AQA GCSE Biology | 8461

SPECIFICATION POINT 4.4.2.1

Aerobic and anaerobic respiration

Past-paper questions

Tier	**Foundation**
Question groups	**40**
Available paper years	**2008–2025**

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.

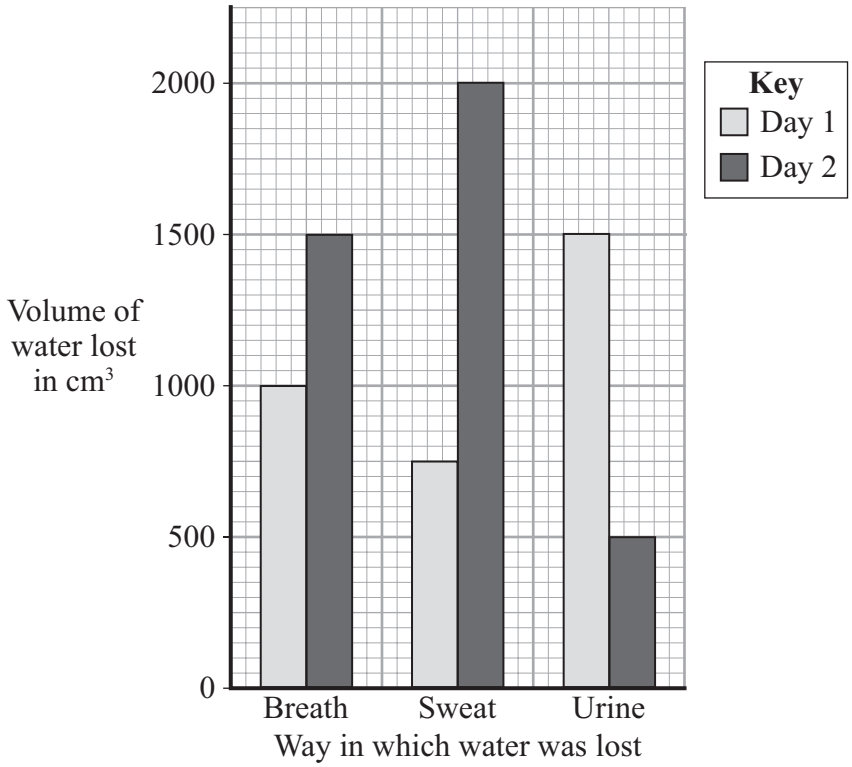
4.4.2.1 Aerobic and anaerobic respiration

Question 01

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)

4.4.2.1 Aerobic and anaerobic respiration

Question 01 · 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)

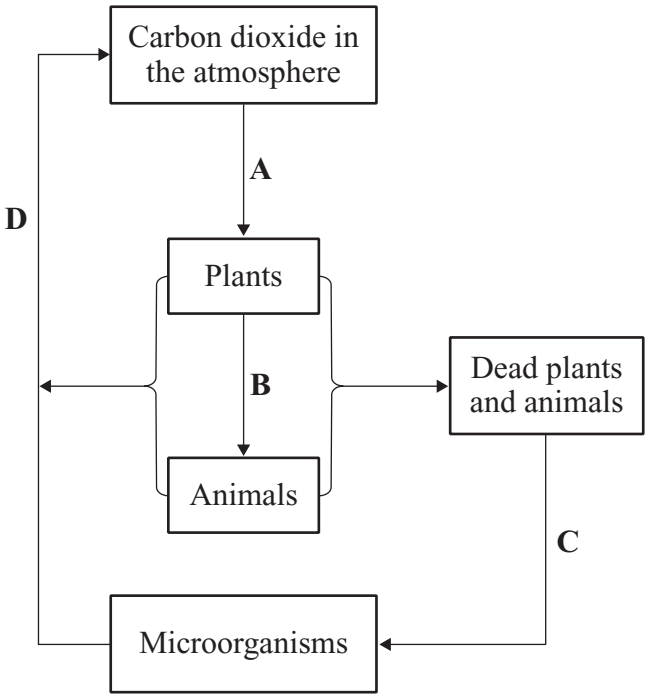
7

4.4.2.1 Aerobic and anaerobic respiration

Question 02

January 2008 | BLY2F | Original Q7 | Legacy

7 The diagram shows part of the carbon cycle.



(a) Which letter, **A**, **B**, **C** or **D**, represents:

(i) respiration .....

(1 mark)

(ii) photosynthesis? .....

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 02 · continued

BLANK

(b) Local authorities are encouraging people to recycle vegetable waste by converting it into compost.

Compost is made by mixing the vegetable waste with soil in a large container.

(i) Decay occurs more quickly if the container has holes in the sides.

Explain why.

.....

.....

.....

.....

(2 marks)

(ii) Spreading compost on the soil between plants leads to better growth of the plants.

Explain why.

.....

.....

(1 mark)

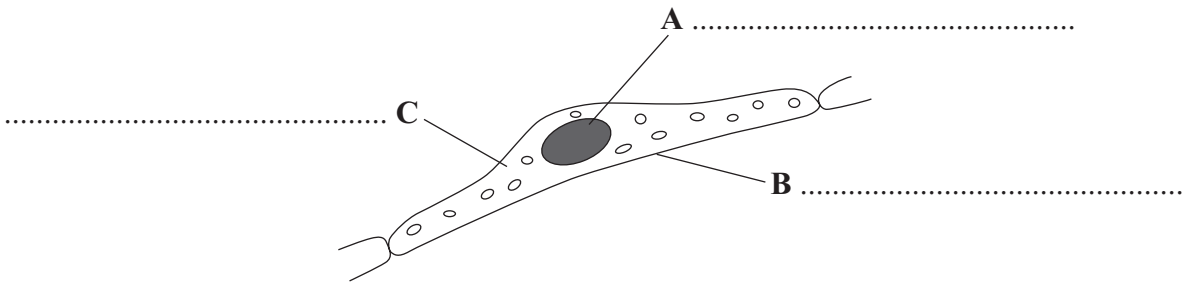
5

4.4.2.1 Aerobic and anaerobic respiration

Question 03

June 2008 | BLY2F | Original Q1 | Legacy

1 The diagram shows a cell from the lining of the lung. This cell is specialised to allow gases to pass through quickly.



1 (a) Use words from the box to label structures **A**, **B** and **C**.

cell membrane	**chloroplast**	**cytoplasm**	**mitochondria**	**nucleus**

(3 marks)

1 (b) (i) Which feature of this cell allows oxygen to pass through quickly?

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

It is thin. ☐

It has a large nucleus. ☐

It has many mitochondria. ☐

(1 mark)

1 (b) (ii) Complete the sentence by drawing a ring around the correct answer in the box.

Oxygen passes through this cell by [diffusion / osmosis / respiration].

(1 mark)

5

4.4.2.1 Aerobic and anaerobic respiration

Question 04

June 2008 | BLY2F | Original Q2 | Legacy

2 Green plants are able to make their own food.

Complete each sentence by drawing a ring around the correct answer in the box.

2 (a) Green plants make their own food during the process of

diffusion
photosynthesis
respiration

.

(1 mark)

2 (b) This process can be summarised by the equation:

carbon dioxide + water → glucose +

mineral salts
light
oxygen

.

(1 mark)

2 (c) The energy needed for this process is trapped for the plant by

chlorophyll
glucose
light

.

(1 mark)

2 (d) Some of the food made by plants is stored as insoluble

chlorophyll
glucose
starch

.

(1 mark)

4

4.4.2.1 Aerobic and anaerobic respiration

Question 05

June 2008 | BLY2F | Original Q5 | Legacy

5 In fish and chip shops, potatoes are cut into chips several hours before they are cooked.

The amount of water in the chips must be kept constant during this time.

To keep the water in the chips constant, the chips are kept in salt solution.

A student investigated the effect of different concentrations of salt solution on the mass of chips.

- He weighed each of five chips.
- He placed each chip into a different concentration of salt solution.
- After one hour he removed the chips, then reweighed them.

His results are shown in the table.

Concentration of salt solution	**0 M**	**0.5 M**	**1 M**	**2 M**	**3 M**
Mass of chip at start in grams	2.6	2.8	2.8	2.5	2.6
Mass of chip after one hour in grams	2.7	2.8	2.7	2.3	2.1

5 (a) (i) In which concentration of salt solution did the chip gain mass?

..... M

(1 mark)

5 (a) (ii) Complete the sentence by drawing a ring around the correct answer in the box.

The chip gained mass because water entered by

digestion
osmosis
respiration

.

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 05 · continued

for mark

5 (b) In which concentration of salt solution should the chips be kept?

..... M

Give a reason for your answer.

.....

.....

(2 marks)

5 (c) How could the student have made his investigation more reliable?

.....

.....

(1 mark)

5

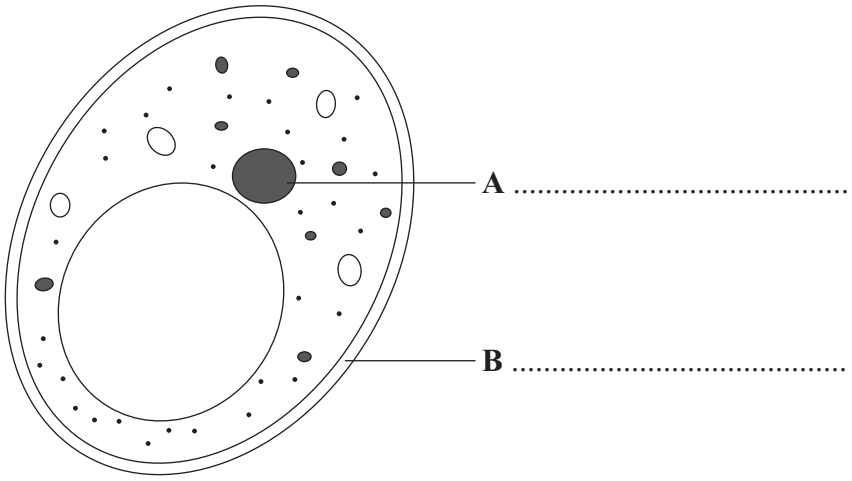
Turn over for the next question

4.4.2.1 Aerobic and anaerobic respiration

Question 06

June 2008 | BLY3F | Original Q1 | Legacy

1 The diagram shows a yeast cell.



1 (a) Label structures **A** and **B** on the diagram.

Choose your answers from the list in the box.

cell membrane	**cell wall**	**nucleus**	**vacuole**

(2 marks)

1 (b) In bread making, the dough rises because a gas is produced by the yeast.

1 (b) (i) Which gas is produced by the yeast?

Draw a ring around **one** answer.

carbon dioxide **oxygen** **sulfur dioxide**

(1 mark)

1 (b) (ii) Name the process which produces this gas.

Draw a ring around **one** answer.

digestion **respiration** **transpiration**

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

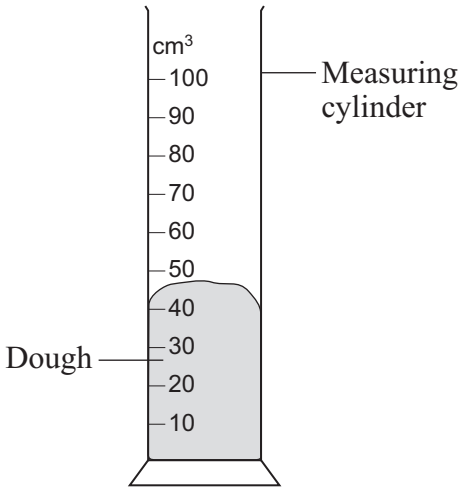
Question 06 · continued

for mark

1 (c) Some students investigated the effect of temperature on the rising of bread dough.

They mixed flour, yeast and water to make the dough.

They then placed pieces of dough into separate measuring cylinders, as shown in the diagram.



The students placed each measuring cylinder in a separate water bath.

Each water bath was at a different temperature.

The table shows the increase in volume of each piece of dough after 30 minutes.

Temperature in °C	0	10	20	25	30	35	40	50
Increase in volume of dough in cm^3	0	6	20	30	42	50	40	11

1 (c) (i) Give **one** variable which the students should have kept constant for each measuring cylinder.

.....

(1 mark)

1 (c) (ii) Use the table of results to find the temperature which gave the largest increase in the volume of the dough.

..... °C

(1 mark)

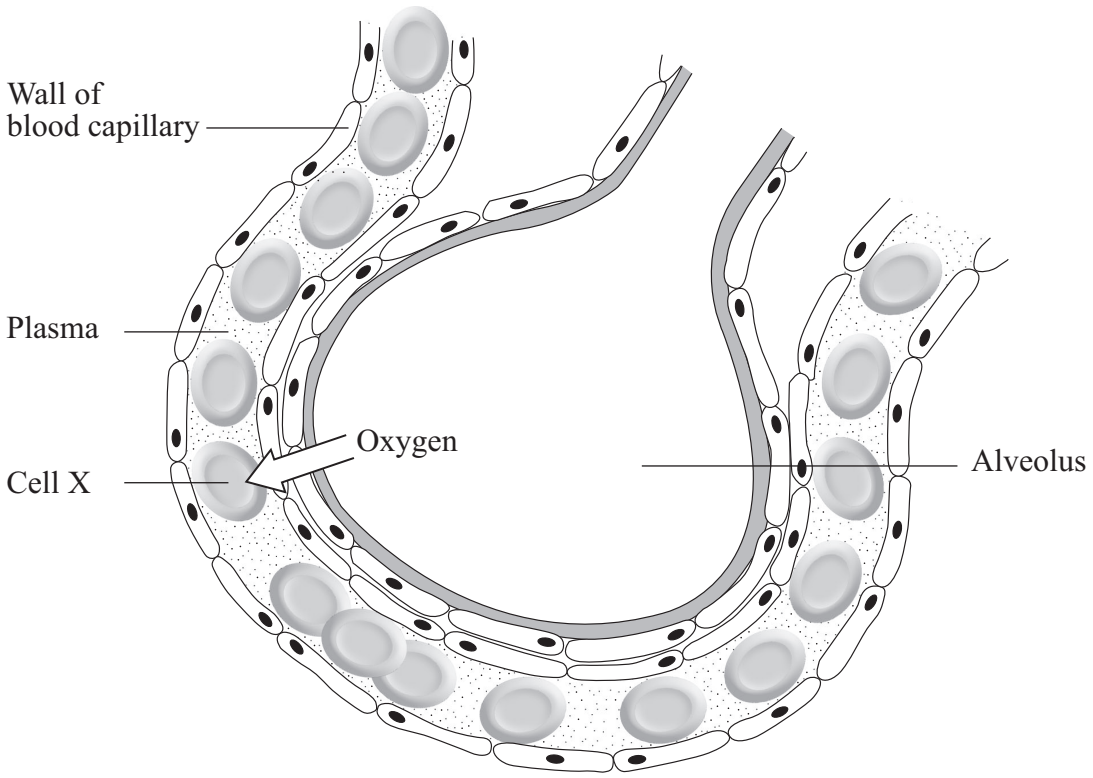
6

4.4.2.1 Aerobic and anaerobic respiration

Question 07

June 2008 | BLY3F | Original Q4 | Legacy

4 The diagram shows a small part of a lung.



4 (a) The arrow on the diagram shows the movement of oxygen from the air in the alveolus to cell **X**.

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

4 (a) (i) Cell **X** is a platelet / red cell / white cell .

(1 mark)

4 (a) (ii) Oxygen moves from the air in the alveolus into cell **X** by diffusion / filtration / respiration .

(1 mark)

4 (a) (iii) The substance in cell **X** that combines with oxygen is called glycogen / haemoglobin / lactic acid .

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 07 · continued

for mark

4 (a) (iv) Cell **X** does **not** have

a cell membrane
cytoplasm
a nucleus

.

(1 mark)

4 (b) **On the diagram**, draw an arrow to show the movement of carbon dioxide during gas exchange. *(1 mark)*

5

4.4.2.1 Aerobic and anaerobic respiration

Question 08

January 2009 | BLY2F | Original Q4 | Legacy

4 Waste products, such as carbon dioxide and urea, have to be removed from the body.

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

4 (a) Carbon dioxide is produced by [breathing / diffusion / respiration].

(1 mark)

4 (b) Most carbon dioxide leaves the body through the [kidneys / lungs / skin].

(1 mark)

4 (c) Urea is produced in the [kidneys / liver / lungs].

(1 mark)

4 (d) Urea is produced from the breakdown of [amino acids / glucose / urine].

(1 mark)

4

4.4.2.1 Aerobic and anaerobic respiration

Question 09

January 2009 | BLY3F | Original Q4 | Legacy

4 Ethanol (alcohol) can be mixed with petrol and used as a fuel in motor vehicles.

4 (a) Which type of microorganism is used to make ethanol from sugar?

Draw a ring around **one** answer.

bacterium **mould** **yeast**

(1 mark)

4 (b) Read the information about ethanol and petrol.

Ethanol
- One litre releases 23.5 megajoules of energy when it is burned.
- It releases carbon dioxide and water when it is burned.
- It can be made from crops such as sugar cane and maize.

Petrol
- One litre releases 34.8 megajoules of energy when it is burned.
- It releases carbon dioxide, water, carbon monoxide, sulfur dioxide and oxides of nitrogen when it is burned.
- It is made from crude oil which is pumped out of the ground.

4 (b) (i) Use the information above to explain **two** advantages of using ethanol rather than petrol as a fuel in motor vehicles.

Explanation 1 .....

.....

.....

.....

Explanation 2 .....

.....

.....

.....

(4 marks)

4 (b) (ii) Give **one** disadvantage of using ethanol rather than petrol as a fuel in motor vehicles.

.....

.....

(1 mark)

6

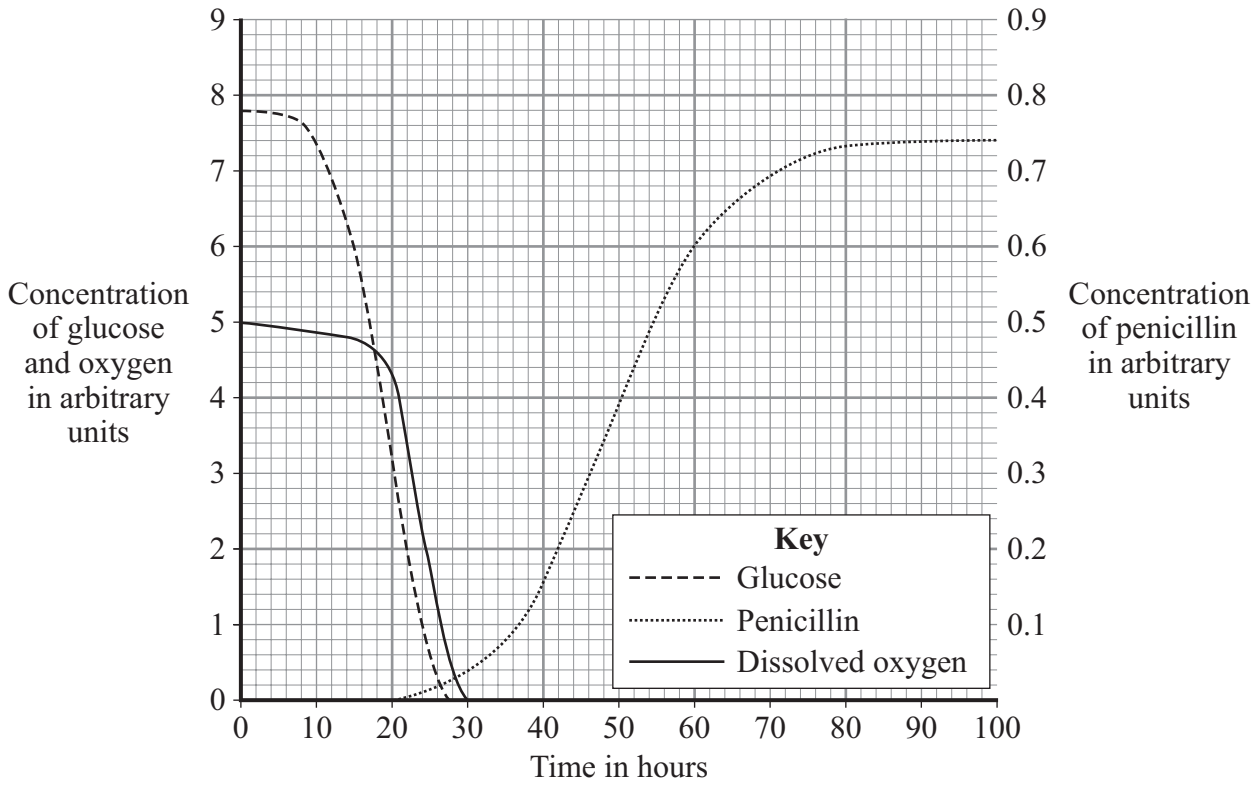
4.4.2.1 Aerobic and anaerobic respiration

Question 10

January 2009 | BLY3F | Original Q5 | Legacy

5 The mould *Penicillium* can be grown in a fermenter. It produces the antibiotic penicillin.

The graph shows changes that occurred in the fermenter during the production of penicillin.



5 (a) During which time period was penicillin produced most quickly?

Draw a ring around **one** answer.

0 – 20 hours **40 – 60 hours** **80 – 100 hours**

(1 mark)

5 (b) (i) Describe how the concentration of glucose in the fermenter changes between 0 and 30 hours.

.....

.....

.....

.....

(2 marks)

4.4.2.1 Aerobic and anaerobic respiration

Question 10 · continued

for mark

5 (b) (ii) How does the change in the concentration of oxygen in the fermenter compare with that of glucose between 0 and 30 hours?

Put a tick (✓) in **two** boxes next to your choices.

The oxygen concentration changes after the glucose concentration. ☐

The oxygen concentration changes before the glucose concentration. ☐

The oxygen concentration changes less than the glucose concentration. ☐

The oxygen concentration changes more than the glucose concentration. ☐

(2 marks)

5 (b) (iii) What is the name of the process that uses both glucose and oxygen?

Draw a ring around **one** answer.

aerobic respiration **distillation** **filtration**

(1 mark)

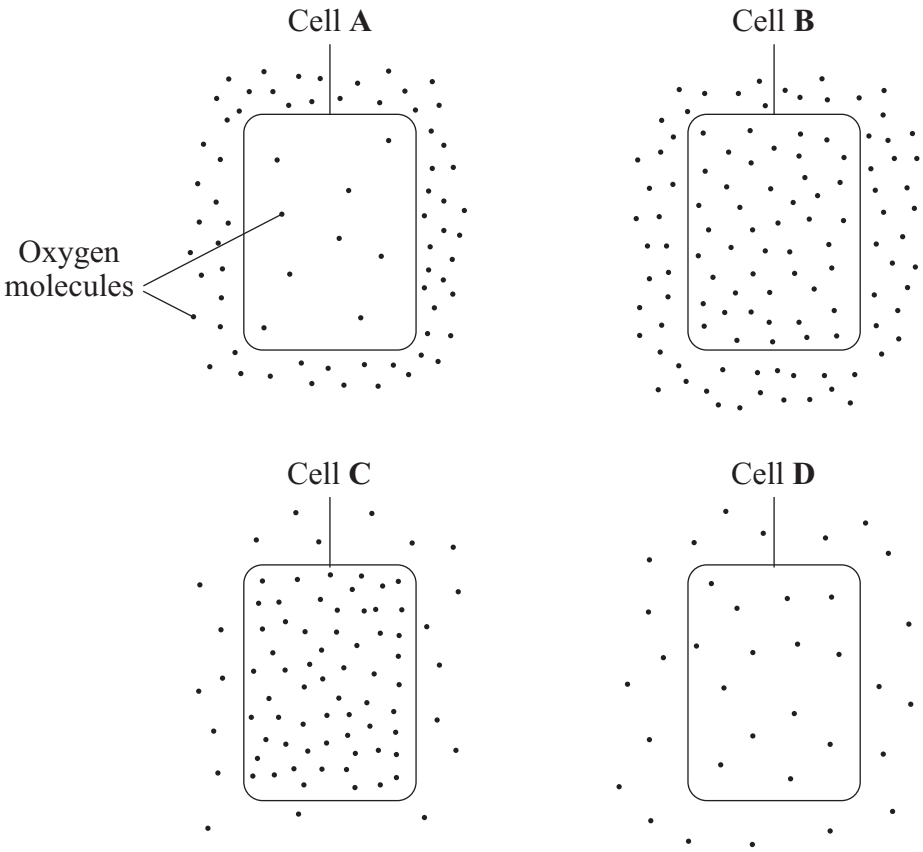
6

4.4.2.1 Aerobic and anaerobic respiration

Question 11

June 2009 | BLY2F | Original Q2 | Legacy

2 (a) The diagrams show cells containing and surrounded by oxygen molecules. Oxygen can move into cells or out of cells.



Into which cell, **A**, **B**, **C** or **D**, will oxygen move the fastest?

Write your answer, **A**, **B**, **C** or **D**, in the box.

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 11 · continued

for mark

2 (b) Draw a ring around the correct word to complete each sentence.

2 (b) (i) Oxygen is taken into cells by the process of

diffusion
osmosis
respiration

.

(1 mark)

2 (b) (ii) Cells need oxygen for

breathing
photosynthesis
respiration

.

(1 mark)

2 (b) (iii) The parts of cells that use up the most oxygen are the

membranes
mitochondria
nuclei

.

(1 mark)

2 (b) (iv) Some cells produce oxygen in the process of

diffusion
photosynthesis
respiration

.

(1 mark)

5

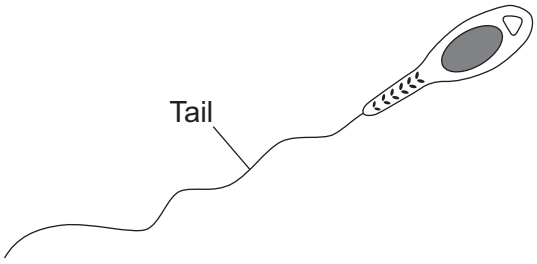
4.4.2.1 Aerobic and anaerobic respiration

Question 12

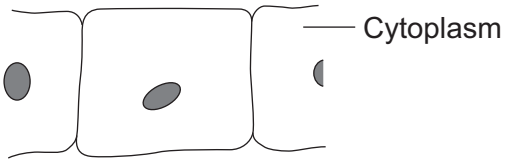
June 2010 | BLY2F | Original Q1 | Legacy

1 The diagrams show four types of cell, **A**, **B**, **C** and **D**.
Two of the cells are plant cells and two are animal cells.

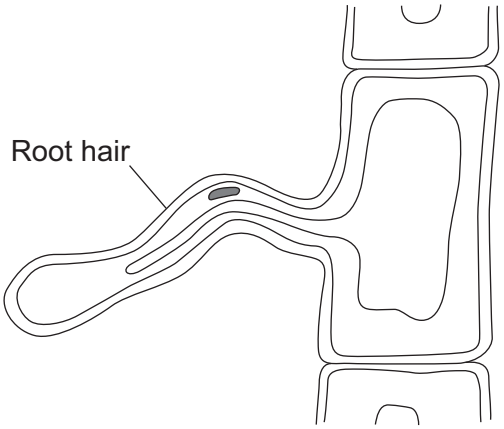
A



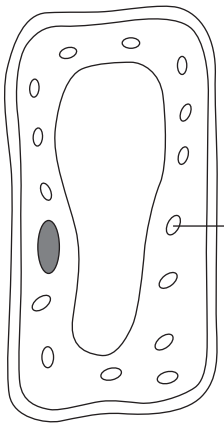
B



C



D



1 (a) (i) Which **two** of the cells are plant cells?

Tick (✓) **one** box.

A and **B** ☐

A and **D** ☐

C and **D** ☐

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 12 · continued

1 (a) (ii) Which part is found **only** in plant cells?

Draw a ring around **one** answer.

cell membrane **cell wall** **nucleus**

(1 mark)

1 (b) (i) Which cell, **A**, **B**, **C** or **D**, is adapted for swimming? ☐

(1 mark)

1 (b) (ii) Which cell, **A**, **B**, **C** or **D**, can produce glucose by photosynthesis? ☐

(1 mark)

1 (c) Cells **A**, **B**, **C** and **D** all use oxygen.

For what process do cells use oxygen?

Draw a ring around **one** answer.

osmosis **photosynthesis** **respiration**

(1 mark)

5

4.4.2.1 Aerobic and anaerobic respiration

Question 13

June 2010 | BLY2F | Original Q2 | Legacy

2 This question is about what happens during decay.

Draw a ring around the correct word to complete each sentence.

2 (a) After living things die, they are decayed by

animals.
microorganisms.
plants.

(1 mark)

2 (b) Decay happens faster when there is plenty of oxygen and conditions are

cold.
dry.
moist.

(1 mark)

2 (c) During decay carbon dioxide is produced by

osmosis.
respiration.
photosynthesis.

(1 mark)

2 (d) Decay releases mineral salts into the soil.

These mineral salts are absorbed by plant

leaves.
roots.
stems.

(1 mark)

4

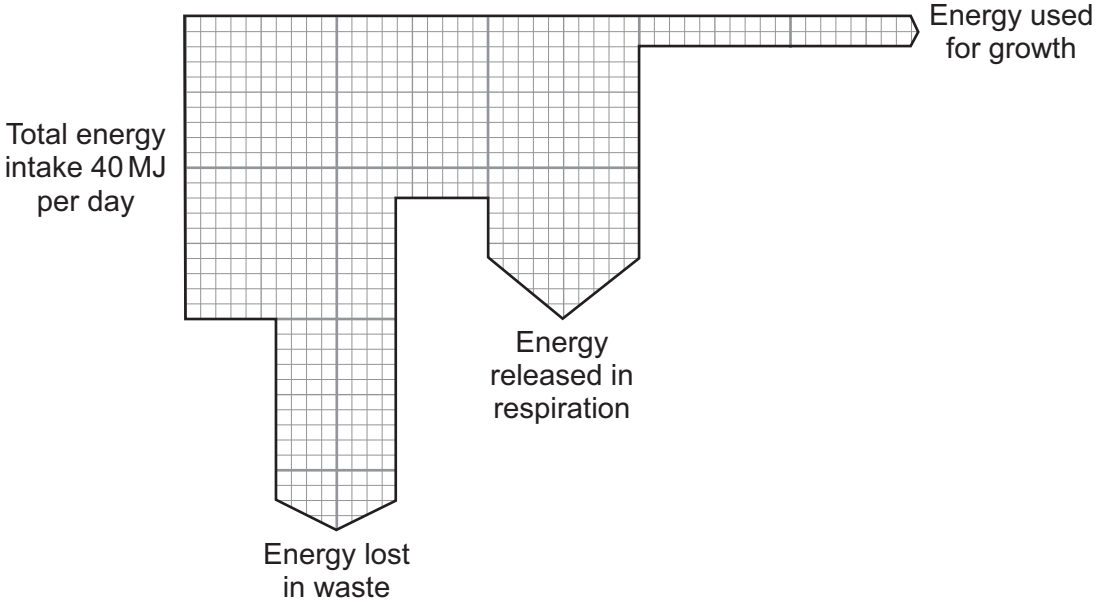
4.4.2.1 Aerobic and anaerobic respiration

Question 14

June 2010 | BLY2F | Original Q7 | Legacy

7 (a) **Diagram 1** represents what happens to the energy in the food eaten by a herbivore (an animal that eats plants).

Diagram 1



7 (a) (i) How much energy is released in respiration by the herbivore?

.....

.....

Answer ..... MJ per day
(1 mark)

7 (a) (ii) What proportion of the total energy intake of the herbivore is used for growth?

Show clearly how you work out your answer.

.....

.....

.....

Proportion .....
(2 marks)

7 (b) Give **two** ways in which the energy, released in respiration, is used by a herbivore.

1 .....

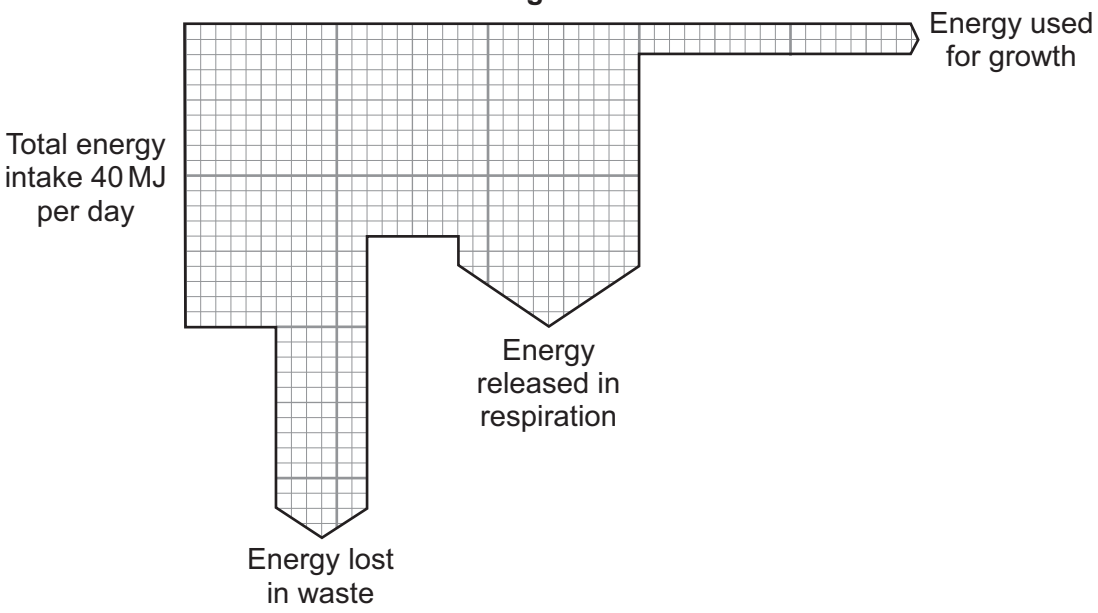
2 .....
(2 marks)

4.4.2.1 Aerobic and anaerobic respiration

Question 14 · continued

7 (c) **Diagram 2** represents what happens to the energy in the food eaten by a carnivore (an animal that eats other animals).

Diagram 2



The carnivore releases a greater proportion of energy in respiration than the herbivore.

Suggest **one** reason for this.

.....

.....

(1 mark)

7 (d) Some farmers keep their animals outdoors. Other farmers keep their animals indoors.

Keeping farm animals indoors increases the proportion of energy in their food that is converted into growth.

Give **two** reasons why.

1 .....

.....

2 .....

.....

(2 marks)

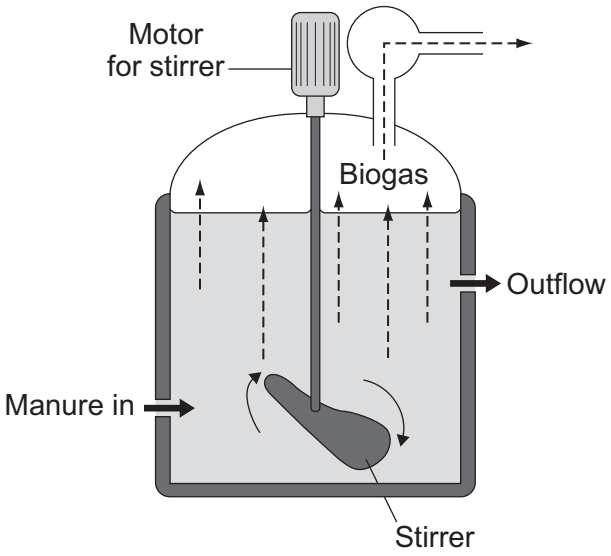
8

4.4.2.1 Aerobic and anaerobic respiration

Question 15

June 2019 | BLY3F | Original Q5 | Legacy

5 The diagram shows one type of biogas generator.



5 (a) With this type of biogas generator, the concentration of solids fed into the reactor must be kept very low.

Suggest **one** reason for this.

Tick (✓) **one** box.

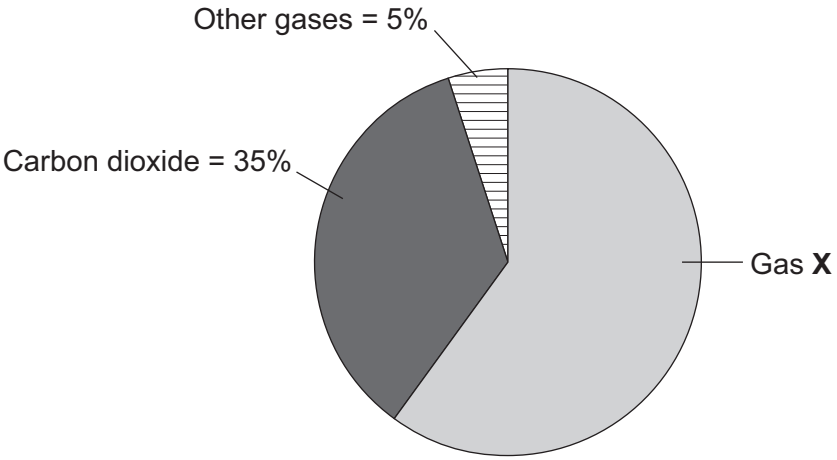
A higher concentration contains too little oxygen. ☐

A higher concentration would be difficult to stir. ☐

A higher concentration contains too much carbon dioxide. ☐

(1 mark)

5 (b) The pie chart shows the percentages of the different gases found in this biogas.



4.4.2.1 Aerobic and anaerobic respiration

Question 15 · continued

Gas **X** is the main fuel gas found in this biogas.

5 (b) (i) What is the name of gas **X**?

Draw a ring around **one** answer.

methane **nitrogen** **oxygen**

(1 mark)

5 (b) (ii) What is the percentage of gas **X** in the biogas?

Show clearly how you work out your answer.

.....

.....

.....

Percentage of gas **X** = ...

(2 marks)

5 (c) If the biogas generator is not airtight, the biogas will contain a much higher percentage of carbon dioxide.

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

5 (c) (i) The air that leaks in will increase the rate of

aerobic respiration.
anaerobic respiration.
fermentation.

(1 mark)

5 (c) (ii) The process in part (c)(i) occurs because the air contains

ammonia.
nitrogen.
oxygen.

(1 mark)

6

4.4.2.1 Aerobic and anaerobic respiration

Question 16

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)

4.4.2.1 Aerobic and anaerobic respiration

Question 16 · 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

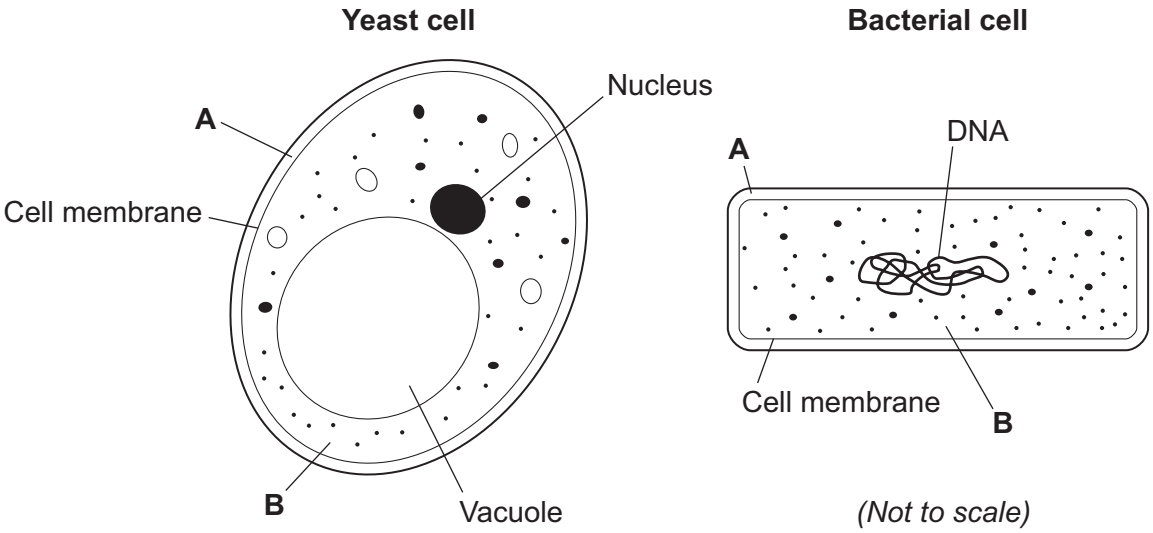
4.4.2.1 Aerobic and anaerobic respiration

Question 17

June 2010 | BLY3F | Original Q7 | Legacy

7 Sourdough bread is light in texture and tastes slightly sour. It is made using two types of microorganism, a yeast and a bacterium. The bacterium can make acids such as lactic acid. This acid makes the bread taste sour.

7 (a) The diagrams show the structures of the yeast cell and the bacterial cell.



7 (a) (i) Both the yeast cell and the bacterial cell have structures **A** and **B**.

Name structures **A** and **B**.

A .....

B .....

(2 marks)

7 (a) (ii) The yeast cell and the bacterial cell have different shapes.

Give **one** other way in which the structure of the bacterial cell is different from the structure of the yeast cell.

.....

.....

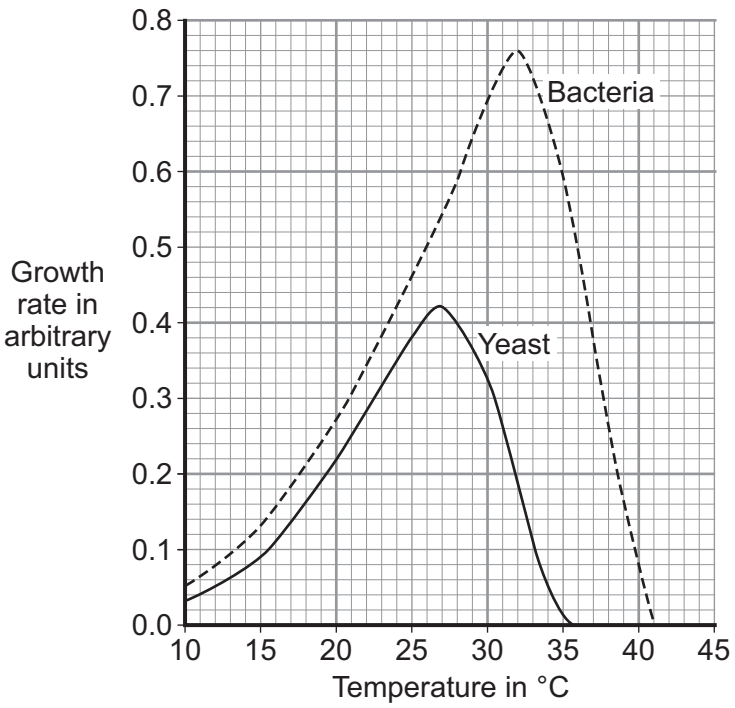
(1 mark)

Question 7 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 17 · continued

7 (b) The graph shows how the growth rates of the yeast and the bacteria change with temperature.



7 (b) (i) Sourdough bread rises fastest at 27 °C.

Explain why.

.....

.....

.....

.....

(2 marks)

7 (b) (ii) The bread has a sourer taste if it rises at 32 °C.

Explain why.

.....

.....

.....

.....

(2 marks)

4.4.2.1 Aerobic and anaerobic respiration

Question 17 · continued

7 (b) (iii) The growth rate of the yeast is unaffected by pH in the range 3.5 to 7.0 pH units.

Why is this useful in the production of sourdough bread?

.....

.....

(1 mark)

8

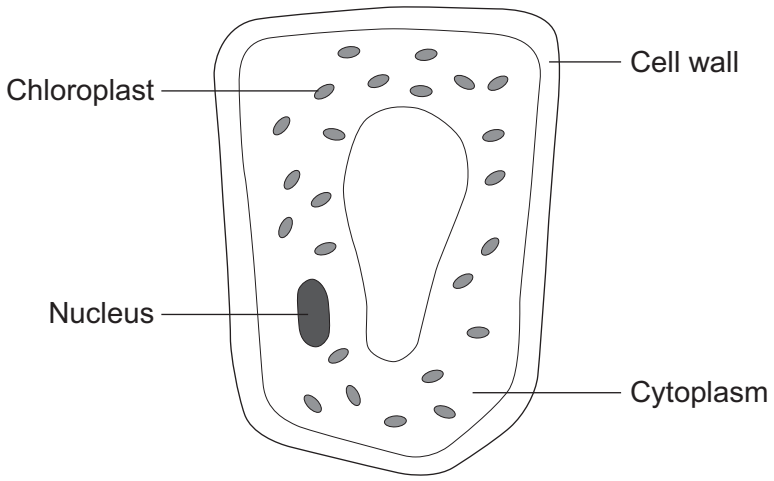
Turn over for the next question

4.4.2.1 Aerobic and anaerobic respiration

Question 18

January 2011 | BLY2F | Original Q1 | Legacy

1 The diagram shows a plant cell from a leaf.



1 (a) **List A** gives the names of three parts of the cell.
List B gives the functions of parts of the cell.

Draw a line from each part of the cell in **List A** to its function in **List B**.

List A **Parts of the cell**	**List B** **Functions**
	Where most of the chemical reactions take place
Nucleus	
	Absorbs light energy to make food
Cytoplasm	
	Strengthens the cell
Chloroplast	
	Controls the activities of the cell

(3 marks)

4.4.2.1 Aerobic and anaerobic respiration

Question 18 · continued

1 (b) Respiration takes place in the cell.

Draw a ring around the correct answer to complete the sentence.

All cells use respiration to release

energy.

oxygen.

sugar.

(1 mark)

4

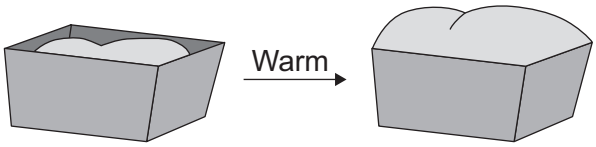
Turn over for the next question

4.4.2.1 Aerobic and anaerobic respiration

Question 19

January 2011 | BLY3F | Original Q1 | Legacy

1 Yeast produces a gas. This gas makes bread dough rise.



Bread dough

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

1 (a) (i) The gas that makes bread dough rise is

carbon dioxide.

methane.

oxygen.

(1 mark)

1 (a) (ii) The process which produces this gas is called

biogenesis.

fermentation.

malting.

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 19 · continued

1 (b) The table shows the effect of temperature on how quickly bread dough rises.

Temperature in °C	Rate of rising in arbitrary units
10	0.14
15	0.41
20	1.00
25	1.73
30	1.50
35	0.00

At which temperature did the bread dough rise fastest? ..... °C
(1 mark)

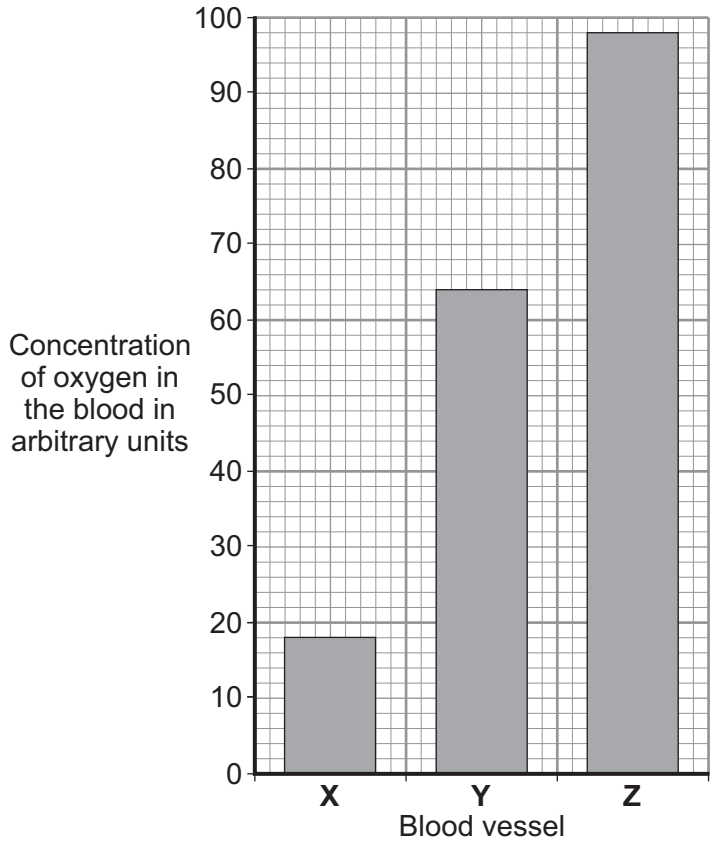
3

4.4.2.1 Aerobic and anaerobic respiration

Question 20

January 2011 | BLY3F | Original Q3 | Legacy

3 The bar chart shows the concentration of oxygen in the blood in three different blood vessels, **X**, **Y** and **Z**.



3 (a) (i) What is the concentration of oxygen in blood vessel **X**?

Answer ..... arbitrary units.

(1 mark)

3 (a) (ii) Which blood vessel, **X**, **Y** or **Z**, carries blood from the lungs to the heart?

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 20 · continued

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

3 (b) (i) Most of the oxygen in the blood is carried by the

plasma.

red blood cells.

white blood cells.

(1 mark)

3 (b) (ii) Oxygen combines with a coloured pigment in the blood.

This coloured pigment is called

alveoli.

haemoglobin.

lactic acid.

(1 mark)

4

Turn over for the next question

4.4.2.1 Aerobic and anaerobic respiration

Question 21

June 2011 | BLY3F | Original Q1 | Legacy

1 Microorganisms are used to make yoghurt and alcoholic drinks.

List A gives four materials used in making yoghurt and alcoholic drinks.
List B gives information about these materials.

Draw a line from each material in **List A** to the correct information in **List B**.

List A Material	List B Information
Lactose	The sugar in milk
Lactic acid	Used in brewing beer to give a bitter flavour
Hops	Enzyme made by yeast
Ethanol	Causes milk to clot in yoghurt making
	Made in fermentation by yeast

(4 marks)

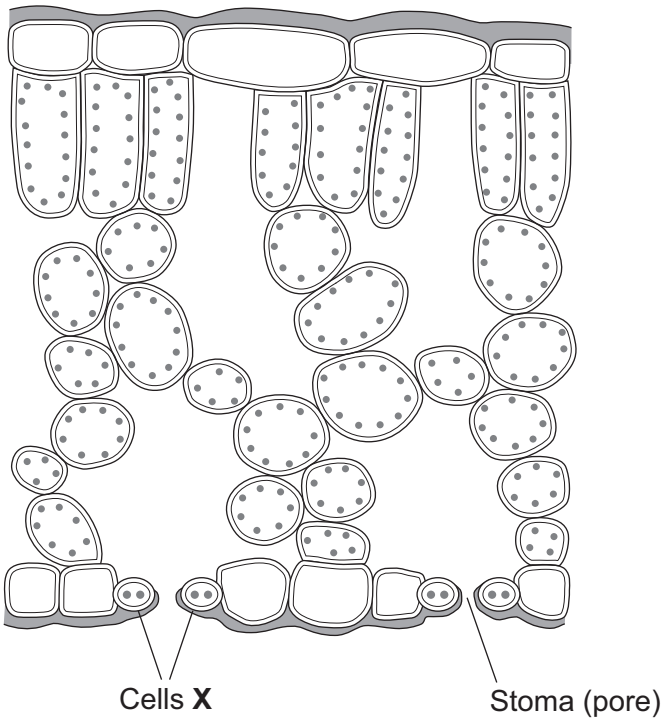
4

4.4.2.1 Aerobic and anaerobic respiration

Question 22

June 2011 | BLY3F | Original Q2 | Legacy

2 The diagram shows a section through a plant leaf.



2 (a) The cells labelled **X** surround a stoma (pore).

Draw a ring around the correct answer to complete the sentence.

Cells **X** are called

- alveoli.
- guard cells.
- villi.

(1 mark)

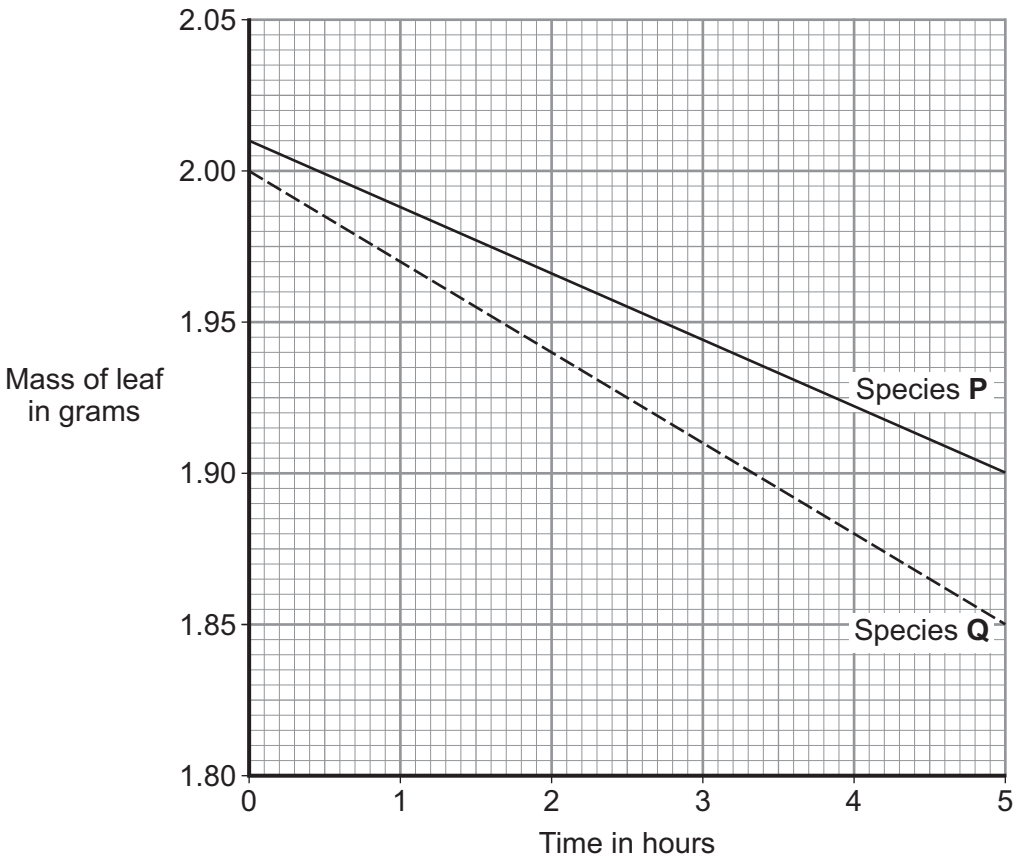
Question 2 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 22 · continued

2 (b) Water vapour is lost from leaves. Water loss causes a leaf to lose mass.

The graph shows how the masses of leaves from two plant species, **P** and **Q**, changed over several hours. Both leaves were kept in the same conditions.



2 (b) (i) What was the mass of the leaf of species **Q** at 0 hours? ..... grams

(1 mark)

2 (b) (ii) What was the difference between the mass of the leaf of species **P** and the mass of the leaf of species **Q** after 5 hours?

..... grams

(1 mark)

2 (b) (iii) The leaf of species **Q** lost water at a faster rate than the leaf of species **P**.

Suggest **one** reason why.

.....

.....

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 22 · continued

2 (b) (iv) Which weather conditions would cause the greatest rate of loss of mass for both species **P** and species **Q**?

Tick (✓) **one** box in the table.

Weather conditions		Tick (✓)
Still air or wind	**Temperature in °C**	
Wind	30	
Still air	30	
Wind	20	

(1 mark)

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

In very hot, dry conditions, the stomata close.

This is to prevent

anaerobic respiration.

breathing.

wilting.

(1 mark)

6

4.4.2.1 Aerobic and anaerobic respiration

Question 23

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)

4.4.2.1 Aerobic and anaerobic respiration

Question 23 · continued

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

4.4.2.1 Aerobic and anaerobic respiration

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)

4.4.2.1 Aerobic and anaerobic respiration

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

4.4.2.1 Aerobic and anaerobic respiration

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)

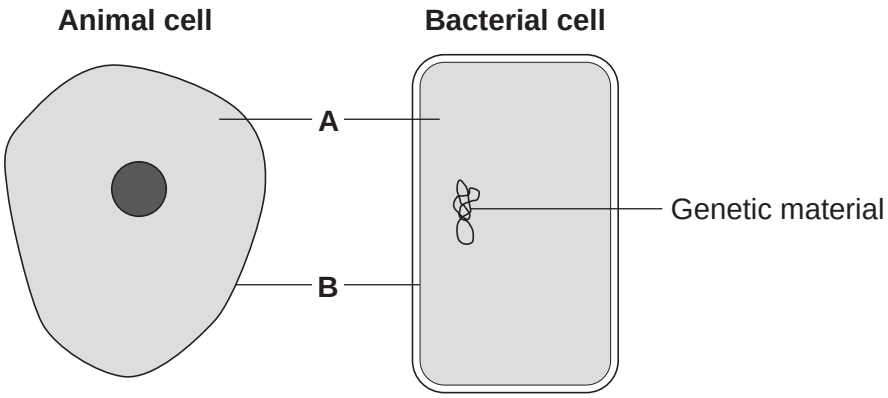
11

4.4.2.1 Aerobic and anaerobic respiration

Question 25

June 2013 | BL2FP | Original Q1 | Legacy

1 The diagrams show an animal cell and a bacterial cell.



1 (a) (i) Structures **A** and **B** are found in both the animal cell and the bacterial cell.

Use words from the box to name structures **A** and **B**.

cell membrane	**chloroplast**	**cytoplasm**	**vacuole**

A .....

B .....

(2 marks)

1 (a) (ii) Both cells contain genetic material.

Name the structure in the animal cell that contains genetic material.

.....

(1 mark)

4.4.2.1 Aerobic and anaerobic respiration

Question 25 · continued

1 (b) **List A** gives three structures found in animal cells.

List B gives four functions of cell structures.

Draw **one** line from each structure in **List A** to its correct function in **List B**.

List A – Structure	List B – Function
Cell membrane	Controls what substances enter the cell
Mitochondrion	Photosynthesis
Ribosome	Protein synthesis
	Respiration

(3 marks)

6

4.4.2.1 Aerobic and anaerobic respiration

Question 26

June 2013 | BL2FP | Original Q6 | Legacy

6 (a) Use words from the box to complete the equation for aerobic respiration.

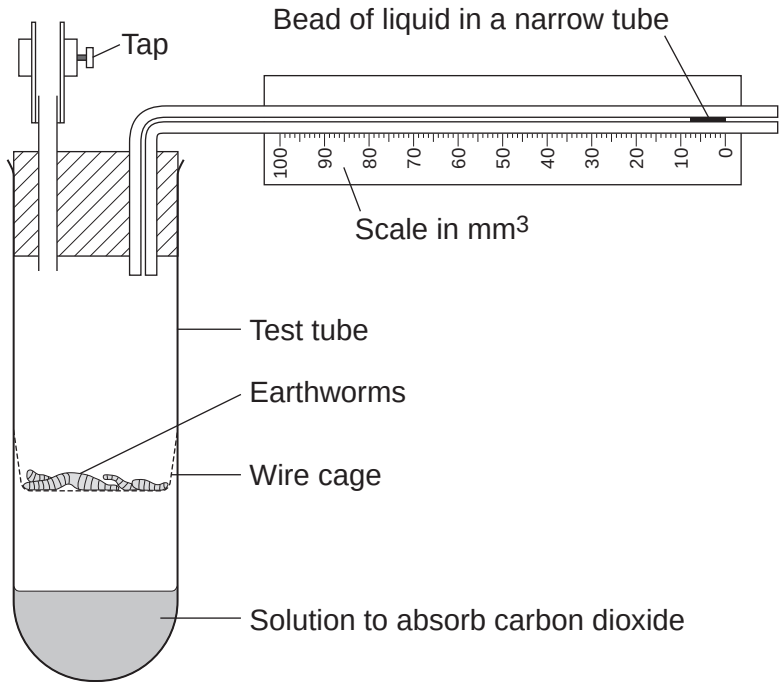
alcohol	**glucose**	**lactic acid**	**water**

..... + oxygen ⟶ carbon dioxide + ... (+ energy)

(2 marks)

6 (b) Some students investigated the effect of temperature on the rate of aerobic respiration in earthworms.

The diagram shows the apparatus the students used.
When the tap is closed, the bead of liquid moves to the left as the earthworms take in oxygen.



The students put the test tube into a water bath at 20 °C for 10 minutes.
They left the tap open during this time.

4.4.2.1 Aerobic and anaerobic respiration

Question 26 · continued

Why did the students put the test tube in the water bath at 20 °C for 10 minutes?

Tick (✓) **one** box.

Because the air contains more oxygen at 20°C. ☐

Because the air contains less carbon dioxide at 20°C. ☐

So the earthworms' body temperature would change to 20°C. ☐

(1 mark)

Question 6 continues on the next page

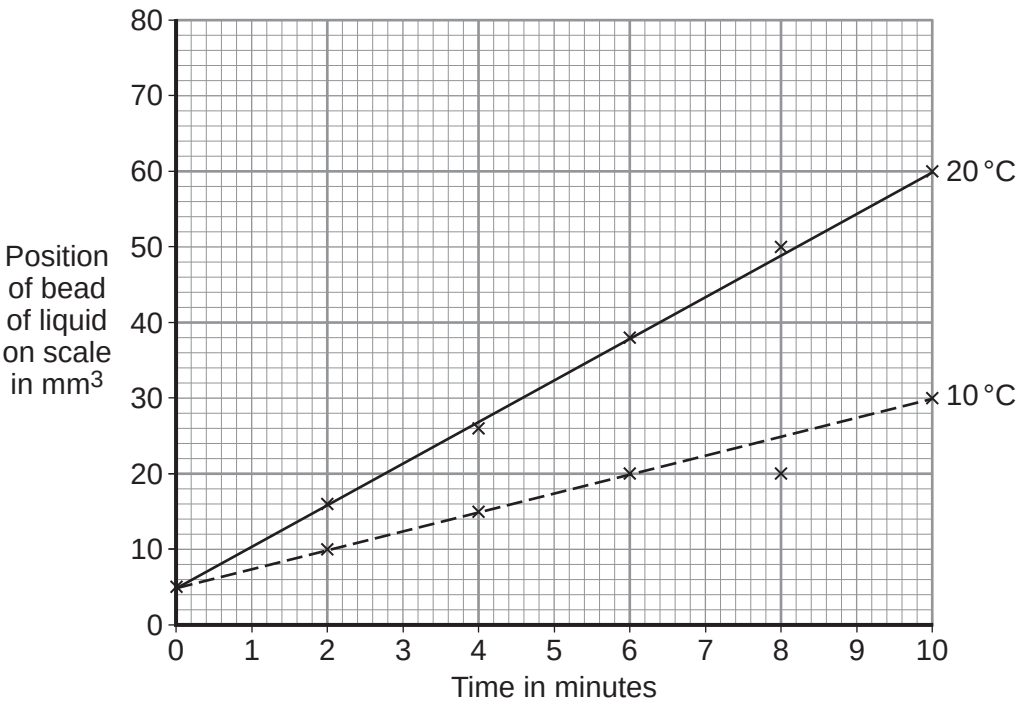
4.4.2.1 Aerobic and anaerobic respiration

Question 26 · continued

6 (c) The students then:

- closed the tap
- started a stopwatch
- recorded the position of the bead of liquid every 2 minutes for 10 minutes
- repeated the experiment at 10 °C.

The graph shows the students' results.



6 (c) (i) How much oxygen did the earthworms take in during the 10 minutes at 20 °C?

Use information from the graph to work out your answer.

.....

.....

.....

Volume of oxygen taken in = ... mm^3

(2 marks)

4.4.2.1 Aerobic and anaerobic respiration

Question 26 · continued

6 (c) (ii) The earthworms took in this volume of oxygen in 10 minutes.

Use your answer from part **(c)(i)** to calculate how much oxygen the earthworms took in each minute.

.....

.....

Volume of oxygen taken in = ... mm^3 per minute

(1 mark)

6 (c) (iii) The earthworms took in less oxygen each minute at 10 °C than they took in at 20 °C.

Explain why.

.....

.....

.....

.....

(2 marks)

6 (d) When drawing the line on the graph for the experiment at 10 °C, the students ignored the reading at 8 minutes.

6 (d) (i) Suggest why they ignored the reading at 8 minutes.

.....

.....

(1 mark)

6 (d) (ii) One student suggested they should repeat the experiment twice more at each temperature.

How would repeating the experiment improve the investigation?

.....

.....

(1 mark)

10

4.4.2.1 Aerobic and anaerobic respiration

Question 27

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.

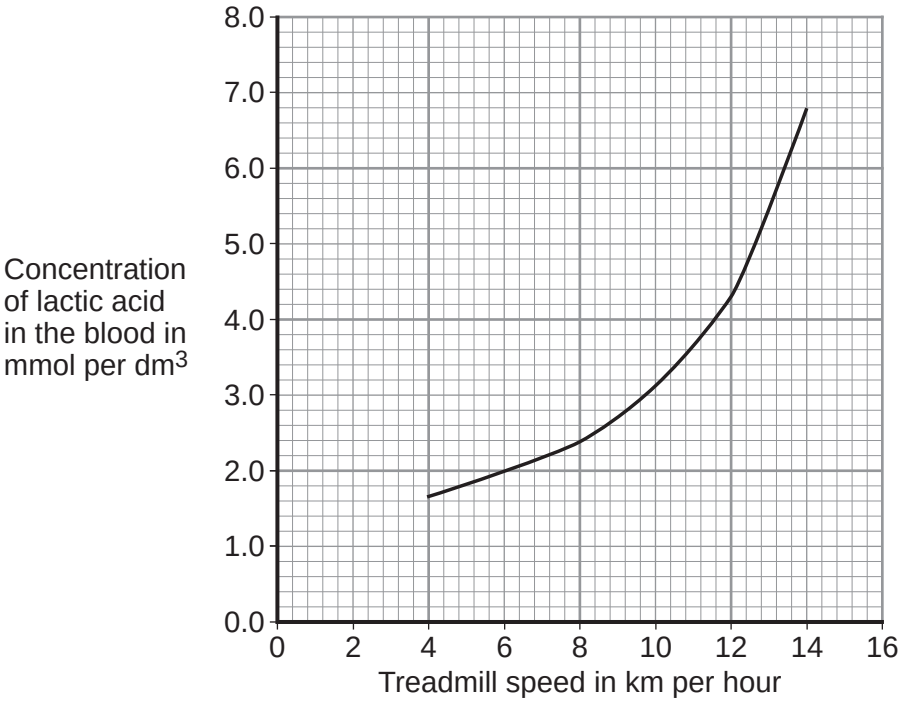
The investigation was repeated for different running speeds.

Figure 14 shows the scientists' results.

4.4.2.1 Aerobic and anaerobic respiration

Question 27 · 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

4.4.2.1 Aerobic and anaerobic respiration

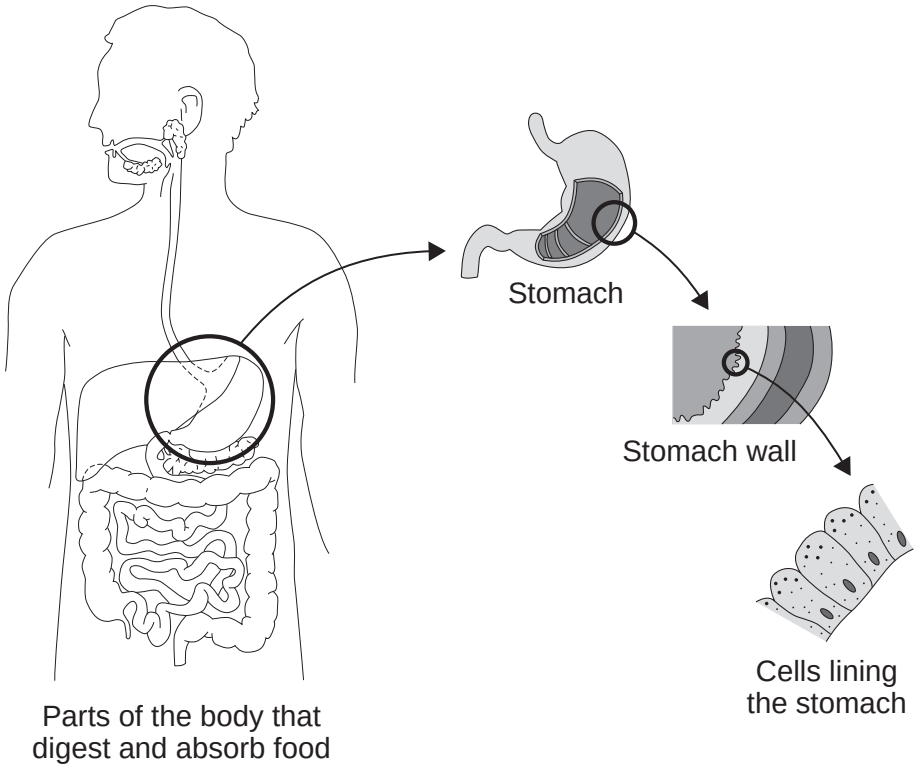
Question 28

June 2015 | BL2FP | Original Q3 | Legacy

3 **Figure 2** shows the parts of the body that digest and absorb food.

Figure 2 also shows some details about the structure of the stomach.

Figure 2



3 (a) Complete **Table 1** to show whether each structure is an organ, an organ system or a tissue.

For each structure, tick (✓) **one** box.

[2 marks]

Table 1

Structure	Organ	Organ system	Tissue
Stomach			
Cells lining the stomach			
Mouth, oesophagus, stomach, liver, pancreas, small and large intestine			

4.4.2.1 Aerobic and anaerobic respiration

Question 28 · continued

3 (b) (i) The blood going to the stomach has a high concentration of oxygen.
The cells lining the stomach have a low concentration of oxygen.

Complete the following sentence.

[1 mark]

Oxygen moves from the blood to the cells lining the stomach by

the process of ..... .

3 (b) (ii) What other substance must move from the blood to the cells lining the stomach so that respiration can take place?

Draw a ring around the correct answer.

[1 mark]

glucose **protein** **starch**

3 (b) (iii) In which part of a cell does aerobic respiration take place?

Draw a ring around the correct answer.

[1 mark]

cell membrane **mitochondria** **nucleus**

5

4.4.2.1 Aerobic and anaerobic respiration

Question 29

June 2015 | BL3FP | Original Q7 | Legacy

7 The world population is increasing and the need for food is increasing.

Mycoprotein is a high-protein food made in fermenters using the organism *Fusarium*.

The process takes only a few weeks to produce a large amount of food.

7 (a) (i) What type of organism is *Fusarium*?

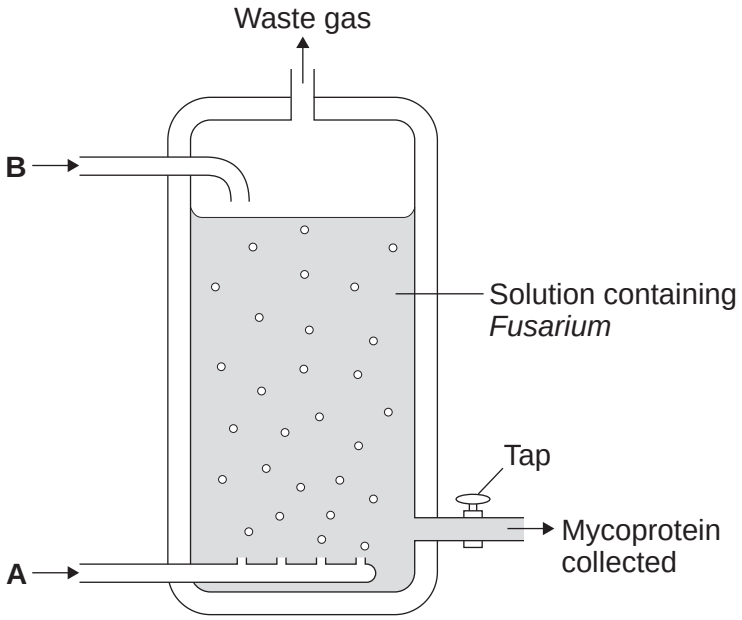
Draw a ring around the correct answer.

[1 mark]

bacterium **fungus** **virus**

Figure 8 shows a fermenter used in mycoprotein production.

Figure 8



7 (a) (ii) *Fusarium* makes mycoprotein. *Fusarium* respires aerobically.

Suggest which gas is added to the fermenter at point **A**.

[1 mark]

.....

7 (a) (iii) Another substance is added to the fermenter at point **B**. This substance is used in aerobic respiration.

Name this substance.

[1 mark]

.....

4.4.2.1 Aerobic and anaerobic respiration

Question 29 · continued

7 (b) People need to eat protein to grow and to be healthy.

Some people think that it would be an advantage to get more food from mycoprotein and less from farming animals.

Suggest **two** possible advantages of getting more food from mycoprotein.

[2 marks]

1 .....

.....

2 .....

.....

5

Turn over for the next question

4.4.2.1 Aerobic and anaerobic respiration

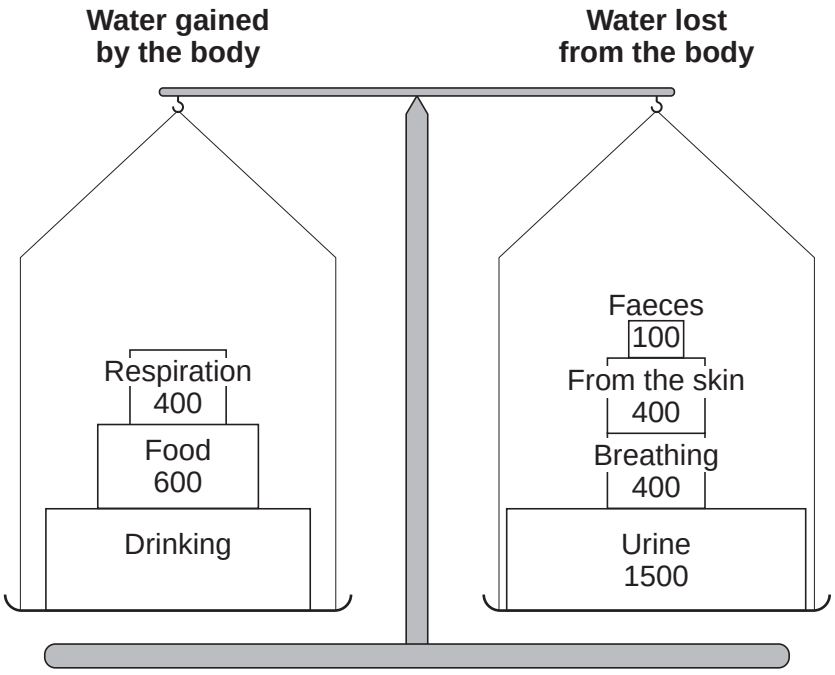
Question 30

June 2016 | BL1FP | Original Q1 | Legacy

1 **Figure 1** shows the water balance for a person on a cold day.

The numbers show the volume of water, in cm^3, the person's body gained and lost.

Figure 1



1 (a) (i) How much water was lost from the body on the cold day?

[1 mark]

Draw a ring around the correct answer.

1800 cm^3 **2400 cm^3** **3300 cm^3**

1 (a) (ii) The volume of water gained by the body should balance the volume of water lost from the body.

How much water should the person have drunk to keep the balance?

[2 marks]

_____

_____

Volume of water = _____ cm^3

4.4.2.1 Aerobic and anaerobic respiration

Question 30 · continued

1 (b) (i) Name the process by which water is lost from the skin.

[1 mark]

_____

1 (b) (ii) Why does the body need to lose water from the skin?

[1 mark]

_____

_____

1 (c) The next day was a hot day. The person gained the same volume of water and did the same activities.

1 (c) (i) What effect did the increase in temperature have on the volume of water the person lost?

[1 mark]

Tick (✓) **one** box.

Less water was lost through the skin. ☐

More water was lost through the skin. ☐

More water was lost in faeces. ☐

1 (c) (ii) What effect would the increase in temperature have on the volume of urine the person lost?

[1 mark]

Draw a ring around the correct answer.

decrease **increase** **no change**

7

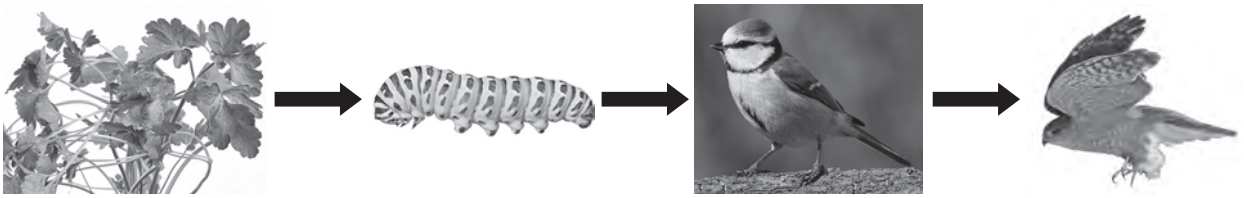
4.4.2.1 Aerobic and anaerobic respiration

Question 31

June 2016 | BL1FP | Original Q3 | Legacy

3 **Figure 3** shows how energy and biomass pass along a food chain.

Figure 3



Parsley → Swallowtail caterpillar → Blue tit → Hawk

3 (a) The parsley shown in **Figure 3** carries out photosynthesis.

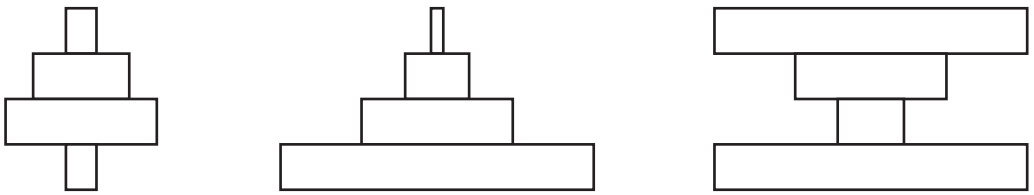
Why is photosynthesis important in the food chain?

[2 marks]

3 (b) Which diagram shows the pyramid of biomass for the food chain in **Figure 3**?

[1 mark]

Tick (✓) **one** box.

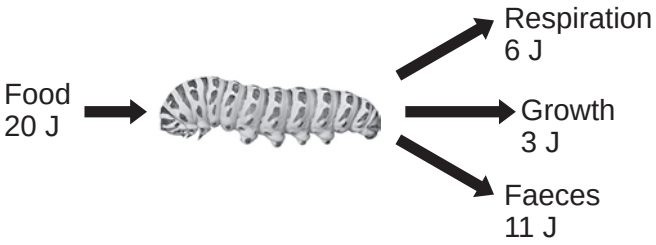


4.4.2.1 Aerobic and anaerobic respiration

Question 31 · continued

3 (c) **Figure 4** shows the ways a swallowtail caterpillar transfers 20 J of energy from food.

Figure 4



What percentage of the energy in the caterpillar's food is used for growth?

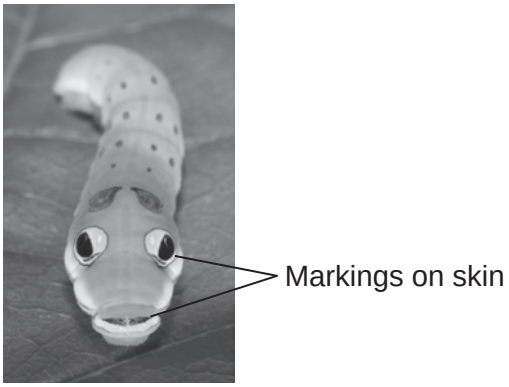
[2 marks]

Percentage = _____

3 (d) The organisms in the food chain are adapted for survival.

3 (d) (i) **Figure 5** shows a swallowtail caterpillar seen from the back.

Figure 5



Suggest how the swallowtail caterpillar shown in **Figure 5** is adapted to reduce the chance of being eaten by blue tits.

[2 marks]

4.4.2.1 Aerobic and anaerobic respiration

Question 31 · continued

3 (d) (ii) **Figure 6** shows a hawk.

Figure 6



Suggest **two** ways that the hawk is adapted to catch and kill blue tits.

[2 marks]

1 _____

_____

2 _____

_____

9

4.4.2.1 Aerobic and anaerobic respiration

Question 32

June 2016 | BL2FP | Original Q1 | Legacy

1 Living organisms are made of cells.

1 (a) Animal and plant cells have several parts. Each part has a different function.

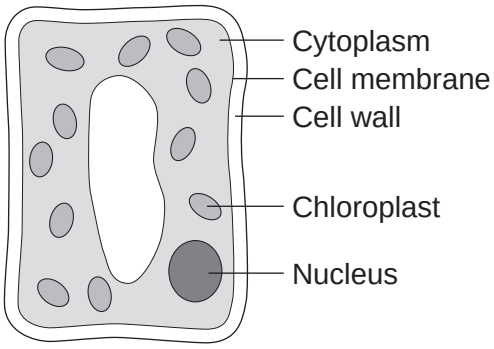
Draw **one** line from each cell part to the correct function of that part.

[3 marks]

Cell part	Function
Cell membrane	Where most energy is released in respiration
Mitochondria	Controls the movement of substances into and out of the cell
Nucleus	Controls the activities of the cell
	Where proteins are made

1 (b) **Figure 1** shows a cell from a plant leaf.

Figure 1



Which **two** parts in **Figure 1** are **not** found in an animal cell?

[2 marks]

1 _____

2 _____

5

4.4.2.1 Aerobic and anaerobic respiration

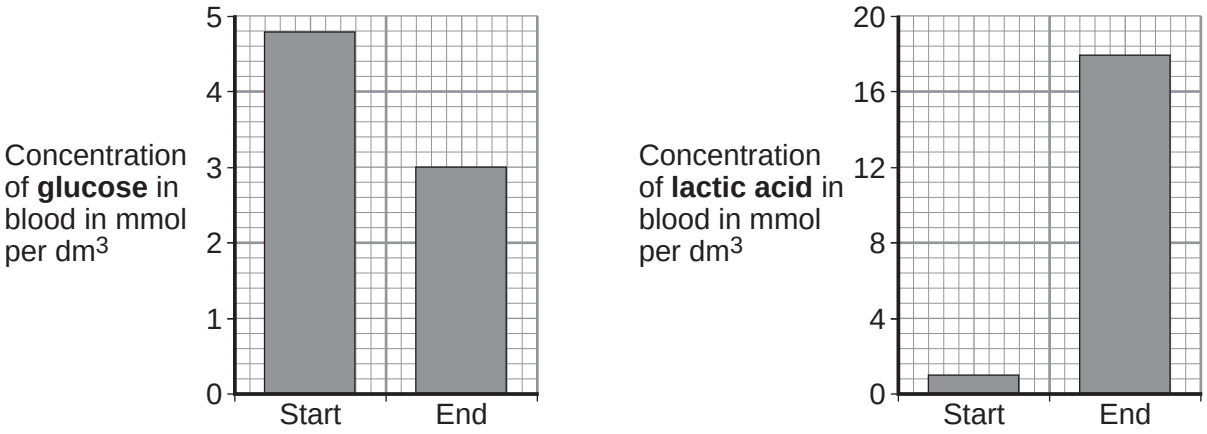
Question 33

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]

_____

_____

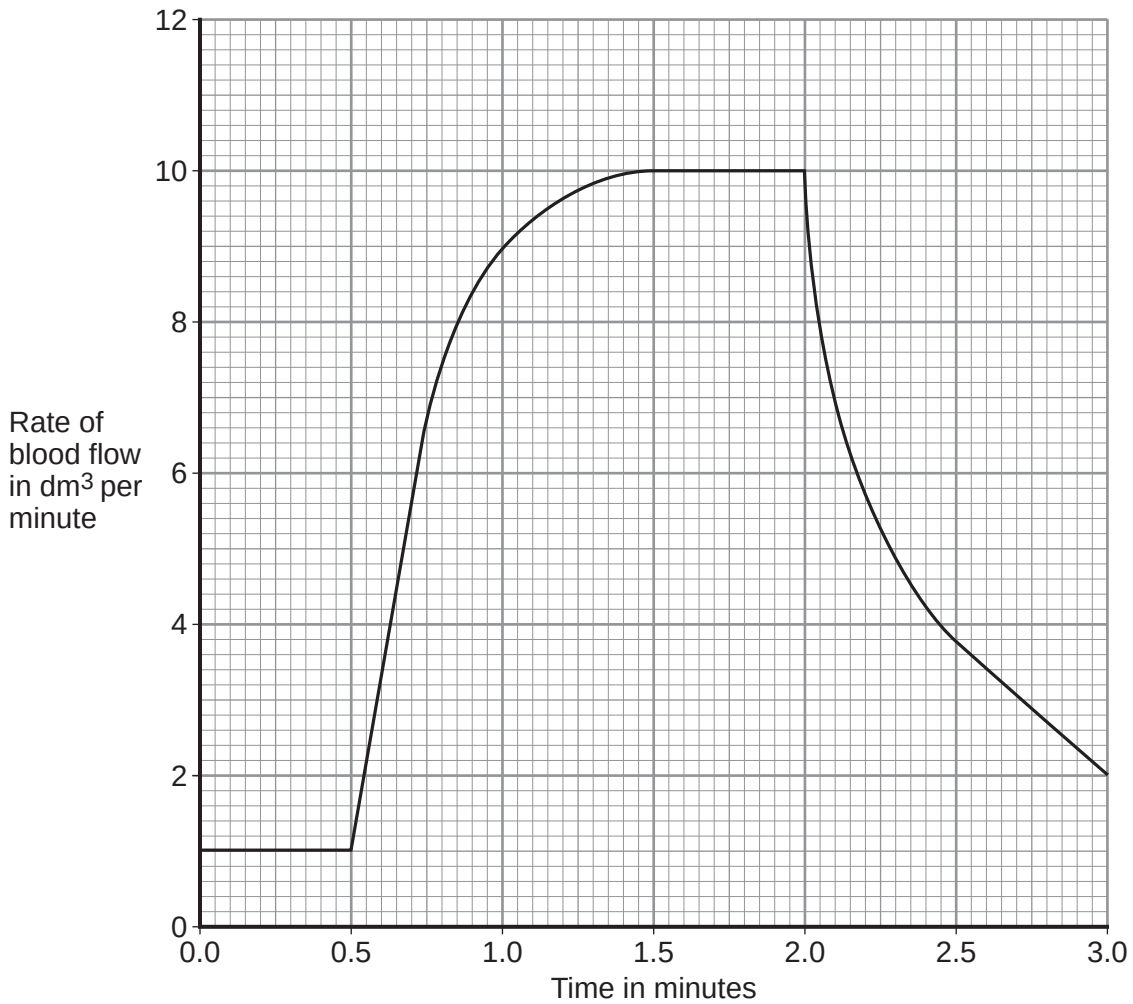
Question 7 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 33 · 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]

_____

_____

_____

_____

4.4.2.1 Aerobic and anaerobic respiration

Question 33 · continued

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

[4 marks]

9

4.4.2.1 Aerobic and anaerobic respiration

Question 34

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

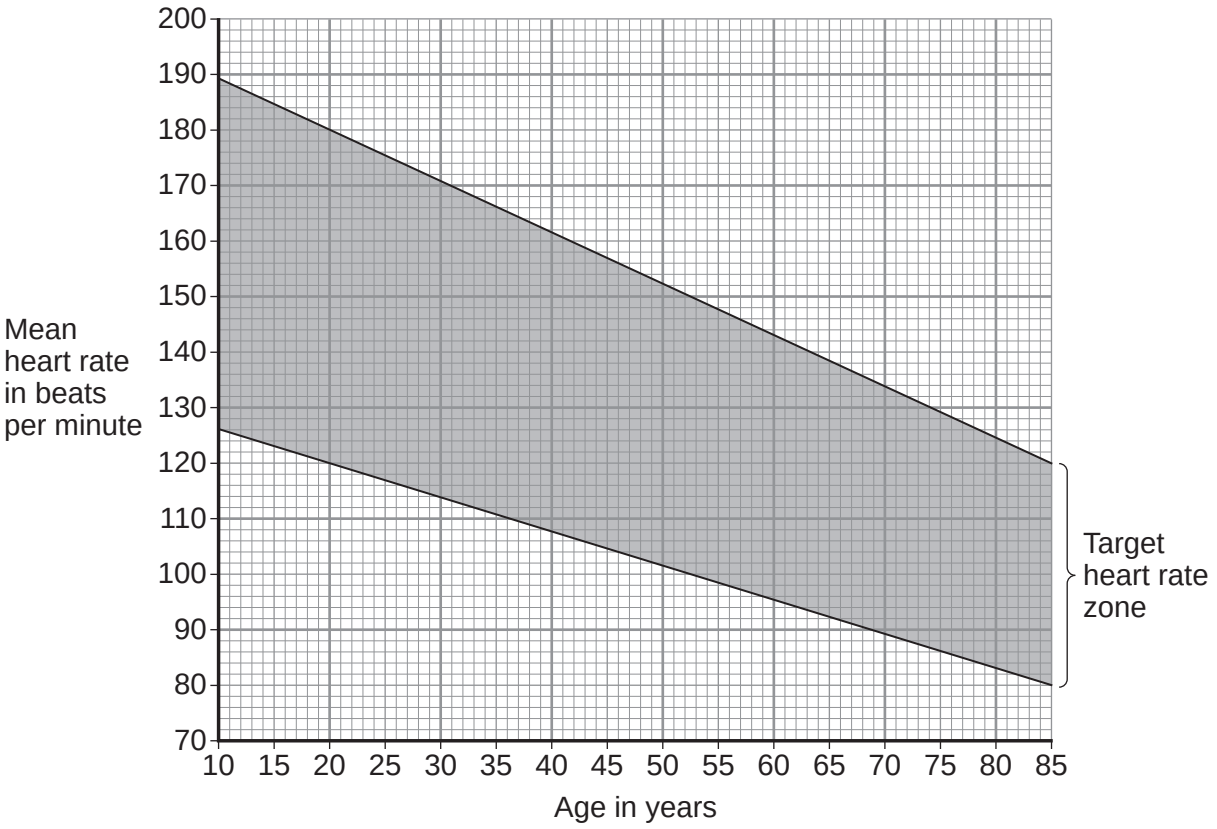
4.4.2.1 Aerobic and anaerobic respiration

Question 34 · continued

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

4.4.2.1 Aerobic and anaerobic respiration

Question 34 · 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**

4.4.2.1 Aerobic and anaerobic respiration

Question 34 · 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

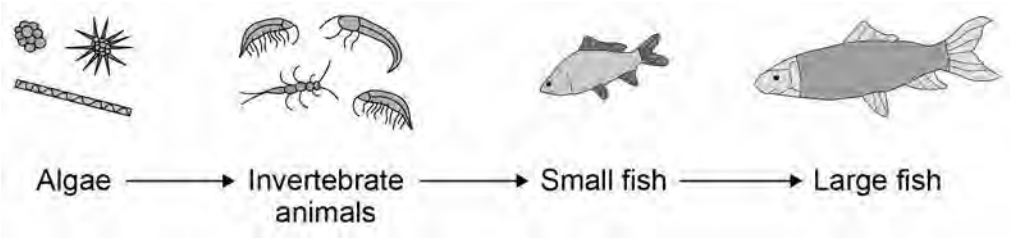
4.4.2.1 Aerobic and anaerobic respiration

Question 35

June 2018 | 8461/2F | Original Q1

0 1 **Figure 1** shows a food chain in a river.

Figure 1



0 1 . 1 Draw **one** line from each scientific term to the correct organism in the food chain.

[3 marks]

Scientific term	Organism in the food chain
	Algae
Apex predator	Invertebrate animals
Primary consumer	Large fish
Producer	Small fish

4.4.2.1 Aerobic and anaerobic respiration

Question 35 · continued

0 1 . 2 **Table 1** shows the biomass of the organisms at each stage in the food chain.

Table 1

Organism	Biomass in arbitrary units
Algae	840
Invertebrate animals	200
Small fish	40
Large fish	10

Calculate the percentage of the biomass of the invertebrate animals that is transferred to the large fish.

[2 marks]

Use the equation:

$$\text{percentage} = \frac{\text{biomass of large fish}}{\text{biomass of invertebrate animals}} \times 100$$

Percentage = _____

Question 1 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 35 · continued

0 1 . 3 A large amount of biomass is lost from the food chain.

Complete the sentences.

Choose answers from the box.

[3 marks]

coordination	**digestion**	**excretion**
filtration	**ingestion**	**respiration**

When the small fish eat the invertebrate animals, not all of this material is broken down during _____ .

Materials absorbed from the gut may enter the body cells of the small fish. These materials are broken down into carbon dioxide and water by _____ .

The carbon dioxide and other waste materials from the body cells are removed from the small fish by _____ .

0 1 . 4 A disease kills many of the small fish.

Why does the number of invertebrate animals increase?

[1 mark]

_____

_____

9

4.4.2.1 Aerobic and anaerobic respiration

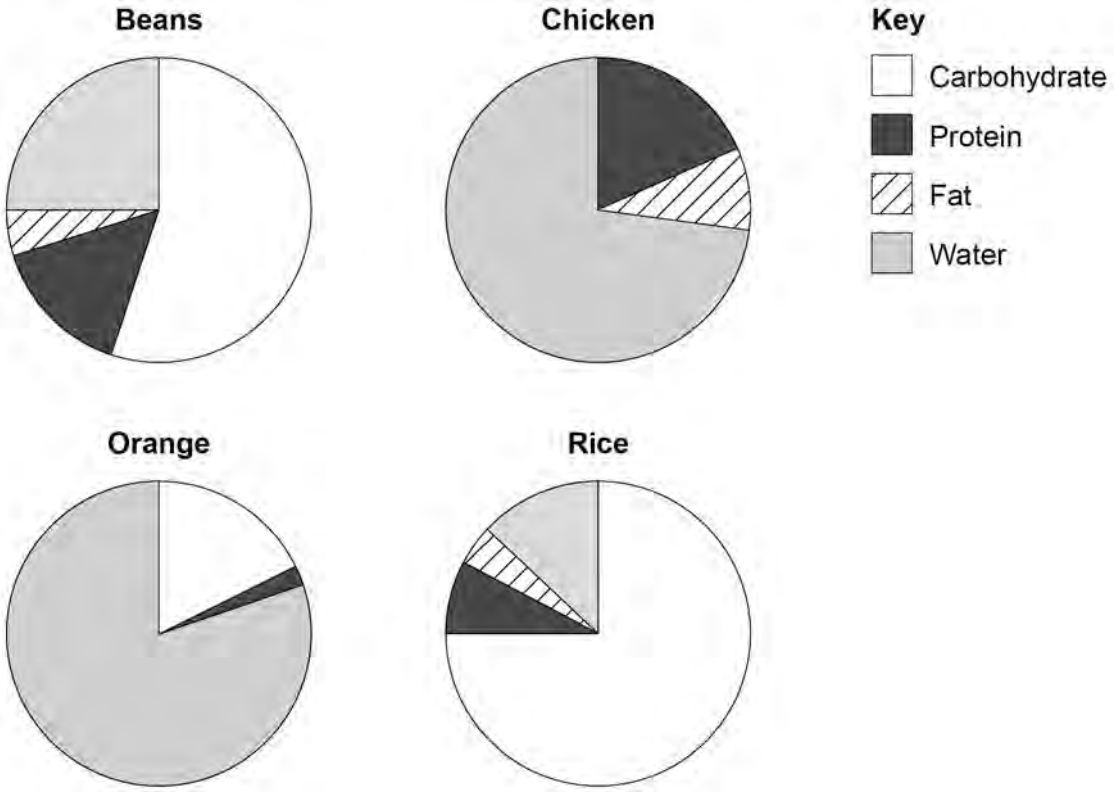
Question 36

June 2019 | 8461/1F | Original Q1

0 1 Many foods contain carbohydrates.

Figure 1 shows information about four different foods.

Figure 1



0 1 . 1 Which food contains the highest percentage of carbohydrate?

[1 mark]

Tick (✓) **one** box.

- Beans ☐
- Chicken ☐
- Orange ☐
- Rice ☐

4.4.2.1 Aerobic and anaerobic respiration

Question 36 · continued

0 1 . 2 Estimate the percentage of water found in beans.

[1 mark]

Percentage = _____ %

0 1 . 3 Look at **Figure 1**.

Why would eating only beans provide a more balanced diet than eating only chicken?

[1 mark]

_____

_____

0 1 . 4 Sugars are produced when enzymes break down starch.

What is the name of the enzyme which breaks down starch to produce sugars?

[1 mark]

Tick (✓) **one** box.

- Amylase ☐
- Bile ☐
- Lipase ☐
- Protease ☐

0 1 . 5 Which chemical could be used to test for glucose?

[1 mark]

Tick (✓) **one** box.

- Benedict's reagent ☐
- Biuret reagent ☐
- Iodine solution ☐
- Sulfuric acid ☐

4.4.2.1 Aerobic and anaerobic respiration

Question 36 · continued

0 1 . 6 What colour change would be seen in a positive test for glucose?

[1 mark]

From blue to _____.

0 1 . 7 People with diabetes have difficulty controlling the concentration of glucose in their blood.

The blood of four people was tested.

Table 1 shows the results.

Table 1

Person	Concentration of glucose in blood in arbitrary units
A	4.2
B	6.9
C	7.1
D	5.1

Table 2 shows the information used to help decide if a person has diabetes.

Table 2

Concentration of glucose in blood in arbitrary units	Conclusion
<5.6	No diabetes
5.6 to 7.0	Mild diabetes
>7.0	Severe diabetes

Which person has severe diabetes?

[1 mark]

Tick (✓) **one** box.

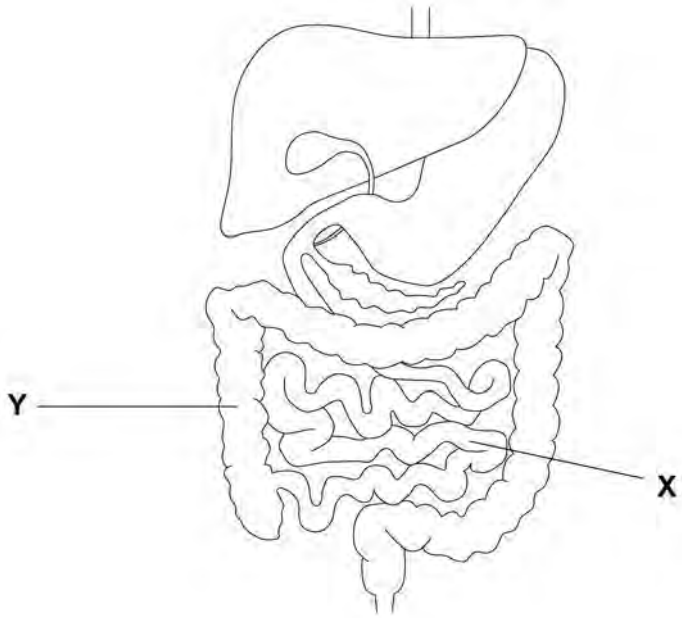
A ☐ **B** ☐ **C** ☐ **D** ☐

4.4.2.1 Aerobic and anaerobic respiration

Question 36 · continued

Figure 2 shows part of the human digestive system.

Figure 2



0 1 . 8 Glucose is absorbed into the bloodstream in part **X**.

Name part **X**.

[1 mark]

_____

0 1 . 9 Complete the sentences.

[2 marks]

Choose answers from the box.

active transport	**digestion**	**excretion**
osmosis	**respiration**	

Some glucose is absorbed into the bloodstream against the concentration gradient by the process of _____.

Water moves out of part **Y** and into the bloodstream by the process of _____.

10

4.4.2.1 Aerobic and anaerobic respiration

Question 37

June 2019 | 8461/1F | Original Q4

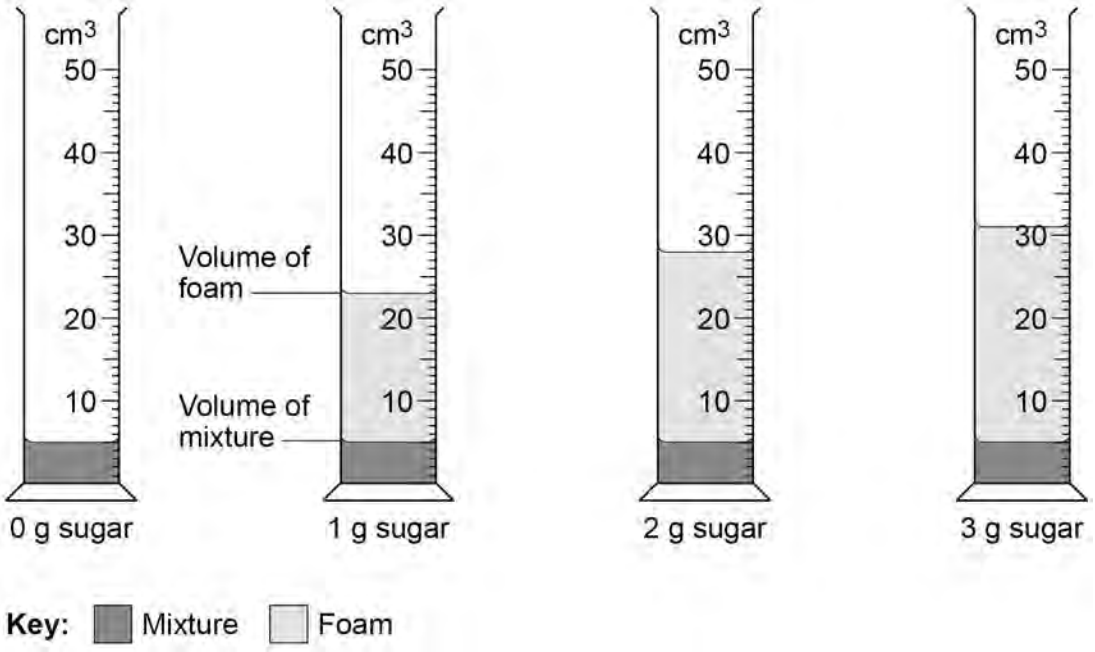
0 4 A student investigated respiration in yeast.

This is the method used.

1. Add 5 cm^3 of a yeast and water mixture to each measuring cylinder.
2. Add different masses of sugar to each measuring cylinder.
3. Mix the contents of each measuring cylinder gently for 5 seconds.
4. Put the measuring cylinders in a water bath at 25 °C
5. Over the next 20 minutes, record the maximum volume the foam reaches in each measuring cylinder.

Figure 8 shows the student's results.

Figure 8



4.4.2.1 Aerobic and anaerobic respiration

Question 37 · continued

0 4 . 1 Which **two** variables did the student control in the method?

[2 marks]

Tick (✓) **two** boxes.

- Mass of sugar ☐
- pH of the mixture ☐
- Temperature ☐
- Volume of foam ☐
- Volume of yeast and water ☐

Table 3 shows the results.

Table 3

Mass of sugar in g	Maximum volume in cm^3
0	5
1	23
2	**X**
3	31

0 4 . 2 What is value **X** in **Table 3**?

Use **Figure 8**.

[1 mark]

X = _____ cm^3

Question 4 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 37 · continued

June 2019 | 8461/1F | Original Q4

In the investigation, the yeast respires and releases a gas which causes the foam to rise.

0 4 . 3 Which gas causes the foam to rise?

[1 mark]

Tick (✓) **one** box.

- Carbon dioxide ☐
- Hydrogen ☐
- Nitrogen ☐
- Oxygen ☐

0 4 . 4 What conclusion can you make about the relationship between the mass of sugar used and the volume of gas produced?

[1 mark]

0 4 . 5 Why was no foam produced in the mixture with 0 g of sugar?

[1 mark]

0 4 . 6 Why was the measuring cylinder with 0 g of sugar included in the investigation?

[1 mark]

4.4.2.1 Aerobic and anaerobic respiration

Question 37 · continued

0 4 . 7 The top of the mixture can be covered with a layer of oil after step 3 in the method.

Suggest why the layer of oil stops the yeast respiring aerobically.

[1 mark]

0 4 . 8 What other substance is produced during **anaerobic** respiration in yeast?

[1 mark]

Tick (✓) **one** box.

- Ethanol ☐
- Hydrochloric acid ☐
- Lactic acid ☐
- Water ☐

9

4.4.2.1 Aerobic and anaerobic respiration

Question 38

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 _____.

4.4.2.1 Aerobic and anaerobic respiration

Question 38 · 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

Question 38 · continued

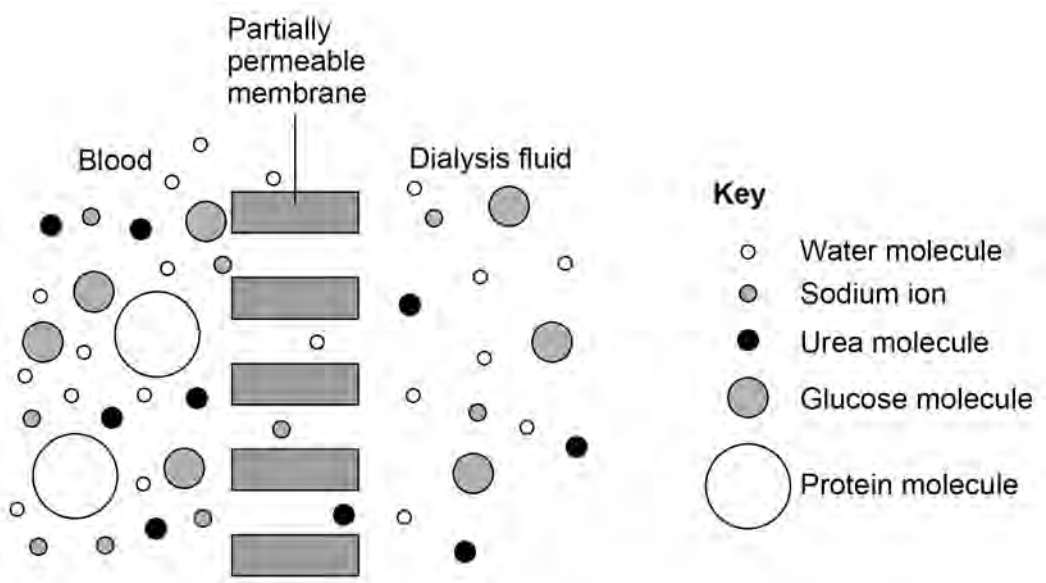
Some people have kidney disease.

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 ☐

4.4.2.1 Aerobic and anaerobic respiration

Question 38 · continued

June 2019 | 8461/2F | Original Q6

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

Question 38 · 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

4.4.2.1 Aerobic and anaerobic respiration

Question 39

June 2023 | 8461/1F | Original Q1

0 1 Plants are made of cells, tissues and organs.

0 1 . 1 Which part of a plant is the largest?

[1 mark]

Tick (✓) **one** box.

A guard cell ☐

A leaf ☐

A root hair ☐

Students investigated the effect of concentration of salt solution on the mass of pieces of potato.

This is the method used.

1. Cut two pieces of potato to the same size.
2. Record the mass of each piece of potato.
3. Place one piece of potato into a beaker containing a dilute salt solution.
4. Place the other piece of potato into a beaker containing a concentrated salt solution.
5. After 20 minutes, remove each piece of potato from its solution.
6. Record the change in mass of each piece of potato.
7. Repeat steps 1 to 6 two more times.

Table 1 shows the results.

Table 1

Solution	Change in mass of piece of potato in grams			
	Test 1	Test 2	Test 3	Mean
Dilute salt solution	1.1	1.1	1.4	**X**
Concentrated salt solution	–7.2	–6.8	–32.4	–7.0

4.4.2.1 Aerobic and anaerobic respiration

Question 39 · continued

0 1 . 2 Calculate mean value **X** in **Table 1**.

[2 marks]

X = _____ grams

There is an anomalous result for the concentrated salt solution in **Table 1**.

0 1 . 3 Draw a ring around the anomalous result in **Table 1**.

[1 mark]

0 1 . 4 What did the students do with the anomalous result when calculating the mean in **Table 1**?

[1 mark]

0 1 . 5 What name is given to a variable that is kept the same during an investigation?

[1 mark]

Tick (✓) **one** box.

- Control variable ☐
- Dependent variable ☐
- Independent variable ☐

Question 1 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 39 · continued

0 1 . 6 One variable the students kept the same during the investigation was the size of the pieces of potato.

Which other variable did the students keep the same?

[1 mark]

Tick (✓) **one** box.

Change in mass of pieces of potato ☐

Concentration of salt solution ☐

Time in the salt solution ☐

0 1 . 7 The pieces of potato in the concentrated salt solution decreased in mass.

Complete the sentence.

Choose the answer from the box.

[1 mark]

excretion	**osmosis**	**respiration**

Water moved out of the potato by the process of _____.

4.4.2.1 Aerobic and anaerobic respiration

Question 39 · continued

0 1 . 8 The potato cells have a partially permeable membrane.

Which particles can pass through a partially permeable membrane?

[1 mark]

Tick (✓) **one** box.

- No particles ☐
- Some particles ☐
- All particles ☐

0 1 . 9 How could the students improve their investigation?

[1 mark]

Tick (✓) **one** box.

- Boil the pieces of potato at the start. ☐
- Leave the skin on some pieces of potato. ☐
- Use more concentrations of salt solution. ☐

10

4.4.2.1 Aerobic and anaerobic respiration

Question 40

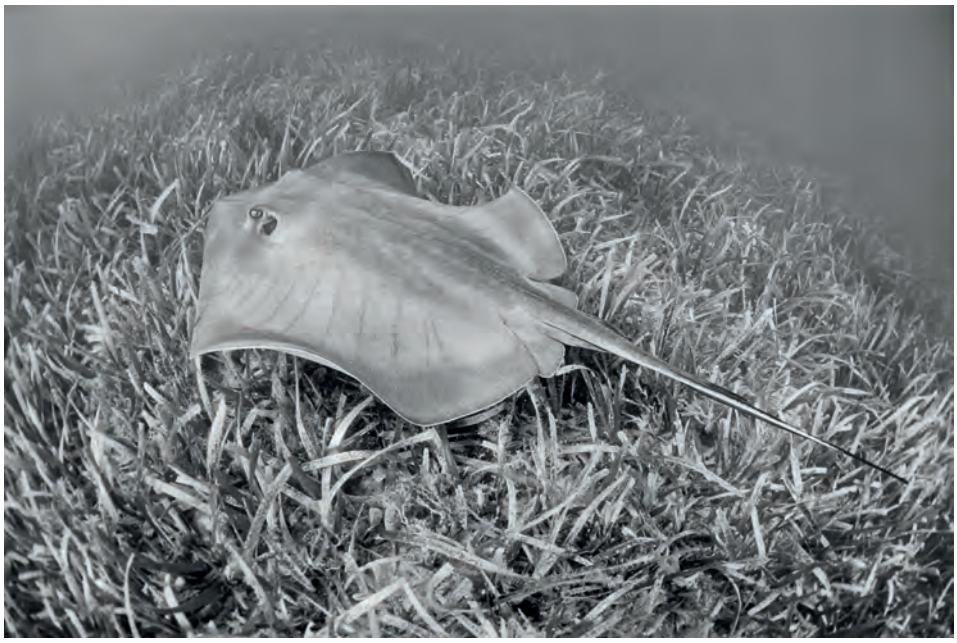
June 2025 | 8461/1F | Original Q5

0 5 Plants and animals have adaptations that help them survive.

A stingray is an animal that lives in the sea.
Seagrass is a plant that grows on the sea floor.

Figure 8 shows a stingray swimming above seagrass.

Figure 8



0 5 . 1 Draw **one** line from each adaptation of **seagrass** to how the adaptation helps the seagrass survive.

[2 marks]

Adaptation of seagrass	How the adaptation helps the seagrass to survive
Flexible leaves	Keep seagrass in one place on the sea floor
Long, deep roots	Poison animals that try to eat the seagrass
	Stop seagrass breaking in strong water currents

4.4.2.1 Aerobic and anaerobic respiration

Question 40 · continued

In the stingray, gas exchange takes place in the gills.

0 5 . 2 Name the organs where gas exchange takes place in humans.

[1 mark]

0 5 . 3 Gills are adapted to maximise gas exchange.

Which **two** features of gills help to maximise gas exchange?

[2 marks]

Tick (✓) **two** boxes.

- Gills are not open at night. ☐
- Gills have a large surface area. ☐
- Gills have a low temperature. ☐
- Gills have thin walls. ☐
- Gills have very few capillaries. ☐

Question 5 continues on the next page

Question 40 · continued

0 5 . 4 Stingrays rest on the sea floor.

Table 4 shows information about the metabolic rate of a stingray.

Table 4

Activity of stingray	Metabolic rate in arbitrary units
Resting	484
Swimming	944

Calculate how many times greater the metabolic rate of the stingray is when swimming compared with when resting.

Give your answer to the nearest whole number.

[3 marks]

0 5 . 5 When the metabolic rate of the stingray increases, the rate of aerobic respiration in the stingray increases.

Complete the word equation for aerobic respiration.

Choose answers from the box.

[3 marks]

carbon dioxide	magnesium	nitrogen	oxygen	water

glucose + _____ ⟶ _____ + _____

4.4.2.1 Aerobic and anaerobic respiration

Question 40 · continued

0 5 . 6 Explain why the rate of respiration in the stingray increases when the stingray starts to swim.

[3 marks]

0 5 . 7 Some plants can use anaerobic respiration.

Which **two** substances are produced during anaerobic respiration in plants?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Ethanol ☐
- Hydrochloric acid ☐
- Oil ☐
- Protein ☐

16