Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3430UA0-1

S24-3430UA0-1

MONDAY, 10 JUNE 2024 – MORNING

SCIENCE (Double Award)

Unit 1: BIOLOGY 1
HIGHER TIER

1 hour 15 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**7**	
3.	**9**	
4.	**11**	
5.	**6**	
6.	**8**	
7.	**11**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

Question **5** is a quality of extended response (QER) question where your writing skills will be assessed.

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Answer **all** questions.

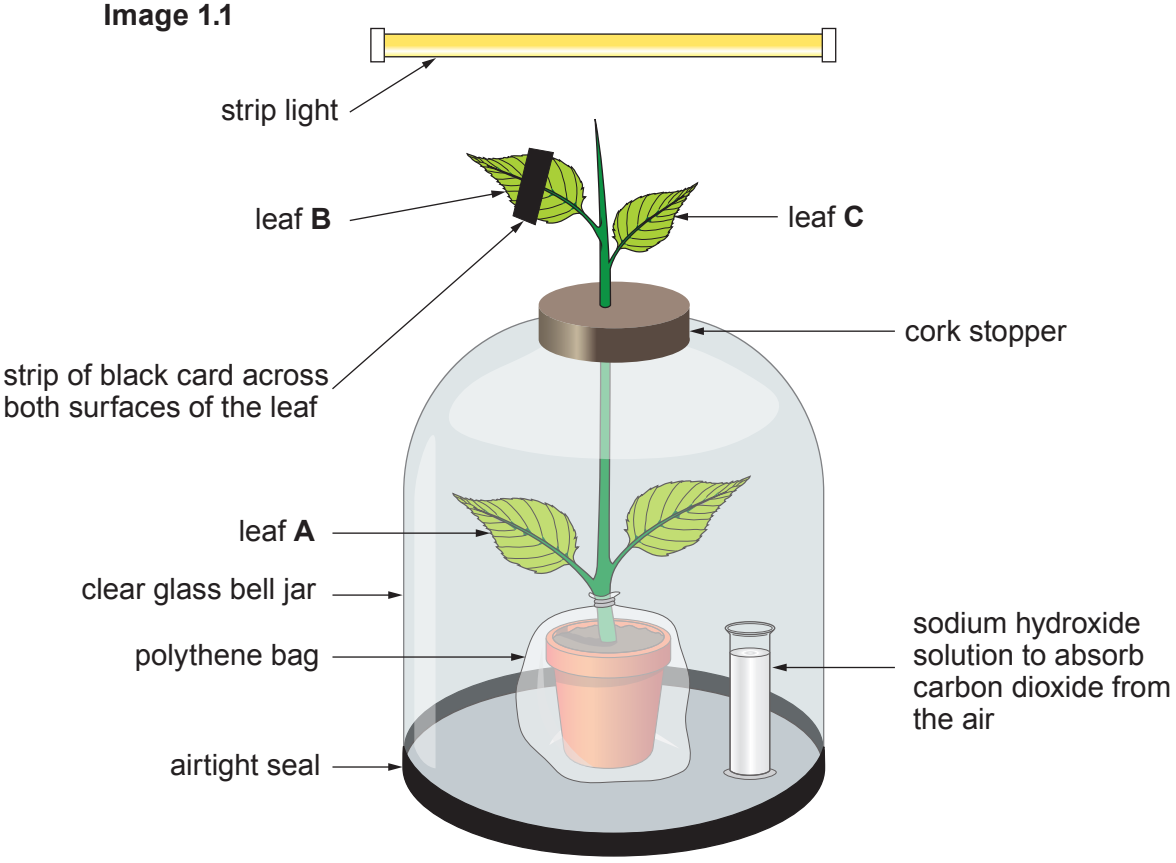
1. (a) State the function of chlorophyll. [1]

.....

(b) James investigated photosynthesis in a potted plant using the following method:

- Place a potted plant in the dark for 24 hours to destarch the leaves.
- After 24 hours, set up the apparatus as shown in in **Image 1.1**.

Image 1.1



- Leave the apparatus containing the potted plant in bright light for 24 hours.
- Remove leaves **A**, **B** and **C**, then:
  - remove the card from leaf **B**
  - place the leaves in boiling water
  - place the leaves in boiling ethanol to remove the chlorophyll
  - dip the leaves in hot water and blot dry
- Carry out the starch test by dropping iodine solution onto the leaves.

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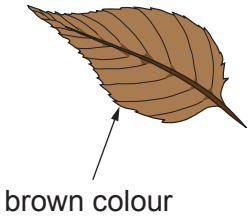
The appearance of each leaf after the starch test is shown in **Image 1.2**.

Image 1.2

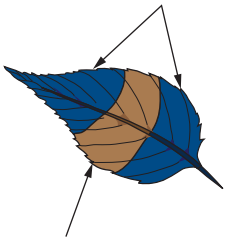
Leaf **A**



brown colour

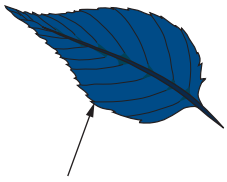
Leaf **B**

blue / black colour



brown colour

Leaf **C**



blue / black colour

(i) I. Explain the results for leaf **A** in **Image 1.2**. [3]

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II. Explain the appearance of the brown band across the middle of leaf **B** in **Image 1.2**. [2]

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(ii) Identify the control leaf (**A, B,** or **C**) and give the reason for your choice.

Leaf: ..... [1]

Reason: [1]

.....

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2. Fertilisers used by farmers can accidentally enter lakes.
In 2016, Natural Resources Wales reported that 12 lakes contained high levels of nitrates from fertilisers.

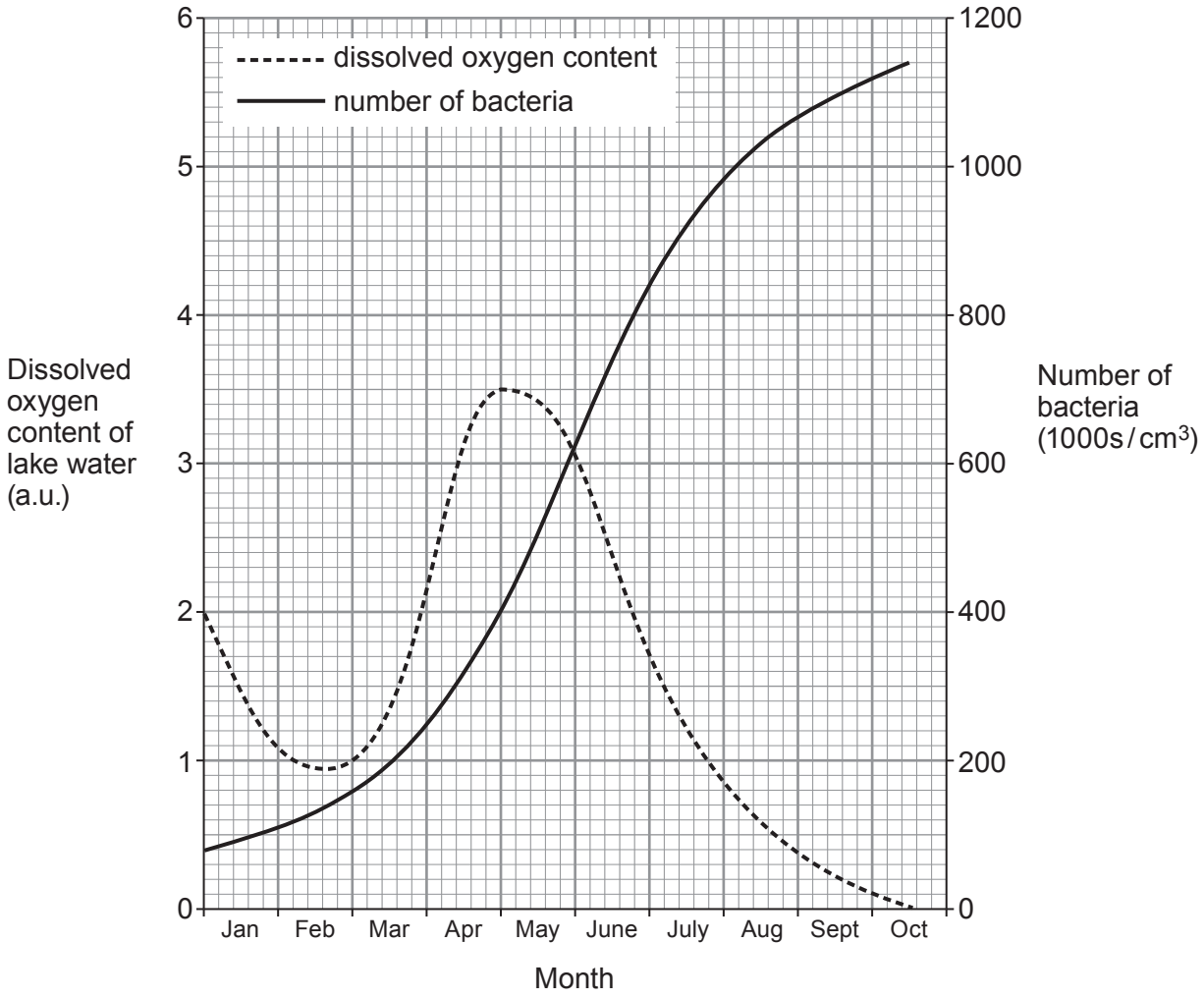
(a) Suggest how the fertilisers accidentally entered these lakes. [1]

.....

.....

(b) Students used a computer to model the effect of fertiliser on dissolved oxygen content and bacteria numbers in a lake, after adding fertiliser.
The results are shown in **Graph 2.1**.

Graph 2.1



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(i) Calculate the **percentage** increase in dissolved oxygen from the start of March to the start of May. [2]

Increase = ... %

(ii) Explain why the dissolved oxygen content and number of bacteria change from May to September. [3]

.....

.....

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(iii) Suggest why the increase in the number of bacteria was slow in January and February. [1]

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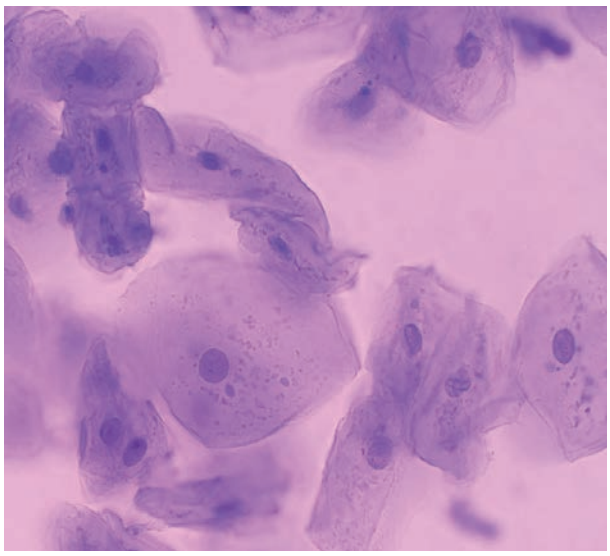
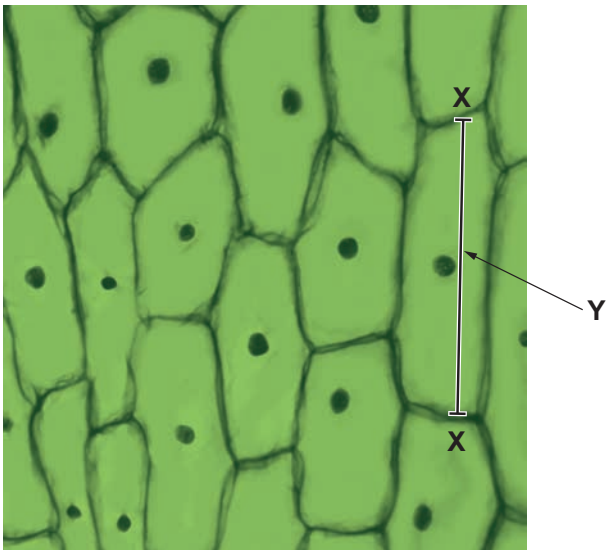
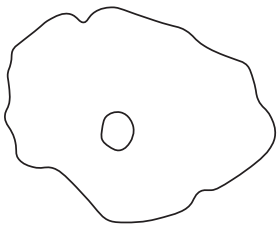
3. **Image 3.1A** and **3.1B** are photographs taken down a light microscope. Both groups of cells have been treated with biological stains. One of the animal cells (a human cheek cell) has been drawn below its photograph.

Image 3.1A **Image 3.1B**

Photograph of animal cells (human cheek cells) taken down a microscope	Photograph of plant cells taken down a microscope
	
Drawing of **one** animal (human cheek) cell	Drawing and labelling of **one** plant cell
	

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(a) (i) Choose **one plant cell** from **Image 3.1B** and draw it in the space below **Image 3.1B**.
Label any **two** parts of the plant cell shown in your drawing.
You must not draw or label anything that cannot be seen in the photograph.
Do not colour or shade your drawing. [3]

(ii) State why the cells were treated with biological stains. [1]

.....

(iii) I. Measure the length of cell **Y** along the line **X**–**X** and record it below. [1]

Length of cell **Y** along line **X**–**X** = ... mm

II. The actual length of the plant cell labelled **Y** in **Image 3.1B** is 70 µm (1 mm = 1000 µm).
Calculate the magnification of cell **Y**. Use your answer to (iii) I. to help you.
Give your answer to two significant figures. [2]

Space for working

Magnification of cell **Y** in **Image 3.1B** = × .....

(b) In **Image 3.1B** it can be clearly seen that similar cells are grouped together.

(i) State the name given to a group of similar cells. [1]

.....

(ii) Suggest **one** advantage to the organism of similar cells being grouped together. [1]

.....

.....

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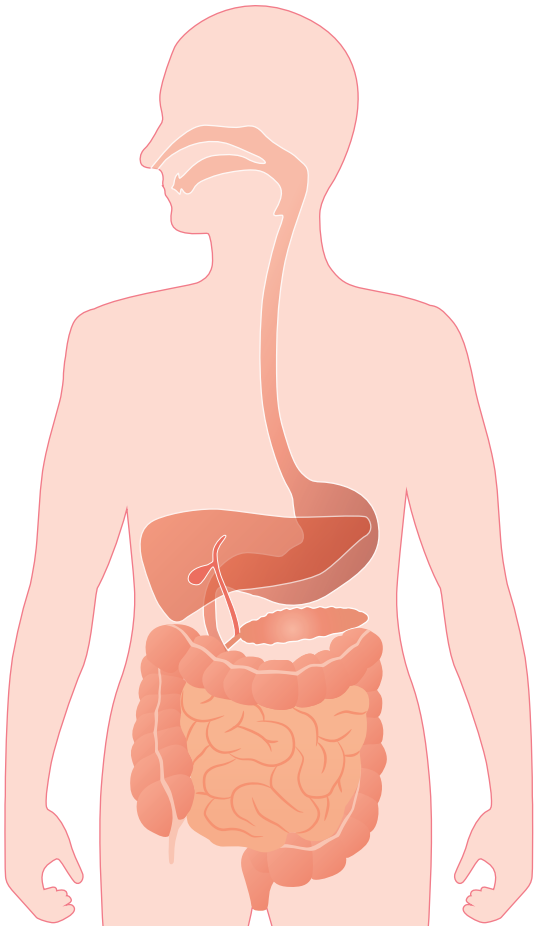
4. **Image 4.1** shows the human digestive system.

Image 4.1



(a) **Use labelled arrows** to identify the following organs on **Image 4.1**. [2]

(i) gall bladder

(ii) pancreas

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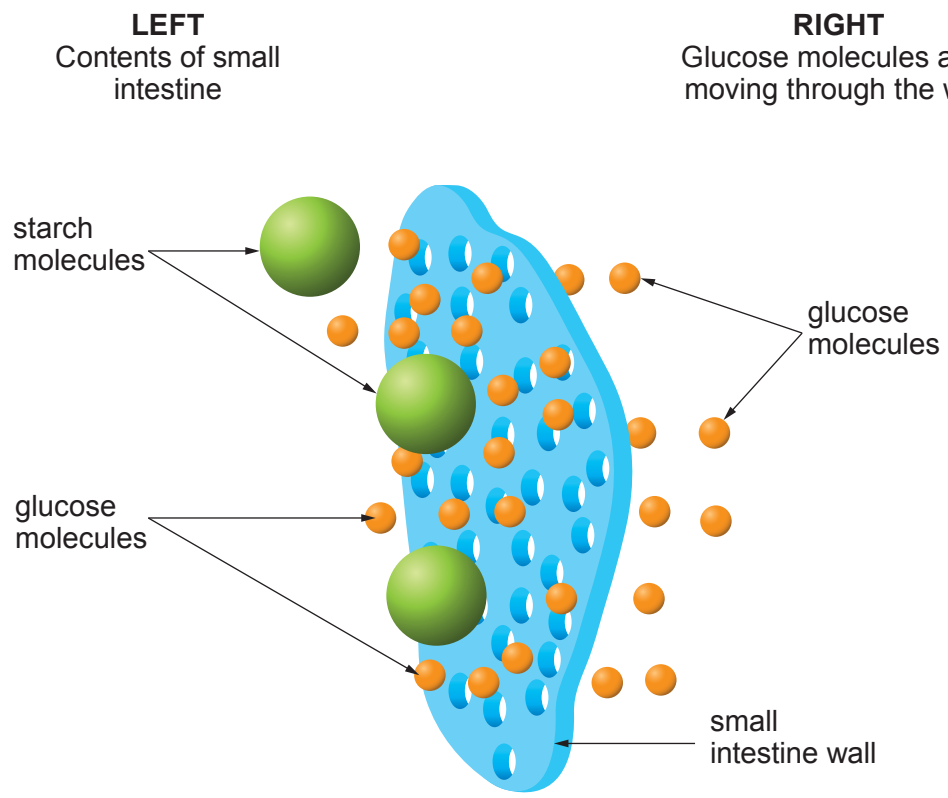
(b) **Image 4.2** represents a part of the wall of the small intestine. The left side of the diagram represents the contents of the small intestine.

Image 4.2



(i) The only **food substance** originally in the contents of the small intestine was starch. Explain the presence of glucose in the small intestine. [2]

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(ii) Absorption involves the movement of glucose molecules through the wall of the small intestine.

I. Name the process that enables absorption to take place. [1]

.....

II. In the human body, the glucose moves into a fluid on the right side of the intestine wall. Give the name of this fluid. [1]

.....

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(iii) I. If the only food substance in the contents of the small intestine was **protein**, state what would be found on the **right** side of the diagram. [1]

.....

II. Explain your answer. [2]

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.....

(c) In a food test investigation some students were given a beaker containing an unknown solution. They were asked to use two different chemical reagents to identify the foods in the solution. The table below shows some of the observations recorded by one of the students.

Complete the table. [2]

Name of reagent	Colour of reagent at start of test	Colour of reagent at end of test	Food present in solution
.....	blue	purple/ violet	.....
.....	.....	brick red	glucose

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5. Explain how the process of **inspiration (breathing in)** occurs in the human thorax. (Diagrams will **not** be credited) [6 QER]

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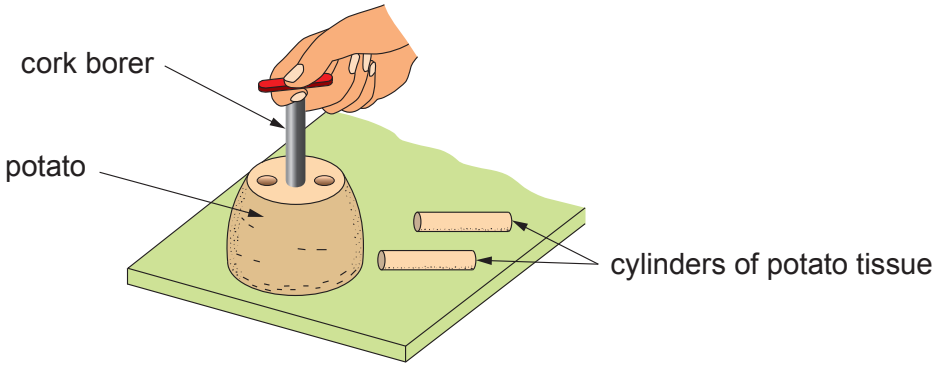
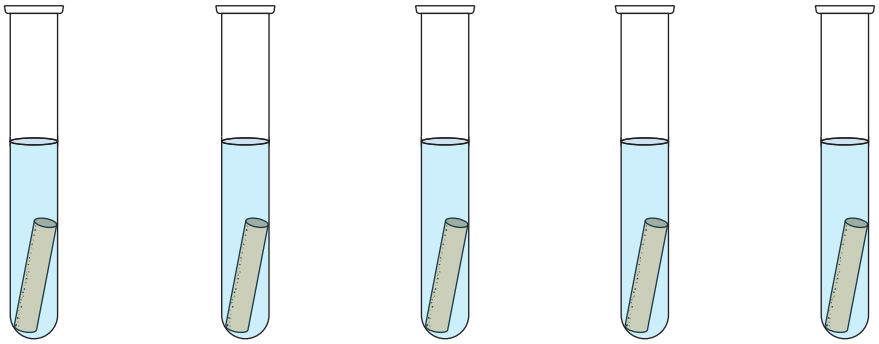
6. In an experiment on osmosis, students investigated the effect of different concentrations of glucose solution on cylinders of potato tissue. They used a 5 mm diameter cork borer to cut the cylinders. Each of the cylinders was then cut to a length of 40 mm. This is shown in **Image 6.1**.

Image 6.1



The students set up 5 test tubes **A** to **E**. Tube **A** contained 10 cm^3 of distilled water whilst tubes **B** to **E** each contained 10 cm^3 of glucose solution of different concentrations. A potato cylinder was placed in each of the test tubes and left for 2 hours. After this time the cylinders were removed and their final lengths were recorded. The contents of each tube and the results are shown in **Table 6.2**.

Table 6.2



	Tube				
	A	**B**	**C**	**D**	**E**
Concentration of glucose solution (%)	0 (distilled water)	1	2	3	4
Initial length of cylinders (mm)	40	40	40	40	40
Final length of cylinders (mm)	43	41	39	37	35
Change in length of cylinders (mm)	.....	.....	.....	.....	.....

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(a) **Complete Table 6.2** by calculating the **change in length** of the potato cylinders. [1]

(b) Explain the change in length of the potato cylinder in **Tube B**. [3]

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(c) (i) Use **Table 6.2** to **estimate** the concentration of glucose solution which would cause no change of length of a potato cylinder. [1]

Concentration = ... %

(ii) Describe how the students could improve their investigation to obtain a more accurate value for the concentration of glucose solution that would cause no change in the length of a potato cylinder. [2]

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(d) Another group of students was asked by their teacher to test the reproducibility of the above experiment. State **one** other variable, the value of which they would need to know, before they could proceed. [1]

.....

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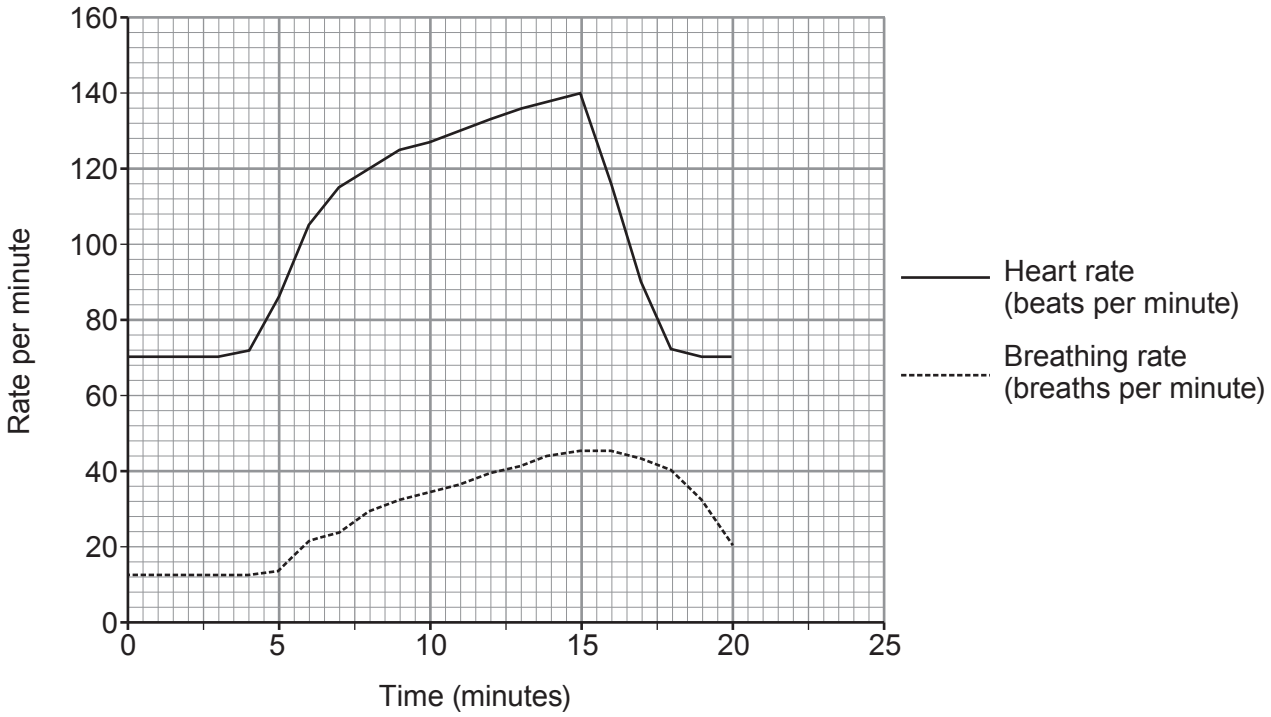
7. (a) Write the **word** equation for aerobic respiration. [2]

.....

(b) The heart and breathing rates of an athlete were recorded before, during and after a 3 km race.
The results are shown in **Graph 7.1**.

Graph 7.1



(i) Use **Graph 7.1** to state at what time the race: [1]

I. began ..... minutes

II. ended ..... minutes

(ii) Describe the relationship between the heart rate and breathing rate shown in **Graph 7.1**. [2]

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(iii) In this race the athlete started to respire anaerobically when 85% of the maximum heart rate was reached.

I. Use **Graph 7.1** to calculate the heart rate when anaerobic respiration began. [2]

Heart rate at which anaerobic respiration began = ... beats per minute

II. **Draw a horizontal line** on **Graph 7.1** to show the heart rate at which anaerobic respiration began. [1]

(iv) Explain why the breathing rate remains high at the end of a race. [2]

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(c) State why anaerobic respiration is less efficient than aerobic respiration. [1]

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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