



**Surname** \_\_\_\_\_

**Other Names** \_\_\_\_\_

**Centre Number** \_\_\_\_\_

**Candidate Number** \_\_\_\_\_

**Candidate Signature** \_\_\_\_\_

**I declare this is my own work.**

**GCSE**

**BIOLOGY**

**F**

**Foundation Tier Paper 2F**

**8461/2F**

**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]**



**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.**

<b>0</b>	<b>1</b>
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**A food for pet dogs contains meat from chickens.**

**FIGURE 1 shows the food chain.**

**FIGURE 1**



01.1

**What is the trophic level of the dog?  
[1 mark]**

**Tick (✓) ONE box.**

**1**

**2**

**3**

**[Turn over]**



**0 1 . 2**

**Draw ONE line from each organism to the description of the organism's position in the food chain. [3 marks]**

**ORGANISM****DESCRIPTION****Herbivore****Chicken****Producer****Dog****Secondary  
consumer****Wheat****Tertiary  
consumer**

01.3

**Name the process wheat plants use to make glucose. [1 mark]**

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**[Turn over]**



**0** **1** . **4**

**Some of the chicken biomass does NOT become part of the dog's biomass.**

**What is ONE reason why? [1 mark]**

**Tick (✓) ONE box.**

**Some of the chicken is used for the dog to grow**

**The dog produces waste in faeces**

**The wheat is eaten by the dog**

**A new dog food has been developed.**

**The new dog food is made from insects.**

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

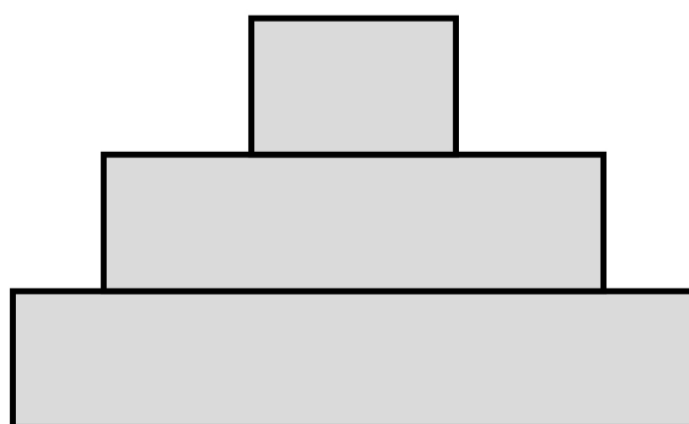
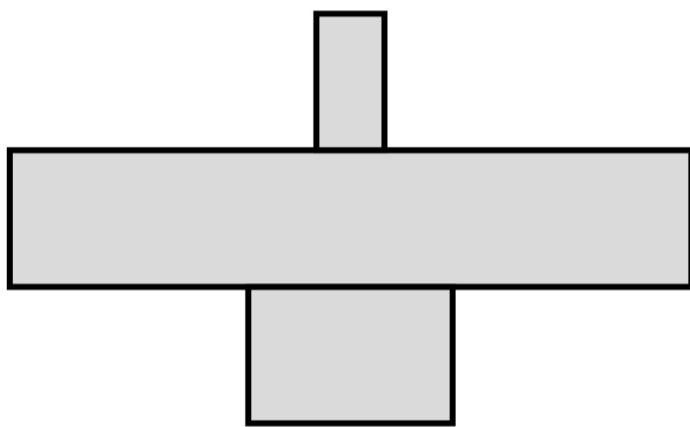




**0 1 . 5**

**Which pyramid of biomass represents the vegetables, insects and dogs in this food chain? [1 mark]**

**Tick (✓) ONE box.**



**[Turn over]**



01.6

**Beef from cows is used to make some dog food.**

**Cows release methane.**

**The company that makes dog food from insects made the statement:**

**‘Dog food made from insects is more sustainable than dog food made from beef.’**



**Which are TWO reasons that support the company's statement? [2 marks]**

**Tick (✓) TWO boxes.**

**Dogs will eat more insects than cows**

**Farming cows needs more land than farming insects**

**Fewer cows being farmed will slow down global warming**

**Fewer insects than cows are needed to produce dog food**

**The food chain for dog food made from insects has more trophic levels**

**[Turn over]**

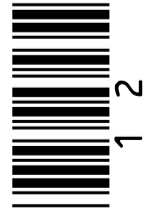
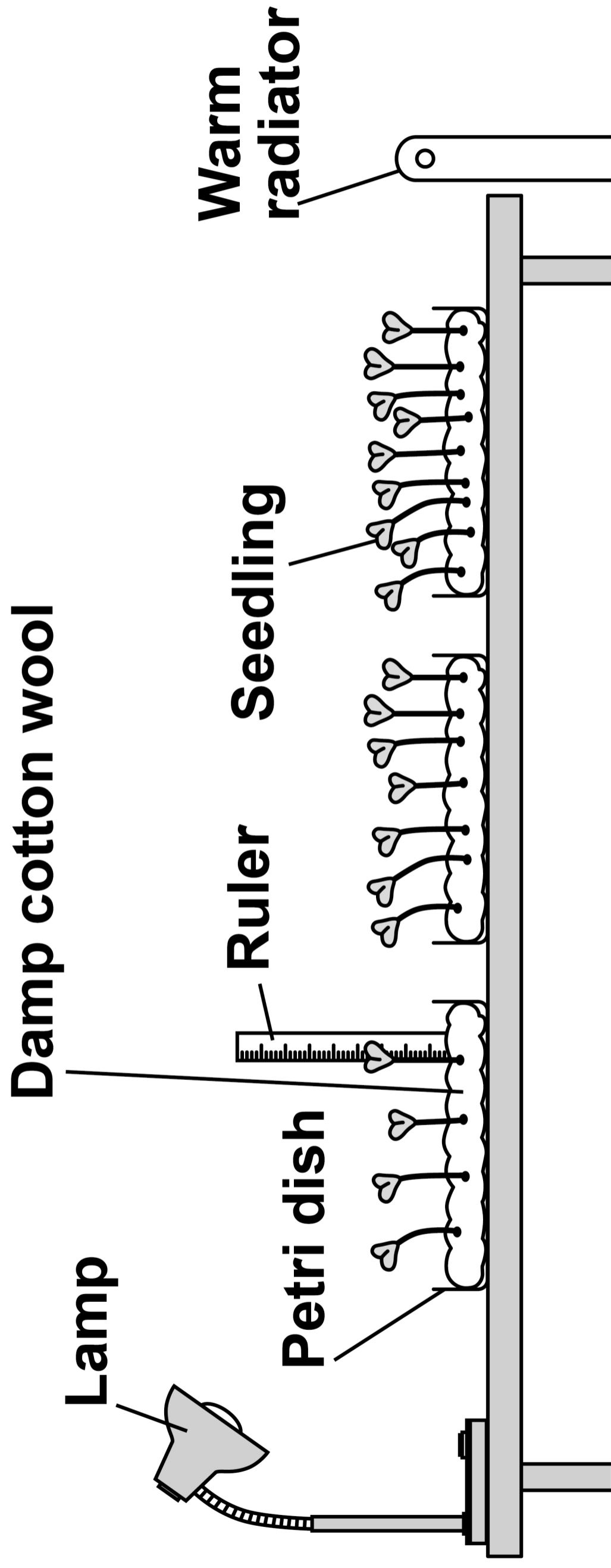
<hr/>
9



A student investigated the effect of light intensity on the growth of seedlings.

FIGURE 2 shows the equipment.

FIGURE 2



0 2 . 1

**Which TWO improvements should the student make to the investigation? [2 marks]**

**Tick (✓) TWO boxes.**

**Give more water to the seedlings nearest the lamp**

**Leave some of the seedlings for a few more days**

**Open a window to let more air in**

**Put all the dishes the same distance from the radiator**

**Use equal numbers of seedlings in each dish**



0 2 . 2

**What is the dependent variable in the investigation?**

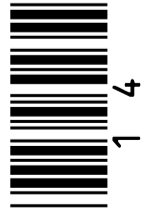
**[1 mark]**

**Tick (✓) ONE box.**

**The height of the seedlings**

**The mass of cotton wool**

**The temperature of the room**



**0 2 . 3**

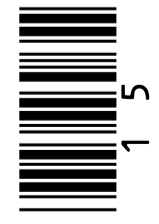
**In each dish the seedlings compete with each other.**

**Give TWO factors the seedlings compete for. [2 marks]**

- 1** \_\_\_\_\_  
\_\_\_\_\_  
**2** \_\_\_\_\_  
\_\_\_\_\_

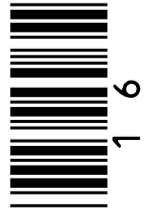
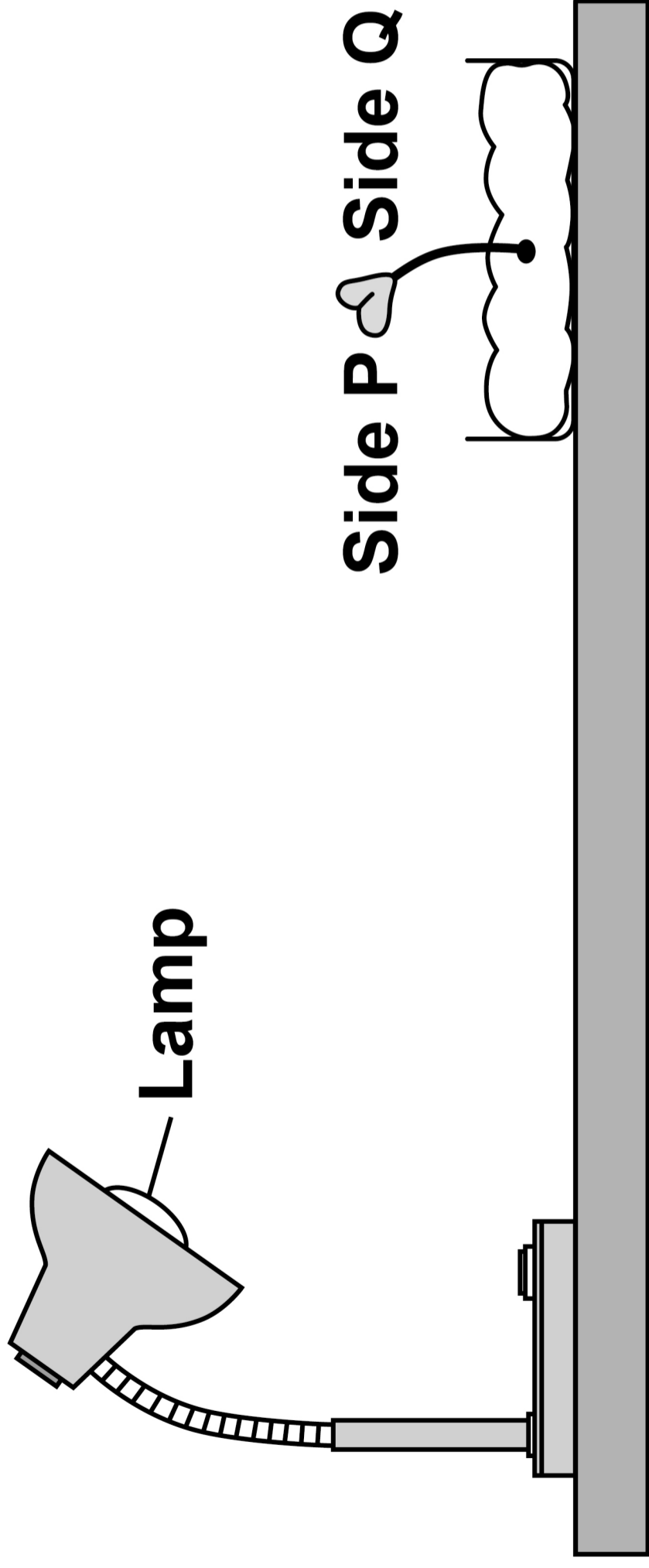
**15**

**[Turn over]**



**FIGURE 3 shows a seedling growing towards a lamp.**

**FIGURE 3**





0 2 . 4

**What happened to the growth of the seedling on side P compared with the growth on side Q? [1 mark]**

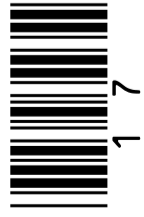
**Tick (✓) ONE box.**

**Side P has grown less than side Q**

**Side P has grown more than side Q**

**Side P has grown the same as side Q**

**[Turn over]**



**02.5**

**Plant responses are called tropisms.**

**Which tropism causes the seedling to grow towards light? [1 mark]**

**Tick (✓) ONE box.**

**Geotropism**

**Gravitropism**

**Phototropism**



02.6

**Which hormone causes the seedling to grow towards the light? [1 mark]**

**Tick (✓) ONE box.**

**Auxin**

**Insulin**

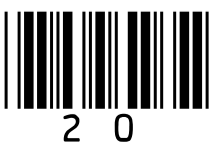
**Testosterone**

**[Turn over]**

**8**



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**0 3**

**Sperm cells and egg cells are formed by meiosis.**

**0 3 . 1**

**During meiosis a cell divides twice.**

**How many sperm cells are formed when a cell divides by meiosis? [1 mark]**

---

**0 3 . 2**

**Human body cells contain 46 chromosomes.**

**How many chromosomes are in each human egg cell? [1 mark]**

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**[Turn over]**



**Dupuytren's is a disorder that affects the hands.**

**One form of Dupuytren's is caused by a dominant allele (D).**

**The allele for NOT having Dupuytren's is recessive (d).**

**0 3 . 3**

**What is an allele? [1 mark]**

**Tick (✓) ONE box.**

**A different form of a chromosome**

**A different form of a gamete**

**A different form of a gene**



0	3	.	4
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**A man with Dupuytren's has the genotype Dd.**

**Which word describes the man's genotype? [1 mark]**

**Tick (✓) ONE box.**

**Heterozygous**

**Homozygous**

**Phenotype**

**[Turn over]**



The man with Dupuytren's (Dd) and a woman who does NOT have Dupuytren's (dd) plan to have a child.

03.5

Complete the genetic diagram in FIGURE 4 to show the possible genotypes of the child. [2 marks]

FIGURE 4

		<b>Woman</b>	
		d	d
<b>Man</b>	<b>D</b>	<b>Dd</b>	
	d		





**03.6**

**Draw a ring around the genotype of a child in FIGURE 4 who will have Dupuytren's. [1 mark]**

**03.7**

**What is the chance of the child having Dupuytren's? [1 mark]**

**Tick (✓) ONE box.**

**25%**

**50%**

**75%**

**100%**

**[Turn over]**



0	3	.	8
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**A genetic disorder develops as a result of a change in a gene.**

**What scientific term describes a change in a gene? [1 mark]**

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0	3	.	9
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**People with a family history of some genetic disorders are offered embryo screening.**

**Suggest ONE way embryo screening can help people with a family history of a genetic disorder. [1 mark]**

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**[Turn over]**

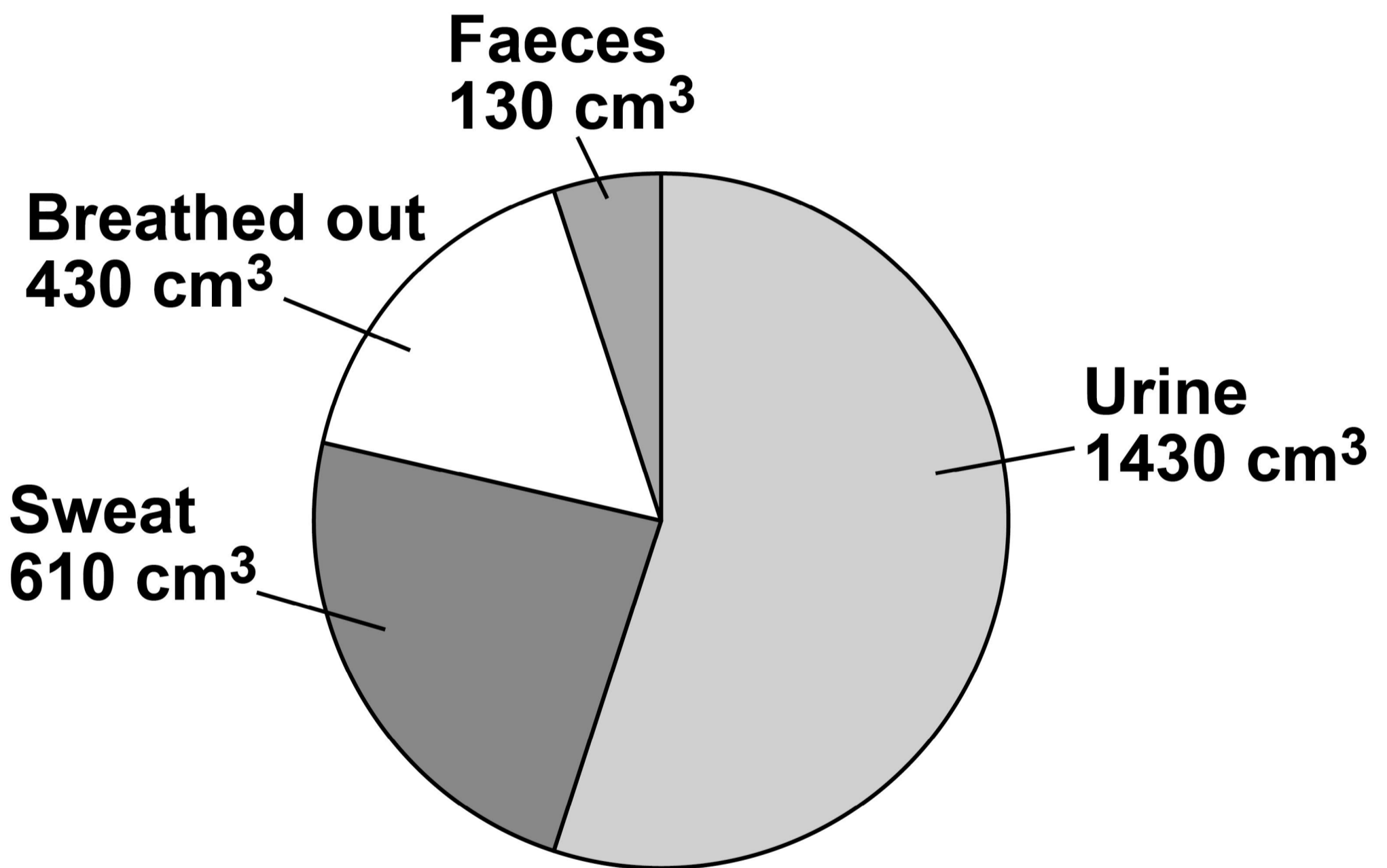
10



04

**FIGURE 5** shows the water loss from a person on one day.

**FIGURE 5**



The total water loss was 2600 cm<sup>3</sup>.

0 4 . 1

Calculate the percentage of the total water loss that was lost as urine.  
[2 marks]

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Percentage lost as urine =

\_\_\_\_\_ %

[Turn over]



**A marathon race is 42 km long.**

**0 4 . 2**

**What happens to the volume of water lost as sweat when a person runs a marathon? [1 mark]**

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**0 4 . 3**

**What must marathon runners do to prevent themselves becoming dehydrated? [1 mark]**

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0	4	.	4
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**Complete the sentences. [3 marks]**

**Choose answers from the list.**

- **digestion**
- **excretion**
- **fertilisation**
- **filtration**
- **reabsorption**

**Blood entering the kidneys goes through the process of \_\_\_\_\_.**

**Glucose is NOT found in urine because of \_\_\_\_\_.**

**Urine is removed from the body in the process of \_\_\_\_\_.**

**[Turn over]**



**04.5**

**People with kidney failure can have dialysis or a kidney transplant.**

**Dialysis is often needed 3 times each week and can take over 4 hours each time.**

**Dialysis usually happens in a hospital.**

**Kidney transplants require a donor and major surgery.**

**Describe the advantages AND disadvantages of having a kidney transplant instead of having dialysis.  
[4 marks]**

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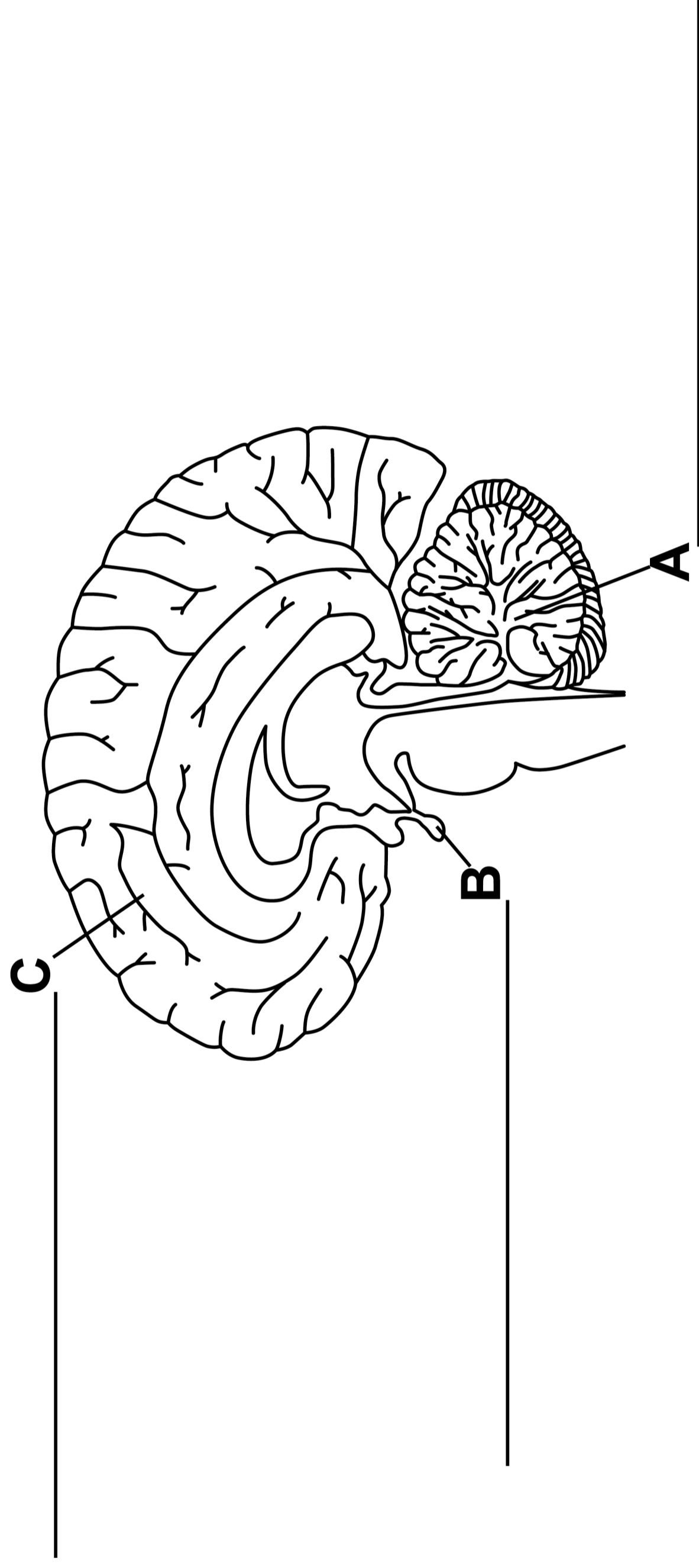






FIGURE 6 shows the brain.

FIGURE 6



**05.1**

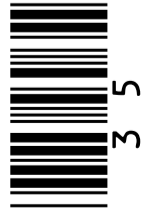
**Label A, B and C on FIGURE 6. [3 marks]**

**Choose answers from the list.**

- cerebellum**
- cerebral cortex**
- medulla**
- pituitary gland**

**35**

**[Turn over]**



**05.2**

**Which part of the brain controls balance when riding a bicycle? [1 mark]**

**Tick (✓) ONE box.**

**Cerebellum**

**Medulla**

**Pituitary gland**



0	5	.	3
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**The ears send information about sound to the brain.**

**Which word describes the brain?  
[1 mark]**

**Tick (✓) ONE box.**

**Coordinator**

**Effector**

**Receptor**

**Stimulus**

**[Turn over]**



**05.4**

**What type of cell carries impulses from the ears to the brain? [1 mark]**

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**05.5**

**Human eyes detect light.**

**Which part of the eye has cells that detect light? [1 mark]**

**Tick (✓) ONE box.**

**Iris****Lens****Retina**

05.6

**The eyes of some birds have specialised cells to detect ultraviolet (UV) light.**

**Some fruits reflect UV light.**

**Explain why it is an advantage for birds to be able to detect UV light. [2 marks]**

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**[Turn over]**



**FIGURE 7 shows a student reading a book.**

## **FIGURE 7**



**There are trees on the far side of the field. The student is sitting in the middle of the field.**

**The student looks at the trees instead of looking at the book.**





**05.7**

**What process occurs in the eye when the student looks at the trees instead of looking at the book? [1 mark]**

**Tick (✓) ONE box.**

**Accommodation**

**Magnification**

**Reflection**

**[Turn over]**



**05.8**

**What change happens in the student's eyes when they look up at the trees?  
[1 mark]**

**Tick (✓) ONE box.**

**Light rays are refracted less**

**More light is reflected**

**The optic nerves move**



0	5	.	9
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**The student CANNOT see the trees in focus.**

**Name the common defect of the eye which causes distant objects to appear out of focus. [1 mark]**

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**[Turn over]**

12



06

**FIGURE 8** shows what the extinct Siberian rhinoceros ('*Elasmotherium sibiricum*') might have looked like.

**FIGURE 8**



0	6	.	1
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**What is the genus of the Siberian rhinoceros? [1 mark]**

**Tick (✓) ONE box.**

**'Elasmotherium'**

**'Elasmotherium sibiricum'**

**'sibiricum'**

**[Turn over]**



**The 'three-domain system' of classification places all living organisms in one of three domains.**

**06.2**

**Which domain was the Siberian rhinoceros in? [1 mark]**

**Tick (✓) ONE box.**

**Archaea**

**Eukaryota**

**Prokaryota**



0	6	.	3
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**Who developed the ‘three-domain system’ of classification? [1 mark]**

**Tick (✓) ONE box.**

**Carl Woese**

**Charles Darwin**

**Gregor Mendel**

**[Turn over]**



0	6	.	4
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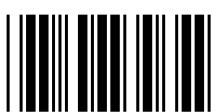
**The horn of the Siberian rhinoceros is estimated to have been 150 cm long.**

**Suggest ONE advantage of this adaptation to the Siberian rhinoceros.  
[1 mark]**

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**06.5**

**The only parts of the Siberian rhinoceros that have been found are fossilised bones.**

**Give ONE reason why ONLY the bones of the body of the Siberian rhinoceros became fossils. [1 mark]**

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**06.6**

**Suggest how scientists can estimate when the Siberian rhinoceros was alive. [1 mark]**

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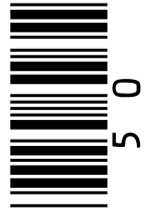
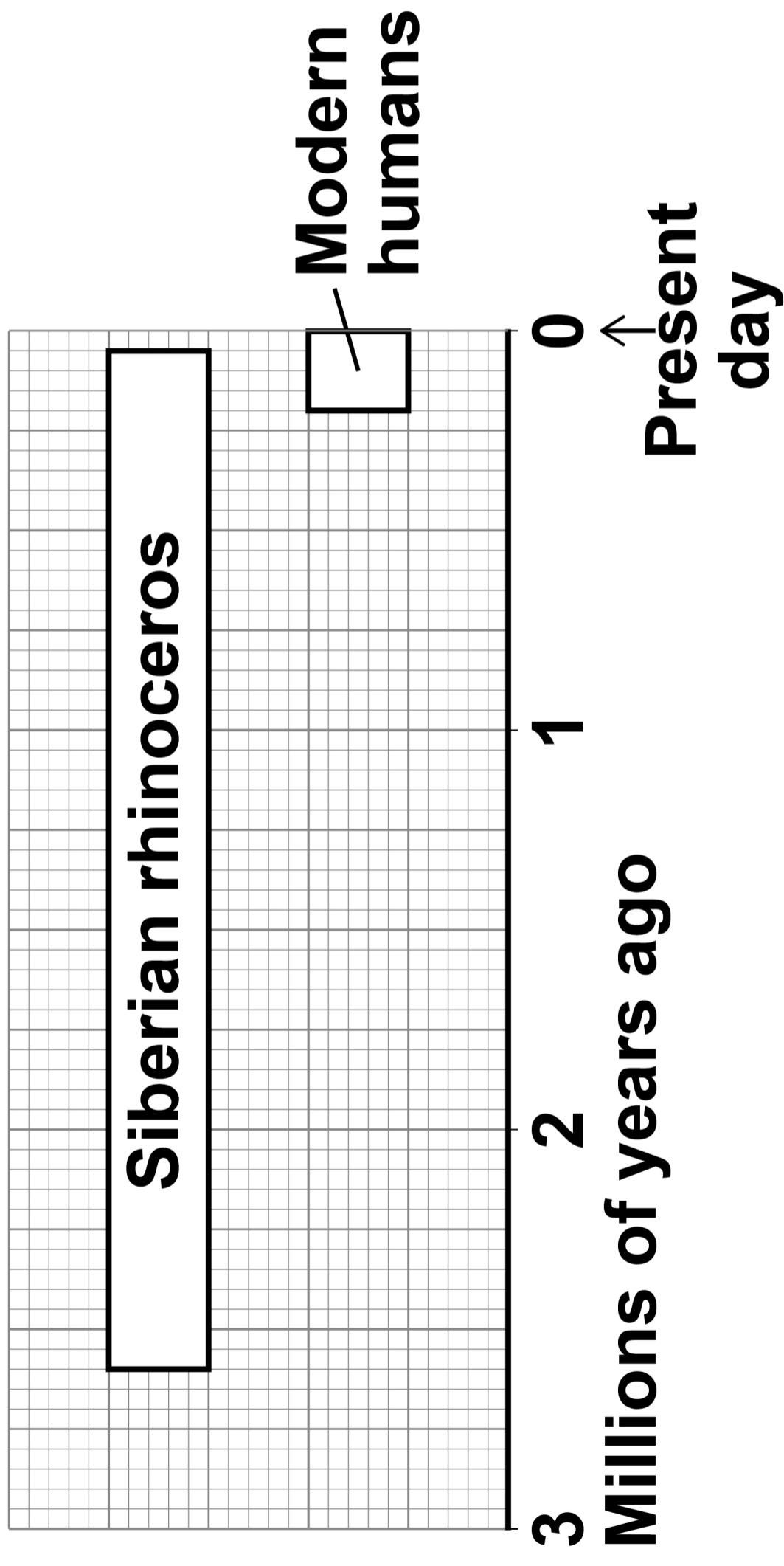
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**[Turn over]**



**FIGURE 9 shows when the Siberian rhinoceros existed and when modern humans existed.**

**FIGURE 9**



06.7

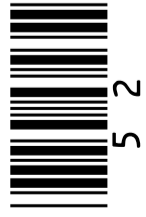
**How many million years ago did the Siberian rhinoceros become extinct? [1 mark]**

\_\_\_\_\_ million years ago

**[Turn over]**



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06.8

**Determine the time in years when both the Siberian rhinoceros and modern humans existed together.**

**Use FIGURE 9, on page 50, and your answer to Question 06.7. [3 marks]**

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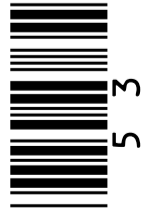
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**53**

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

**[Turn over]**



0	6	.	9
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**Suggest TWO factors that may have caused the extinction of the Siberian rhinoceros. [2 marks]**

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

<b>12</b>



07

**This question is about DNA.**

07.1

**Describe the shape of a DNA molecule.  
[2 marks]**

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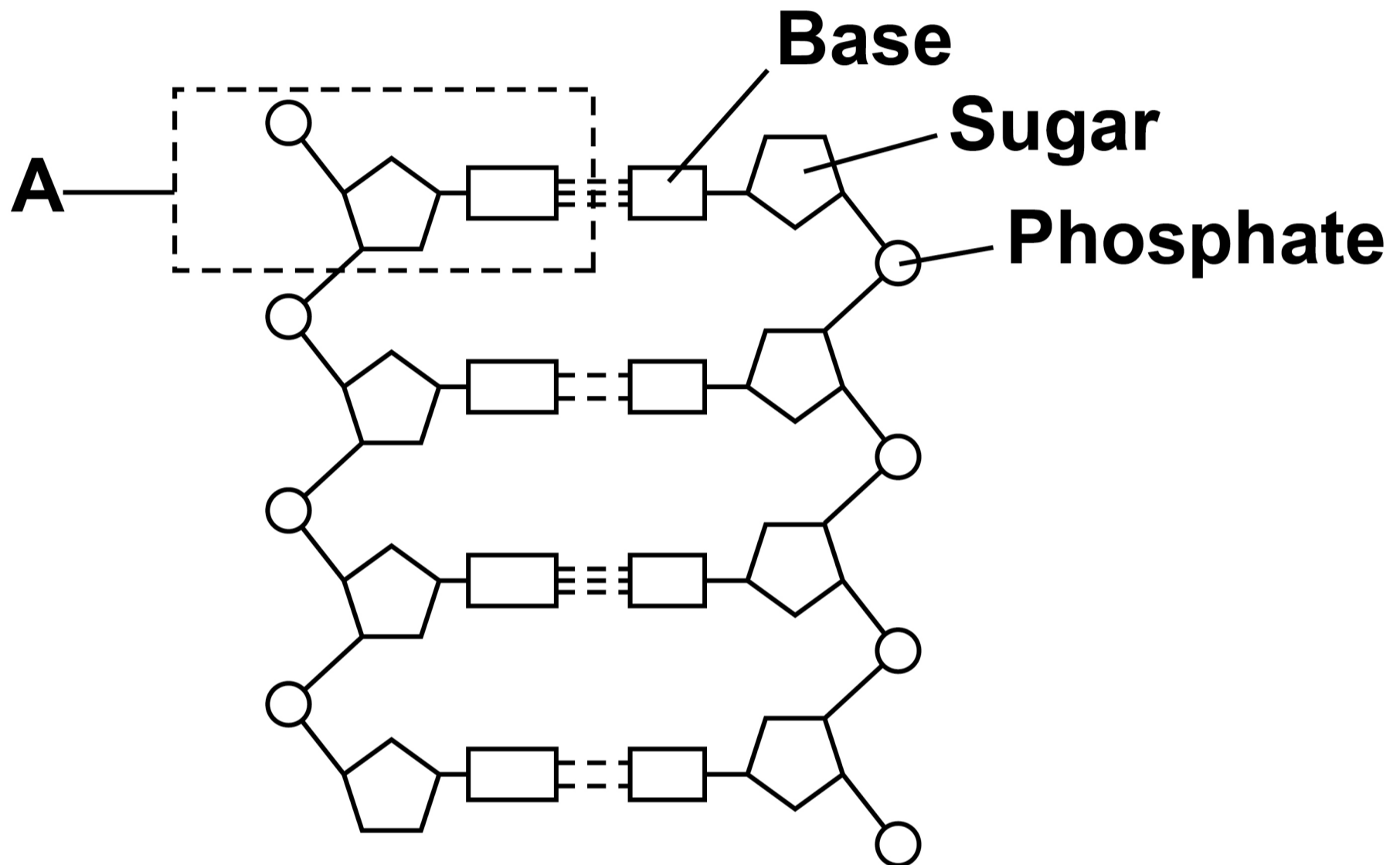
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**[Turn over]**



**FIGURE 10** shows part of a DNA molecule.

**FIGURE 10**





**07.2**

**DNA codes for a sequence of amino acids.**

**Which part of DNA forms the code for a particular amino acid? [1 mark]**

**Tick (✓) ONE box.**

**Bases**

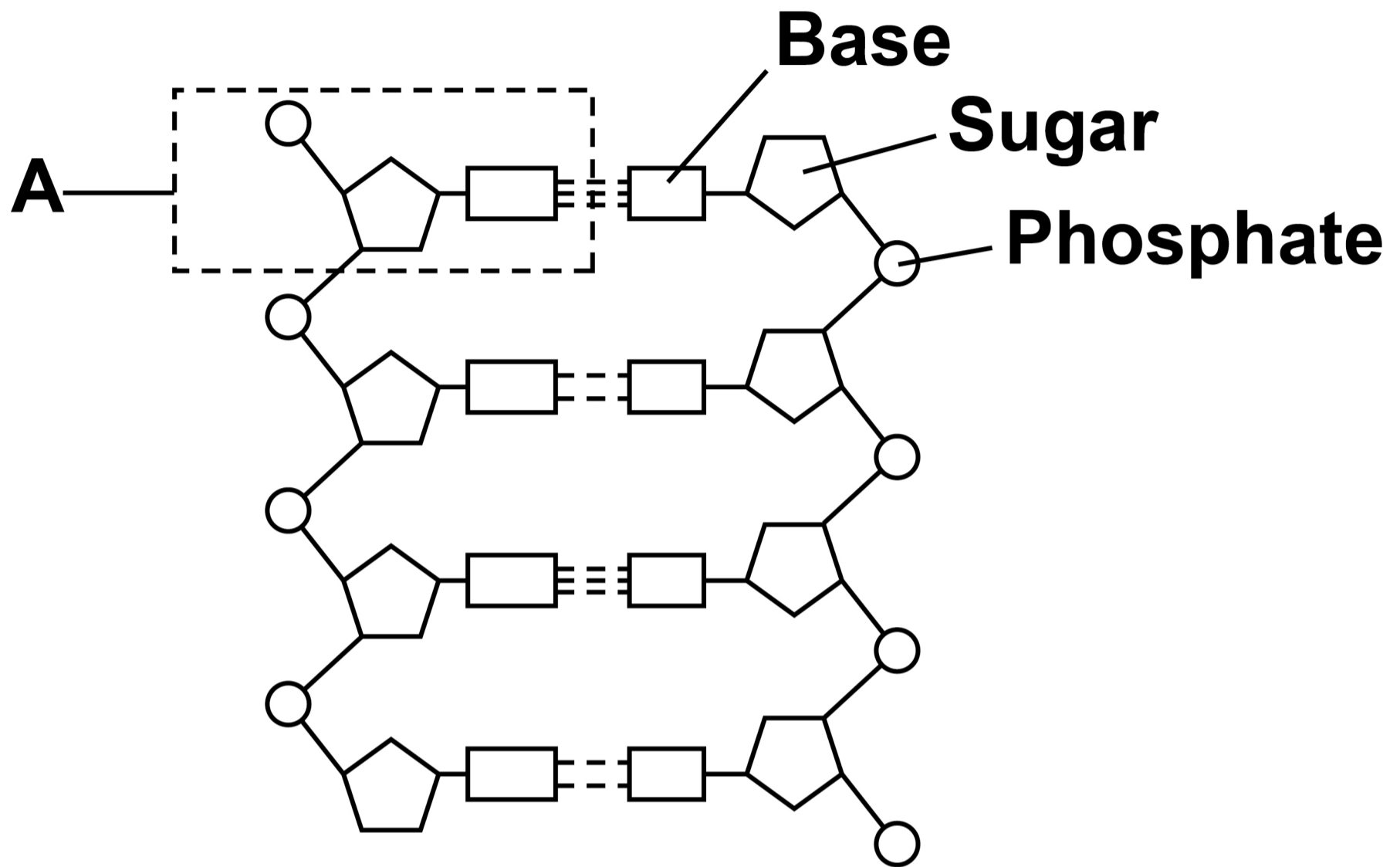
**Phosphates**

**Sugars**

**[Turn over]**



## REPEAT OF FIGURE 10



**07.3**

**Which substance is produced when amino acids are joined together?  
[1 mark]**

**Tick (✓) ONE box.**

**Carbohydrate**

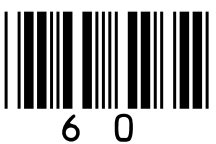
**Fat**

**Protein**

**[Turn over]**



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0	7	.	4
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**DNA is made of repeating units. One of the units is labelled A in FIGURE 10, on page 58.**

**What is the name of the repeating unit labelled A? [1 mark]**

**Tick (✓) ONE box.**

**Chromosome**

**Enzyme**

**Nucleotide**

**[Turn over]**



**07.5**

**The DNA in one human body cell is the length of 6 000 million repeating units (part A).**

**Each repeating unit is 0.34 nanometres (nm) long.**

**Calculate the length of the DNA in the cell in millions of nanometres.**

**[2 marks]**

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**Length = \_\_\_\_\_ million nm**



0	7	.	6
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**Give your answer to Question 07.5 in metres.**

**1 metre =  $1 \times 10^9$  nanometres [1 mark]**

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**Length = \_\_\_\_\_ m**

**[Turn over]**



**07.7**

**DNA analysis can show people which alleles they have.**

**Patients who have certain types of cancer can be offered DNA analysis.**

**The family of the patient can also be offered DNA analysis.**

**Suggest ONE advantage of having DNA analysis. [1 mark]**

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**9**



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**[Turn over]**



08

**This question is about the decay of milk.**

08.1

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

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_



**08.2**

**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]**

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**[Turn over]**



**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 8 . 3**

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

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**08.4**

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

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

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

**[Turn over]**



The student improved the investigation to produce valid results.

FIGURE 11, on the opposite page, shows the results.

0 8 . 5

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

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**KEY**

———— Cows' milk

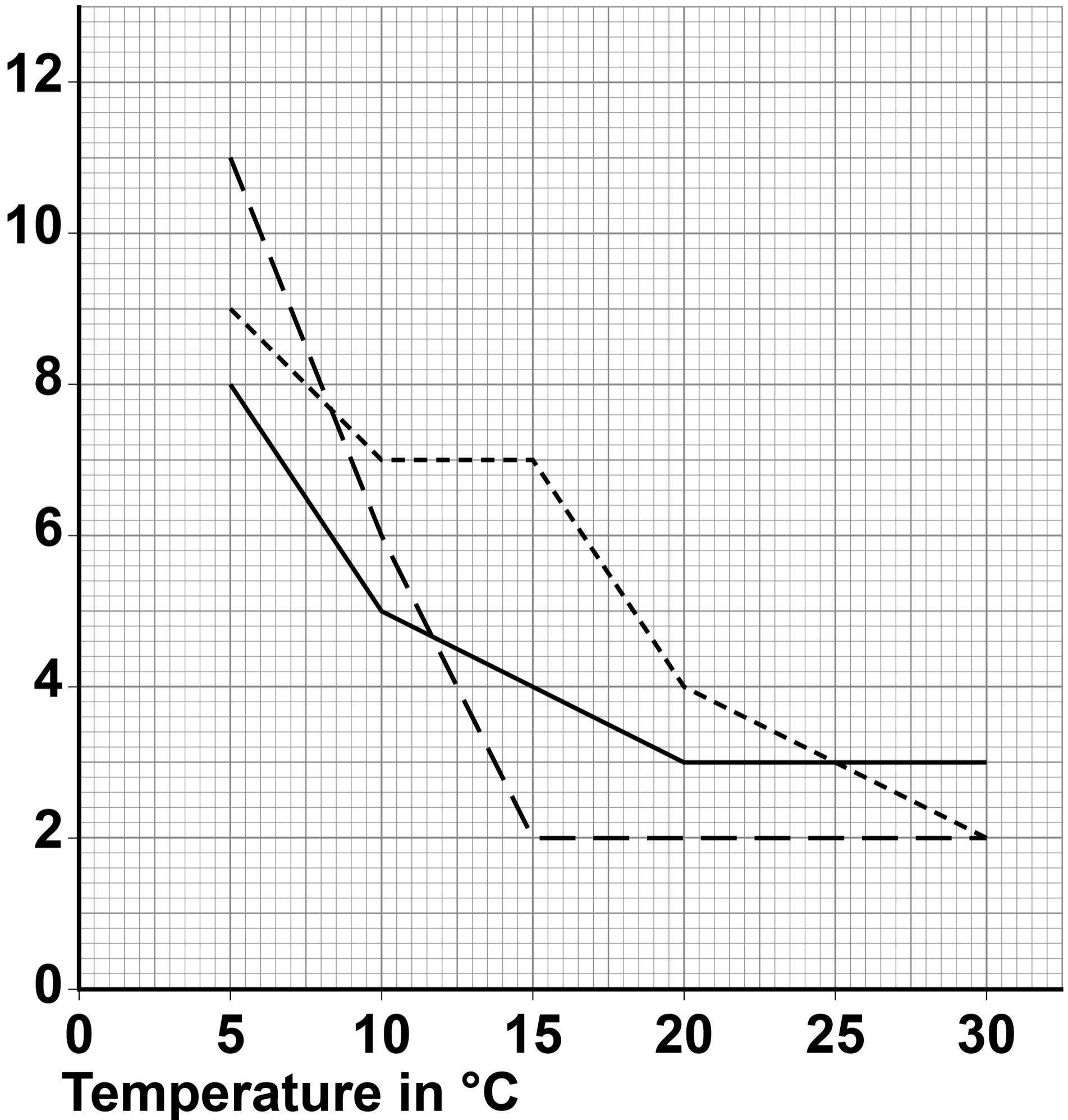
- - - - Goats' milk

----- Almond milk



**FIGURE 11**

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

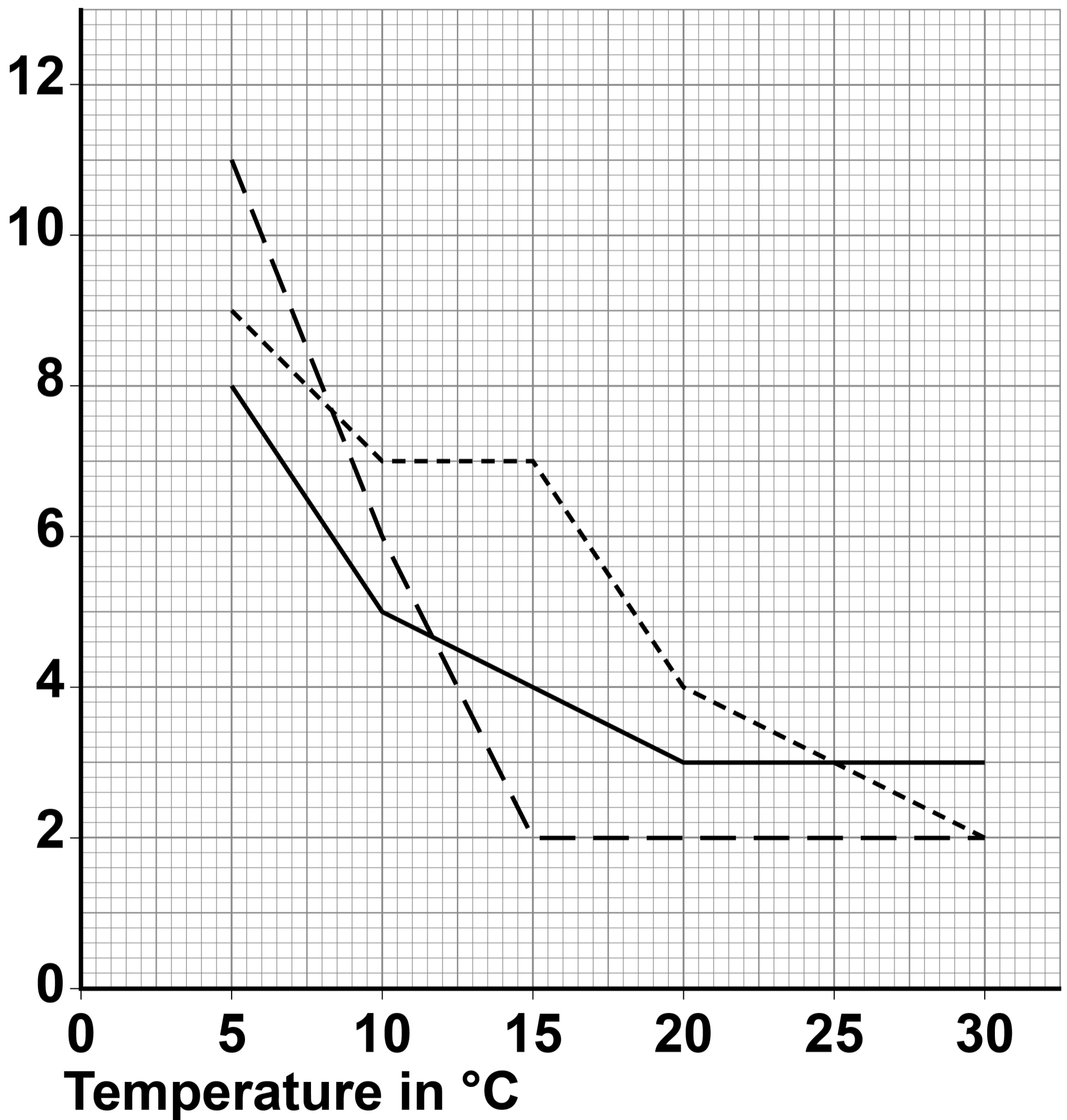


**[Turn over]**



## REPEAT OF FIGURE 11

Time taken  
to reach pH 5  
in days





**KEY**

———— Cows' milk

- - - - Goats' milk

----- Almond milk

**0 8 . 6**

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

**Use data from FIGURE 11 in your answer. [2 marks]**

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**[Turn over]**



0	8	.	7
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**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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08.8

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

1 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**[Turn over]**



**08.9****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**

<b>13</b>



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**[Turn over]**



0	9
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**FIGURE 12, on the opposite page, shows the human population from 1600 to 2010.**

**In 1900 the human population was 1.6 billion.**

0	9	.	1
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**Calculate how many times greater the human population was in the year 2000 compared with the year 1900. [2 marks]**

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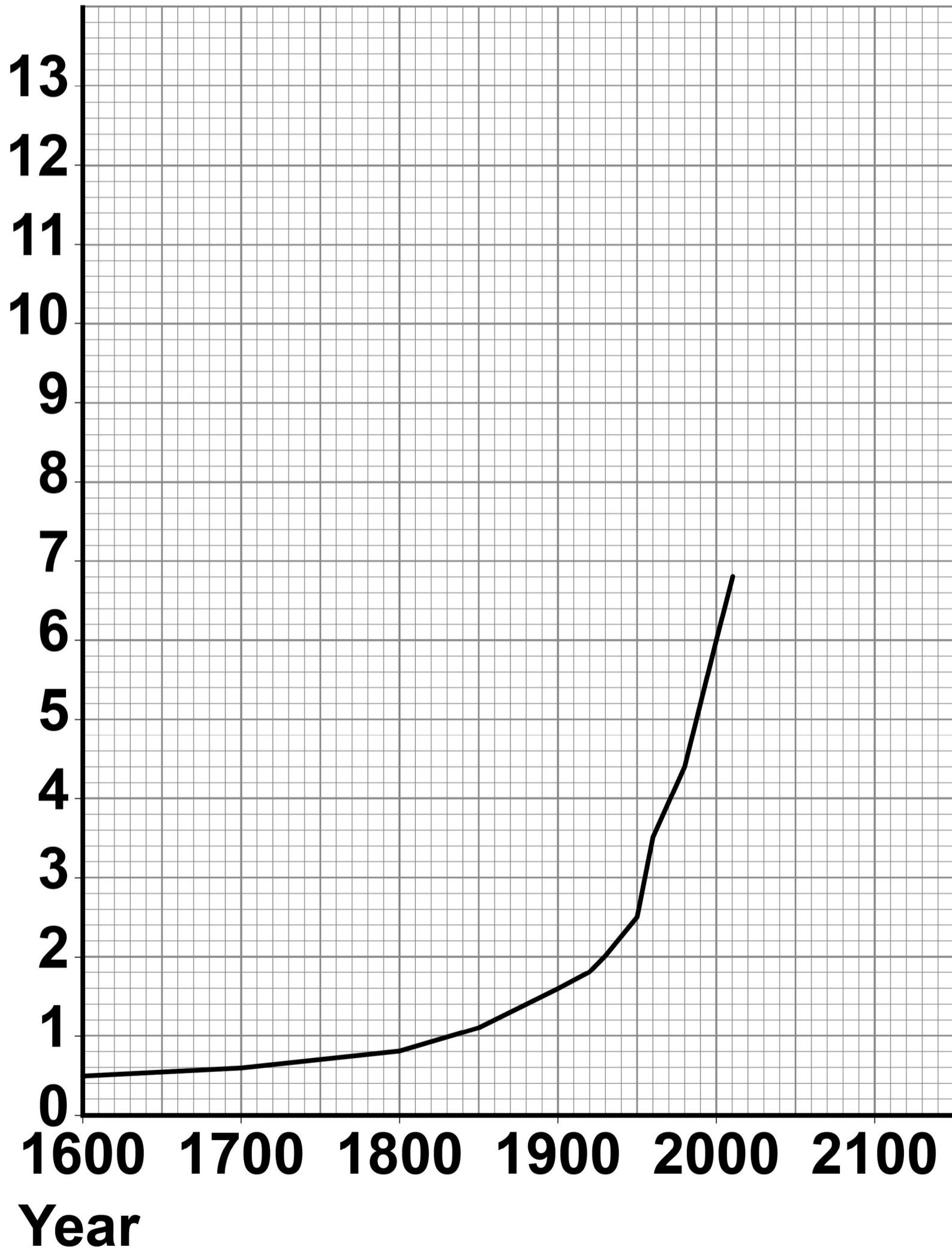
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**Number of times greater = \_\_\_\_\_**



# FIGURE 12

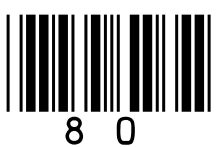
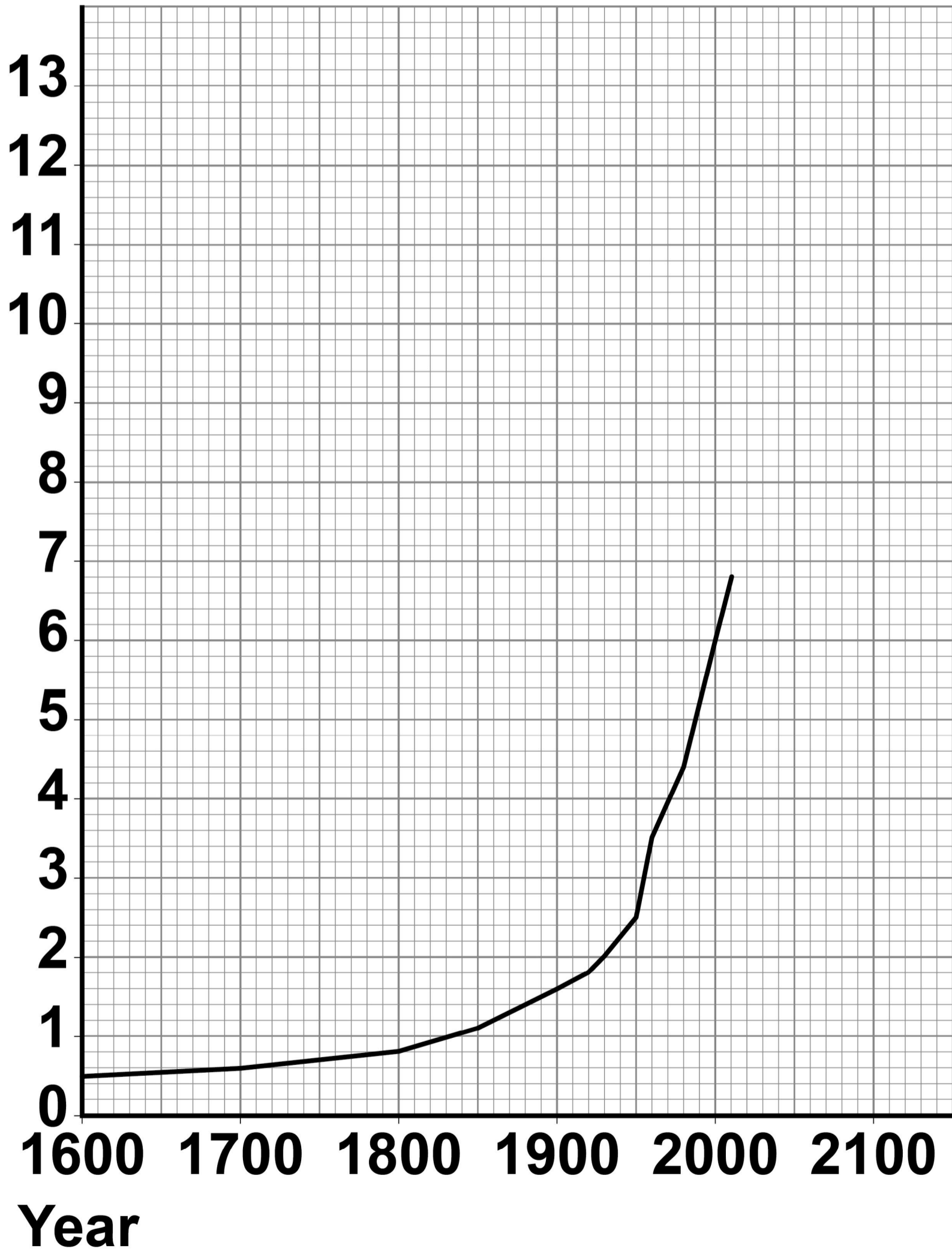
## Human population in billions



[Turn over]

# REPEAT OF FIGURE 12

## Human population in billions





0	9	.	2
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**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 =**  

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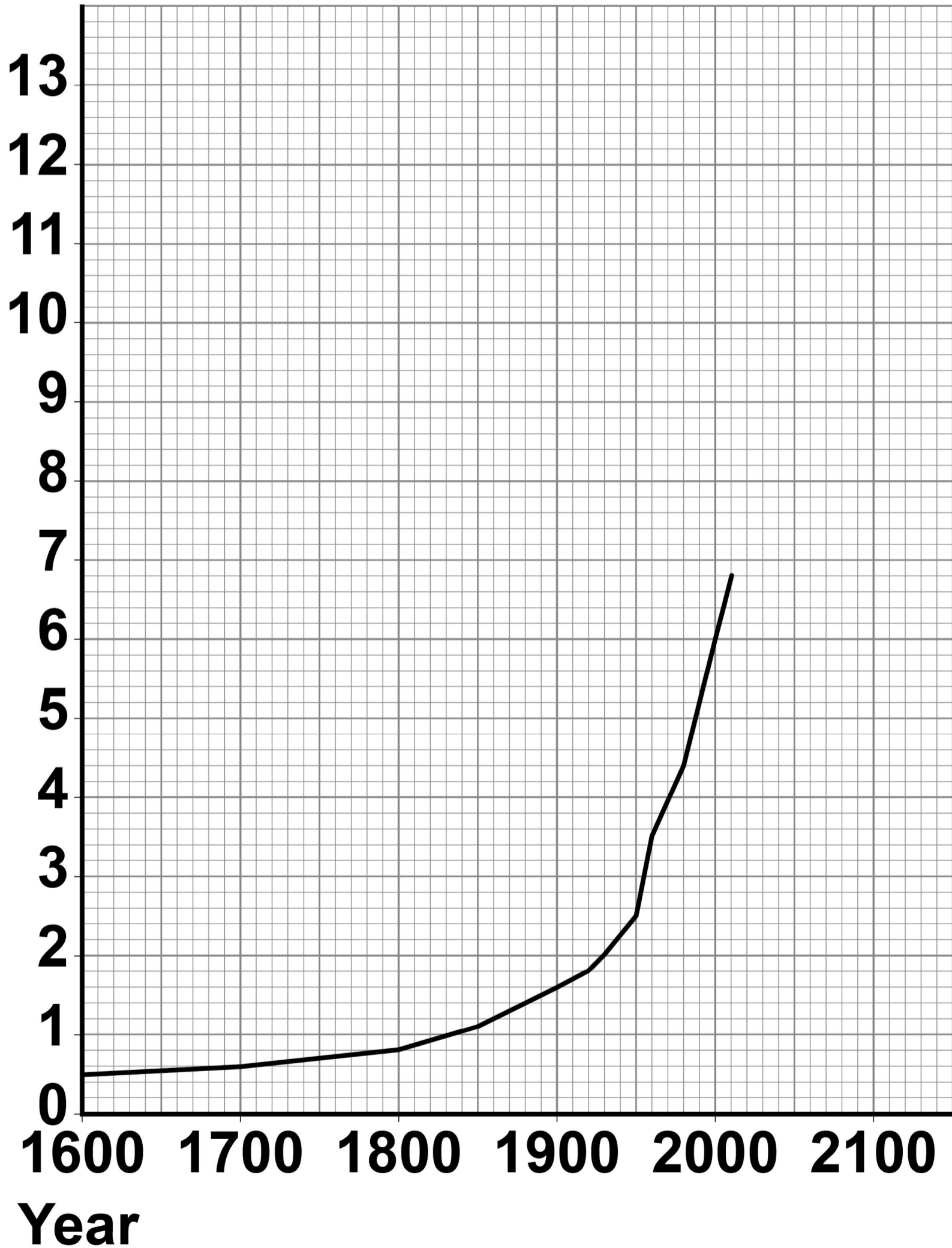
 **billion per year**

**[Turn over]**



# REPEAT OF FIGURE 12

## Human population in billions



0	9	.	3
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**Predict the human population in 2050 if the current rate of population increase continues.**

**You should draw an extrapolation line on FIGURE 12. [2 marks]**

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**Predicted human population =**

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**[Turn over]**



09.4

**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 9 . 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]**

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**[Turn over]**





**09.6**

**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	9	.	7
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**Suggest ONE reason why some people are concerned about the use of golden rice. [1 mark]**

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**END OF QUESTIONS**

<b>16</b>





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For Examiner's Use	
Question	Mark
1	
2	
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<b>TOTAL</b>	

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