Specimen Paper

Surname

Other Names

Candidate Signature

AQA↗

General Certificate of Secondary Education
Higher Tier

Further Additional Science   [CODE]
Unit 1 Biology 3

H

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 60 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 7(b)(ii) should be answered in continuous prose. In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

[CODE]

Answer **all** questions in the spaces provided.

1 The diagram shows four ways in which molecules may move into a cell and out of a cell.

The dots show the concentration of molecules.
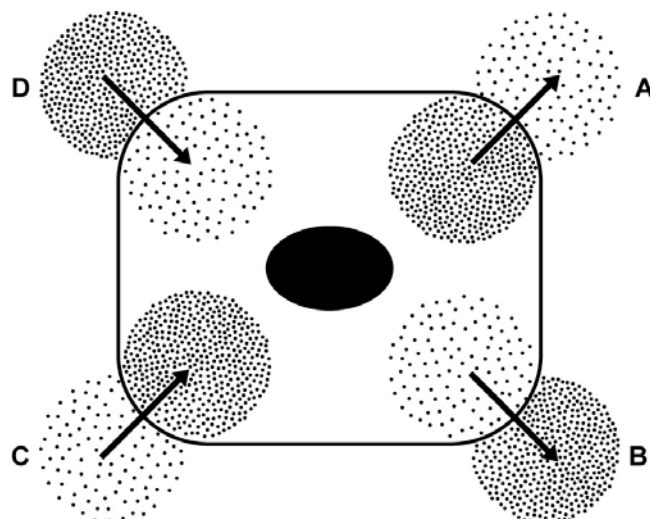
The cell is respiring aerobically.

Write the correct letter, **A**, **B**, **C** or **D**, next to each process.

Process	Arrow **A**, **B**, **C** or **D**
The movement of oxygen molecules	
The movement of carbon dioxide molecules	
The active uptake of glucose molecules	

(3 marks)

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3

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

2 Four leaves were removed from the same plant. A waterproofing agent was spread onto some of the leaves, as follows:

• leaf **A** on both surfaces

• leaf **B** on the lower surface only

• leaf **C** on the upper surface only

• leaf **D** on neither surface.

Each leaf was then placed in a separate beaker, as shown in **Diagram 1**.

Diagram 1
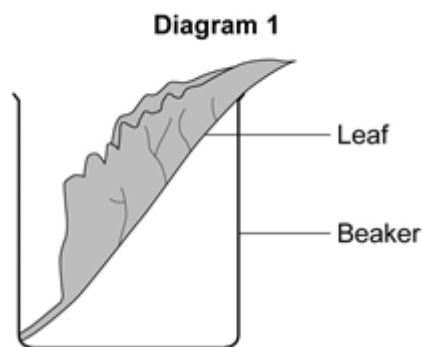
Each beaker was weighed at intervals.

The results are shown in the graph.
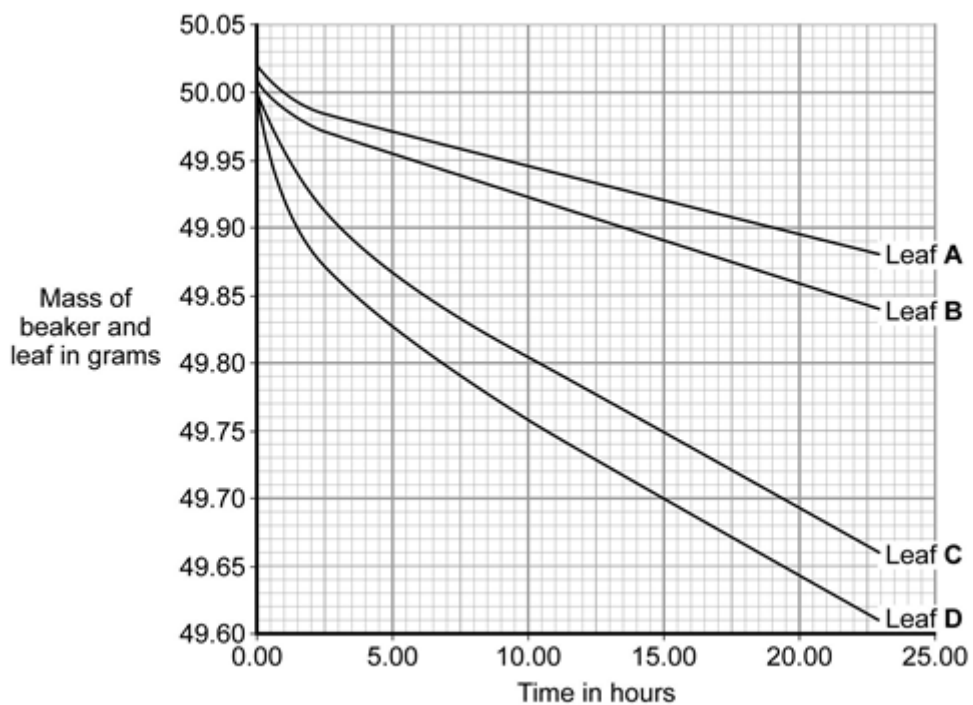
2 (a) Give evidence from the graph when answering the following questions.

2 (a) (i) Which leaf, **A**, **B**, **C** or **D**, loses water most rapidly? ☐

Evidence ....

....

(1 mark)

2 (a) (ii) Is water lost from both surfaces of the leaf?

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

Evidence ....

....

(1 mark)

2 (b) **Diagram 2** shows the appearance of each surface of the leaf as seen through a microscope.

Diagram 2

Upper surface of leaf   Lower surface of leaf

X
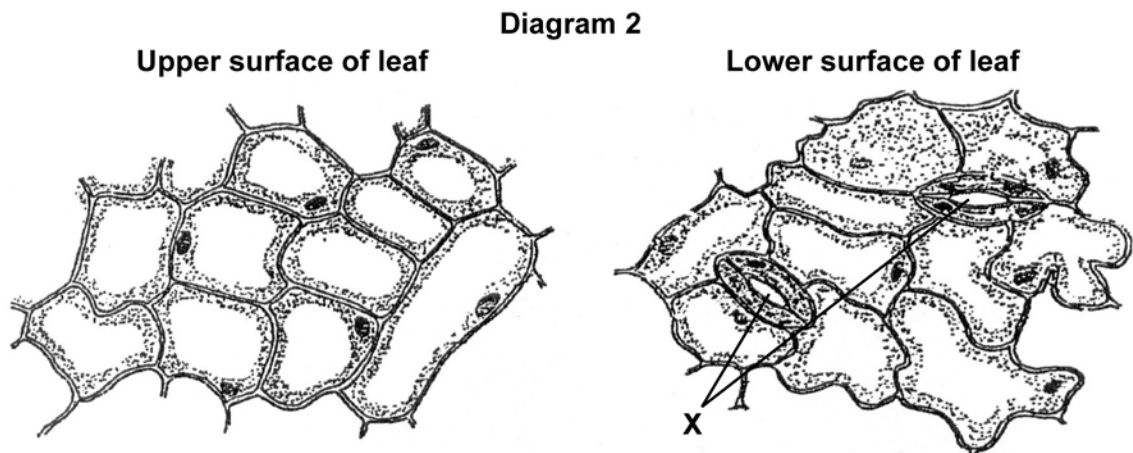
2 (b) (i) Name the spaces labelled **X**. .... *(1 mark)*

2 (b) (ii) Use information in **Diagram 2** to explain why the results are different for leaves **B** and **C**.

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(2 marks)

5

3 The food we eat affects how quickly our blood glucose concentration changes.

In an experiment a person ate two slices of white bread.

Her blood glucose concentration was recorded over the next 120 minutes.

The experiment was repeated:

• first with two slices of brown bread

• then with two slices of wholemeal bread.

The graph shows the results of the three experiments.

3 (a) Describe the effect of eating two slices of white bread on the person's blood sugar concentration.

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(2 marks)

3 (b) Wholemeal bread would be most suitable for a person with diabetes.

Explain why.

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(3 marks)

5

Turn over for the next question

4 The photograph shows one type of artificial heart.

The diagram shows how this artificial heart is fitted inside the body.
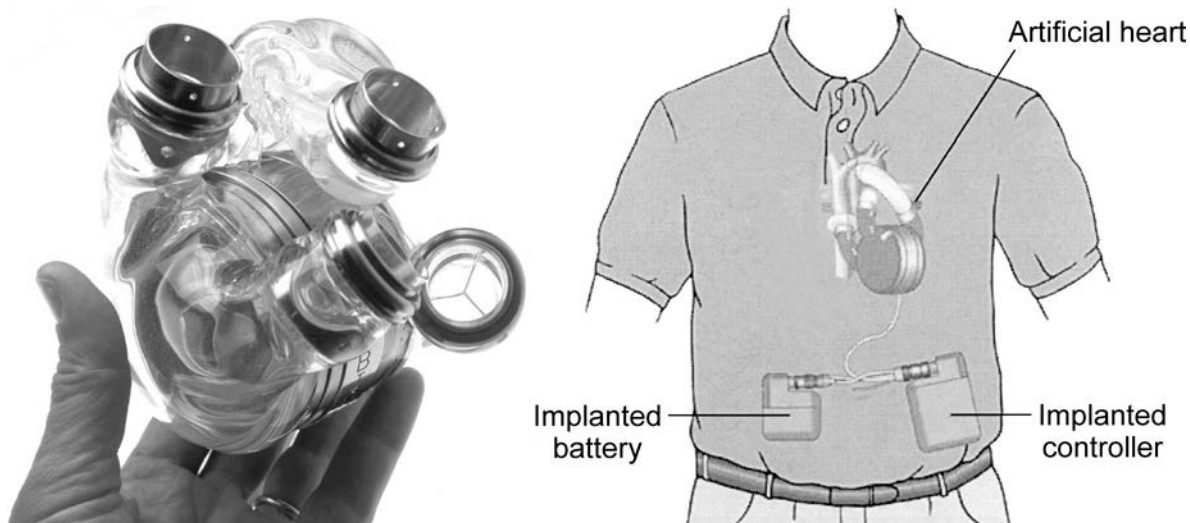
Read the information about this artificial heart.

The first patient to receive the heart lived for 151 days before dying from a stroke.

The second patient was given less than a 20 % chance of surviving 30 days at the time of his surgery. He lived for 512 days after receiving the heart. He died because an internal membrane in the device wore out.

Suggest **advantages** and **disadvantages** of treating patients with this artificial heart.

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(5 marks)

5

Turn over for the next question

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5 Blood contains red blood cells, white blood cells and platelets.

5 (a) Give the function of the platelets.

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(1 mark)

The photograph shows a red blood cell.

5 (b) The average diameter of a real red blood cell is 0.008 millimetres.
On the photograph, the diameter of the red blood cell is 100 millimetres.

Use the formula to calculate the magnification of the photograph.

diameter on photograph = real diameter × magnification

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Magnification = ...

(2 marks)

5 (c)   Some blood capillaries have an internal diameter of approximately 0.01 millimetres.

Use information given in part (b) to explain why only one red blood cell at a time can pass through a capillary.

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(1 mark)

5 (d) (i)   Red blood cells transport oxygen.

Explain how oxygen is moved from the lungs to the tissues.

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(3 marks)

5 (d) (ii)   Red blood cells have no nucleus.

Explain how this feature is an adaptation to the function of red blood cells.

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(1 mark)

5 (e)   Oxygen is exchanged between the blood capillaries and the tissue.

Give **two** ways in which capillaries are adapted for exchanging oxygen with the tissues.

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(2 marks)

10

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6 The design of biogas generators depends upon the climate.

Photograph 1 shows a biogas generator on a farm in India.

Photograph 1

Biogas storage tank

1 metre

Biogas generator (underground)

6 (a) Describe the processes that occur in the biogas generator.

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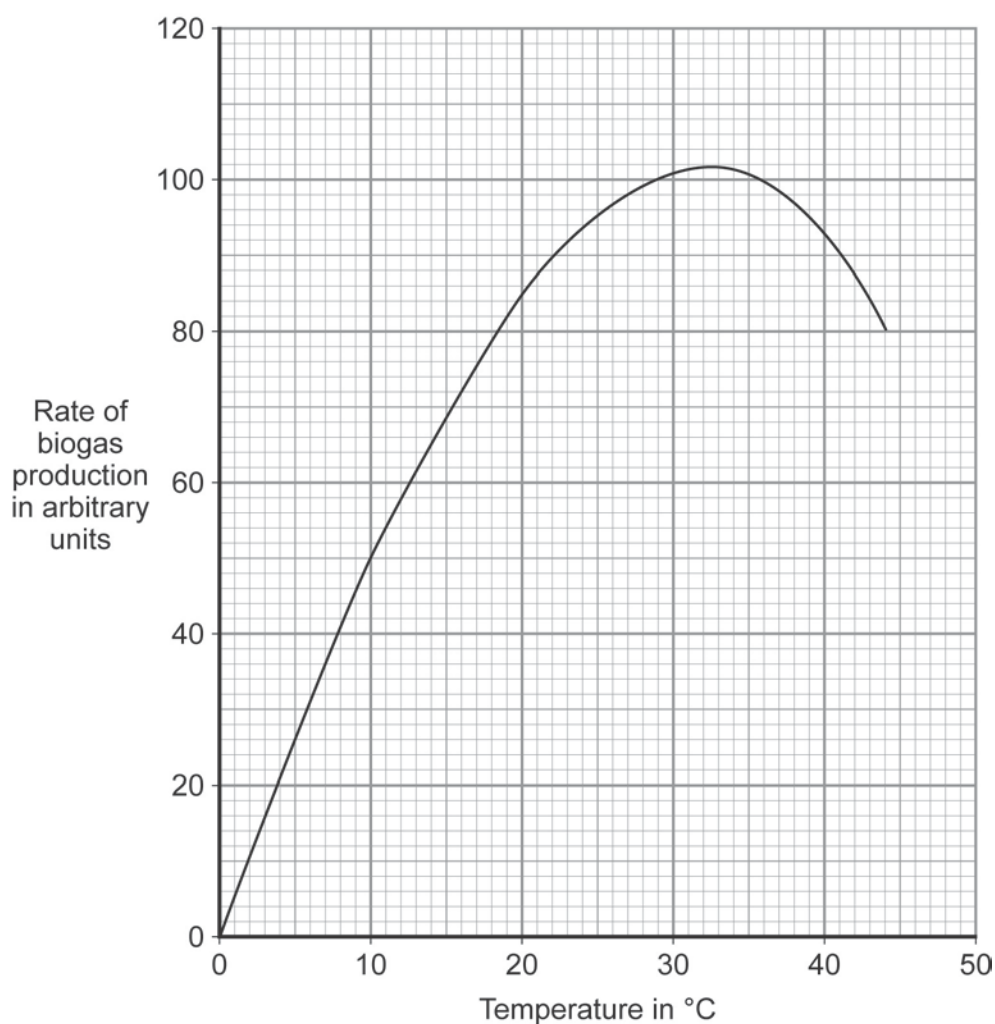
(3 marks)

Question 6 continues on the next page

6 (b) The graph shows the effect of temperature on the rate of biogas production.

Temperatures in India frequently rise to 40°C and above.

The biogas generator shown in **Photograph 1** is built mainly underground.

Use information from the graph to suggest why.

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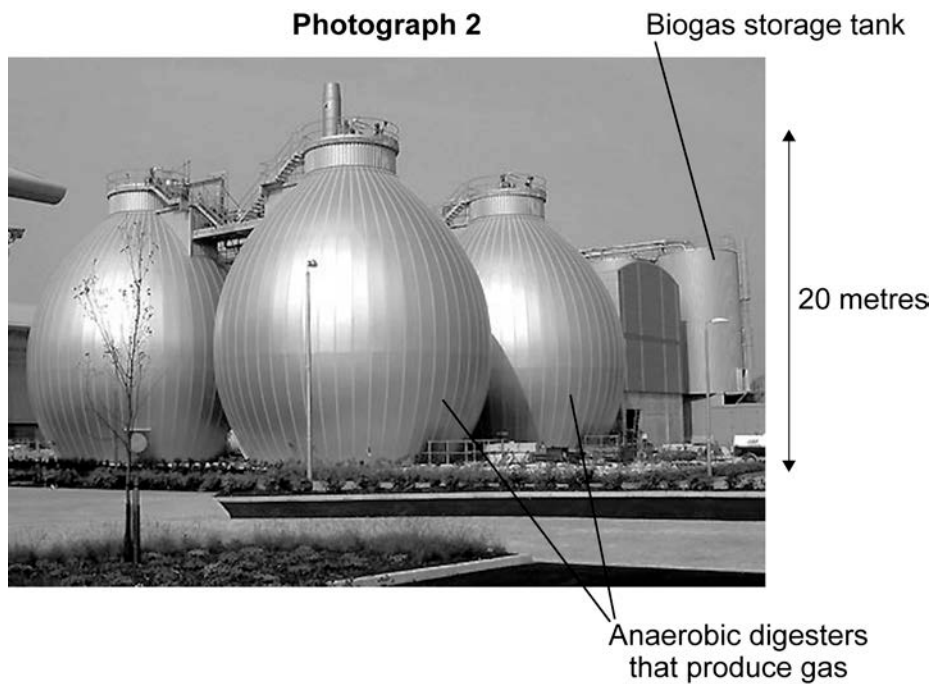..

(2 marks)

6 (c) **Photograph 2** shows a set of three biogas generators built at a sewage works in the UK in 2004.

Photograph 2

Biogas storage tank

20 metres

Anaerobic digesters that produce gas

The UK biogas generator has been built with concrete walls, 60 cm thick.

Use information from the graph on the opposite page to suggest why.

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(2 marks)

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7

7 The kidneys regulate the concentration of substances in the blood.

7 (a) Glucose is found in the blood but not in the urine.

Describe the processes that prevent glucose being excreted in the urine.

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(3 marks)

7 (b) The table shows the concentrations of dissolved substances in the urine of a healthy person and in the urine of a person with one type of kidney disease.

Substance	Concentration in grams per dm^3	
	Urine of a healthy person	Urine of a person with kidney disease
Protein	0	6
Glucose	0	0
Amino acids	0	0
Urea	21	21
Mineral ions	19	19

7 (b) (i) Suggest an explanation for the difference in composition of the urine between the healthy person and the person with kidney disease.

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(2 marks)

7 (b) (ii) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The person with the kidney disease could be treated either by using a dialysis machine or by a kidney transplant operation.

Compare the **advantages** and **disadvantages** of these two methods of treatment.

Use your knowledge and understanding of the two methods in your answer.

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(6 marks)

11

8   Producing food for humans affects the environment.

8 (a) Increasing the efficiency of human food production will help to feed an increasing world population.

Give **three** ways in which the efficiency of human food production can be increased.

For each of these ways explain why the efficiency of food production is increased.

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(6 marks)

8 (b) Organic foods have become popular in recent years. They are grown without the use of artificial pesticides and fertilisers.

A government report in 2007 showed that the production of some organic foods is more damaging to the environment than their non-organic equivalents.

However, supporters of organic farming claim that it is better than non-organic farming in conserving biodiversity and is better for the soil.

8 (b) (i) What is meant by biodiversity?

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(1 mark)

8 (b) (ii) Why is it important to conserve biodiversity?

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(1 mark)

Question 8 continues on the next page

8 (c) The table compares some of the effects of non-organic and organic food production on the environment.

Environmental effect and units per kilogram of production on farm	Sheep meat		Chicken		Milk	
	Non-organic	Organic	Non-organic	Organic	Non-organic	Organic
Energy used (in MJ)	23	18	12	16	2.5	1.6
Global warming potential (in grams of CO_2 equivalent)	17 400	10 100	4750	6680	1060	1230
Freshwater pollution potential by fertiliser (in grams of phosphate equivalent)	200	584	49	86	6.3	10.3
Land use (in hectares)	0.0014	0.003	0.64	1.4	0.001	0.002

Use data from the table to answer these questions.

8 (c) (i) What additional data is needed to calculate which method of food production is most damaging to the environment?

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(1 mark)

8 (c) (ii) How would a complete change from non-organic to organic farming affect the area of land used for food production?

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(1 mark)

8 (c) (iii) Raising sheep has a greater global warming potential than raising chickens, per kilogram of meat produced.

Suggest an explanation for this.

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(2 marks)

8 (c) (iv) Give **two** ways in which global warming might affect species on a worldwide scale.

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(2 marks)

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14

END OF QUESTIONS

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