9. Transport in animals

9.2 Heart

Paper 3 and 4

Question Paper

Paper 3

Questions are applicable for both core and extended candidates

1   **(a)** Fig. 3.1 is a diagram of a cross-section of a human heart.
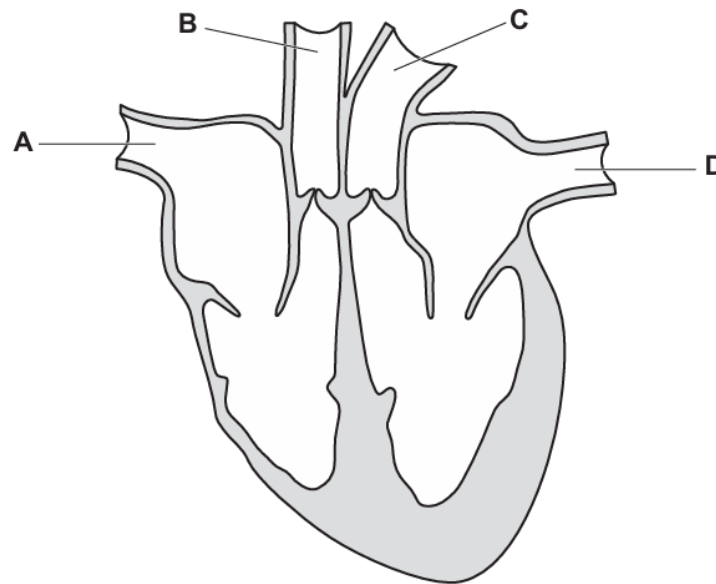

Fig. 3.1

    (i)   Draw an **X** on Fig. 3.1 to identify the position of the left atrium.   [1]

   (ii) On Fig. 3.1, label with a label line and the correct name a structure that ensures the one-way flow of blood.   [2]

  (iii) State **two** letters that identify arteries in Fig. 3.1.

      .... and .... [1]

   (iv) State the name of the part that separates the left and right sides of the heart.

      .... [1]

    (v) State the name of the main tissue the wall of the heart is made from.

      .... [1]

(b) In one country, the percentages of males and females with coronary heart disease (CHD) in different age groups were recorded.
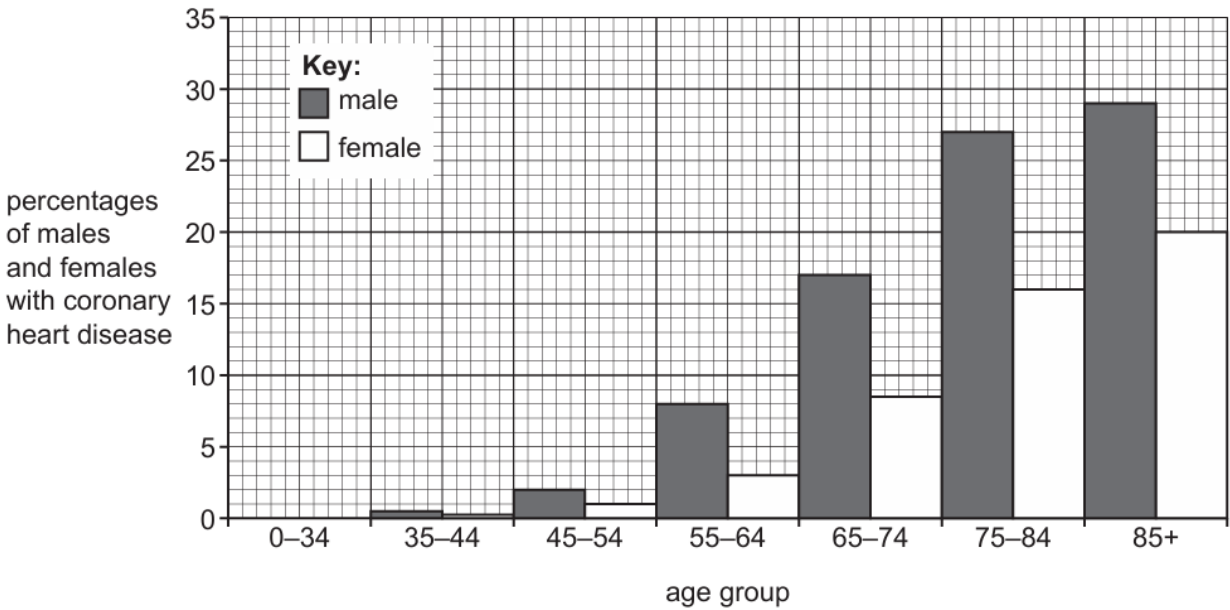
Fig. 3.2 shows these data.

Fig. 3.2

(i) Using the information in Fig. 3.2, describe the similarities and differences between the percentages of males and females with CHD.

....

....

....

....

....

....

.... [3]

(ii) State **three** risk factors for CHD **not** identified in Fig. 3.2.

1 ....

2 ....

3 ....
[3]

[Total: 12]

2 **(a)** Complete the description of the human circulatory system.

The circulatory system is a system of blood vessels with a .... and

.... to ensure one-way flow of blood.

[2]

(b) A student investigated the resting heart rate in people of different ages.

The student recorded the heart rate as the number of beats per minute (bpm).

(i) The student wore a watch that could monitor their heart rate.

State **two other** methods that can be used to monitor heart rate.

1 ....

2 ....

[2]

(ii) Table 4.1 shows the results of the investigation.

Table 4.1

age of participant / years	resting heart rate / bpm
1	140
5	110
10	85
40	70
70	90

Tick (✓) **two** correct conclusions that can be drawn from the data shown in Table 4.1.

As age increases, the resting heart rate decreases.	
As age increases, the resting heart rate decreases until age 40 and then increases.	
From age 5 to 10, the resting heart rate decreases by 25 bpm.	
The difference between the maximum and minimum resting heart rates was 50 bpm.	
The highest resting heart rate was at 5 years old.	

[2]

(c) A 38-year-old person had a resting heart rate of 72 bpm.

The person exercised for 10 minutes.

At the end of exercise their heart rate was 170 bpm.

Calculate the percentage change in heart rate from the beginning to the end of exercise for the 38-year-old.

Give your answer to the nearest whole number.

Space for working.

....%

[2]

(d) A lack of physical activity is one factor that can increase the risk of coronary heart disease.

Diet also has a role in the risk of coronary heart disease.

Discuss the role of diet in reducing the risk of coronary heart disease.

....

....

....

....

....

....

.... [3]

[Total: 11]

3   **(a)** Fig. 1.1 is a diagram of part of the human circulatory system.

to organs

....

....

....

....
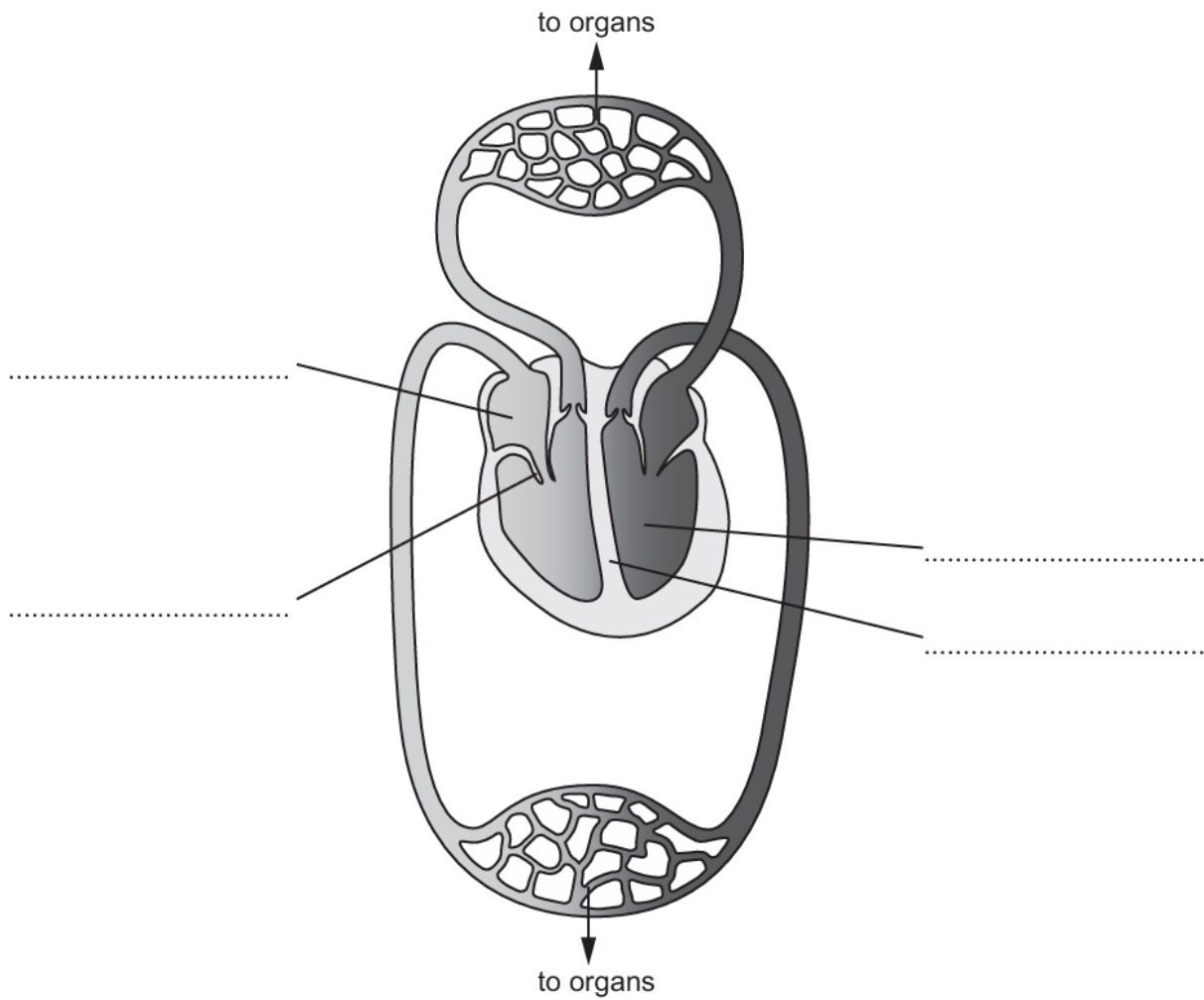
to organs

Fig. 1.1

  (i)   Identify and label on Fig. 1.1 in the spaces provided:

  •   the left ventricle
  •   the right atrium
  •   the septum
  •   a valve

[4]

(ii) Complete the flow chart of the circulatory system by writing the correct blood vessels from the list, in the spaces provided.

The arrows show the direction of blood flow.

Each word or phrase may be used once, more than once or not at all.

aorta   **pulmonary artery**   **pulmonary vein**

renal artery   **renal vein**   **vena cava**

body

↓

....

↓

heart

↓

....

↓

lungs

↓

....

↓

heart

↓

....

↓

body

[4]

(b) A healthy diet is recommended to reduce the risk of coronary heart disease (CHD).

State **three** other risk factors for CHD.

1 ....

2 ....

3 ....

[3]

[Total: 11]

4   **(a)**   Fig. 5.1 is a diagram of a human heart.

blood vessel **B**
– to the lungs

blood vessel **C**
– to the body

blood vessel **D**
– from the lungs

blood vessel **A**
– from the body

Fig. 5.1

   (i)   Use label lines and labels to identify these structures on Fig. 5.1:

•   **atrium**
•   **septum**
•   **ventricle**
•   **valve**

[4]

   (ii)   Identify the letter or letters of all the blood vessels from Fig. 5.1, that:

are arteries ....

is the pulmonary vein ....

[2]

(b)   The activity of the heart can be monitored by measuring the pulse rate.

State **two other** ways of monitoring the activity of the heart.

1 ....

2 ....

[2]

(c) Coronary heart disease (CHD) is caused by a blockage of blood vessels in the heart.

    (i) State the name of the blood vessels that become blocked.

       .... [1]

    (ii) State **three** risk factors for developing CHD.

       1 ....

       2 ....

       3 ....

                                                                                                     [3]

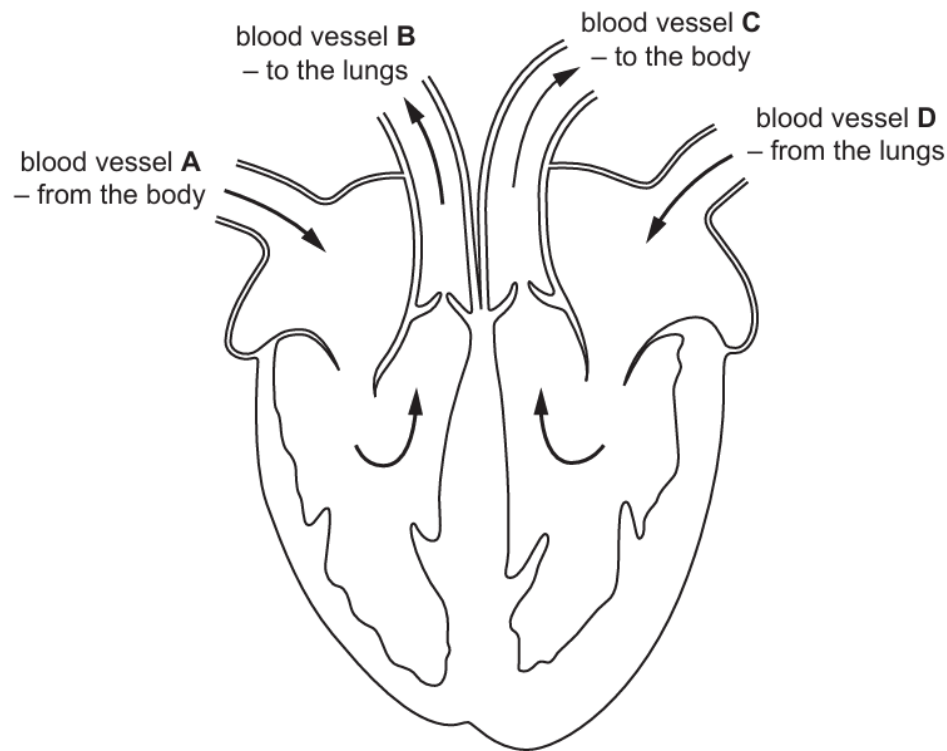   [Total: 12]

5   (a)   The activity of the heart can be monitored by measuring the pulse rate.

Two students measured their pulse rates before, during and after exercise.

The results are shown in Fig. 6.1.

Fig. 6.1

(i)   Describe the changes in the pulse rates shown in Fig. 6.1 for student **A** and student **B**.

....

....

....

....

....

....

.... [4]

(ii) Calculate the percentage change in the pulse rate between 0 and 15 minutes for student **A**.

Give your answer to the nearest whole number.

Space for working.

.... %

[3]

(iii) State **two** other methods that can be used to monitor the activity of the heart.

1 ....

2 ....

[2]

6 **(c)** Coronary heart disease (CHD) is a disease of the circulatory system.

(i) State **three** risk factors for developing CHD.

1 ....

2 ....

3 ....

[3]

(ii) State the name of the blood vessel that becomes blocked in CHD.

.... [1]

7 A student completed different types of activity.

She measured her pulse rate during each type of activity in beats per minute (bpm).

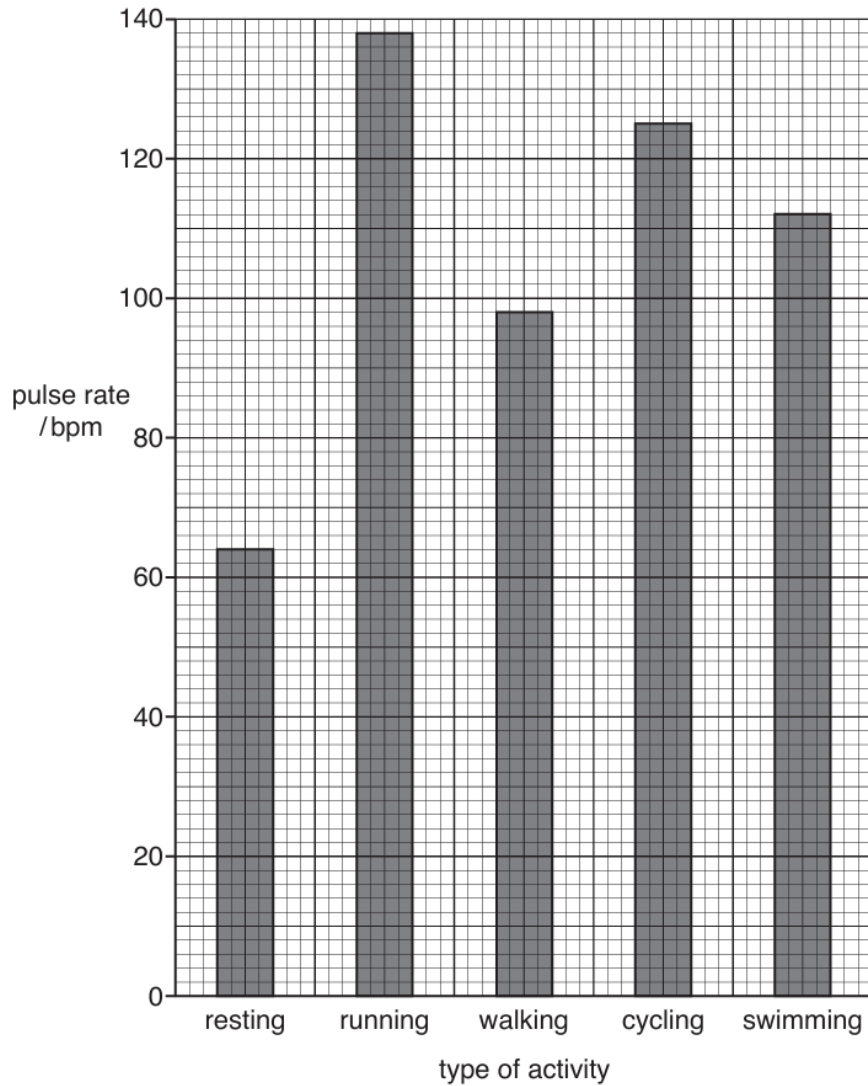The results are shown in Fig. 3.1.

Fig. 3.1

(a) Use Fig. 3.1 to answer these questions.

(i) State the type of activity that results in the highest pulse rate.

....[1]

(ii) State the pulse rate of the student when she was cycling.

.... bpm [1]

(iii) Calculate the percentage increase in her pulse rate between resting and walking.

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

.... %

[2]

(b) Measuring the pulse is one way of monitoring the activity of the heart.

State **one other** way of monitoring the activity of the heart.

....

....[1]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

8   **(b)** The blood vessels that supply the heart muscle can become blocked.

   (i) State the name of the blood vessels that supply the heart muscle.

   .... [1]

   (ii) State **one** way in which blockages in these blood vessels can be treated.

   .... [1]

9   Mammals have a double circulation.

   Fig. 2.1 is a diagram of a section through the heart of a mammal. The arrows show the direction of blood flow through the heart and blood vessels.
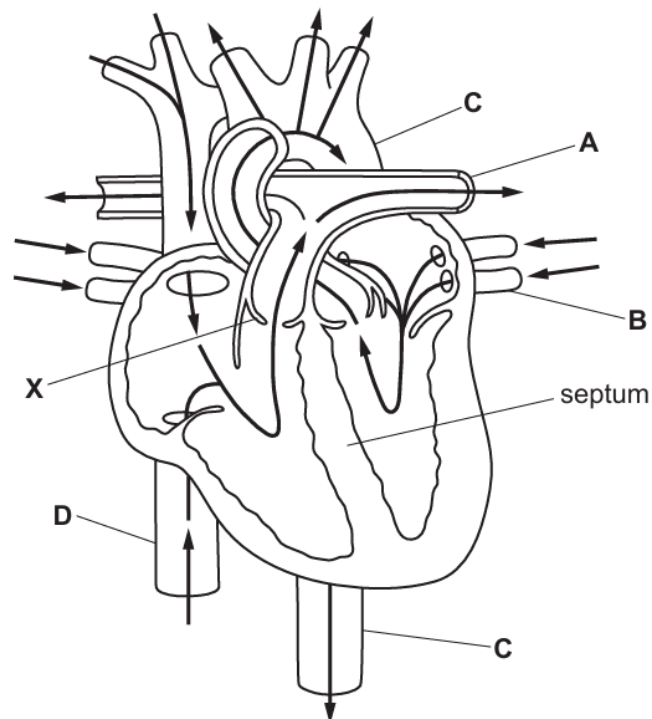

Fig. 2.1

(a) (i) State the name of the chamber of the heart with the thickest wall. **(extended only)**

.... [1]

(ii) **D** is a vein. State the name of this vein and describe its structure.

name ....

description of structure ....

....

....

....

....

....
[3]

(iii) Identify the structure labelled **X** in Fig. 2.1 **and** state its role in the heart. **(extended only)**

....

....

....

....

.... [2]

10   The circulatory system is comprised of the heart, blood vessels and the blood.

(a) Explain how the structures of the heart ensure that blood flows in one direction.

Include the names of these structures in your answer. **(extended only)**

....

....

....

....

....

....

....

....

.... [4]

11   Fig. 5.1 shows an angiogram of a heart before and after treatment for coronary heart disease (CHD). An angiogram is an image of the blood flow through the blood vessels of the heart.
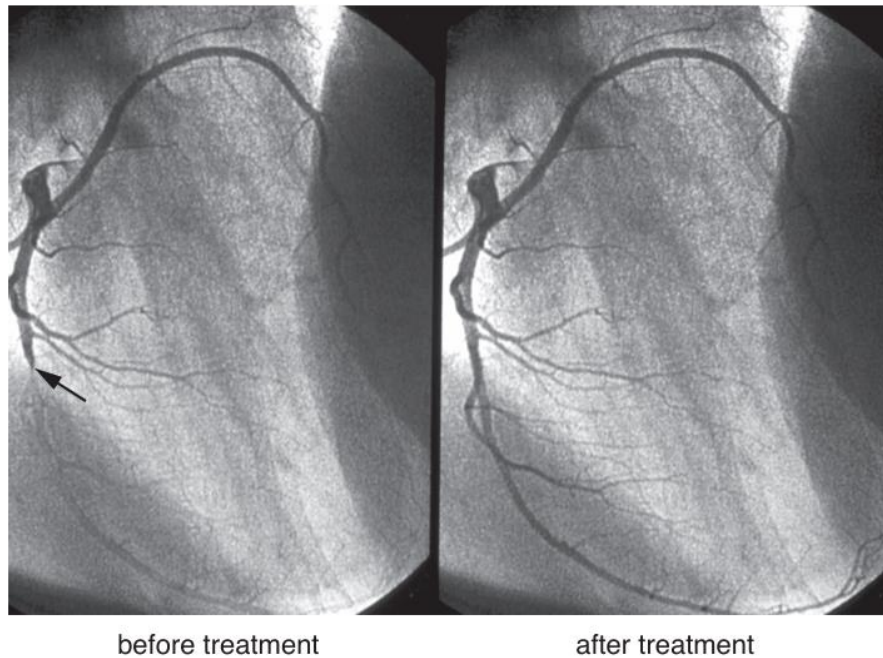

before treatment   after treatment

Fig. 5.1

(a)   The arrow on Fig. 5.1 shows the position of a blockage in a blood vessel.

   (i)   State the name of the blocked blood vessel.

   .... [1]

   (ii)   The blockage is caused by a blood clot.

   Describe how a blood clot forms.

   ....

   ....

   ....

   ....

   ....

   ....

   .... [3]

   (iii)   State the name of a drug that can be used to treat coronary heart disease.

   .... [1]

(b) Many health specialists think that the risk of coronary heart disease can be reduced by doing regular exercise.

A long-term study of a large group of women was used to test this hypothesis.
The women were between 35 and 45 years old at the start of the study.
Every two years the same group of women were asked how much they were exercising.

After 28 years the researchers analysed their data:
- They calculated the average time spent exercising per week by each woman.
- They put the women into categories determined by how much exercise they had done.
- For each category, they calculated the number of women who died from coronary heart disease (CHD).
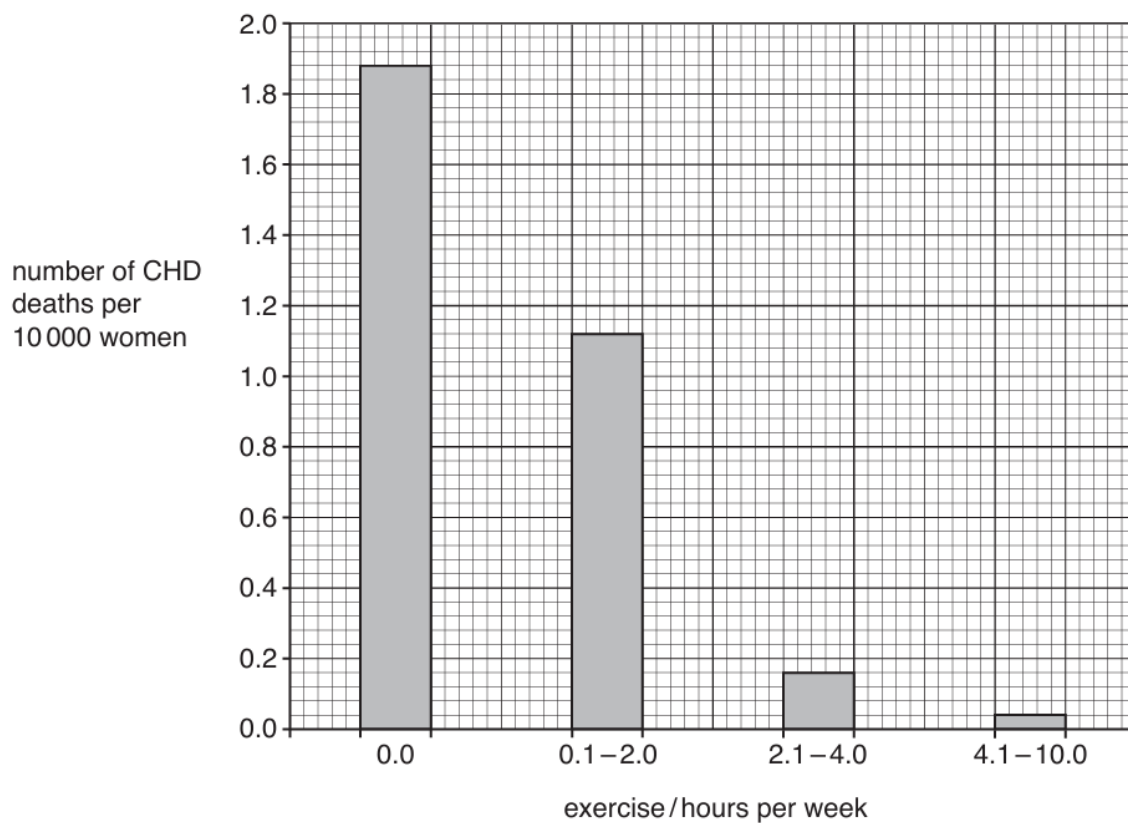
The results are shown in Fig. 5.2.

Fig. 5.2

(i) Calculate the percentage **decrease** in the number of CHD deaths per 10 000 women between those who did no exercise and those who exercised for 4.1 to 10.0 hours a week, using the data in Fig. 5.2.

number of CHD deaths per 10 000 women who did no exercise ....

number of CHD deaths per 10 000 women who did 4.1 to 10.0 hours per week of exercise

....

Give your answer to the nearest whole number.

Space for working.

.... %

[3]

(c) Exercise causes heart rate to increase.

Explain why exercise causes an increase in heart rate. **(extended only)**

....

....

....

....

....

....

.... [3]