A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE
BIOLOGY

H

Higher Tier Paper 2H

8461/2H

Monday 1 June 2020 Afternoon

Time allowed: 1 hour 45 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]

JUN208461 2H01

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 100.**
- **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

Answer ALL questions in the spaces provided.

0 1

This question is about the decay of milk.

0 1 . 1

Name TWO types of microorganism that cause decay. [2 marks]

1 _____

_____

2 _____

_____

0 1 . 2

Cows' milk is pH 6.6.

As milk decays, lipids in the milk are broken down.

One of the products of the breakdown of lipids causes the pH of milk to decrease.

Name the product that causes the pH to decrease. [1 mark]

_____

_____

A student investigated the effect of temperature on the time taken for different types of milk to decay.

This is the method used.

1. Put cows' milk in six test tubes.
2. Keep each test tube at a different temperature.
3. Measure the pH of the milk in each tube every day for 12 days.
4. Record the number of days taken to reach pH 5.
5. Repeat steps 1 to 4 with goats' milk and with almond milk.

0 1 . 3

Give ONE way the pH can be measured.
[1 mark]

0 1 . 4

Give TWO control variables the student should have used in this investigation.
[2 marks]

1 _____

_____

2 _____

_____

The student improved the investigation to produce valid results.

FIGURE 1, on the opposite page, shows the results.

0 1 . 5

Which type of milk stays fresh the longest at 10 °C? [1 mark]

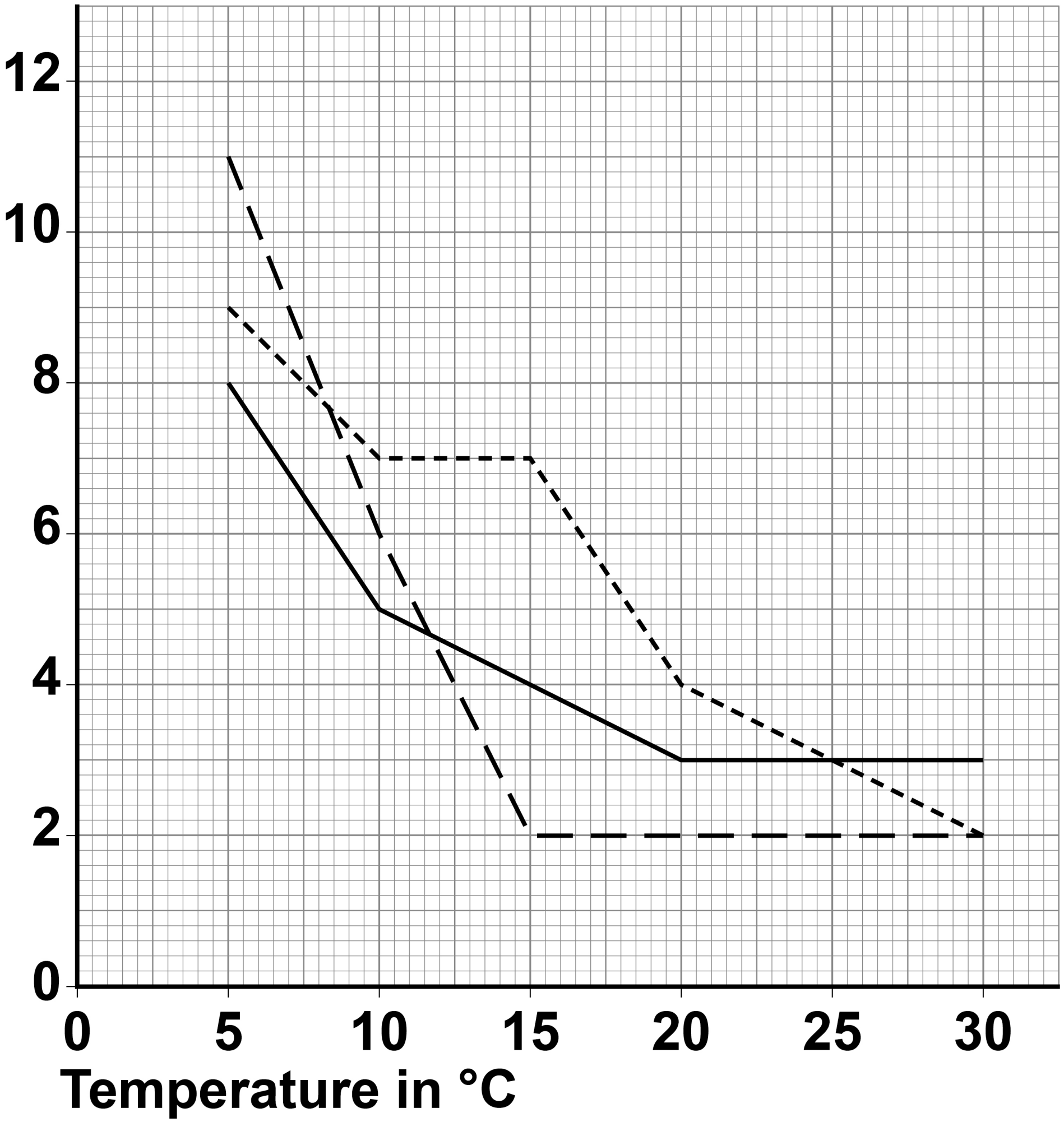
KEY

——— Cows' milk

– – – Goats' milk

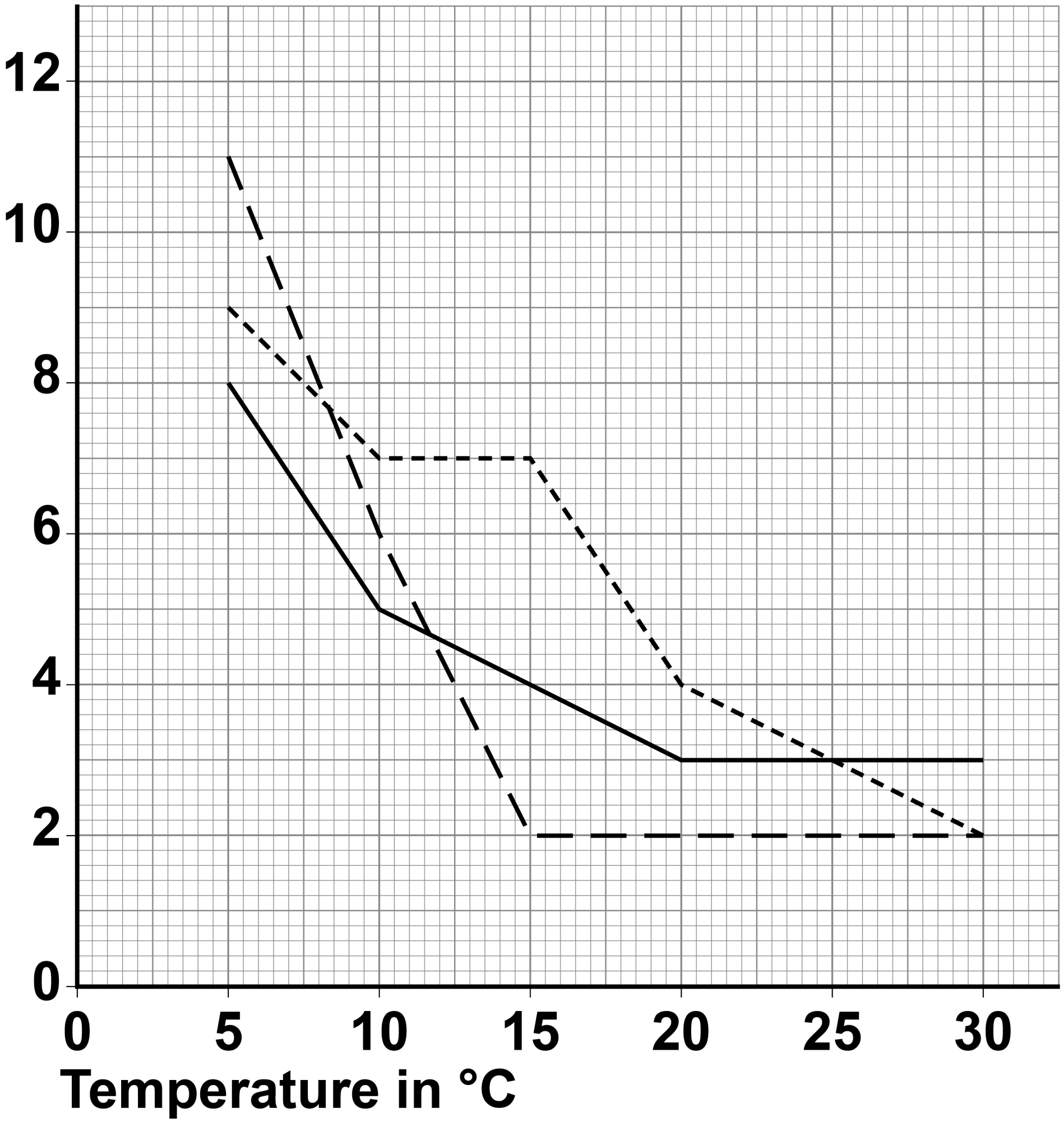
------- Almond milk

FIGURE 1



[Turn over]

REPEAT OF FIGURE 1



KEY

——— Cows' milk

– – – Goats' milk

------- Almond milk

0 1 . 6 Describe the effect of temperature on the time taken for GOATS' milk to reach pH 5.

Use data from FIGURE 1 in your answer.
[2 marks]

0 1 . 7

The time taken for cows' milk to reach pH 5 at 10 °C is less than the time taken for cows' milk to reach pH 5 at 5 °C.

Suggest ONE reason why. [1 mark]

0 1 . 8

Suggest TWO reasons why the different types of milk took different lengths of time to reach pH 5. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

0 1 . 9

The student said:

‘The temperature milk is stored at affects how likely the milk is to cause food poisoning.’

How can the investigation be developed to find out if the student is correct?
[1 mark]

Tick (✓) ONE box.

☐ **Determine the types of bacteria present in the milk**

☐ **Record the pH every 12 hours**

☐ **Use more than three different types of milk**

13

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[Turn over]

0 2

FIGURE 2, on the opposite page, shows the human population from 1600 to 2010.

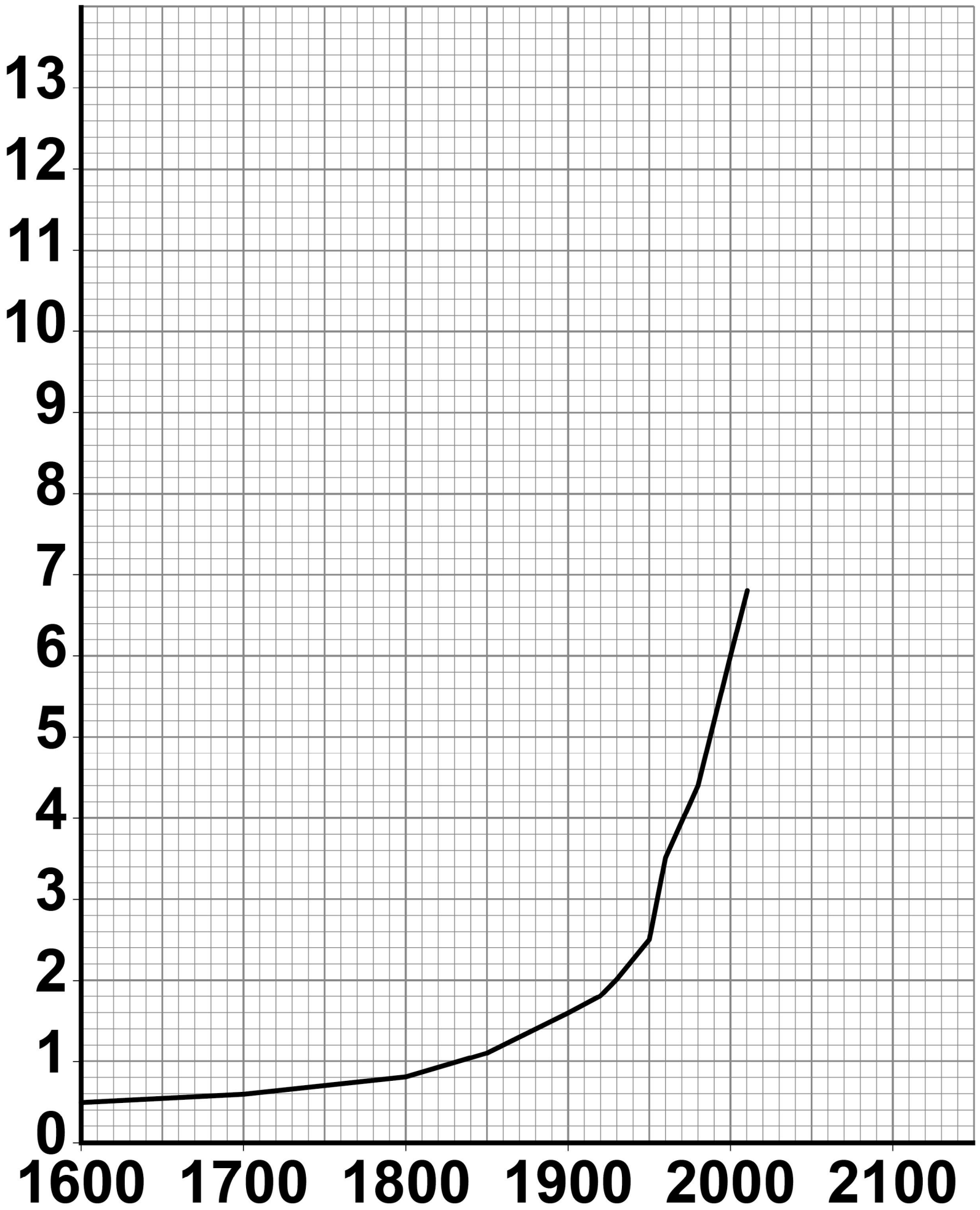
In 1900 the human population was 1.6 billion.

0 2 . 1

Calculate how many times greater the human population was in the year 2000 compared with the year 1900. [2 marks]

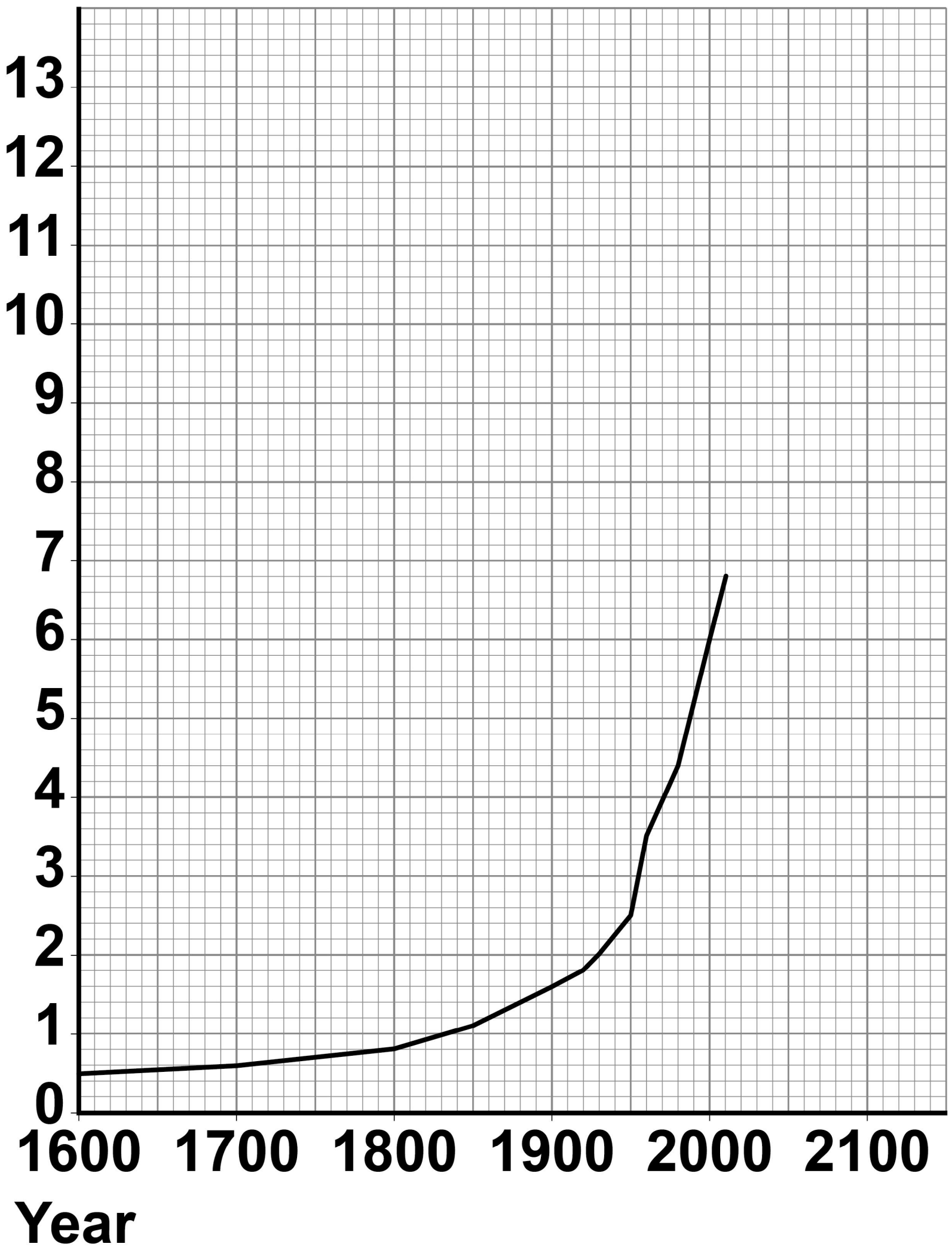
Number of times greater = _____

FIGURE 2



[Turn over]

REPEAT OF FIGURE 2



0 2 . 2

In 1950 the human population was 2.5 billion.

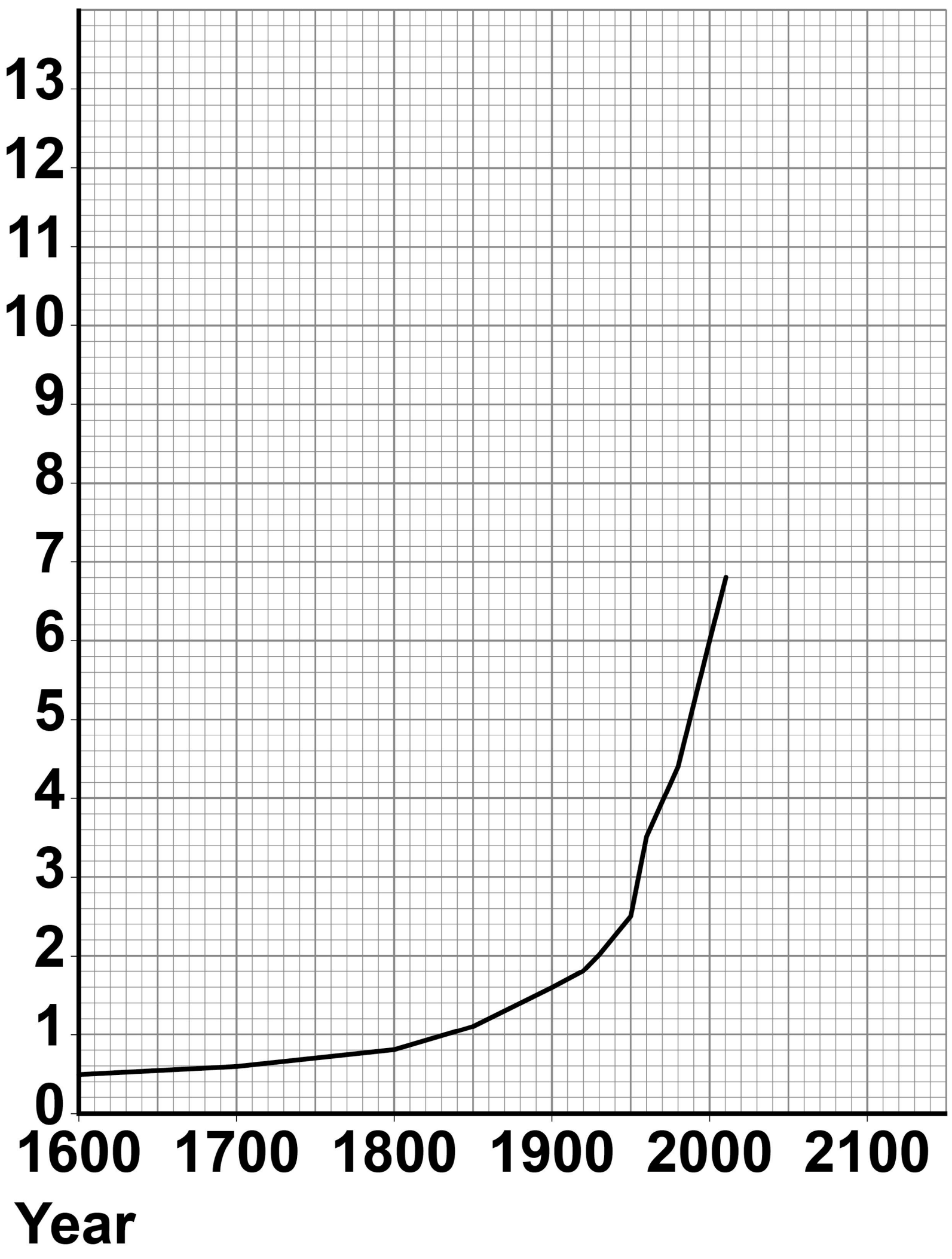
Calculate the mean annual increase in the human population between 1900 and 1950. [2 marks]

Mean annual increase =

_____ billion per year

[Turn over]

REPEAT OF FIGURE 2



0 2 . 3

Predict the human population in 2050 if the current rate of population increase continues.

You should draw an extrapolation line on FIGURE 2. [2 marks]

Predicted human population =

0 2 . 4

The increasing human population has caused a decline in fish stocks.

Describe how fishing quotas can help to return fish stocks to a sustainable level.

[2 marks]

0 2 . 5

Farming techniques have changed in recent years.

Describe:

- **why more land is being used for farming**
- **how increased farming has decreased biodiversity.**

[6 marks]

0 2 . 6

Genetic modification of crop plants can help meet the demands of the increasing human population.

Golden rice is a genetically modified (GM) crop.

What is the advantage of golden rice compared with non-GM rice? [1 mark]

Tick (✓) ONE box.

- ☐ **Golden rice contains protein-rich mycoprotein**
- ☐ **Golden rice has improved nutritional value**
- ☐ **Golden rice produces human insulin**

[Turn over]

0 2 . 7

Suggest ONE reason why some people are concerned about the use of golden rice. [1 mark]

16

0 3

This question is about plant hormones.

0 3 . 1

Farmers can spray seeds with gibberellins to start germination.

What are TWO other uses of gibberellins? [2 marks]

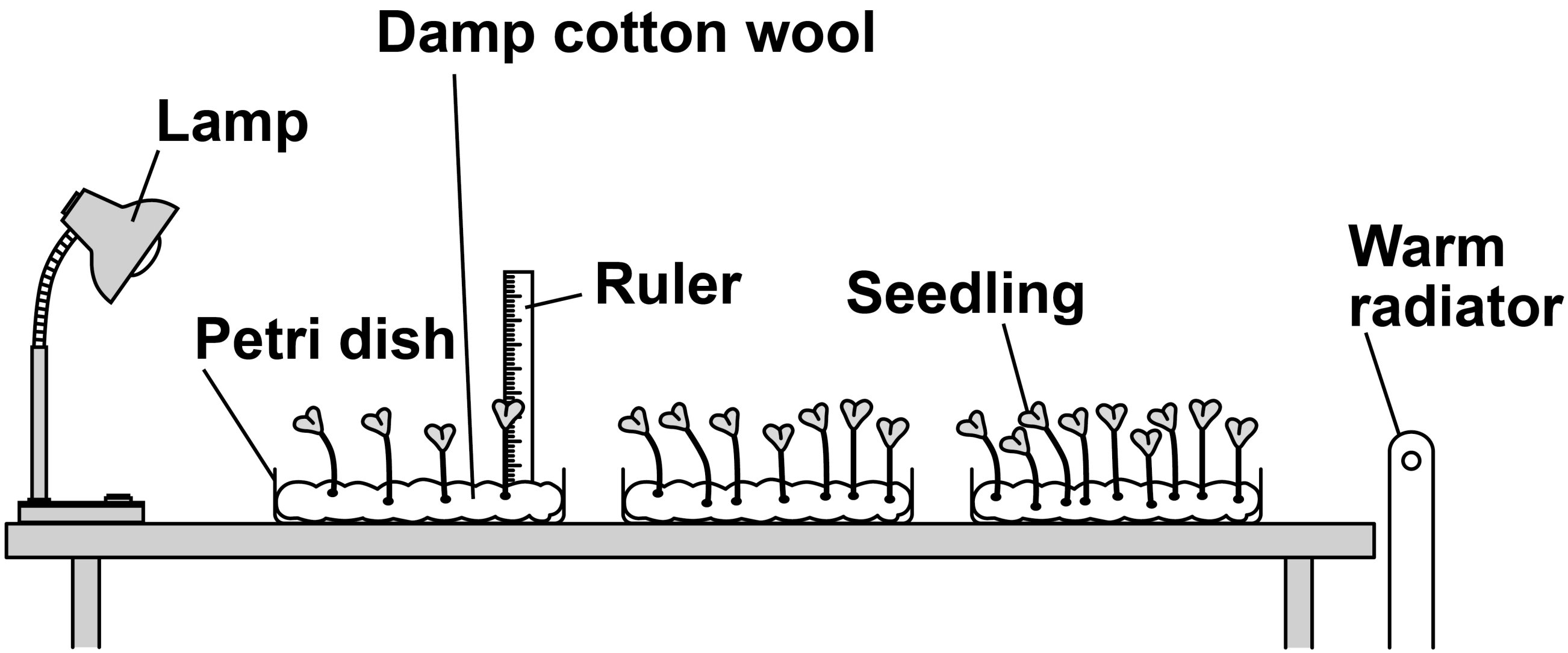
Tick (✓) TWO boxes.

- ☐ **To help in tissue culture**
- ☐ **To help roots form**
- ☐ **To increase fruit size**
- ☐ **To kill weeds**
- ☐ **To promote flower production**

[Turn over]

Students investigated the effect of light intensity on the height of seedlings.

FIGURE 3 shows the equipment.
FIGURE 3



0 3 . 2

Describe TWO improvements the students should make to their investigation. [2 marks]

1 _____

_____

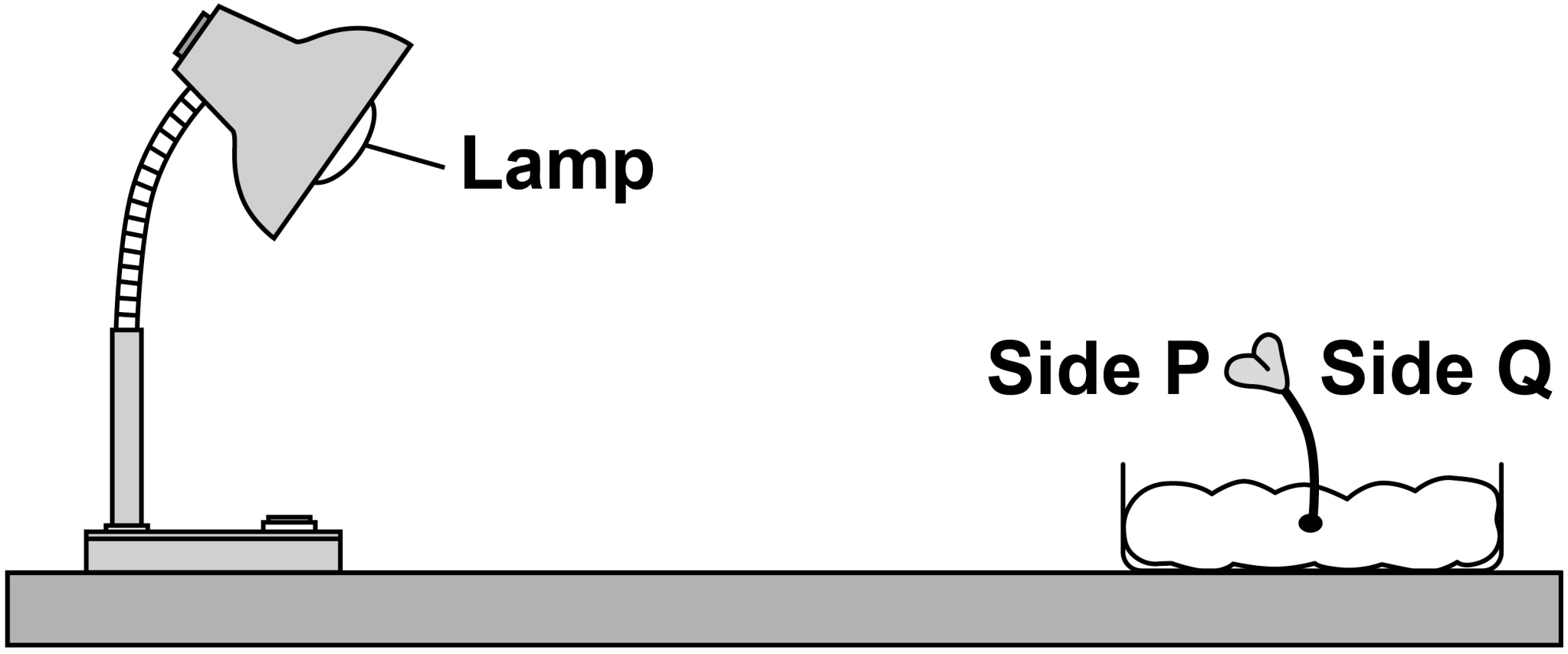
2 _____

_____

[Turn over]

FIGURE 4 shows a seedling growing towards a lamp.

FIGURE 4



0 3 . 3

Suggest how the students measured the length of the curved seedling in FIGURE 4. [1 mark]

_____

_____

[Turn over]

0 3 . 4

Explain what happened to the growth of the seedling on side Q compared with the growth on side P. [3 marks]

0 3 . 5

Bananas are often stored separately from other fruits because bananas release a plant hormone.

Why does storing bananas with other fruits cause the other fruits to ripen faster? [1 mark]

_____

_____

_____

9

0 4

DNA is a polymer of nucleotides.

0 4 . 1

Why is DNA described as a polymer?

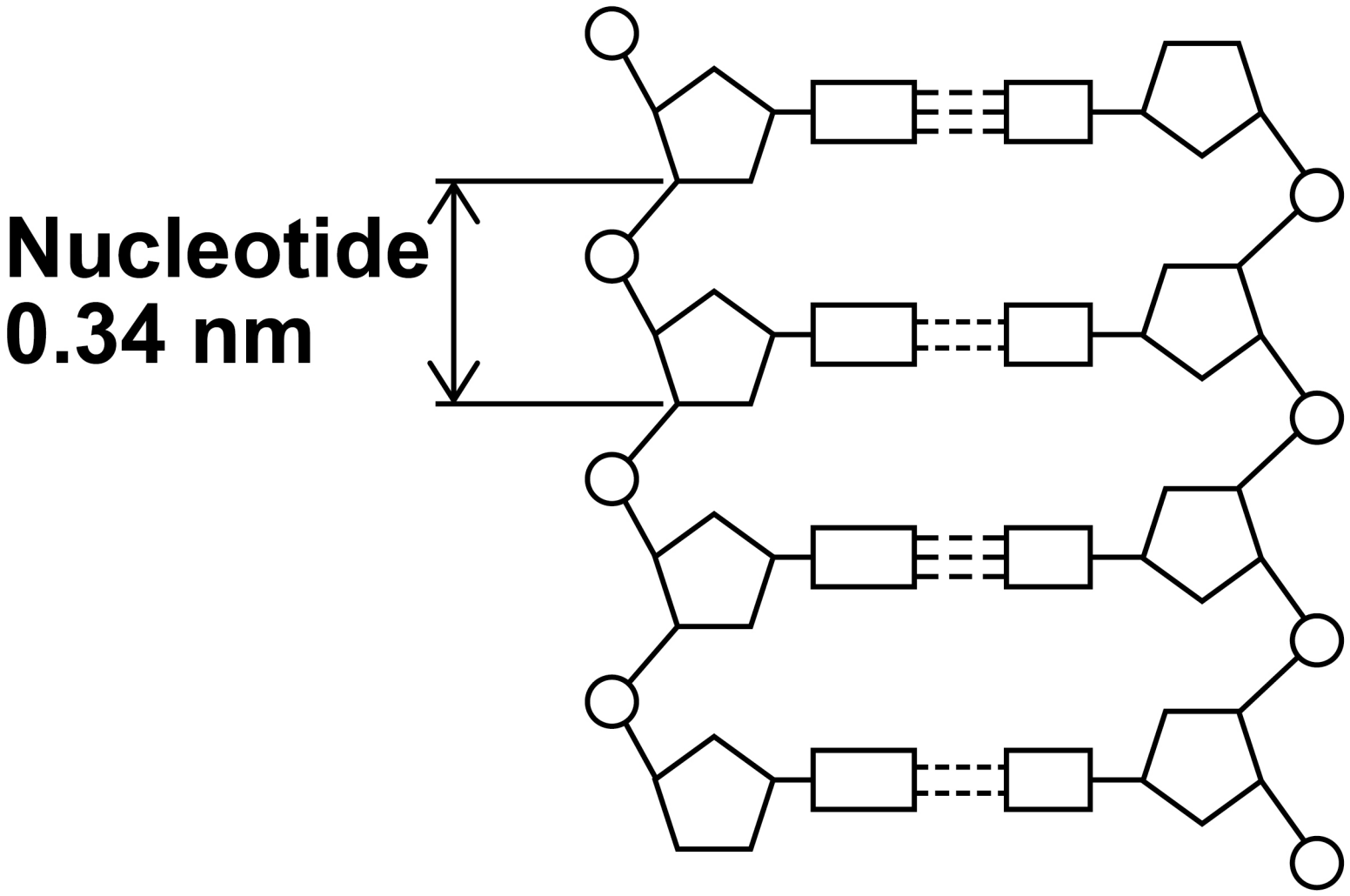
[1 mark]

BLANK PAGE

[Turn over]

FIGURE 5 shows part of a DNA molecule.

FIGURE 5

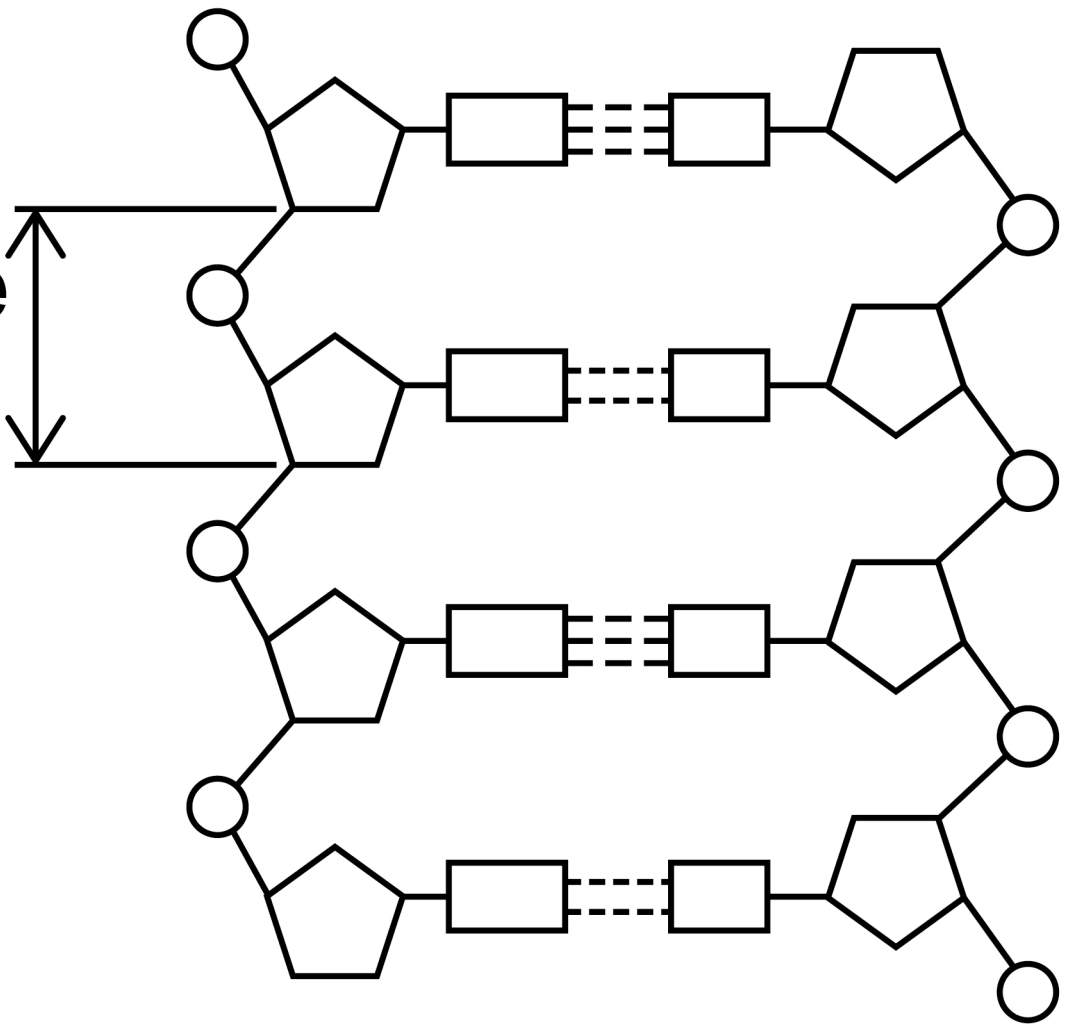


0 4 . 2

Describe the structure of a nucleotide.
[4 marks]

[Turn over]

REPEAT OF FIGURE 5



0 4 . 3

The length of a DNA double helix increases by 0.34 nm for every pair of nucleotides.

The total number of nucleotides in a human body cell is 1.2×10^{10}.

Calculate the total length of double helix in a human body cell.

Give your answer in metres. Use information from FIGURE 5. [5 marks]

Total length = _____ m

[Turn over]

0 4 . 4

Some parts of DNA do NOT code for proteins.

Describe how non-coding parts of DNA can affect the expression of genes.

[1 mark]

11

BLANK PAGE

[Turn over]

0 5

There are two types of cell division: mitosis and meiosis.

0 5 . 1

Describe THREE differences between the processes of mitosis and meiosis. [3 marks]

1

2

3 _____

_____

_____

_____

0 5 . 2

Describe ONE similarity between the processes of mitosis and meiosis.
[1 mark]

_____

_____

_____

[Turn over]

Dupuytren's is a disorder that affects the hands.

FIGURE 6 shows the inheritance of Dupuytren's in one family.

Dupuytren's is caused by a dominant allele in this family.

D = dominant allele

d = recessive allele

0 5 . 3

Give the genotype of person 1.

Explain your answer. [2 marks]

Genotype _____

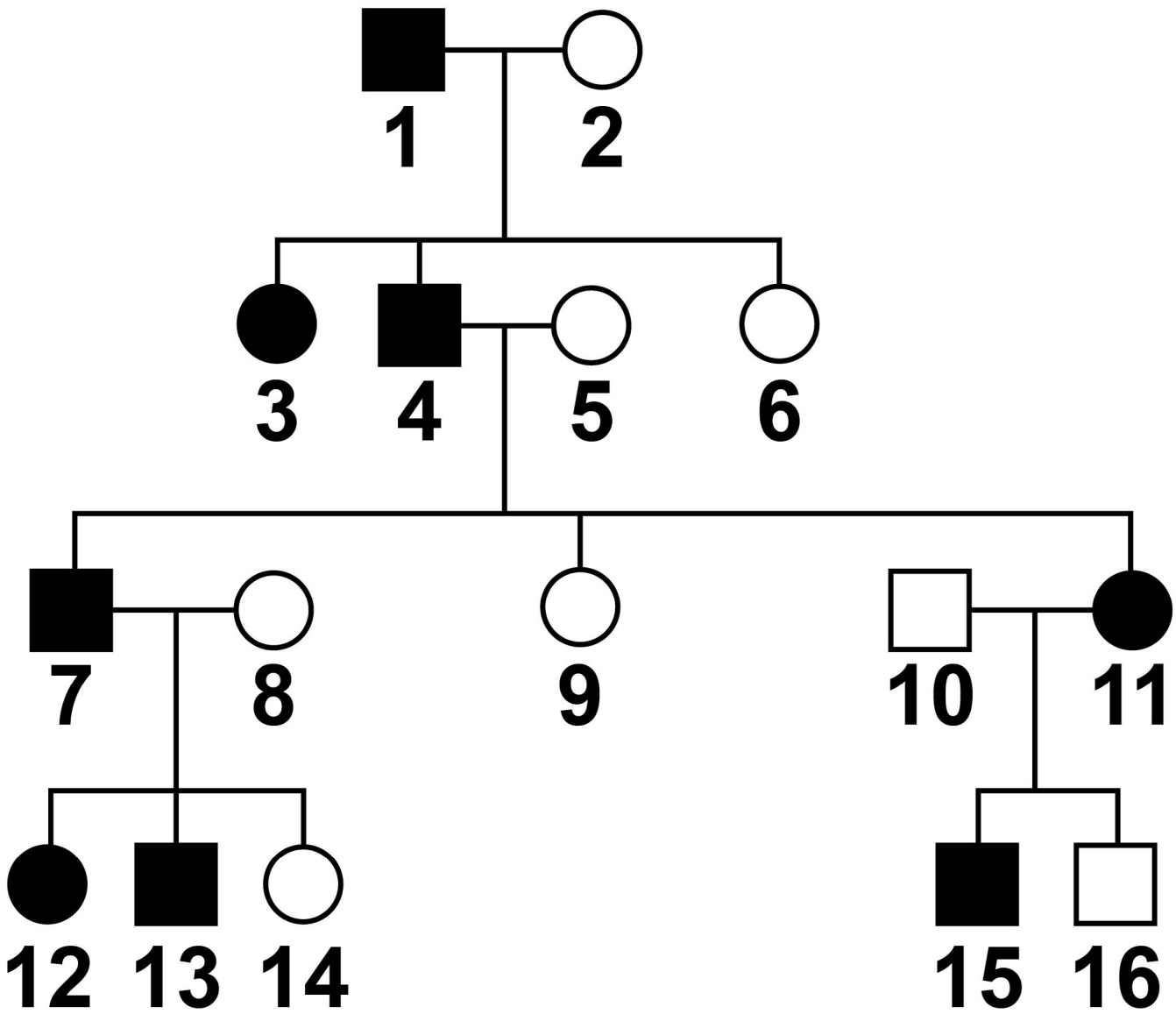
_____

_____

_____

_____

FIGURE 6



KEY

■ **Male with Dupuytren's**

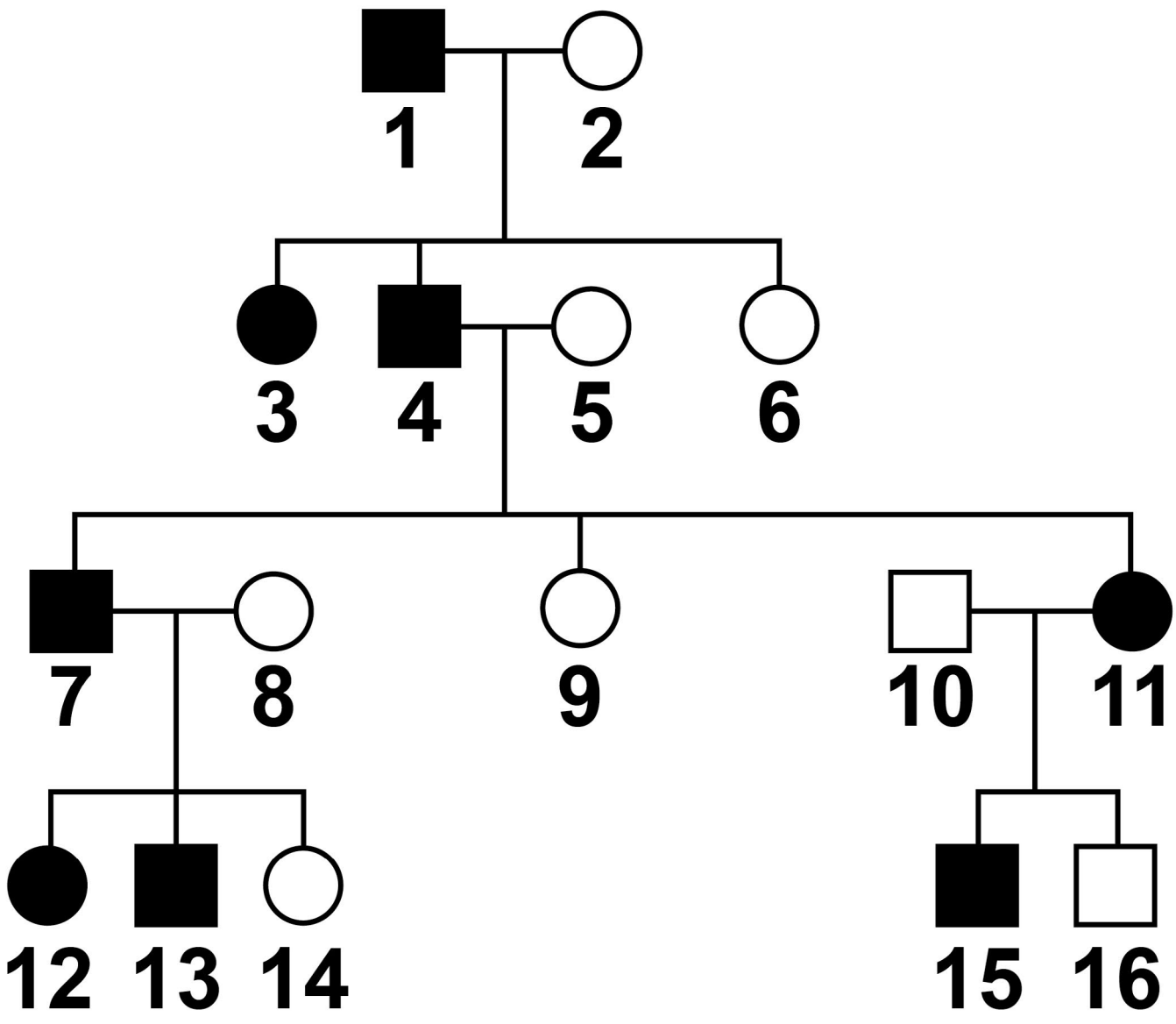
● **Female with Dupuytren's**

□ **Male without Dupuytren's**

○ **Female without Dupuytren's**

[Turn over]

REPEAT OF FIGURE 6



KEY

■ **Male with Dupuytren's**

● **Female with Dupuytren's**

□ **Male without Dupuytren's**

○ **Female without Dupuytren's**

0	5	.	4

Person 7 and person 8 in FIGURE 6 are expecting a fourth child.

What is the probability of the child having Dupuytren's?

You should:

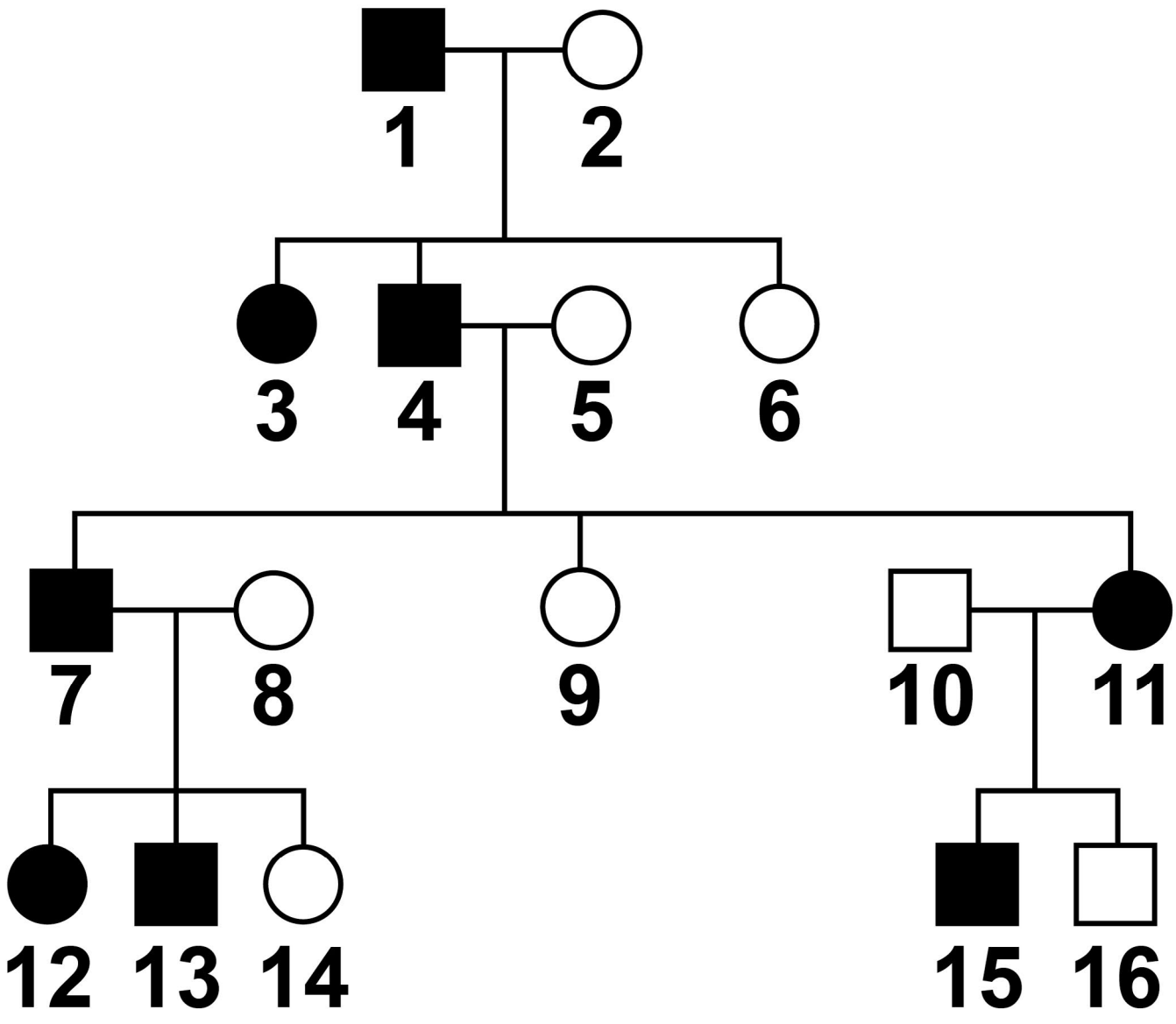
- **draw a Punnett square diagram**
- **identify which offspring have Dupuytren's.**

[5 marks]

Probability = _____

[Turn over]

REPEAT OF FIGURE 6



KEY

■ **Male with Dupuytren's**

● **Female with Dupuytren's**

□ **Male without Dupuytren's**

○ **Female without Dupuytren's**

0 5 . 5

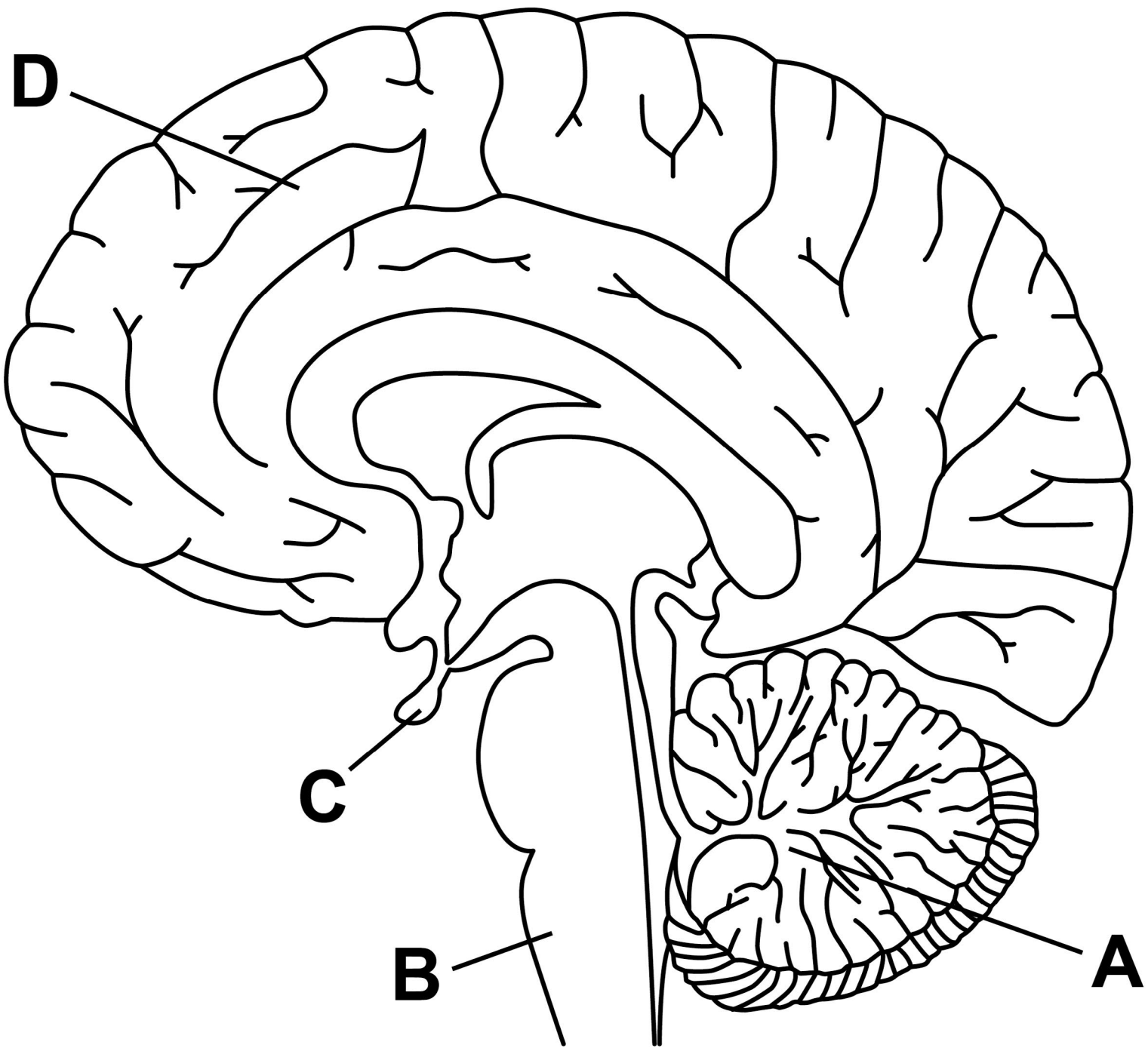
Explain how FIGURE 6 shows the allele for Dupuytren's is NOT on the Y chromosome. [2 marks]

13

0 6

FIGURE 7 shows the brain.

FIGURE 7



0 6 . 1

Which part of the brain becomes more active if a person balances on one leg instead of standing on two legs?
[1 mark]

Tick (✓) ONE box.

☐ **A**

☐ **B**

☐ **C**

☐ **D**

[Turn over]

0 6 . 2

Name the part of the brain that is responsible for making a decision. [1 mark]

0 6 . 3

In most MRI scanners the person being scanned needs to stay completely still.

A functional MRI (fMRI) scanner allows a person to move while the scanner makes images of the person's brain activity.

Suggest how the fMRI scanner could help to find out more about the brain damage a person has. [3 marks]

[Turn over]

0 6 . 4

Describe how the brain receives information about light entering the eye.

You should include the names of structures in your answer. [3 marks]

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[Turn over]

0 6 . 5

The eyes of some birds contain cells that detect ultraviolet (UV) light.

UV light is reflected by some fruits and the urine of small mammals.

Explain how birds that detect UV light have evolved from birds that could not detect UV light. [6 marks]

[Turn over]

0	7

A new dog food has been developed that does NOT contain meat from cows, sheep or chickens.

The new dog food contains insects.

The insects in the dog food factory are fed on waste vegetables.

0 7 . 1

Sketch the pyramid of biomass for the food chain that produces food for dogs from insects.

Label the pyramid. [2 marks]

0 7 . 2

Describe TWO reasons why the biomass of the insects eaten by dogs does NOT all become biomass of the dogs.
[2 marks]

1 _____

_____

2 _____

_____

_____

0 7 . 3

Explain how making dog food from insects could improve HUMAN food security in the future. [4 marks]

_____

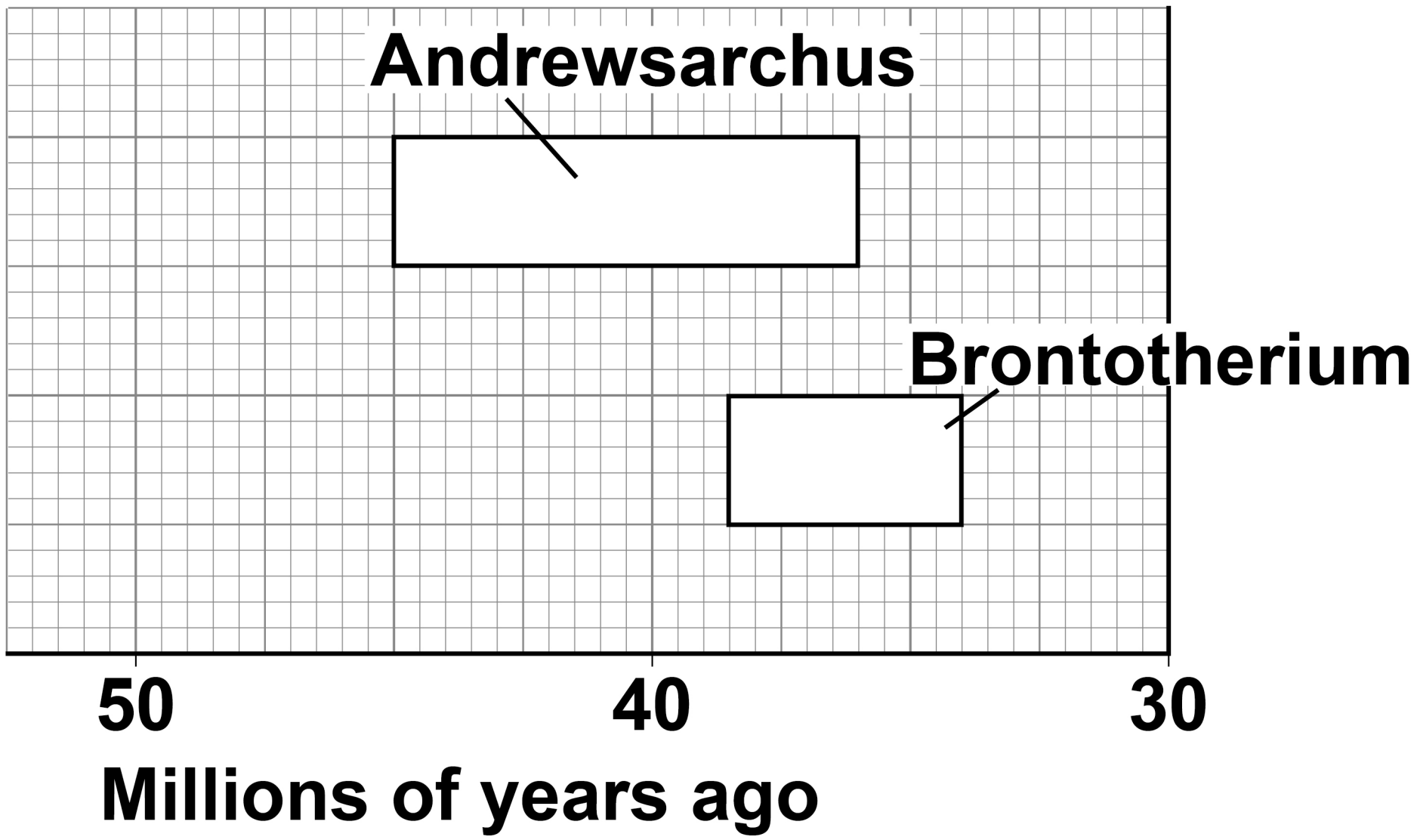
_____

_____

0 8

FIGURE 8 shows when two mammals existed in Asia.

FIGURE 8



0 8 . 1

Determine the number of years both Andrewsarchus and Brontotherium existed together. [2 marks]

Time = _____ years

0 8 . 2

The oldest fossils of human ancestors found in this area are 700 000 years old.

Andrewsarchus was a carnivore and Brontotherium was a herbivore.

Suggest how the extinction of Andrewsarchus could have resulted in the extinction of Brontotherium.
[3 marks]

[Turn over]

0 8 . 3

Information about extinct animals is often NOT clear because the fossil record is incomplete.

Give THREE reasons why the fossil record is NOT clear for older species.
[3 marks]

1 _____

_____

_____

2 _____

_____

3 _____

_____

_____

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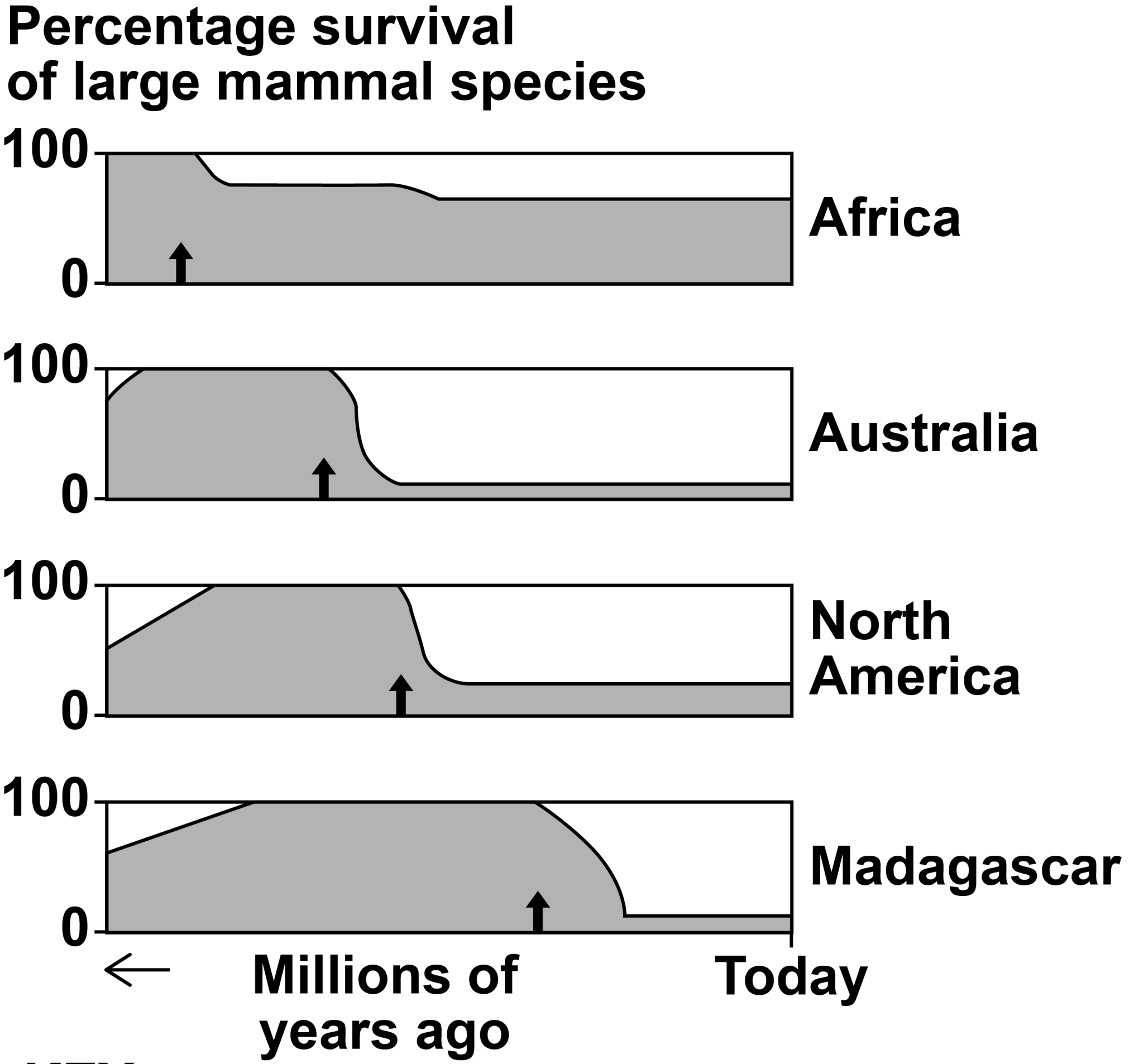
[Turn over]

FIGURE 9, on the opposite page, shows the percentage (%) survival of large mammal species in four areas of the world.

The time at which humans first appeared in each of the four areas is also shown.

FIGURE 9



[Turn over]

A mass extinction is a rapid decrease in biodiversity on Earth.

0 8 . 4

A student stated:

‘The data in FIGURE 9 shows that humans caused mass extinctions.’

Evaluate the student’s statement.
[6 marks]

[Turn over]

0 8 . 5

Give ONE disadvantage and ONE advantage of mass extinction events.

Answer in terms of evolution. [2 marks]

Disadvantage _____

_____

_____

Advantage _____

_____

_____

END OF QUESTIONS

16

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.

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

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For Examiner's Use	
Question	Mark
1	
2	
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TOTAL	