AQA GCSE Biology | 8461

SPECIFICATION POINT 4.4.2.2

Response to exercise

Past-paper questions

Tier	**Foundation**
Question groups	**39**
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

June 2007 | BLY1A | Original Q7 | Legacy

QUESTION SEVEN

The table is from the label on a loaf of sliced bread.

Nutrition information			Guideline daily amounts		
Typical values	**Per 100 g**	**Per slice**	**Women**	**Men**	**Children (5–10 years)**
energy (kJ)	2144	658	8500	10 500	7500
protein (g)	4.0	1.2	75	95	65
carbohydrate (g)	55.1	16.9	230	300	220
fat (g)	22.6	7.0	70	70	50
salt (g)	0.9	0.3	5	6	4
Other information Keep an eye on your salt intake Generally a low fat diet is good for you If possible take 30 minutes of brisk exercise each day					

7A For which food type is the guideline daily amount the same for men and women?

1 carbohydrate

2 fat

3 protein

4 salt

7B A woman ate two slices of bread for breakfast.

What proportion of the daily guideline amount of fat did she eat?

1 $\frac{1}{14}$

2 $\frac{1}{10}$

3 $\frac{1}{7}$

4 $\frac{1}{5}$

7C **Table 1** shows the amount of energy used for different levels of exercise.

Table 1

Level of exercise	Energy used in kilojoules per hour
light exercise	620
moderate exercise	1200
vigorous exercise	2760

Table 2 shows a person's weekly exercise routine.

Table 2

	Type of exercise in minutes		
Day of week	**Light**	**Moderate**	**Vigorous**
Monday	20	20	20
Tuesday	30	30	20
Wednesday	30	30	20
Thursday	30	30	20
Friday	30	30	20
Saturday	30	30	20
Sunday	30	20	20

What is the total amount of energy used by this person on Tuesday and Wednesday together?

1 3460 kilojoules

2 3660 kilojoules

3 3760 kilojoules

4 4580 kilojoules

Question 7 continues on the next page

4.4.2.2 Response to exercise

Question 01 · continued June 2007 | BLY1A | Original Q7 | Legacy

7D The link between exercise and nutrients in food is . . .

1 the less exercise you take, the less energy you need.

2 the less exercise you take, the more carbohydrate you need.

3 the less exercise you take, the more protein you need.

4 the more exercise you take, the less salt you need.

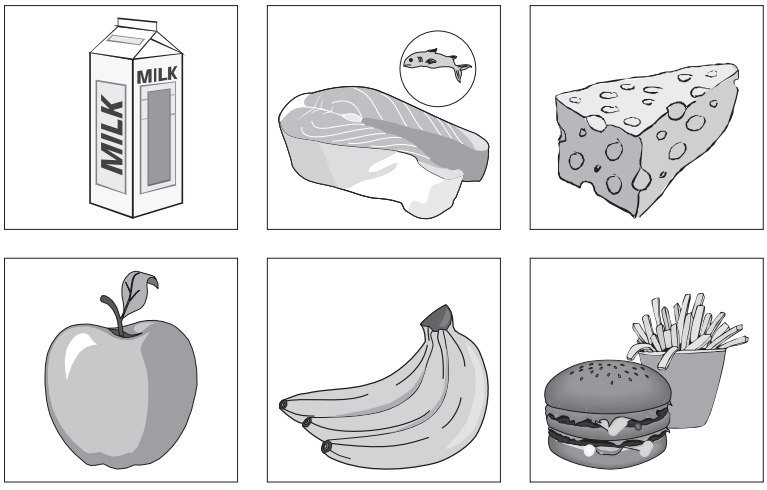
4.4.2.2 Response to exercise

Question 02

November 2007 | BLY1A | Original Q3 | Legacy

QUESTION THREE

This question is about a healthy diet.



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

A better than

B less than

C more than

D the same as

A balanced diet containing fruit and vegetables is . . . **1** . . . a diet of only burger and chips.

A person loses weight when the energy they take in is . . . **2** . . . the energy they use up.

If you want to remain the same weight, it is important that the energy in the food you eat is . . . **3** . . . the amount of energy you are using.

Exercise helps to reduce an obese person's weight by making sure that the energy they use is . . . **4** . . . the energy they take in.

4.4.2.2 Response to exercise

Question 03

November 2007 | BLY1A | Original Q9 | Legacy

QUESTION NINE

This question is about obesity.

9A Which one of the following diseases is linked to obesity?

1 arthritis

2 brain damage

3 deficiency disease

4 lung cancer

9B 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.

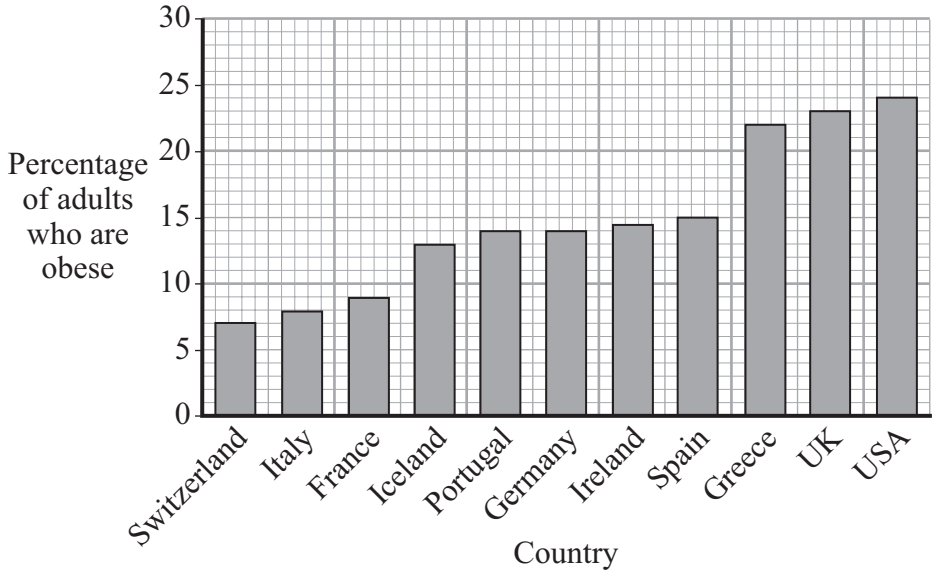
3 people have less time to eat when they are exercising.

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.



9C 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.

9D 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.

END OF TEST

4.4.2.2 Response to exercise

Question 04

January 2008 | BLY1F | Original Q3 | Legacy

3 (a) Use words from the box to complete the sentences about controlling conditions in our bodies.

kidneys	**liver**	**lungs**	**skin**

(i) When we breathe out, water leaves the .....

(1 mark)

(ii) When we sweat, water leaves the body through the .....

(1 mark)

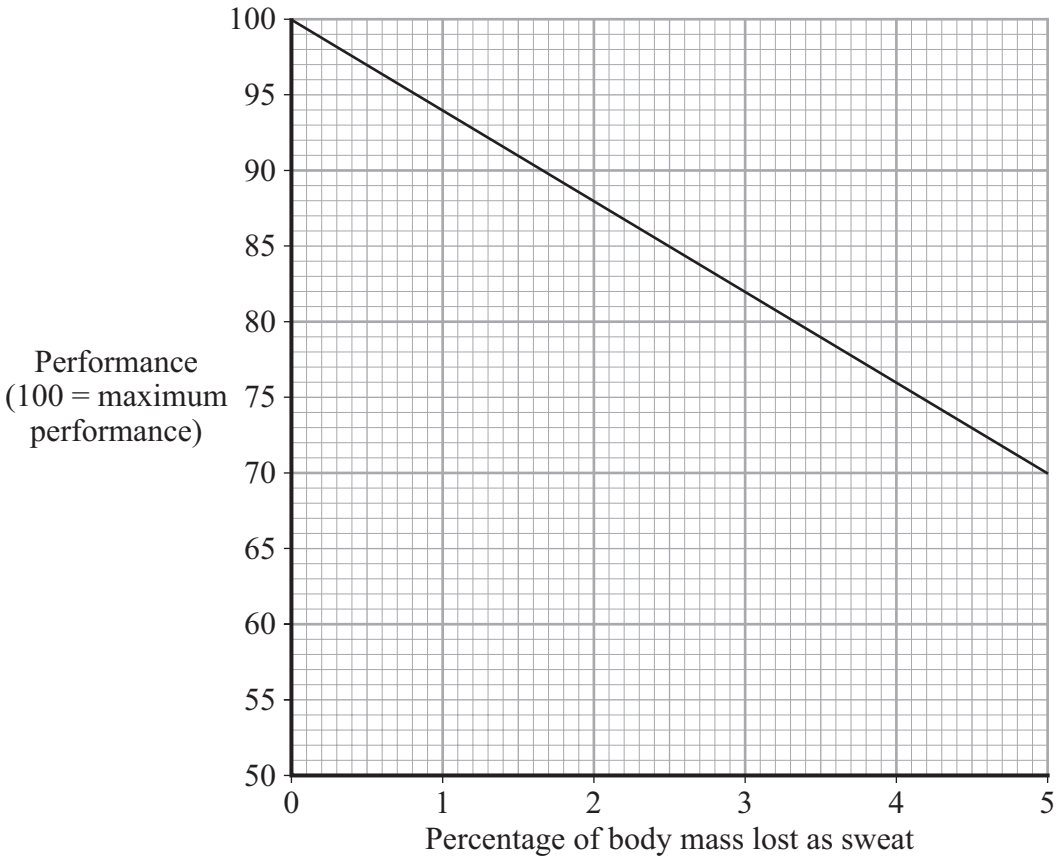
(iii) Excess water leaves the body in a liquid called urine.

Urine is produced by the ..... .

(1 mark)

(b) We lose a lot of sweat during exercise. When this happens, we cannot perform as well as we could at the start of the exercise.

The graph shows the effect of losing sweat on the performance of an athlete.



4.4.2.2 Response to exercise

Question 04 · continued

BLANK

(i) Describe the effect of losing sweat on performance.

.....

.....

(1 mark)

(ii) How can athletes reduce this effect on performance?

.....

.....

(1 mark)

5

Turn over for the next question

4.4.2.2 Response to exercise

Question 05

January 2008 | BLY1F | Original Q4 | Legacy

4 Health is affected by diet and exercise.

(a) List **A** gives the names of three conditions which affect the body.

List **B** gives information about these conditions.

Draw a straight line from each condition in List **A** to the information about it in List **B**.

List A – Condition	**List B – Information**
	Linked to lack of food
High blood cholesterol level	
	Linked to eating too much saturated fat
Arthritis	
	Linked to too much salt in the diet
Reduced resistance to infection	
	Linked to too much weight acting on the joints

(3 marks)

(b) Give **two** reasons why exercise is good for us.

1 .....

.....

2 .....

.....

(2 marks)

5

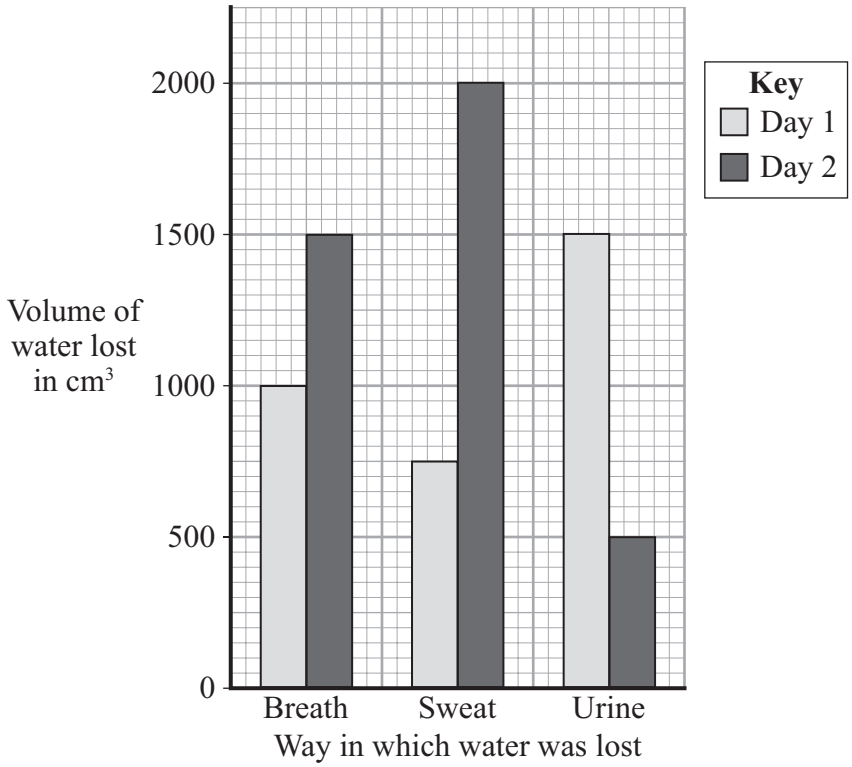
4.4.2.2 Response to exercise

Question 06

January 2008 | BLY2F | Original Q2 | Legacy

2 The bar chart shows the amount of water lost from the body of a student on two different days.

The student ate the same amount of food and drank the same amount of liquid on the two days. The temperature of the surroundings was similar on the two days.



(a) The total volume of water lost on day 1 was 3250 cm^3.

How much water was lost on day 2? Show all your working.

.....

..... cm^3

(2 marks)

(b) The student did much more exercise on one of the days than on the other.

On which day did he do more exercise? Day .....

Give **two** reasons for your answer.

1 .....

.....

2 .....

.....

(2 marks)

4.4.2.2 Response to exercise

Question 06 · continued

BLANK

(c) (i) Which **one** of these is a chemical reaction that produces water in the body?

Put a tick (✓) in the box next to your choice.

Breathing ☐

Osmosis ☐

Respiration ☐

Sweating ☐

(1 mark)

(ii) How does sweating help the body?

.....

.....

(1 mark)

(iii) If the body loses more water than it gains, it becomes dehydrated.
The concentration of the solution surrounding the body cells increases.
This causes the cells to lose water.

By which process do cells lose water?

Put a tick (✓) in the box next to your choice.

Breathing ☐

Osmosis ☐

Respiration ☐

Sweating ☐

(1 mark)

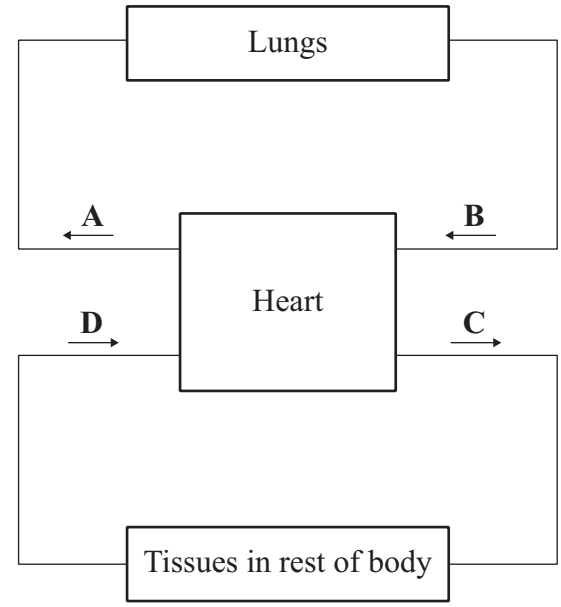
7

4.4.2.2 Response to exercise

Question 07

January 2008 | BLY3F | Original Q2 | Legacy

2 The diagram represents the human blood circulation system.



(a) **A**, **B**, **C** and **D** are blood vessels.

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

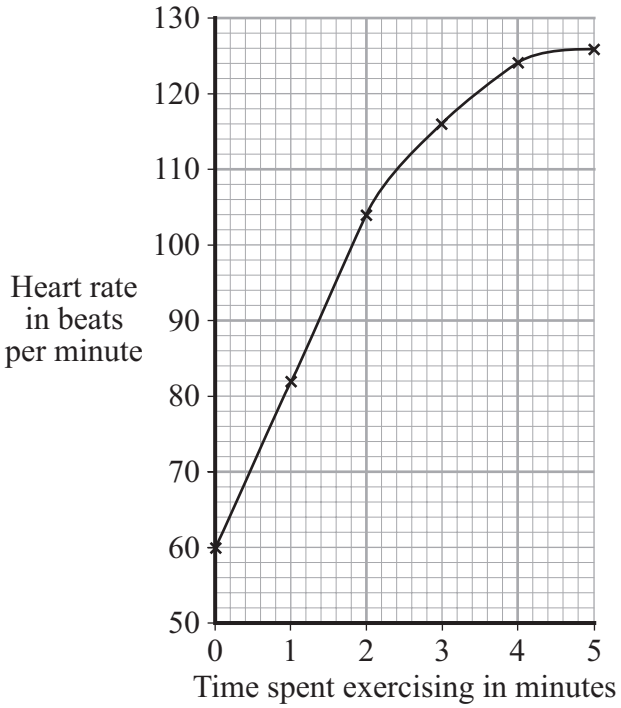
(ii) Give the letter of **one** blood vessel that is a vein. .....
(1 mark)

4.4.2.2 Response to exercise

Question 07 · continued

BLANK

(b) 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.
The results are shown in the graph.



(i) What was the student's heart rate before the exercise began?

..... per minute
(1 mark)

(ii) How long was it before the student's heart rate reached 124 beats per minute?

..... minutes
(1 mark)

(c) Which of the following parts of the blood carries most oxygen?

Draw a circle around **one** answer.

plasma **red blood cells** **white blood cells**

(1 mark)

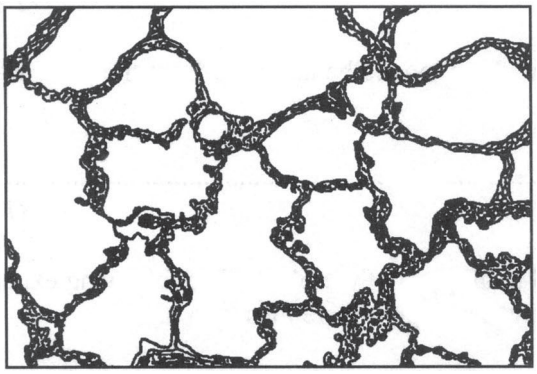
5

4.4.2.2 Response to exercise

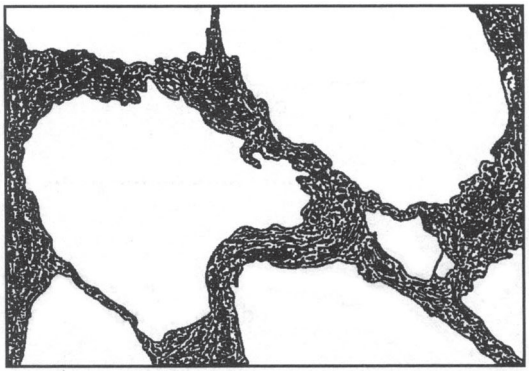
Question 08

5 Emphysema is a lung disease.

(a) The drawings show sections through the lung of a healthy person and through the lung of a person with emphysema. The drawings are drawn to the same scale.



Section through the lung of a healthy person



Section through the lung of a person with emphysema

Use information from the drawings to answer the questions.

What effect does emphysema have on:

(i) the thickness of the surface used for gas exchange

.....

.....

(1 mark)

(ii) the total area available for gas exchange?

.....

.....

(1 mark)

4.4.2.2 Response to exercise

Question 08 · continued

BLANK

(b) Two men did the same amount of exercise.
One man was in good health. The other man had emphysema.

The results are shown in the table.

	Man with good health	**Man with emphysema**
Oxygen entering blood in dm^3 per minute	2.1	1.1
Air flow into lungs in dm^3 per minute	90.7	46.0

The man in good health was able to take more oxygen into his blood than the man with emphysema.

Calculate how much more oxygen was taken into the blood per minute by the man in good health. Show your working.

.....

.....

Answer =..... dm^3 per minute
(2 marks)

4

4.4.2.2 Response to exercise

Question 09

June 2008 | BLY1F | Original Q6 | Legacy

6 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

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

.....

(1 mark)

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

.....

(1 mark)

4.4.2.2 Response to exercise

Question 09 · continued

for mark

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

1 .....

.....

2 .....

.....

(2 marks)

6 (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

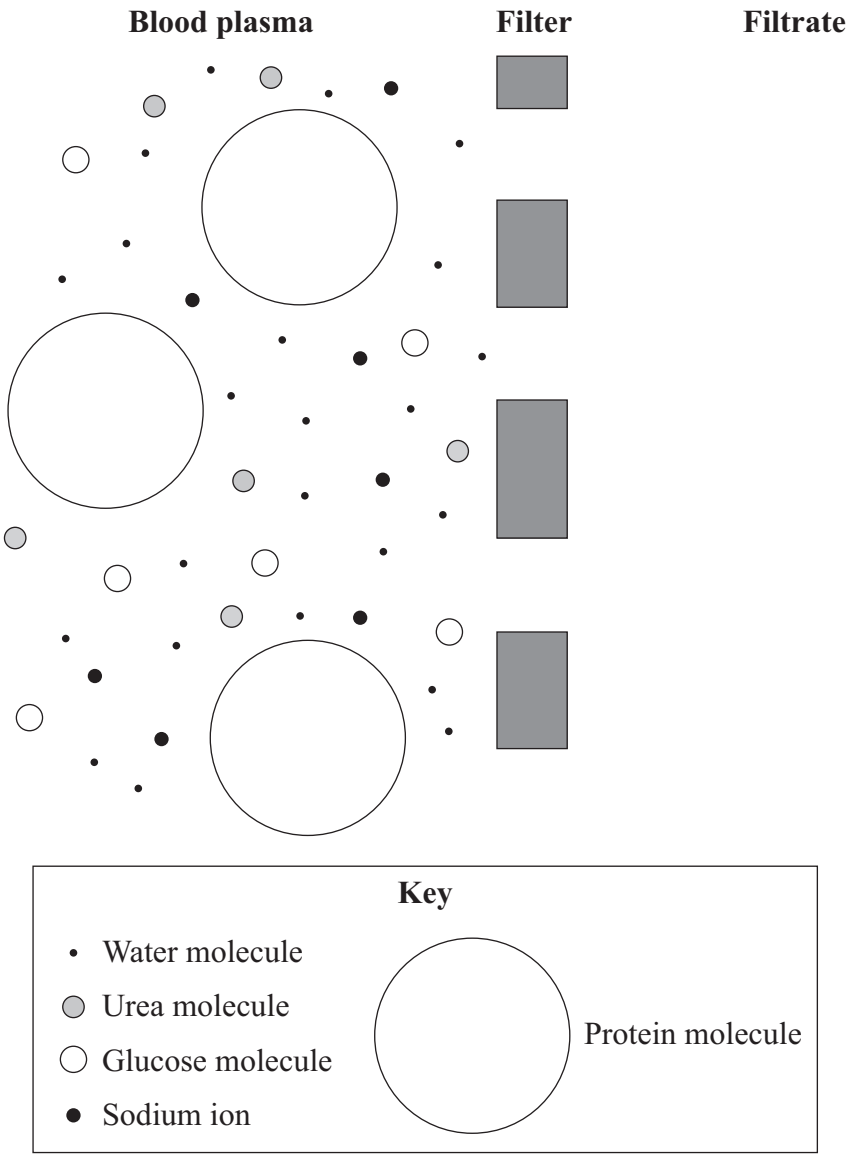
4.4.2.2 Response to exercise

Question 10

June 2008 | BLY3F | Original Q2 | Legacy

2 The kidneys filter the blood.

The diagram shows the site of filtration in the kidney.



4.4.2.2 Response to exercise

Question 10 · continued

for mark

2 (a) Use information from the diagram to answer this question.

Put a tick (✓) in the box next to every substance that will pass through the filter from the blood plasma into the filtrate.

One has been done for you.

glucose	✓
urea	
water	
sodium ions	
protein	

(2 marks)

2 (b) Proteins and glucose are not present in the urine of a healthy person.

2 (b) (i) Use information from the diagram to explain why protein is not found in the urine of a healthy person.

.....

.....

(1 mark)

2 (b) (ii) Complete the sentence by drawing a ring around the correct answer.

After filtration, all the glucose is

reabsorbed
released
respired

.

(1 mark)

Question 2 continues on the next page

4.4.2.2 Response to exercise

Question 10 · continued

for mark

2 (c) An athlete trained on a hot day and on a cold day. On each day, he did the same amount of exercise and drank the same volume of water.

Complete the sentences by drawing a ring around the correct answer.

2 (c) (i) On the hot day, the athlete would produce [less / more / the same amount of] urine.

(1 mark)

2 (c) (ii) This is because he would produce [less / more / the same amount of] sweat.

(1 mark)

6

4.4.2.2 Response to exercise

Question 11

November 2008 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

This question is about food and energy.

6A Which of the following conditions is **not** linked to obesity?

1 diabetes

2 measles

3 high blood pressure

4 arthritis

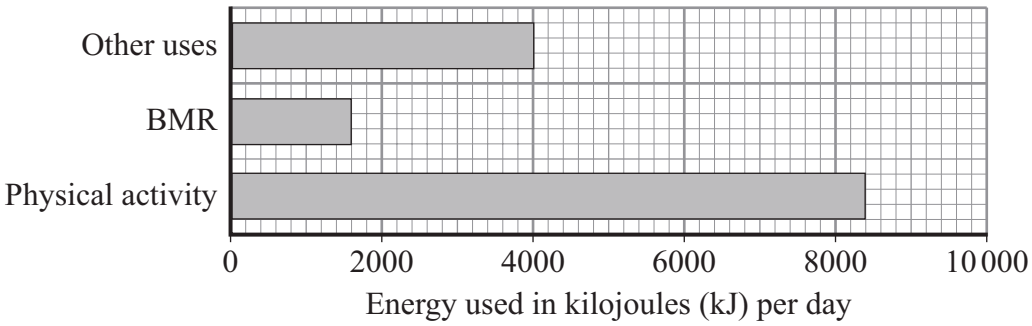
6B Which person is likely to need the least amount of food?

Person	Amount of exercise	Temperature of country where person lives
1	high	warm
2	high	cold
3	low	warm
4	low	cold

4.4.2.2 Response to exercise

Question 11 · continued

The bar chart shows the amount of energy used by a teenager.
BMR is the amount of energy needed to keep the teenager alive.



6C What is the total amount of energy used by the teenager in one day?

1 1600 kJ

2 4000 kJ

3 8400 kJ

4 14 000 kJ

6D What is likely to happen if the same teenager takes in 17 000 kJ each day?

The teenager would . . .

1 gain mass.

2 gain height.

3 become fitter.

4 be hungry all the time.

4.4.2.2 Response to exercise

Question 12

January 2009 | BLY3F | Original Q7 | Legacy

7 (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	

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

Show clearly how you work out your answer.

.....

.....

.....

.....

Answer = ... cm^3 per minute

(2 marks)

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

Explain why this is helpful during exercise.

.....

.....

.....

.....

.....

(2 marks)

4.4.2.2 Response to exercise

Question 12 · continued

for mark

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

1 .....

.....

2 .....

.....

(2 marks)

6

Turn over for the next question

4.4.2.2 Response to exercise

Question 13

June 2009 | BLY1AP | Original Q8 | Legacy

QUESTION EIGHT

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.

8A What was the dependent variable in this investigation?

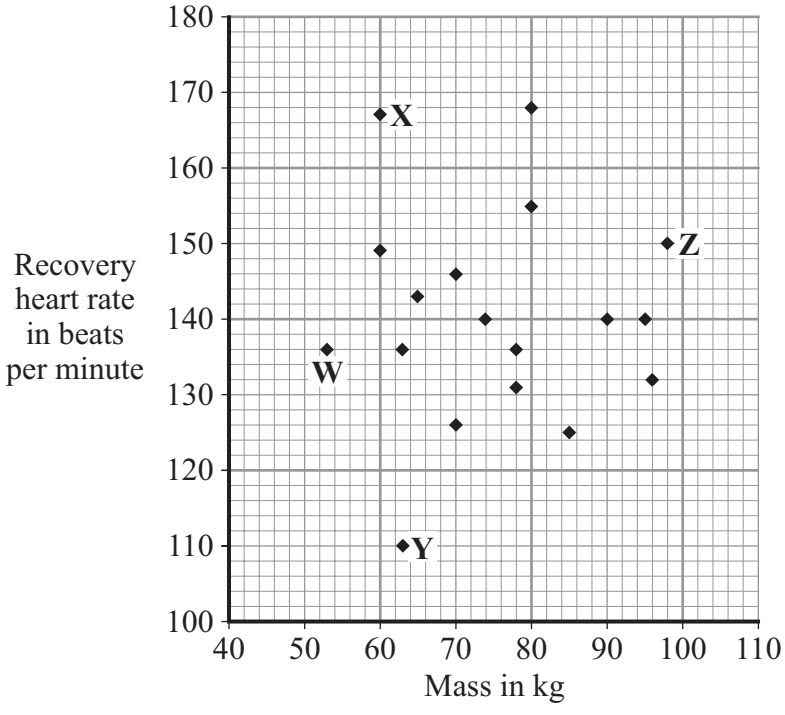
1 the mass of each student

2 the number of step-ups per minute

3 the length of the exercise period

4 the recovery heart rate of each student

The scattergram shows the results of the investigation.



4.4.2.2 Response to exercise

Question 13 · continued June 2009 | BLY1AP | Original Q8 | Legacy

8B Which was the fittest student?

1 **W**

2 **X**

3 **Y**

4 **Z**

8C 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.

8D 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

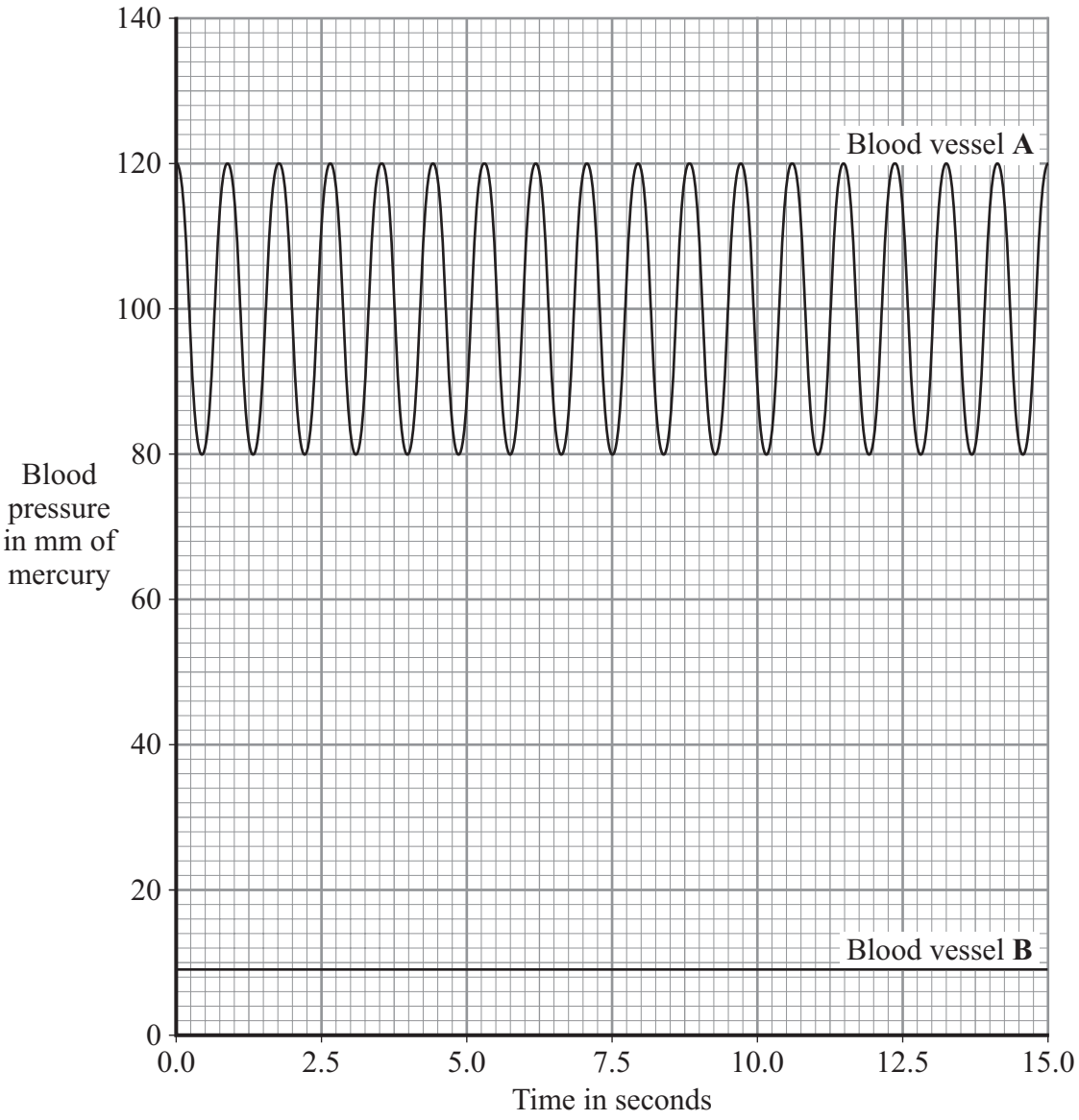
4.4.2.2 Response to exercise

Question 14

June 2009 | BLY3F | Original Q6 | Legacy

6 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 14 · continued

for mark

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

Blood vessel .....

Give **two** reasons for your answer.

Reason 1 .....

.....

Reason 2 .....

.....

(2 marks)

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

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

(1 mark)

6 (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)

6 (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.

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

1 .....

2 .....

(2 marks)

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

.....

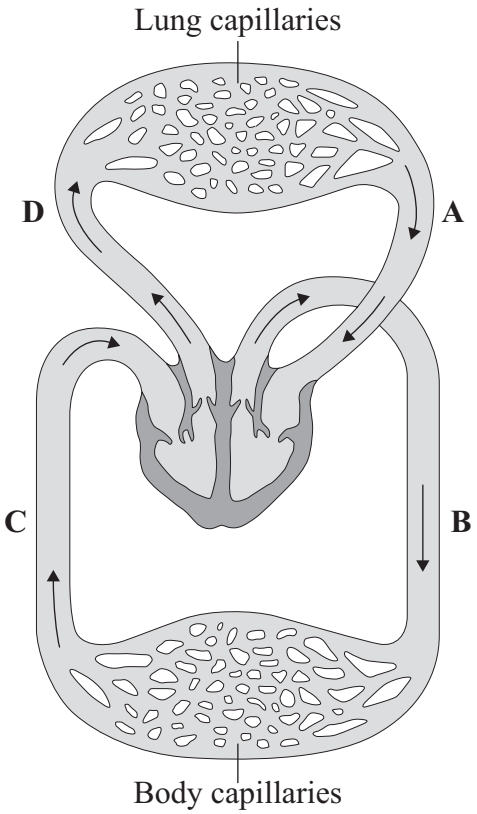
(1 mark)

7

4.4.2.2 Response to exercise

Question 15

7 The diagram shows the human circulation system.



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

(1 mark)

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

(1 mark)

4.4.2.2 Response to exercise

Question 15 · continued

for mark

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

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

6

4.4.2.2 Response to exercise

Question 16

March 2010 | BLY1AP | Original Q5 | Legacy

QUESTION FIVE

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 17

June 2010 | BLY1AP | Original Q9 | Legacy

QUESTION NINE

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.

9A 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

9B 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 17 · continued

9C 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.

9D 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.

END OF TEST

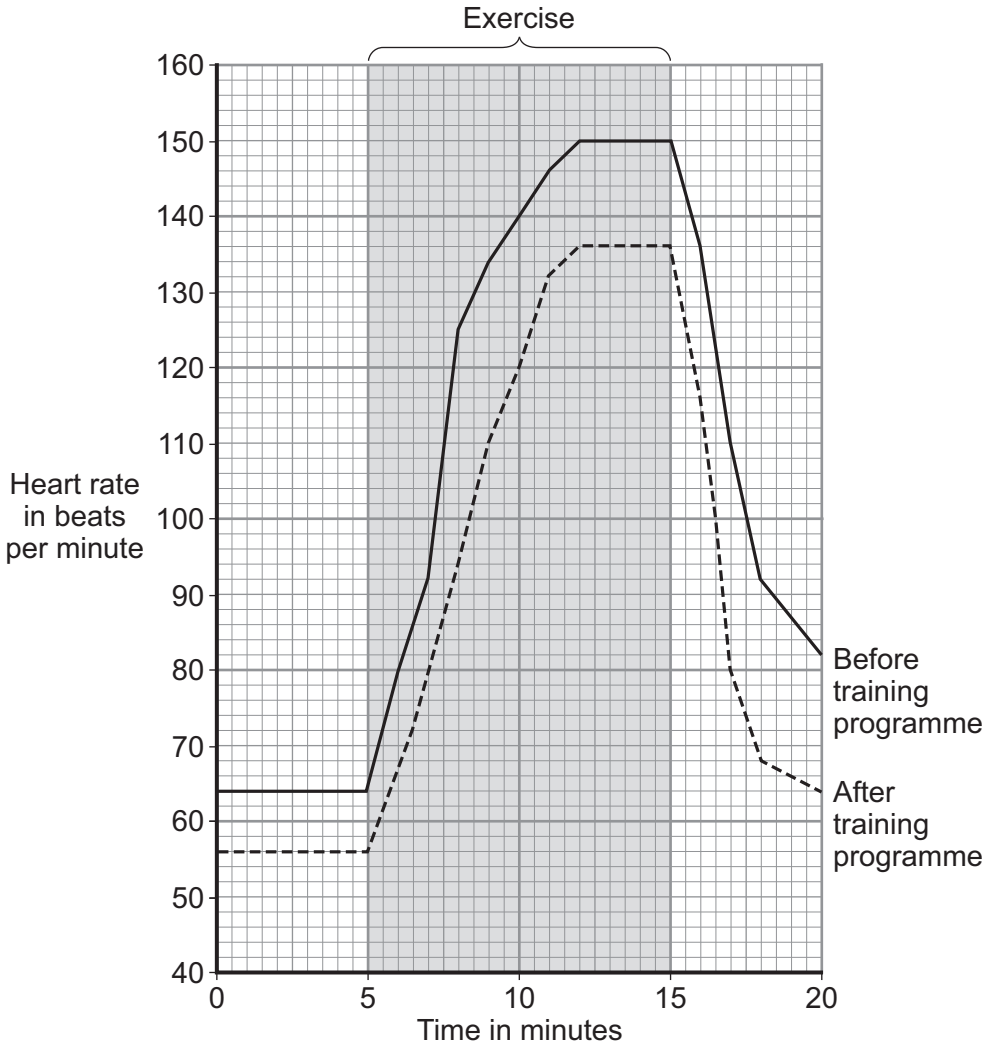
4.4.2.2 Response to exercise

Question 18

June 2010 | BLY3F | Original Q4 | Legacy

4 An athlete did a 6-month training programme.

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



4 (a) (i) What was the maximum heart rate of the athlete during exercise before the training programme?

..... beats per minute
(1 mark)

4.4.2.2 Response to exercise

Question 18 · continued

4 (a) (ii) Give **two** differences between the heart rate of the athlete before and after the training programme.

After the training programme

Difference 1 .....

.....

Difference 2 .....

.....

(2 marks)

4 (b) Which **two** substances need to be supplied to the muscles in larger amounts during exercise?

Tick (✓) **two** boxes.

Carbon dioxide ☐

Glucose ☐

Lactic acid ☐

Oxygen ☐

Urea ☐

(2 marks)

5

4.4.2.2 Response to exercise

Question 19

June 2019 | BLY3F | Original Q6 | Legacy

6 The table shows the concentrations of some substances in the blood plasma, kidney filtrate and urine of one person.

Substance	Concentration in grams per dm^3		
	Plasma	Filtrate	Urine
Protein	78.0	0.0	0.0
Glucose	0.8	0.8	0.0
Urea	0.3	0.3	20.0
Sodium ions	2.8	2.8	3.5

6 (a) Draw a ring around the correct answer to complete each sentence.

6 (a) (i) Protein is **not** found in the filtrate.

This is because protein molecules are

too large to pass through the filter.

used up in respiration.

reabsorbed into the blood.

(1 mark)

6 (a) (ii) Glucose is found in the filtrate but **not** in the urine.

This is because glucose is

too large to pass through the filter.

used up in respiration.

passed through the filter, then reabsorbed into the blood.

(1 mark)

4.4.2.2 Response to exercise

Question 19 · continued

6 (a) (iii) The concentration of urea is much higher in the urine than in the filtrate.

This is because

- urea is made by the kidney.
- water is reabsorbed from the filtrate into the blood.
- glucose and salts are reabsorbed from the filtrate into the blood.

(1 mark)

6 (a) (iv) The fluid entering the bladder

will contain

- water, protein, glucose, urea and sodium ions.
- water, urea and sodium ions.
- water, glucose, urea and sodium ions.

(1 mark)

6 (b) An athlete ran a 10-kilometre race on a cold day. He then ran the same race on a hot day. He ate and drank the same on each day.

Draw a ring round the correct answer to complete each sentence.

6 (b) (i) On the **hot** day this athlete will produce

- more urine.
- less urine.
- the same amount of urine.

(1 mark)

6 (b) (ii) On the **hot** day the athlete's urine will be

- more concentrated.
- less concentrated.
- the same concentration.

(1 mark)

6

4.4.2.2 Response to exercise

Question 20

January 2011 | BLY3F | Original Q7 | Legacy

7 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**

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

.....

(1 mark)

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

.....

(1 mark)

7 (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 20 · continued

7 (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)

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

Explain what causes this increase.

.....

.....

.....

.....

.....

.....

(3 marks)

8

4.4.2.2 Response to exercise

Question 21

June 2011 | BLY1AP | Original Q7 | Legacy

QUESTION SEVEN

Several factors affect the risk of heart disease.

The table shows how different occupations and the risk factors for heart disease are linked.

Risk factor	Percentage of occupational group at risk of heart disease				
	Professional	Semi-professional	Self-employed	Semi-skilled	Unskilled
Smoking	18	22	26	28	35
Less than 30 minutes of exercise per week	28	30	28	30	35
Drinking over 4 units of alcohol per day	34	37	34	36	34
Drinking over 8 units of alcohol on at least one day per week	18	19	18	20	18
High blood pressure	25	27	25	29	28
High total cholesterol	66	65	67	65	60
Being overweight	43	43	38	39	39
Obesity	21	20	27	24	23

7A Which occupational group take least exercise on average?

1 professional

2 semi-professional

3 semi-skilled

4 unskilled

7B Which risk factor affects all occupational groups the most?

1 smoking

2 drinking over 4 units of alcohol per day

3 high total cholesterol

4 obesity

4.4.2.2 Response to exercise

Question 21 · continued

7C For which risk factor is there the least variation between the different occupational groups?

1 smoking

2 drinking over 8 units of alcohol on at least one day per week

3 high blood pressure

4 being overweight

7D To which occupational group would it be best to target an anti-smoking campaign?

1 professional

2 semi-professional

3 self-employed

4 unskilled

Turn over for the next question

4.4.2.2 Response to exercise

Question 22

June 2011 | BLY3F | Original Q4 | Legacy

4 Muscles need energy during exercise.

Draw a ring around the correct answer in parts (a) and (b) to complete each sentence.

4 (a) (i) The substance stored in the muscles and used during exercise is

glycogen.

lactic acid.

protein.

(1 mark)

4 (a) (ii) The process that releases energy in muscles is

digestion.

respiration.

transpiration.

(1 mark)

4.4.2.2 Response to exercise

Question 22 · continued

June 2011 | BLY3F | Original Q4 | Legacy

4 (b) The table shows how much energy is used by two men of different masses when swimming at different speeds.

Speed of swimming in metres per minute	Energy used in kJ per hour	
	34 kg man	70 kg man
25	651	1155
50	1134	2103

4 (b) (i) When the 34 kg man swims at 50 metres per minute instead of at 25 metres per minute, the extra energy he uses each hour is

- 36 kJ.
- 483 kJ.
- 948 kJ.

(1 mark)

4 (b) (ii) When swimming at 50 metres per minute, each man's heart rate is faster than when swimming at 25 metres per minute.

A faster heart rate helps to supply the muscles with more

- carbon dioxide.
- glycogen.
- oxygen.

(1 mark)

4 (b) (iii) During the exercise the arteries supplying the muscles would

- constrict.
- dilate.
- pump harder.

(1 mark)

4 (c) When a person starts to swim, the breathing rate increases.

Give **one** way in which this increase helps the swimmer.

.....

.....

(1 mark)

6

4.4.2.2 Response to exercise

Question 23

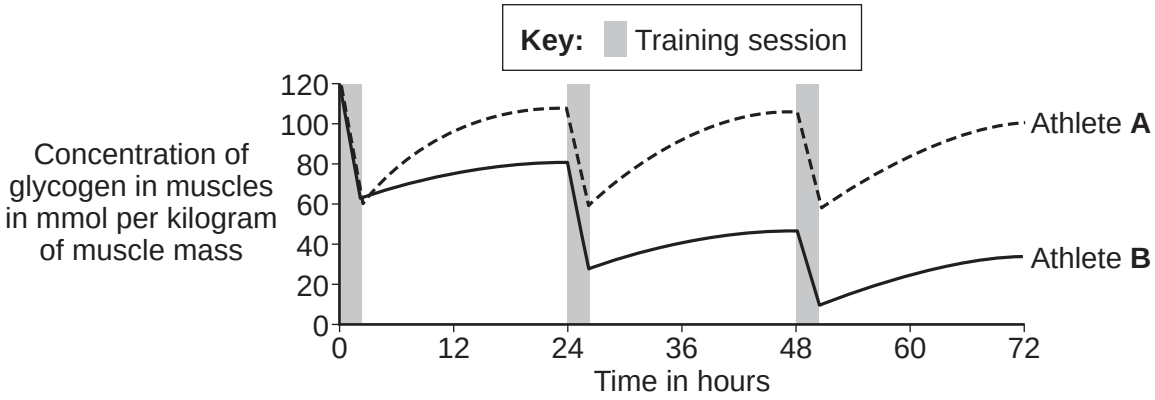
June 2012 | BL2FP | Original Q9 | Legacy

9 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.



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

.....

.....

.....

.....

.....

.....

(3 marks)

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

.....

.....

.....

.....

(2 marks)

4.4.2.2 Response to exercise

Question 23 · continued

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

.....

.....

(1 mark)

9 (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.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

10

4.4.2.2 Response to exercise

Question 24

January 2013 | BL2FP | Original Q6 | Legacy

6 Scientists investigated how exercise affects blood flow to different organs in the body.

The scientists made measurements of blood flow to different organs of:

- a person resting in a room at 20°C
- the same person, in the same room, doing vigorous exercise at constant speed on an exercise cycle.

The table shows the scientists' results.

Organ	Blood flow in cm^3 per minute whilst …	
	resting	doing vigorous exercise
Brain	750	750
Heart	250	1000
Muscles	1200	22 000
Skin	500	600
Other	3100	650

6 (a) In this investigation, it was better to do the exercise indoors on an exercise cycle than to go cycling outdoors on the road.

Suggest **two** reasons why.

Do **not** include safety reasons.

1 .....

.....

.....

2 .....

.....

.....

(2 marks)

6 (b) Blood flow to **one** organ did **not** change between resting and vigorous exercise.

Which organ? .....

(1 mark)

4.4.2.2 Response to exercise

Question 24 · continued

6 (c) (i) How much more blood flowed to the muscles during vigorous exercise than when resting?

.....

.....

Answer = ... cm^3 per minute

(2 marks)

6 (c) (ii) Name **two** substances needed in larger amounts by the muscles during vigorous exercise than when resting.

1 .....

2 .....

(2 marks)

6 (c) (iii) Tick (✓) **one** box to complete the sentence.

The substances you named in part **(c)(ii)** helped the muscles to

make more lactic acid. ☐

respire aerobically. ☐

make more glycogen. ☐

(1 mark)

Question 6 continues on the next page

4.4.2.2 Response to exercise

Question 24 · continued

6 (c) (iv) The higher rate of blood flow to the muscles during exercise removed larger amounts of waste products made by the muscles.

Which **two** substances need to be removed from the muscles in larger amounts during vigorous exercise?

Tick (✓) **two** boxes.

Amino acids ☐

Carbon dioxide ☐

Glycogen ☐

Lactic acid ☐

(2 marks)

6 (d) The total blood flow was much higher during exercise than when resting.

One way to increase the total blood flow is for the heart to pump out a larger volume of blood each beat.

Give **one** other way to increase the blood flow.

.....

.....

(1 mark)

11

4.4.2.2 Response to exercise

Question 25

June 2013 | BL1FP | Original Q1 | Legacy

1 The photograph shows an athlete at the start of a race.



1 (a) The athlete's sense organs contain special cells.
These special cells detect changes in the environment.

1 (a) (i) **List A** shows changes in the environment.

List B shows some of the athlete's sense organs.

Draw **one** line from each change in the environment in **List A** to the sense organ detecting the change in **List B**.

List A Change in the environment	List B Sense organ
Sight of the finishing line	Ear
Sound of the starting gun	Nose
Pressure of the ground on the fingers	Eye
	Skin

(3 marks)

4.4.2.2 Response to exercise

Question 25 · continued

1 (a) (ii) Which cells detect changes in the environment?

Tick (✓) **one** box.

Gland cells ☐

Muscle cells ☐

Receptor cells ☐

(1 mark)

1 (b) During the race, the concentration of sugar in the athlete's blood decreases.

Why?

.....

.....

(1 mark)

1 (c) Some athletes use anabolic steroids to improve performance.

1 (c) (i) Draw a ring around the correct answer to complete the sentence.

Anabolic steroids increase

breathing rate.

growth of muscles.

heart rate.

(1 mark)

1 (c) (ii) Sporting regulations ban the use of anabolic steroids.

Suggest **one** reason why.

.....

.....

(1 mark)

7

4.4.2.2 Response to exercise

Question 26

June 2014 | BL2FP | Original Q9 | Legacy

9 **Figure 13** shows an athlete running on a treadmill.

Figure 13



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.

9 (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]

.....

9 (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.

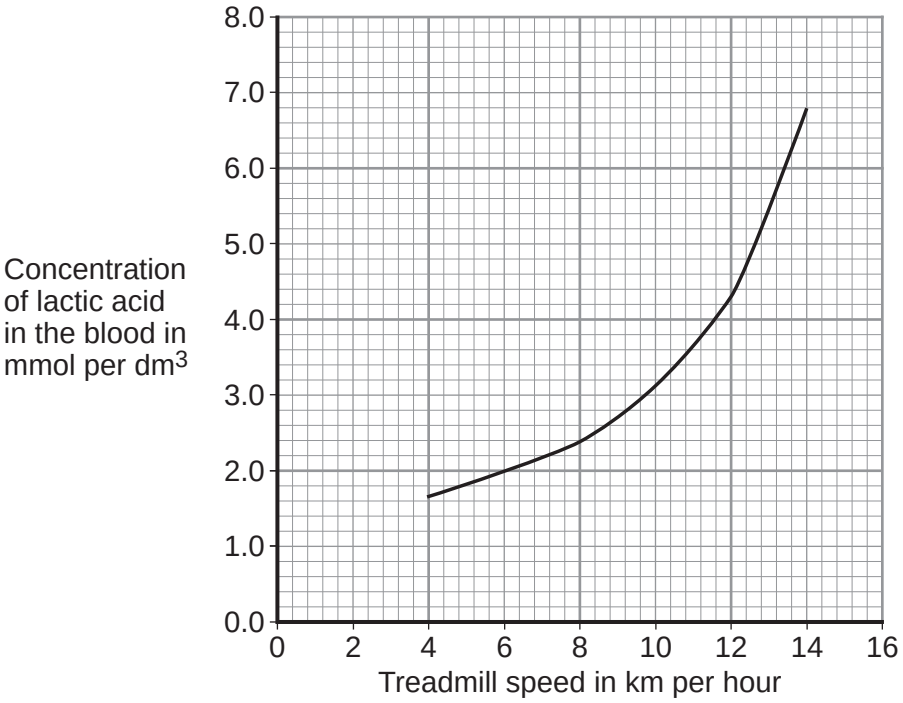
The investigation was repeated for different running speeds.

Figure 14 shows the scientists' results.

4.4.2.2 Response to exercise

Question 26 · continued

Figure 14



9 (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]

.....

.....

.....

Answer = ... mmol per dm^3

9 (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]

.....

.....

.....

.....

.....

.....

6

4.4.2.2 Response to exercise

Question 27

June 2014 | BL3FP | Original Q2 | Legacy

2 Human body temperature must be kept within narrow limits.

Figure 4 shows a cyclist in a race.

Figure 4



2 (a) Use the correct answer from the box to complete each sentence.

[3 marks]

blood	**brain**	**kidney**	**sweat**	**urine**

The cyclist's body temperature is monitored by a centre in the ..... .

This centre is sensitive to the temperature of the cyclist's ..... .

If the cyclist's body temperature increases, his body increases

the production of ..... .

4.4.2.2 Response to exercise

Question 27 · continued

2 (b) (i) Cyclists drink sports drinks after a race.

Table 1 shows the ratio of glucose to ions in three sports drinks, **A**, **B** and **C**.

Table 1

	Sports drink		
	A	**B**	**C**
Ratio of glucose (g per dm^3) to ions (mg per dm^3)	15:14	12:1	2:7

The closer this ratio of glucose to ions is to 1:1 in a sports drink, the faster the body replaces water.

Which sports drink, **A**, **B** or **C**, would replace water fastest in an athlete? ☐

[1 mark]

2 (b) (ii) Why should sports drinks contain ions?

[1 mark]

.....

.....

2 (b) (iii) Why should a person with diabetes **not** drink too much sports drink?

[1 mark]

.....

.....

6

4.4.2.2 Response to exercise

Question 28

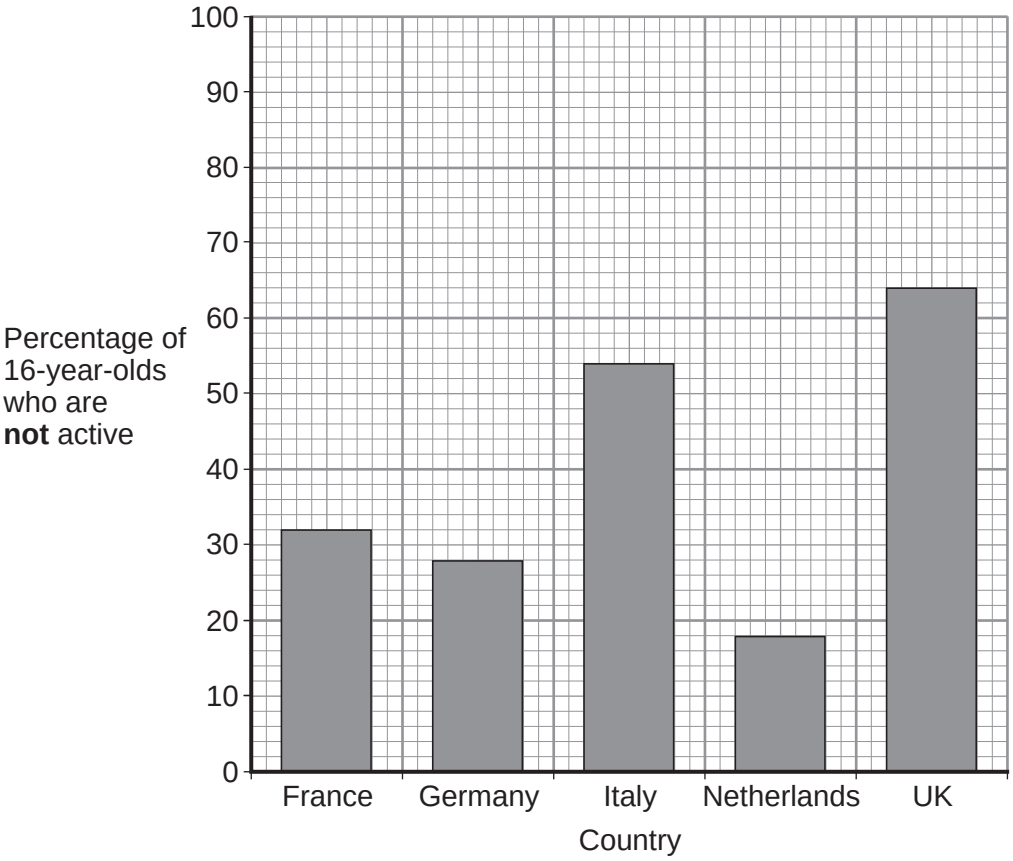
June 2015 | BL1FP | Original Q2 | Legacy

2 Scientists investigated the effect of different factors on health.

2 (a) People who are **not** active may have health problems.

Figure 3 shows the percentage of 16-year-olds in some countries who are **not** active.

Figure 3



2 (a) (i) What percentage of 16-year-olds in the UK are **not** active?

[1 mark]

..... %

2 (a) (ii) What percentage of 16-year-olds in the UK are **active**?

[1 mark]

..... %

4.4.2.2 Response to exercise

Question 28 · continued

2 (a) (iii) A newspaper headline states:

People in the UK are the laziest in the world.

Information in **Figure 3** does **not** support the newspaper headline.

Suggest **one** reason why the newspaper headline may be wrong.

[1 mark]

.....

.....

2 (b) Doctors gave a percentage rating to the health of 16-year-olds.
100% is perfect health.

Table 2 shows the amount of exercise 16-year-olds do and their health rating.

Table 2

Amount of exercise done in minutes every week	Health rating as %
Less than 30	72
90	76
180	82
300	92

What conclusion can be made about the effect of exercise on health?

Use information from **Table 2**.

[1 mark]

.....

.....

Question 2 continues on the next page

4.4.2.2 Response to exercise

Question 28 · continued

2 (c) Inherited factors can also affect health.

Give **one** health problem that may be affected by the genes someone inherits.

Draw a ring around the correct answer.

[1 mark]

being malnourished	**having a high cholesterol level**	**having a deficiency disease**

2 (d) White blood cells are part of the immune system.

Use the correct answer from the box to complete each sentence.

antibiotics	**antibodies**	**pathogens**	**vaccines**

2 (d) (i) When we are ill, white blood cells produce ..... to kill microorganisms.

[1 mark]

2 (d) (ii) Many strains of bacteria, including MRSA, have developed resistance to drugs called ..... .

[1 mark]

7

4.4.2.2 Response to exercise

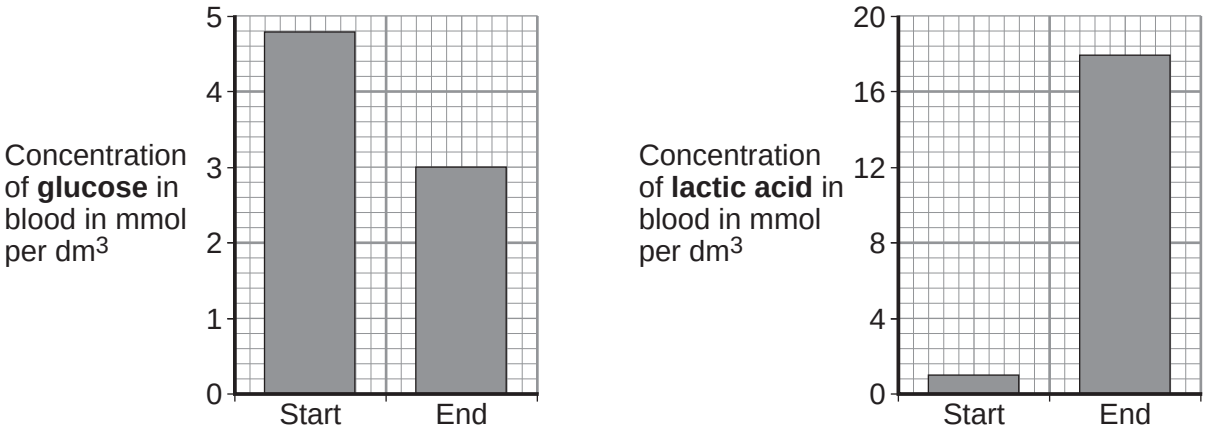
Question 29

June 2016 | BL2FP | Original Q7 | Legacy

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

7 (a) **Figure 7** 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 7



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

What does anaerobic mean?

[1 mark]

_____

_____

7 (a) (ii) Give evidence from **Figure 7** that the athlete respired anaerobically during the run.

[1 mark]

_____

_____

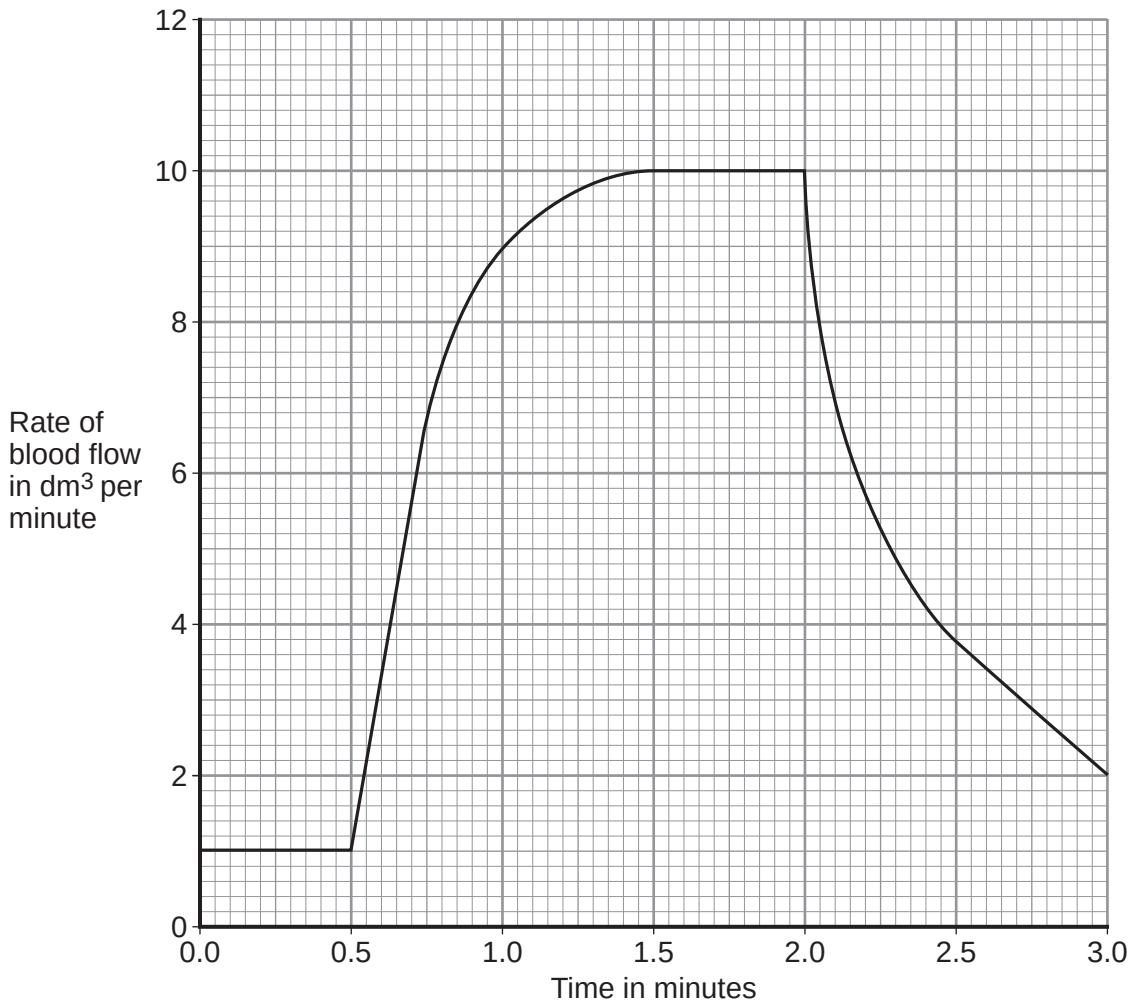
Question 7 continues on the next page

4.4.2.2 Response to exercise

Question 29 · continued

7 (b) **Figure 8** shows the effect of running on the rate of blood flow through the athlete's muscles.

Figure 8



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

[1 mark]

Time = _____ minutes

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

Use data from **Figure 8** in your answer.

[2 marks]

_____

_____

_____

_____

4.4.2.2 Response to exercise

Question 29 · continued

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

[4 marks]

9

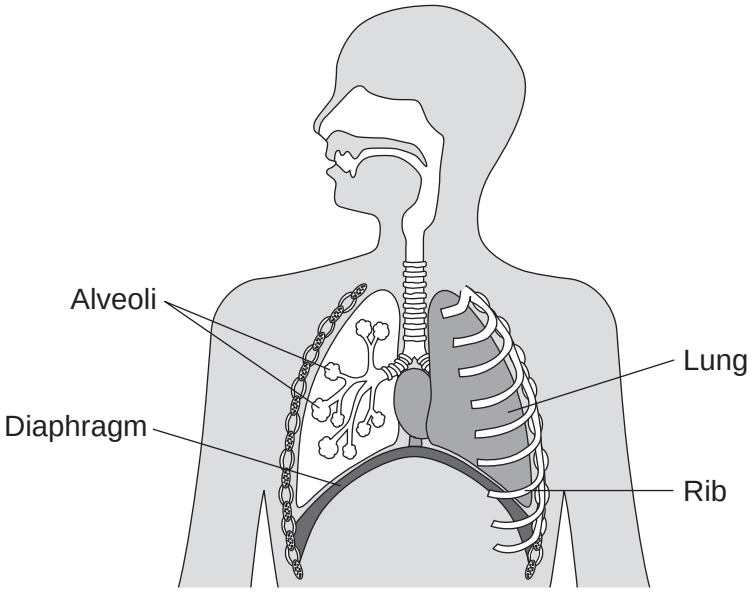
4.4.2.2 Response to exercise

Question 30

June 2016 | BL3FP | Original Q1 | Legacy

1 (a) **Figure 1** shows the breathing system in humans.

Figure 1



Use the correct answer from the box to complete the sentence.

[1 mark]

abdomen	**air passages**	**thorax**

The lungs and ribs are found in the _____ .

1 (b) (i) What happens to the ribs when we breathe in?

[1 mark]

Tick (✓) **one** box.

The ribs move down and in. ☐

The ribs move up and in. ☐

The ribs move up and out. ☐

1 (b) (ii) Describe what happens to the muscles between the ribs when we breathe in.

[1 mark]

_____

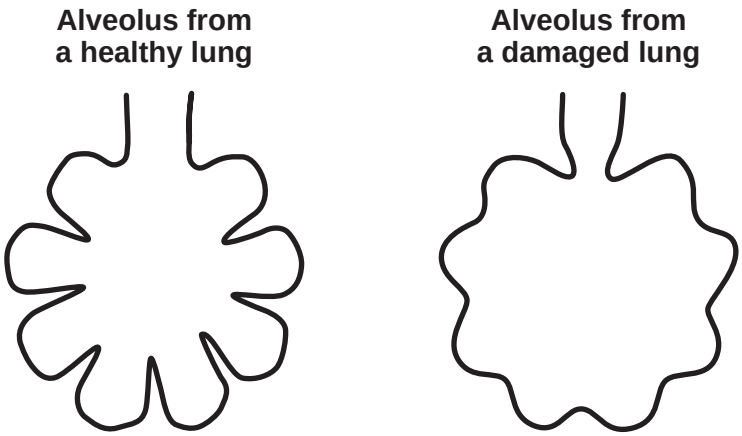
_____

4.4.2.2 Response to exercise

Question 30 · continued

1 (c) **Figure 2** shows an alveolus from a healthy lung and an alveolus from a damaged lung.

Figure 2



1 (c) (i) Which **one** of the following is a difference between the alveolus from the damaged lung and the alveolus from the healthy lung?

[1 mark]

Tick (✓) **one** box.

The damaged alveolus has a smaller surface area. ☐

The damaged alveolus has a shorter diffusion pathway. ☐

The damaged alveolus has a better blood supply. ☐

1 (c) (ii) A person with damaged alveoli finds exercising difficult.

Which **one** of the following is the reason why the damaged alveoli will make exercising difficult?

[1 mark]

Tick (✓) **one** box.

Less carbon dioxide is taken in. ☐

Less energy is needed for exercise. ☐

Less oxygen is taken in. ☐

5

4.4.2.2 Response to exercise

Question 31

June 2017 | BL1FP | Original Q6 | Legacy

6 **Figure 7** is an article about performance-enhancing drugs in sport.

Figure 7

Athletes who win Olympic medals may be paid large amounts of money to use a particular company's equipment.

A study of more than 1000 athletes in the Olympic Games showed that 1.6% of athletes tested positive for banned drugs.

A member of the World Anti-Doping Agency said that drug cheats were often one step ahead of the testing agency as they find new ways to cover up a drug in an athlete's body.

Athletes who are found to have used banned drugs are not allowed to compete for a minimum of 2 years and have to give back any medals they have won.

6 (a) What is the advantage of having more than 1000 athletes in the study?

[1 mark]

Use the correct answer from the box to complete the sentence.

precise	**systematic**	**valid**

Having more than 1000 athletes in the study means that the study is _____.

6 (b) Use information from **Figure 7** and your own knowledge to answer parts **(b)(i)** and **(b)(ii)**.

6 (b) (i) Suggest **two** reasons why athletes should **not** use performance-enhancing drugs.

[2 marks]

1 _____

_____

2 _____

_____

6 (b) (ii) Some athletes use performance-enhancing drugs to stimulate muscle growth.

Suggest **one** other reason why some athletes use performance-enhancing drugs.

[1 mark]

_____

_____

4.4.2.2 Response to exercise

Question 31 · continued

6 (b) (iii) Name the type of drug used to stimulate muscle growth.

[1 mark]

_____

5

Turn over for the next question

4.4.2.2 Response to exercise

Question 32

June 2017 | BL2FP | Original Q5 | Legacy

5 A 20-year-old student investigated the effect of exercise on his heart rate.

The student:

- measured his resting pulse rate for 15 seconds
- pedalled a stationary exercise bike at a fast pace
- stopped at various time intervals during the exercise to measure his pulse rate for 15 seconds.

5 (a) The student measured his pulse rate each time for 15 seconds.
He calculated his pulse rate per minute at the end of the investigation.

5 (a) (i) Suggest why the student measured his pulse rate for only 15 seconds instead of for a full minute.

[1 mark]

_____

_____

5 (a) (ii) **Table 1** shows the student's results.

Table 1

Time spent exercising in minutes	Measured pulse rate in beats per 15 seconds	Calculated pulse rate in beats per minute
0 (resting)	15	
1	38	152
2	44	176
4	47	188

One of the results is missing from **Table 1**.

Calculate the missing result.

[1 mark]

Calculated pulse rate = _____ beats per minute

4.4.2.2 Response to exercise

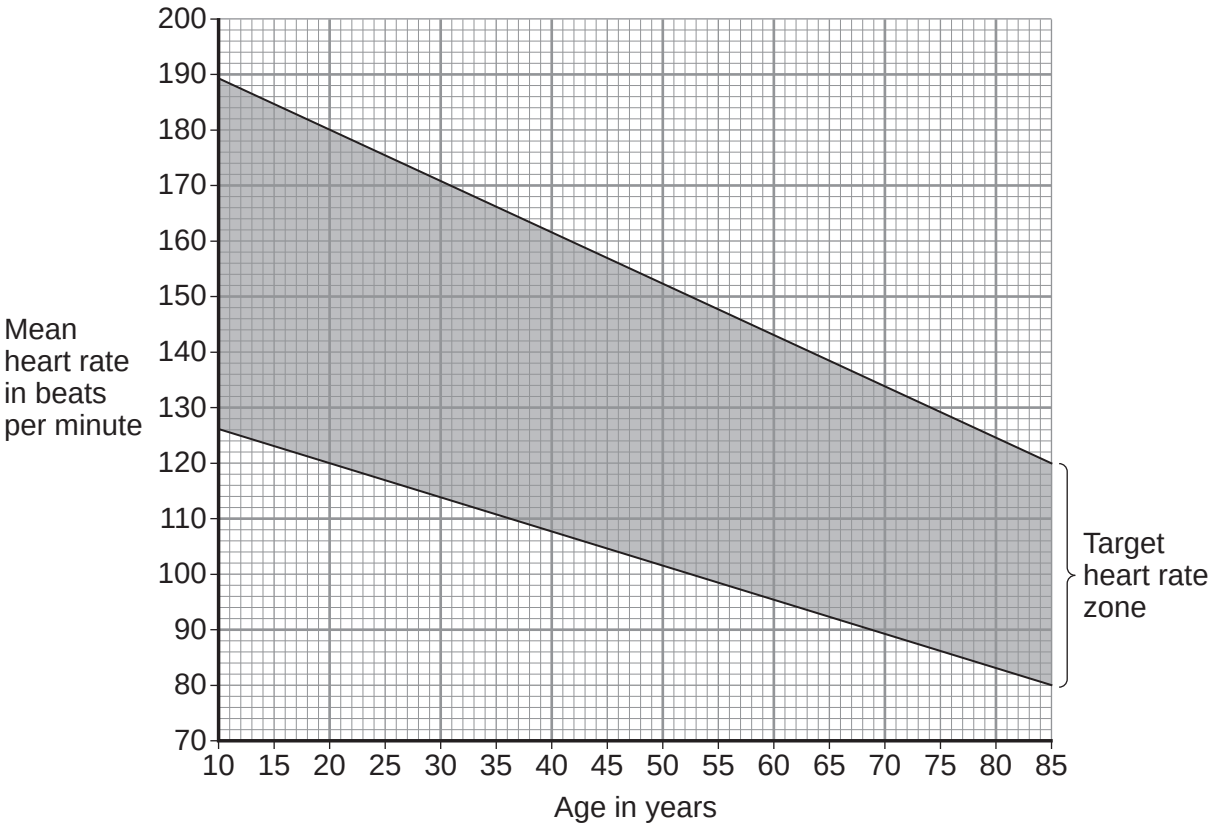
Question 32 · continued

June 2017 | BL2FP | Original Q5 | Legacy

5 (b) Doctors recommend that people of different ages should exercise at different intensities.

Figure 5 shows the range of target heart rates during exercise recommended for people of different ages.

Figure 5



5 (b) (i) Describe **two** ways that the target heart rate zone changes as age increases.

[2 marks]

1 _____

_____

2 _____

_____

5 (b) (ii) What range of heart rates during exercise is recommended for the 20-year-old student?

[1 mark]

Use information from **Figure 5**.

From _____ to _____ beats per minute

Question 5 continues on the next page

4.4.2.2 Response to exercise

Question 32 · continued

5 (b) (iii) At 4 minutes, the 20-year-old student was cycling at a pace that caused his heart rate to be 188 beats per minute. This was higher than the upper limit of the target heart rate for exercising.

How much higher?

[1 mark]

Use your answer to part **(b)(ii)**.

_____ beats per minute

5 (b) (iv) The student continued to exercise at this rate for a further 30 minutes.

Suggest **one** reason why the student should **not** continue to exercise above the recommended range for 30 minutes.

[1 mark]

_____

_____

5 (b) (v) The student took part in a training programme for 6 months.

He exercised within the recommended range.

Suggest what effect the training programme would have on his resting heart rate.

[1 mark]

_____

5 (c) Muscles need extra energy during exercise. This energy comes from glucose. Some glucose is stored in the muscles.

5 (c) (i) In what form do muscles store glucose?

[1 mark]

Draw a ring around the correct answer.

fructose **glycogen** **protein** **starch**

4.4.2.2 Response to exercise

Question 32 · continued

5 (c) (ii) The increased heart rate during exercise supplied more glucose to the student's muscle cells.

Which other substance is needed to release energy from glucose?

[1 mark]

_____

5 (c) (iii) Name the process that releases energy from glucose in cells.

[1 mark]

_____

11

Turn over for the next question

4.4.2.2 Response to exercise

Question 33

June 2018 | 8461/1F | Original Q8

0 8 Metabolism is the sum of all the chemical reactions in the cells of the body.

One metabolic reaction is the formation of lipids.

0 8 . 1 Give **one** other metabolic reaction in cells.

[1 mark]

Table 5 shows the mean metabolic rate of humans of different ages.

Table 5

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 8 . 2 What **two** conclusions can be made from the data in **Table 5**?

[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 33 · continued

June 2018 | 8461/1F | Original Q8

0 8 . 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 8 continues on the next page

4.4.2.2 Response to exercise

Question 33 · continued

Regular exercise can increase metabolic rate.

Two people did five minutes of gentle exercise from rest.

Table 6 shows the effect of the exercise on their heart rates.

Table 6

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 8 . 4 Describe **two** differences in the response of person **R** and person **S** to the exercise.

Use information from **Table 6**.

[2 marks]

1 _____

_____

2 _____

_____

0 8 . 5 Complete the line graph in **Figure 12** for person **S**.

You should:

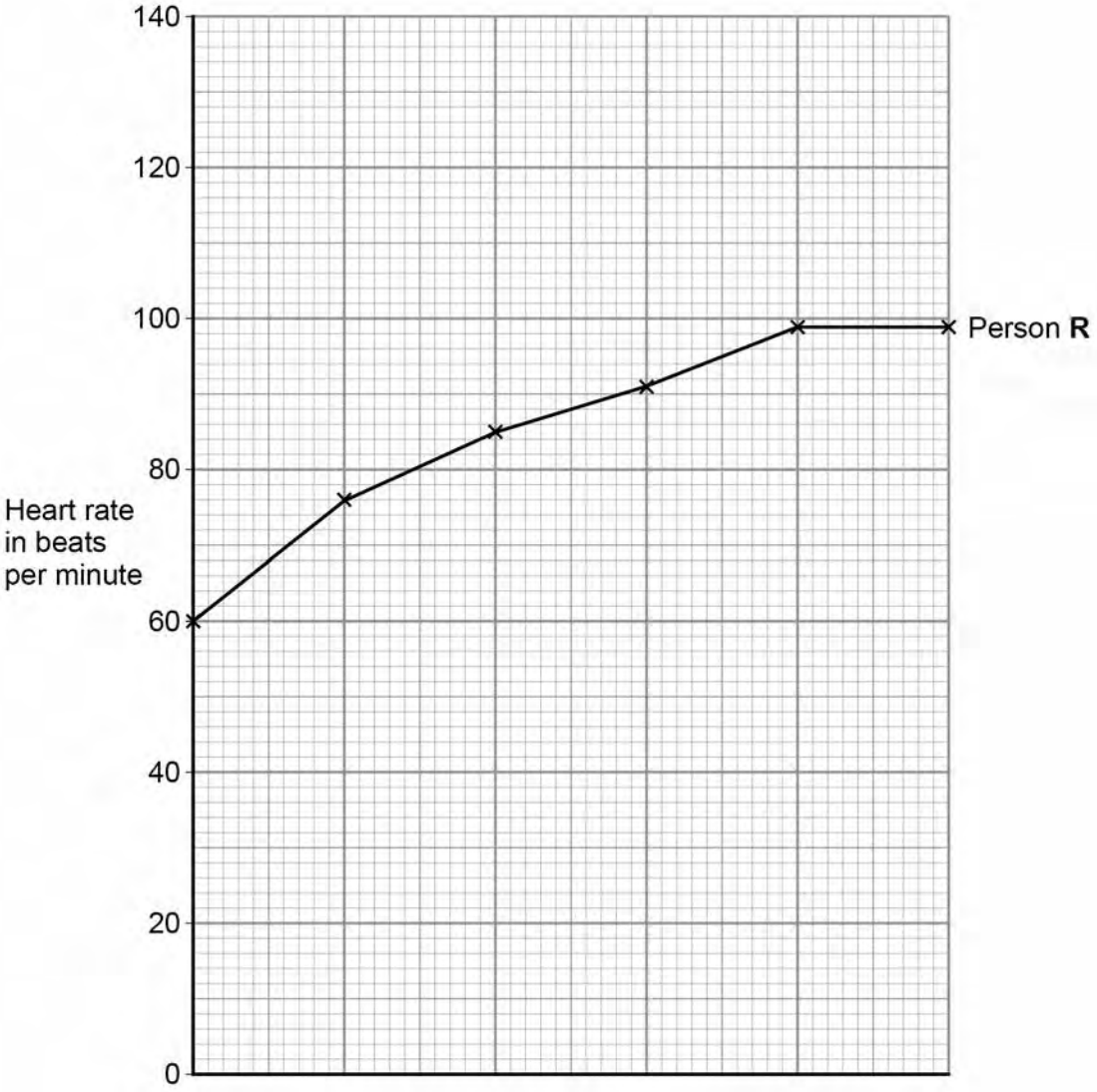
- add the scale to the x axis
- label the x axis.

[4 marks]

4.4.2.2 Response to exercise

Question 33 · continued

Figure 12



0 8 . 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

Question 8 continues on the next page

4.4.2.2 Response to exercise

Question 33 · continued

0 8 . 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 34

June 2019 | 8461/2F | Original Q6

0 6 Two of the substances the body excretes are urea and carbon dioxide.

0 6 . 1 Complete the sentence.

[1 mark]

Choose the answer from the box.

carbohydrate	**lipid**	**protein**	**salt**

A person makes a lot of urea if the person's diet contains

a lot of _____.

0 6 . 2 Why must urea be excreted from the body?

[1 mark]

_____

_____

0 6 . 3 A person produces more carbon dioxide during exercise than when resting.

Complete the sentences.

[2 marks]

Choose answers from the box.

breathing	**digestion**	**egestion**
osmosis	**respiration**	

The process that makes carbon dioxide is _____.

During exercise, extra carbon dioxide can be removed from the body by increasing the rate of _____.

4.4.2.2 Response to exercise

Question 34 · continued

0 6 . 4 Excess water must also be removed from the body.

If a person sweats a lot, less water will be excreted in the urine.

A healthy person did the same amount of exercise on each of 3 days.

Table 2 shows information for the 3 days.

Table 2

Day	Air temperature in °C	Volume of water consumed in cm^3	Relative amount of urine produced by the kidneys
1	30	1500	
2	20	1500	
3	15	2000	

Complete **Table 2**.

[2 marks]

Choose answers from the box.

least	medium	most

Question 6 continues on the next page

4.4.2.2 Response to exercise

Question 34 · continued

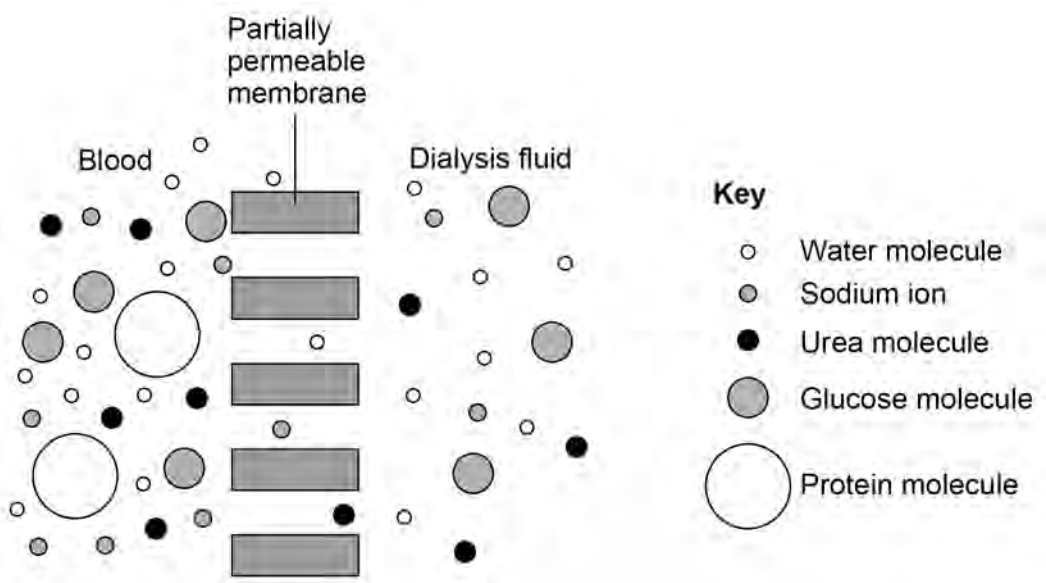
Some people have kidney disease.

Kidney disease may be treated by dialysis or by having a kidney transplant operation.

- During dialysis, a person is connected to a machine that filters the blood.
- Each dialysis session lasts about 6 hours.
- The person has several dialysis sessions each week.

Figure 12 shows how dialysis works.

Figure 12



0 6 . 5 How does urea move out of the blood during dialysis?

[1 mark]

Tick (✓) **one** box.

Diffusion ☐

Digestion ☐

Osmosis ☐

Respiration ☐

4.4.2.2 Response to exercise

Question 34 · continued

0 6 . 6 Which substance in **Figure 12** does **not** pass from the blood into the dialysis fluid?

Give the reason for your answer.

[2 marks]

Substance _____

Reason _____

_____

Question 6 continues on the next page

4.4.2.2 Response to exercise

Question 34 · continued

Two people have kidney disease.

- Person **A** is treated by dialysis.
- Person **B** has had a kidney transplant.

Figure 13 shows changes in the urea concentration in the blood of each person over 2 weeks.

Figure 13



0 6 . 7 How many dialysis sessions did person **A** have **each week**?

[1 mark]

_____

0 6 . 8 What happens to the concentration of urea in the blood between dialysis sessions?

[1 mark]

_____

0 6 . 9 Give **two** reasons why a kidney transplant is a better method for treating kidney disease than dialysis.

[2 marks]

1 _____

_____

2 _____

_____

13

4.4.2.2 Response to exercise

Question 35

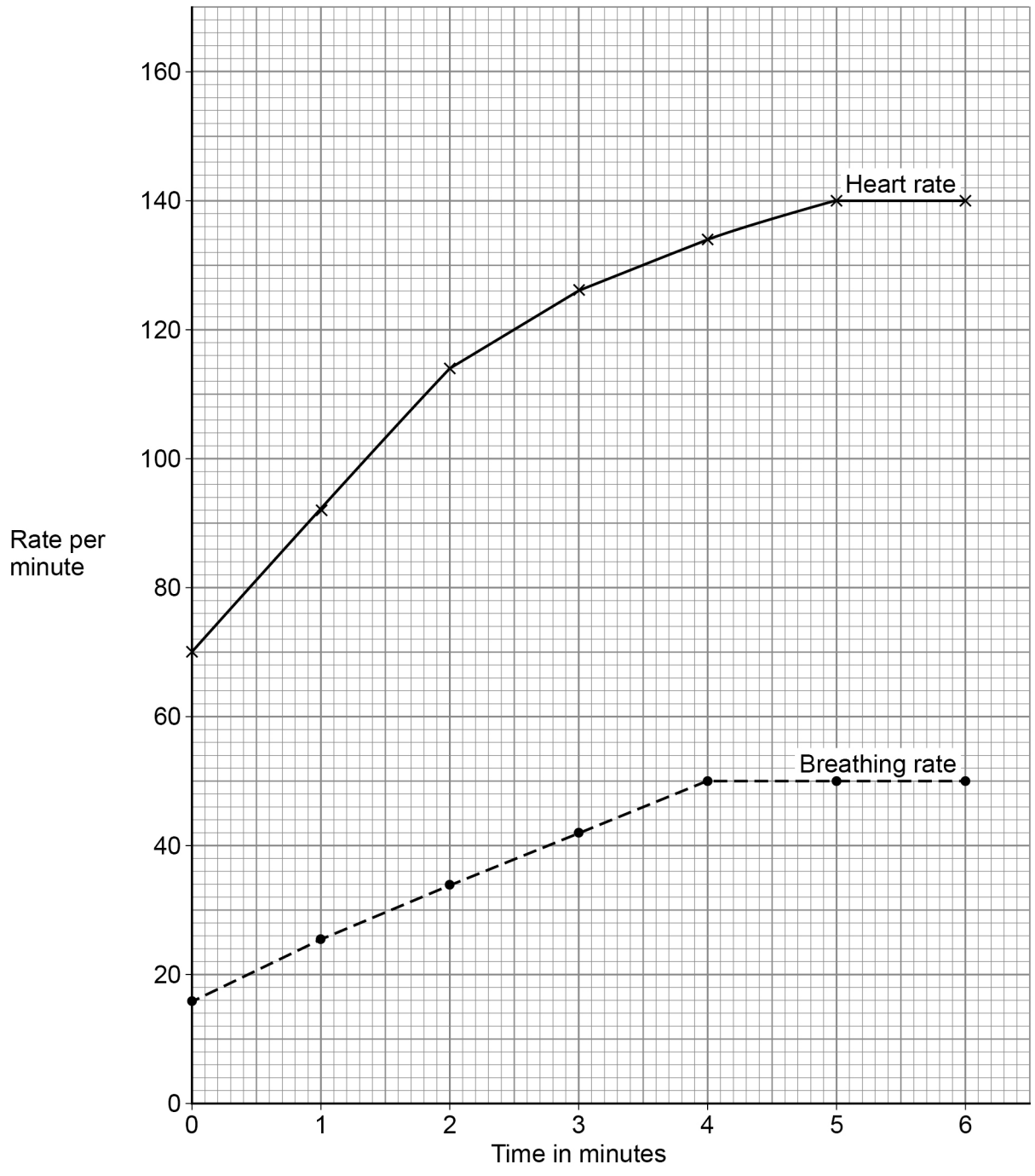
November 2020 | 8461/1F | Original Q4

0 4 A 45-year-old man exercised on a rowing machine for six minutes.

A fitness monitor recorded his heart rate and breathing rate every minute.

Figure 6 shows the results.

Figure 6



4.4.2.2 Response to exercise

Question 35 · continued

0 4 . 1 Describe the trend for breathing rate shown in **Figure 6**.

Use data from **Figure 6** in your answer.

[3 marks]

0 4 . 2 The safe maximum heart rate for a person exercising can be calculated using the equation:

safe maximum heart rate = 220 – age in years

Calculate the safe maximum heart rate for the man.

[1 mark]

Safe maximum heart rate = _____ beats per minute

0 4 . 3 What is the man's maximum heart rate?

Use **Figure 6**.

[1 mark]

Man's maximum heart rate = _____ beats per minute

0 4 . 4 The man concluded that he was exercising at a safe heart rate.

Give the reason for his conclusion.

Use your answers from Question **04.2** and Question **04.3**

[1 mark]

4.4.2.2 Response to exercise

Question 35 · continued

0 4 . 5 Explain the ways the man's body has responded to the exercise.

Use information from **Figure 6** on page 16.

[6 marks]

12

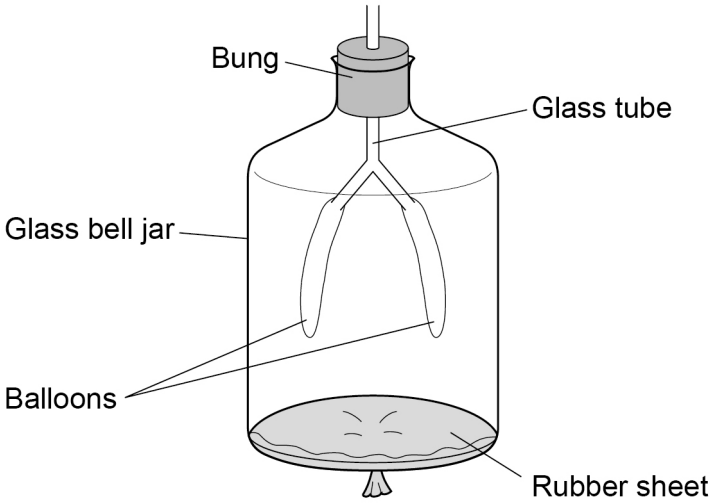
4.4.2.2 Response to exercise

Question 36

November 2021 | 8461/1F | Original Q6

0 6 **Figure 12** shows a model used to demonstrate human breathing.

Figure 12



0 6 . 1 Which part of the breathing system is represented by the glass tube?

[1 mark]

Tick (✓) **one** box.

- Alveoli ☐
- Capillaries ☐
- Lung ☐
- Trachea ☐

4.4.2.2 Response to exercise

Question 36 · continued

The model in **Figure 12** represents the human breathing system.

A teacher said:

"The model does **not** represent the human breathing system very well."

0 6 . 2 Give **two** reasons why the teacher is correct.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

4.4.2.2 Response to exercise

Question 36 · continued

A scientist investigated the effect of exercise on breathing rate.

This is the method used.

1. Record the breathing rates of 10 male non-smokers at rest.
2. Tell each man to run on a treadmill at the same speed for 8 minutes.
3. Record the breathing rate of each man every 2 minutes.
4. Continue to record the breathing rate of each man for 4 minutes after he stops running.

0 6 . 3 Give **two** variables the scientist controlled in the investigation.

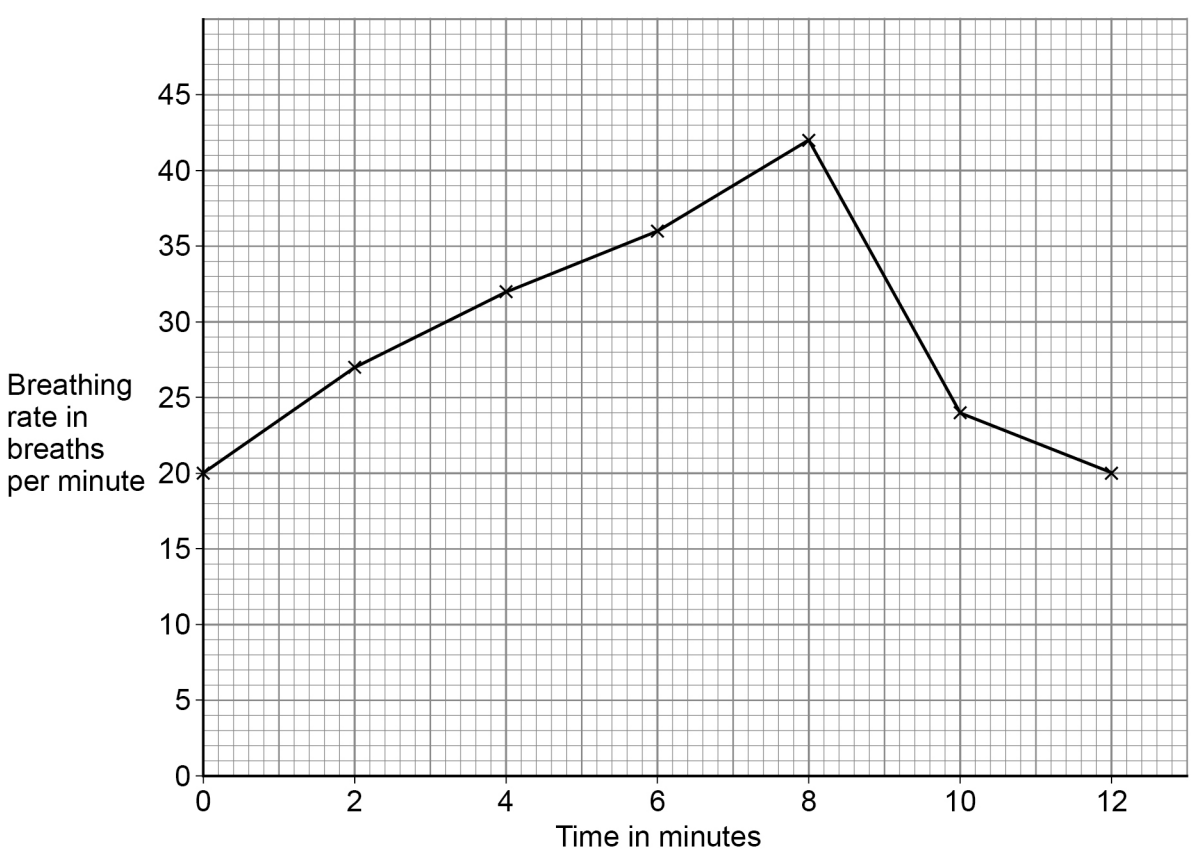
[2 marks]

1 _____

2 _____

Figure 13 shows the data collected from **one** of the men.

Figure 13



4.4.2.2 Response to exercise

Question 36 · continued

0 6 . 4 Calculate the percentage increase in the man's breathing rate between 0 minutes and 8 minutes.

[3 marks]

Use the equation:

$$\text{percentage increase} = \frac{(\text{breathing rate at 8 minutes} - \text{breathing rate at 0 minutes})}{\text{breathing rate at 0 minutes}} \times 100$$

Percentage increase = _____ %

0 6 . 5 Explain why the man's breathing rate increased when he was running.

[2 marks]

Question 6 continues on the next page

4.4.2.2 Response to exercise

Question 36 · continued

0 6 . 6 Give **one** measurement that could be taken to show a different effect of exercise on the body.

Do **not** refer to breathing rate in your answer.

[1 mark]

_____

0 6 . 7 The men in the investigation were all non-smokers.

Give **one** effect that smoking can have on the body.

[1 mark]

_____

_____

12

4.4.2.2 Response to exercise

Question 37

November 2021 | 8461/2F | Original Q10

1 0 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.

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

[1 mark]

Question 10 continues on the next page

4.4.2.2 Response to exercise

Question 37 · continued

Figure 17 and **Figure 18** show the scientists' results.

Figure 17

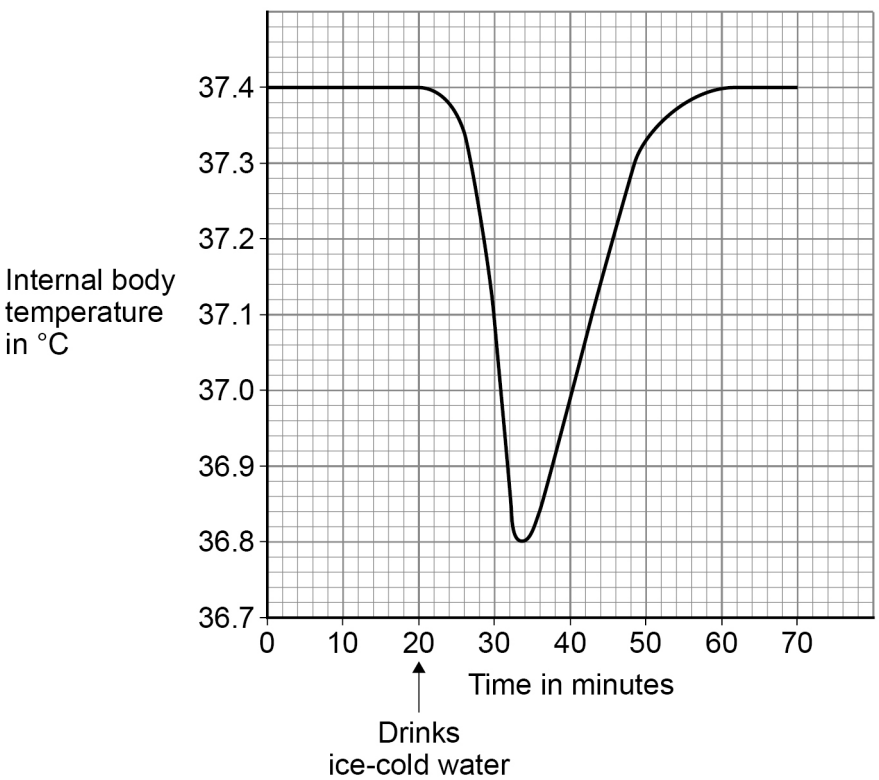
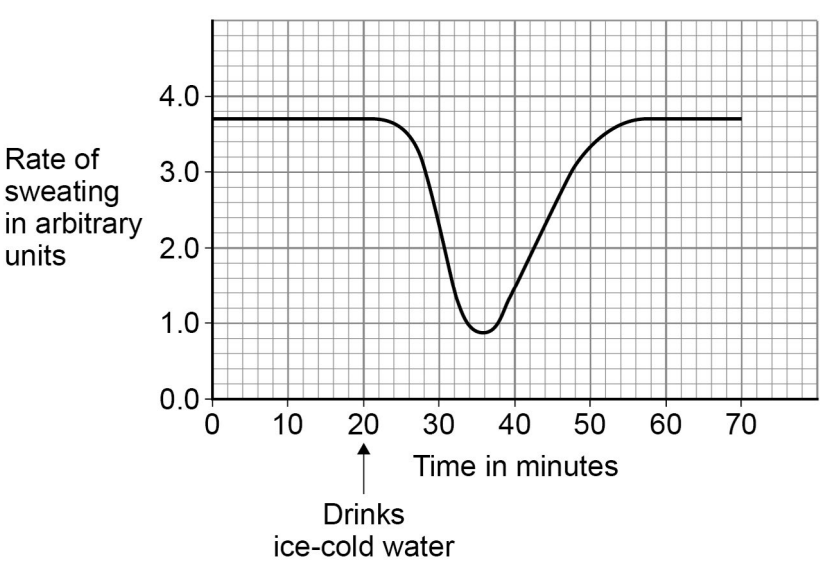


Figure 18



4.4.2.2 Response to exercise

Question 37 · continued

1 0 . 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.

1 0 . 3 Explain why the temperature near the brain decreased.

[2 marks]

1 0 . 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]

1 0 . 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 10 continues on the next page

4.4.2.2 Response to exercise

Question 37 · continued

1 0 . 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 38

June 2022 | 8461/2F | Original Q6

0 6 The echidna is a mammal that lives in Australia.

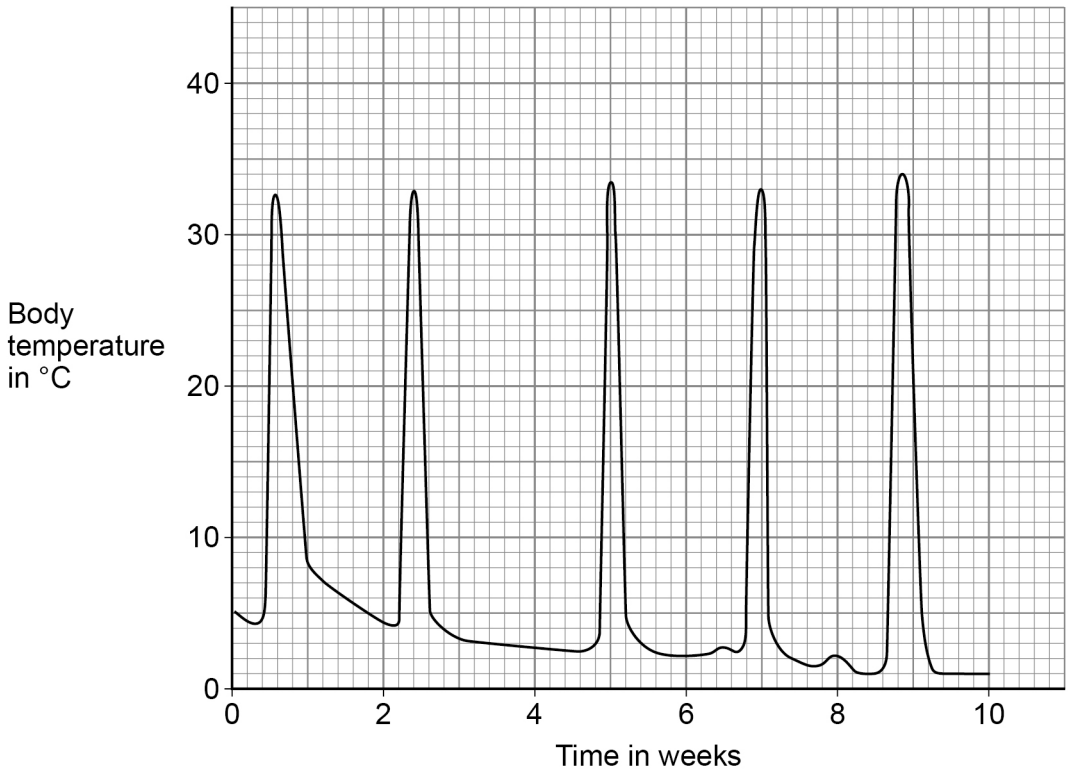
Figure 8 shows an echidna.

Figure 8



Figure 9 shows how the body temperature of the echidna varies during the cold winter months.

Figure 9



4.4.2.2 Response to exercise

Question 38 · continued

0 6 . 1 Give the lowest and highest body temperatures for the echidna shown in **Figure 9**.

[1 mark]

Lowest temperature = _____ °C

Highest temperature = _____ °C

In the cold winter months, the echidna hibernates.

Figure 9 shows that the echidna woke up from hibernation several times.

The echidna's body temperature increased to over 30 °C each time the echidna woke up.

0 6 . 2 How many times did the echidna wake up?

Use information from **Figure 9**.

[1 mark]

_____

0 6 . 3 Each time the echidna wakes up, it hunts for food.

Suggest why the echidna needs to eat food several times during hibernation.

[1 mark]

_____

_____

Question 6 continues on the next page

4.4.2.2 Response to exercise

Question 38 · continued

0 6 . 4 During hibernation:

- the echidna sleeps
- the echidna's body temperature decreases to below 5 °C
- the echidna uses food stored in its body cells to provide energy.

What process releases energy from stored food?

[1 mark]

Tick (✓) **one** box.

Diffusion ☐

Excretion ☐

Respiration ☐

0 6 . 5 Most mammals use a lot of energy to evaporate sweat.

The echidna does **not** sweat.

Suggest **one** use of energy in the echidna's body.

[1 mark]

4.4.2.2 Response to exercise

Question 38 · continued

The control of body temperature is important in the human body.

An athlete trained in a hot climate.

0 6 . 6 On one day, the athlete lost 3 200 cm^3 of water in sweat.

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

Calculate the energy the athlete used for evaporation of sweat.

[2 marks]

Energy = _____ kJ

0 6 . 7 On a different day the athlete used 6 000 kJ of energy to evaporate sweat.

The athlete's energy intake was 24 000 kJ.

Calculate the percentage of the athlete's energy intake used for evaporation of sweat.

[2 marks]

Percentage = _____ %

0 6 . 8 Some days the athlete did **not** do any training and rested at home.

What effect would resting have on the volume of sweat produced each day?

[1 mark]

10

4.4.2.2 Response to exercise

Question 39

0 4 It is important to maintain the water balance of the body.

The volume of water a person gained and lost was measured on a day the person did no exercise.

Table 2 shows how much water the person gained and lost by different methods on the day.

Table 2

Water gained	
Method	**Volume in cm^3**
Food	550
Drink	1540
Metabolism	410
Total	2500

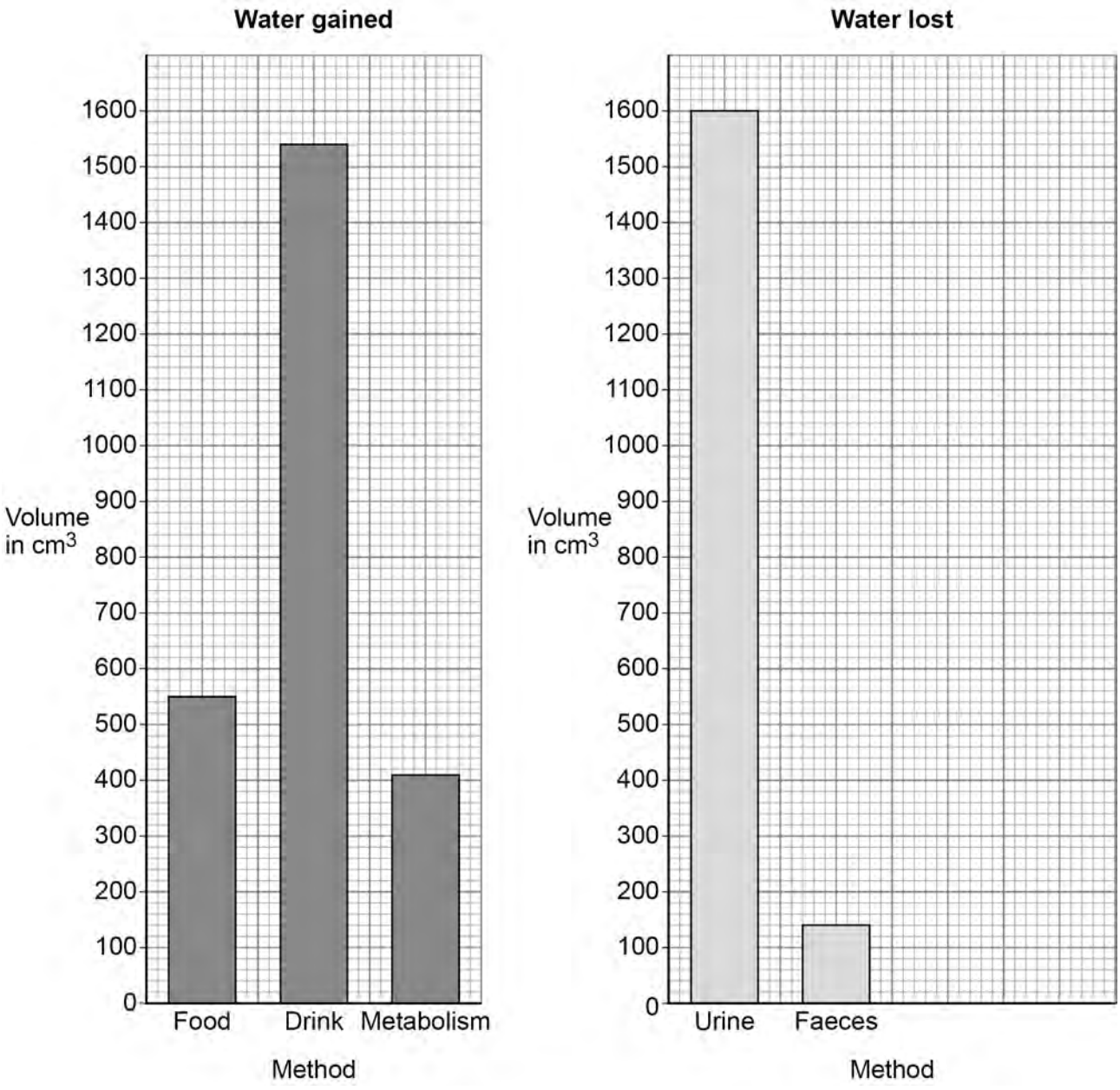
Water lost	
Method	**Volume in cm^3**
Urine	1600
Faeces	140
Sweat	420
Breathing	340
Total	2500

4.4.2.2 Response to exercise

Question 39 · continued

Figure 7 shows some of the data from **Table 2**.

Figure 7



0 4 . 1 Complete **Figure 7**.

[2 marks]

You should:

- plot the data for sweat and for breathing from **Table 2**
- label each bar.

Question 4 continues on the next page

4.4.2.2 Response to exercise

Question 39 · continued

0 4 . 2 On another day, the person ran in a long-distance race.

What would happen to the volume of water lost by sweating on the day of the race?

[1 mark]

Tick (✓) **one** box.

Decrease ☐

No change ☐

Increase ☐

0 4 . 3 The kidneys control the amount of water in the body.

Draw **one** line from each process in the kidneys to the name of that process.

[3 marks]

Process in the kidneys	Name of process
Removes water from the blood	Coordination
Takes excess water out of the body	Excretion
Takes water back into the blood	Filtration
	Reabsorption

4.4.2.2 Response to exercise

Question 39 · continued

0 4 . 4 A person with kidney failure can be treated by dialysis or by a kidney transplant.

For dialysis:

- a person needs 3 dialysis sessions each week
- each session can last 6 to 8 hours
- each session has to happen in a hospital.

For a kidney transplant:

- a suitable donor is needed
- a surgical operation is needed.

Evaluate the use of a kidney transplant instead of dialysis for treating kidney failure.

Include your own knowledge in your answer.

[4 marks]

Extra space

10