AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

# GCSE
# COMBINED SCIENCE: TRILOGY

**H**

## Higher Tier
## Biology Paper 1H

Tuesday 14 May 2019 Afternoon Time allowed: 1 hour 15 minutes

**Materials**

For this paper you must have:
- a ruler
- a scientific calculator.

**Instructions**
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

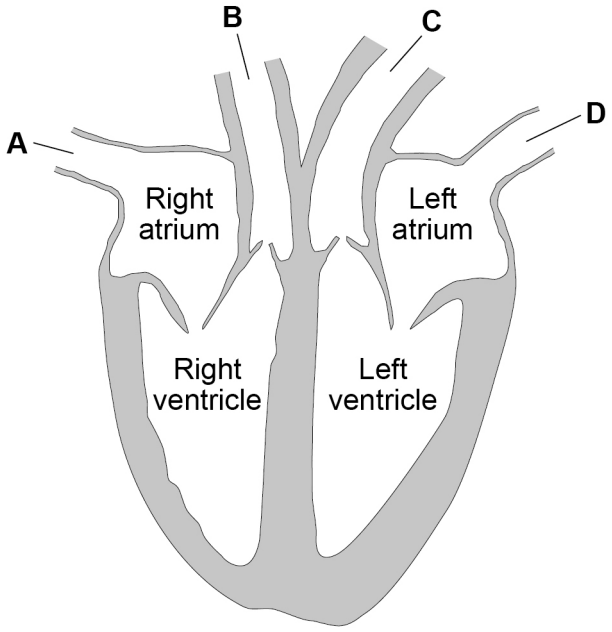
| For Examiner's Use | |
|---|---|
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| **TOTAL** | |

**Information**
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

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**0 1** **Figure 1** shows a human heart.

**Figure 1**




**0 1 . 1** Which blood vessel carries deoxygenated blood away from the heart to the lungs?

**[1 mark]**

Tick (✓) **one** box.

**A** ☐ **B** ☐ **C** ☐ **D** ☐

**0 1 . 2** The natural resting heart rate is controlled by a group of cells that act as a pacemaker.

Where in the heart are 'pacemaker cells' found?

**[1 mark]**

Tick (✓) **one** box.

Left atrium ☐

Left ventricle ☐

Right atrium ☐

Right ventricle ☐

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Some people may be treated with a drug to slow their heart rate.

**0 1 . 3** Digitalis is a drug that slows the heart rate.

Where does the drug digitalis originate from?

**[1 mark]**

Tick (✓) **one** box.

Bacteria ☐

Foxgloves ☐

Mould ☐

Willow ☐

**Question 1 continues on the next page**

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Beta blockers are another type of drug that slows the heart rate.

**Table 1** shows information for people who do not take beta blockers and for people who do take beta blockers.

- Stroke volume is the volume of blood pumped out of the heart each time it beats.
- Cardiac output is the total volume of blood pumped out of the heart each minute.

**Table 1**

| | **No beta blockers taken** | | **Taking beta blockers** | |
|---|---|---|---|---|
| | **At rest** | **During exercise** | **At rest** | **During exercise** |
| **Heart rate in beats per minute** | 68 | 150 | 52 | 88 |
| **Stroke volume in $cm^3$** | 80 | 120 | **X** | 98 |
| **Cardiac output in $cm^3$ per minute** | 5440 | 18 000 | 2800 | 8624 |

**0 1 . 4** Calculate stroke volume **X** in **Table 1**.

Use the equation:

cardiac output = stroke volume × heart rate

Give your answer to 2 significant figures.

**[3 marks]**

Stroke volume **X** = _____ $cm^3$

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**0 1 . 5** Some people who take beta blockers get out of breath when they exercise.

Explain why beta blockers can have this effect during exercise.

You should refer to information given in **Table 1**.

**[6 marks]**

12

**Turn over for the next question**

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**0 2** This question is about digestion.

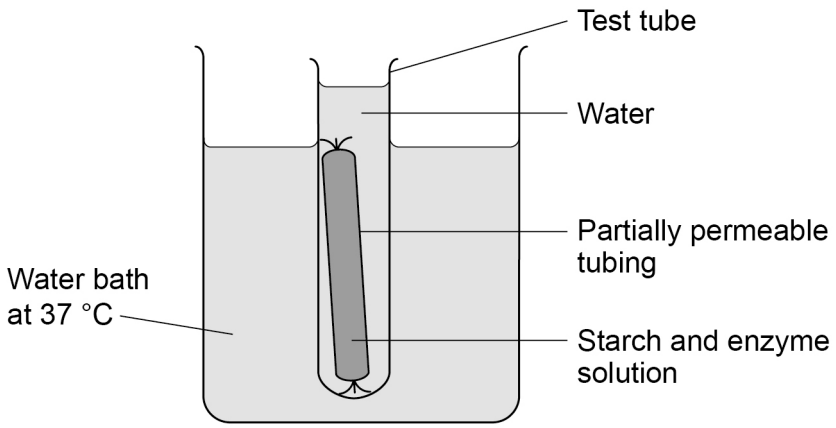
**0 2 . 1** Name the enzyme that digests starch in the human digestive system.

**[1 mark]**

A student set up a model to represent the digestion and absorption of food molecules in the digestive system.

**Figure 2** shows the student's model.

**Figure 2**




This is the method used.

1. Fill a test tube with water at 37 °C
2. Test the water for starch and for sugar.
3. Mix together starch and enzyme solution and immediately test it for starch and for sugar.
4. Fill some partially permeable tubing with the starch and enzyme mixture.
5. Seal the tubing and place it in the test tube of water.
6. Place the test tube in a water bath at 37 °C
7. After 30 minutes, test the mixture inside the partially permeable tubing and test the water in the test tube for starch and for sugar.

**0 2 . 2** Suggest which parts of the body the partially permeable tubing and the water in the test tube represent.

**[2 marks]**

Partially permeable tubing _____

Water in the test tube _____

**Turn over ►**

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**Table 2** shows the results.

**Table 2**

| Test | Description of liquid | Result of starch test | Result of sugar test |
|---|---|---|---|
| **1** | Mixture inside tubing at start | ✓ | ✘ |
| **2** | Water in the test tube at start | ✘ | ✘ |
| **3** | Mixture inside tubing after 30 minutes | ✓ | ✓ |
| **4** | Water in the test tube after 30 minutes | ✘ | ✓ |

**Key**
✓ = Present
✘ = Not present

**0 2 . 3** Name the reagents used to test for starch and for sugar.

**[2 marks]**

Starch _____

Sugar _____

**0 2 . 4** Why was there no sugar present in test **1**?

**[1 mark]**

_____

_____

**0 2 . 5** Explain the results for test **3**.

**[2 marks]**

_____

_____

_____

_____

_____

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**0 2 . 6** Explain the results for test **4**.

**[2 marks]**

10

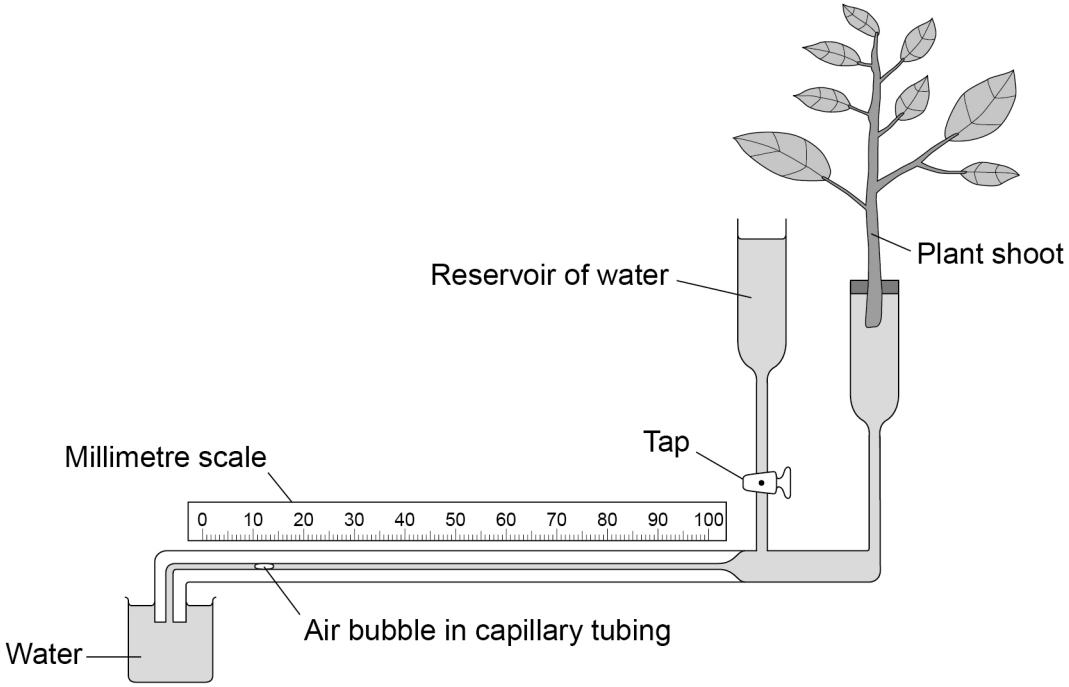
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**0 3** A student used a potometer to investigate the rate of water uptake in a plant shoot.

**Figure 3** shows a potometer.

**Figure 3**




As the shoot takes in water the air bubble moves.

The rate of water uptake is the distance the air bubble moves in a given time.

This is the method used.

1. Place the potometer in moist air at 25 °C
2. Position the air bubble at 0 mm in the capillary tube.
3. Record the position of the air bubble in the capillary tube every minute for 5 minutes.
4. Repeat steps 2 and 3 with the potometer in different conditions.

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**Table 3** shows the conditions used.

**Table 3**

| Investigation | Conditions |
|---|---|
| **A** | Moist air at 25 °C |
| **B** | Dry air at 15 °C |
| **C** | Dry air at 25 °C |

**0 3 . 1** After investigation **A** the air bubble had moved part way along the capillary tube.

Suggest how the student moved the air bubble back to 0 mm for the start of investigation **B**.

**[1 mark]**

**0 3 . 2** Capillary tubing is very narrow.

Explain why narrow tubing was used.

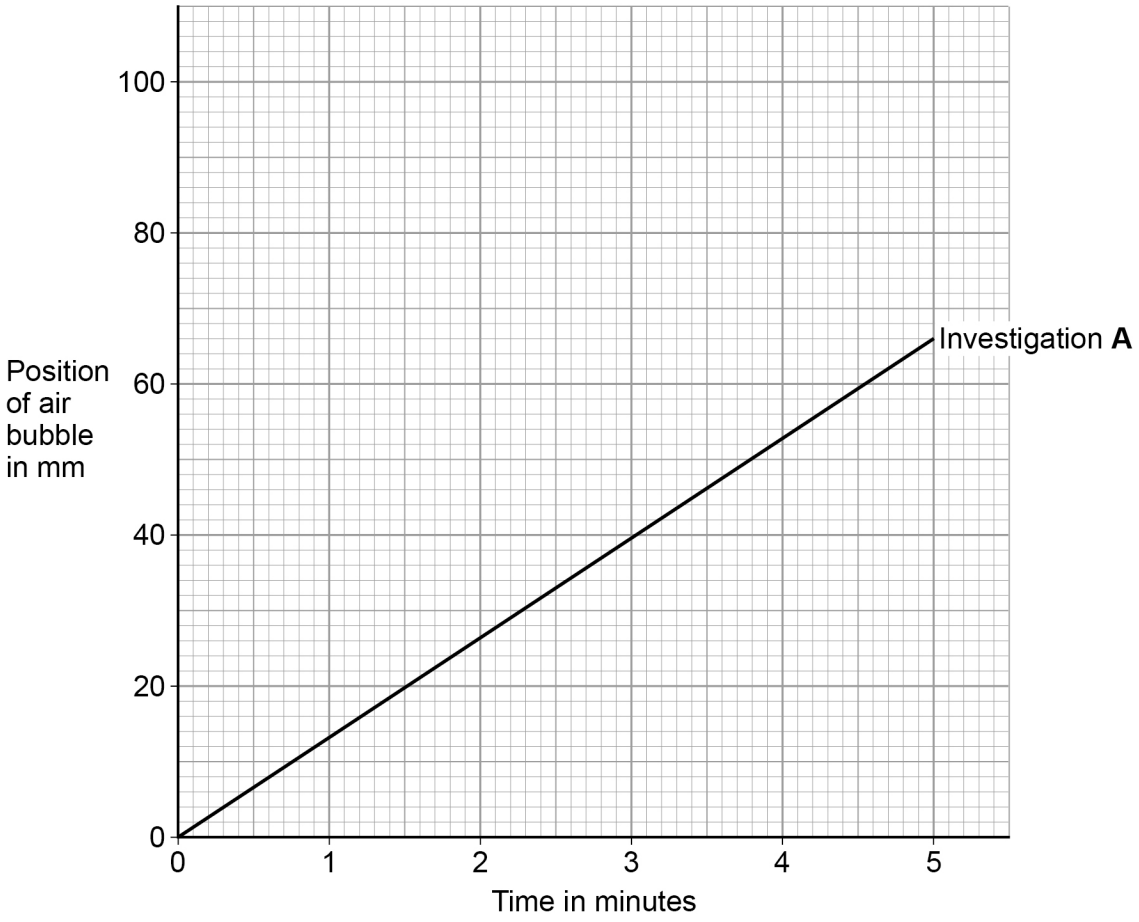
**[2 marks]**

**Question 3 continues on the next page**

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**Figure 4** shows the results for investigation **A**.

**Figure 4**




**0 3 . 3** The cross-sectional area of the capillary tube was 0.8 $mm^2$

Calculate the rate of water uptake for investigation **A** in $mm^3$/min

**[3 marks]**

Rate = _____ $mm^3$/min

*Do not write outside the box*

**0 3 . 4** **Table 4** shows the results from investigation **B**.

**Table 4**

| Time in minutes | Position of air bubble in mm |
|---|---|
| 0 | 0 |
| 1 | 6 |
| 2 | 16 |
| 3 | 22 |
| 4 | 30 |
| 5 | 42 |

Plot the data from **Table 4** on **Figure 4**.

You should:

- draw a line of best fit
- label the line **B**.

**[3 marks]**

**0 3 . 5** Investigation **C** was carried out in dry air at 25 °C

Draw a line on **Figure 4** to show the results you would expect for investigation **C**.

Label the line **C**.

**[1 mark]**

**0 3 . 6** The investigations were carried out in daylight.

The air bubble would **not** move if the investigations were done in the dark.

Explain why.

**[3 marks]**

13

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**0 4** Pathogens are microorganisms that cause infectious diseases.

**0 4 . 1** What type of pathogen causes malaria?

**[1 mark]**

Tick (✓) **one** box.

Bacterium ☐

Fungus ☐

Protist ☐

Virus ☐

**0 4 . 2** Give **two** methods used to prevent people catching malaria.

Give a reason why each method works.

**[4 marks]**

Method 1 _____

_____

Reason _____

_____

_____

Method 2 _____

_____

Reason _____

_____

_____

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**0 4 . 3** Describe **two** differences between a bacterial cell and a eukaryotic cell.

**[2 marks]**

1 _____

_____

_____

2 _____

_____

_____

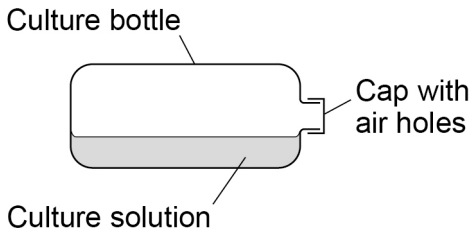
A scientist investigated the population growth of bacteria in a culture solution.

At the start of the investigation the culture solution contained all the nutrients the bacteria needed.

The scientist determined the number of living bacterial cells in the solution every hour over two days.

**Figure 5** shows the apparatus used.

**Figure 5**




**0 4 . 4** Describe why there are air holes in the cap of the culture bottle.

**[1 mark]**

_____

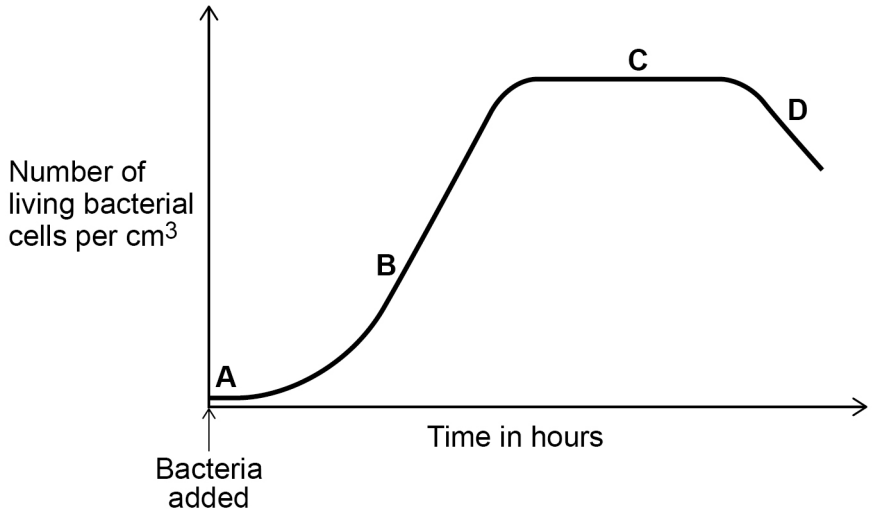
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**Question 4 continues on the next page**

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**Figure 6** shows the scientist's results.

**Figure 6**




**0 4 . 5** Give **one** reason for what is happening to the number of bacteria at each of the stages.

**[4 marks]**

Stage **A** _____

_____

_____

Stage **B** _____

_____

_____

Stage **C** _____

_____

_____

Stage **D** _____

_____

_____

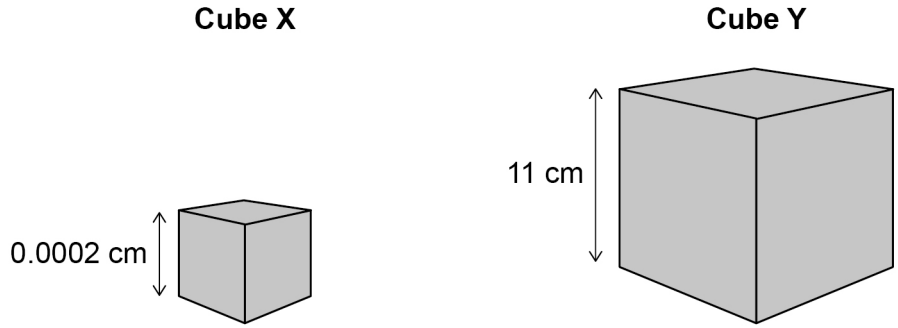
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**0 4 . 6** **Figure 7** shows two cubes.

Cube **X** represents a bacterial cell.

Cube **Y** represents a small multicellular organism.

**Figure 7**




A bacterial cell can absorb all the nutrients it needs by diffusion through its outer surface.

Explain why a multicellular organism **cannot** absorb all the nutrients it needs by diffusion through its outer surface.

You **must** include calculations in your answer.

Use **Figure 7**.

**[5 marks]**

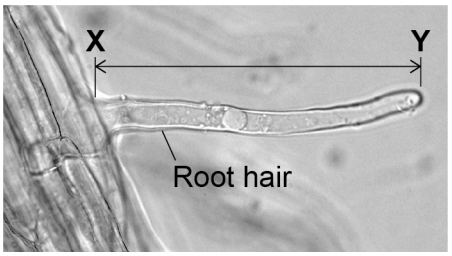
17

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**0 5** **Figure 8** shows a root hair viewed using a microscope.

**Figure 8**




**0 5 . 1** The root hair was viewed at a magnification of ×50

The image length of the root hair **X**–**Y** is 43 mm

Calculate the real length of the root hair in micrometres (μm).

**[4 marks]**

Real length = _____ μm

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**0 5 . 2** A microscope has a ×5 eyepiece lens.

Describe how to use this microscope to observe a prepared slide of root hair cells at a magnification of ×50

**[4 marks]**

**Question 5 continues on the next page**

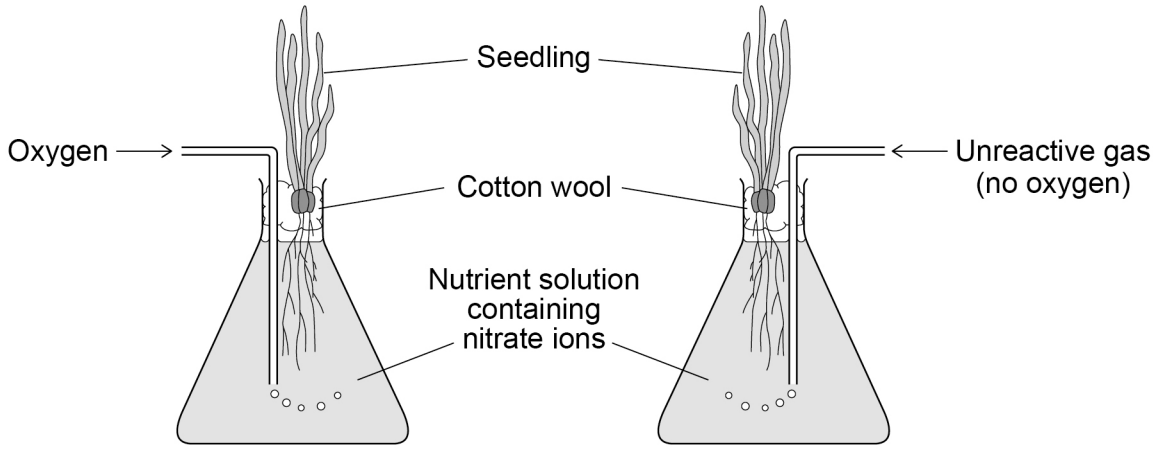
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Root hair cells absorb water and mineral ions from the soil.

A scientist investigated the rate of nitrate ion uptake by two seedlings.

**Figure 9** shows how the investigation was set up.

**Figure 9**




The scientist determined the mass of nitrate ions absorbed by each seedling every 30 minutes for 4 hours.

**Table 5** shows the results.

**Table 5**

| Time in hours | Total mass of nitrate ions absorbed by seedling in arbitrary units | |
|---|---|---|
| | With oxygen added | With no oxygen added |
| 0 | 0 | 0 |
| 0.5 | 100 | 60 |
| 1.0 | 145 | 95 |
| 1.5 | 170 | 105 |
| 2.0 | 195 | 115 |
| 2.5 | 215 | 120 |
| 3.0 | 235 | 125 |
| 3.5 | 250 | 130 |
| 4.0 | 265 | 130 |

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**0 5 . 3** Describe the changes in the rate of absorption of nitrate ions for the seedling with **no** oxygen added.

Use information from **Table 5**.

**[3 marks]**

**0 5 . 4** Explain what the results in **Table 5** show about how nitrate ions are absorbed.

**[4 marks]**

**Question 5 continues on the next page**

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**0 5 . 5** Nitrate ions are essential for plants to grow.

Describe how nitrate ions are used in a plant to help the plant grow.

**[3 marks]**

**18**

**END OF QUESTIONS**

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