



General Certificate of Secondary Education
2016

Centre Number

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Candidate Number

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Biology

Unit 1

Higher Tier



[GBY12]

GBY12

FRIDAY 10 JUNE, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the box, around each page or on blank pages.

Complete in blue or black ink only. **Do not write with a gel pen.**

Answer **all twelve** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

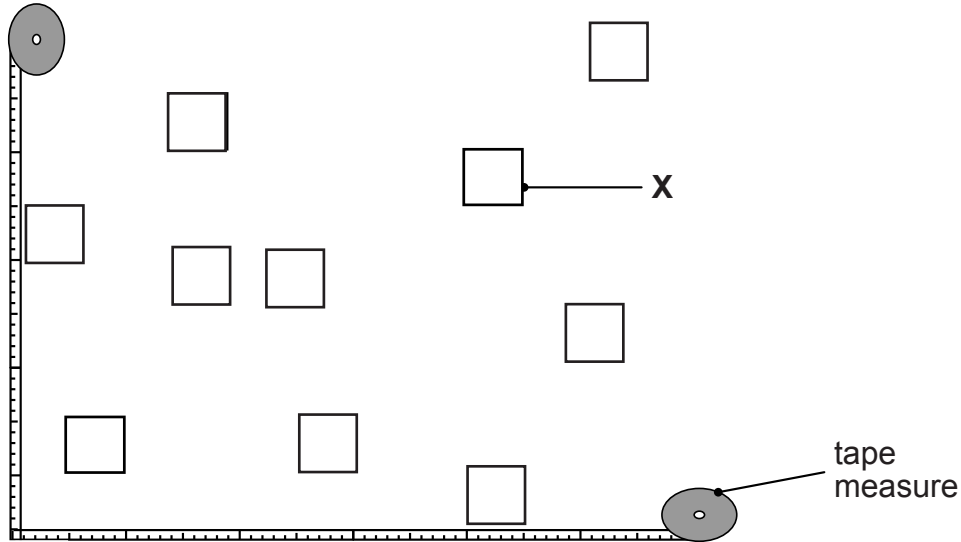
Quality of written communication will be assessed in Questions **4** and **12(b)(ii)**.



- 1 Pupils carried out an investigation to estimate the size of a population of daisies on a playing field.

They placed two tape measures at right angles on the playing field.

They then placed apparatus **X** at 10 random coordinates inside the area enclosed by the two tape measures.



© Chief Examiner

- (a) Name apparatus **X**.

[1]

- (b) Explain why random coordinates were used to decide where to place apparatus **X**.

[1]

The area of apparatus **X** is 0.25m^2 .

- (c) Describe how the pupils would have used apparatus **X** to calculate the number of daisies per square metre on the playing field.

[2]



2 Sulfur dioxide is one cause of acid rain.

(a) Explain how sulfur dioxide forms acid rain.

[2]

(b) Describe **one** harmful effect acid rain has on living organisms.

[1]

The table shows changes in sulfur dioxide emissions in Ireland from 1999 to 2007.

Year	Sulfur dioxide emissions /1000 tonnes
1999	159.5
2000	140.5
2001	135.5
2002	102.2
2003	79.4
2004	71.7
2005	70.4
2006	60.3
2007	54.7

Greenhouse Gas and Acid Rain Precursor Accounts for Ireland 1998-2007
© Government of Ireland 2009, Material compiled by the Central Statistics Office. ISBN: 978 1-4064-2098-2.
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(c) Describe the change in sulfur dioxide emissions from 1999 to 2007.

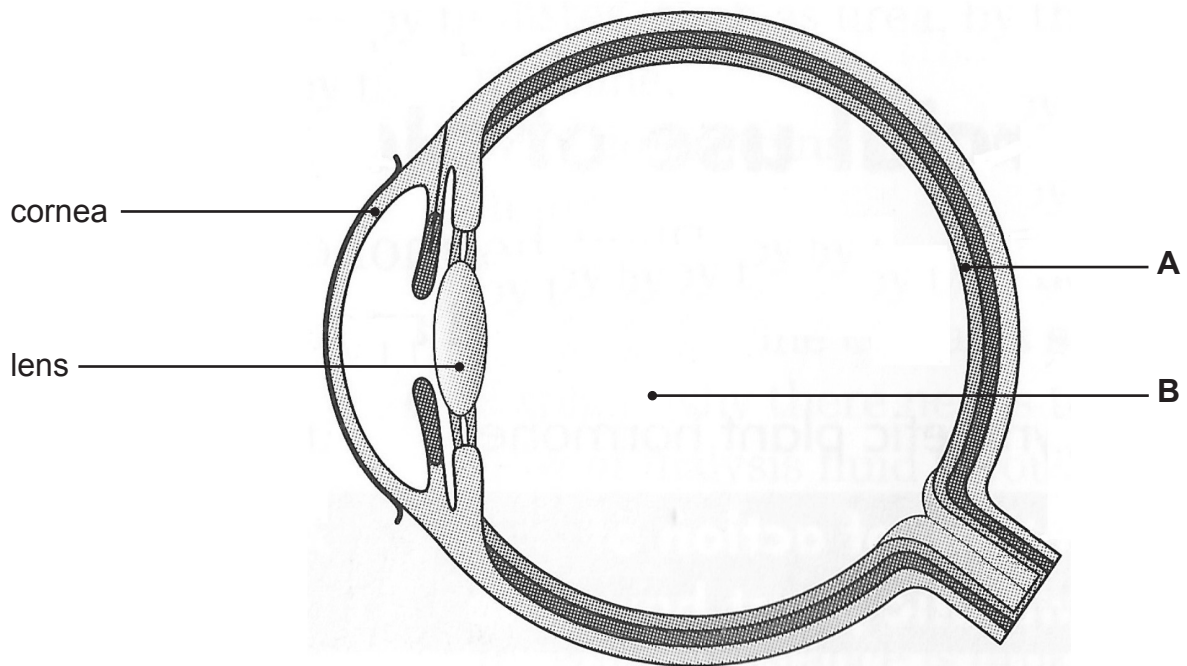
Suggest **one** reason for this change.

[2]

[Turn over



3 The photograph shows a section through an eye.



© GCSE Biology for CCEA, Revision Book by James Napier. Publisher Hodder Education, 2007.
ISBN: 9780340940556. "Reproduced by permission of Hodder Education".

(a) Name and give the function of parts **A** and **B**.

A _____ [1]

Function _____

_____ [1]

B _____ [1]

Function _____

_____ [1]

(b) The lens and the cornea work together to carry out one function.

Describe this function.

_____ [1]





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(Questions continue overleaf)



- 4 The photograph shows a farmer in a rainforest area clearing land by cutting down and burning trees.



© Vaughan Fleming / Science Photo Library

Use your knowledge and understanding of the carbon cycle to explain how

- cutting down and burning trees affects the concentration of the carbon dioxide in the atmosphere.
- the change in the atmospheric carbon dioxide concentration harms the environment.



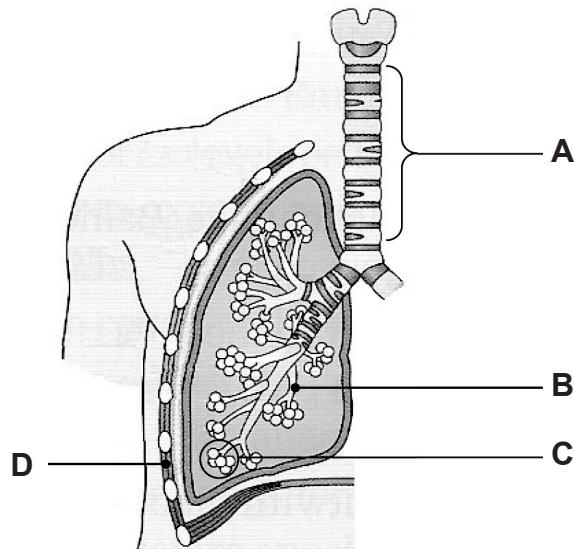
In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

[Turn over



5 The diagram shows part of the respiratory system.



Adapted figure ('The main parts of the human respiratory system') from OCR Gateway GCSE Biology by S Broadley, S Hocking and M Matthews (OUP, 2011), copyright © Oxford University Press 2011, reproduced by permission of Oxford University Press.

(a) Name parts A, B, C and D.

- A _____ [1]
B _____ [1]
C _____ [1]
D _____ [1]

(b) Describe the process of breathing in.

_____ [4]





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6 A class set up an experiment to investigate the movement of molecules.

Starch agar is a jelly with starch added.

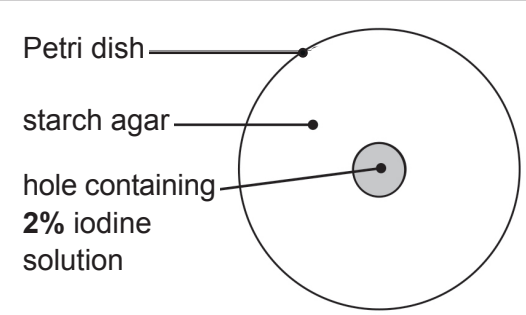
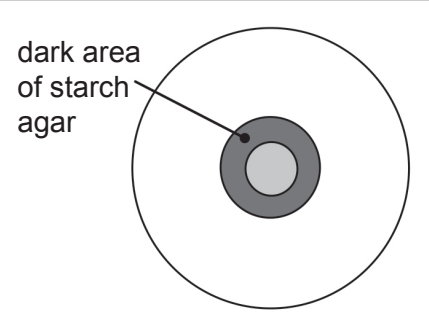
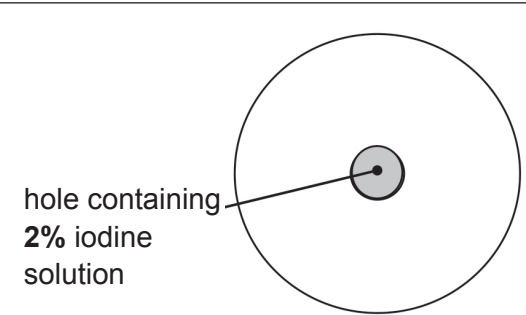
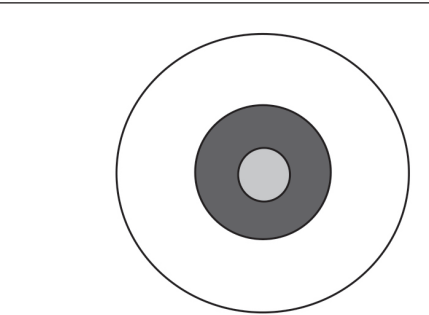
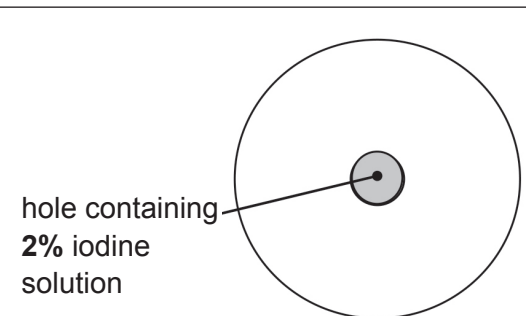
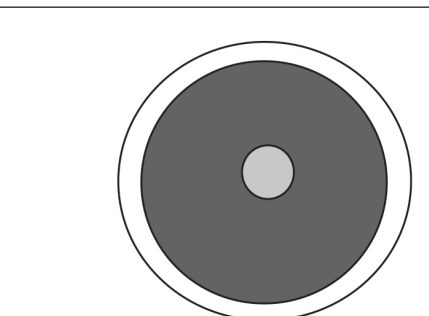
Starch agar was placed in three Petri dishes.

A hole was cut out of the starch agar in the centre of each Petri dish.

Each hole was filled with a 2% concentration of iodine solution.

The Petri dishes were left for 30 minutes at different temperatures.

The table shows the results.

Temperature /°C	Start of experiment	After 30 minutes
10	 <p>Petri dish</p> <p>starch agar</p> <p>hole containing 2% iodine solution</p>	 <p>dark area of starch agar</p>
15	 <p>hole containing 2% iodine solution</p>	
20	 <p>hole containing 2% iodine solution</p>	



- (a) Describe and explain the colour change of the starch agar after 30 minutes in the Petri dish left at 10°C.

Colour change _____
_____ [2]

Explanation _____

_____ [3]

- (b) What conclusion can be made about the effect of temperature on the movement of molecules?

Use evidence from the diagrams to help explain your conclusion.

Conclusion _____

_____ [1]

Explanation _____

_____ [2]

[Turn over

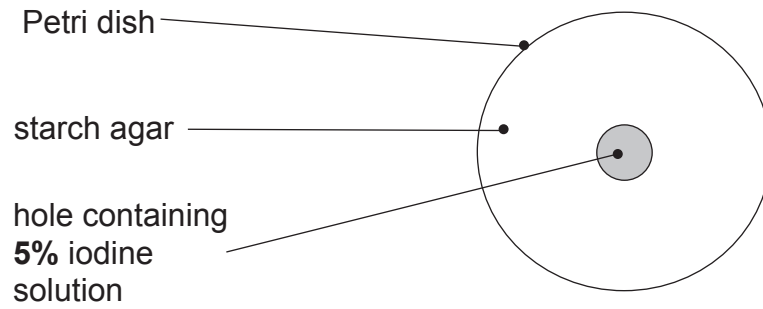


A fourth Petri dish was set up in the same way.

The hole in the centre of the starch agar was filled with **5%** iodine solution.

It was kept at a temperature of **15°C** for 30 minutes.

(c) **Complete the diagram** by shading in the **dark area** of starch agar that would form in the Petri dish after 30 minutes. [1]





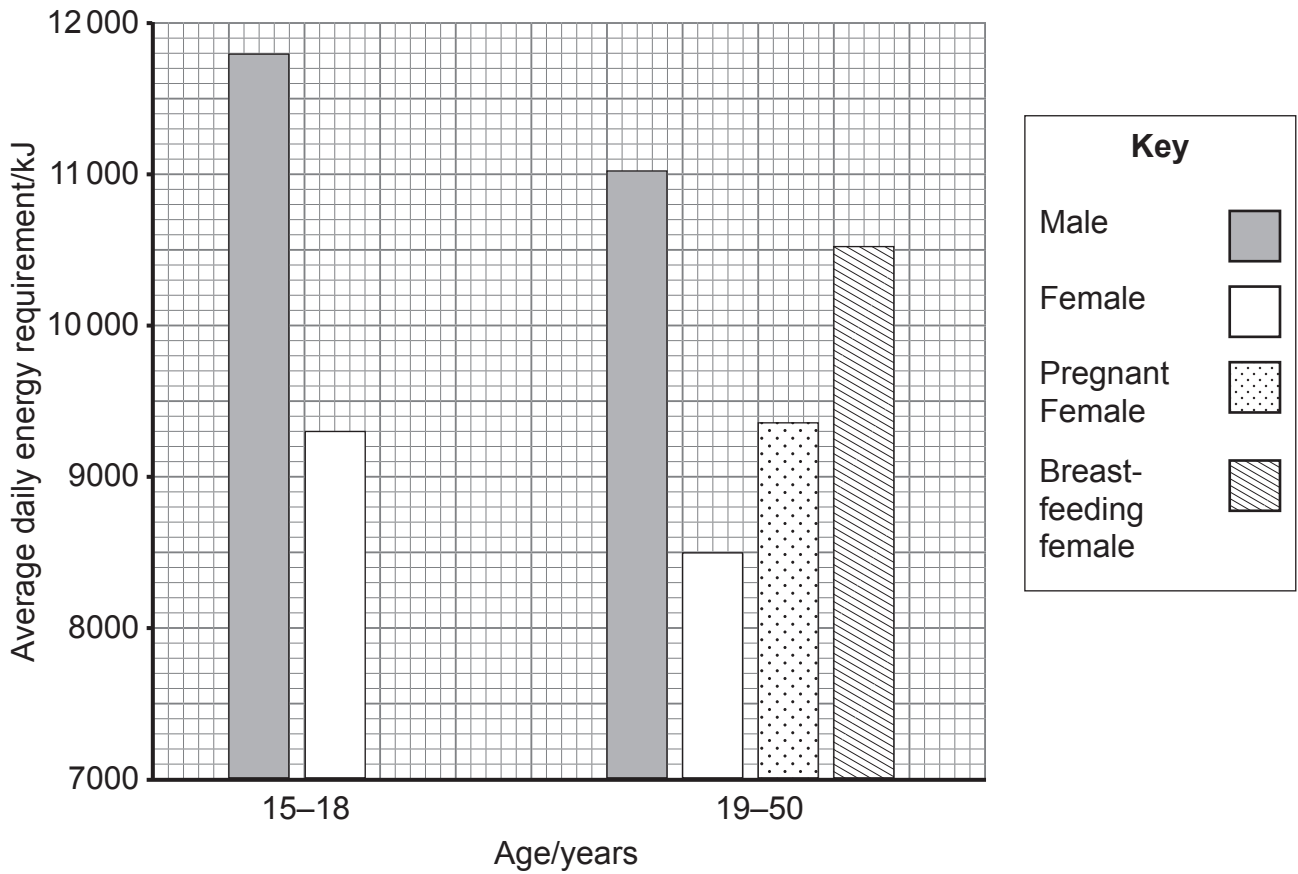
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7 (a) The graph shows how the average daily energy requirement, of 15 to 50 year old males and females, varies with age.



(i) Describe and explain the difference in the average daily energy requirement of 15-18 year old males and females.

[2]



(ii) Pregnancy increases a woman's average daily energy requirement.

Calculate the **percentage increase** in the average daily energy requirement due to pregnancy.

Show your working.

_____ % [3]

(iii) Explain why pregnancy increases a woman's average daily energy requirement.

_____ [1]

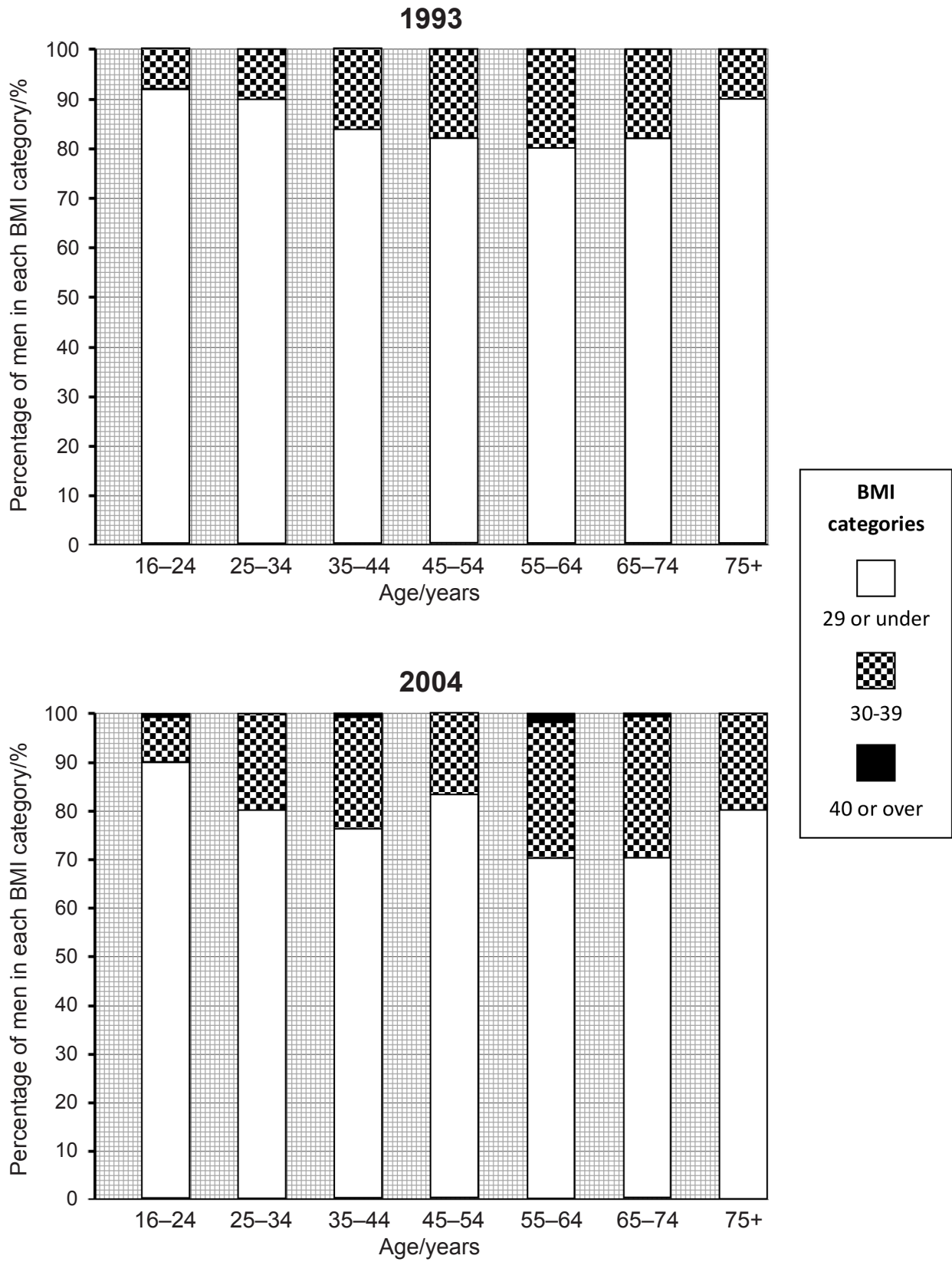
(iv) Give **one** factor, not shown in the graph, which affects a person's average daily energy requirement.

_____ [1]

[Turn over



(b) The graphs show the percentage of men of different ages in each BMI category in 1993 and 2004.



A person with a BMI of 30 and above is described as obese.

(i) Describe the relationship between age and obesity levels in **1993**.

[2]

(ii) Calculate the change in the percentage of men aged 55–64 who were obese in the eleven years between 1993 and 2004.

_____ % [1]

(iii) Use this trend to predict what percentage of men aged 55–64 will be obese eleven years later, in 2015.

_____ % [1]

(iv) Predictions of future obesity levels in men can be unreliable.

Use the data for 45–54 year old men in 2004 to suggest why.

[1]

(c) Obesity is estimated to cost the Northern Ireland economy £500 million per year.

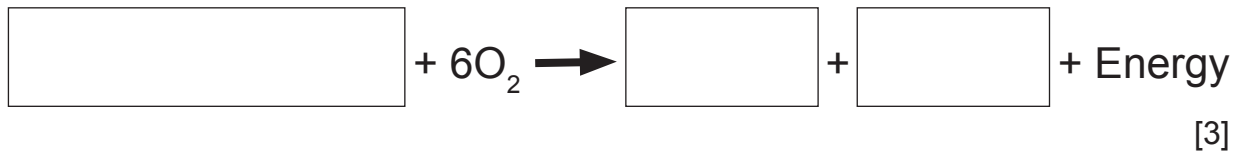
Give **two** ways obesity costs the local economy.

[2]

[Turn over



8 (a) Complete the **balanced chemical equation** for aerobic respiration.



(b) Aerobic respiration uses oxygen, anaerobic does not.

Describe **other** ways aerobic respiration differs from anaerobic respiration in yeast.

[3]

(c) (i) Give the **word equation** for anaerobic respiration in human muscles.

[2]

(ii) Describe **one** difference in the products of anaerobic respiration in human muscles and yeast.

[1]



9 Rivers are often polluted with nitrates.

(a) Give **one** source of the nitrates in polluted river water.

_____ [1]

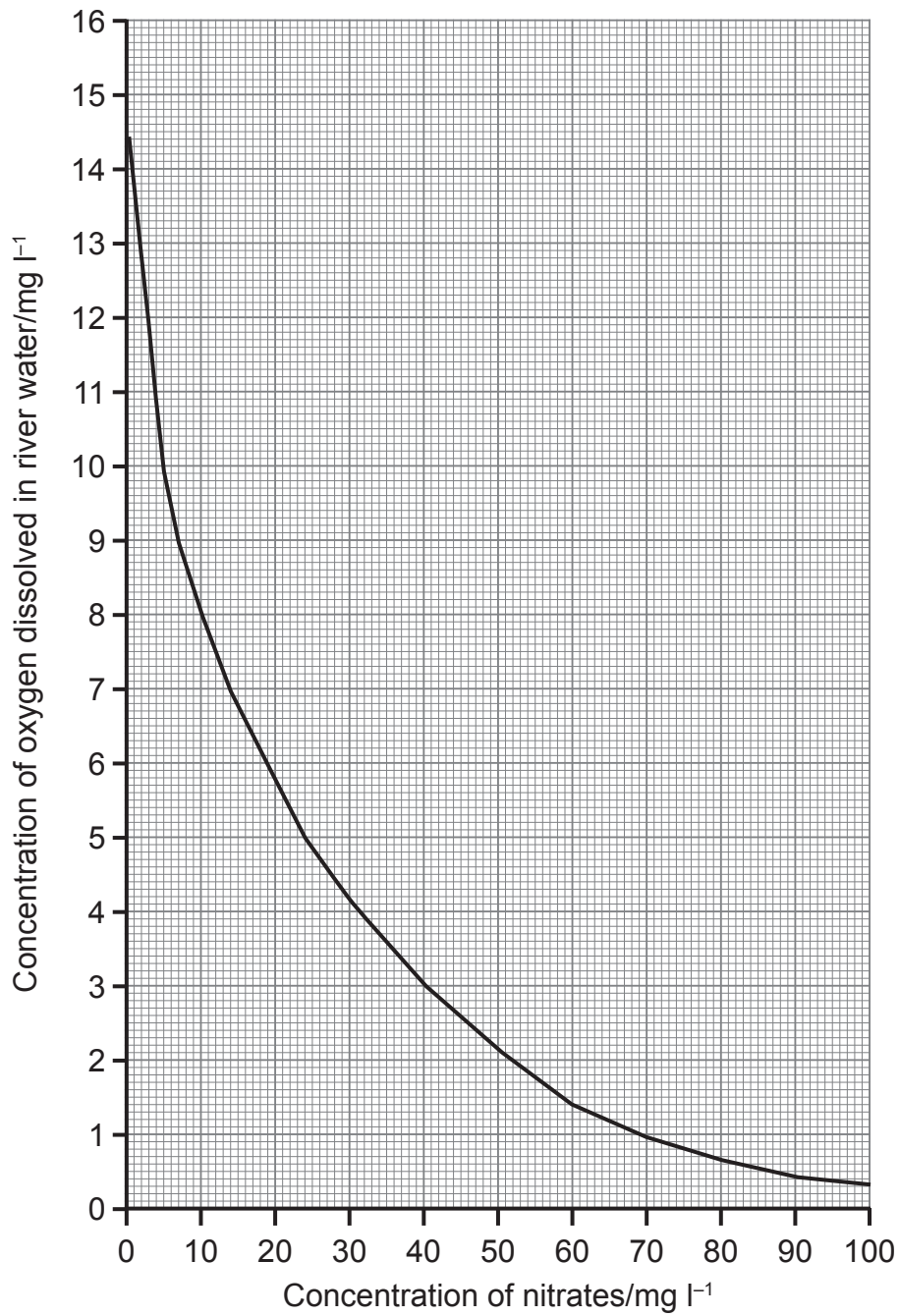
(b) Increased nitrate concentration can lead to a decrease in the concentration of oxygen dissolved in river water.

Explain how.

_____ [3]



The graph shows how the concentration of oxygen dissolved in river water varies with the concentration of nitrates.



The concentration of nitrates was sampled in three rivers, **A**, **B** and **C**.

The table shows the results.

River	Concentration of nitrates /mg l ⁻¹
A	18.5
B	5.0
C	43.0

River water with less than 3 mg l⁻¹ of oxygen dissolved in it is lethal to many aquatic animals.

The number of bloodworms in the river may be used as a measure of the water quality.

(c) Suggest which river may have the largest number of bloodworms.

Explain your answer using data from the graph.

River _____

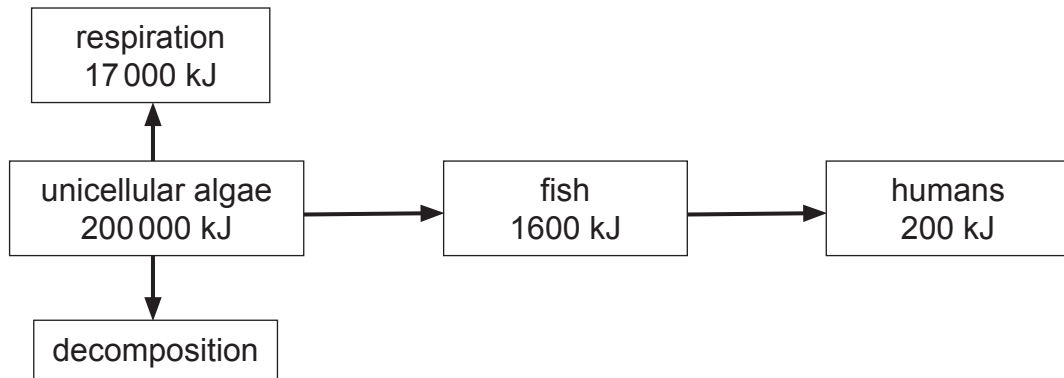
Explanation _____

[3]

[Turn over



10 The diagram shows the flow of energy through a marine food chain.



- (a) Less than 1% of the light energy hitting the sea is used by the unicellular algae in photosynthesis.

Suggest what happens to the other 99% of the light energy.

_____ [1]

- (b) How much of the energy trapped by the unicellular algae passes to the decomposers?

Show your working.

_____ [3]

- (c) Calculate what percentage of the energy trapped by the unicellular algae passes to the secondary consumers.

Show your working.

_____ [2]



Unicellular algae grow quickly and have a high protein content.

They can be grown in large quantities and used to make single cell protein for humans to eat.

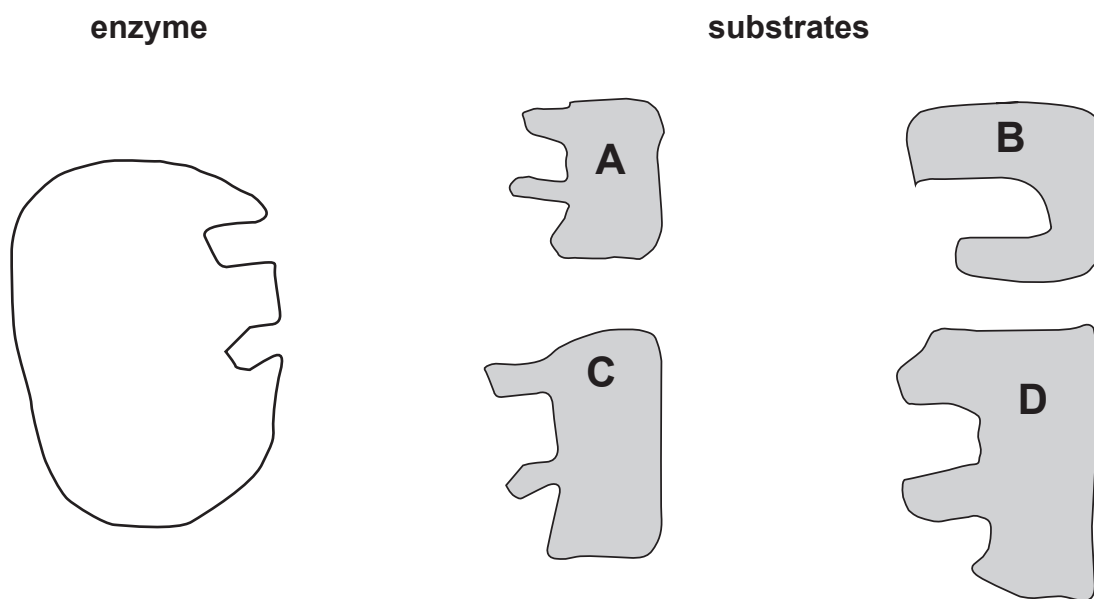
- (d) Rather than eating fish it would be better to use unicellular algae to provide food for the growing human population.

Use data from the food chain to explain why.

[3]



11 The diagram shows an enzyme and four substrate molecules.



(a) (i) Which substrate molecule will react with this enzyme?

[1]

(ii) Explain why this is the only substrate which will react with enzyme.

[3]

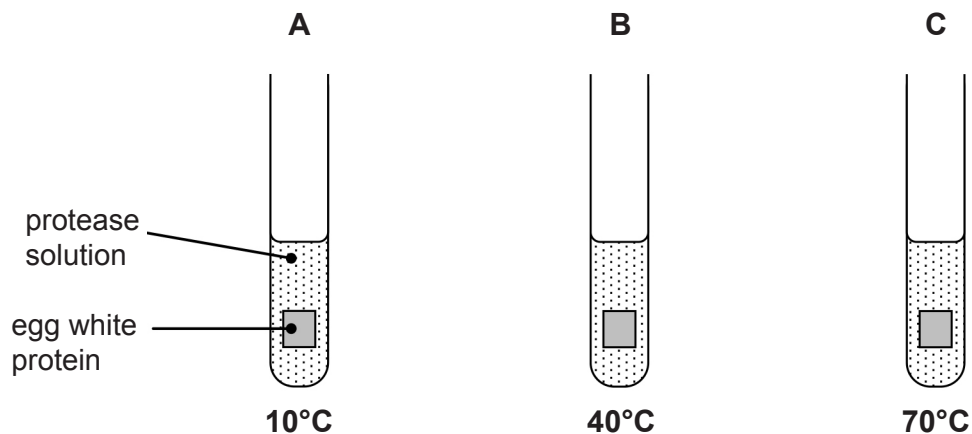


- (b) A student set up three test tubes to investigate the effect of temperature on the action of a human protease enzyme on egg white protein.

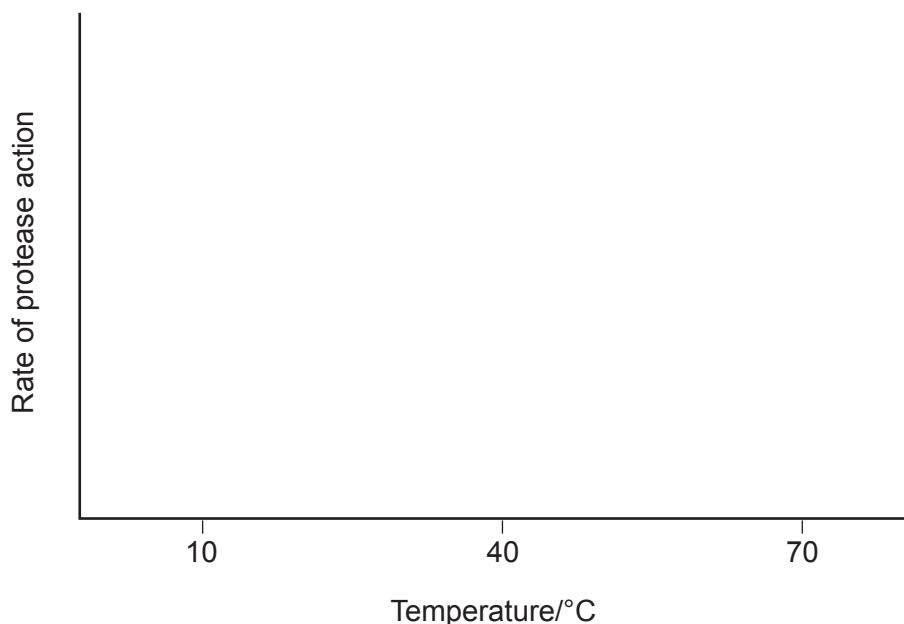
The optimum temperature of human enzymes is 37°C.

He added a 1 cm³ cube of egg white protein and 20 ml of protease solution to each test tube.

He then placed the test tubes in water baths at 10°C, 40°C and 70°C.



- (i) **Sketch** a graph, on the axes provided, to show how temperature affects the rate of this protease action.



[1]

[Turn over



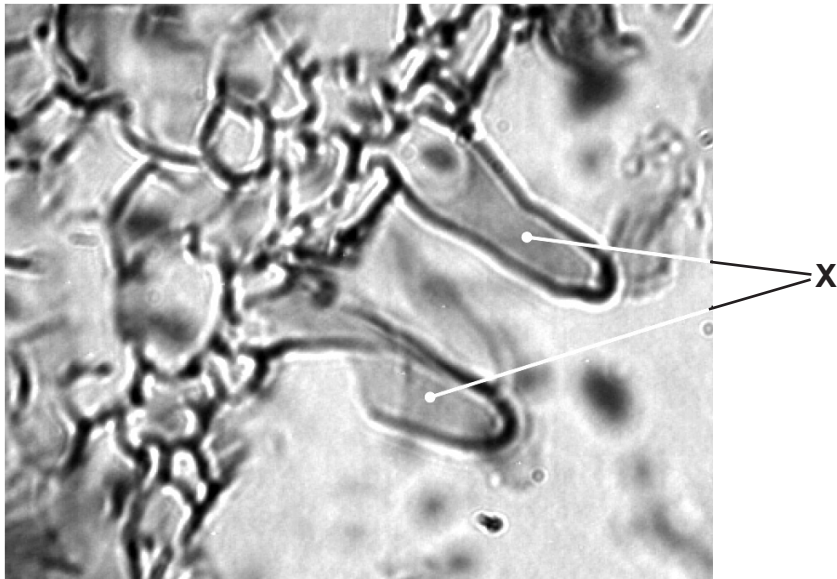
(ii) Explain the rate of reaction at 10°C and 70°C.

[4]



12 (a) Nitrates in the soil are absorbed by plant roots.

The photograph shows a section of a root viewed through a microscope.



Source: Principal Examiner

(i) Identify the cells labelled X.

[1]

(ii) Give one way, visible in the photograph, cells X adapt plants to absorb nitrates.

[1]

(iii) Explain why farmers need to add fertiliser to their fields each year.

[2]

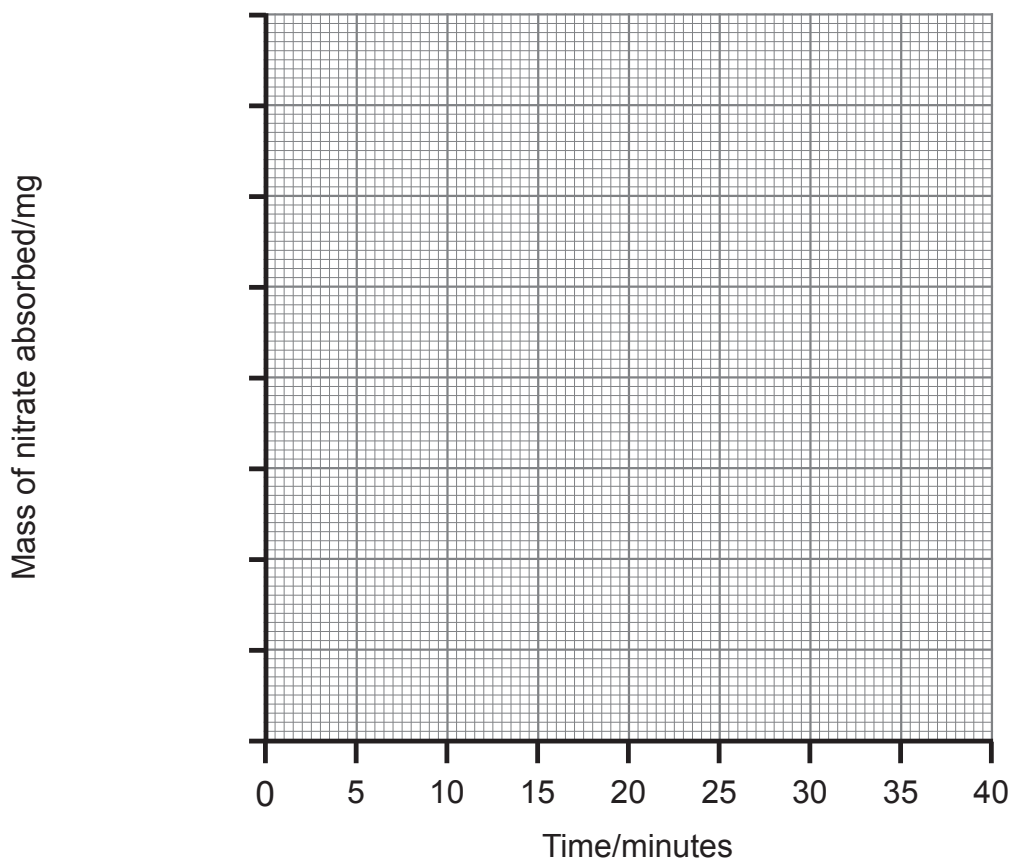
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(b) The table shows the mass of nitrate absorbed by a root over forty minutes at 5°C and 25°C.

Time /minutes	Mass of nitrate absorbed /mg	
	5°C	25°C
0	0.00	0.00
10	0.08	0.08
20	0.09	0.10
30	0.09	0.12
40	0.09	0.14

(i) Complete the graph of these results.



[5]



(ii) Compare the mass of nitrate absorbed at 5°C and 25°C over the forty minute period.

Explain the differences.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]



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For Examiner's use only	
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Examiner Number

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