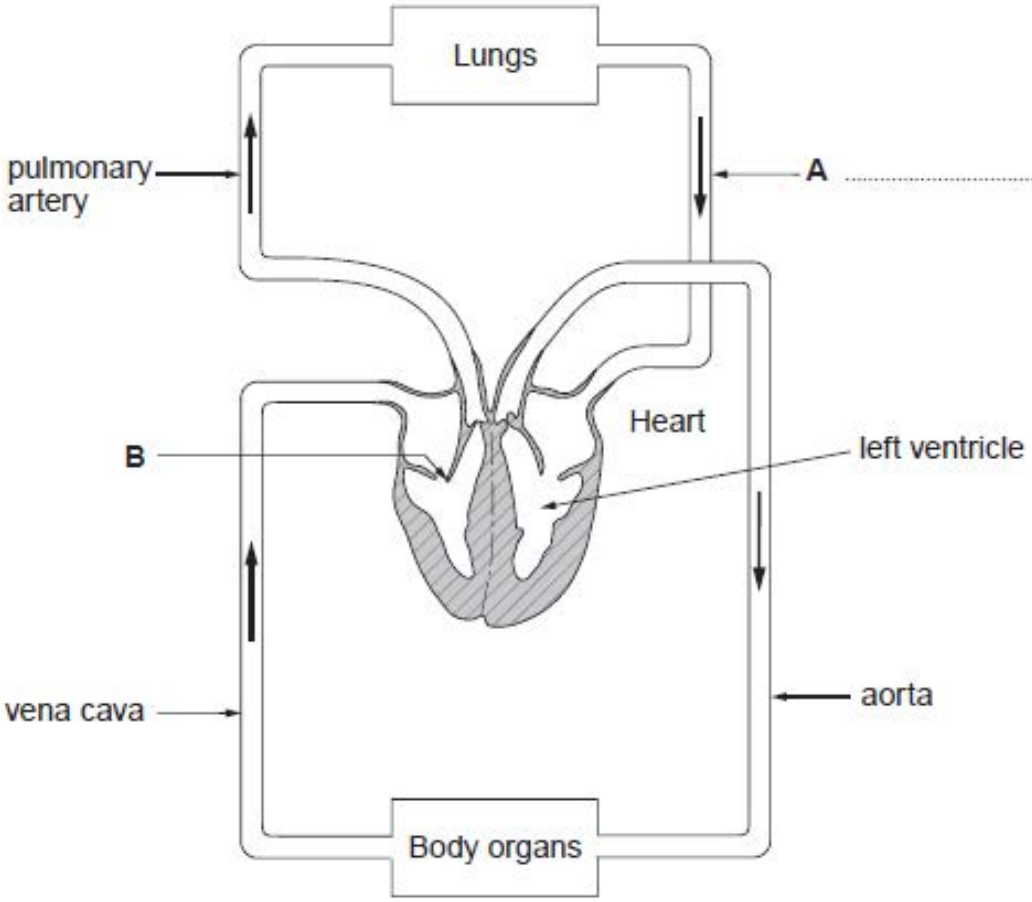
WJEC (Wales) Biology GCSE
Topic 1.4 Circulatory System in Humans
Questions by Topic

1. The diagram shows the human circulatory system.



(a) (i) Label the blood vessel **A on the diagram**. [1]

(ii) State the function of structure **B**. [1]

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(b) The table shows blood pressures in different parts of the circulatory system.

Blood vessel	Maximum blood pressure (kPa)
pulmonary artery	3.3
aorta	16.0
capillary in body organ	2.0
left ventricle	17.0
right ventricle	3.5

(i) I. Calculate the difference in the maximum blood pressure between the aorta and the pulmonary artery. [1]

Difference in pressure = ... kPa

II. State the reason for the difference in blood pressure in these two blood vessels. [1]

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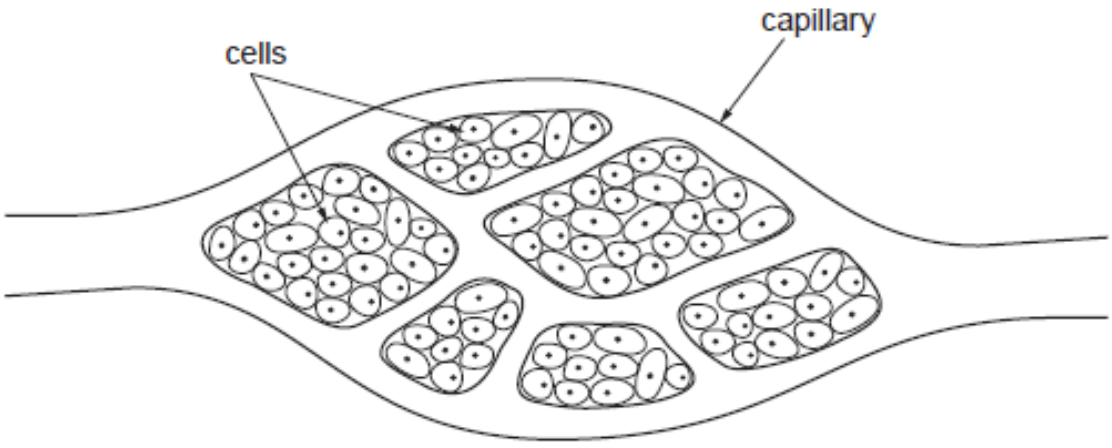
(ii) The diagram shows some capillaries in an organ of the body.



Blood flows very slowly through the capillaries, allowing useful substances in the blood and waste products in cells to be exchanged.

I. From the table above, what is the evidence that the blood flows slowly through the capillaries? [1]

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II. State how the capillary walls are well adapted for the exchange of substances. [1]

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2. *(a)* State what is meant by a double circulatory system. [2]

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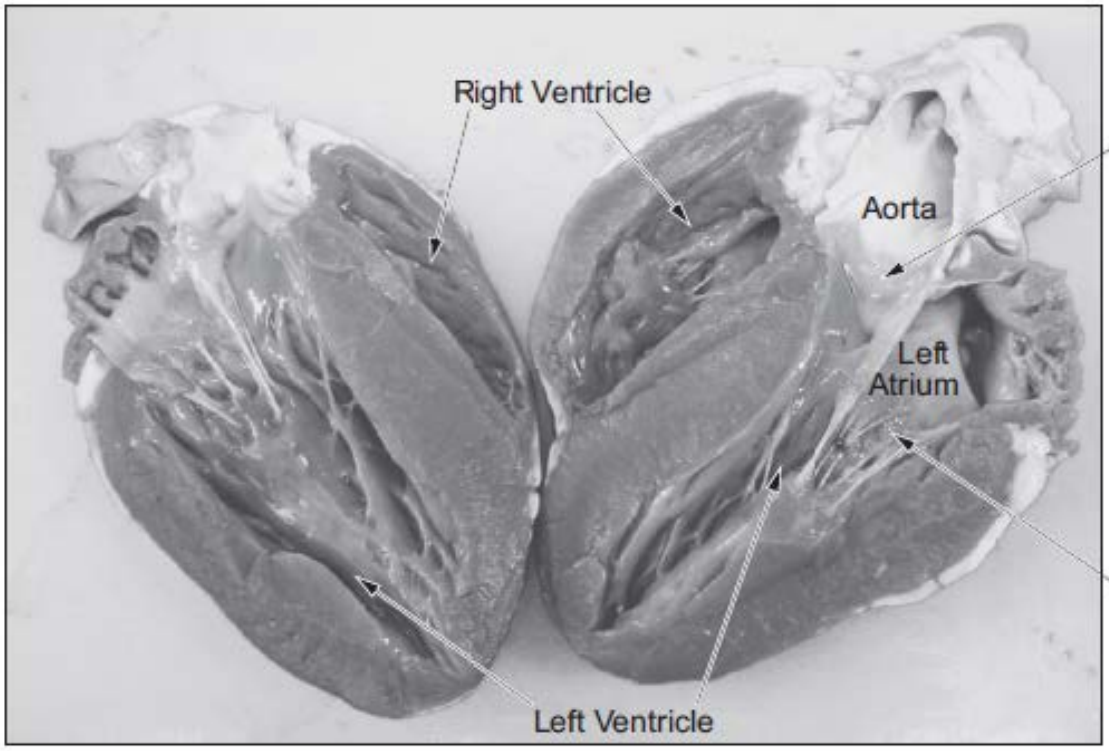
The photograph below shows a section through the heart.



(b) Use the picture above and your own knowledge to identify valve **A**. [1]

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(c) Explain how the semi-lunar valve, shown in the photograph, helps to ensure a one-way flow of blood through the heart. [3]

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(d) The walls of the left ventricle are thicker than the walls of the right ventricle. Explain the significance of this difference. [2]

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In 2016, a research group at Imperial College London reported that weekly exercise seemed to increase the thickness of the walls of the ventricles. This effect could be mistaken for serious heart disease even though the individuals are healthy.

(e) Suggest an explanation for the effect of exercise on the thickness of the walls of the ventricles. [2]

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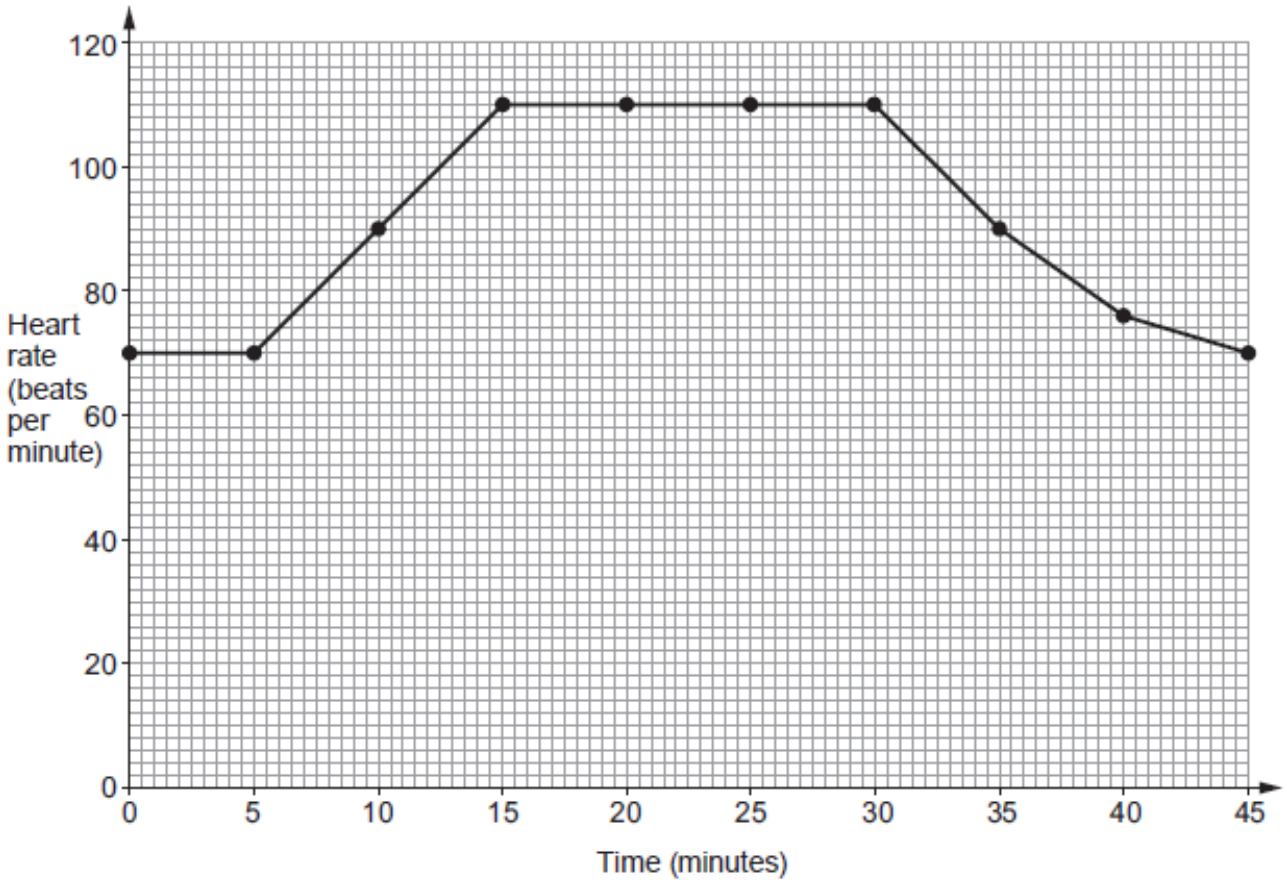
(f) Cardiac output is a measurement of the volume of blood pumped by a ventricle in one minute. It can be calculated as follows:

Cardiac output = volume of blood in ventricle × heart rate

The volume of blood in a ventricle of an average adult human is 70 cm^3.

The graph below shows the heart rate of an individual before, during and after a session on an exercise bike.



(i) Calculate the cardiac output at 5 minutes and 20 minutes. [1]

5 minutes = ... cm^3/min

20 minutes = ... cm^3/min

(ii) Calculate the percentage increase in cardiac output between 5 and 20 minutes. [2]

percentage increase in cardiac output = ... %

(b) The table below compares the contents of the blood in blood vessels **K** and **L**.

contents	vessel **K** (a.u.)	vessel **L** (a.u.)
glucose	120	90
oxygen	100	40
carbon dioxide	30	44

(i) Use the data in the table to calculate how much carbon dioxide will pass from the muscle cells into the blood shown by the arrows **B**. [1]

..... a.u.

(ii) Choose **one** substance from the table above which will pass from blood vessel **M** to the muscle cells in the direction shown by the arrows **A**. [1]

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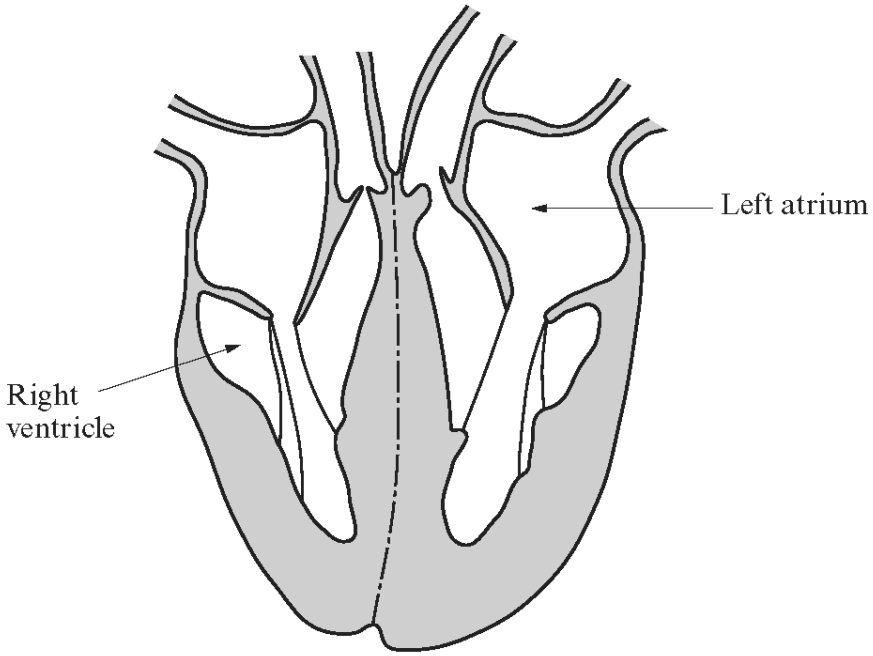
5. The diagram shows the human heart in section.



Describe and explain how blood in the right ventricle travels to the left atrium. [6 QWC]

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6. During the London Olympic Games of 2012, a government minister called for schools to promote a healthy diet and provide more sport to reduce the number of obese (overweight) teenagers in the UK.

"Teenagers need a healthy diet which balances fat intake with activity levels," he said.

(a) Give **one** health problem that may result from being obese. [1]

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(b) Give a reason why increased activity might help to reduce the number of obese teenagers. [1]

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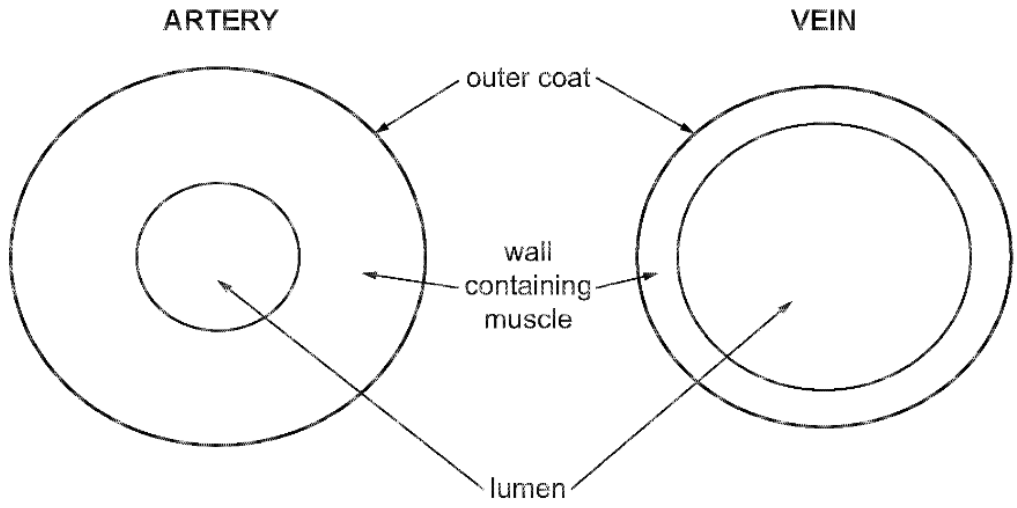
7. The diagrams show cross sections of an artery and a vein.

Compare the structure of arteries and veins and explain how they are related to their functions in the circulation of blood in the human body. [6 QER]



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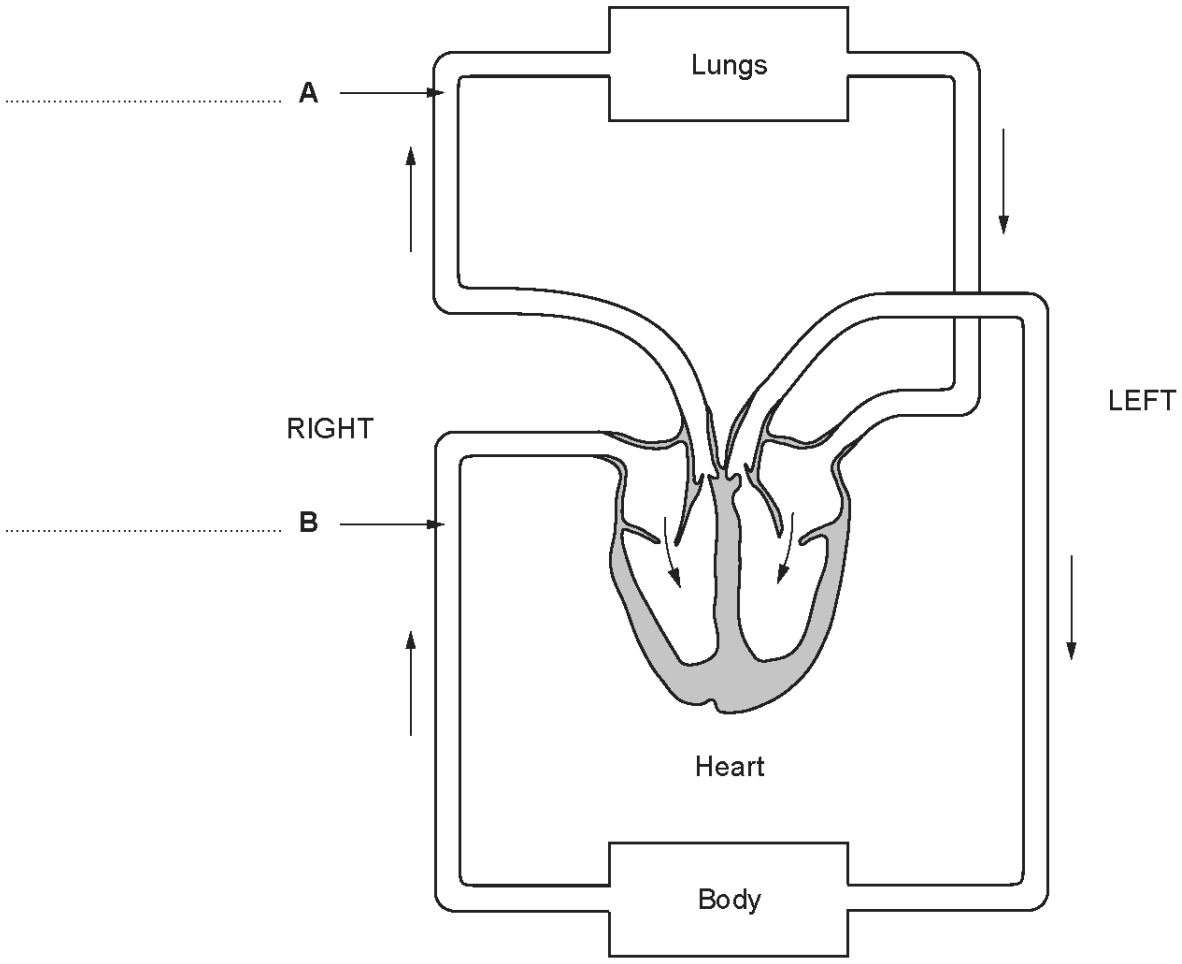
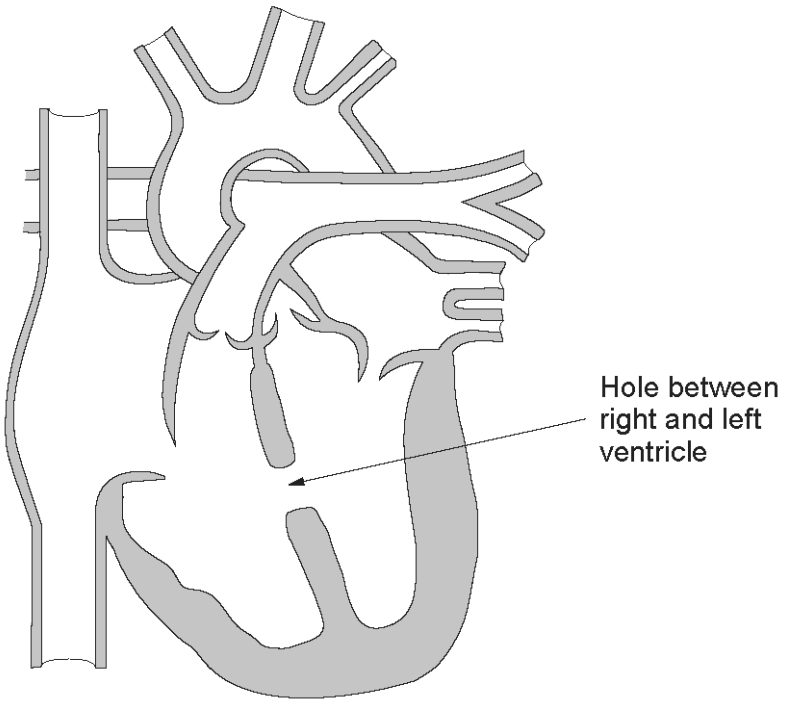
8.

The diagram below shows the double circulation of blood found in humans.



(a) Label blood vessels **A** and **B** on the diagram above. [2]

(b) Occasionally a baby is born with a hole in the wall that separates the left and right sides of the heart. In the diagram below this hole is shown in the wall separating the right and left ventricles.



Using the diagram of the double circulation of blood shown opposite and your knowledge of blood circulation, explain the consequences to a person suffering from a hole between the right and left ventricles of the heart. [4]

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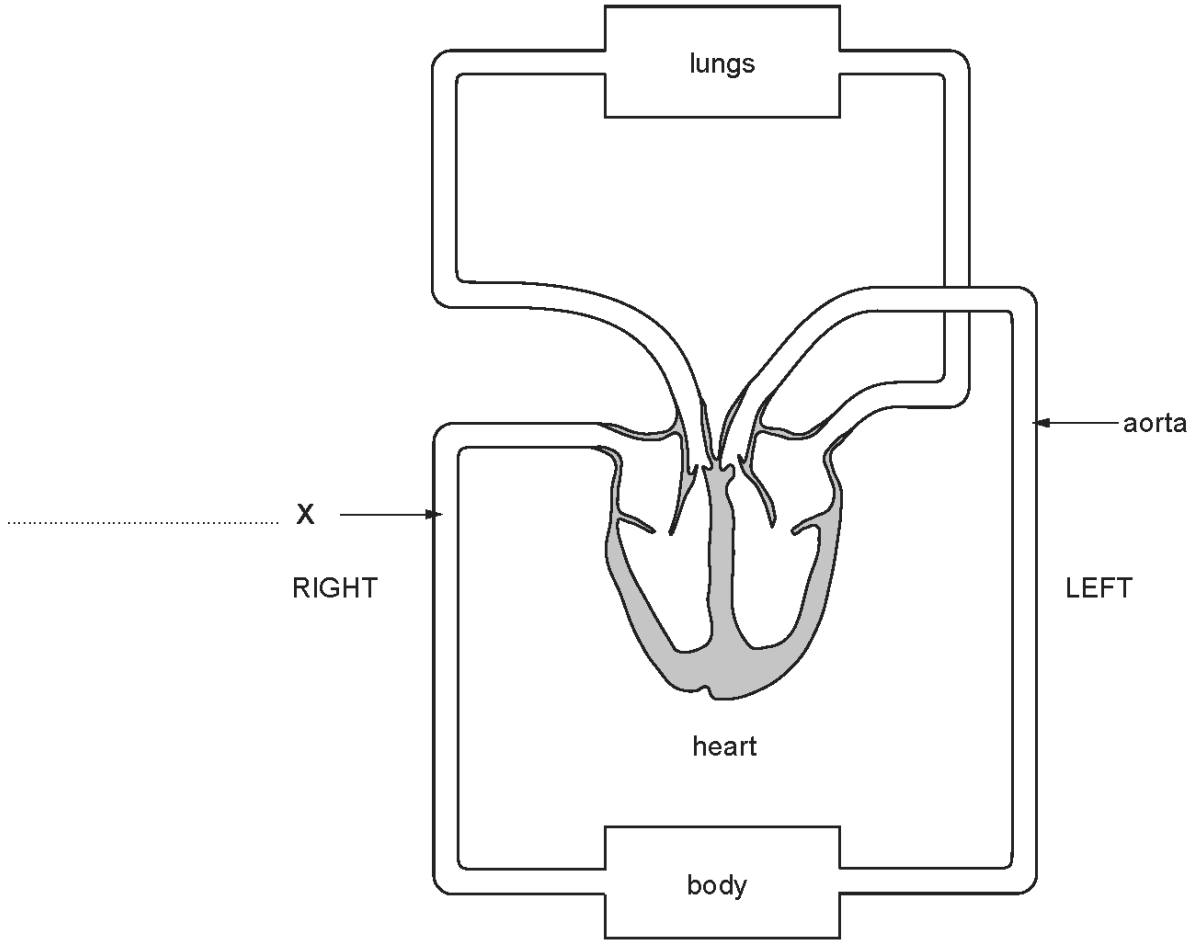
9. *(a)* The diagram below shows the circulatory system of the human body. This is called a *double circulation*. Some structures have been labelled.



On the diagram above:

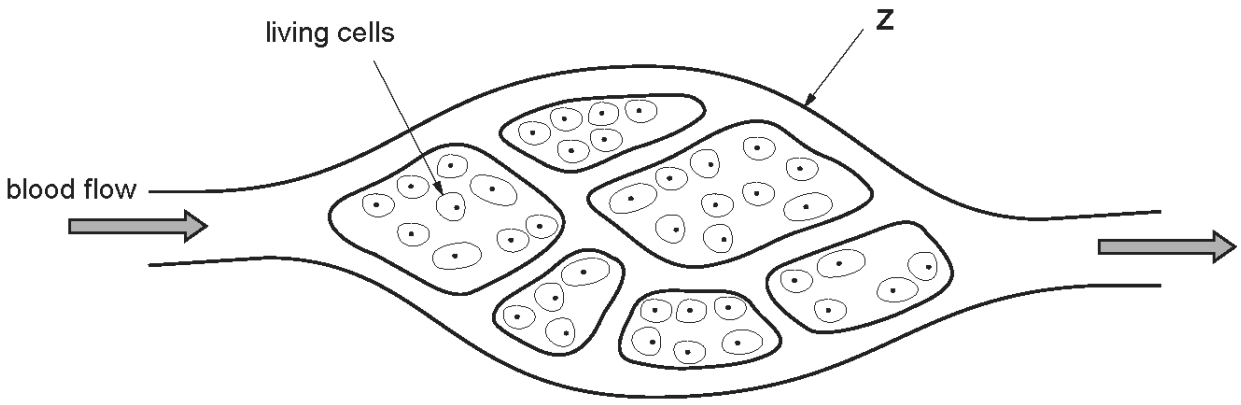
(i) label blood vessel **X**; [1]

(ii) draw arrows on the aorta and blood vessel **X** to show the direction of blood flow. [1]

(iii) Complete the table below which shows features of the double circulatory system. [2]

Name of circulation	Pathway of blood flow
Pulmonary circulation	Blood leaves the heart and travels to the ..... .
..... circulation	Blood leaves the heart and travels to the body organs.

(b) Small blood vessels bring blood to the living cells in every organ of the body, as shown in the diagram below.



(i) Name the type of blood vessel labelled **Z**. [1]

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(ii) Explain how the structure of blood vessel **Z** allows substances to pass easily into and out of the living cells. [2]

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10. In a study of physical fitness levels, experts analysed a survey of adults in which they were asked how much they had exercised in the previous four weeks.

The report of the survey, which involved 1615 people, claimed that 30% of the British population did no exercise.

Reported in DailyTelegraph 05/06/15

(a) Using the above information, calculate the number of people in the survey who did no exercise. [2]

Number of people = ...

(b) Why was it important to use a large number of people in this survey? [1]

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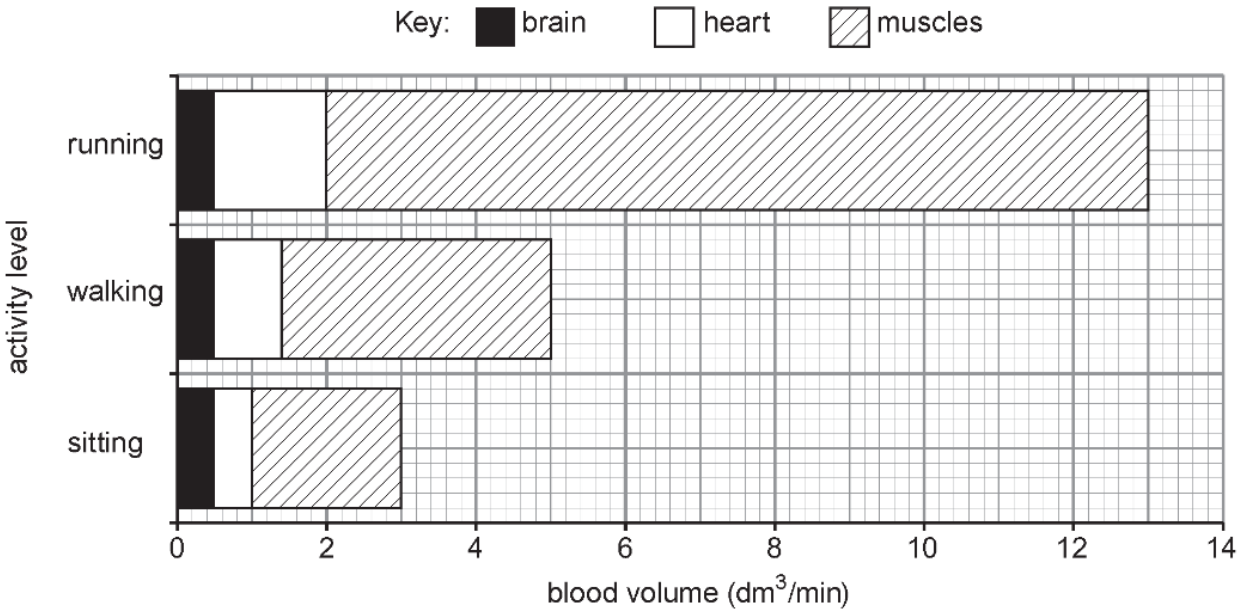
(c) The bar chart shows the blood volume (dm^3/min) supplied to some parts of the body at rest and during exercise.



(i) Calculate the blood volume supplied to the muscles when sitting. [1]

Blood volume = ... dm^3/min

(ii) Calculate the increase in blood volume supplied to the muscles when running compared to sitting. [1]

Increase in blood volume = ... dm^3/min

(iii) Complete the following sentence. [1]

As blood flows through muscles, substances pass out of narrow blood vessels.

These blood vessels are called ..... .

(iv) Three of the following statements correctly describe the result of **an increase in blood volume** supplied to muscles.

Underline the **three** correct statements. [3]

More oxygen is supplied

More lactic acid is produced

More glucose is supplied

More anaerobic respiration takes place

More aerobic respiration takes place

(d) Explain why lack of exercise can result in obesity. [2]

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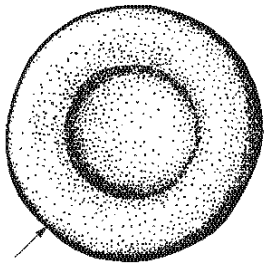
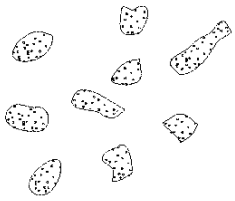
11.

(a) The table below has information on some of the parts of blood.

part of blood	structure	function
red blood cell	 cell membrane	.....
white blood cell		defence against disease
platelets		.....

Complete the table above by

(i) drawing a diagram of a white blood cell and labelling the cell membrane and nucleus; [2]

(ii) giving the functions of a red blood cell and platelets. [2]

(b) The liquid part of the blood is called plasma. State **two** substances which are transported in blood plasma. [2]

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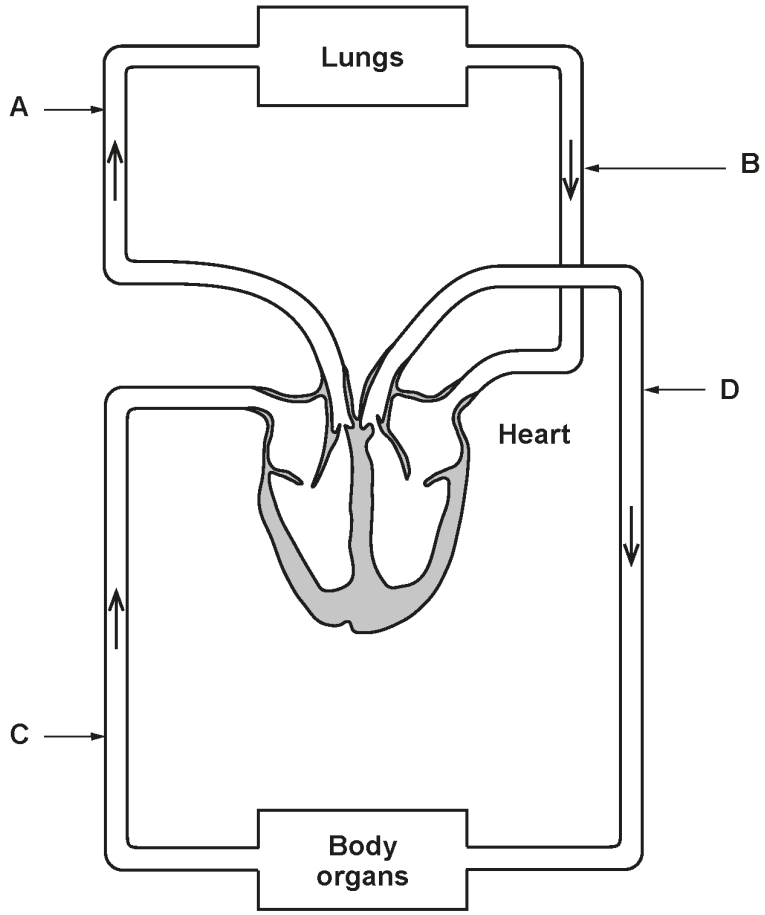
The diagram below shows the human circulatory system.



(i) From the diagram above, state the letter which shows [2]

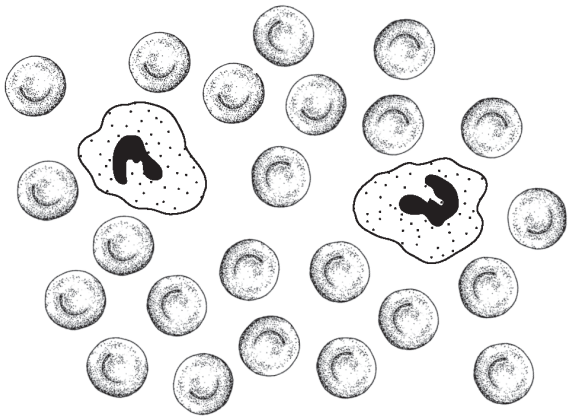
I. the pulmonary artery .....

II. the aorta .....

(ii) Name the doctor, working in the 17th century, who discovered how blood circulated around the human body.
Underline your answer. [1]

Harvey Fleming Mendel

12. The diagram shows a blood smear as seen through a light microscope.



(a) Complete the table below about the different parts of the blood. [4]

name of part	function
red cell	.....
.....	produce antibodies
phagocyte	.....
platelets	.....

(b) Explain why the centre of a red blood cell appears paler than the surrounding cytoplasm when seen through a light microscope. [2]

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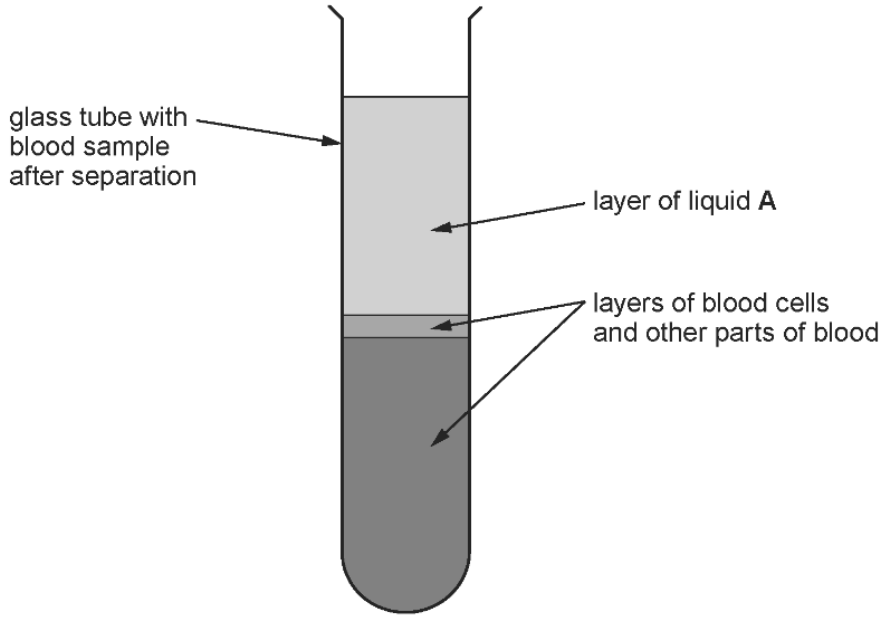
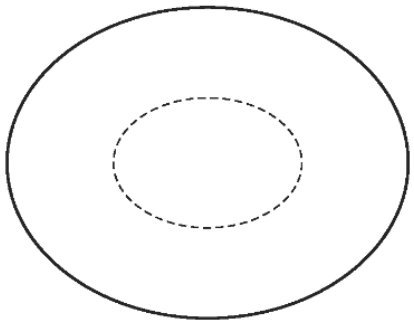
13. A sample of human blood was placed in a test tube and the contents were separated by spinning the tube at high speed in a laboratory centrifuge. The diagram below shows the results.



(a) (i) The drawing below shows a red blood cell.

In the space, draw **another** type of cell which would be found in the sample.

State the name of the cell and its function. [3]

Red blood cell	Name of cell .....
	
Function – carries oxygen	Function .....

(ii) Name the liquid in layer **A** in the sample and state **two** substances which it transports. [3]

Name of liquid .....

Substances transported

1. .....

2. .....

(iii) The volume of the blood sample was 20 cm^3. Liquid **A** accounts for 45% of this volume.
Calculate the volume of liquid **A**. [2]

(iii) The volume of the blood sample was 20 cm^3. Liquid **A** accounts for 45% of this volume.
Calculate the volume of liquid **A**. [2]

Volume = ... cm^3

(b) A laboratory technician was working on some blood samples. She noticed that if the samples were left to stand for five minutes before placing them in the centrifuge, they could not be separated properly, as they had started to solidify.

Use your knowledge of the functions of the parts of blood to explain this observation. [2]

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