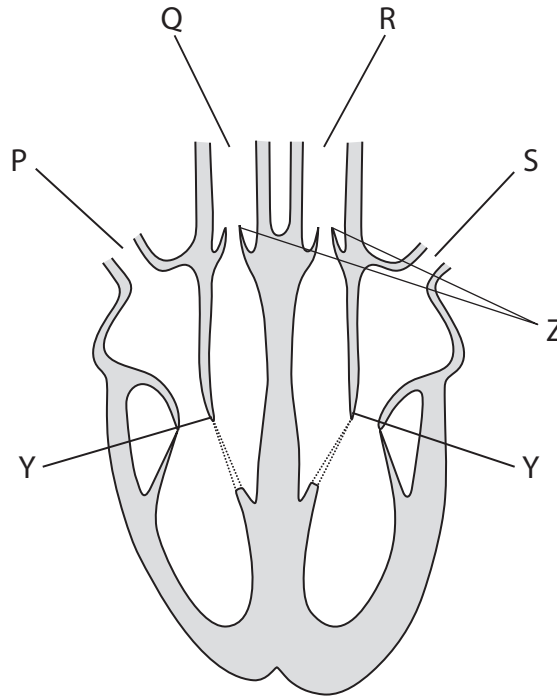**1** The diagram below shows a section of a human heart and blood vessels P, Q, R and S.

(a) (i) Place a cross ⊠ in the box next to the letter that shows the pulmonary artery.

(1)

☒ **A** blood vessel P

☒ **B** blood vessel Q

☒ **C** blood vessel R

☒ **D** blood vessel S

(ii) Place a cross ⊠ in the box next to the letter that shows the sequence of blood flow through these blood vessels.

(1)

☒ **A** P → Q → S → R

☒ **B** Q → P → R → S

☒ **C** R → S → P → Q

☒ **D** S → R → Q → P

(b) Explain the difference in thickness of the wall of the **right atrium** and the wall of the **right ventricle**.

(3)

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(c) During the cardiac cycle, the valves labelled **Y** and **Z** on the diagram may be open or closed.

For each stage of the cardiac cycle, if the valves are open, place a tick (✓) in the appropriate box and if the valves are closed, place a cross (✗) in the appropriate box.

(2)

Stage of cardiac cycle	Y valves	Z valves
Atrial systole		
Diastole		

(d) The diagram below shows a cross-section of an artery.

Wall
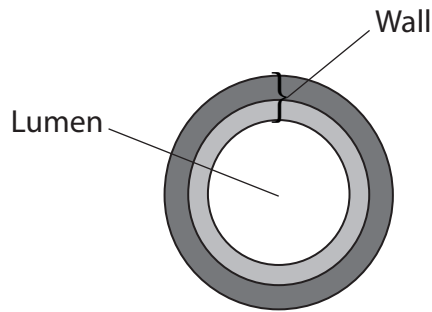
Lumen

(i) The diameter of the lumen of this artery is 1.9 mm.

Calculate the cross-sectional area of the lumen. Show your working.

The area of a circle is calculated using the formula πr^2, where r is the radius of the circle and $\pi = 3.14$.

(2)

Answer .... mm^2

(ii) Explain how the structure of an artery is related to its functions.

(3)

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(Total for Question 1 = 12 marks)

2 (a) Some foods and drinks contain plant statins.

Explain the benefits of plant statins to human health.

(2)

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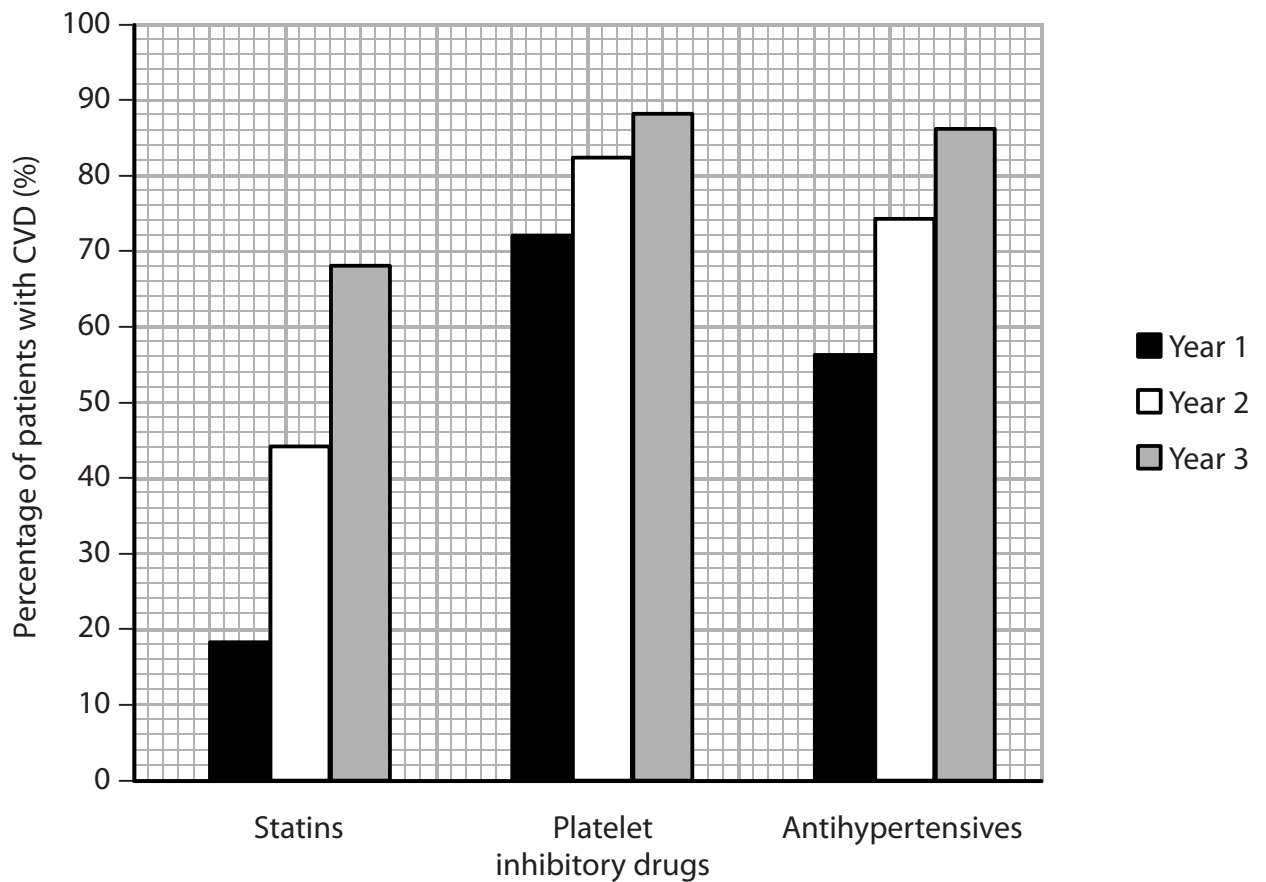..

(b) In a three-year study, the percentage of patients with CVD (cardiovascular disease) who were using different types of drugs was recorded.

The graph below shows the results of this study.

(i) Suggest why there was an increase in the percentage of patients taking statins over the three years of the study.

(2)

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(ii) Using the information in the graph, compare the change in the use of platelet inhibitory drugs with the change in the use of antihypertensives, over the three years of this study.

(3)

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(c) Explain why patients with CVD would take each of the following drugs.

(i) Platelet inhibitory drugs such as aspirin

(2)

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(ii) Antihypertensives such as beta-blockers

(2)

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(Total for Question 2 = 11 marks)

3 Researchers collected data to study the relationship between the time spent watching television and coronary heart disease (CHD).

A total of 12 608 men and women, aged between 45 and 79 years, took part. None of them had previously had a stroke or heart attack.

(a) The table below shows the categories in the questionnaire that each person completed.

Categories	
smoking	family history of CHD
alcohol intake	sleep duration
total energy intake	physical activity
medication	time spent watching television

(i) Suggest why people who had not had strokes or heart attacks were selected for this study.

(1)

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(ii) Suggest why people were asked to provide the researchers with information based on the categories shown in the table.

(2)

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(b) The table below shows the types of data that were collected for each person by health professionals.

height and body mass	blood pressure	HDL cholesterol
waist circumference	plasma triglycerides	LDL cholesterol

(i) Suggest why these data were collected.

(2)

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(ii) Suggest why these data might be considered to be more accurate than the information in the questionnaire.

(3)

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(c) This study was funded by the government and charities supporting research into heart diseases and strokes.

Suggest why it was important that none of the funding came from drug companies or television manufacturers.

(2)

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(d) The researchers carried out the study over a period of 10 years.

They found that there was a positive correlation between the number of hours spent watching television and the risk of developing coronary heart disease.

A journalist wrote an article about the results of this study with the title 'Watching television causes heart disease'.

Is this statement valid? Give an explanation for your answer.

(3)

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(Total for Question 3 = 13 marks)

4 (a) Read through the following passage on the blood clotting process, then write on the dotted lines the most appropriate word or words to complete the passage.

(5)

The blood clotting process starts when cell fragments called ....

release molecules of .... These molecules

are .... which catalyse the conversion of ....

into .... , in the presence of calcium ions. As a result, fibrinogen

is converted into fibrin and blood cells are trapped to form the clot.

(b) Fibrinogen and fibrin are both proteins.

A protein consists of a chain of amino acids joined together by bonds.

(i) In the space below, draw a diagram to show the structure of an amino acid.

(3)

(ii) Name the covalent bond that joins the amino acids into a chain.

(1)

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(iii) Suggest **two** differences between fibrinogen and fibrin.

(2)

1 ....

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2 ....

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(Total for Question 4 = 11 marks)