



**GCSE BIOLOGY**

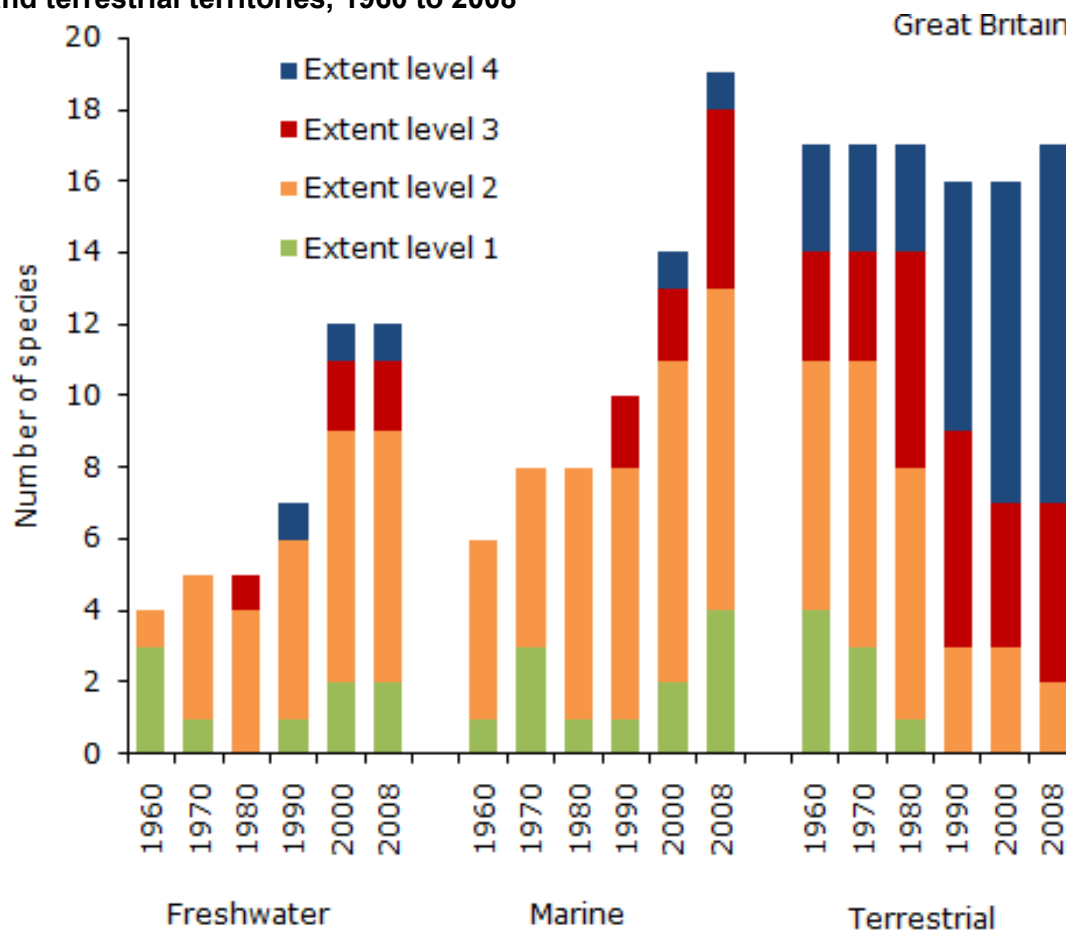
**COMPONENT 2**  
**Applications of Biology**  
**HIGHER TIER**

**RESOURCE BOOKLET**  
**for use in Section A**

## ALIENS HAVE LANDED

Every year new 'alien invaders' are being found in Britain. These invasive species have been introduced either deliberately or by accident into habitats where they do not usually live. In the 1990s, conservationists estimated that 600 alien species were breeding in Britain. Since then, the number has increased by 80%.

**Figure 1 Changes in the extent of invasive non-native species in marine, freshwater and terrestrial territories, 1960 to 2008**



**KEY:** Extent levels are defined as follows:

- |                |  |
|----------------|--|
| Extent level 1 | Present in territory and have not spread more than 10 km from their source |
| Extent level 2 | Established populations represent less than 10% of territory               |
| Extent level 3 | Established populations represent 10 to 50% of the territory               |
| Extent level 4 | Established in more than 50% of the territory                              |

Black swans are an example of an invasive species. They originate in Australia. They were first introduced to England in 1791. Now the species has a wide geographical spread throughout the British Isles. Black swans are regarded as pests by farmers, because of their grazing and fouling grass and eating crops. The species is also known to be aggressive and can out-compete native species of wildfowl. Adult black swans mainly feed on aquatic plants. Their cygnets (young swans) will also eat small insects.

Figure 2 A black swan in its natural habitat in Australia

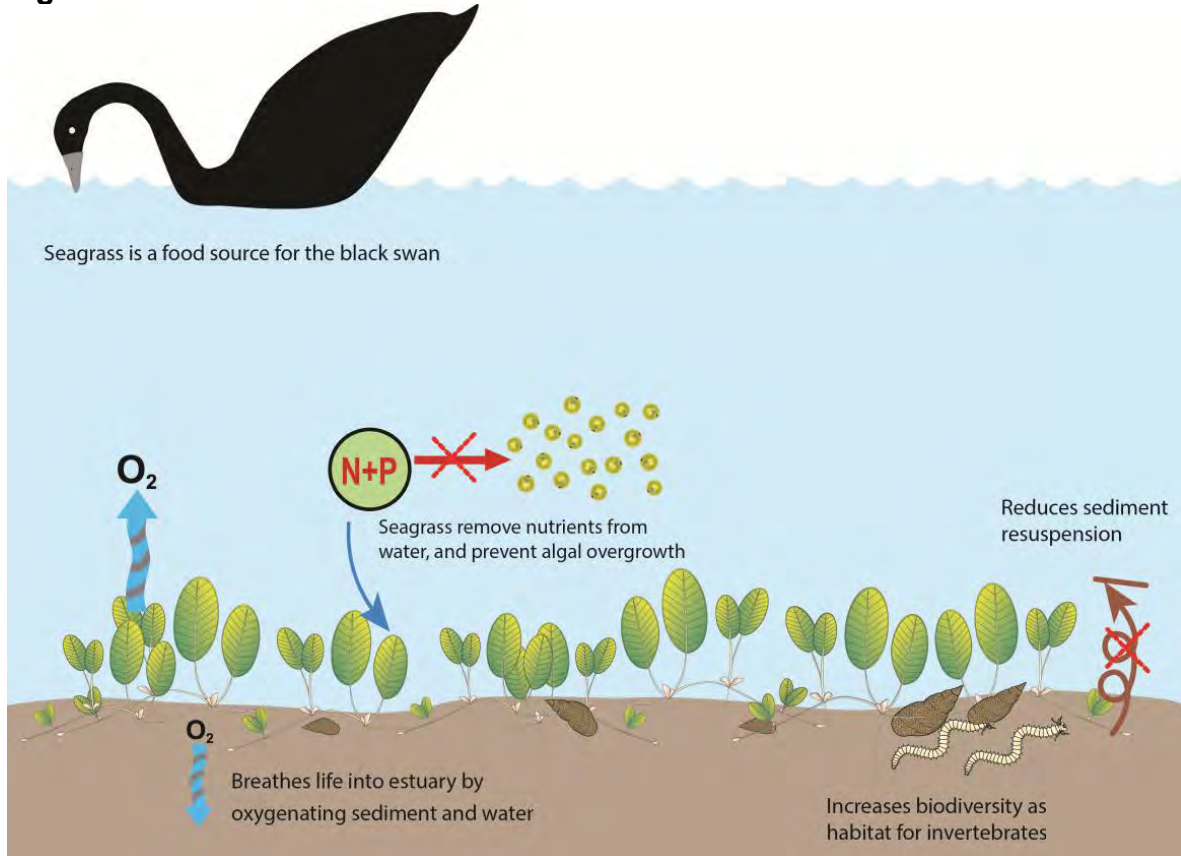
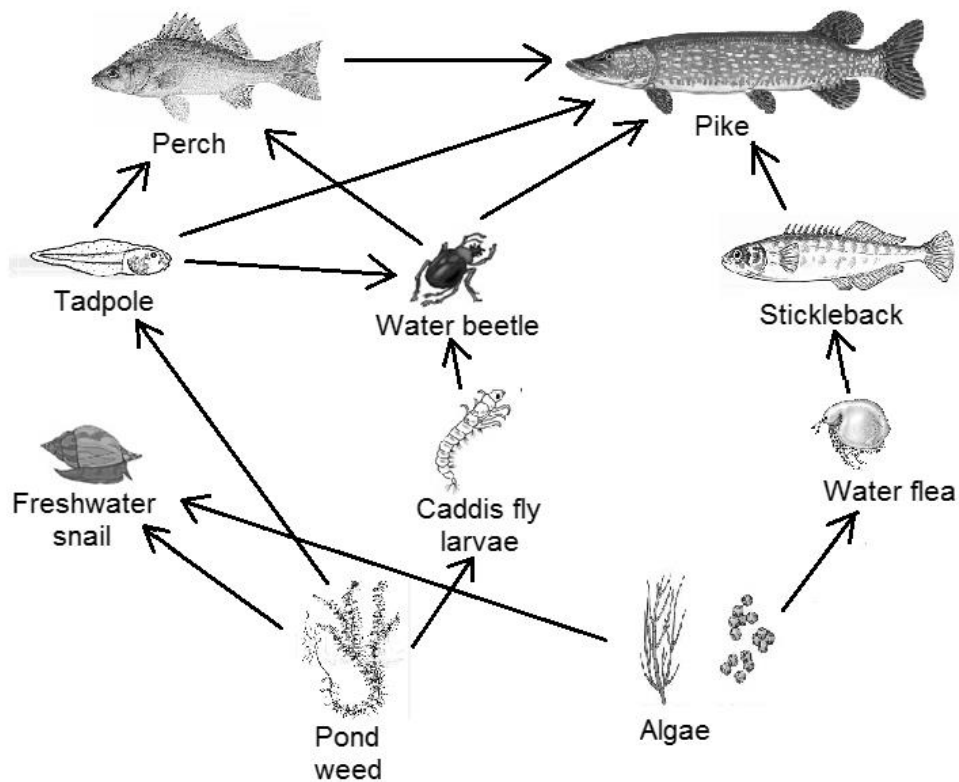


Figure 3 An aquatic food web in the UK



Candidate Name	Centre Number				Candidate Number			



**GCSE BIOLOGY**  
**COMPONENT 2**  
**Applications in Biology**  
**HIGHER TIER**  
**SAMPLE PAPER**  
**(1 hour 15 minutes)**



	For Examiner's use only		
	Question	Maximum Mark	Mark Awarded
<b>Section A</b>	<b>1</b>	<b>15</b>	
<b>Section B</b>	<b>2</b>	<b>10</b>	
	<b>3</b>	<b>11</b>	
	<b>4</b>	<b>8</b>	
	<b>5</b>	<b>10</b>	
	<b>6</b>	<b>6</b>	
	<b>Total</b>	<b>60</b>	

### ADDITIONAL MATERIALS

In addition to this examination paper you will need a resource booklet, a calculator and a ruler.

### INSTRUCTIONS TO CANDIDATES

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

### INFORMATION FOR CANDIDATES

This paper is in 2 sections, **A** and **B**.  
 Section **A**: 15 marks. Read the article in the resource folder carefully then answer **all** questions. You are advised to spend about 20 minutes on this section.  
 Section **B**: 45 marks. Answer **all** questions. You are advised to spend about 50 minutes on this section.  
 The number of marks is given in brackets at the end of each question or part-question.  
 The assessment of the quality of extended response (QER) will take place in question **6**.

**SECTION A**

*Answer all questions*

*Read the article in the resource booklet carefully and answer all the questions that follow.*

1. (a) (i) Calculate the number of alien species that are in Britain today. Show your working. [2]

number of species = .....

- (ii) Suggest why the answer in (i) is only an estimated value. [1]

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- (b) Using the information in **Figure 1** describe how the distribution of invasive marine species changed between 1960 and 2008. [4]

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- (c) Research suggests that black swan numbers have increased at such a rate that they may now be added to the "British List" of birds found in the UK.

- (i) Suggest a method by which black swans were introduced into England. [1]

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- (ii) Describe the method of collecting data to estimate the number of black swans in a habitat. [2]

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(d) State **two** adverse effects on the ecosystem in **Figure 2** caused by the black swan feeding on seagrass. [2]

1. ....

2. ....

(e) Adult and cygnet black swans are introduced into the food web shown in **Figure 3**. Explain how this will affect the pike population. [3]

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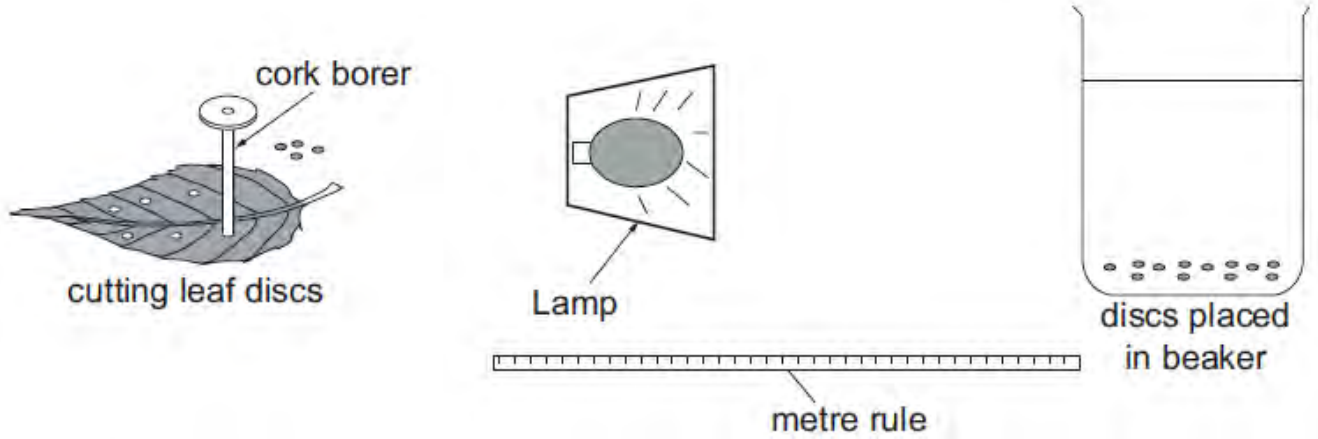
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**SECTION B**

Answer **all** questions.

2. Students investigating the effect of a limiting factor on the rate of photosynthesis cut discs from a leaf using a cork borer as shown below.



- The air was removed from the leaf discs using a syringe.
- The discs were then placed in beakers of sodium hydrogen carbonate solution where they sank to the bottom of the beakers.
- The beakers were placed at different distances from a lamp.
- The time taken for the discs to rise to the surface of the solutions was recorded in the table below.

Results

Distance from lamp (cm)	5	25	50	75	100
Mean time taken for all discs to rise (minutes)	5	20	27	55	97

- (a) Name the limiting factor being investigated. [1]

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- (b) (i) What trend is shown by the results? [1]

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(ii) What conclusions could be reached from the trend shown? Explain your answer. [4]

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(c) State why sodium hydrogen carbonate was used in this investigation. [2]

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(d) Identify the variable which should have been controlled in the experiment, which could have affected the discs in the beaker nearest to the lamp. Suggest how this variable could be controlled. [2]

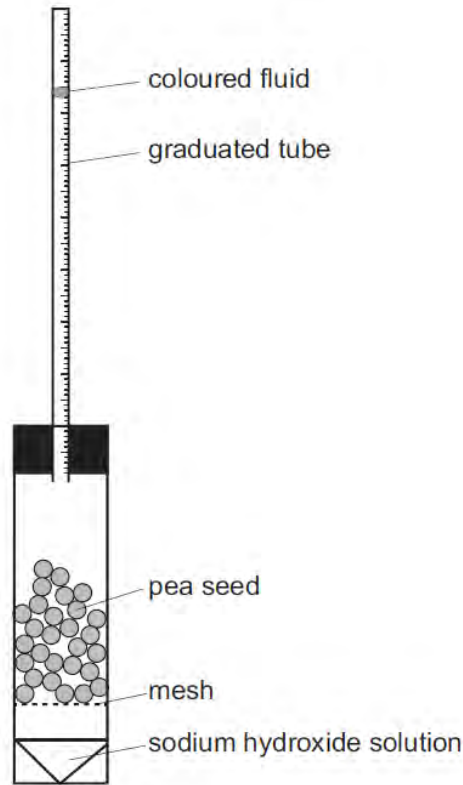
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3. One way of calculating the rate of respiration of germinating pea seeds is to measure the volume of oxygen taken up over a period of time.

A student investigated the effect of temperature on the rate of respiration in germinating pea seeds by using the apparatus shown below.



If the apparatus is kept at a constant temperature, any changes in the volume of air in the graduated tube will be due to oxygen uptake.

- (a) What is the purpose of the sodium hydroxide? [2]

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- (b) The student set up 4 pieces of apparatus as illustrated, **A**, **B**, **C** and **D**. **A** and **B** were kept at 15 °C, **C** and **D** were kept at 25 °C.

The contents of each apparatus are shown in the table:

Temperature (°C)	Apparatus	Contents
15	<b>A</b>	30 germinating pea seeds
	<b>B</b>	28 glass beads
25	<b>C</b>	30 germinating pea seeds
	<b>D</b>	28 glass beads

- (i) What was the purpose of apparatus **B** and **D**? [1]

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- (ii) State what the student would have had to measure to determine the number of glass beads to use in apparatus **B** and **D**. [1]

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- (c) The apparatus **A**, **B**, **C** and **D** were kept at their appropriate temperatures for 20 minutes in water baths. During this time the level of coloured fluid changed in some of the graduated tubes. The level of the coloured fluid in each piece of apparatus was recorded at the start of the investigation and after 20 minutes.

The results are shown in the table:

Temperature (°C)	Apparatus	Reading at start (cm <sup>3</sup> )	Reading after 20 min (cm <sup>3</sup> )	Difference (cm <sup>3</sup> )	Rate of oxygen uptake (cm <sup>3</sup> /min)
15	<b>A</b>	0.93	0.74	0.19	0.009
	<b>B</b>	0.91	0.91	0	0
25	<b>C</b>	0.94	0.63	0.31	
	<b>D</b>	0.95	0.95	0	0

- (i) Calculate the rate of oxygen uptake for the germinating pea seeds in Apparatus **C** at 25 °C. Give your answer to a suitable number of significant figures. [2]

rate of oxygen uptake ..... cm<sup>3</sup>/min

- (ii) Explain why there is an increase in the rate of respiration in germinating pea seeds at 25 °C compared with those at 15 °C. [2]

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(d) Describe how the carbohydrate stores in the pea seeds are made available for use in respiration. [3]

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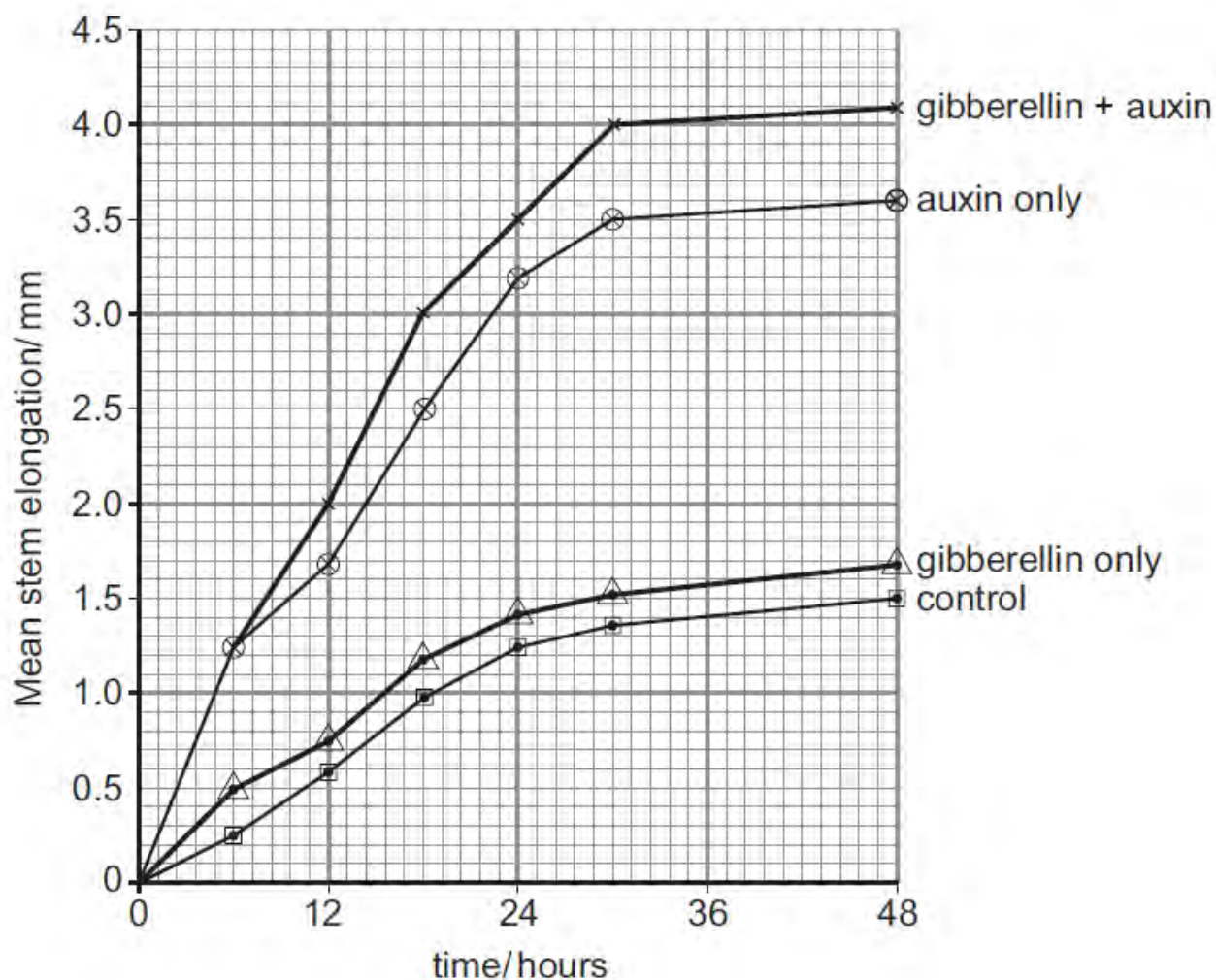
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4. Four pea seedlings, **A**, **B**, **C** and **D**, were used in an investigation into the effects of the plant hormones, auxin and gibberellin on the growth of stems. All the seedlings were of the same age.

- A** had gibberellin + auxin
- B** had auxin only
- C** had gibberellin only
- D** was the control without hormones.

After the application of the hormones to the stem, the seedlings were left for 48 hours.

The results are shown in the graphs below.



(a) What observations can you make from the graphs? [4]

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(b) Describe **four** different ways that people use plant hormones to control plant growth. [4]

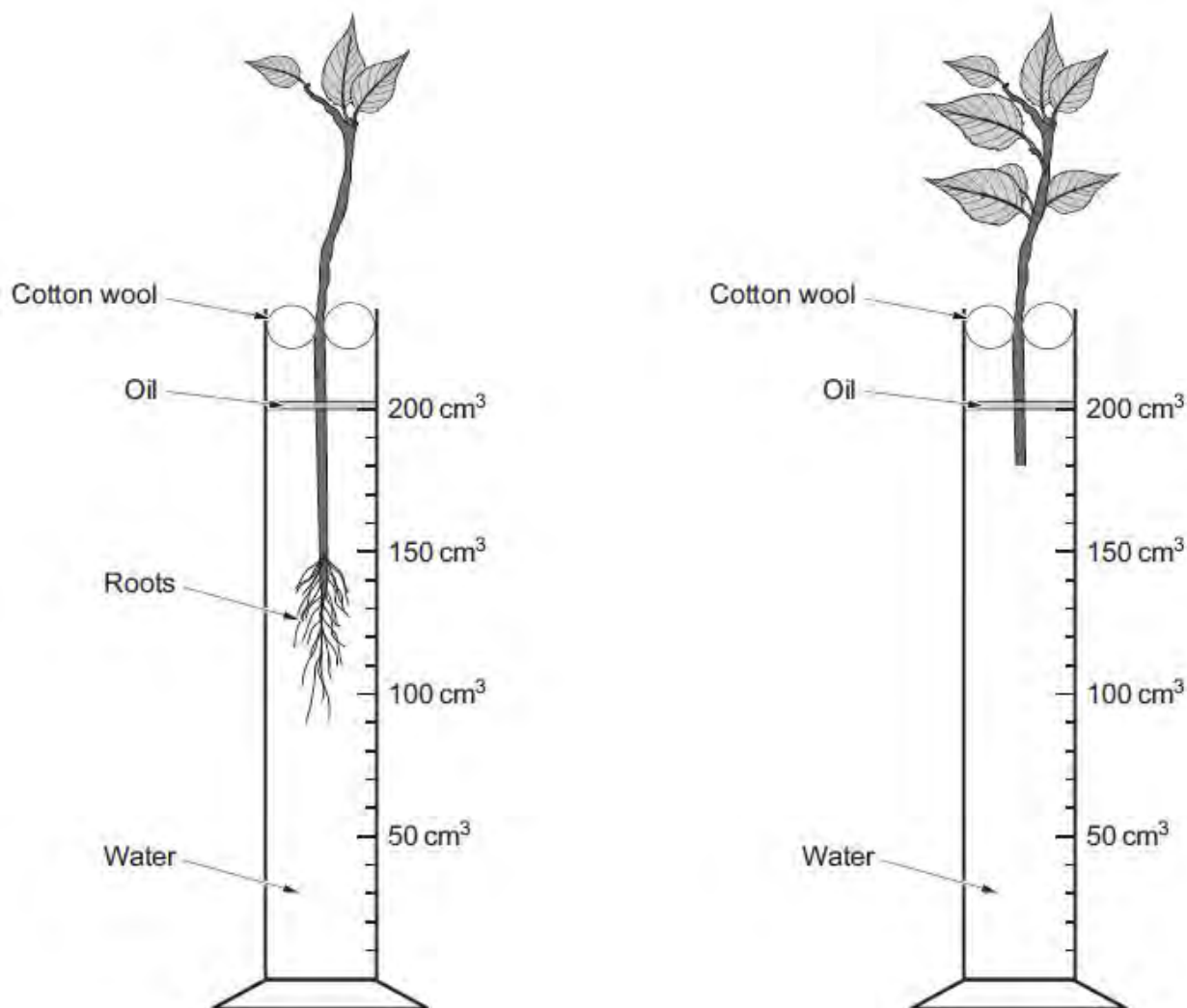
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5. An experiment was carried out to compare the uptake of water in plants with and without roots. The experiment was set up as shown in the diagram below.



The volume of water in each measuring cylinder was recorded at the start of the experiment and, again, after 24 hours. The results are shown below.

Measurement	Plant with roots	Plant without roots
Total water uptake after 24 hours ( $\text{cm}^3$ )	6	6
Total surface area of leaves ( $\text{cm}^2$ )	60	100

- (a) Using the results of this experiment draw a conclusion about the effect of roots on the rate of water uptake per cm<sup>2</sup> of leaf. [4]

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- (b) Explain how the use of oil, as shown in the diagram, helped to make the experiment a fair comparison. [2]

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- (c) It was concluded that the experimental method used did not produce valid results. Identify problems with this method and explain how the method could be improved to increase confidence in your conclusion. [4]

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6. Diagnosis of several diseases involves analysis of urine samples. It is known that some forms of kidney disease cause damage to the membranes of the glomeruli. Diabetes also affects the kidneys if uncontrolled; high pressure can damage the glomeruli and also affect reabsorption by the cells lining the proximal convoluted tubules.

Describe how food tests could be used to identify the follow urine samples:

- urine from a healthy person
- urine from a person suffering from kidney disease
- urine from a person with uncontrolled diabetes

Explain the biological basis for the expected differences between the urine samples and your conclusion. [6 QER]

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