



Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Higher Tier

Biology Paper 2H

8464/B/2H

H

Time allowed: 1 hour 15 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



For this paper you must have:

- **a ruler**
- **a scientific calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Pencil should only be used for drawing.**
- **Answer ALL questions in the spaces provided.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **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.**



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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO



0	1
---	---

This question is about the cycling of water and carbon in ecosystems.

0	1	.	1
---	---	---	---

**Which reaction produces water?
[1 mark]**

Tick (✓) ONE box.

Aerobic respiration

Anaerobic respiration

Photosynthesis



BLANK PAGE

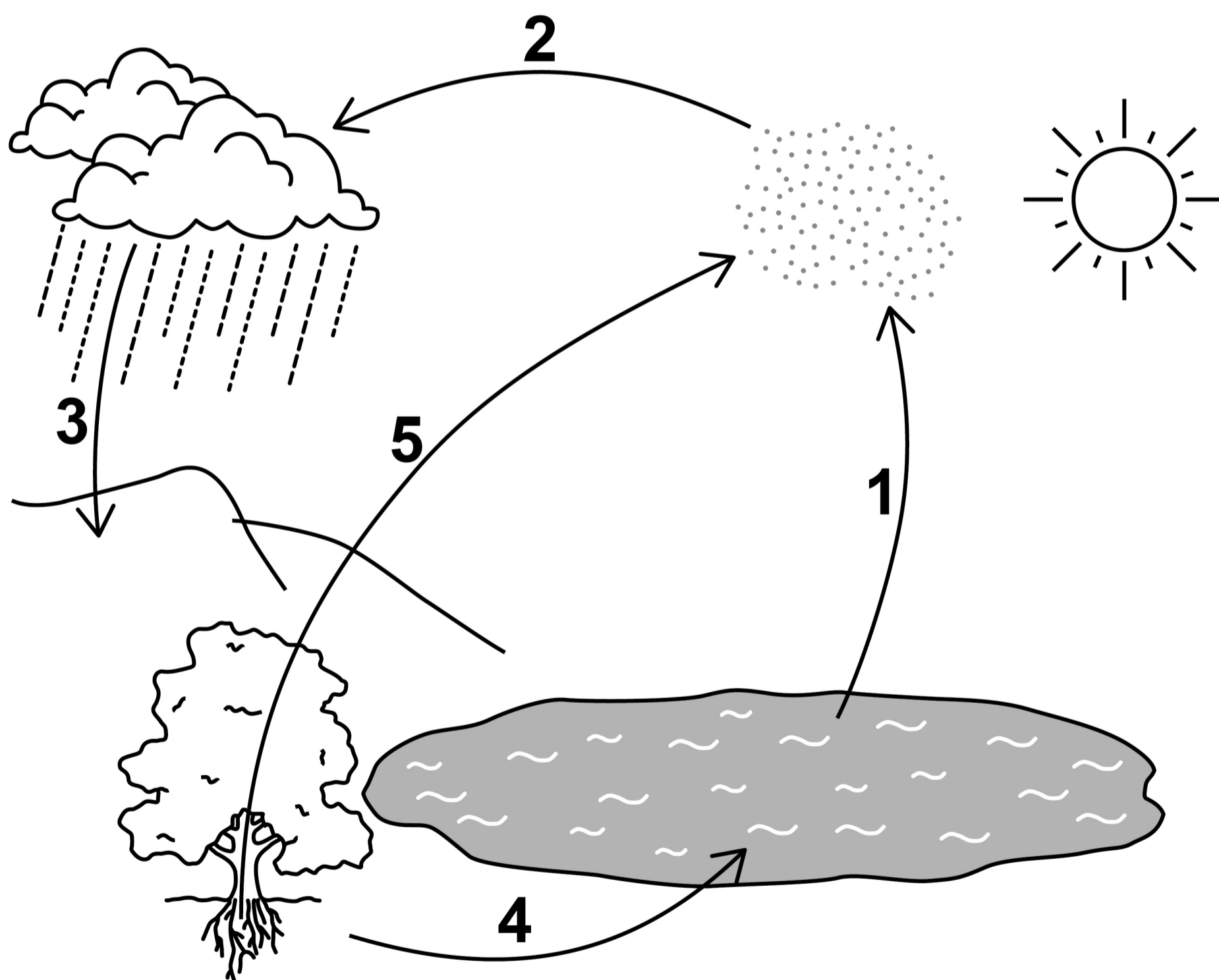
[Turn over]



The water cycle provides water for plants and animals on land before the water goes into lakes and seas.

FIGURE 1 represents the water cycle.

FIGURE 1



0 1 . 2

**Name the processes 1 to 5 shown on
FIGURE 1, on the opposite page.**

[5 marks]

1 _____

2 _____

3 _____

4 _____

5 _____

[Turn over]



0 1 . 3

**In 2007 the population of the world was
6 000 000 000**

**A study found that 4.5% of the
population had severe water shortage.**

**Calculate how many people had severe
water shortage.**

**Give your answer in standard form.
[3 marks]**



Number of people (in standard form) =

[Turn over]



0 1 . 4

Why do more people have severe water shortage now than in 2007? [2 marks]

Tick (✓) TWO boxes.

Climate change has increased the area of deserts.

Each person drinks less water.

More water is used to grow crops.

Sea levels have risen because the ice caps are melting.

Some countries have built de-salting factories for seawater.



Leaves on a tree contain carbon compounds.

In autumn the leaves fall to the ground.

0 1 . 5

Microorganisms in the soil recycle carbon from the leaves so that the carbon is used for new plant growth.

Explain how. [4 marks]

[Turn over]





0	1	.	6
---	---	---	---

What is ONE benefit of fallen leaves for living plants? [1 mark]

Tick (✓) ONE box.

Energy is released for living plants.

Insect pests in the soil are killed.

Nitrates are released into the soil.

Oxygen is supplied to root cells.

16

[Turn over]



0 2

Water pollution is a problem for humans and wildlife.

**Explain how human activities are polluting rivers, lakes and seas.
[6 marks]**

[Turn over]

6



0	3
---	---

On a school field:

- **one area of the soil was usually wet**
- **another area of the soil was usually dry.**

Students investigated the effect of water in the soil on the number of buttercup plants growing in each area.

0	3	.	1
---	---	---	---

Water is an abiotic factor.

Name ONE BIOTIC factor which may affect the number of buttercups growing on the field. [1 mark]



0 3 . 2

Describe a method to investigate if the amount of water in the soil affects the number of buttercups in the field.

[6 marks]

[Turn over]



7

0	4
---	---

Scientists investigated the effect of soil nitrate ion concentration on the yield of corn.

This is the method used.

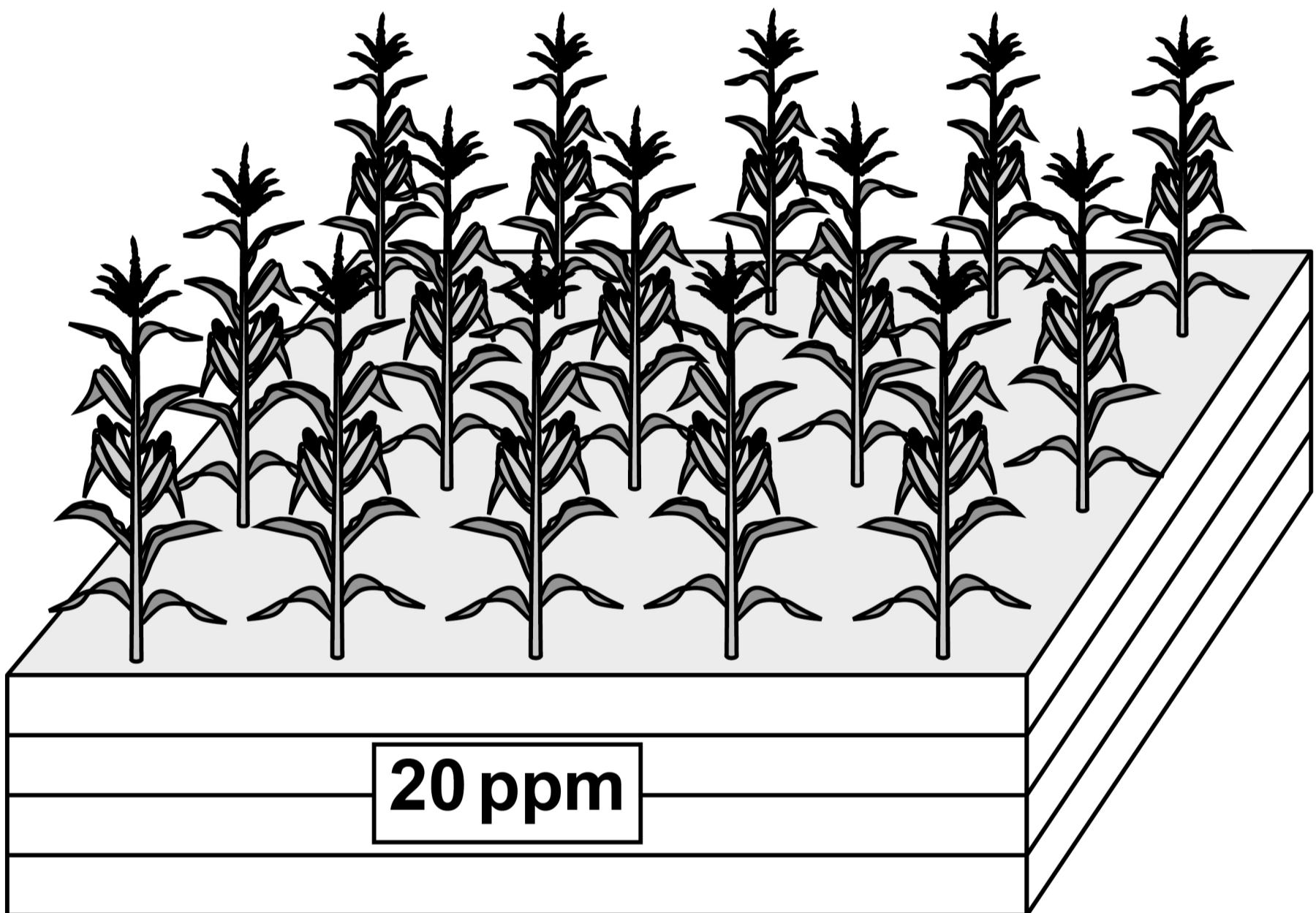
- 1. Corn plants were grown in a large box of soil.**
- 2. The soil nitrate ion concentration in the box was kept at 0 parts per million (ppm).**
- 3. All the corn from each plant in the box was removed and weighed.**
- 4. The mean mass of corn per plant was calculated.**
- 5. Steps 1 to 4 were repeated for boxes containing soil with different concentrations of nitrate ions.**

[Turn over]



FIGURE 2 shows the corn plants in the box with a 20 ppm soil nitrate ion concentration.

FIGURE 2



04.1

Give TWO variables the scientists should have controlled in this investigation.

[2 marks]

1 _____

2 _____

[Turn over]

The scientists carried out a valid investigation.

TABLE 1 shows the scientists' results.

TABLE 1

Soil nitrate ion concentration in ppm	Mean mass of corn per plant in grams
0	122
10	190
20	256
30	268
40	240
50	184



BLANK PAGE

[Turn over]



04.2

Complete FIGURE 3, on the opposite page.

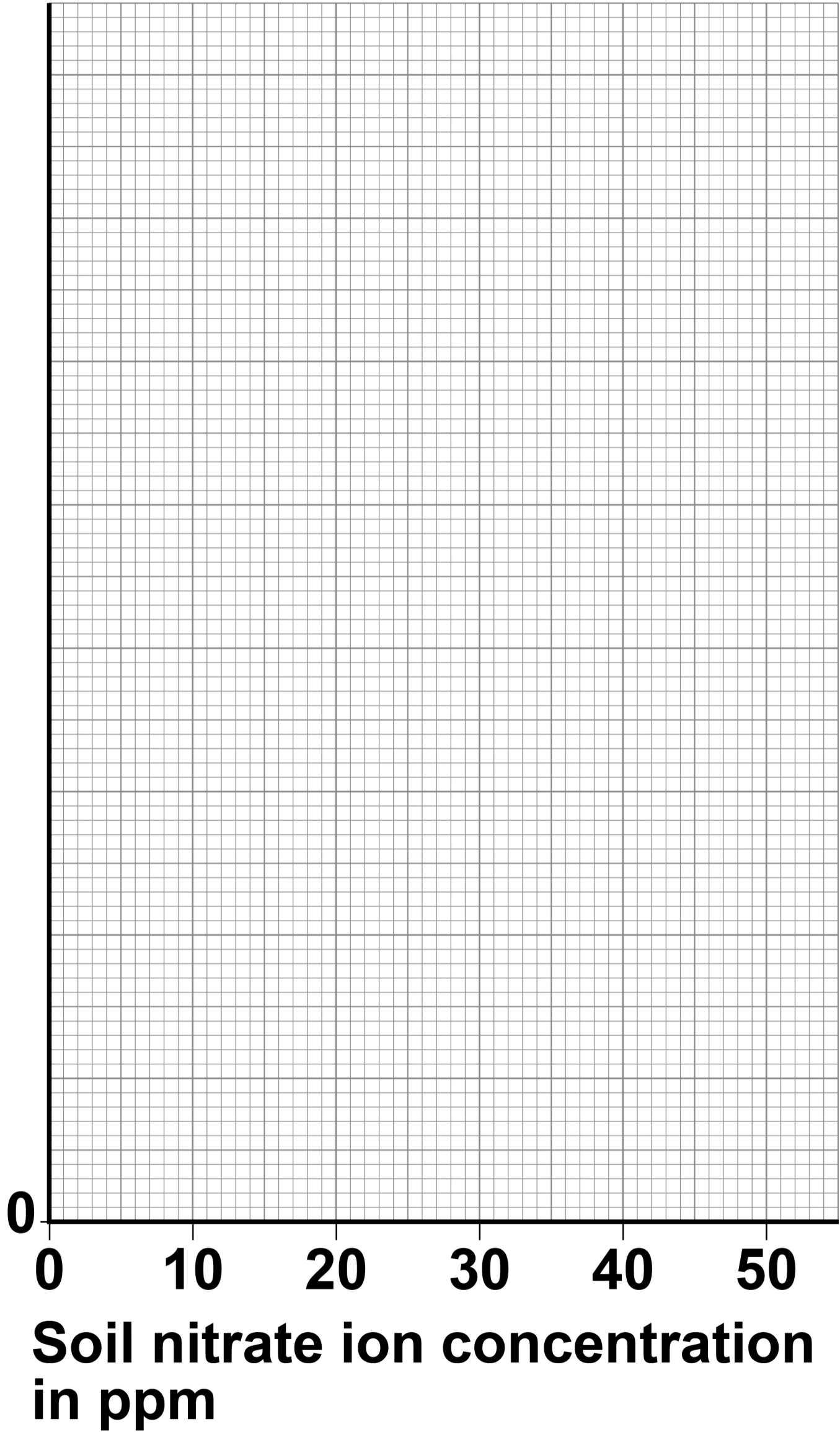
You should:

- **label the y -axis**
- **use a suitable scale for the y -axis**
- **plot the data from TABLE 1 on page 22**
- **draw a line of best fit.**

[4 marks]



FIGURE 3



[Turn over]

TABLE 1 is repeated below.

TABLE 1

Soil nitrate ion concentration in ppm	Mean mass of corn per plant in grams
0	122
10	190
20	256
30	268
40	240
50	184



0	4	.	3
---	---	---	---

Describe the relationship between soil nitrate ion concentration and the mean mass of corn per plant.

Use data from TABLE 1, on the opposite page, in your answer. [2 marks]

[Turn over]



0 4 . 4

Farmers add nitrate fertiliser to fields where they grow corn.

Nitrate fertilisers are expensive.

Evaluate the economic and environmental implications of adding fertiliser to soil in nitrate ion concentrations ranging from 0 to 50 ppm. [4 marks]

[Turn over]

12

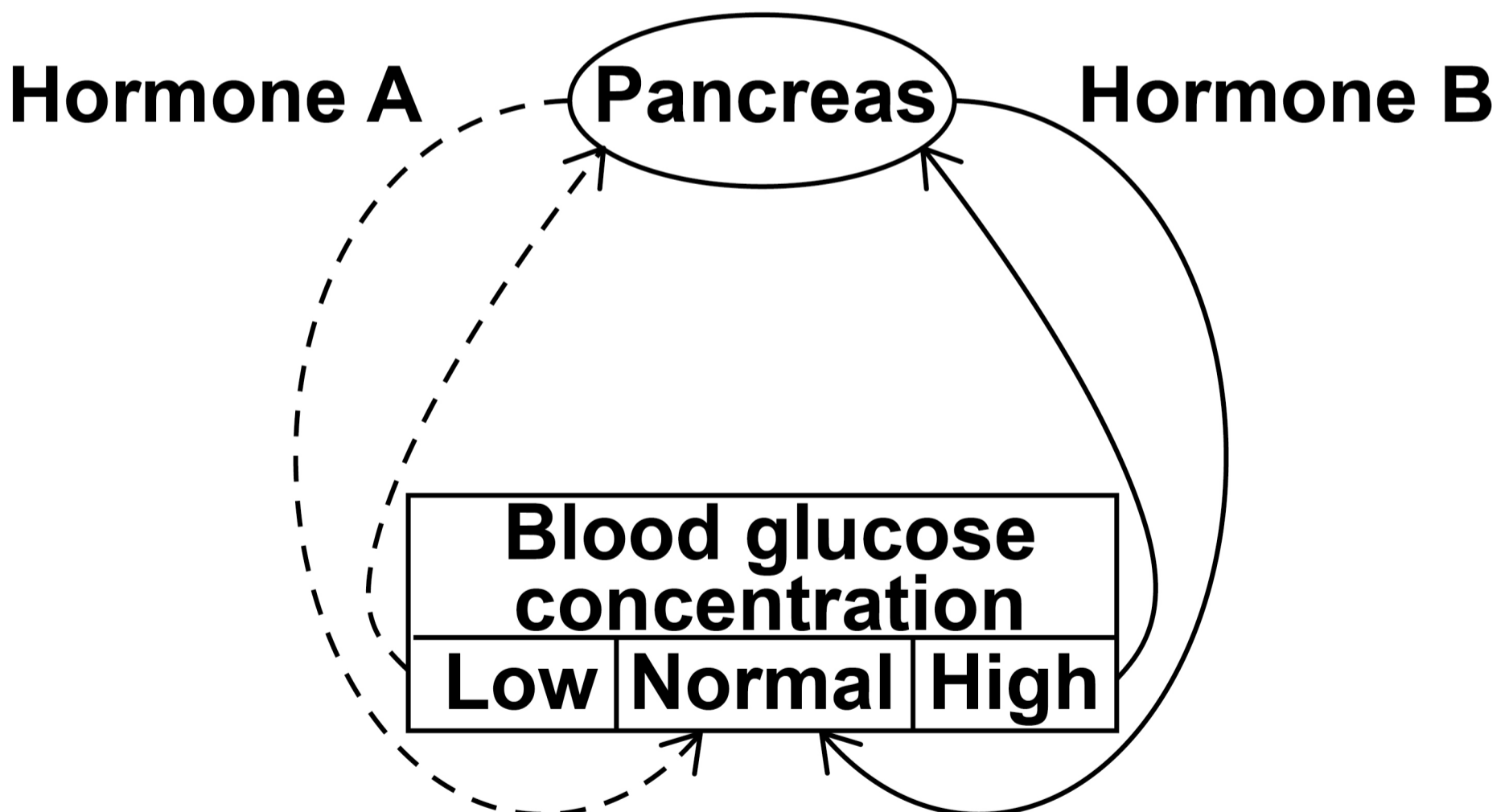


0	5
---	---

Blood glucose concentration in the human body needs to be kept within the normal range.

FIGURE 4 shows that two hormones control blood glucose concentration.

FIGURE 4



05.1

Name the type of hormonal control shown in FIGURE 4, on the opposite page. [1 mark]

05.2

Name hormones A and B in FIGURE 4. [1 mark]

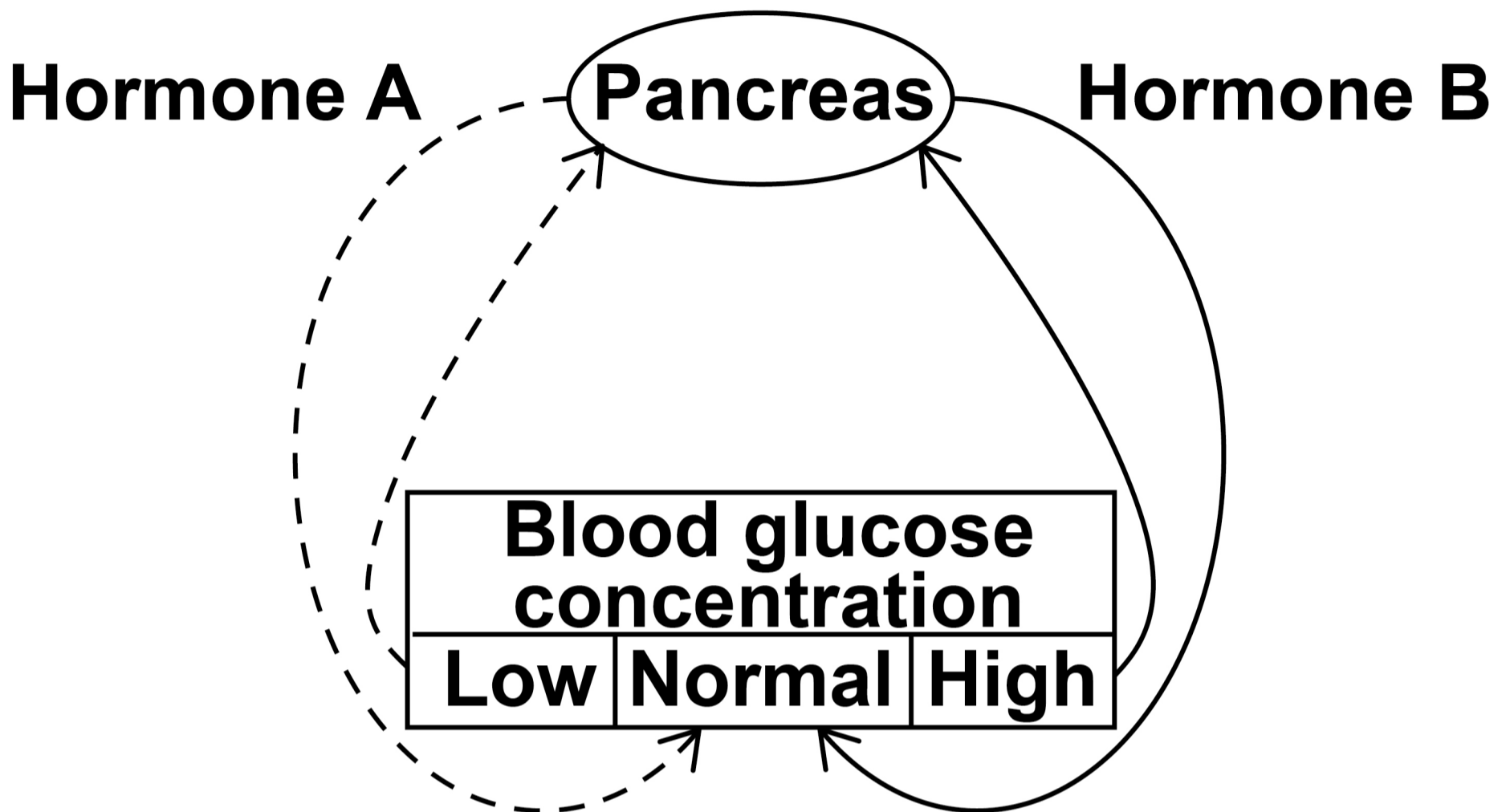
A _____

B _____

[Turn over]



REPEAT OF FIGURE 4



0 5 . 3

Explain how the two hormones in FIGURE 4 keep the blood glucose concentration within the normal range for 3 hours after a meal. [6 marks]



[Turn over]



Female reproductive hormones are used to treat infertility in women.

0 5 . 4

Follicle Stimulating Hormone (FSH) and then Luteinising Hormone (LH) can be injected into a woman to help her become pregnant by sexual intercourse.

Explain how injecting FSH and then LH will help a woman to become pregnant. [3 marks]

[Turn over]



05.5

In some women the injections of FSH and LH are the first steps for In Vitro Fertilisation (IVF).

**Describe the remaining steps in IVF.
[4 marks]**

BLANK PAGE

[Turn over]



05.6

There are two different processes of cell division in humans.

Describe THREE differences between cell division to form sperm cells compared with cell division to form liver cells. [3 marks]

1 _____

2 _____

3

[Turn over]

18



0	6
---	---

The polar bear is a mammal that lives in arctic habitats.

0	6	.	1
---	---	---	---

Complete TABLE 2, on the opposite page for the classification of the polar bear, 'Ursus maritimus'. [2 marks]



TABLE 2

Classification group	Name
Domain	
Kingdom	
	chordata
Class	mammalia
Order	carnivora
	ursidae
Genus	Ursus
Species	maritimus

[Turn over]



Scientists have been measuring the area of sea ice in the Arctic since 1980.

FIGURE 5, on page 44, shows the area covered by sea ice every September.



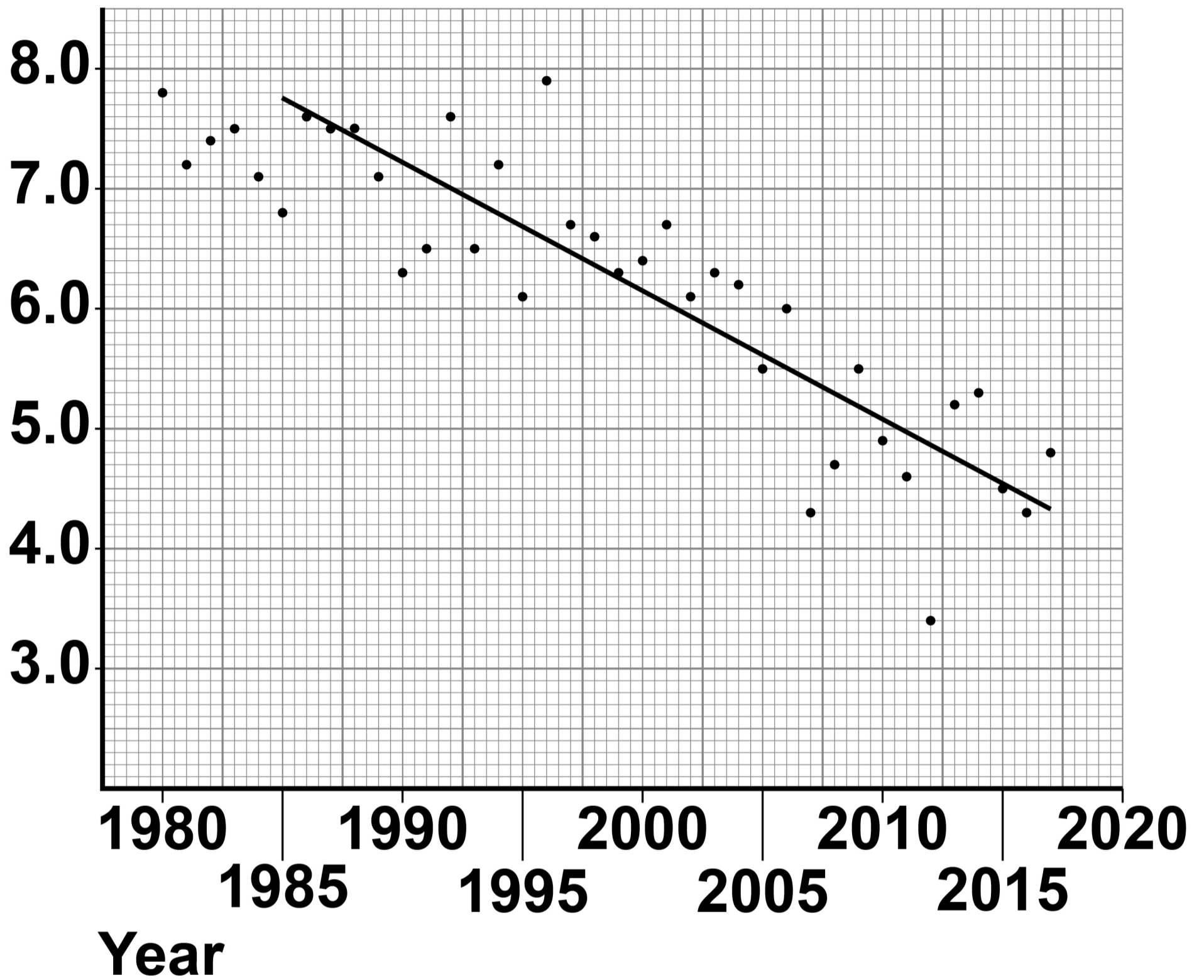
BLANK PAGE

[Turn over]



FIGURE 5

Area of sea ice in millions of square kilometres



0	6	.	2
---	---	---	---

Determine the annual rate of loss of sea ice between 1985 and 2017.

A trend line has been drawn on FIGURE 5, on the opposite page, to help you. [3 marks]

**Rate of loss = _____
million square kilometres per year**

[Turn over]



The total number of polar bears living on the arctic ice is not known.

The hunting of polar bears has been banned or reduced in some areas.

In some populations the average mass and height of polar bears has decreased.

Polar bears eat seals. Seals live on the sea ice in winter and raise their pups there in early spring. In the summer seals live mainly in the sea catching fish to eat.

Polar bears spend much of the year hunting seals on the sea ice and in the sea nearby. The sea ice area is at its lowest each year in September at the end of summer. The polar bears feed mainly in early spring, and again in autumn to build fat stores to survive the next winter.



During the winter of 2017 scientists measured the metabolic rates of nine female polar bears and found them to be much higher than expected. Cameras attached to the female polar bears showed they had to swim long distances to find seals to eat.

0 6 . 3

Suggest why polar bears find it harder to catch seals in autumn than in spring.

[2 marks]

[Turn over]



06.4

Evaluate what might happen to the population of polar bears in the Arctic in the future. [4 marks]

END OF QUESTIONS

11



Additional page, if required.
Write the question numbers in the
left-hand margin.



**Additional page, if required.
Write the question numbers in the
left-hand margin.**

BLANK PAGE

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

Copyright information

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.aqa.org.uk.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2022 AQA and its licensors. All rights reserved.

IB/M/CD/Jun22/8464/B/2H/E2

5 2



2 2 6 G 8 4 6 4 / B / 2 H