



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]



J U N 2 0 8 4 6 1 2 H 0 1

**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]

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**0 1 . 4** Give TWO control variables the student should have used in this investigation. [2 marks]

1 

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2 

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[Turn over]



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]

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**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]

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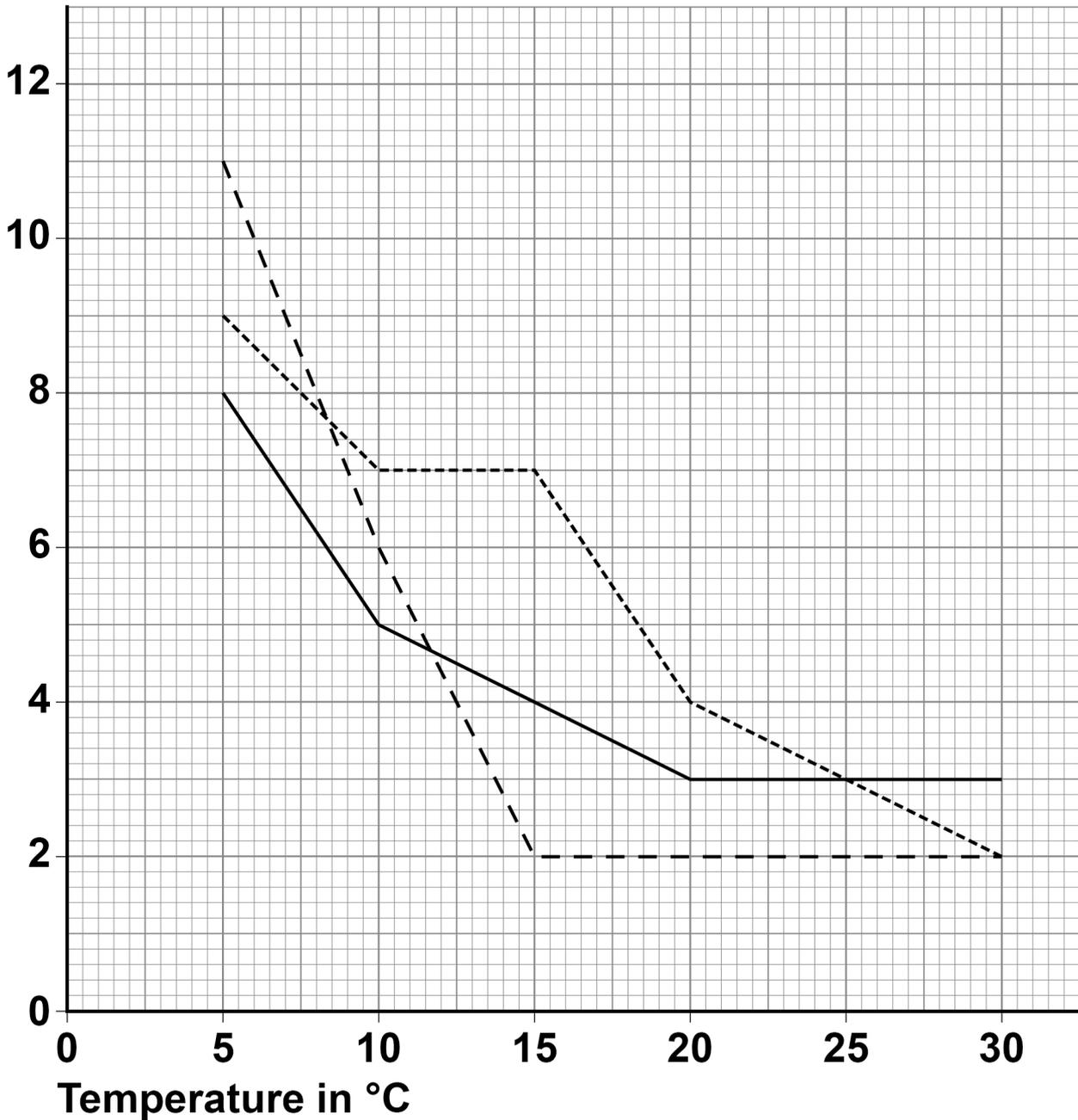
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**FIGURE 1**

**Time taken  
to reach pH 5  
in days**

**KEY**

- Cows' milk
- - - Goats' milk
- ..... Almond milk



[Turn over]

**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]**

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**0 1 . 8** Suggest TWO reasons why the different types of milk took different lengths of time to reach pH 5. [2 marks]

**1** \_\_\_\_\_

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**2** \_\_\_\_\_

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**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**

**[Turn over]**

<hr/>
<b>13</b>



**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]**

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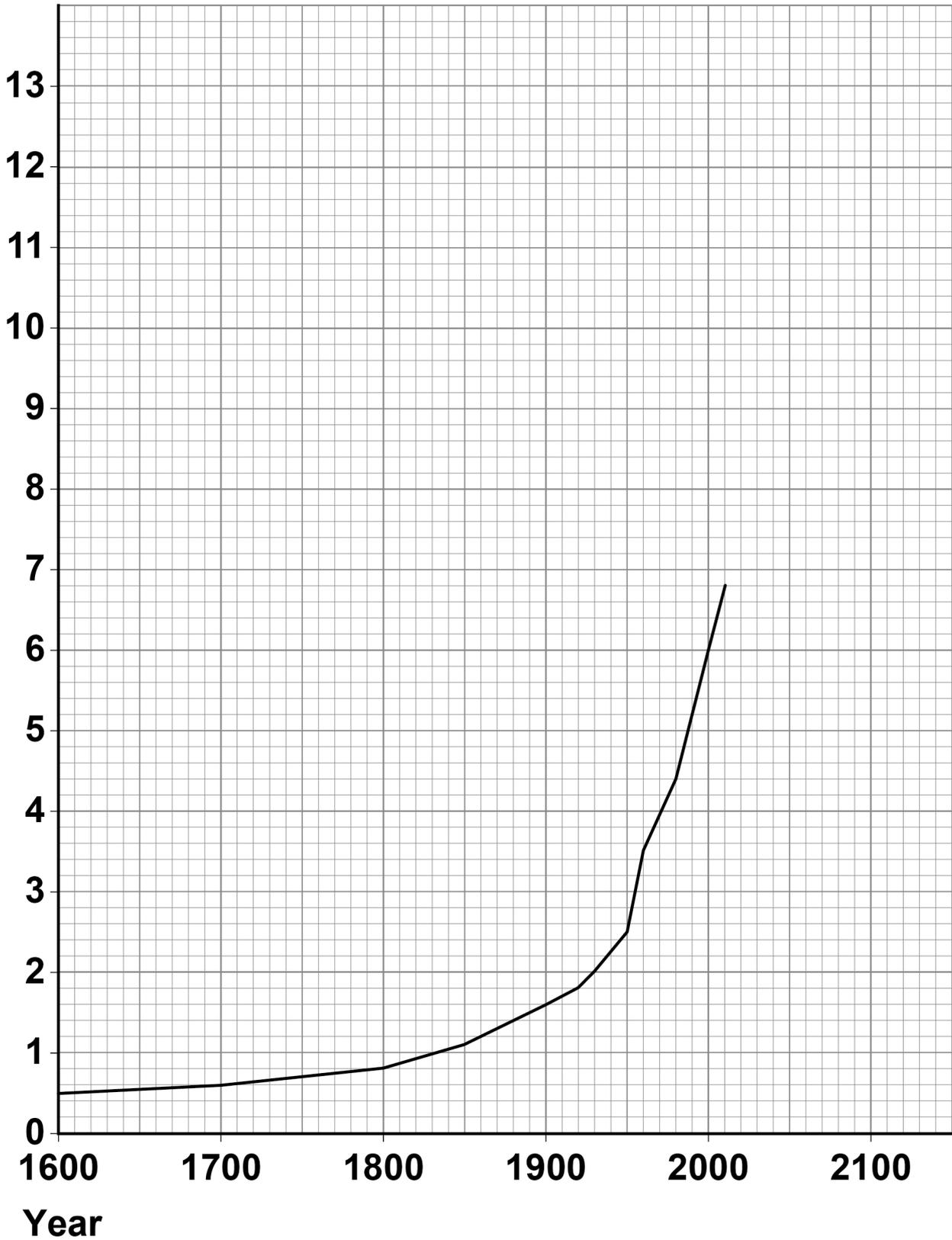
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**Number of times greater = \_\_\_\_\_**



**FIGURE 2**

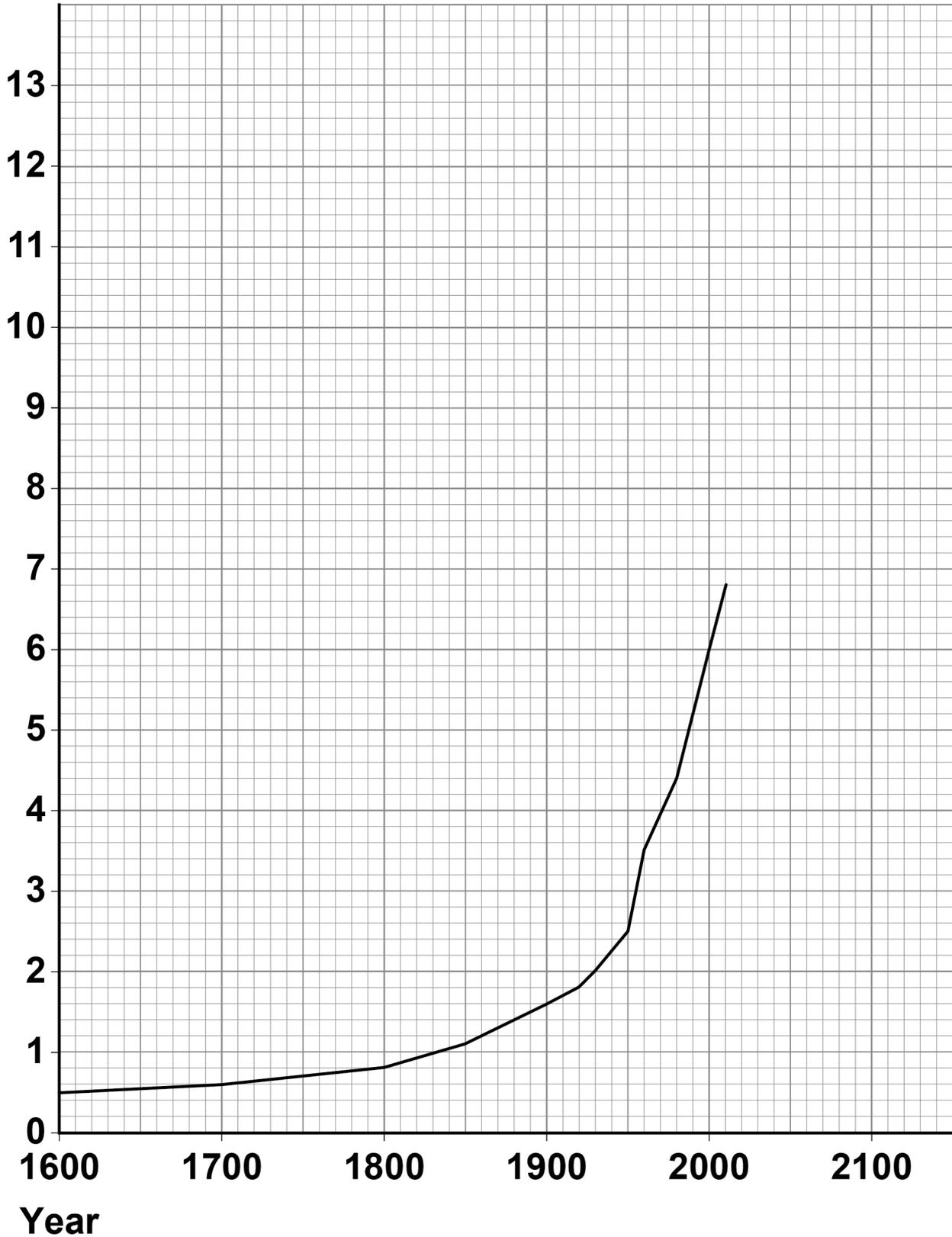
**Human  
population  
in billions**



[Turn over]

REPEAT OF FIGURE 2

Human  
population  
in billions



**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]**

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**Mean annual increase =**

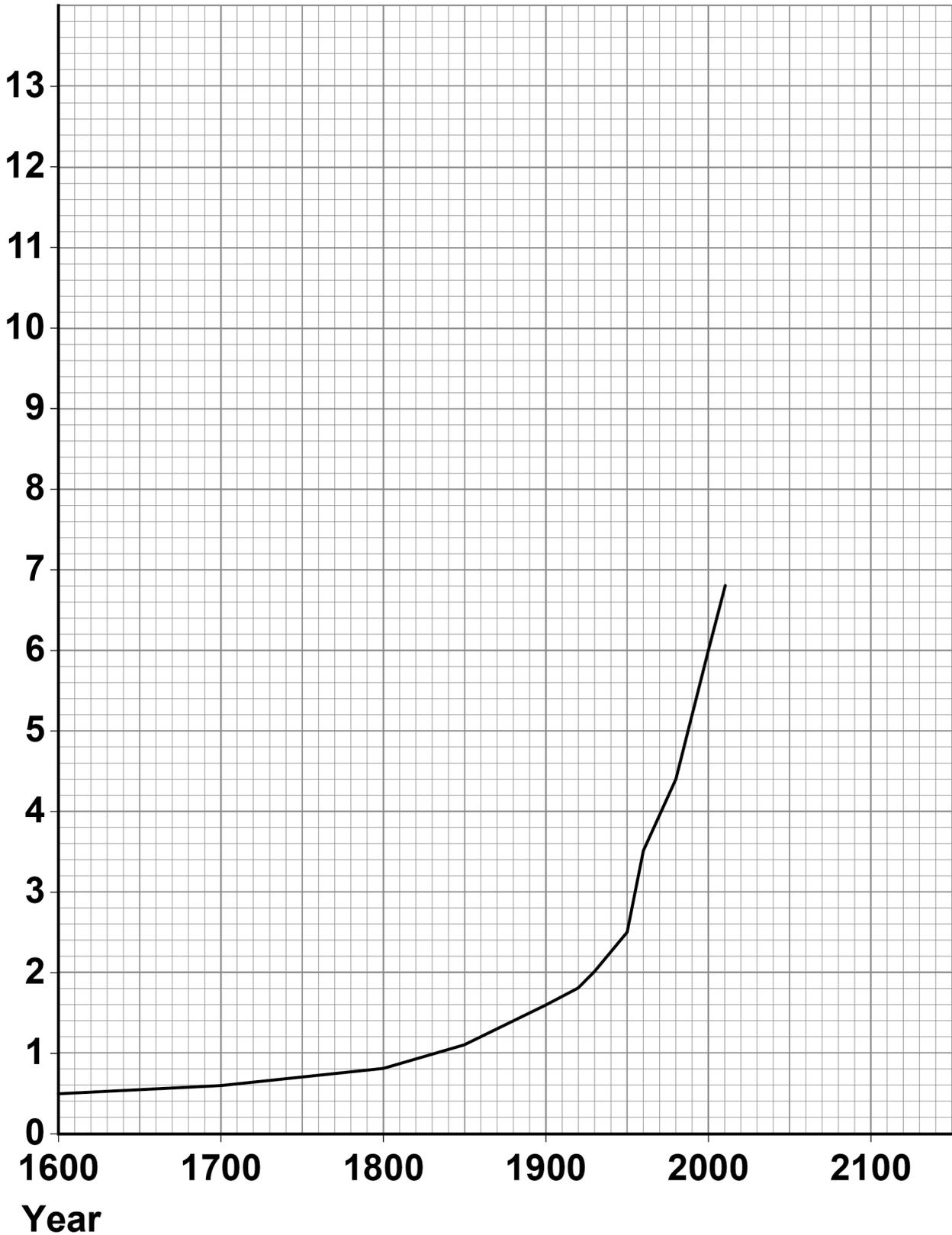
**\_\_\_\_\_ billion per year**

**[Turn over]**



REPEAT OF FIGURE 2

Human  
population  
in billions



**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]

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**Predicted human population =**

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**[Turn over]**

**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]**

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**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**

- 0 2 . 7** Suggest ONE reason why some people are concerned about the use of golden rice. [1 mark]

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**[Turn over]**

16



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**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**

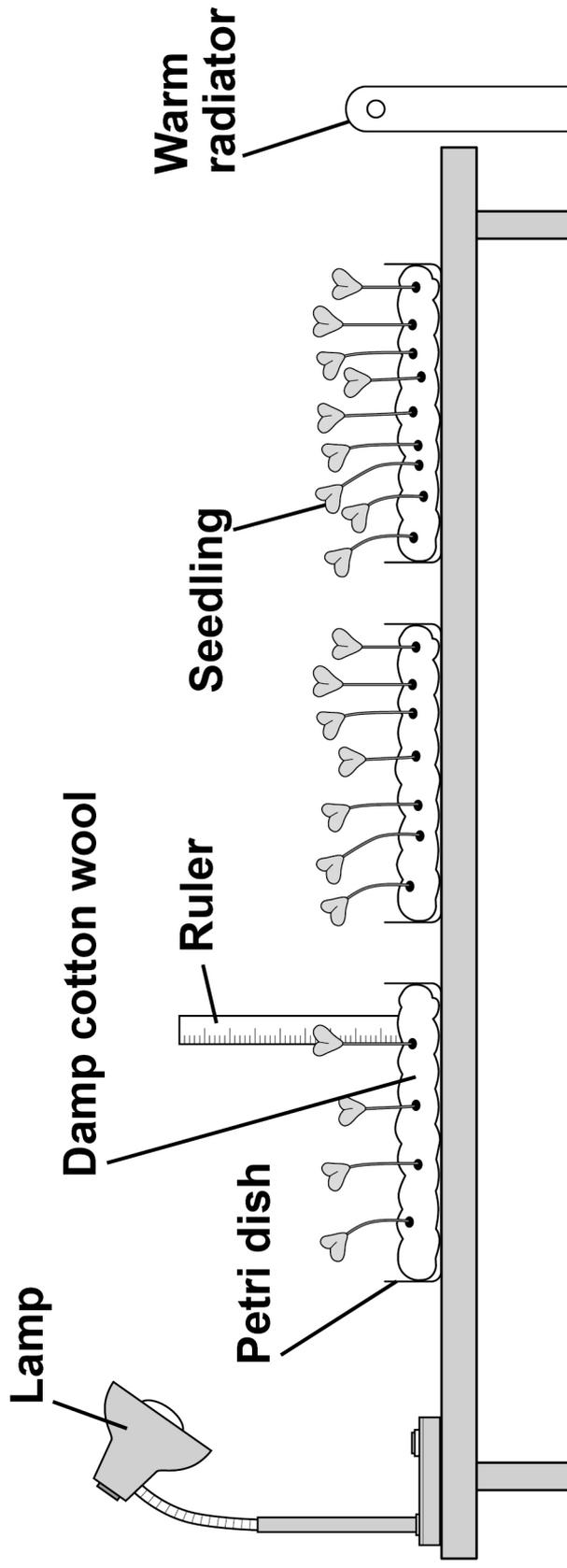
**[Turn over]**



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

FIGURE 3 shows the equipment.

FIGURE 3



**03.2**

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

**1**

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**2**

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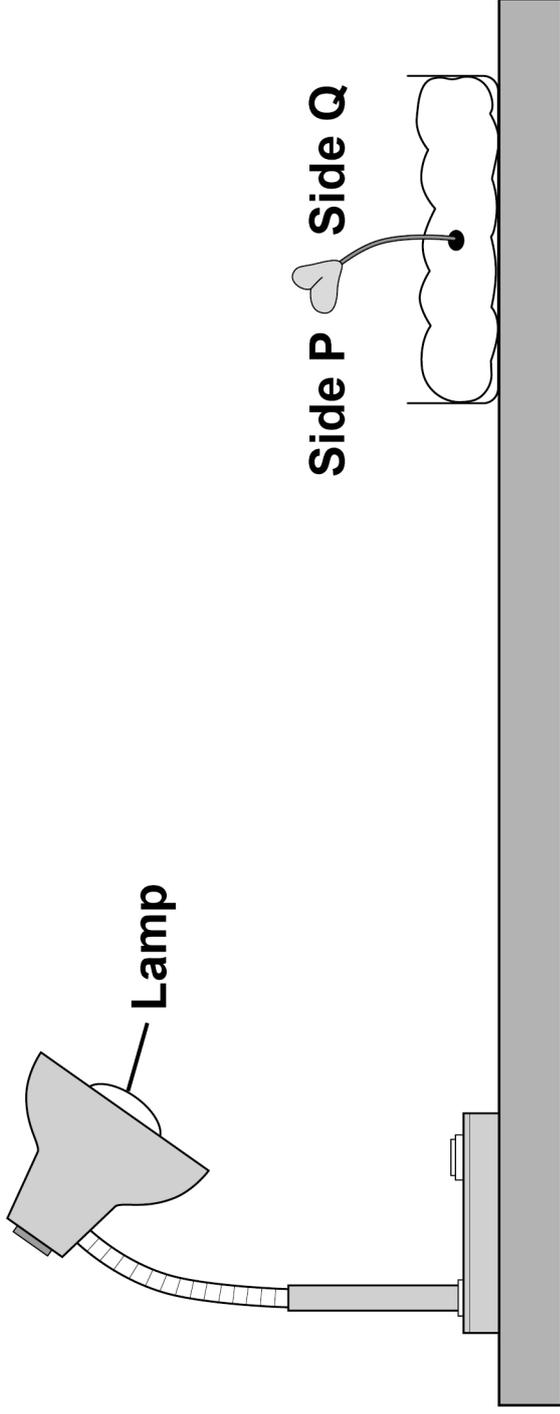
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**[Turn over]**



FIGURE 4 shows a seedling growing towards a lamp.

FIGURE 4



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

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03.4

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

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25

[Turn over]



**03.5** 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]**

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9



0 4

DNA is a polymer of nucleotides.

0 4

. 1

Why is DNA described as a polymer? [1 mark]

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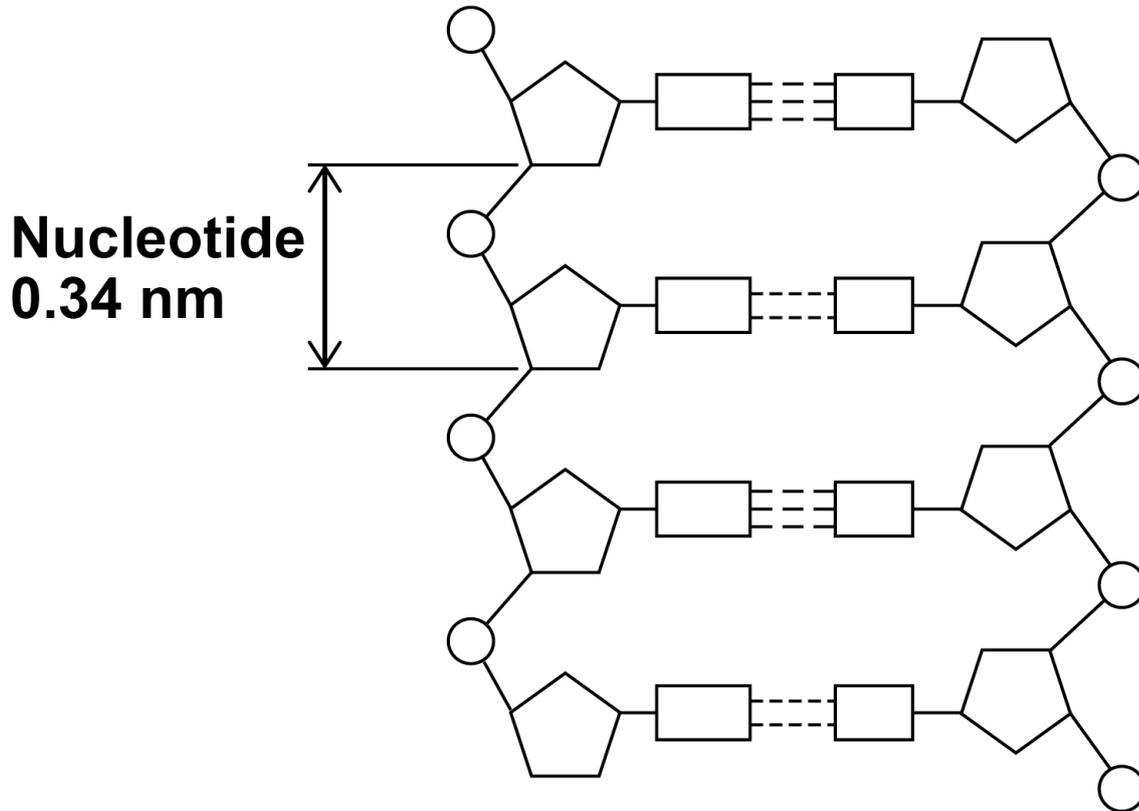
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[Turn over]



FIGURE 5 shows part of a DNA molecule.

FIGURE 5



**0 4 . 2** Describe the structure of a nucleotide.  
**[4 marks]**

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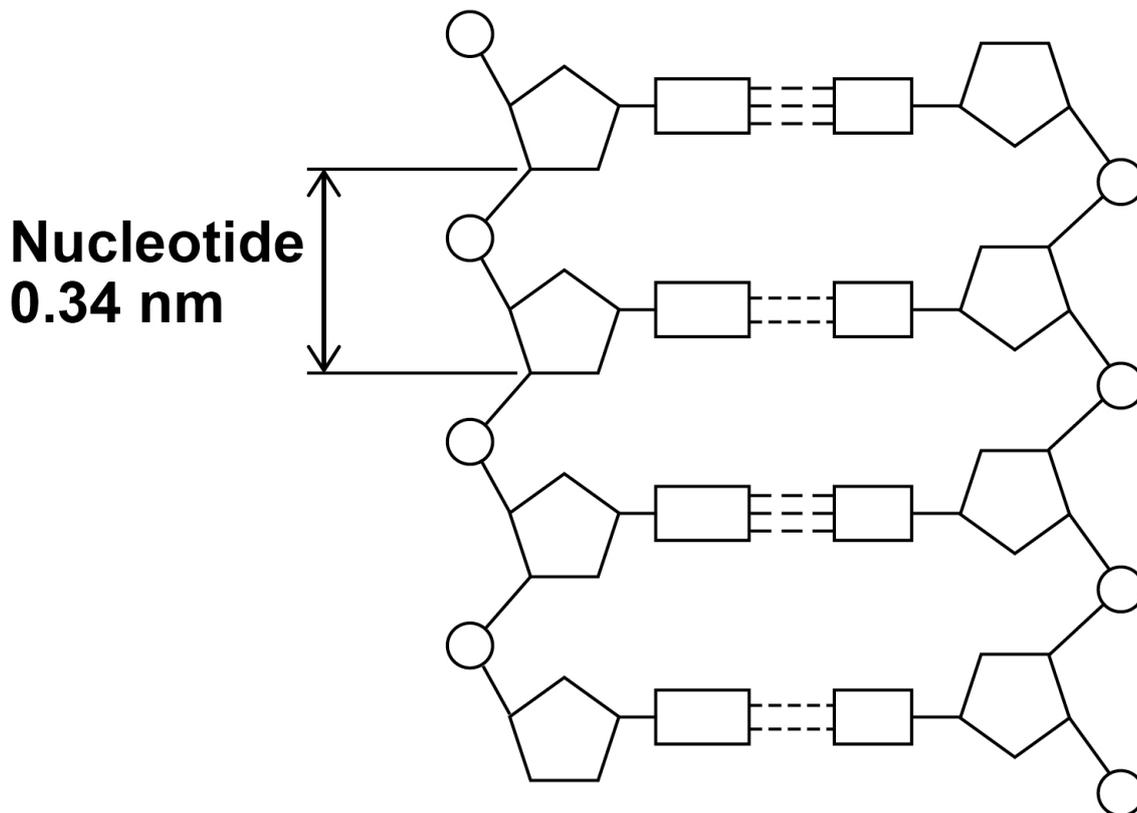
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## REPEAT OF FIGURE 5



**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  $1.2 \times 10^{10}$ .

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

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

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**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]**

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11



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**[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

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2

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3

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**0 5 . 2** Describe ONE similarity between the processes of mitosis and meiosis. [1 mark]

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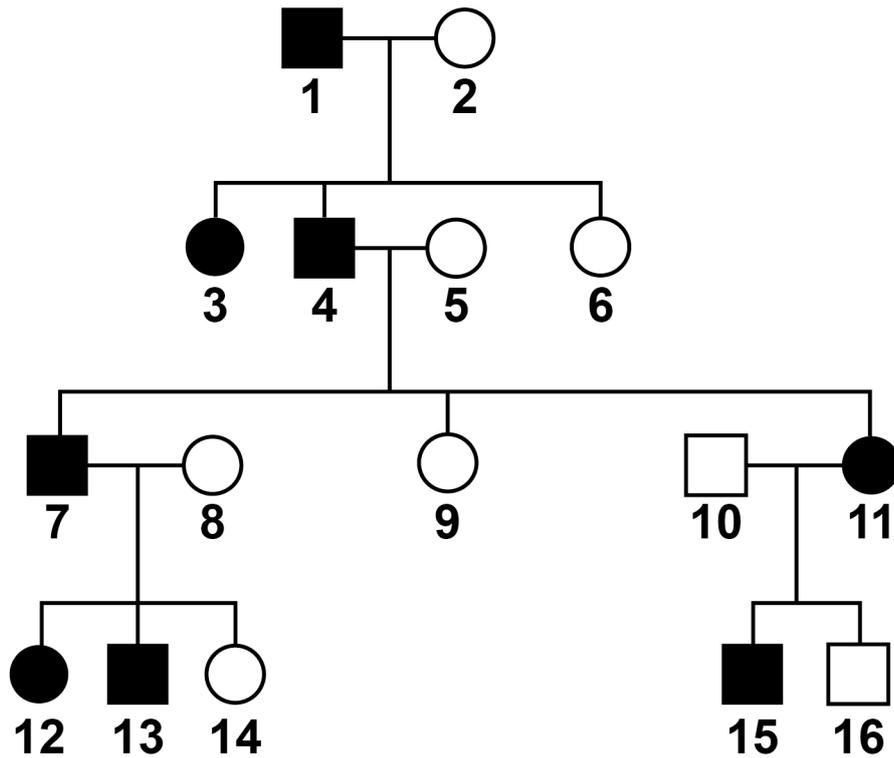
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**[Turn over]**

Dupuytren's is a disorder that affects the hands.

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

FIGURE 6



KEY

- Male with Dupuytren's
- Female with Dupuytren's
- Male without Dupuytren's
- Female without Dupuytren's



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 \_\_\_\_\_

\_\_\_\_\_

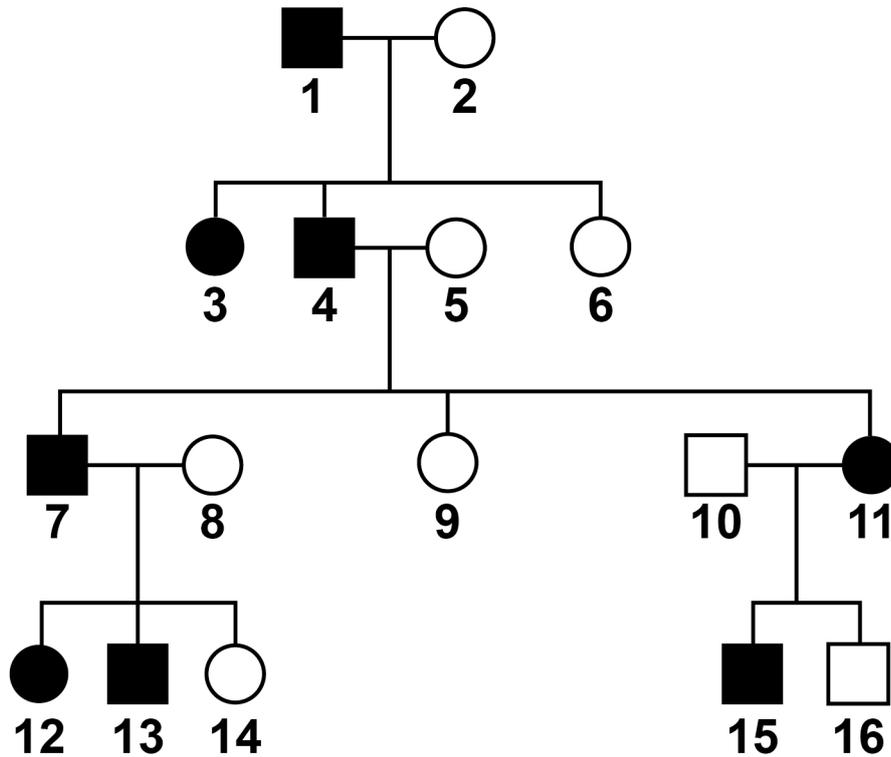
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[Turn over]

## REPEAT OF FIGURE 6



## KEY

- Male with Dupuytren's
- Female with Dupuytren's
- Male without Dupuytren's
- Female without Dupuytren's

.  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**

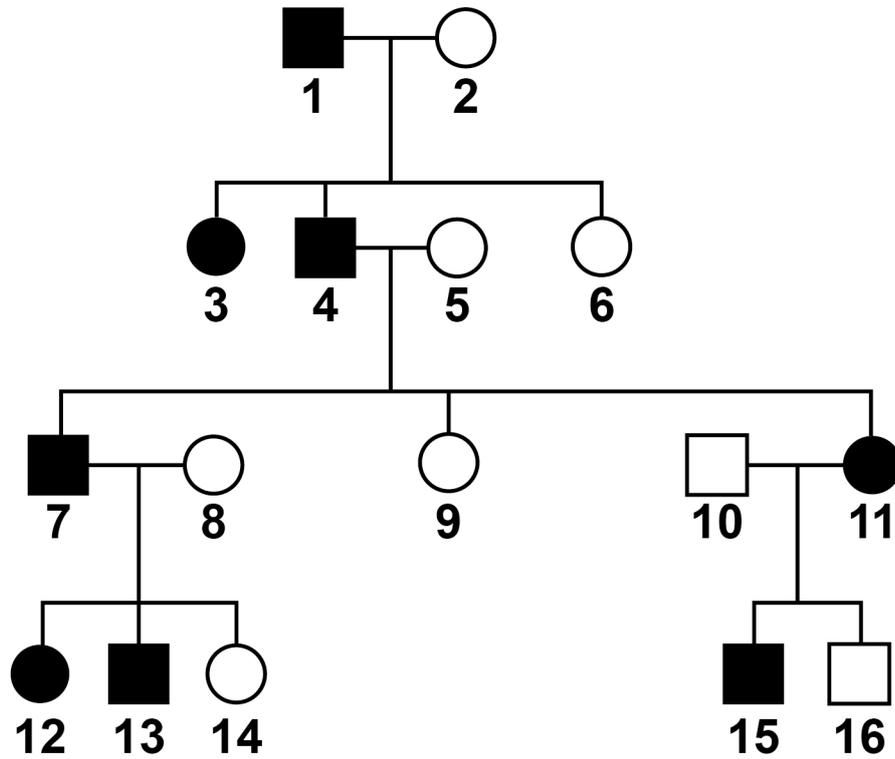
**[5 marks]**

**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]

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[Turn over]

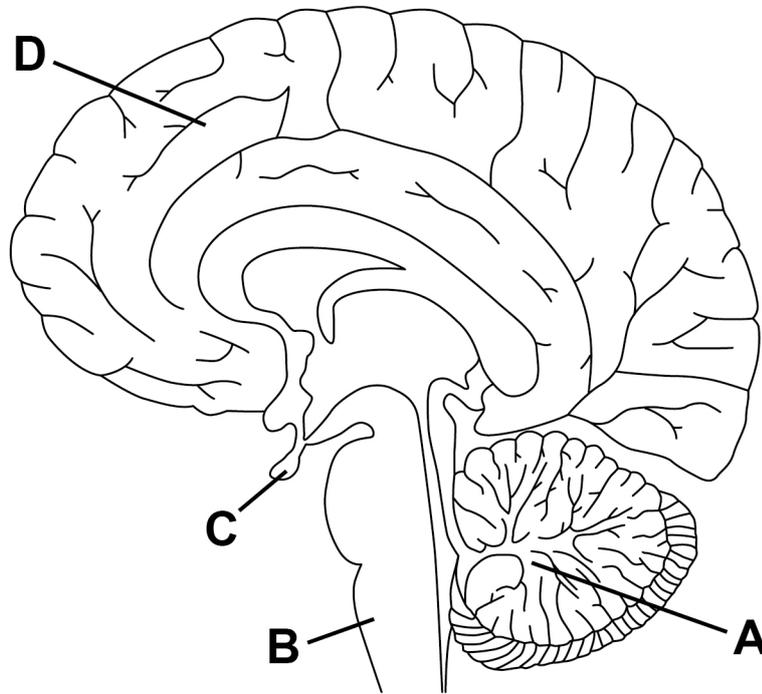
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06

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**

- 0 6 . 2** Name the part of the brain that is responsible for making a decision. [1 mark]

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**[Turn over]**











**07**

**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.**

**07.1**

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

**Label the pyramid. [2 marks]**



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

**1**

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**2**

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**[Turn over]**



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[Turn over]

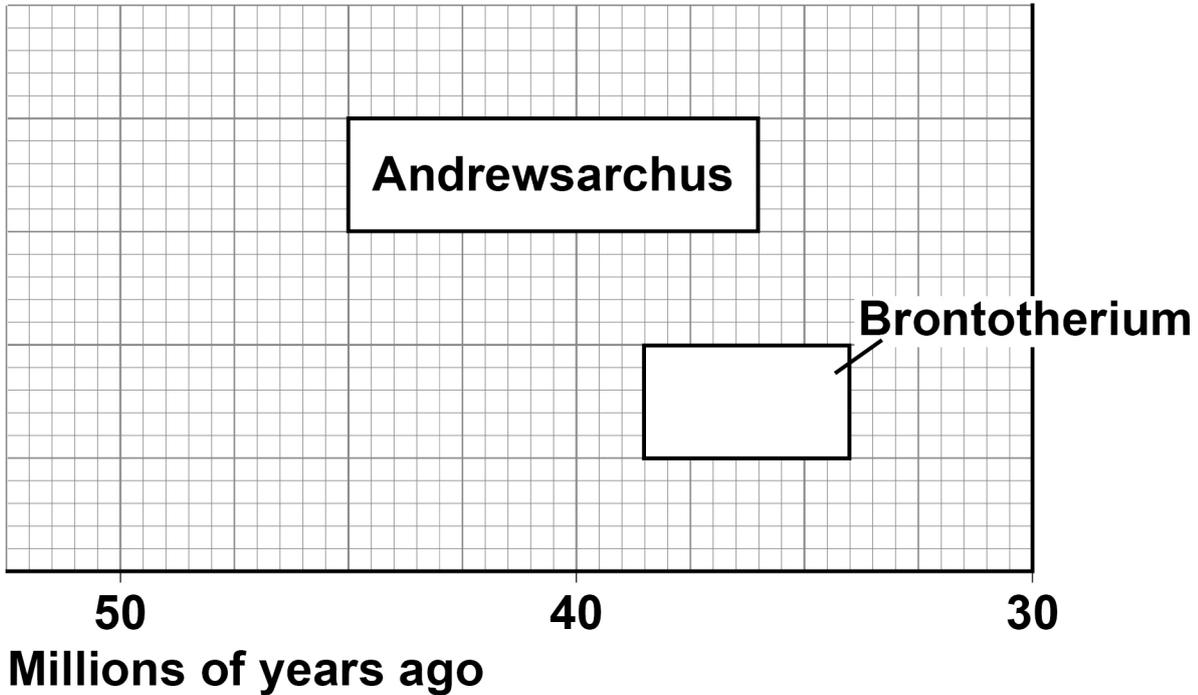
8



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]

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Time = \_\_\_\_\_ years





**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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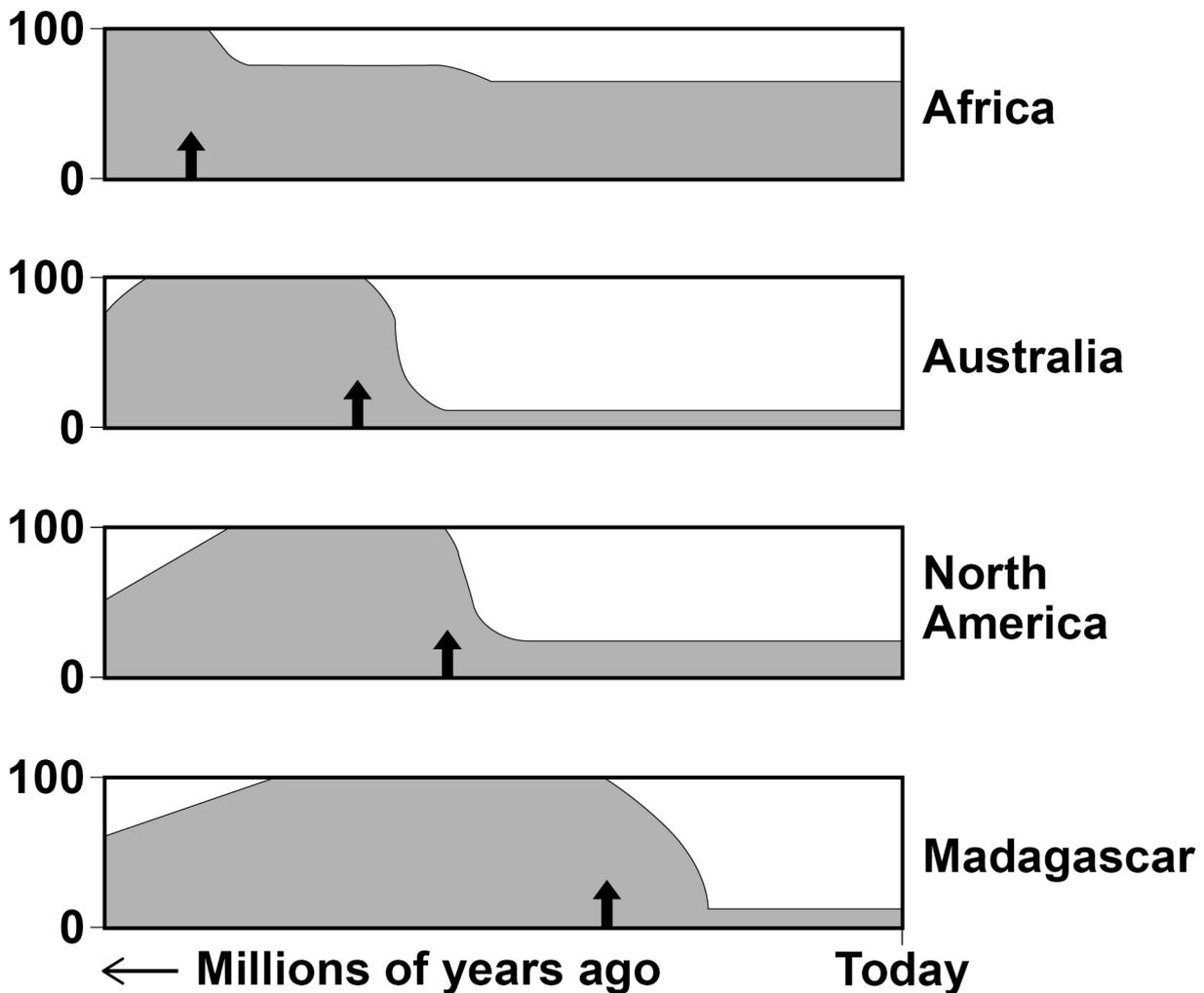


**FIGURE 9** shows the percentage (%) survival of large mammal species in four areas of the world.

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

### FIGURE 9

#### Percentage survival of large mammal species



#### KEY

↑ Humans first  
appeared in area

■ Percentage survival of  
large mammal species







**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**

<b>16</b>







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For Examiner's Use	
Question	Mark
1	
2	
3	
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5	
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7	
8	
<b>TOTAL</b>	

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