AQA GCSE Biology | 8461

SPECIFICATION POINT 4.4.2.2

Response to exercise

Past-paper questions

Tier	**Higher**
Question groups	**42**
Available paper years	**2007–2025**

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.

4.4.2.2 Response to exercise

Question 01

January 2007 | BLY1H | Original Q3 | Legacy

3 It is legal in the UK to use certain recreational drugs but illegal to use others.

(a) Tobacco is a legal drug. Pregnant women are strongly advised not to smoke.

Explain how a fetus may be affected if the mother smokes tobacco.

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(2 marks)

(b) Illegal drugs are classified as Class **A**, **B** or **C**. Class **A** drugs are the most dangerous. The use of Class **A** drugs attracts the most serious punishments and fines.

Cannabis is a Class **C** drug.

These are some facts about cannabis.

- It is less addictive than amphetamines, tobacco or alcohol.
- It may cause mental illness.
- It does not seem to cause major social problems.
- It may be a 'gateway' drug to more harmful substances.
- It has a higher tar content than tobacco.
- It has an effect on the heart, similar to the effects of exercise.
- It can upset the control of blood pressure.

Use the above information to answer these questions.

(i) Give **two** reasons why many people think that cannabis should be classified as a Class **A** or Class **B** drug.

1 .....

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2 .....

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(2 marks)

4.4.2.2 Response to exercise

Question 01 · continued

BLANK

(ii) Give **two** reasons why many people think that cannabis should **not** be classified as an illegal drug.

1 .....

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2 .....

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(2 marks)

6

Turn over for the next question

4.4.2.2 Response to exercise

Question 02

January 2007 | BLY1H | Original Q4 | Legacy

4 Cholesterol is a substance which affects our health.

(a) (i) Which organ in the body produces cholesterol?

.....

(1 mark)

(ii) Which organ in the body may be damaged by high levels of cholesterol in the blood?

.....

(1 mark)

(iii) Name **one** factor, other than diet, which affects the level of cholesterol in the blood.

.....

(1 mark)

(b) Other than increasing fitness, give **two** reasons why regular exercise is important in maintaining a healthy body.

1 .....

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2 .....

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(2 marks)

5

4.4.2.2 Response to exercise

Question 03

November 2007 | BLY1A | Original Q4 | Legacy

QUESTION FOUR

This question is about obesity.

4A Which one of the following diseases is linked to obesity?

1 arthritis

2 brain damage

3 deficiency disease

4 lung cancer

4B One way to prevent obesity is to increase the amount of exercise that people take.

Exercise helps to prevent obesity mainly because . . .

1 exercise increases the metabolic rate.

2 exercise decreases the amount of muscle in the body.

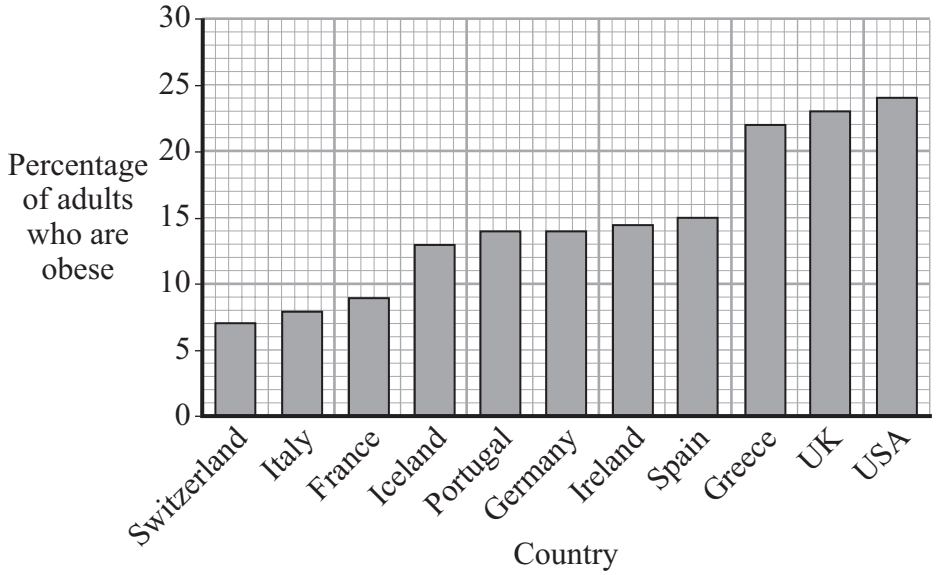
3 people have less time to eat when they are exercising.

4 people who exercise are usually fitter than those who do not.

4.4.2.2 Response to exercise

Question 03 · continued

A manufacturer of slimming foods carried out a telephone survey in 11 countries to find the percentage of the population who are obese.
The results of the telephone survey of 5000 people are shown in the bar chart.



4C The information in the bar chart shows that . . .

1 people in Greece have a healthier diet than people in Ireland.

2 obesity levels are rising in all countries.

3 whether or not you are obese depends directly on where you live in the world.

4 obesity levels in the USA are three times those in Italy.

4D The information in the bar chart may be biased.

This is because . . .

1 it only considers a few countries.

2 it was gathered by a manufacturer of slimming foods.

3 the total number of people in the survey was small.

4 the survey was carried out to find the percentage of obese people, not the actual number.

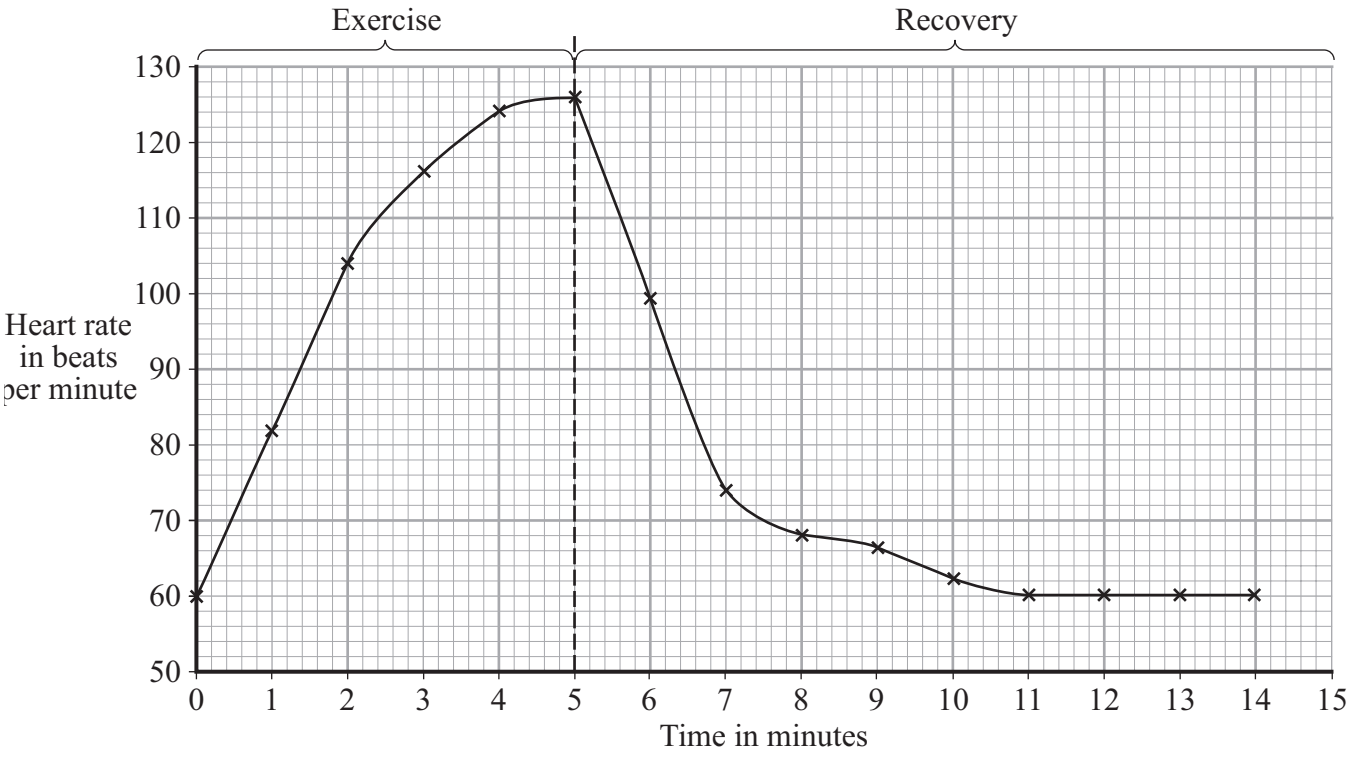
4.4.2.2 Response to exercise

Question 04

January 2008 | BLY3H | Original Q4 | Legacy

4 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 and also during recovery.

The results are shown in the graph.



(a) Describe, in as much detail as you can, the changes in heart rate between 0 and 14 minutes.

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(3 marks)

4.4.2.2 Response to exercise

Question 04 · continued

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(b) How do arteries supplying the leg muscles alter the rate of blood flow through them during exercise?

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(1 mark)

(c) Explain how an increase in heart rate helped the student during exercise.

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(4 marks)

8

4.4.2.2 Response to exercise

Question 05

June 2008 | BLY1AP | Original Q5 | Legacy

QUESTION FIVE

5A During a race, a runner produces a lot of sweat.

This can be dangerous because . . .

1 less water is lost as urine due to an increase in sweating.

2 less energy is available for running, as more energy is used to cool the body.

3 the ion concentration in the blood rises because more water is lost by increased sweating.

4 the rates of chemical reactions in the body decrease.

5B Carbohydrates are necessary in a sports drink in order to . . .

1 replace the ions lost in sweat during a race.

2 replace the sugars used in energy release during the race.

3 balance the amount of water lost in sweat during the race.

4 increase the growth of muscle during a race.

4.4.2.2 Response to exercise

Question 05 · continued June 2008 | BLY1AP | Original Q5 | Legacy

The table shows the composition of four different sports drinks, **P**, **Q**, **R** and **S**.

Drink	Glucose in g per dm^3	Ions in mg per dm^3	Fats in mg per dm^3	Protein in g per dm^3
P	110	23	0	1.2
Q	68	96	0.1	0
R	78	82	0.3	0
S	136	25	0	0.2

5C During a race, a runner drinks 5 bottles of drink **Q**. Each bottle contains 0.5 dm^3 of the drink.

Which line correctly shows his intake of glucose and ions?

	Intake of glucose in g	Intake of ions in mg
1	17	24
2	65	95
3	170	240
4	272	384

5D One factor which influences the rate of uptake of ions from a sports drink into an athlete's blood is the ratio of the ion concentration to the glucose concentration. The nearer this ratio is to 1:1, the greater the rate of ion uptake from the drink.

Considering **only** this factor, from which drink would the rate of ion uptake be the greatest?

1 **P**

2 **Q**

3 **R**

4 **S**

4.4.2.2 Response to exercise

Question 06

June 2008 | BLY1H | Original Q3 | Legacy

3 A popular diet book claims that a low-carbohydrate diet results in quicker weight loss and a more healthy body than a low-fat diet.

Scientists carried out an investigation to see if this claim is true.

- They used 120 overweight volunteers divided into two equal groups.
- **Group 1** was given a diet containing less than 20 g of carbohydrate per day.
- **Group 2** was given a low fat diet. This contained less than 30 % of energy from fat and less than 300 mg of cholesterol per day.
- Both groups were given the same exercise programmes and a weekly information meeting.
- Both groups were allowed only 2000 kilocalories per day.

The results after 24 weeks are shown in the table.

	Group 1 Low-carbohydrate diet	**Group 2 Low-fat diet**
Proportion of volunteers who completed the trial	76 %	57 %
Mean change in body mass	–12.9 %	–6.7 %
Mean change in body fat mass	–9.4 kg	–4.8 kg
Mean change in blood HDL concentration	+55 mg per litre	–16 mg per litre
Mean change in blood LDL concentration	+16 mg per litre	–74 mg per litre

3 (a) What was the independent variable in this investigation?

.....

(1 mark)

3 (b) Give **one** variable that the scientists tried to control in this investigation.

.....

(1 mark)

4.4.2.2 Response to exercise

Question 06 · continued

for mark

3 (c) Give **two** ways in which the method used by the scientists could have led to unreliable data.

1 .....

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2 .....

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(2 marks)

3 (d) Does the data support the claim in the book?

Draw a ring around your answer. **Yes / No**

Give **two** reasons for your answer.

1 .....

.....

2 .....

.....

(2 marks)

6

4.4.2.2 Response to exercise

Question 07

January 2009 | BLY2H | Original Q5 | Legacy

5 During exercise an athlete's core body temperature may rise.

5 (a) What causes this rise in core body temperature?

.....

.....

(1 mark)

5 (b) During a long race one athlete did not drink any liquid. Towards the end of the race the amount of sweat he produced began to fall.

5 (b) (i) This athlete's core body temperature increased more than that of other similar athletes who had drunk enough liquid during the race.

Explain why.

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(2 marks)

5 (b) (ii) Describe **one** other way in which this athlete's body would respond in order to reduce core body temperature.

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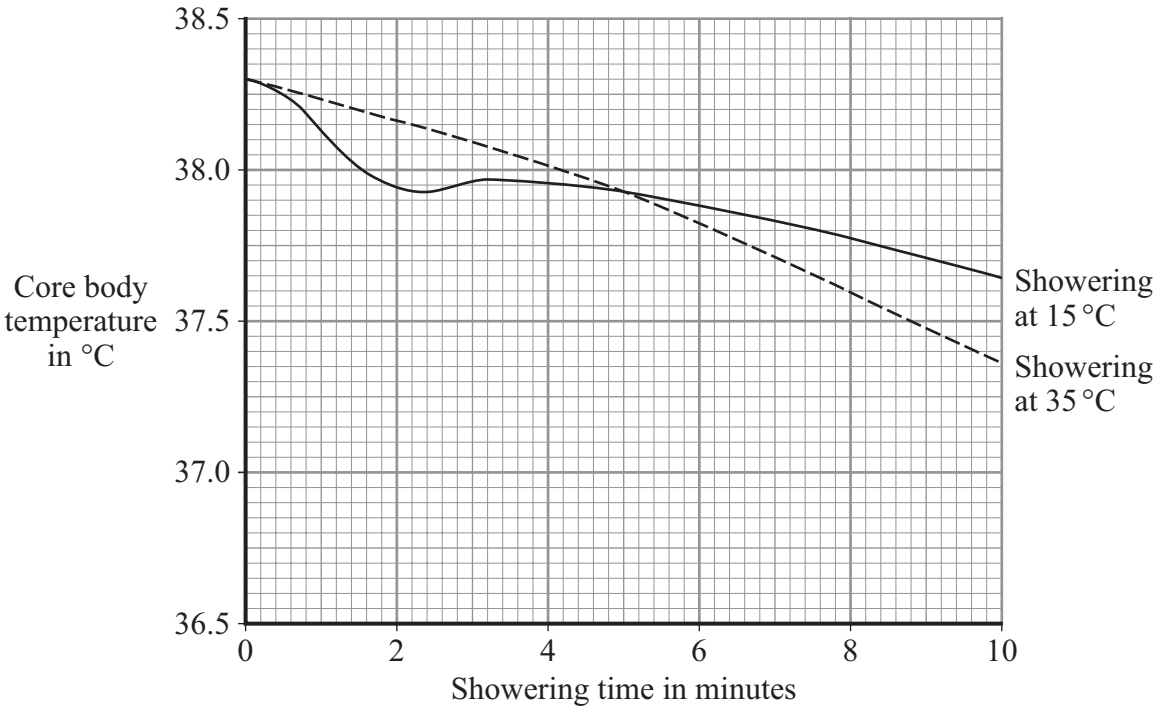
(2 marks)

4.4.2.2 Response to exercise

Question 07 · continued

for mark

5 (c) The graph shows the effects of showering for ten minutes at 15 °C and at 35 °C on core body temperature after a long race.



Suggest an explanation for the differences in core body temperature:

5 (c) (i) between 0 and 2 minutes

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(1 mark)

5 (c) (ii) between 4 and 10 minutes.

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(2 marks)

8

4.4.2.2 Response to exercise

Question 08

January 2009 | BLY3H | Original Q1 | Legacy

1 (a) The table shows the effect of exercise on the action of one person's heart.

	At rest	During exercise
Heart rate in beats per minute	72	165
Volume of blood leaving the heart in each beat in cm^3	75	120
Heart output in cm^3 per minute	5400	

1 (a) (i) Calculate the heart output for this person during exercise.

Show clearly how you work out your answer.

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Answer = ... cm^3 per minute

(2 marks)

1 (a) (ii) During exercise, more oxygen is carried to the working muscles.

Explain why this is helpful during exercise.

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(2 marks)

4.4.2.2 Response to exercise

Question 08 · continued

for mark

1 (b) Give **two** other changes in the body that help to increase the amount of oxygen delivered to the working muscles during exercise.

1 .....

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2 .....

.....

(2 marks)

6

Turn over for the next question

4.4.2.2 Response to exercise

Question 09

March 2009 | BLY1AP | Original Q2 | Legacy

QUESTION TWO

A combination of balanced diet and regular exercise is needed to keep our bodies healthy.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A constant

B greater

C insufficient

D irregular

Lack of food can result in a woman's periods becoming . . . **1** . . . .

Obesity may result from . . . **2** . . . exercise.

When an adult's energy intake balances their energy consumption, their body mass will be . . . **3** . . . .

When people do more exercise, their metabolic rate becomes . . . **4** . . . .

4.4.2.2 Response to exercise

Question 10

March 2009 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

Body mass index (BMI) is an indication of a person's obesity.

A person's BMI is calculated using the formula below.

$$\text{BMI} = \frac{\text{body mass in kg}}{(\text{height in m})^2}$$

The table shows the relationship between BMI and obesity.

BMI	Obesity category
less than 18.5	underweight
18.5 – 24.9	normal
25.0 – 29.9	overweight
30.0 and over	obese

6A A 1.83 m tall adult with a body mass of 61 kg is . . .

1 underweight.

2 normal.

3 overweight.

4 obese.

6B Scientists want to survey 2000 adults for BMI.

Which factor would be most difficult to control in the survey?

1 age

2 ethnic origin

3 diet type

4 gender

4.4.2.2 Response to exercise

Question 10 · continued March 2009 | BLY1AP | Original Q6 | Legacy

6C Compared with an adult female whose BMI is 19, an adult female with a BMI of 28 is more likely to have . . .

1 a high blood sugar level.

2 irregular periods.

3 a low blood LDL level.

4 reduced resistance to infection.

6D Muscle tissue is more dense than fat. Athletes who train regularly build up their muscles. As a result, they have a higher muscle to fat ratio than non-athletes.

An adult athlete with a BMI of 26.2 . . .

1 is likely to be healthy and fit even though he is outside the 'normal' guideline in the obesity category.

2 should begin a diet programme to encourage weight loss.

3 should still be classed as 'normal' in the obesity category.

4 would have a lower metabolic rate than non-athletes.

4.4.2.2 Response to exercise

Question 11

June 2009 | BLY1AP | Original Q3 | Legacy

QUESTION THREE

Recovery heart rate is the heart rate measured one minute after exercise. The lower the heart rate after this minute, the fitter a person is.

A class of students investigated the relationship between recovery heart rate and body mass:

- they measured the mass of each student
- each student stepped onto and off a low stool for 3 minutes at a rate of 22 complete step-ups per minute
- on completing the exercise, the students counted their heart rate, starting one minute after the exercise.

3A What was the dependent variable in this investigation?

1 the mass of each student

2 the number of step-ups per minute

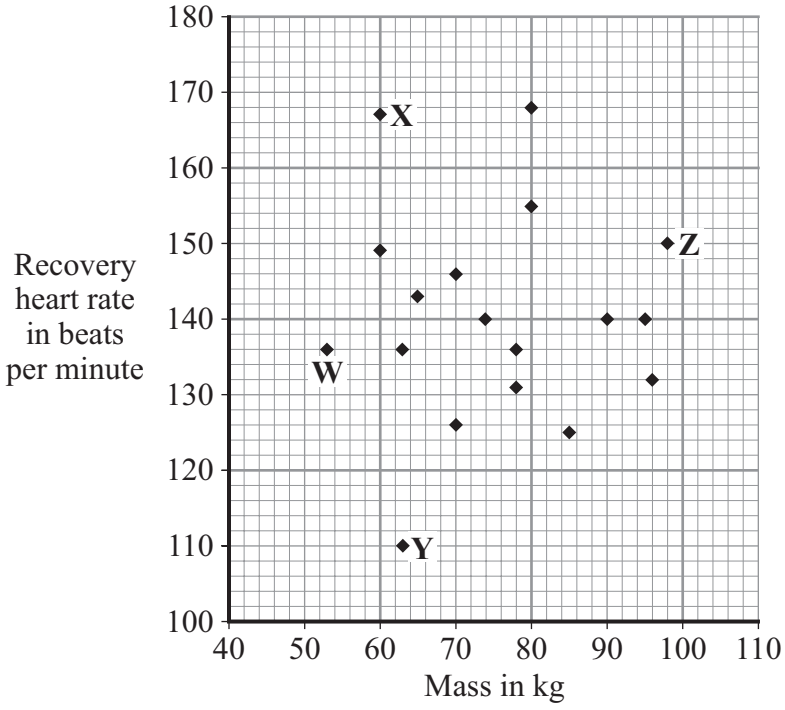
3 the length of the exercise period

4 the recovery heart rate of each student

4.4.2.2 Response to exercise

Question 11 · continued June 2009 | BLY1AP | Original Q3 | Legacy

The scattergram shows the results of the investigation.



3B Which was the fittest student?

1 **W**

2 **X**

3 **Y**

4 **Z**

3C The scattergram shows that . . .

1 the greater the body mass, the higher the recovery heart rate.

2 the lower the body mass, the higher the recovery heart rate.

3 there is no association between body mass and recovery heart rate.

4 exercise reduces recovery heart rate.

3D Which one of the following factors would have the greatest effect on the results of the investigation?

1 the proportion of muscle to fat in each student's body

2 the amount of sweat produced by each student during exercise

3 the change in the breathing rate of each student during exercise

4 the time of day of exercise

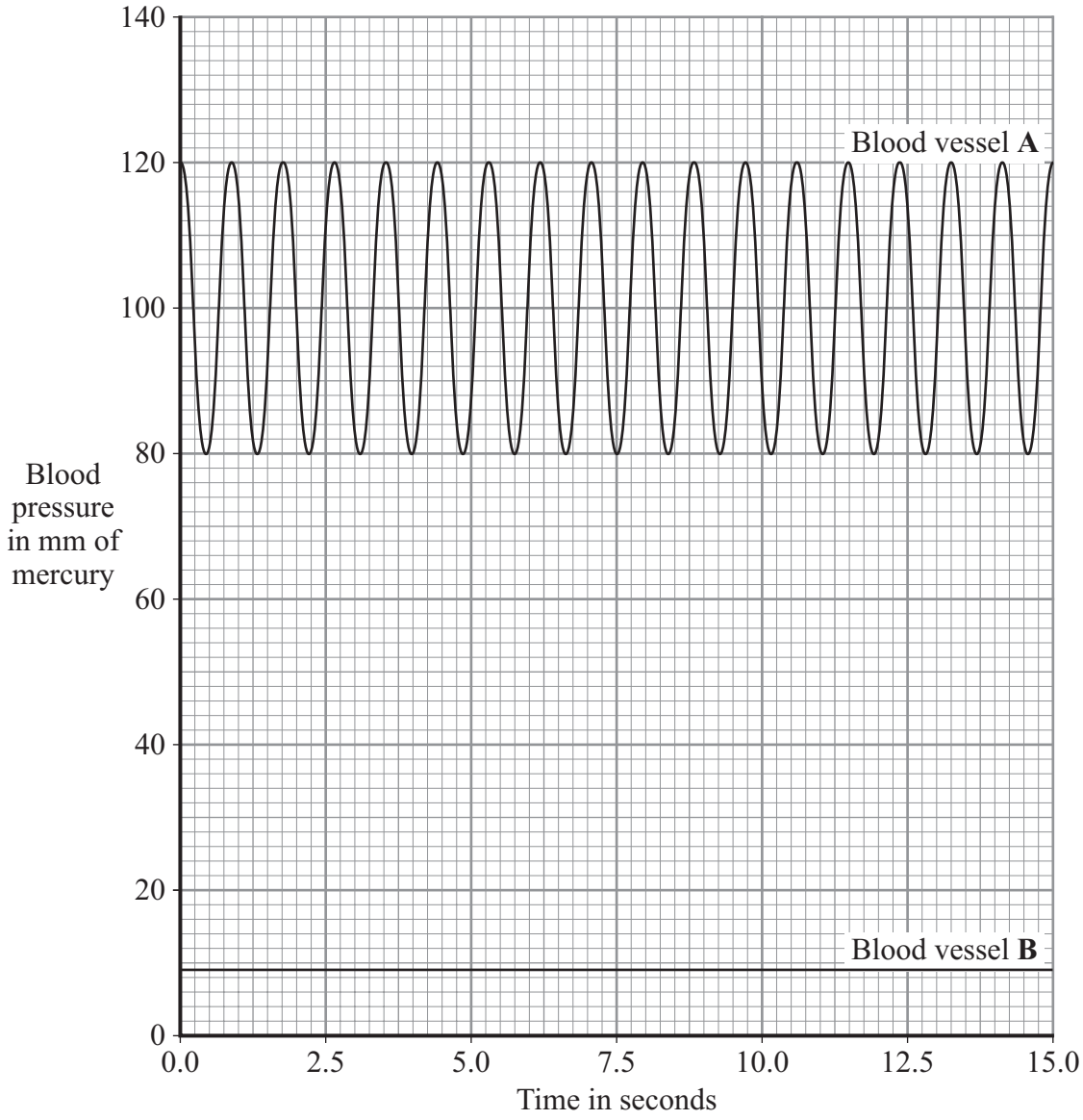
4.4.2.2 Response to exercise

Question 12

June 2009 | BLY3H | Original Q1 | Legacy

1 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.



4.4.2.2 Response to exercise

Question 12 · continued

for mark

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

Blood vessel .....

Give **two** reasons for your answer.

Reason 1 .....

.....

Reason 2 .....

.....

(2 marks)

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

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

(1 mark)

1 (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)

1 (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.

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

1 .....

2 .....

(2 marks)

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

.....

(1 mark)

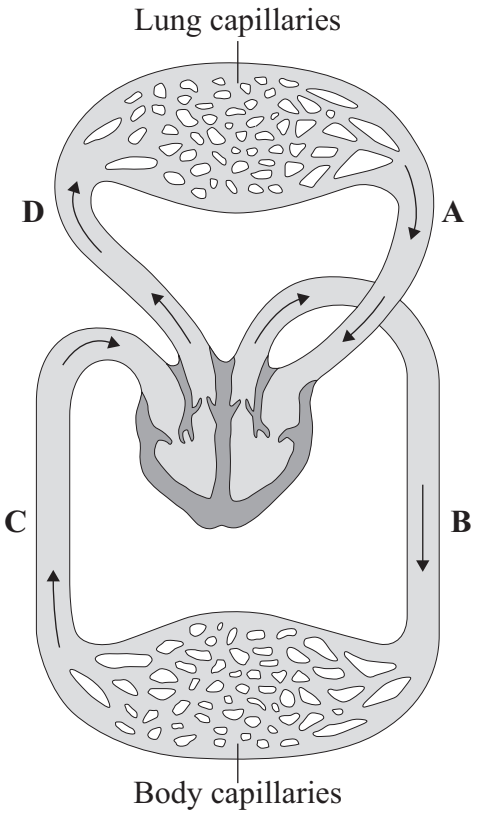
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4.4.2.2 Response to exercise

Question 13

January 2010 | BLY3H | Original Q1 | Legacy

1 The diagram shows the human circulation system.



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

(1 mark)

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

(1 mark)

4.4.2.2 Response to exercise

Question 13 · continued

for mark

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

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

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(4 marks)

6

4.4.2.2 Response to exercise

Question 14

March 2010 | BLY1AP | Original Q1 | Legacy

QUESTION ONE

Most long-distance runners drink sports drinks during a race.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A energy

B enzymes

C mass

D sweat

Ions and water are lost during a race in . . . **1** . . . .

Sugar is added to sports drinks to replace the sugar used to release . . . **2** . . . .

In hot conditions, the athlete's body temperature may rise. This affects the working of . . . **3** . . . .

An athlete who drinks too much water during a race will probably gain . . . **4** . . . .

4.4.2.2 Response to exercise

Question 15

March 2010 | BLY1AP | Original Q5 | Legacy

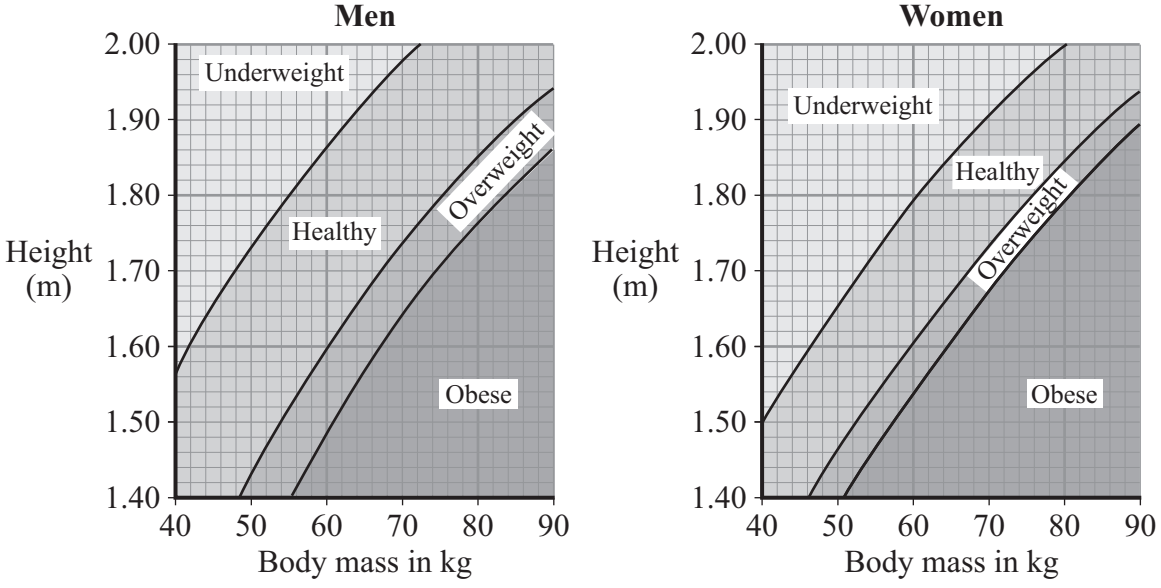
QUESTION FIVE

A combination of a balanced diet and exercise are needed to keep the body healthy.

5A Which row in the table correctly shows a cause and an effect of obesity?

	Cause of obesity		Effect of obesity	
	High salt	**High fat**	**Arthritis**	**Lung cancer**
1	✓		✓	
2		✓		✓
3	✓			✓
4		✓	✓	

The charts are used to find if a person has a healthy mass for his/her height.



5B A woman is 1.6 m tall and has a mass of 66 kg.

From the chart, she is . . .

1 underweight.

2 healthy.

3 overweight.

4 obese.

4.4.2.2 Response to exercise

Question 15 · continued

5C A man is 1.70 m tall. He is overweight.

His body mass is between . . .

1 48 and 68 kg.

2 66 and 72 kg.

3 67 and 74 kg.

4 76 and 84 kg.

5D The metabolic rate of a healthy person eating a balanced diet will **not** be affected by . . .

1 the proportion of muscle to fat in the body.

2 taking vitamin tablets.

3 inherited factors.

4 the amount of exercise taken.

4.4.2.2 Response to exercise

Question 16

June 2010 | BLY1AP | Original Q4 | Legacy

QUESTION FOUR

If you take in less energy than you use, you will lose weight.
A popular diet book claims that a low carbohydrate diet results in quicker weight loss and a more healthy body than a low fat diet.

Scientists carried out an investigation to see if this claim is true.

- They used 120 overweight volunteers divided into two equal groups.
- Both groups were allowed 2000 kilocalories per day.
- **Group 1** was given a diet containing less than 20 g of carbohydrate per day.
- **Group 2** was given a low-fat diet containing less than 30 % of energy from fat and less than 300 mg of cholesterol per day.
- Both groups were given the same exercise programmes which they did at home.
- Both groups attended a weekly information meeting.

4A In what way did the scientists plan a controlled investigation?

1 All volunteers were allowed the same amount of fat per day.

2 All volunteers had the same starting weight.

3 All volunteers were given a low-cholesterol diet.

4 All volunteers were allowed the same amount of energy per day.

The results after 24 weeks are shown in the table.

	Group 1 Low carbohydrate diet	Group 2 Low fat diet
Proportion of volunteers who completed the trial	76 %	57 %
Mean change in body mass	–12.9 %	– 6.7 %
Mean change in body fat mass	– 9.4 kg	– 4.8 kg
Mean change in blood HDL concentration	+ 55 mg per litre	– 16 mg per litre
Mean change in blood LDL concentration	+ 16 mg per litre	– 74 mg per litre

4B The investigation would have been more reliable if all the volunteers . . .

1 had been allowed more energy per day.

2 had done the exercise programme under supervision.

3 had lost the same amount of mass.

4 had been given the same amount of cholesterol per day.

4.4.2.2 Response to exercise

Question 16 · continued

4C The difference in the mean change in blood HDL concentration between **Group 1** and **Group 2** was . . .

1 16 mg per litre.

2 39 mg per litre.

3 55 mg per litre.

4 71 mg per litre.

4D The data supports the popular diet book's claim because . . .

1 people on the low carbohydrate diet had an increased blood LDL concentration.

2 people on the low fat diet had a bigger decrease in blood HDL concentration.

3 people on the low fat diet lost less body mass, on average.

4 more people on the low carbohydrate diet completed the trial.

Turn over for the next question

4.4.2.2 Response to exercise

Question 17

June 2019 | BLY1H | Original Q4 | Legacy

4 Diet and exercise affect health.

4 (a) Many people are obese (very overweight).

Obesity can lead to heart disease.

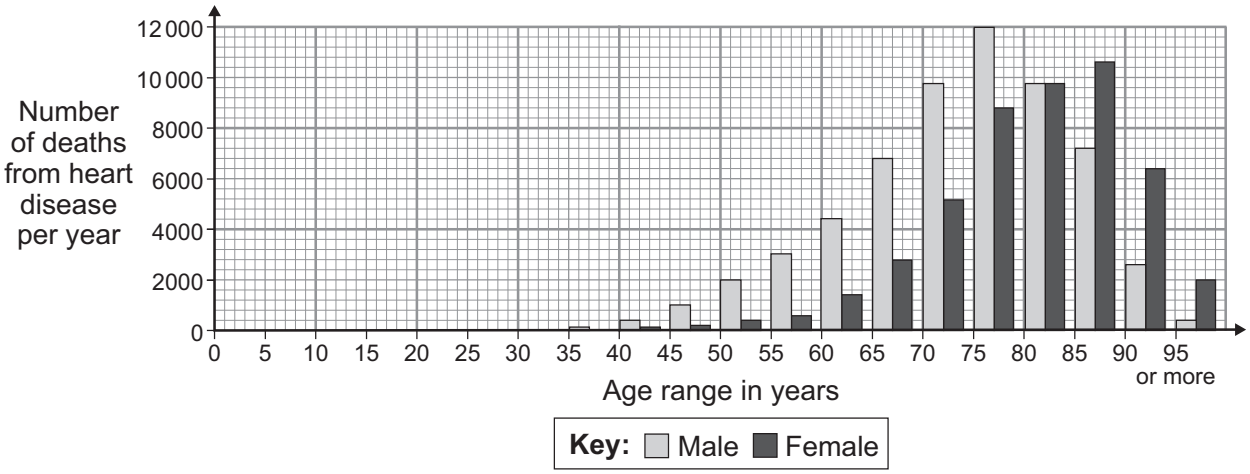
Other than heart disease, name **two** conditions which are linked to obesity.

1 .....

2 .....

(2 marks)

4 (b) The graph shows the number of deaths from heart disease each year in the UK.



The pattern for deaths from heart disease in men is different from the pattern in women.

4 (b) (i) Give **two** differences between the patterns for men and women.

1 .....

.....

2 .....

.....

(2 marks)

4.4.2.2 Response to exercise

Question 17 · continued

4 (b) (ii) Suggest **two** reasons for the difference in the number of deaths from heart disease in men and women between the ages of 40 and 60.

1 .....

.....

2 .....

.....

(2 marks)

4 (c) Scientists have developed drugs to reduce the concentration of cholesterol in the blood.

Give the **three** main stages in testing a new drug before it is sold to the public.

1 .....

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2 .....

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3 .....

.....

(3 marks)

9

4.4.2.2 Response to exercise

Question 18

June 2010 | BLY1H | Original Q5 | Legacy

5 Drinking after exercise to replace the water lost in sweat is called rehydration. Scientists at a Spanish university investigated rehydration after exercise.

- 24 students took part in the investigation.
- All the students ran on a treadmill in a temperature of 40 °C until they were exhausted.
- 12 of the students were each given half a litre of beer to drink.
- The other 12 students were each given half a litre of tap water to drink.
- Both groups of students were then allowed to drink as much tap water as they wanted.
- The scientists measured how quickly each student rehydrated.
- The students who had been given beer rehydrated 'slightly better' than the ones given only water.

A newspaper reported the investigation.

The headline was

'Forget water after a workout ... drink some beer instead.'

The newspaper headline was **not** justified.

Explain why.

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(3 marks)

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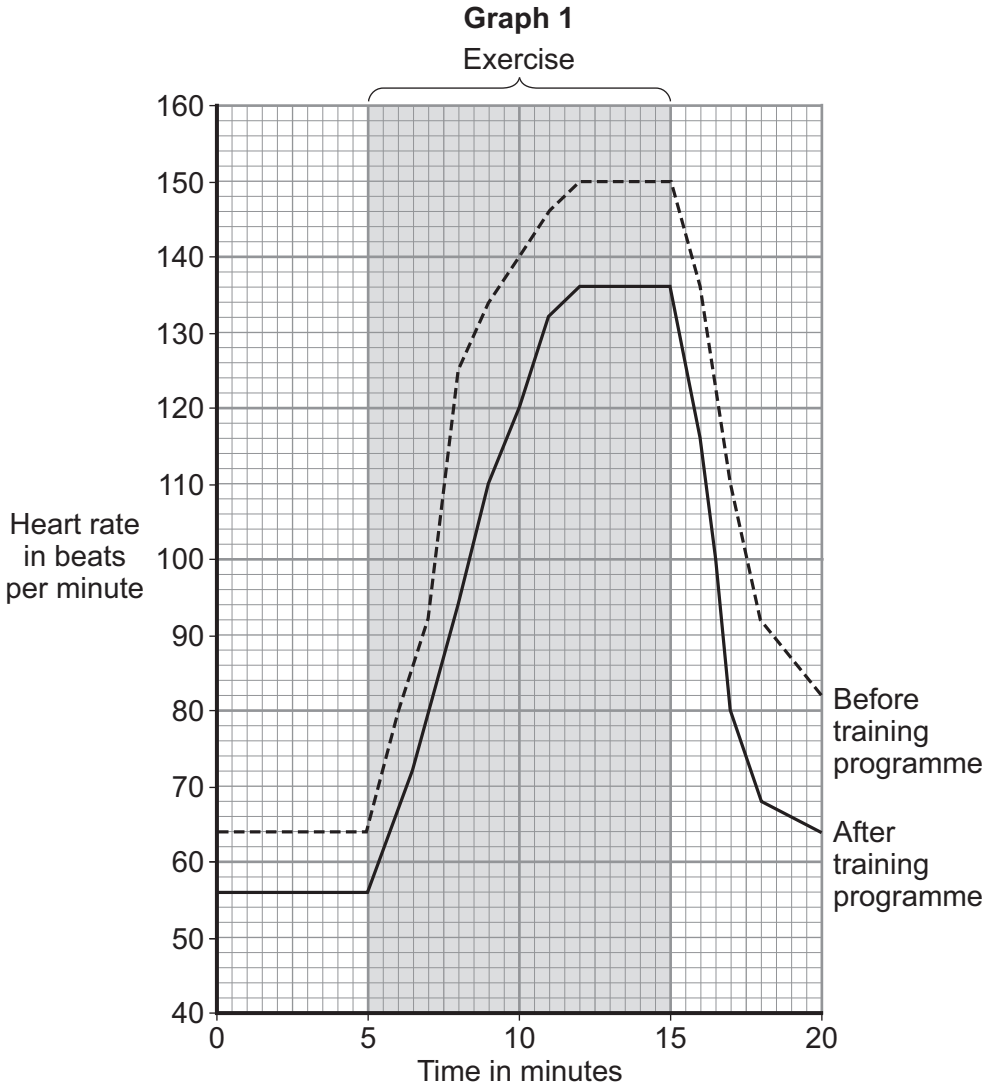
4.4.2.2 Response to exercise

Question 19

June 2010 | BLY3H | Original Q4 | Legacy

4 An athlete carried out a 6-month training programme.

Graph 1 shows the effect of the same amount of exercise on his heart rate before and after the training programme.



4 (a) (i) Use **Graph 1** to find the heart rate of the **trained** athlete 5 minutes after the start of the exercise.

Heart rate = ... beats per minute

(1 mark)

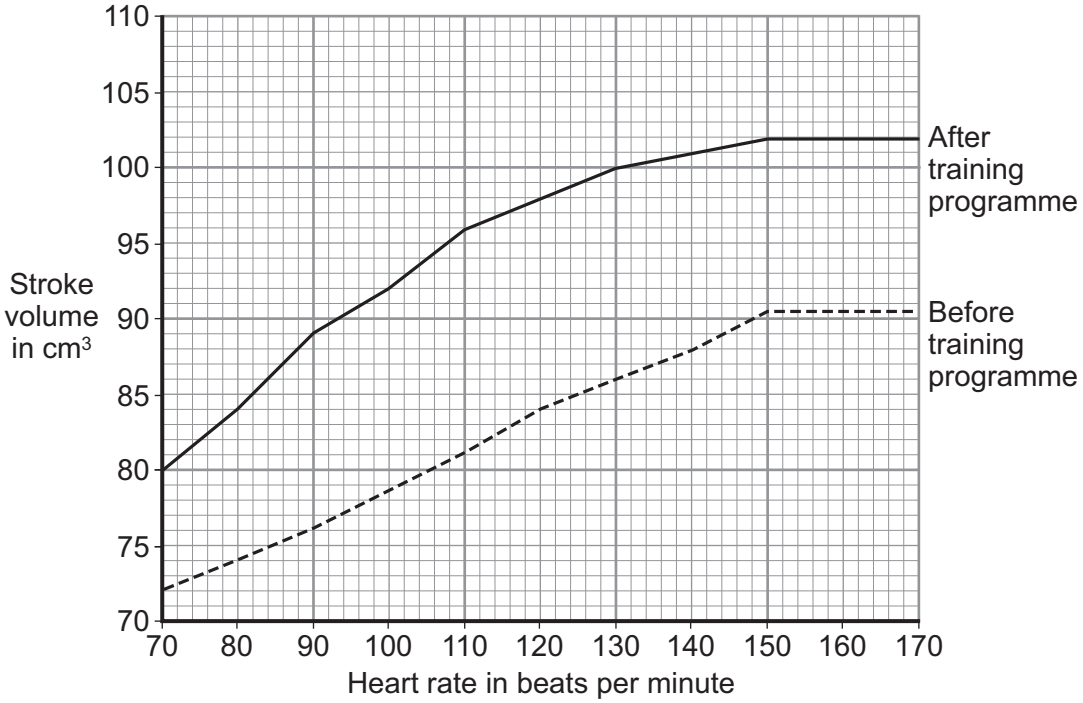
The stroke volume of the heart is the volume of blood pumped out of the left side of the heart in one heart beat.

Graph 2 shows the relationship between the stroke volume and the heart rate before and after the athlete did the training programme.

4.4.2.2 Response to exercise

Question 19 · continued June 2010 | BLY3H | Original Q4 | Legacy

Graph 2



4 (a) (ii) The *cardiac output* is defined as

cardiac output = heart rate × stroke volume

Calculate the cardiac output of the **trained** athlete 5 minutes after the start of the exercise. Use your answer to part (a)(i), and information from **Graph 2**.

Show clearly how you work out your answer.

.....

.....

Cardiac output = ... cm^3 blood per minute

(2 marks)

4 (b) **Graph 1** shows that, for the same amount of exercise, the heart of the trained athlete was beating more slowly than it did before the training programme.

Use information from **Graph 2** to explain why.

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(2 marks)

Question 4 continues on the next page

4.4.2.2 Response to exercise

Question 19 · continued

4 (c) An increased cardiac output will provide more oxygen and more glucose to the working muscles.

Explain how this helps the athlete during exercise.

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(4 marks)

9

4.4.2.2 Response to exercise

Question 20

November 2010 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

Most recreational drugs damage the body.

6A Heroin is addictive because . . .

1 heroin produces withdrawal symptoms.

2 heroin can change the chemical processes in the body.

3 heroin affects the way the body responds to stimuli.

4 people taking heroin have a gene that makes them addicted.

6B Most people who are addicted to heroin smoked cannabis before they started using heroin. However, the majority of people who smoke cannabis do not progress to using heroin.

Which is the most valid conclusion from this information?

1 There is no link between smoking cannabis and becoming addicted to heroin.

2 Regular cannabis smokers are not at any risk of progressing to heroin.

3 All heroin addicts have smoked cannabis at some time.

4 There may be a link between smoking cannabis and becoming addicted to heroin.

6C An athlete's performance can be affected for several hours after smoking a cigarette.

This is because . . .

1 the blood is not carrying enough oxygen.

2 there are carcinogens in tobacco smoke.

3 reaction times are slower.

4 smoking affects self-control.

6D Legal recreational drugs generally cause more ill-health than illegal recreational drugs because . . .

1 legal drugs are more harmful.

2 illegal drugs are used by fewer people.

3 illegal drugs are addictive.

4 only a doctor can prescribe legal drugs.

4.4.2.2 Response to exercise

Question 21

November 2010 | BLY1AP | Original Q9 | Legacy

QUESTION NINE

The amount of energy we need depends on age, gender and activity.

9A The table shows the mean energy needed per day by different people.

Person	Mean energy needed per day in kJ	
	Male	Female
6-year old	7 500	7 500
16-year old	13 000	10 000
30-year old office worker	11 000	9 500
30-year old labourer	16 000	13 500
Pregnant woman		10 500

From the data in the table, which of the following has the biggest effect on the amount of energy needed by the body?

1 your gender

2 pregnancy

3 how active you are

4 how fit you are

9B Of the following, who needs least food?

People who . . .

1 exercise little and live in cold climates.

2 exercise a lot and live in warm climates.

3 exercise little and live in warm climates.

4 exercise a lot and live in cold climates.

4.4.2.2 Response to exercise

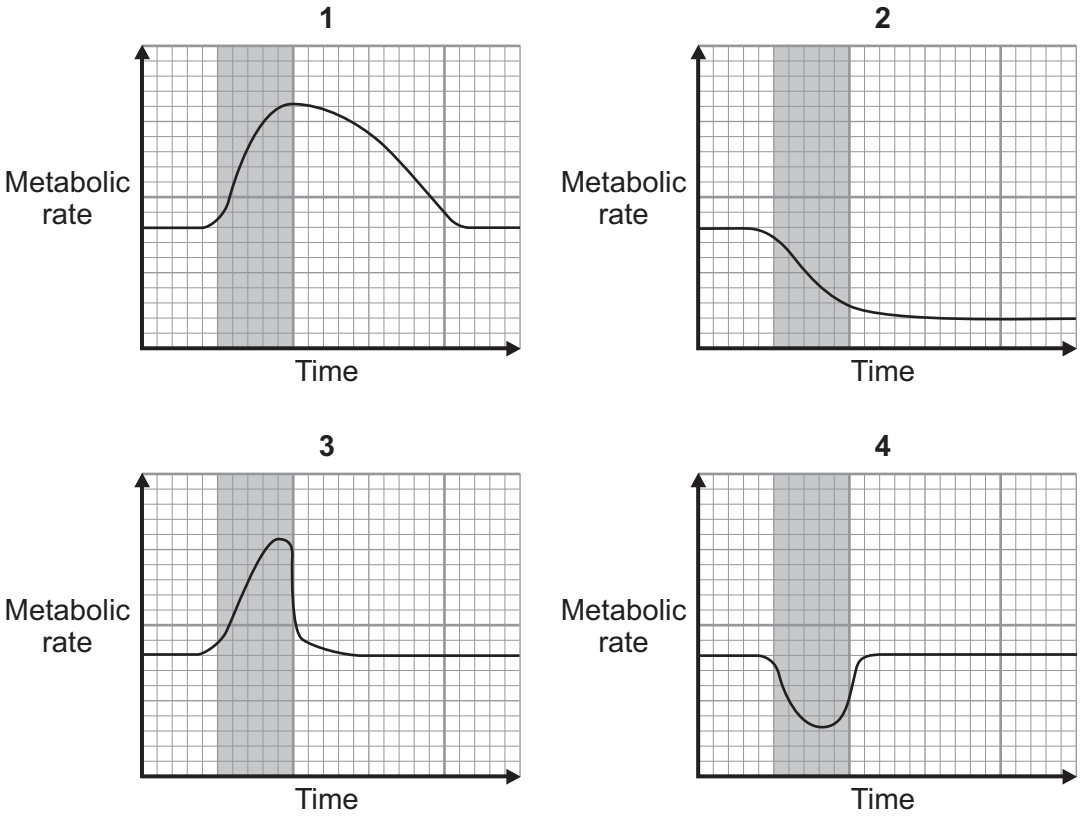
Question 21 · continued

9C Some people take more energy into their body than they use.

Which row in the table shows diseases linked with this?

	Arthritis	Cancer	Diabetes	Rubella	Deficiency diseases
1	✓	✓		✓	
2			✓		✓
3	✓		✓		
4		✓		✓	✓

9D Which graph shows a person's metabolic rate, before, during and after a 20-minute period of exercise?



Key: 20-minute period of exercise

END OF TEST

4.4.2.2 Response to exercise

Question 22

January 2011 | BLY1H | Original Q5 | Legacy

5 Scientists estimate that about one third of cancers in the UK may be linked to obesity.

5 (a) Name **two** diseases linked to obesity.

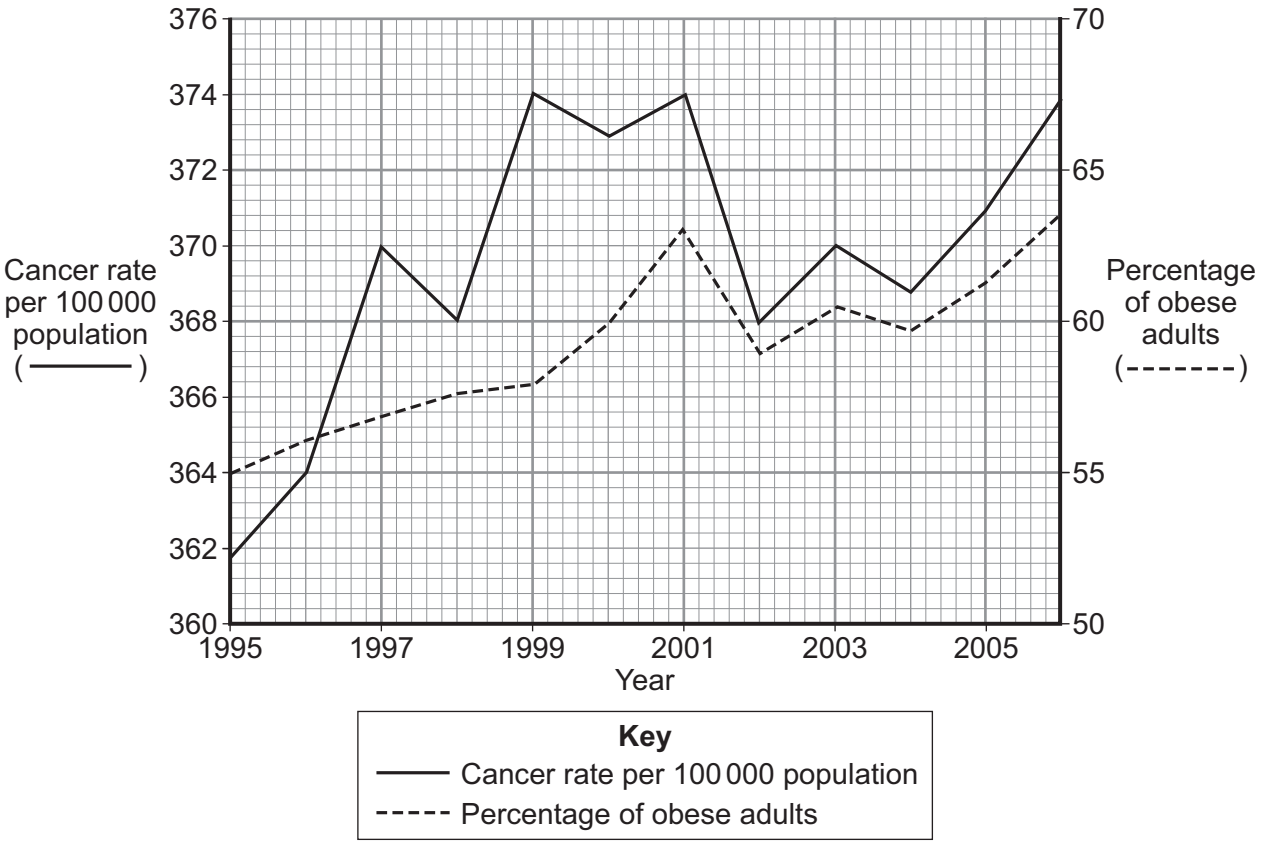
Do **not** give cancer as one of your answers.

1 .....

2 .....

(2 marks)

The graph shows the changes in the cancer rate and the changes in the percentage of obese adults in the UK from 1995 to 2006.



4.4.2.2 Response to exercise

Question 22 · continued

5 (b) Does the data in the graph prove that obesity causes cancer?

Draw a ring round your answer. **Yes** / **No**

Explain the reason for your answer.

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(2 marks)

5 (c) Exercise helps a person to lose weight.

Explain why.

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(2 marks)

6

4.4.2.2 Response to exercise

Question 23

1 The table shows the volume of blood flowing through different organs at three levels of exercise.

Organ(s)	Volume of blood flowing through organ(s) in cm^3 per minute		
	Light exercise	**Moderate exercise**	**Heavy exercise**
Gut	1 100	600	300
Kidneys	900	600	250
Brain	750	750	750
Heart muscles	350	750	1 000
Skeletal muscles	4 500	12 500	22 000
Skin	1 500	1 900	600
Other	400	500	100
Total	**9 500**	**17 600**	**25 000**

1 (a) (i) Which organ has a constant flow of blood through it?

.....

(1 mark)

1 (a) (ii) Which organ has the greatest reduction in the volume of blood supplied during heavy exercise compared with light exercise?

.....

(1 mark)

1 (a) (iii) What proportion of the blood flows through the heart muscle during heavy exercise?

.....

(1 mark)

4.4.2.2 Response to exercise

Question 23 · continued

1 (b) The volume of blood flowing through the skeletal muscles increases greatly during exercise.

Give **two** ways in which the body brings about this increase.

1 .....

.....

2 .....

.....

(2 marks)

1 (c) During exercise, the concentration of carbon dioxide in the blood increases.

Explain what causes this increase.

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(3 marks)

8

4.4.2.2 Response to exercise

Question 24

June 2011 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

Sometimes, athletes train in hot countries. The athletes need to get used to hot conditions.

In an investigation:

- eight athletes did three different physical exercises before starting to train in hot conditions
- the sweat from the athletes was analysed after each exercise
- the athletes trained in hot conditions for ten days
- the athletes repeated the three different exercises that they had done before training in hot conditions
- the athletes' sweat was analysed after each exercise.

6A The athletes were told that it did not matter if they ate a lot of salt (containing sodium ions) during the 10 days of training in hot conditions.

The athletes could eat a lot of salt because the excess sodium ions . . .

1 are removed by sweating.

2 are removed by the kidneys.

3 cannot be carried by the blood.

4 cannot enter the blood.

6B The athletes were told that they must not go without sodium ions in their diet because . . .

1 the athletes would lack the energy to carry out their exercises.

2 the athletes' blood would become too concentrated.

3 the athletes' body cells would not work efficiently.

4 the athletes' blood pressure would increase.

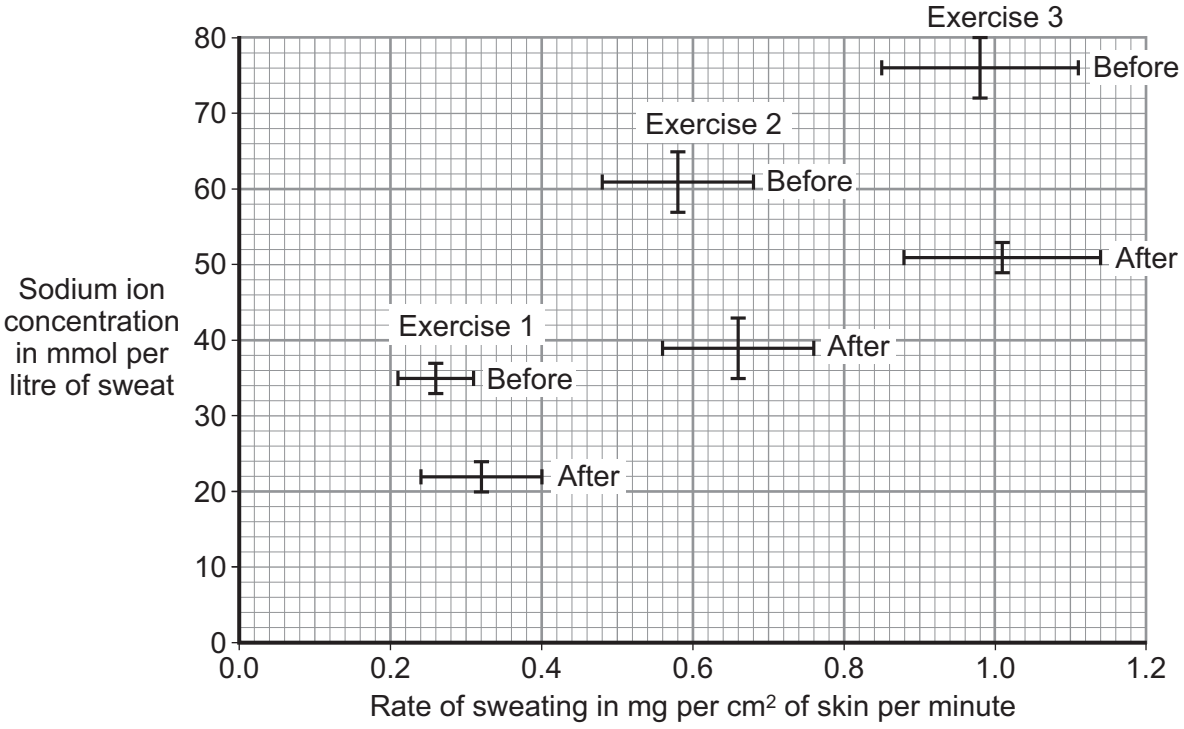
4.4.2.2 Response to exercise

Question 24 · continued

The graph below shows the results of the investigation for each of the three exercises before and after 10 days of training in hot conditions.

The bars at each plot show:

- the range of the rate of sweating (horizontal bar)
- the range of the concentration of sodium ions in the sweat (vertical bar).



6C The data suggests that for each of the three physical exercises after 10 days of training in hot conditions, . . .

1 there was a large difference in the sodium ion concentration but not in the rate of sweating.

2 there was a large difference in the rate of sweating but not in the sodium ion concentration.

3 there was a large difference in the sodium ion concentration and a large difference in the rate of sweating.

4 there was no difference in the sodium ion concentration and no difference in the rate of sweating.

6D The best conclusion from the graph is that . . .

1 training in hot conditions increases the concentration of sodium ions in sweat.

2 an increase in the rate of sweating reduces the concentration of sodium ions lost in sweat.

3 the rate of sweating is decreased by training in hot conditions.

4 training in hot conditions reduces the concentration of sodium ions lost in sweat.

4.4.2.2 Response to exercise

Question 25

June 2011 | BLY3H | Original Q4 | Legacy

4 Oxygen is transported round the body by the blood.

Blood leaving the human lung can carry about 250 milligrams of oxygen per litre. However, only 7 milligrams of oxygen will dissolve in one litre of water at body temperature.

4 (a) Suggest an explanation for the difference.

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(2 marks)

4 (b) Blood leaving the skeletal muscles during exercise may contain only 30 milligrams of oxygen per litre.

Explain what causes the difference in oxygen concentration between the blood leaving the lungs and the blood leaving the skeletal muscles.

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(4 marks)

6

4.4.2.2 Response to exercise

Question 26

November 2011 | BLY1AP | Original Q2 | Legacy

QUESTION TWO

Our weight depends on:

- inherited factors
- the amount of exercise we take
- our diet.

If our energy intake is less than 3300 kJ a day, we slowly use muscle tissue rather than fat to get our energy.

Match outcomes, **A**, **B**, **C** and **D**, with numbers **1**–**4** in the table.

A higher muscle to fat ratio

B obesity

C reduced cholesterol levels, decrease in weight

D very low metabolic rate, muscle loss

1	regular exercise	2800 kJ per day, low fat diet
2	regular exercise	high energy, low fat diet
3	very little exercise	2800 kJ per day, low fat diet
4	very little exercise	high energy, high fat diet

4.4.2.2 Response to exercise

Question 27

November 2011 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

Diabetes is linked to body mass index (BMI).

BMI is calculated using the formula:

$$\text{BMI} = \frac{\text{mass (in kg)}}{\text{height}^2 \text{ (in m}^2\text{)}}$$

A 15 year old girl is 1.61 metres tall, with a mass of 58 kg.

6A Use the formula to calculate her BMI.

Her BMI is . . .

1 0.04

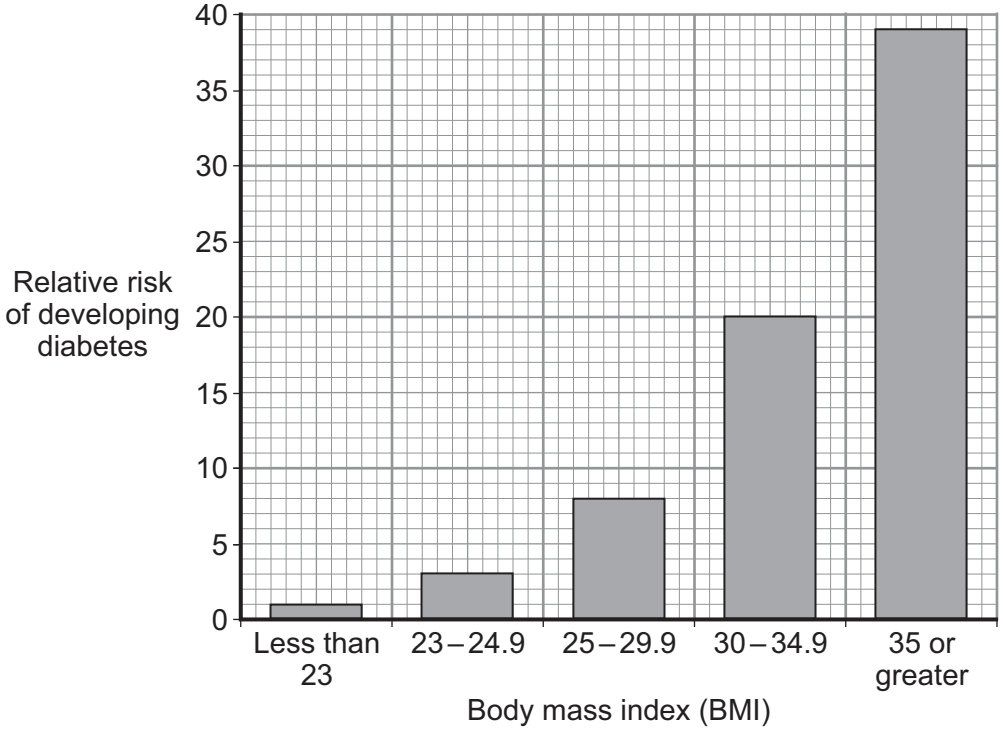
2 18.0

3 22.4

4 36.0

The bar chart shows the link between BMI and the relative risk of developing diabetes.

A relative risk of 1 is the normal risk of developing diabetes.



4.4.2.2 Response to exercise

Question 27 · continued

6B One conclusion that can be made from this bar chart is that . . .

1 heavy people usually develop diabetes.

2 an increase in BMI from 24 to 25 increases the risk of developing diabetes by three times.

3 a person with a BMI of 36 will develop diabetes.

4 a person with a BMI of 20 might develop diabetes.

6C An athlete has a BMI of 32. However, her risk of developing diabetes is likely to be less than 20 times the normal risk.

The most likely reason for this is that she . . .

1 is very short.

2 is fit and healthy.

3 has a lot of muscle compared to fat.

4 has a high metabolic rate.

6D A doctor saw a person with a BMI of 35. The doctor advised the person to take statins. Statins affect the levels of LDL and HDL in the blood.

For a healthy heart there should be . . .

1 high levels of LDL and HDL.

2 a high level of LDL and a low level of HDL.

3 a high level of HDL and a low level of LDL.

4 low levels of LDL and HDL.

4.4.2.2 Response to exercise

Question 28

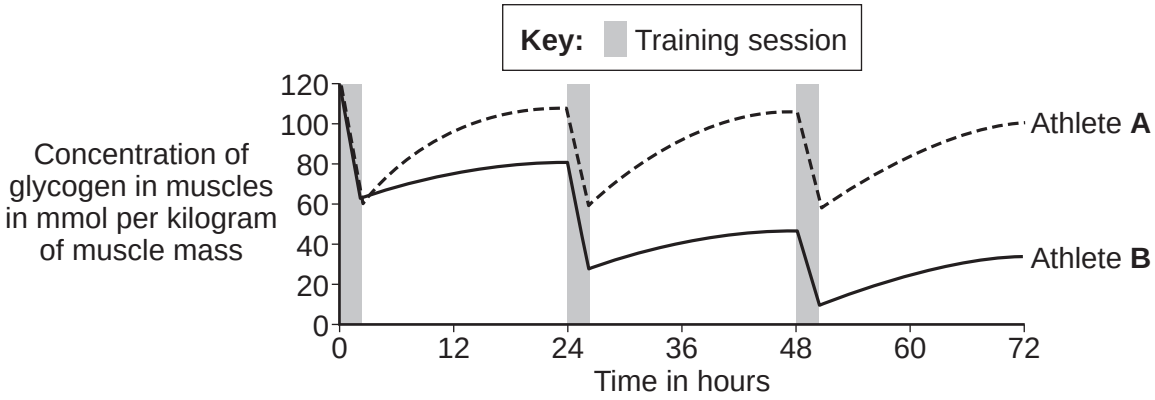
June 2012 | BL2HP | Original Q1 | Legacy

1 Glycogen is stored in the muscles.

Scientists investigated changes in the amount of glycogen stored in the muscles of two 20 year-old male athletes, **A** and **B**.
Athlete **A** ate a high-carbohydrate diet. Athlete **B** ate a low-carbohydrate diet.

Each athlete did one 2-hour training session each day.

The graph shows the results for the first 3 days.



1 (a) (i) Give **three** variables that the scientists controlled in this investigation.

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(3 marks)

4.4.2.2 Response to exercise

Question 28 · continued

1 (a) (ii) Suggest **two** variables that would be difficult to control in this investigation.

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(2 marks)

1 (a) (iii) Describe **one** way in which the results of Athlete **B** were different from the results of Athlete **A**.

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.....

(1 mark)

1 (b) Both athletes were training to run a marathon.

Which athlete, **A** or **B**, would be more likely to complete the marathon?

Use information from the graph to explain your answer.

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(4 marks)

10

4.4.2.2 Response to exercise

Question 29

June 2013 | BL3HP | Original Q6 | Legacy

6 Humans maintain an almost constant body temperature.

6 (a) Describe the role of blood vessels in the control of body temperature.

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(4 marks)

6 (b) An athlete can run a marathon in 2 hours 15 minutes on a dry day in outside temperatures up to 35 °C.

If the air is dry, his body will **not** overheat.

In humid conditions the same athlete can run the marathon in the same time. However, in humid conditions, if the outside temperature goes over 18 °C then his body **will** overheat.

Suggest an explanation for the athlete overheating in humid conditions.

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(3 marks)

7

4.4.2.2 Response to exercise

Question 30

June 2014 | BL2HP | Original Q3 | Legacy

3 **Figure 2** shows an athlete running on a treadmill.

Figure 2



After running for several minutes, the athlete's leg muscles began to ache.
This ache was caused by a high concentration of lactic acid in the muscles.

3 (a) The equation shows how lactic acid is made.

glucose ⟶ lactic acid (+ energy)

Name the process that makes lactic acid in the athlete's muscles.

[1 mark]

.....

3 (b) Scientists investigated the production of lactic acid by an athlete running at different speeds.

In the investigation:

- the athlete ran on the treadmill at 4 km per hour
- the scientists measured the concentration of lactic acid in the athlete's blood after 2 minutes of running.

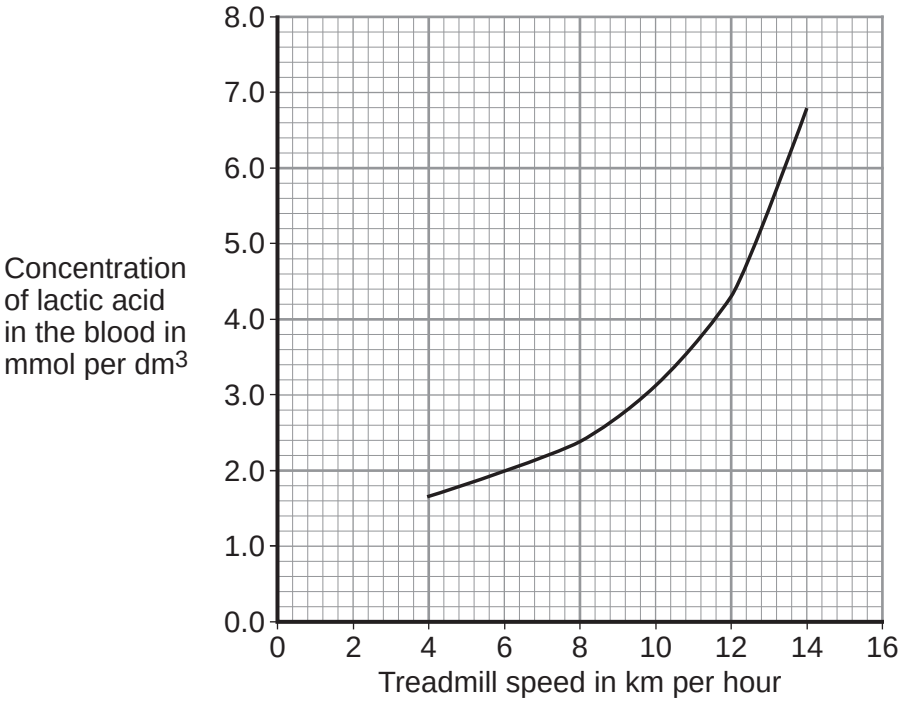
The investigation was repeated for different running speeds.

Figure 3 shows the scientists' results.

4.4.2.2 Response to exercise

Question 30 · continued

Figure 3



3 (b) (i) How much more lactic acid was there in the athlete's blood when he ran at 14 km per hour than when he ran at 8 km per hour?

[2 marks]

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Answer = ... mmol per dm^3

3 (b) (ii) Why is more lactic acid made in the muscles when running at 14 km per hour than when running at 8 km per hour?

[3 marks]

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4.4.2.2 Response to exercise

Question 31

June 2015 | BL2HP | Original Q5 | Legacy

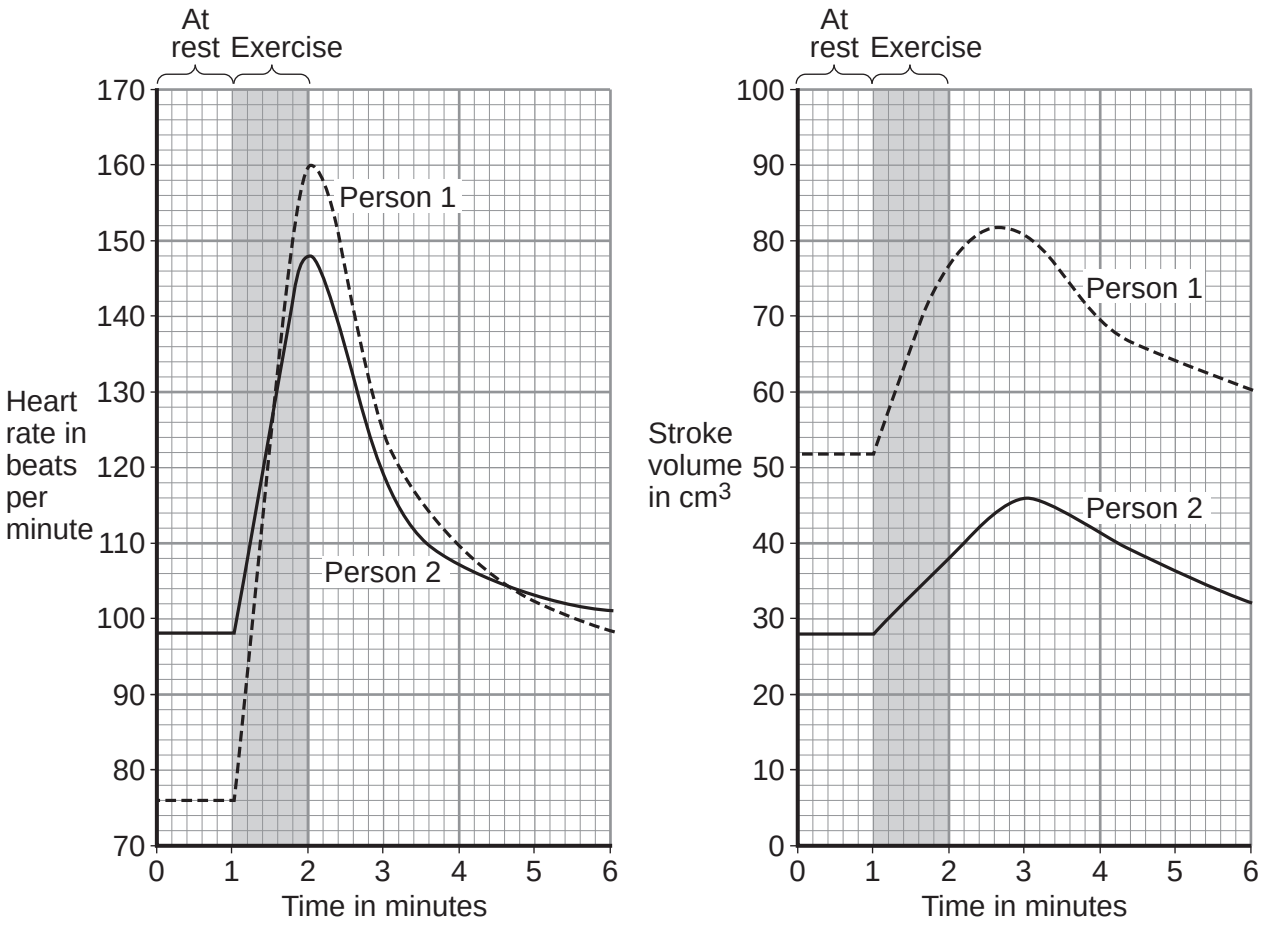
5 During exercise, the heart beats faster and with greater force.

The 'heart rate' is the number of times the heart beats each minute.
The volume of blood that travels out of the heart each time the heart beats is called the 'stroke volume'.

In an investigation, **Person 1** and **Person 2** ran as fast as they could for 1 minute. Scientists measured the heart rates and stroke volumes of **Person 1** and **Person 2** at rest, during the exercise and after the exercise.

Figure 7 shows the scientists' results.

Figure 7



4.4.2.2 Response to exercise

Question 31 · continued

5 (a) The 'cardiac output' is the volume of blood sent from the heart to the muscles each minute.

Cardiac output = Heart rate × Stroke volume

At the end of the exercise, **Person 1**'s cardiac output = 160 × 77 = 12 320 cm^3 per minute.

Use information from **Figure 7** to complete the following calculation of **Person 2**'s cardiac output at the end of the exercise.

[3 marks]

At the end of the exercise:

Person 2's heart rate = ... beats per minute

Person 2's stroke volume = ... cm^3

Person 2's cardiac output = ... cm^3 per minute

5 (b) **Person 2** had a much lower cardiac output than **Person 1**.

5 (b) (i) Use information from **Figure 7** to suggest the **main** reason for the lower cardiac output of **Person 2**.

[1 mark]

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5 (b) (ii) **Person 1** was able to run much faster than **Person 2**.

Use information from **Figure 7** and your own knowledge to explain why.

[5 marks]

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4.4.2.2 Response to exercise

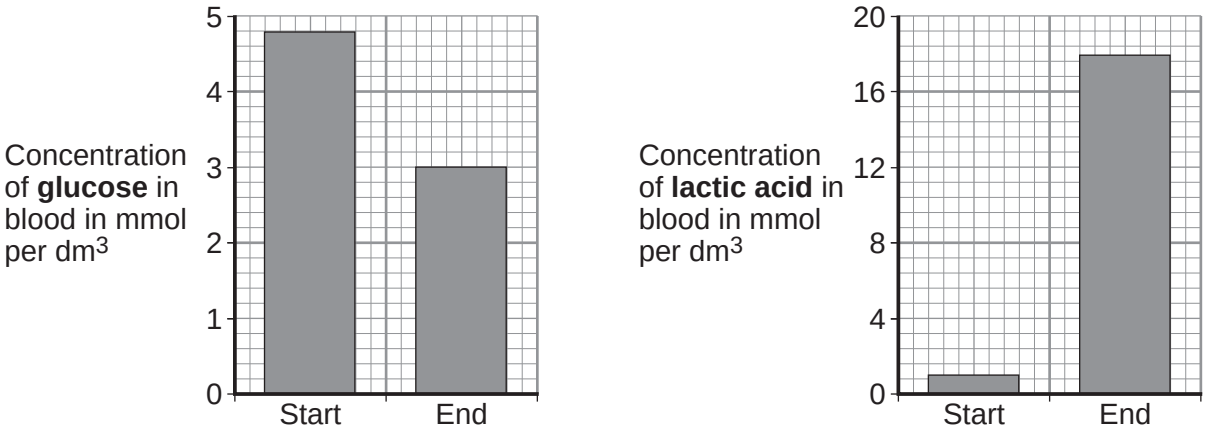
Question 32

June 2016 | BL2HP | Original Q1 | Legacy

1 An athlete ran as fast as he could until he was exhausted.

1 (a) **Figure 1** shows the concentrations of glucose and of lactic acid in the athlete's blood at the start and at the end of the run.

Figure 1



1 (a) (i) Lactic acid is made during anaerobic respiration.

What does anaerobic mean?

[1 mark]

_____

_____

1 (a) (ii) Give evidence from **Figure 1** that the athlete respired anaerobically during the run.

[1 mark]

_____

_____

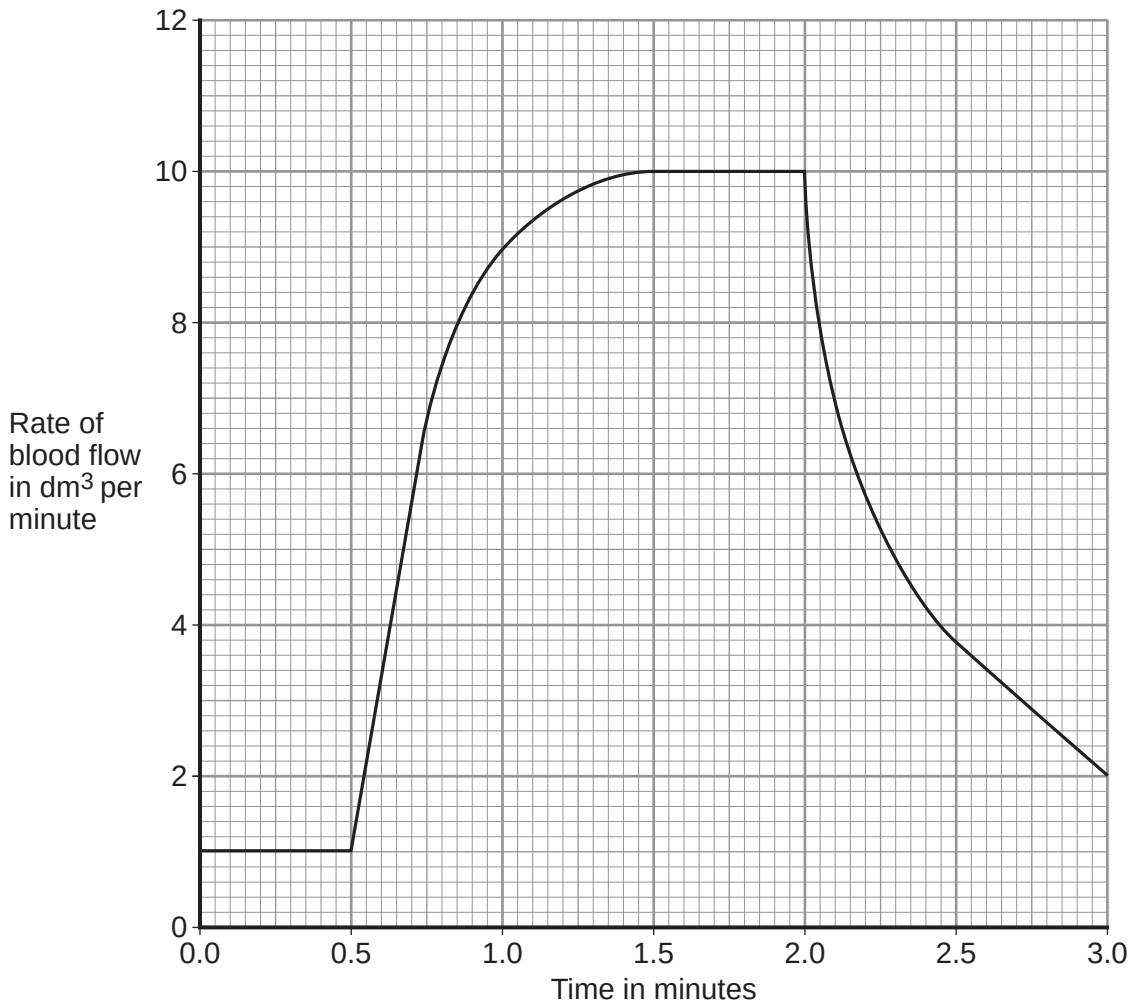
Question 1 continues on the next page

4.4.2.2 Response to exercise

Question 32 · continued

1 (b) **Figure 2** shows the effect of running on the rate of blood flow through the athlete's muscles.

Figure 2



1 (b) (i) For how many minutes did the athlete run?

[1 mark]

Time = _____ minutes

1 (b) (ii) Describe what happens to the rate of blood flow through the athlete's muscles during the run.

Use data from **Figure 2** in your answer.

[2 marks]

_____

_____

_____

_____

4.4.2.2 Response to exercise

Question 32 · continued

1 (b) (iii) Explain how the change in blood flow to the athlete's muscles helps him to run.

[4 marks]

9

4.4.2.2 Response to exercise

Question 33

June 2016 | BL3HP | Original Q5 | Legacy

5 When we breathe in and breathe out the ribs and the diaphragm move.

5 (a) Complete **Table 2** to describe the changes that occur when we breathe in.

[2 marks]

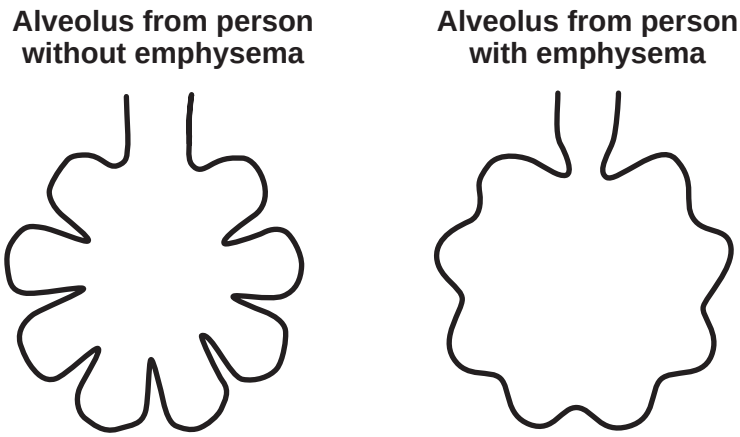
Table 2

	Movement of the ribs	Movement of the diaphragm	Change in volume of the thorax
Breathing in	up and out		

5 (b) Emphysema is a disease affecting the lungs. People with emphysema are often short of breath and find exercise difficult.

Figure 5 shows an alveolus from a person without emphysema and an alveolus from a person with emphysema.

Figure 5



5 (b) (i) Describe **one** difference between the alveolus from a person without emphysema and the alveolus from a person with emphysema.

[1 mark]

4.4.2.2 Response to exercise

Question 33 · continued

5 (b) (ii) Explain how the difference you described in part **(b)(i)** causes the person with emphysema to find exercise difficult.

[3 marks]

6

Turn over for the next question

4.4.2.2 Response to exercise

Question 34

June 2017 | BL3HP | Original Q6 | Legacy

6 Many people drink sports drinks after exercise.

Table 4 shows some data about five different sports drinks, **P**, **Q**, **R**, **S** and **T**.

Table 4

		Mass per 100 cm^3		
Sports drink	**Concentration of the drink in arbitrary units**	**Sodium ions in mg**	**Potassium ions in mg**	**Substance X in g**
P	260	45	21	10
Q	170	48	24	9
R	270	112	38	2
S	280	25	6	10
T	493	6	3	13

6 (a) Substance **X** in **Table 4** is used during exercise.

Substance **X** releases energy during exercise.

What is substance **X**?

[1 mark]

_____

6 (b) A sports scientist investigated the effectiveness of sports drinks. She made the following statements:

- the best sports drinks have a slightly lower concentration than blood plasma
- the mean concentration of blood plasma is 280 arbitrary units
- the closer the ratio of sodium ions to potassium ions is to 2:1, the more effective the sports drink.

6 (b) (i) Calculate the ratio of sodium ions to potassium ions in drink **R**.

[1 mark]

_____

_____

Ratio = _____

4.4.2.2 Response to exercise

Question 34 · continued

6 (b) (ii) The scientist stated:

'sports drink **P** is the most effective sports drink'

Use information from part **(b)** and **Table 4** to give reasons why the scientist made this statement.

[2 marks]

6 (b) (iii) Blood cells were placed in a sample of sports drink **T**.

The concentration inside the blood cells was 280 arbitrary units.

Explain what would happen to the blood cells.

[3 marks]

7

4.4.2.2 Response to exercise

Question 35

June 2017 | BL3HP | Original Q9 | Legacy

9 (a) In a healthy person, blood sugar levels are kept within a narrow range.

Describe what happens in a healthy person when the pancreas detects a rise in blood sugar level.

[2 marks]

9 (b) Glycogen storage disorder is an inherited condition affecting a small number of people.

In some people with the disorder, glycogen does not form properly.

After exercise, a person with this type of glycogen storage disorder can feel very tired and can become unconscious.

Explain why the person has these symptoms after exercise.

[4 marks]

6

4.4.2.2 Response to exercise

Question 36

June 2018 | 8461/1H | Original Q2

0 2 Metabolism is the sum of all the chemical reactions in the cells of the body.

One metabolic reaction is the formation of lipids.

0 2 . 1 Give **one** other metabolic reaction in cells.

[1 mark]

Table 2 shows the mean metabolic rate of humans of different ages.

Table 2

Age in years	Mean metabolic rate in kJ/m^2/hour	
	Males	Females
5	53	53
15	45	42
25	39	35
35	37	35
45	36	35

0 2 . 2 What **two** conclusions can be made from the data in **Table 2**?

[2 marks]

Tick **two** boxes.

- As age increases, mean metabolic rate of males and females increases. ☐
- Males have a higher metabolic rate than females after five years of age. ☐
- The mean metabolic rate of females decreases faster than males up to 25 years of age. ☐
- The mean metabolic rate of males and females decreases more quickly after the age of 35. ☐
- There is no relationship between age and mean metabolic rate. ☐

4.4.2.2 Response to exercise

Question 36 · continued

0 2 . 3 Calculate the percentage decrease in the mean metabolic rate of males between 5 years and 45 years of age.

Use the equation:

$$\text{percentage decrease} = \frac{\text{decrease in metabolic rate}}{\text{original metabolic rate}} \times 100$$

Give your answer to 3 significant figures.

[3 marks]

Percentage decrease = _____

Question 2 continues on the next page

4.4.2.2 Response to exercise

Question 36 · continued

Regular exercise can increase metabolic rate.

Two people did five minutes of gentle exercise from rest.

Table 3 shows the effect of the exercise on their heart rates.

Table 3

Time in minutes	Heart rate in beats per minute	
	Person R	Person S
0 (at rest)	60	78
1	76	100
2	85	110
3	91	119
4	99	129
5	99	132

0 2 . 4 Describe **two** differences in the response of person **R** and person **S** to the exercise.

Use information from **Table 3**.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 5 Complete the line graph in **Figure 3** for person **S**.

You should:

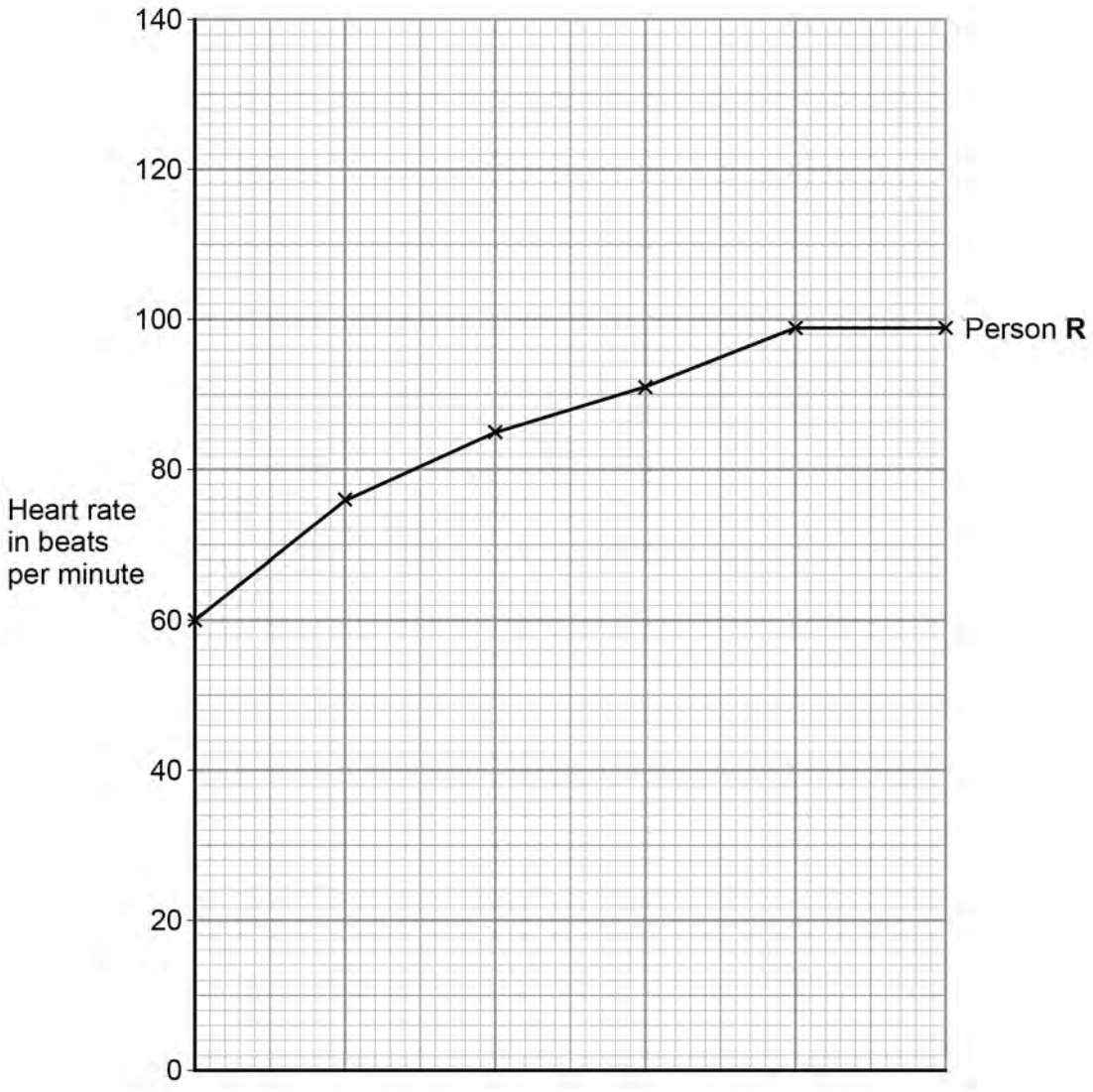
- add the scale to the x axis
- label the x axis.

[4 marks]

4.4.2.2 Response to exercise

Question 36 · continued

Figure 3



0 2 . 6 After five minutes of exercise, the heart rate of person **S** was 132 beats per minute. When person **S** rested, his heart rate decreased steadily at a rate of 12 beats every minute.

Calculate how much time it would take the heart rate of person **S** to return to its resting rate.

[2 marks]

Time = _____ minutes

4.4.2.2 Response to exercise

Question 36 · continued

0 2 . 7 A student made the following hypothesis about the heart rate of smokers and non-smokers during exercise.

"During exercise, the heart rate of smokers increases more than the heart rate of non-smokers."

Design an investigation that would allow you to test this hypothesis.

[6 marks]

20

4.4.2.2 Response to exercise

Question 37

June 2018 | 8461/1H | Original Q3

0 3 The circulatory system is composed of the blood, blood vessels and the heart.

0 3 . 1 Urea is transported in the blood plasma.

Name **two** other substances transported in the blood plasma.

[2 marks]

1 _____

2 _____

0 3 . 2 Some athletes train at high altitude.

Training at high altitude increases the number of red blood cells per cm^3 of blood.

Explain why having more red blood cells per cm^3 of blood is an advantage to an athlete.

[3 marks]

_____

_____

_____

_____

_____

_____

0 3 . 3 Which **two** blood vessels carry deoxygenated blood?

[2 marks]

Tick **two** boxes.

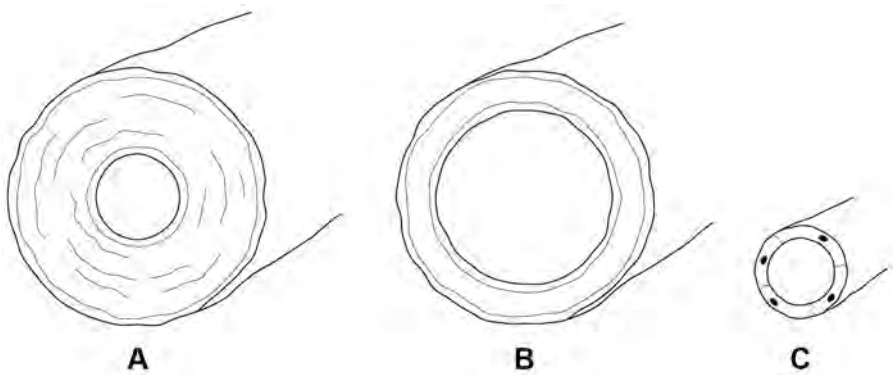
- Aorta ☐
- Coronary artery ☐
- Pulmonary artery ☐
- Pulmonary vein ☐
- Vena cava ☐

4.4.2.2 Response to exercise

Question 37 · continued

Figure 4 shows the three types of blood vessel.

Figure 4



0 3 . 4 Which type of blood vessel carries blood into the right atrium?

[1 mark]

Tick **one** box.

A		B		C	

0 3 . 5 Compare the structure of an artery with the structure of a vein.

[3 marks]

4.4.2.2 Response to exercise

Question 37 · continued

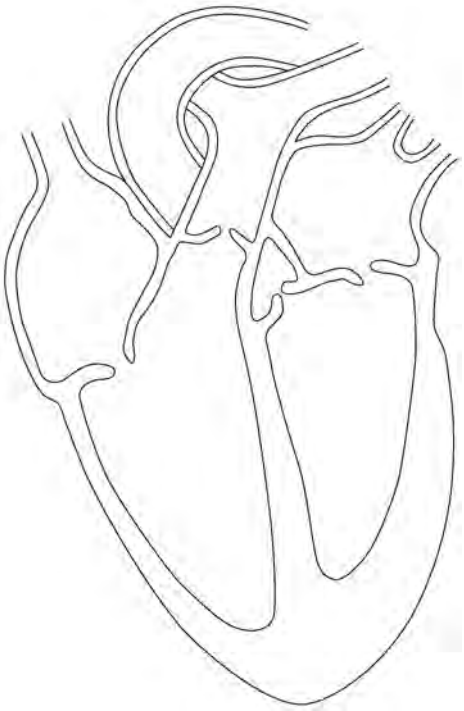
0 3 . 6 Heart rate is controlled by a group of cells. This group of cells act as a pacemaker.

Figure 5 shows a section through the heart.

Draw an **X** on **Figure 5** to show the position of the pacemaker.

[1 mark]

Figure 5



0 3 . 7 A patient may be fitted with an artificial pacemaker.

What condition may be treated using an artificial pacemaker?

[1 mark]

13

4.4.2.2 Response to exercise

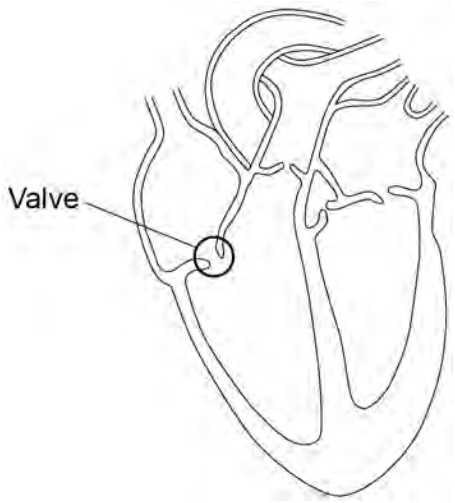
Question 38

June 2019 | 8461/1H | Original Q5

0 5 **Figure 6** shows the internal structure of the human heart.

One of the heart valves is labelled.

Figure 6



Sometimes a valve in the heart can start to leak.

0 5 . 1 Explain why a person with a leaking heart valve has difficulty exercising.

[4 marks]

4.4.2.2 Response to exercise

Question 38 · continued

A patient with a leaking heart valve may have the valve replaced.

A study compared two different types of replacement heart valve:

- mechanical valves
- biological valves from pigs.

The data used in the study was collected from female patients aged 50–69.

Table 4 shows the data.

Table 4

	Type of replacement heart valve	
	Mechanical	**Biological**
Number of patients given the valve	2852	1754
Number of patients who died from heart-related problems after valve replacement	180	178
Percentage of patients alive after 5 years	91	89
Percentage of patients needing a second valve replacement within 6 years	2.2	5.2
Percentage of patients who had a blood clot on the brain after surgery	5.8	0.1

0 5 . 2 Give **one** conclusion about the death of patients from heart-related problems after a valve replacement.

Include calculations to support your answer.

[3 marks]

4.4.2.2 Response to exercise

Question 38 · continued

0 5 . 3 One risk of mechanical valves is that blood clots can form on the surface of the valve.

Name the component of the blood that starts the process of blood clotting.

[1 mark]

0 5 . 4 Evaluate the use of mechanical replacement heart valves and biological replacement heart valves.

Use information from **Table 4** and your own knowledge.

[6 marks]

14

4.4.2.2 Response to exercise

Question 39

November 2021 | 8461/2H | Original Q3

0 3 Human body temperature is controlled within very narrow limits.

Scientists investigated the effect of drinking ice-cold water on:

- internal body temperature
- the rate of sweating.

This is the method used.

1. Sit a person inside a room kept at a constant temperature of 25 °C.
2. Measure the person's internal body temperature near the brain.
3. Measure the person's rate of sweating.
4. After 20 minutes, give the person 500 cm^3 of ice-cold water to drink.
5. Continue to measure the person's internal body temperature and sweating rate for a further 50 minutes.

0 3 . 1 Give the reason why the person should **not** move during the investigation.

[1 mark]

Question 3 continues on the next page

4.4.2.2 Response to exercise

Question 39 · continued

Figure 5 and **Figure 6** show the scientists' results.

Figure 5

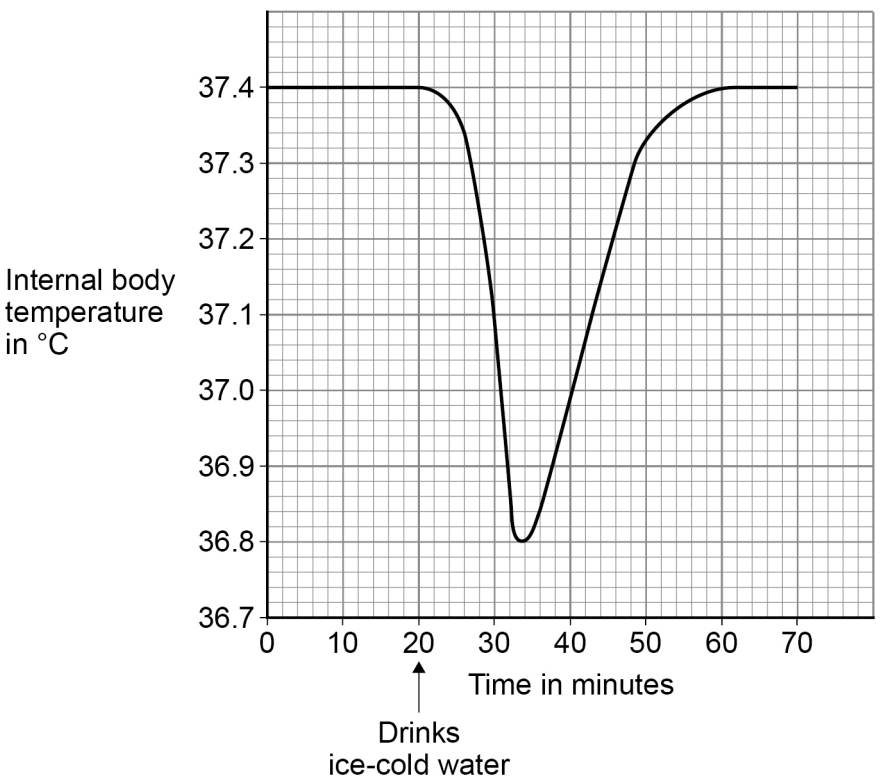
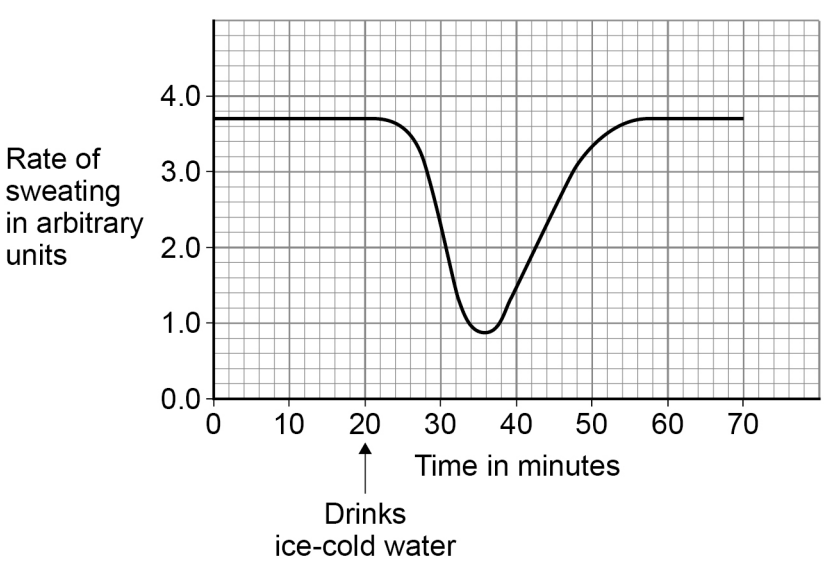


Figure 6



4.4.2.2 Response to exercise

Question 39 · continued

0 3 . 2 What is this person's normal internal body temperature?

[1 mark]

Tick (✓) **one** box.

36.8 °C ☐ 37.0 °C ☐ 37.4 °C ☐

The results show that when the ice-cold water was drunk, the temperature near the brain decreased.

0 3 . 3 Explain why the temperature near the brain decreased.

[2 marks]

0 3 . 4 The thermoregulatory centre in the brain responds to the decrease in temperature.

How does the thermoregulatory centre send information to sweat glands in the skin?

[1 mark]

0 3 . 5 The rate of sweating changes between 24 minutes and 36 minutes.

Explain how this change helps to maintain the person's normal body temperature.

[2 marks]

Question 3 continues on the next page

4.4.2.2 Response to exercise

Question 39 · continued

0 3 . 6 During exercise, the skin appears red.

What causes the skin to appear red?

[1 mark]

Tick (✓) **one** box.

Blood vessels moving closer to the skin surface ☐

Constriction of blood vessels in the skin ☐

Decrease in heart rate ☐

Dilation of blood vessels in the skin ☐

8

Turn over for the next question

4.4.2.2 Response to exercise

Question 40

0 8 An echidna is a mammal that lives in Australia.

Figure 10 shows an echidna.

Figure 10



Figure 11 shows how the body temperature of the echidna varies in warm weather and in cold weather.

Figure 11

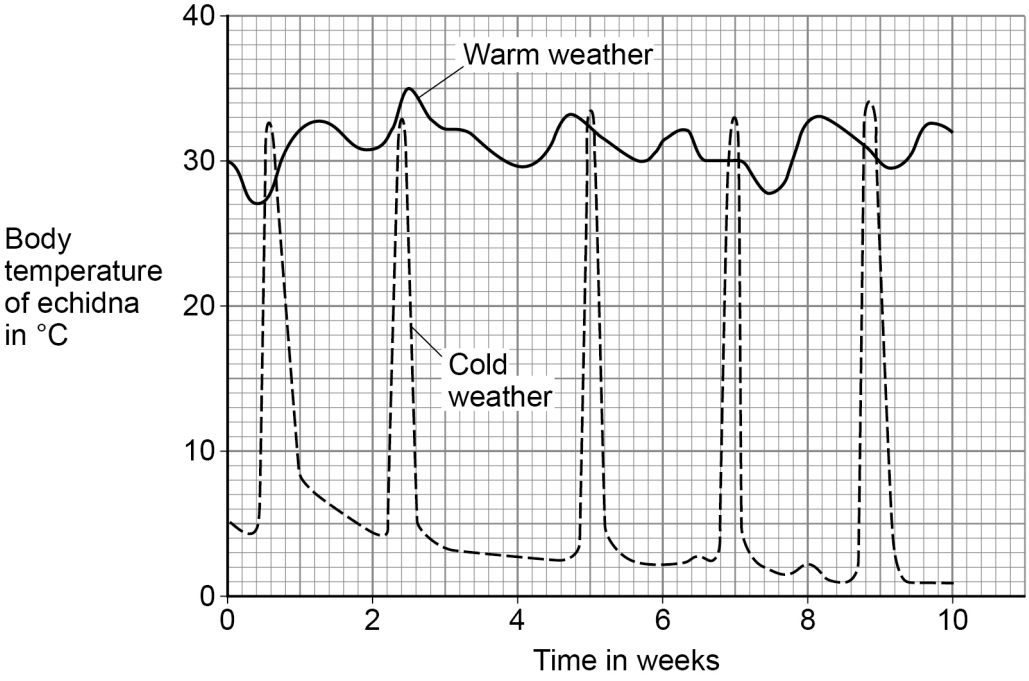
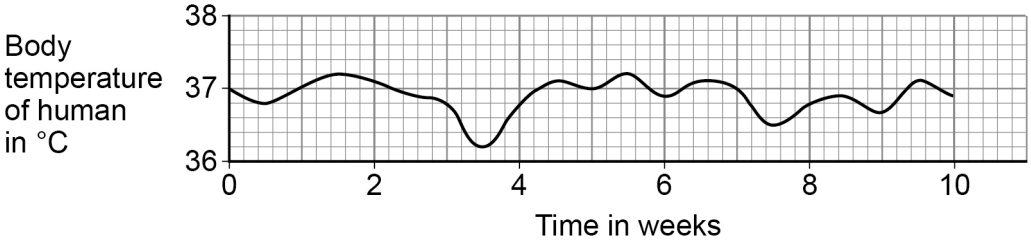


Figure 12 shows how human body temperature varies.

Figure 12



4.4.2.2 Response to exercise

Question 40 · continued

0 8 . 1 Compare the variation in body temperature of the echidna in warm weather with the variation in body temperature of the human.

Use data from **Figure 11** and **Figure 12**.

[2 marks]

In the cold winter months, the echidna hibernates.

During hibernation:

- the echidna's body temperature decreases to below 5 °C
- the echidna sleeps for up to 17 days at a time
- the echidna's rate of metabolism slows down.

0 8 . 2 Explain why the decrease in body temperature is an advantage to the echidna during hibernation.

[2 marks]

Question 8 continues on the next page

4.4.2.2 Response to exercise

Question 40 · continued

0 8 . 3 During hibernation the echidna wakes up several times.

Each time the echidna wakes up it becomes active and its body temperature increases to over 30 °C.

Explain why the echidna has a higher body temperature when it is active.

[2 marks]

0 8 . 4 An echidna can dilate and constrict blood vessels in its skin.

Explain how the **dilation** of blood vessels in the skin can help to decrease body temperature.

[3 marks]

4.4.2.2 Response to exercise

Question 40 · continued

An athlete trained in a hot climate.

The athlete lost a large volume of water each day in sweat.

0 8 . 5 The athlete's energy intake each day from food was 20 000 kJ.

Evaporation of 1 cm^3 of sweat requires 2.5 kJ of energy.

40% of the athlete's daily energy intake was used to evaporate sweat.

Calculate the volume of sweat the athlete lost each day.

Give your answer in dm^3

1 dm^3 = 1 000 cm^3

[3 marks]

Volume of sweat lost in one day = _____ dm^3

0 8 . 6 Suggest why the athlete was advised to take salt tablets each day.

[1 mark]

13

4.4.2.2 Response to exercise

Question 41

June 2023 | 8461/1H | Original Q4

0 4 This question is about exercise.

0 4 . 1 During vigorous exercise, anaerobic respiration occurs in a person's body.

Explain **two** effects of anaerobic respiration on the person's body.

[4 marks]

1 _____

2 _____

4.4.2.2 Response to exercise

Question 41 · continued

0 4 . 2 Design an investigation to show the effect of different types of exercise on the heart rate of athletes.

[6 marks]

Question 4 continues on the next page

4.4.2.2 Response to exercise

Question 41 · continued

Anabolic steroids are drugs.

Anabolic steroids:

- increase muscle mass in humans
- are banned in most competitive sports.

Some athletes take anabolic steroids to improve their performance in sport.

0 4 . 3 Explain how taking anabolic steroids could improve an athlete's performance.

[2 marks]

Scientists use monoclonal antibodies to test for the presence of anabolic steroids in an athlete's urine.

To produce monoclonal antibodies, a mouse lymphocyte is combined with a tumour cell.

0 4 . 4 What type of cell is created when a mouse lymphocyte and a tumour cell combine?

[1 mark]

Tick (✓) **one** box.

- Embryo ☐
- Hybridoma ☐
- Phagocyte ☐
- Stem cell ☐

4.4.2.2 Response to exercise

Question 41 · continued

0 4 . 5 Describe how scientists make monoclonal antibodies using the cell created when a mouse lymphocyte and a tumour cell combine.

[3 marks]

0 4 . 6 What property makes a monoclonal antibody useful in detecting the presence of an anabolic steroid in urine?

[1 mark]

Tick (✓) **one** box.

A monoclonal antibody is quick and easy to produce. ☐

A monoclonal antibody is specific to only one person's urine. ☐

A monoclonal antibody only binds to the anabolic steroid. ☐

A monoclonal antibody can identify many different drugs at the same time. ☐

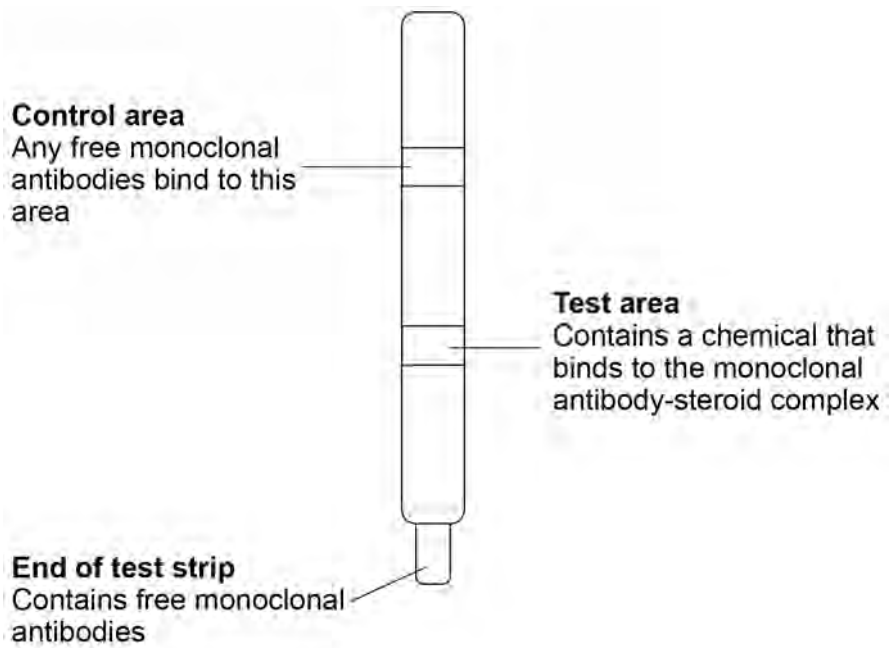
Question 4 continues on the next page

4.4.2.2 Response to exercise

Question 41 · continued

Figure 5 shows a test strip that can detect the presence of an anabolic steroid in an athlete's urine.

Figure 5



The end of the test strip is dipped in urine.

The urine moves up through the test strip.

The test area and the control area contain a dye.
The dye turns blue when monoclonal antibodies bind to it.

0 4 . 7 Suggest the purpose of the control area in the test strip.

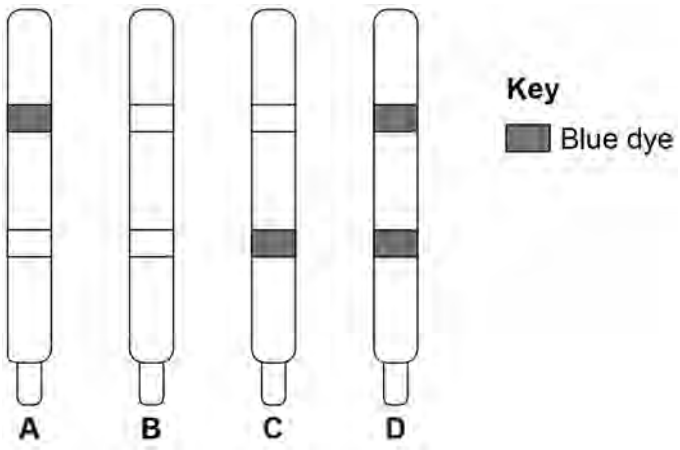
[1 mark]

4.4.2.2 Response to exercise

Question 41 · continued

Figure 6 shows the urine test results of four athletes.

Figure 6



0 4 . 8 Describe the evidence in **Figure 6** that shows the test for athlete **B** has **not** worked.

Suggest **one** reason why the test did **not** work.

[2 marks]

Evidence _____

_____

Reason _____

_____

0 4 . 9 Which athlete has tested positive for anabolic steroids in their urine?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

21

4.4.2.2 Response to exercise

Question 42

June 2025 | 8461/1H | Original Q5

0 5 This question is about the human circulatory system.

0 5 . 1 Blood plasma transports blood cells around the body.

Give **one** other function of blood plasma.

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

[1 mark]

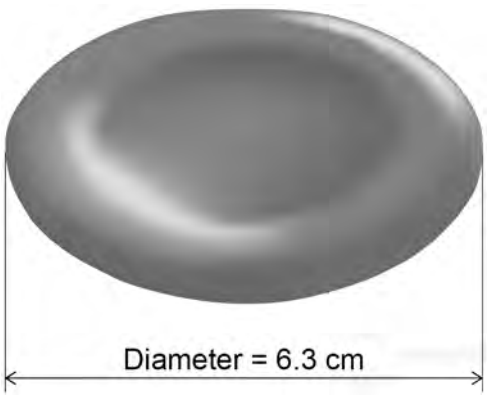
Question 5 continues on the next page

4.4.2.2 Response to exercise

Question 42 · continued

0 5 . 2 **Figure 5** shows a red blood cell.

Figure 5



The image of the red blood cell in **Figure 5** is magnified 7200 times.

Calculate the real diameter of the red blood cell.

Give your answer in micrometres (µm).

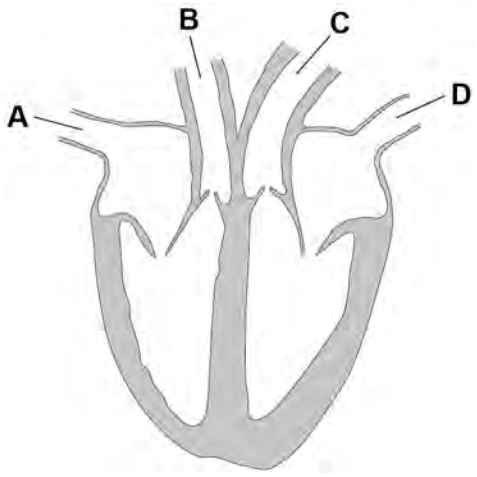
[5 marks]

Real diameter = _____ µm

Question 42 · continued

Figure 6 shows the heart.

Figure 6



0 5 . 3 Blood pressure is a measure of the force of the blood against the walls of the blood vessels.

Table 5 shows information about the different types of blood vessel shown in **Figure 6**.

[2 marks]

Table 5

Pressure of blood travelling through blood vessel in arbitrary units	Blood vessel in Figure 6
4	**D**
5	
18	
120	

Complete **Table 5** using the correct letters from **Figure 6**.

One row has been completed for you.

0 5 . 4 Name blood vessel **D** in **Figure 6**.

[1 mark]

Question 5 continues on the next page

4.4.2.2 Response to exercise

Question 42 · continued

0 5 . 5 Describe the structure of the walls of an artery.

[1 mark]

An athlete ran on a running machine.

The athlete:

- reached their maximum intensity of exercise and then stopped exercising
- had their use of oxygen recorded
- had the lactic acid concentration in their blood recorded.

0 5 . 6 During the exercise the athlete respired aerobically **and** anaerobically.

Explain why anaerobic respiration is less efficient than aerobic respiration.

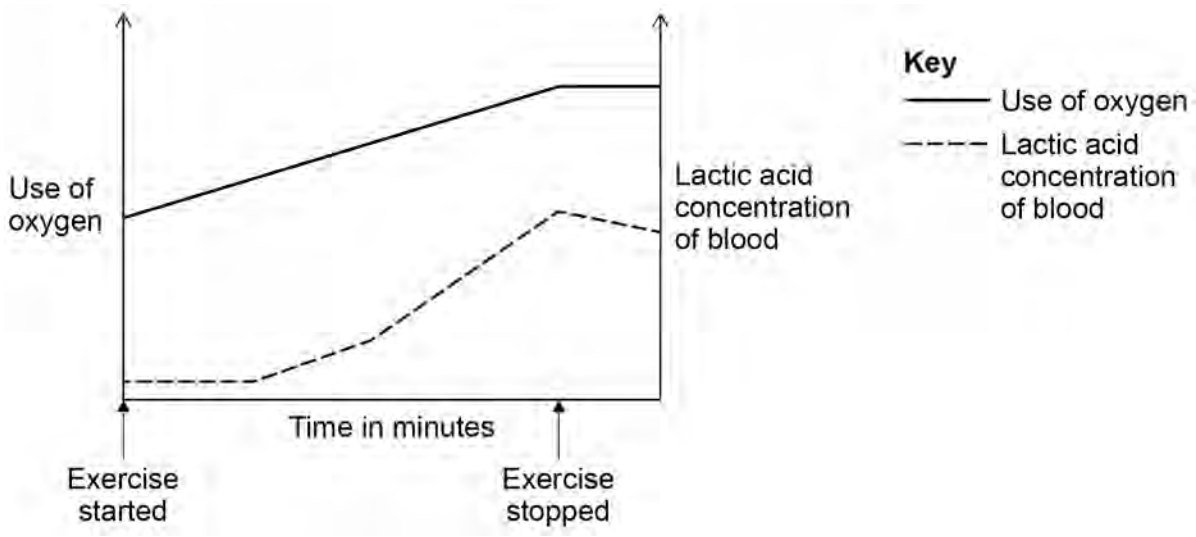
[2 marks]

4.4.2.2 Response to exercise

Question 42 · continued

Figure 7 shows the athlete's use of oxygen and the lactic acid concentration of blood during exercise and after exercise.

Figure 7



0 5 . 7 Explain why the use of oxygen remained high **after** the athlete stopped exercising.

[2 marks]

Question 5 continues on the next page

4.4.2.2 Response to exercise

Question 42 · continued

0 5 . 8 Some athletes regularly exercise in conditions that increase the number of red blood cells.

Explain why having an increased number of red blood cells is an advantage to an athlete.

[2 marks]

16