



General Certificate of Secondary Education
2024

Centre Number

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Candidate Number

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Biology

Unit 1

Higher Tier

MV24

[GBL12]

FRIDAY 17 MAY, MORNING

Time

1 hour 15 minutes, plus your additional time allowance.

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 on blank pages.

Complete in black ink only.

Answer **all nine** questions.

Information for Candidates

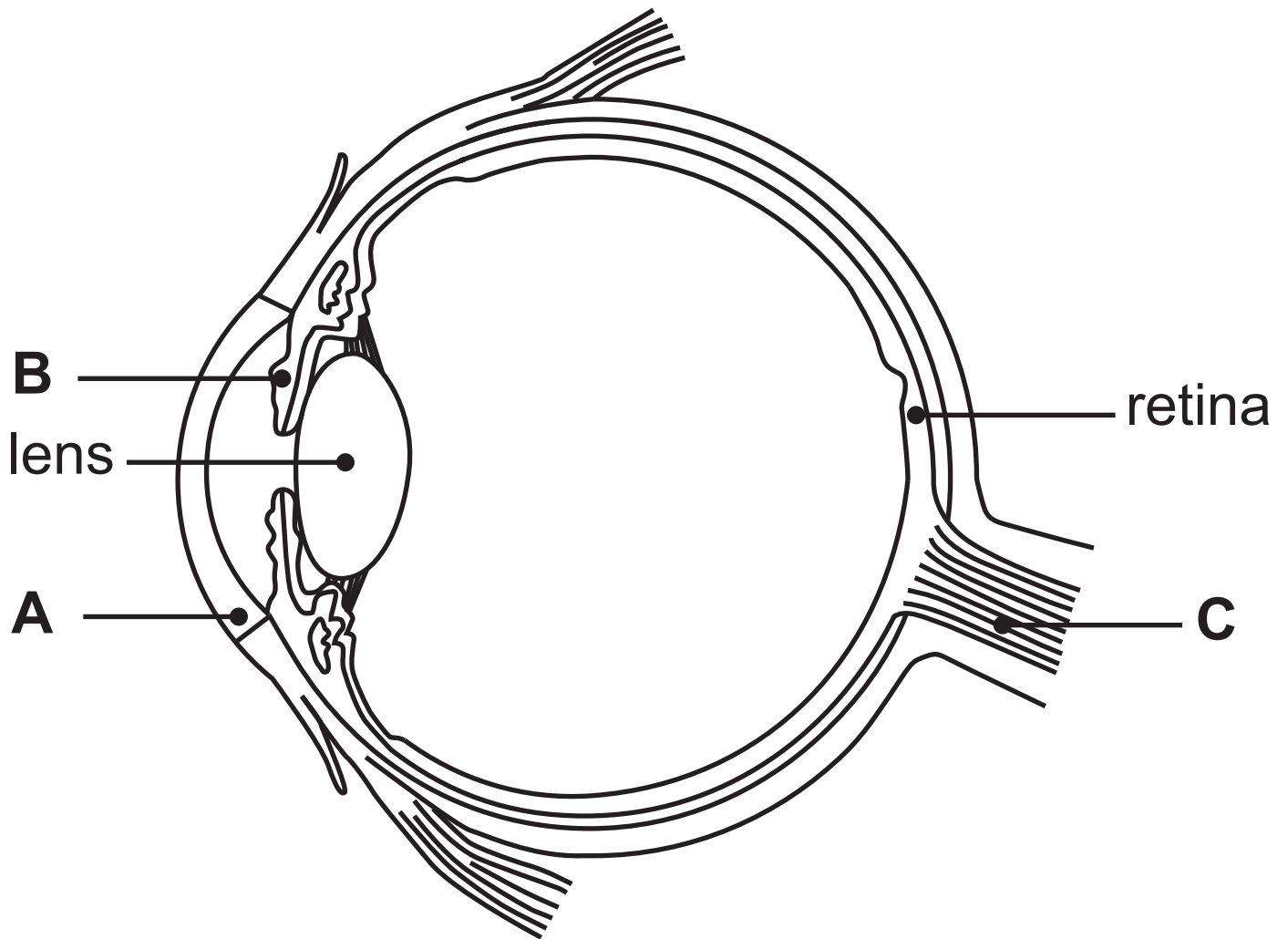
The total mark for this paper is **75**.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **8(b)**.

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(Questions start overleaf)

1 The diagram shows a section through an eye.



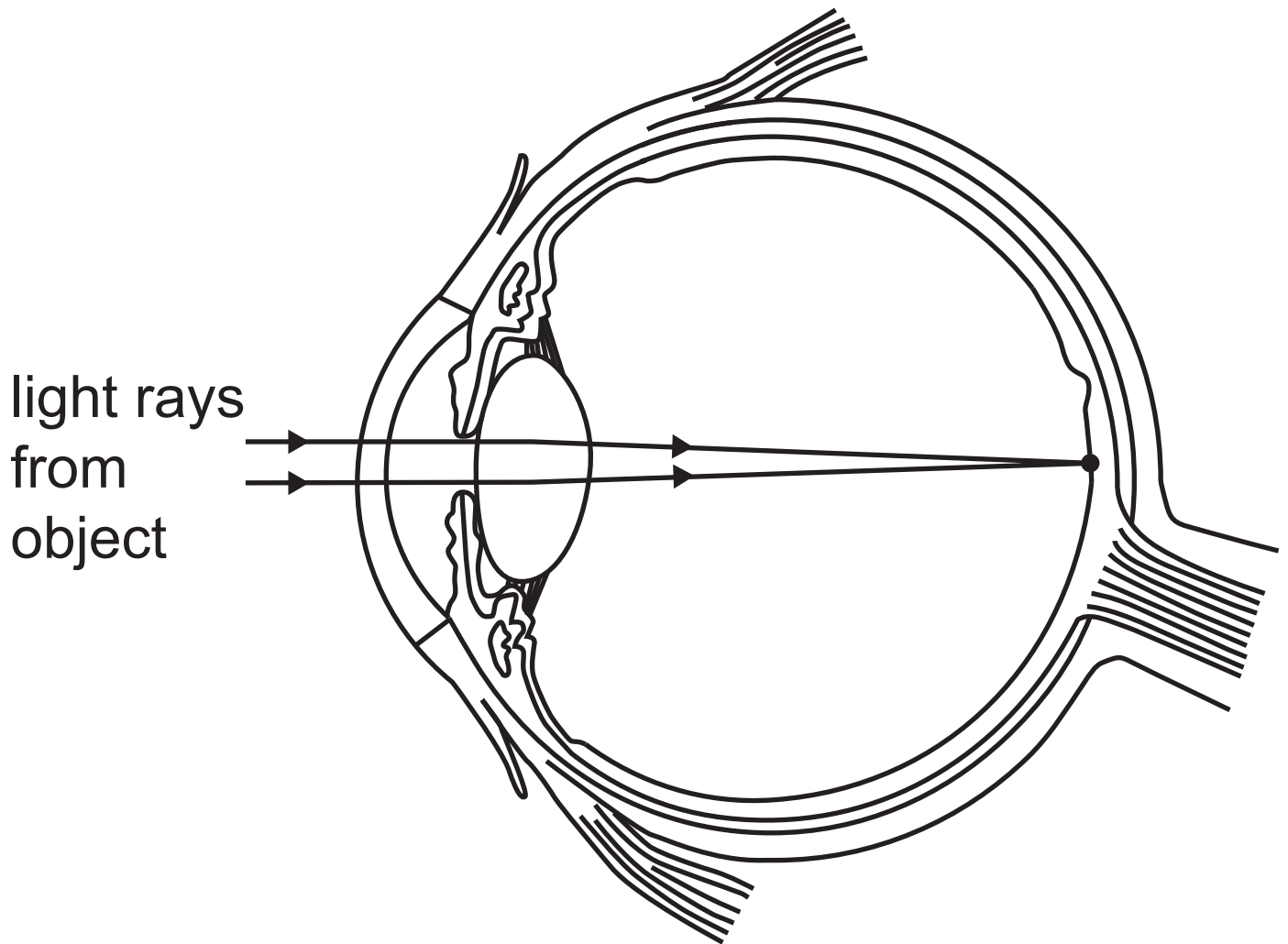
(a) Name parts **A**, **B** and **C**. [3 marks]

A _____

B _____

C _____

The diagram shows light rays from an object entering the eye through the pupil.



(b) Use the diagram to explain how we see an image of an object. [4 marks]

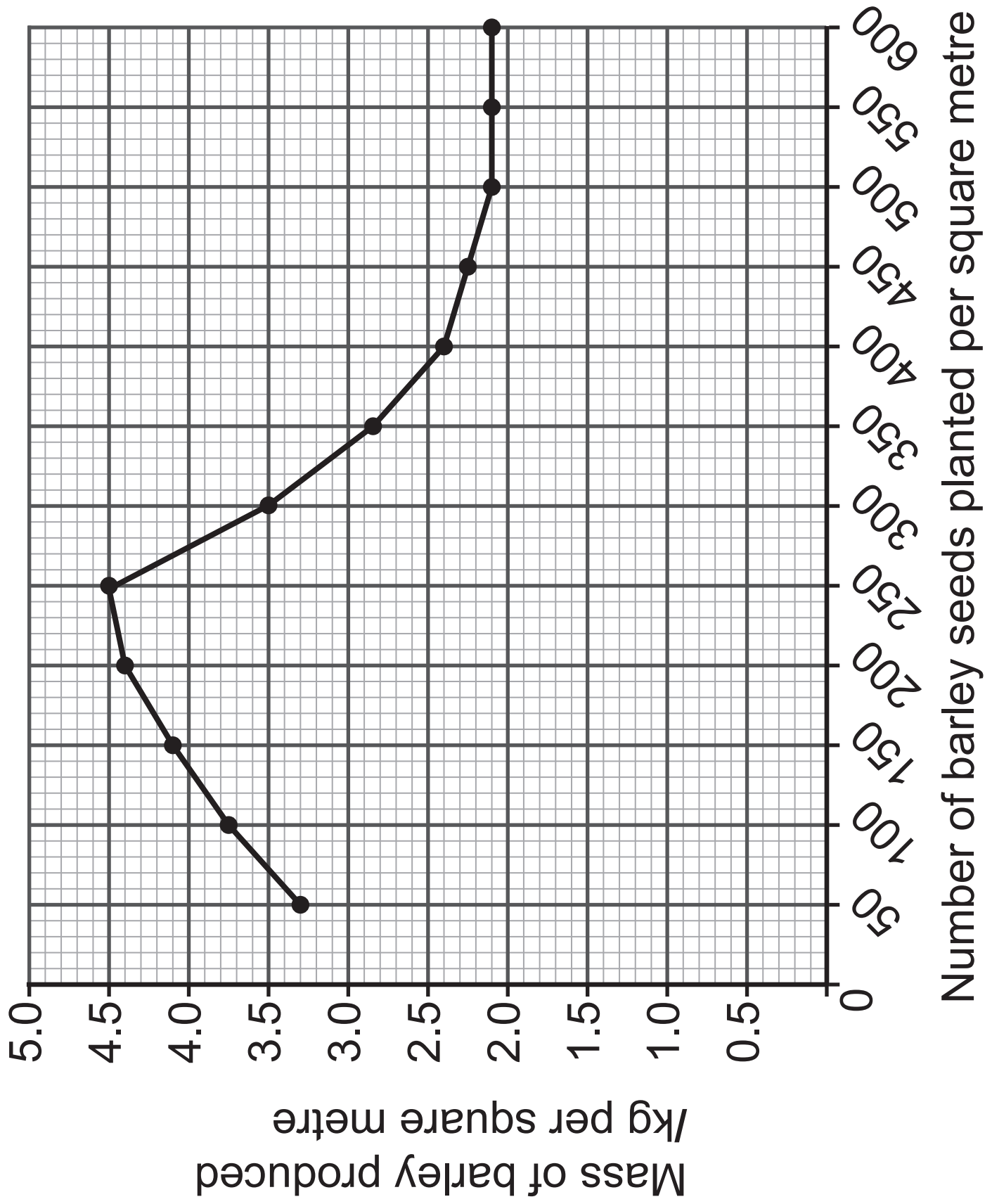
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2 Scientists carried out an investigation into the mass of barley produced when different numbers of barley seeds were planted in test plots.

The scientists planted different numbers of barley seeds per square metre in these test plots.

They recorded the mass of barley produced in each test plot after six weeks.

The graph on page 8 shows their results.



(a) Describe the trend shown by the results.
[4 marks]

Use **data** to support your answer.

(b) When the number of barley seeds planted per square metre was large, competition between the barley plants increased.

One resource the barley plants compete for is light.

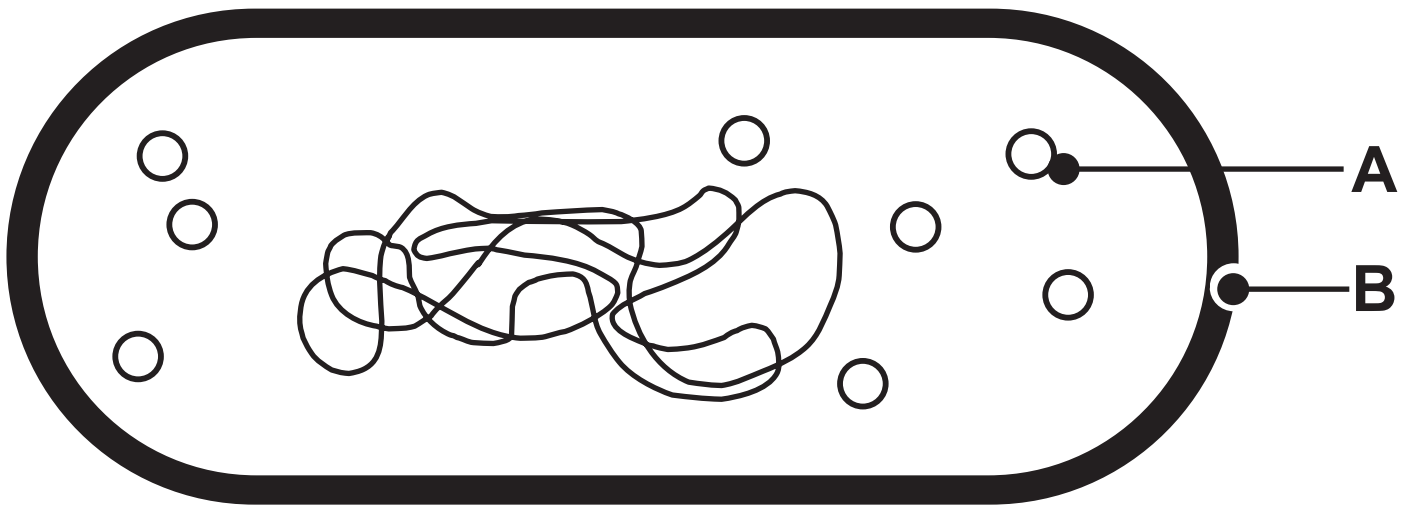
(i) Suggest how competition for light caused the changes shown in the graph when more than 300 barley seeds were planted per square metre. [2 marks]

(ii) Give **two** other resources the barley plants compete for. [2 marks]

1. _____

2. _____

3 The diagram shows a bacterial cell.



(a) Name parts **A** and **B**. [2 marks]

A _____

B _____

(b) Give **two** similarities and **one** difference between a bacterial cell and an **animal** cell. [3 marks]

Similarity 1 _____

Similarity 2 _____

Difference _____

4 (a) Mitochondria are cell structures which carry out aerobic respiration.

(i) Where are mitochondria found in a cell? [1 mark]

(ii) Complete the balanced chemical equation for aerobic respiration.
[2 marks]

energy

+

+

6H₂O

↑

6O₂

+

(b) The table shows the average number of mitochondria found in three different types of animal cell.

Type of animal cell	Average number of mitochondria per cell
skin cell	150
surface cell of a villus in the ileum	1650
white blood cell	700

The average number of mitochondria in a surface cell of a villus in the ileum is greater than in a skin cell.

(i) Calculate how many times greater.
[2 marks]

Show your working.

_____ times
15

The surface cells of a villus in the ileum absorb some digested food molecules by active transport.

(ii) What is active transport? [2 marks]

A surface cell of a villus in the ileum is well-adapted to carry out active transport.

(iii) Use evidence from the table to suggest how. [1 mark]

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(Questions continue overleaf)

- 5 (a) The photograph shows the result of one activity which can contribute to global warming.



- (i) What term is used to describe this activity? [1 mark]

(ii) Explain how this activity can contribute to global warming.
[3 marks]

(b) One effect of global warming is the melting of polar ice caps.

The table shows how the area of ice covering the Arctic Sea has decreased between 1980 and 2020.

Year	Area of ice covering the Arctic Sea/million km²
1980	15.2
1990	14.7
2000	14.2
2010	13.6
2020	13.3

(i) Calculate the **rate** of decrease in the area of ice covering the Arctic Sea between **1980** and **2020**.

[3 marks]

Give your answer to **2 decimal places**.

Show your working.

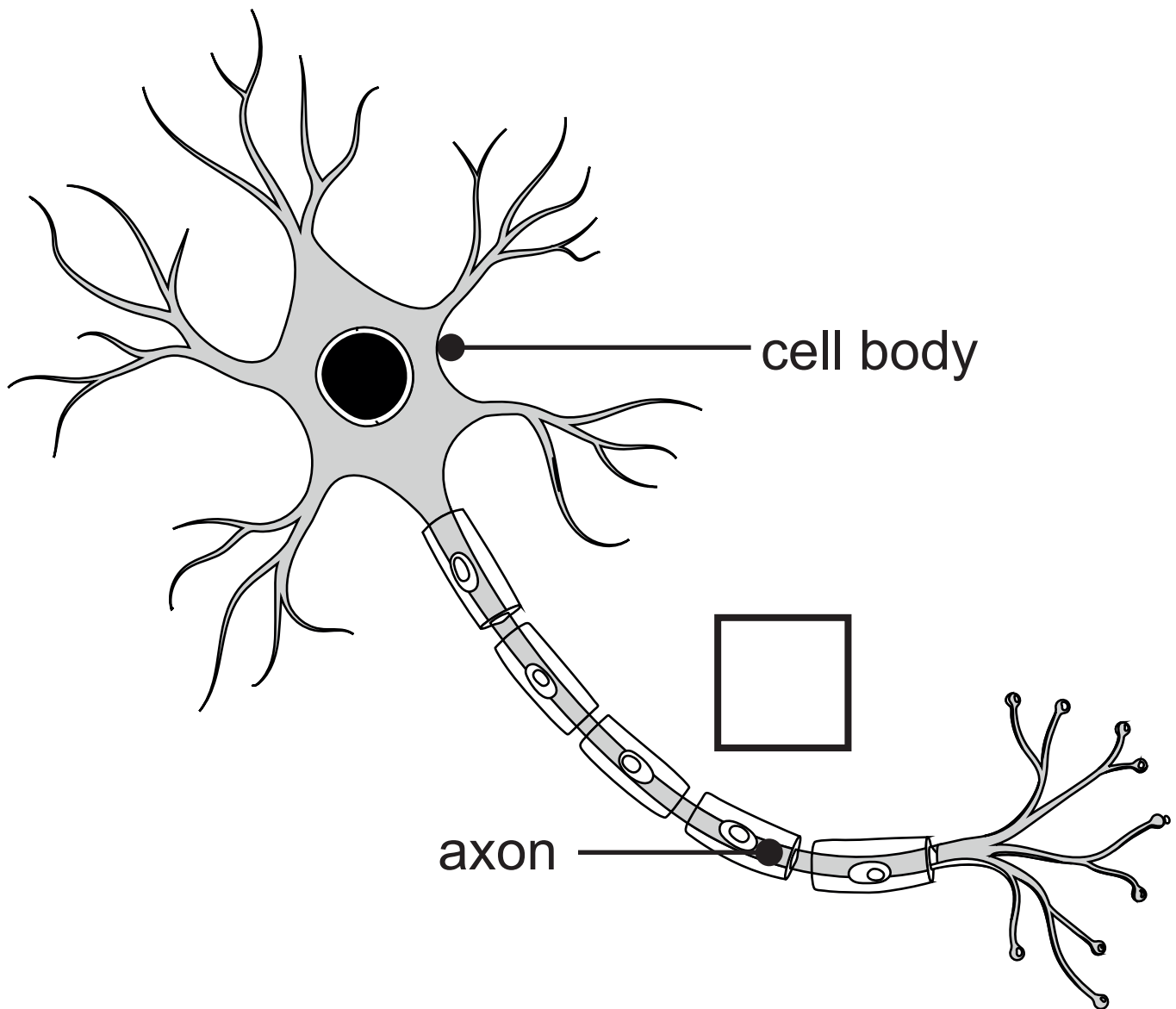
_____ million km² yr⁻¹

(ii) Give **two** environmental effects of this decrease in the area of ice covering the Arctic Sea. [2 marks]

1. _____

2. _____

6 (a) The diagram shows a motor neurone.



(i) **Draw an arrow in the box** to show the direction of a nerve impulse in this neurone. [1 mark]

Motor neurones have long axons.

(ii) Explain how this adapts them to their function. [1 mark]

(iii) Use evidence from the diagram to describe and explain **two other** ways this neurone is adapted for the transmission of nerve impulses.

[4 marks]

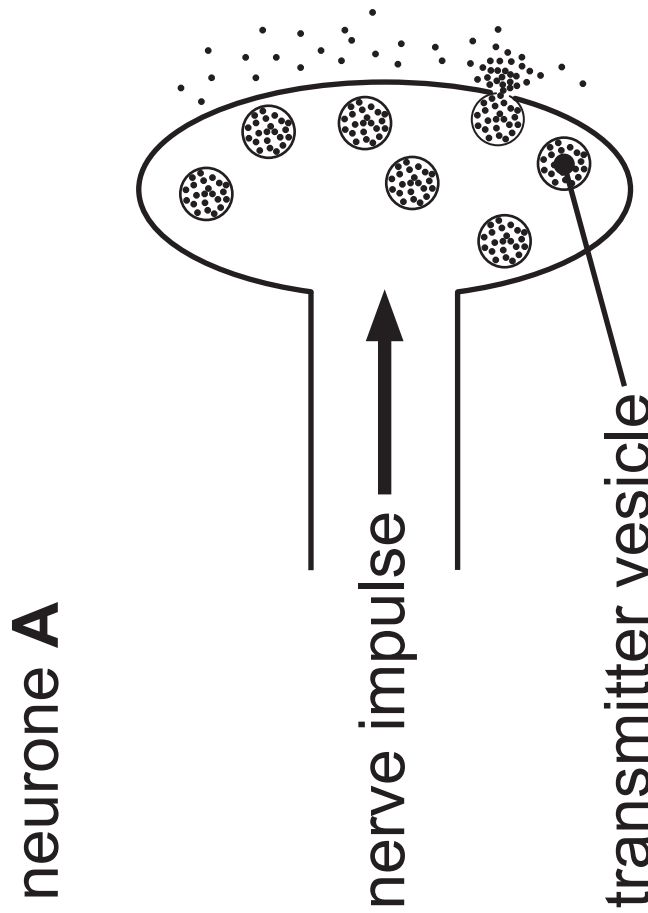
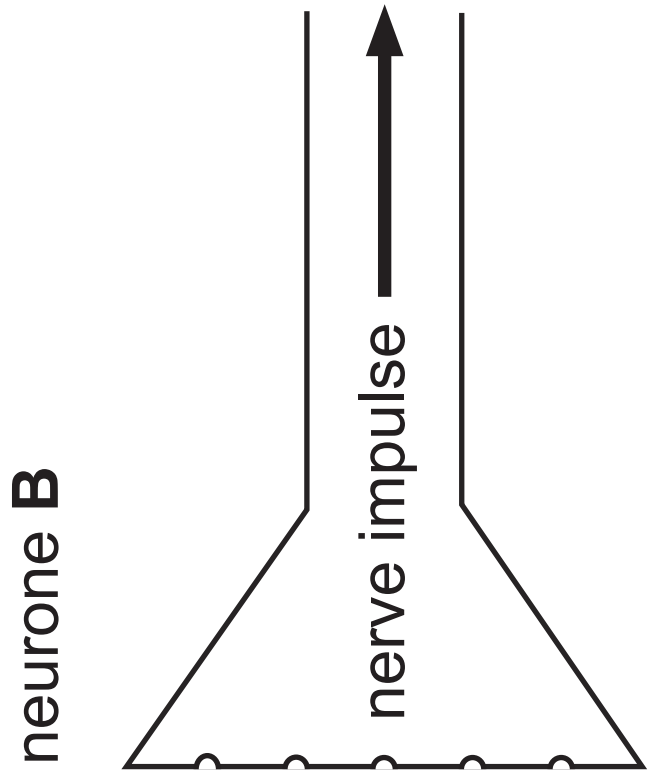
1. Description _____

Explanation _____

2. Description _____

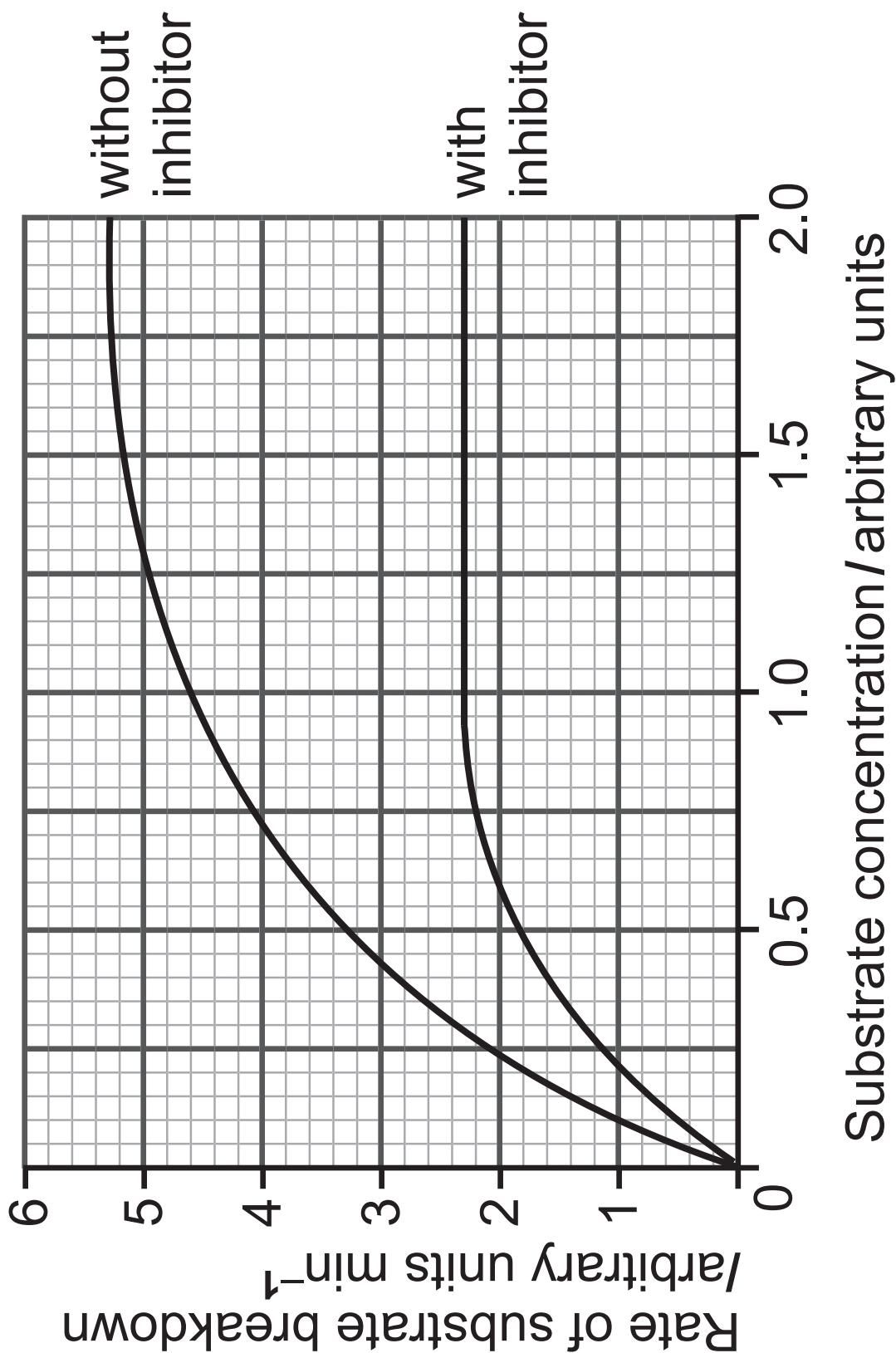
Explanation _____

The diagram shows a synapse between two neurones, **A** and **B**.



(b) Use the diagram to help you describe how the release of a chemical from the transmitter vesicles causes a nerve impulse in neurone **B**. [4 marks]

- 7 (a) The graph shows how increasing the substrate concentration affects the rate at which an enzyme breaks down the substrate with or without an inhibitor present.



- (i) Use the graph to give the rate of substrate breakdown at a substrate concentration of 1.0 arbitrary unit **without an inhibitor**. [1 mark]

_____ arbitrary units min⁻¹

- (ii) Use your answer in (i) to calculate the **time** it would take to break down 23 arbitrary units of substrate at a substrate concentration of 1.0 arbitrary unit **without an inhibitor**. [2 marks]

Show your working.

_____ min
27

[Turn over

(b) Use the lock and key theory of enzyme action to explain the effect of the inhibitor on the rate of substrate breakdown.

[4 marks]

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(Questions continue overleaf)

- 8 The photographs show the effects of an algal bloom caused by fertiliser entering a river.



- (a) Name the process which occurs after excess fertiliser enters a river.
[1 mark]

Government strategies have been introduced to reduce this type of water pollution.

(c) Suggest how each of the following strategies can help reduce water pollution. [2 marks]

Farmers are not allowed to apply fertiliser close to rivers.

Farmers are only allowed to apply fertiliser during the growing season of crops.

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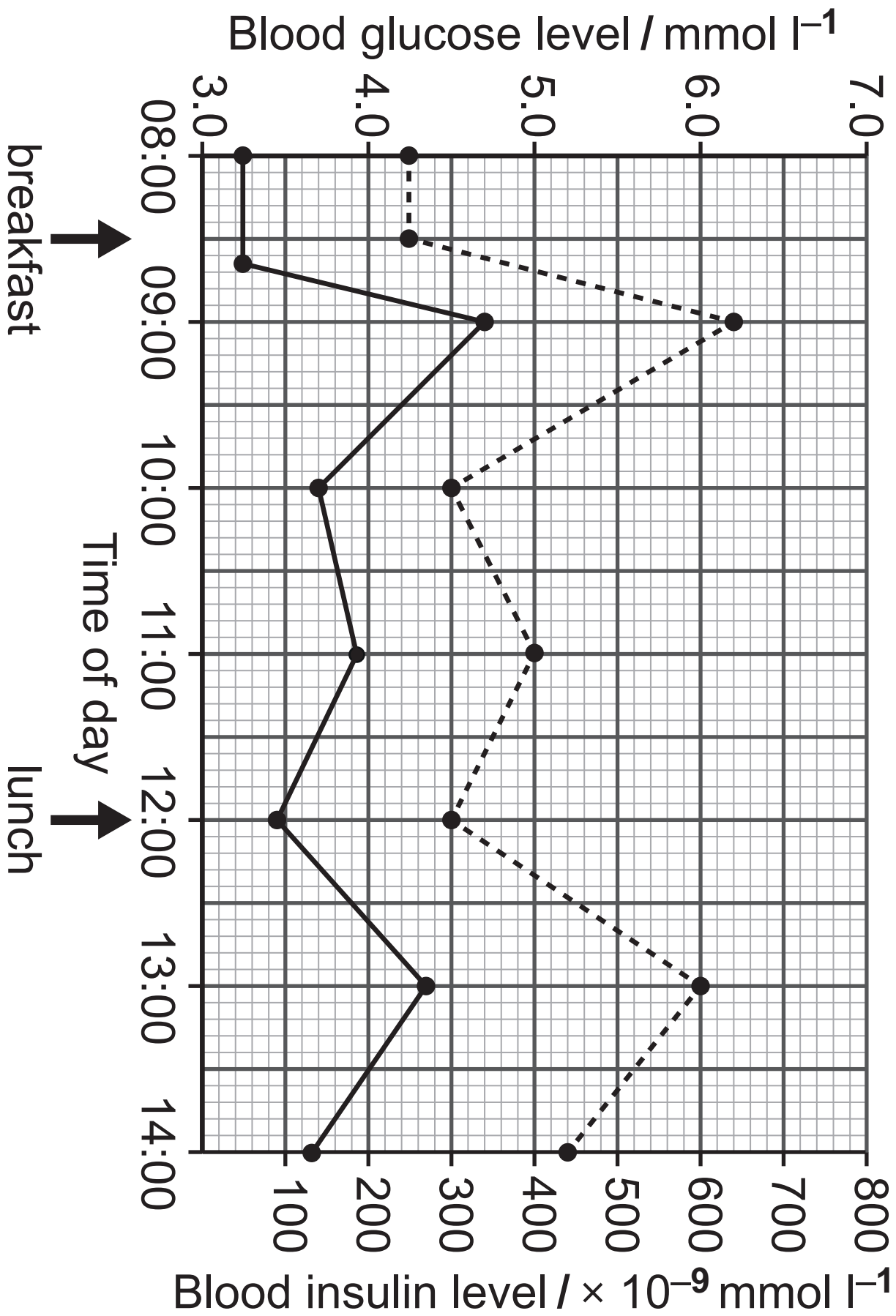
(Questions continue overleaf)

9 The graph opposite shows the blood glucose and blood insulin levels of a man who does not have diabetes.

His blood glucose and blood insulin levels were monitored over six hours.

(a) Describe and explain the blood **insulin** level at 08:00 hours. [3 marks]

Use **data** to support your answer.



(b) (i) Calculate the percentage increase in blood **glucose** level from 12:00 to 13:00. [3 marks]

Show your working.

_____ %

(ii) The control of blood glucose involves a negative feedback system.

Use the graph to give evidence to support this statement. [2 marks]

No data is required in your answer.

(c) People who have diabetes are unable to control their blood glucose levels.

There are two types of diabetes, **Type 1** and **Type 2**.

(i) Give the **cause** of each type of diabetes. [2 marks]

Type 1 _____

Type 2 _____

(ii) Describe how the early stages of each type of diabetes may be treated differently. [2 marks]

**This is the end of the
question paper**

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Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Number

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