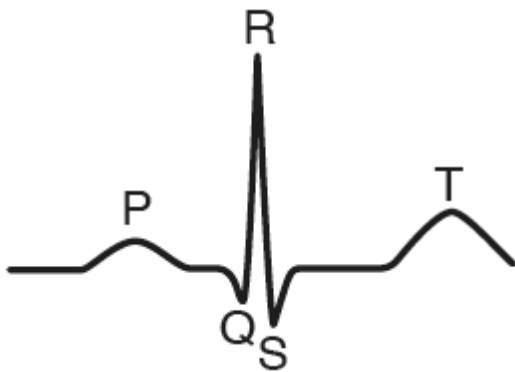
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6a) Heart rate is influenced by electrical impulses from the brain.

State the name of the type of cell that conducts electrical impulses to the heart.

b) The electrical activity of the heart can be recorded on an ECG.

Fig. shows an ECG of one heartbeat.



(i) Table 3.1 shows how the electrical activity, during one heartbeat, corresponds to the opening and closing of the valves in the heart.

Complete Table using the words 'open' and 'closed'.

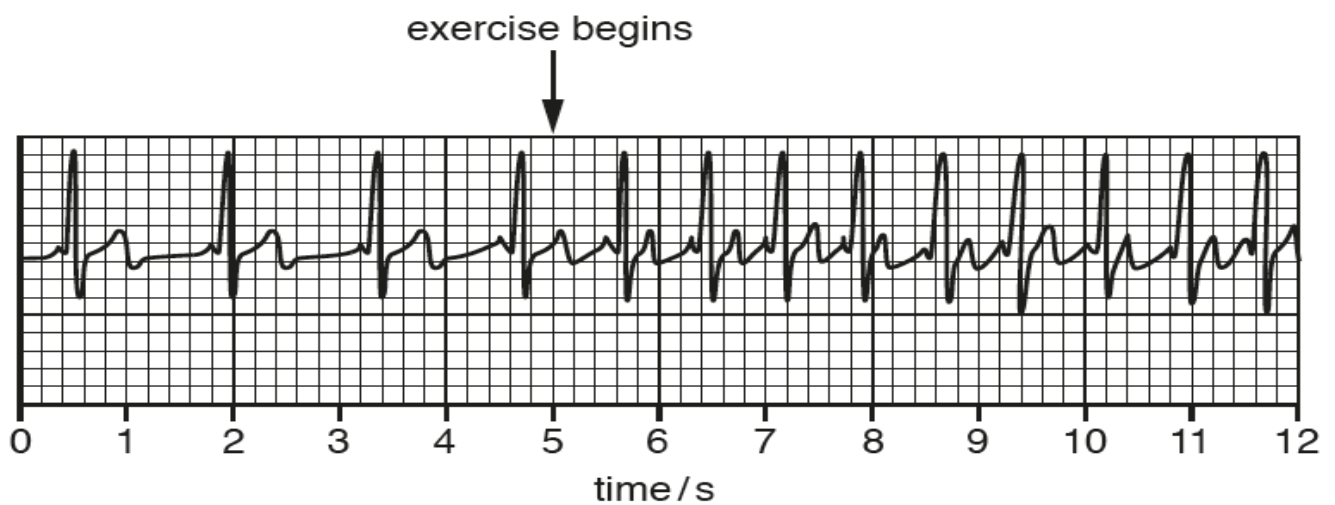
part of the ECG shown in Fig. 3.1	result of electrical activity	atrioventricular valves	semilunar valves
P	atria contract		
QRS	ventricles contract		
T	atria and ventricles relax		



ii) State the function of heart valves.

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c) Fig. shows the ECG of an athlete before and during exercise.



i) Calculate the heart rate, in beats per minute, **before** exercise begins.

Show your working and give your answer to the nearest whole number.

.....beats per minute

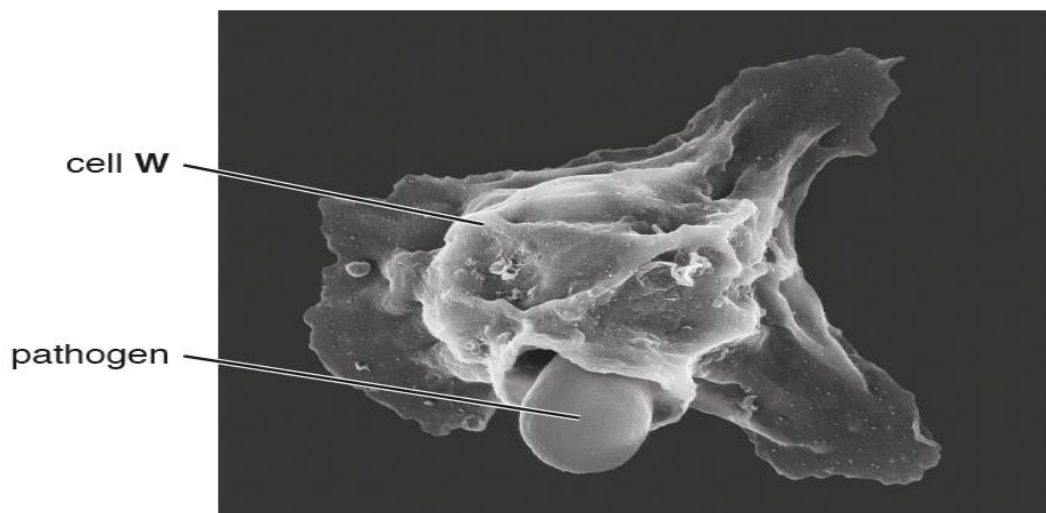
(ii) Using Fig. describe how the electrical activity of the heart during exercise differs from the electrical activity before exercise begins.

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7) Cell **W** in Fig. 6.2 also responds to pathogens.



(i) State the name of the process shown in Fig.

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(ii) Describe what happens to the pathogen during the process shown in Fig. 6.2.

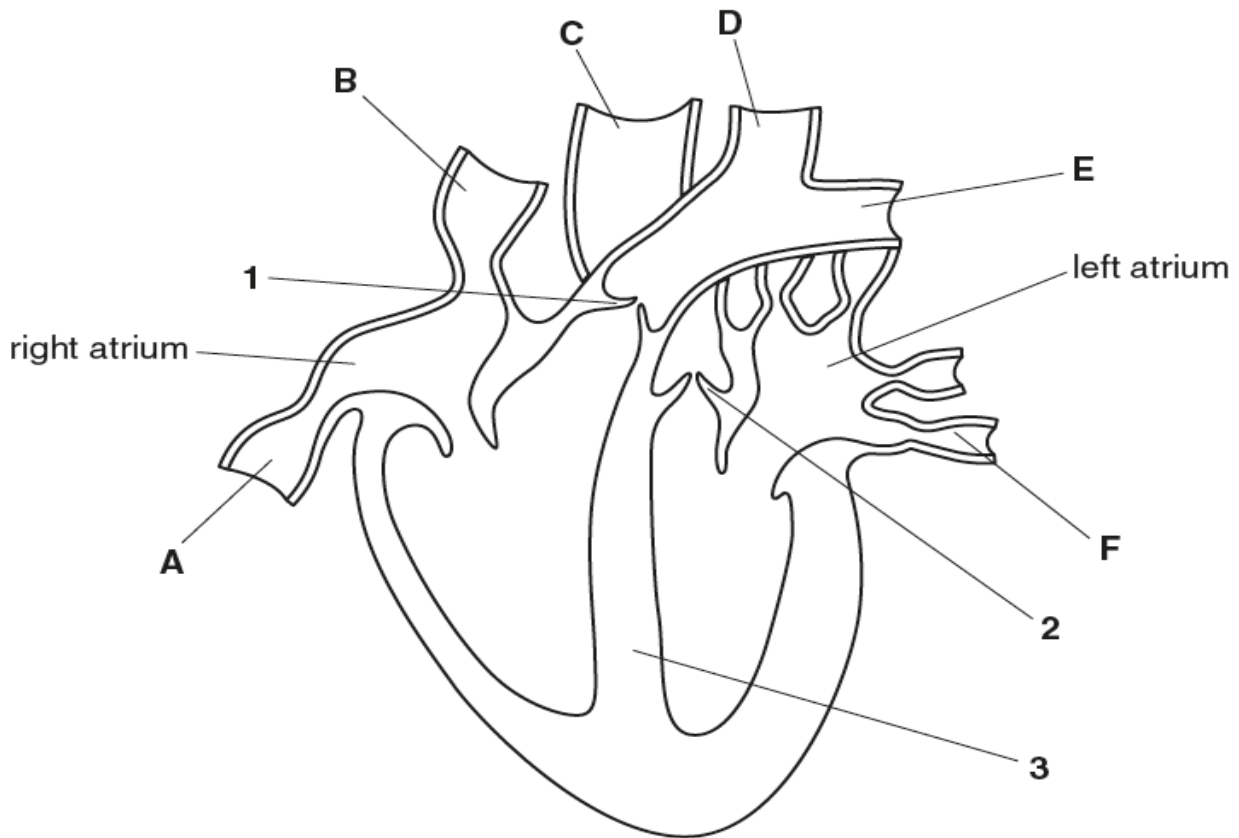
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8a) Fig. 1.1 is a diagram of the human heart. The diagram shows the phase during the heart beat





when the atria contract. The blood vessels that carry blood to and from the heart are labelled A to F.



(a) (i) Draw **one** arrow on Fig. 1.1 to show the pathway taken by blood from a vein into the **right ventricle**.

(ii) Identify the letter of the blood vessel that carries blood at the highest pressure and state its name.

letter .....

name of the blood vessel

.....

(b) (i) Suggest what causes the valves at **1** and **2** to close during a heart beat.



c) Fig. 1.1 shows the phase of the heartbeat when the ventricles are filling with blood.

Using Fig. 1.1, describe **and** explain how the blood travels from the right ventricle to the lungs.

d) State the name of the part of the heart labelled **3** and state its role in the mammalian circulation.

Name

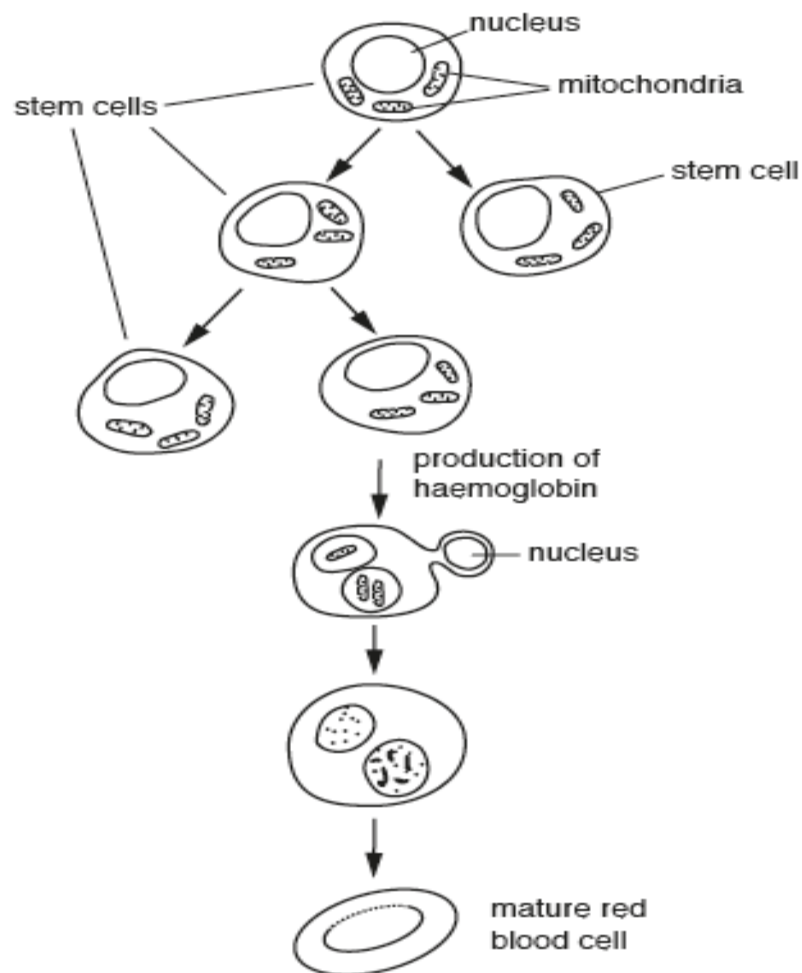


Role

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9a) Red blood cells in humans are produced from stem cells.

Fig. 3.1 shows how a red blood cell is produced and becomes specialised.



Use the information in Fig. to describe how red blood cells are produced and explain how they are adapted to their function.



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9b) Red blood cells are suspended in the liquid part of the blood.

State the name of the liquid part of the blood.

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10a) The spread of meningitis can be controlled by using vaccines.

(i) Explain how vaccination provides active immunity.

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ii) If meningitis disappears from a country, explain why the vaccine should continue to be used in that country.

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10b) People who have meningitis are treated with injections of antibodies to give them passive immunity.

(i) Suggest why the antibodies must be injected rather than taking them by mouth.

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(ii) Explain why passive immunity does not give long-term protection against diseases, such as meningitis.

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11a) (i) Blood transports nutrients.

State the component of the blood that transports nutrients.

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(ii) The nutrients in the blood can be used to become part of cells.  
State the name of this process.

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(iii) Amino acids are an example of a type of nutrient transported in the blood.

State **two** examples of larger molecules found in cells that are made from amino acids.

1 .....

2 .....

12) Before starting the investigation, the researchers confirmed that the woman did not have  
coronary heart disease.



1) Suggest why.

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...[1]

(ii) Explain why exercise is recommended for people with a high risk of developing coronary heart disease.

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13) Describe how vaccination can prevent the spread of disease.

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14) A person who wanted to begin a fitness programme did some vigorous exercise.

A fitness trainer took a drop of blood from the person's finger before, during and after vigorous exercise and tested it for lactic acid.

Explain why it is important that the equipment used for taking blood is clean (sterile).

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15) (i) *H. pylori* can cause infections in the stomach.

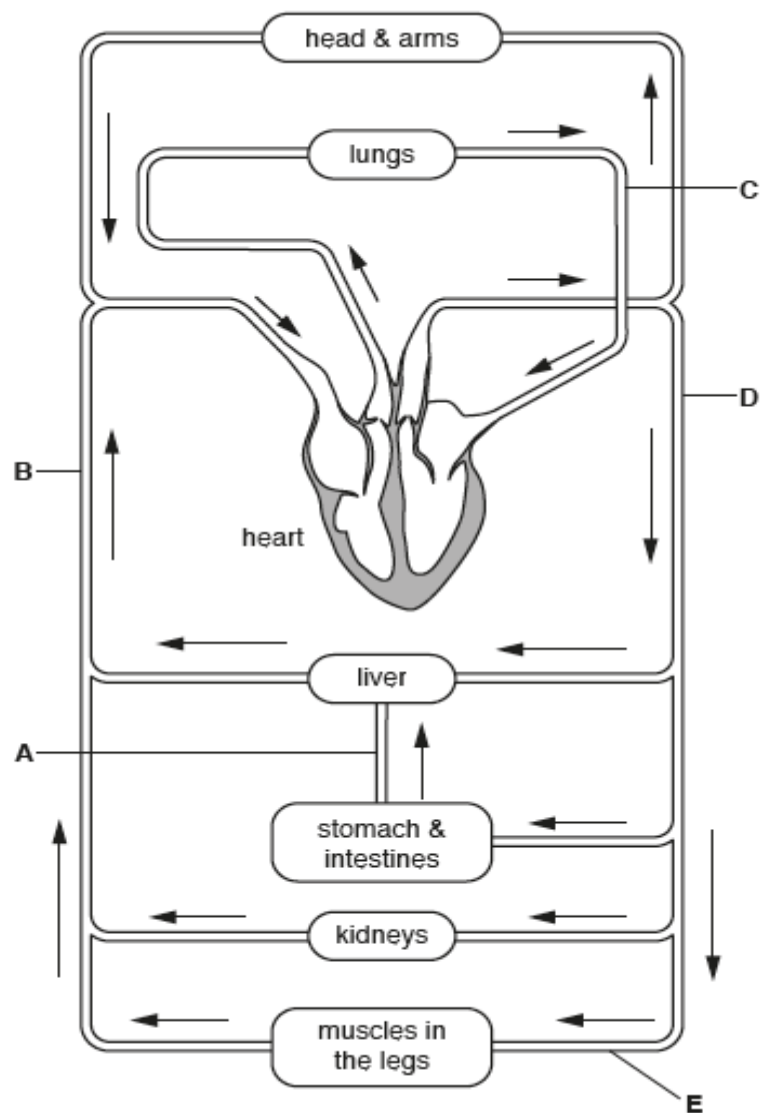
Suggest how this infection could be treated.

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16) Glucose is absorbed into the blood in the small intestine. Fig. 6.1 shows the human circulatory

system and the pathway taken by molecules, such as glucose, when they travel in the blood.





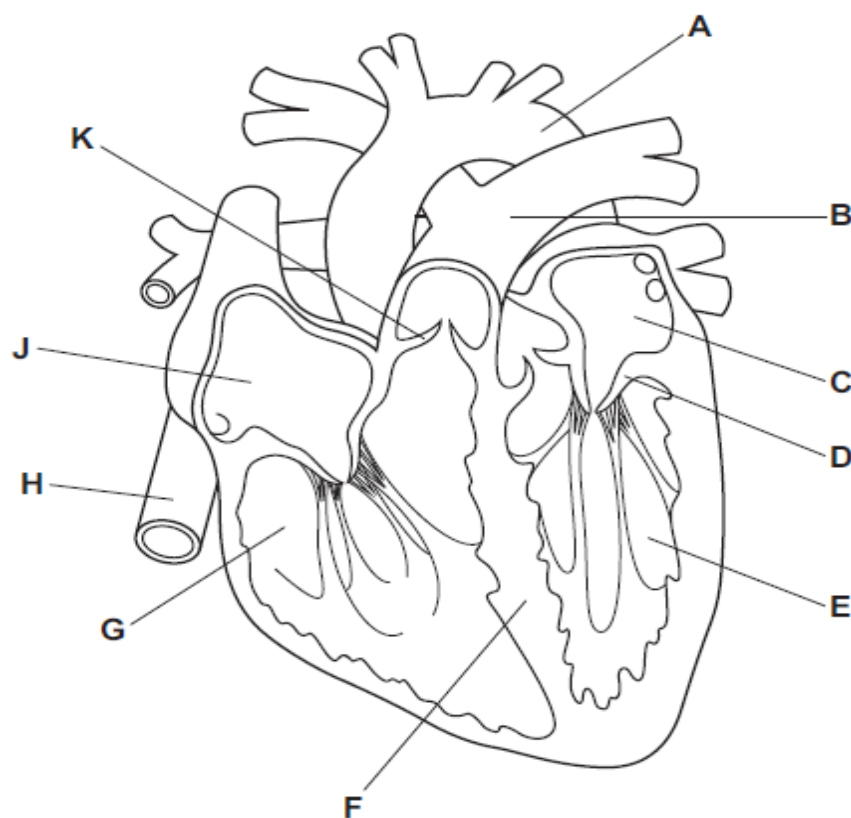
Complete Table 6.1 by naming the blood vessels labelled on Fig. 6.1 and stating whether they contain oxygenated blood or deoxygenated blood. One row has been completed for you.



letter on Fig. 6.1	name of the blood vessel	oxygenated or deoxygenated blood
A		
B		
C		
D		
E	femoral artery	oxygenated

**17a)** Fig. 1.1 shows the human heart and the main blood vessels. The functions of the parts of the

heart and some of the blood vessels are given in Table 1.1.



Complete Table 1.1.

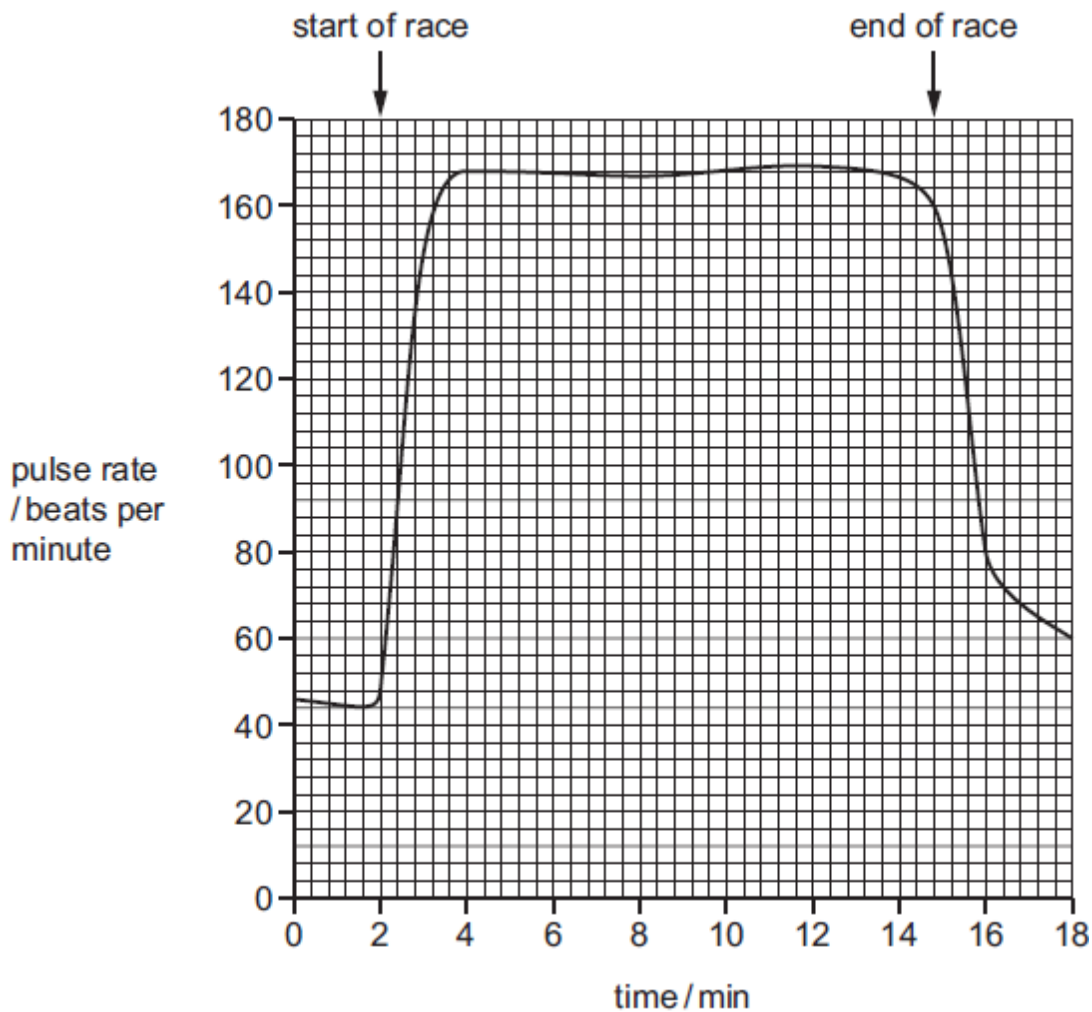
One row has been done for you.



function	letter on Fig. 1.1	name
structure that separates oxygenated and deoxygenated blood		
structure that prevents backflow of blood from ventricle to atrium		
blood vessel that carries oxygenated blood	<b>A</b>	aorta
blood vessel that carries deoxygenated blood		
structure that prevents backflow of blood from pulmonary artery to right ventricle		
chamber of the heart that contains oxygenated blood		
chamber of the heart that contains deoxygenated blood		

b) A group of students used a heart monitor to record the pulse rate of an athlete during a 5000 metre race.

The recordings started just before the race began and ended just after it had finished, as shown in Fig.



(i) Use data from Fig. 1.2 to describe the effect of exercise on the pulse rate of the athlete.

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(ii) Explain the change in pulse rate between 2 minutes and 3 minutes after the recordings started.

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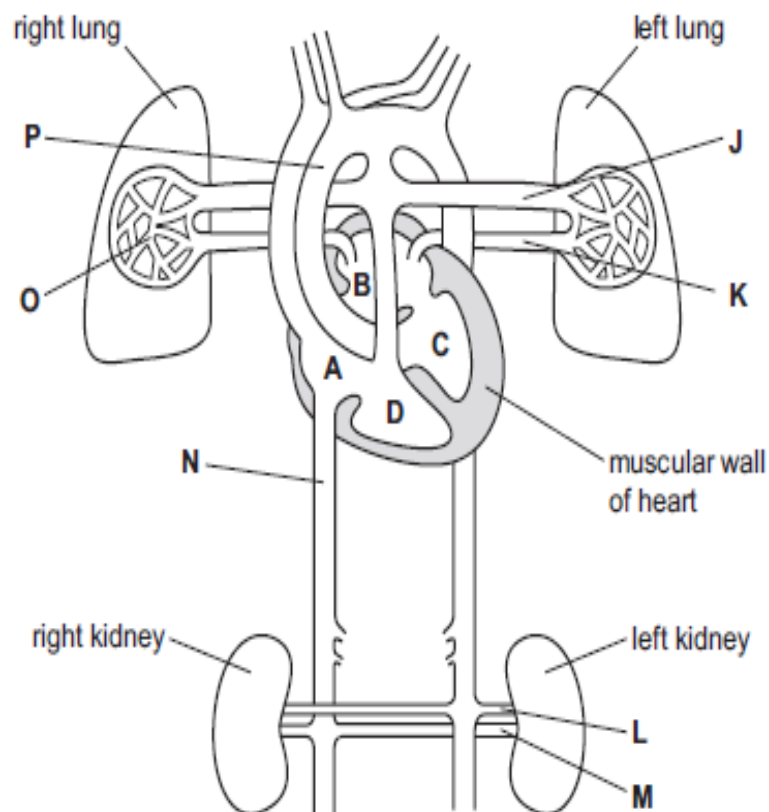
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18a) All mammals have a double circulatory system. Fig. 1.1 shows part of the human double circulatory system.



(a) Name the muscular wall that separates the left and right sides of the human heart.

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(b)

(i) Describe what is meant by the term *double circulation*.

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(ii) State **one** advantage of a double circulation.

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c) Table 1.1 describes some of the structures of the human circulatory system shown in Fig.

Complete the table.

One row has been done for you.

**Table 1.1**

description	name of structure	letter on Fig. 1.1
heart chamber with the thickest muscular wall		
blood vessel that carries oxygenated blood to the heart		
blood vessel that carries oxygenated blood away from the heart		
blood vessel that carries blood away from the kidneys		
blood vessel with the largest lumen	vena cava	<b>N</b>

d) Describe how blood is transported from the vena cava to the lungs. You may use the letters on

Fig. 1.1 in your description.

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e)

(i) Doctors recommend that a healthy diet can reduce the risk of coronary heart disease.

Give **one** other lifestyle improvement patients can make that can reduce the risk of coronary heart disease.

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(ii) Sometimes surgery is required to treat coronary heart disease.

Describe **one** named example of surgery that can treat coronary heart disease.

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19) *V. cholerae* is the pathogen that causes cholera. Vaccination is used to control the spread of cholera during an outbreak.

Explain how vaccination can control the spread of diseases.

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20) Fig. 4.2 is an electron micrograph of a red blood cell within a capillary.



i) Molecules of carbon dioxide that are produced in muscle cells are transported to the blood.

Describe the pathway taken by these molecules of carbon dioxide.

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(ii) Explain how capillaries are adapted for their functions.

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21a) Penicillin is an antibiotic.

(i) Explain why doctors give antibiotics to people who are ill.

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(ii) Explain why it is important to complete a full treatment of antibiotics.

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22a) The numbers of different cells in a blood sample were counted. The results are shown in Table

cell type	number /per mm <sup>3</sup>	percentage
red blood cells	4 820 000	94.91
lymphocytes	1 900	0.04
phagocytes	6 000	0.12
platelets	250 000	
total	5 077 900	100.00

Complete the table by calculating the percentage of platelets. Write your answer in Table 5.1  
to two decimal places.



b) **(b)** State the role of platelets in the blood **and** describe the process they are involved in.

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(c) Lymphocytes are white blood cells that are produced in bone marrow.  
Lymphocytes travel in  
the blood from bone marrow to lymph nodes throughout the body.

If a pathogen infects the body, some of these lymphocytes are activated.

State the role of lymphocytes in defence against pathogens.

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d) During a second infection of the same pathogen the response by lymphocytes is much faster.

Explain how this happens.

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23a) A group of students investigated the effect of exercise on their heart rates.



- before exercise
- immediately after running 1 km
- one minute after running 1 km

(a) (i) Write a hypothesis for this investigation.

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Describe how the students could measure their pulse.

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Coronary heart disease is caused by a blockage in the coronary artery.

Describe the effect on the heart of a blockage in the coronary artery.



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(c) The doctor divided her coronary heart disease patients randomly into two equal groups.

Each group was given different instructions:

- group A – patients were given a daily exercise plan
- group B – patients were told to make their own exercise plan.

The doctor measured the heart rate (HR) of each patient immediately after doing exercise  
and again one minute later.

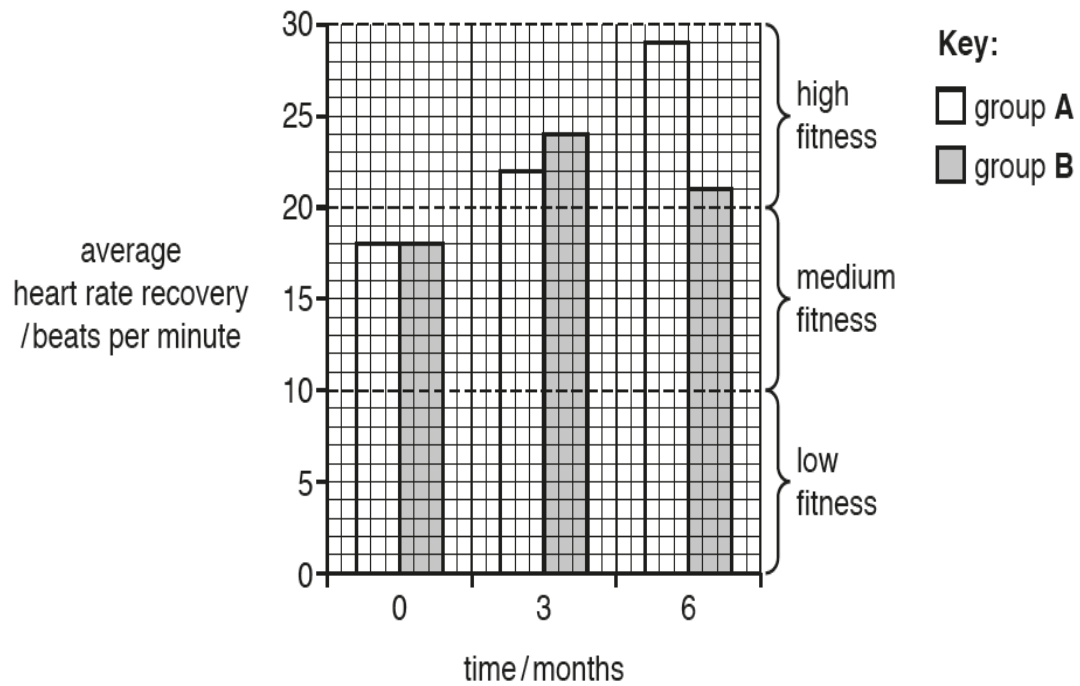
She calculated their heart rate recovery using this formula:

heart rate recovery = HR immediately after exercise – HR one minute after exercise.

She then calculated the average heart rate recovery for each of the two groups of patients.

The doctor repeated these measurements after three months and after six months.

The results are shown in Fig.



Describe **and** explain the effect of exercise on the average heart rate recovery of the coronary heart disease patients in group A and group B.

Use data from Fig. 2.1 to support your answer.

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(d) Exercise may reduce the risk of coronary heart disease.

State **one other** possible way of reducing the risk of developing coronary heart disease.

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24) Some fungi are human pathogens.

Describe how the human body prevents pathogens from entering.

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