A

AQA

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.

0 1 **A food for pet dogs contains meat from chickens.**

FIGURE 1 shows the food chain.

FIGURE 1

Wheat plant ⟶ Chicken ⟶ Dog

0 1 . 1 **What is the trophic level of the dog? [1 mark]**

Tick (✓) ONE box.

☐ **1**

☐ **2**

☐ **3**

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

0 1 . 3 **Name the process wheat plants use to make glucose. [1 mark]**

_____

_____

[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**

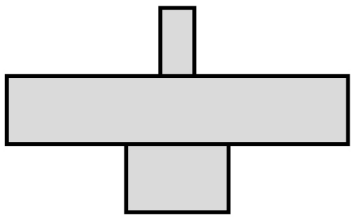
A new dog food has been developed.

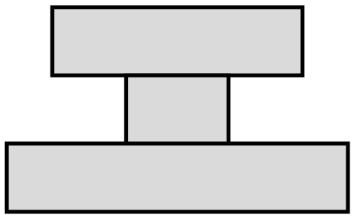
The new dog food is made from insects.

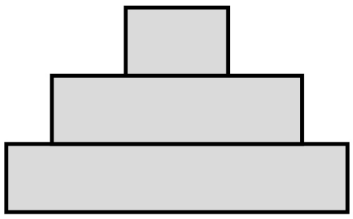
The insects in the dog food factory are fed on vegetables.

0 1 . 5 Which pyramid of biomass represents the vegetables, insects and dogs in this food chain? [1 mark]

Tick (✓) ONE box.

☐ 

☐ 

☐ 

[Turn over]

0 1 . 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**

9

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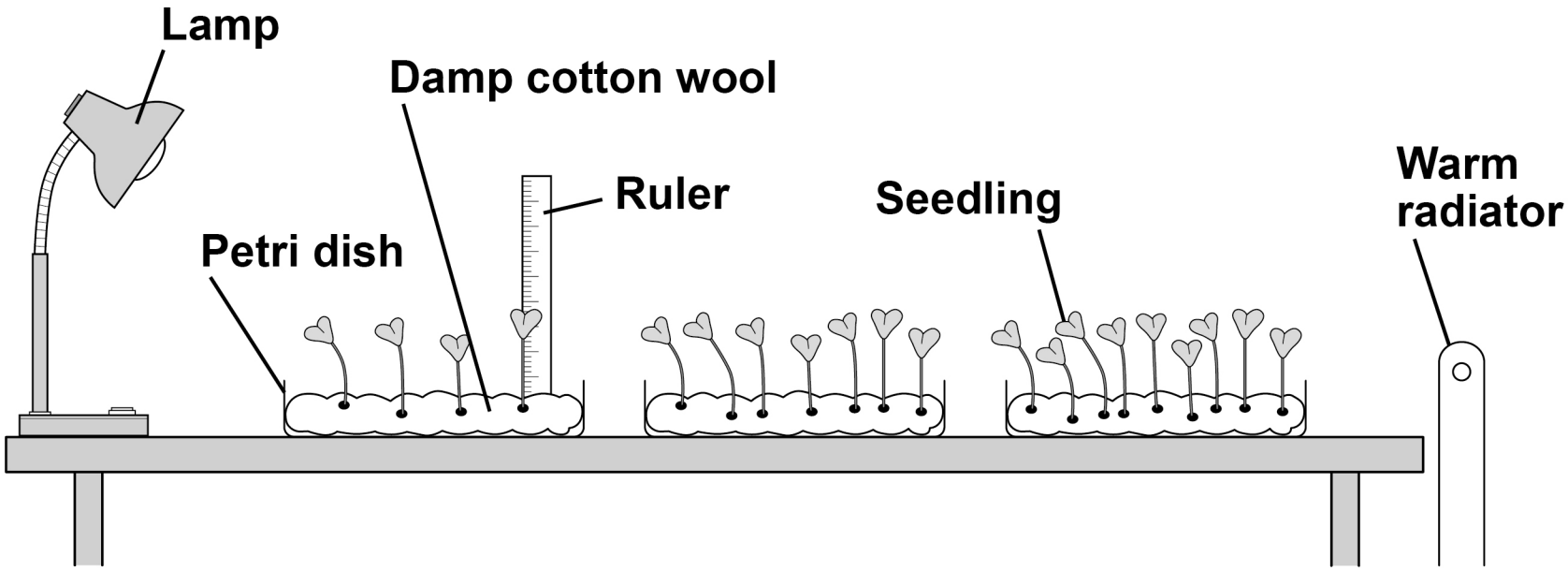
[Turn over]

0 2 **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**

[Turn over]

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 _____

_____

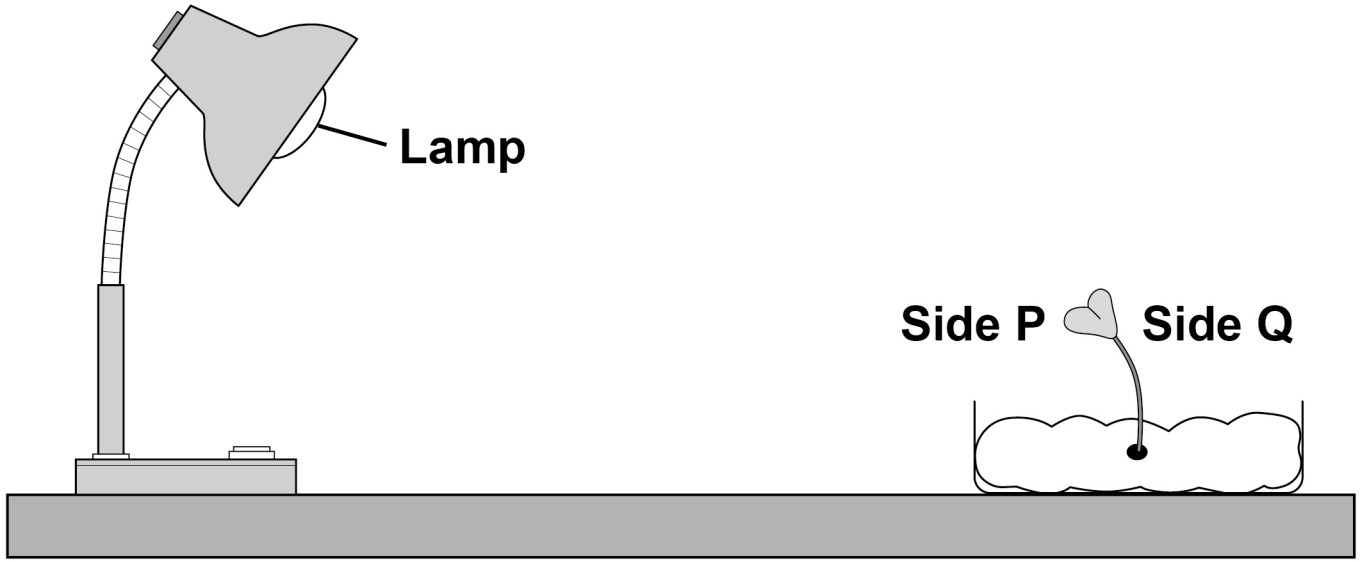
2 _____

_____

[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]

0 2 . 5 **Plant responses are called tropisms.**

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

Tick (✓) ONE box.

- ☐ **Geotropism**
- ☐ **Gravitropism**
- ☐ **Phototropism**

0 2 . 6 **Which hormone causes the seedling to grow towards the light? [1 mark]**

Tick (✓) ONE box.

- ☐ **Auxin**
- ☐ **Insulin**
- ☐ **Testosterone**

8

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[Turn over]

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]

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 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.

0 3 . 5 **Complete the genetic diagram in FIGURE 4 to show the possible genotypes of the child. [2 marks]**

FIGURE 4

		Woman	
		d	**d**
Man	**D**	**Dd**	
	d		

0 3 . 6 **Draw a ring around the genotype of a child in FIGURE 4 who will have Dupuytren's. [1 mark]**

0 3 . 7 **What is the chance of the child having Dupuytren's? [1 mark]**

Tick (✓) ONE box.

- ☐ **25%**
- ☐ **50%**
- ☐ **75%**
- ☐ **100%**

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

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

_____

_____

[Turn over]

0 3 . 9 **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]

_____

_____

_____

10

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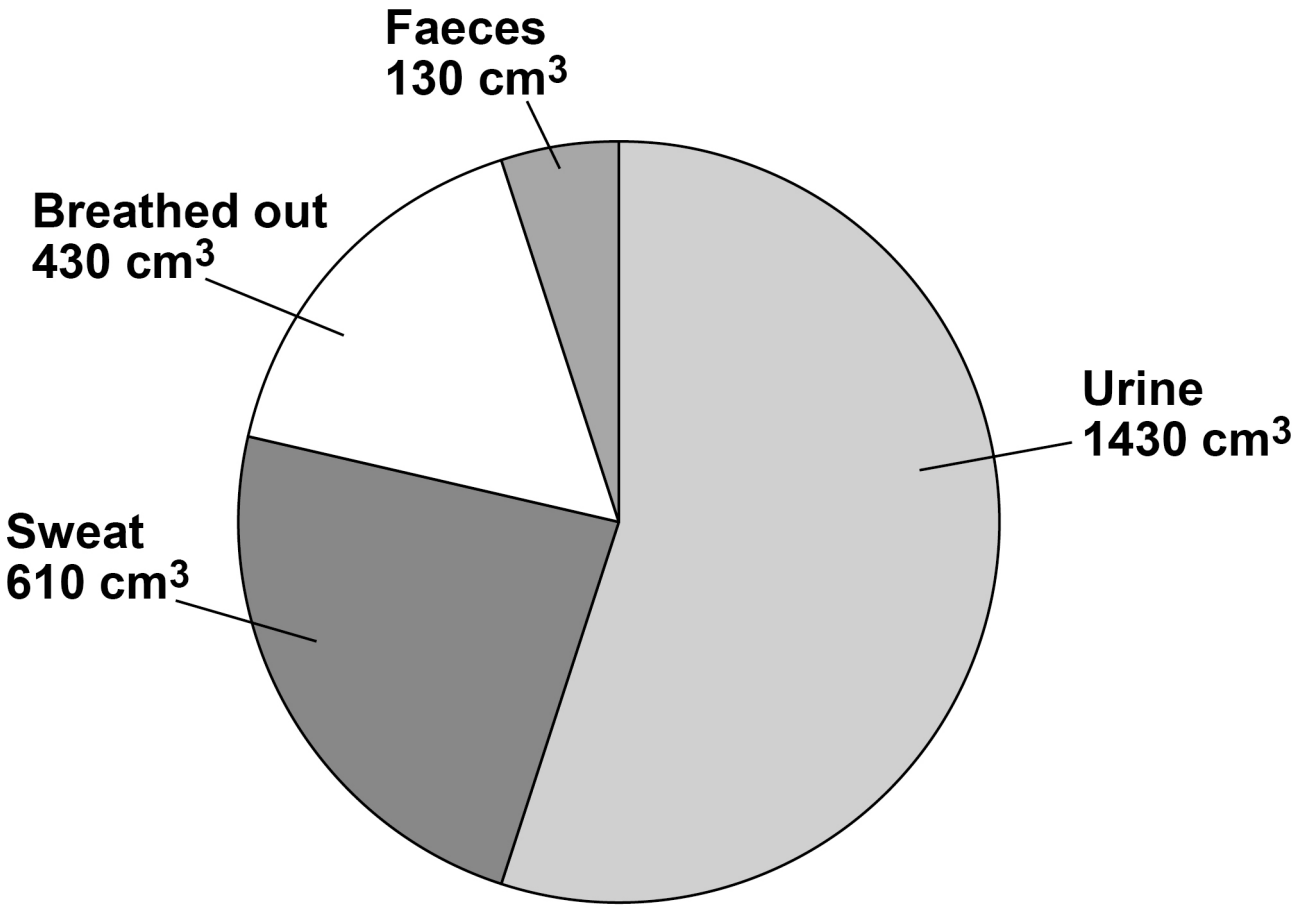
[Turn over]

0 4 **FIGURE 5 shows the water loss from a person on one day.**

FIGURE 5



The total water loss was 2600 cm^3.

0 4 . 1 Calculate the percentage of the total water loss that was lost as urine. [2 marks]

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]**

0 4 . 3 **What must marathon runners do to prevent themselves becoming dehydrated? [1 mark]**

0 4 . 4 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]

0 4 . 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.

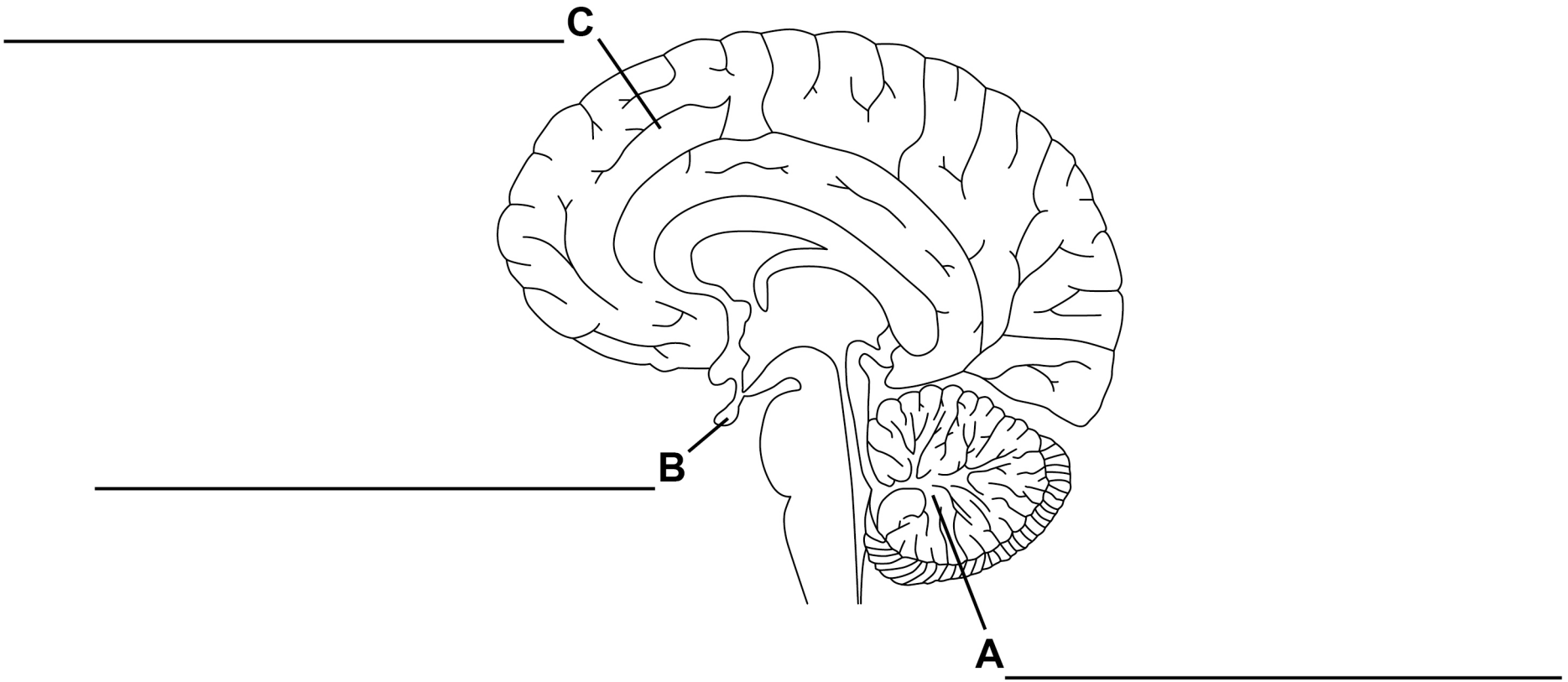
Describe the advantages AND disadvantages of having a kidney transplant instead of having dialysis. [4 marks]

[Turn over]

11

0 5 **FIGURE 6 shows the brain.**

FIGURE 6



0 5 . 1 **Label A, B and C on FIGURE 6. [3 marks]**

Choose answers from the list.

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

0 5 . 2 **Which part of the brain controls balance when riding a bicycle? [1 mark]**

Tick (✓) ONE box.

- ☐ **Cerebellum**
- ☐ **Medulla**
- ☐ **Pituitary gland**

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

Which word describes the brain? [1 mark]

Tick (✓) ONE box.

- ☐ **Coordinator**
- ☐ **Effector**
- ☐ **Receptor**
- ☐ **Stimulus**

0 5 . 4 **What type of cell carries impulses from the ears to the brain? [1 mark]**

_____

_____

0 5 . 5 **Human eyes detect light.**

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

Tick (✓) ONE box.

- ☐ **Iris**
- ☐ **Lens**
- ☐ **Retina**

[Turn over]

0 5 . 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.

0 5 . 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**

0 5 . 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**

[Turn over]

0 5 . 9 **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]

_____

_____

12

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[Turn over]

0 6 **FIGURE 8 shows what the extinct Siberian rhinoceros (‘Elasmotherium sibiricum’) might have looked like.**

FIGURE 8

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

Tick (✓) ONE box.

- ☐ **'Elasmotherium'**
- ☐ **'Elasmotherium sibiricum'**
- ☐ **'sibiricum'**

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

0 6 . 2 Which domain was the Siberian rhinoceros in? [1 mark]

Tick (✓) ONE box.

- ☐ **Archaea**
- ☐ **Eukaryota**
- ☐ **Prokaryota**

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

Tick (✓) ONE box.

- ☐ **Carl Woese**
- ☐ **Charles Darwin**
- ☐ **Gregor Mendel**

0 6 . 4 **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]

0 6 . 5 **The only parts of the Siberian rhinoceros that have been found are fossilised bones.**

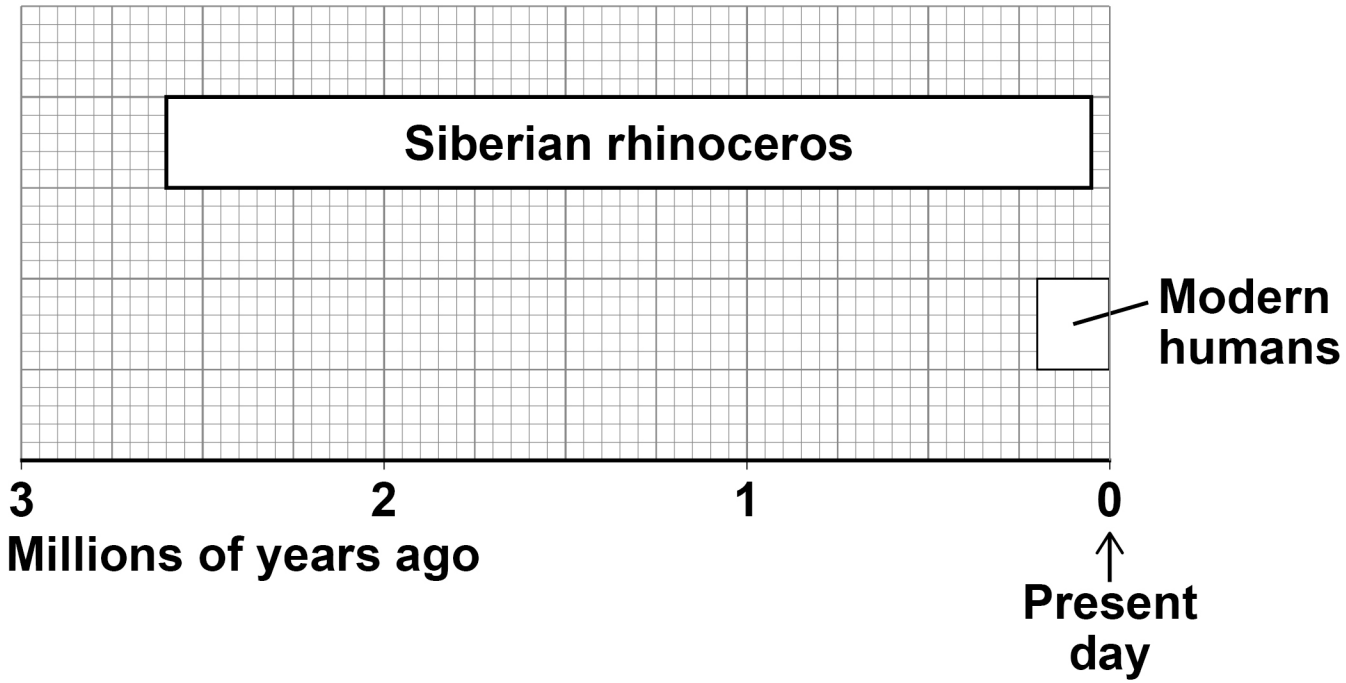
Give ONE reason why ONLY the bones of the body of the Siberian rhinoceros became fossils. [1 mark]

0 6 . 6 **Suggest how scientists can estimate when the Siberian rhinoceros was alive. [1 mark]**

[Turn over]

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

FIGURE 9



0 6 . 7 How many million years ago did the Siberian rhinoceros become extinct? [1 mark]

_____ million years ago

0 6 . 8 Determine the time in years when both the Siberian rhinoceros and modern humans existed together.

Use FIGURE 9 and your answer to Question 06.7. [3 marks]

_____

_____

_____

_____

Time = _____ years

[Turn over]

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

1 _____

_____

_____

2 _____

_____

_____

12

0 7 **This question is about DNA.**

0 7 . 1 **Describe the shape of a DNA molecule.**
[2 marks]

_____

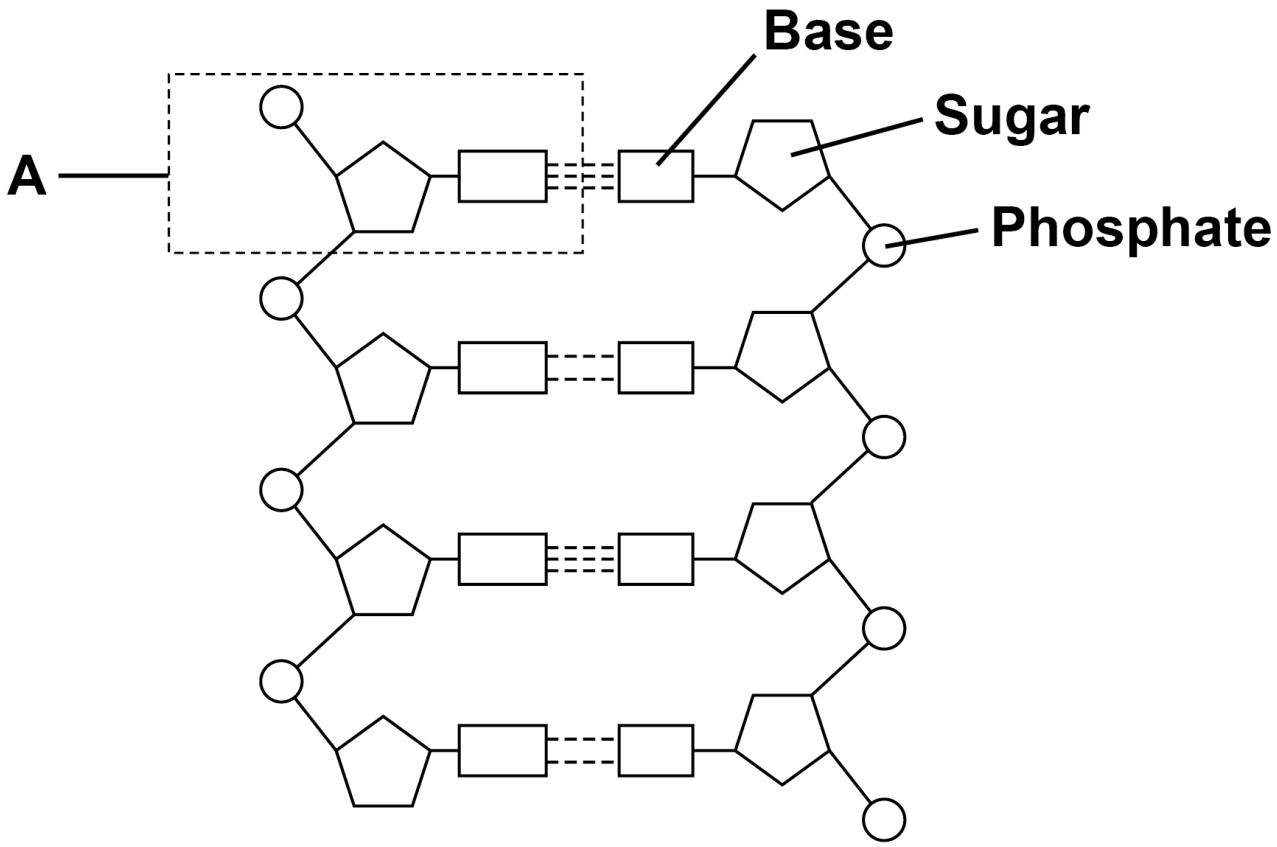
_____

_____

[Turn over]

FIGURE 10 shows part of a DNA molecule.

FIGURE 10



0 7 . 2 DNA codes for a sequence of amino acids.

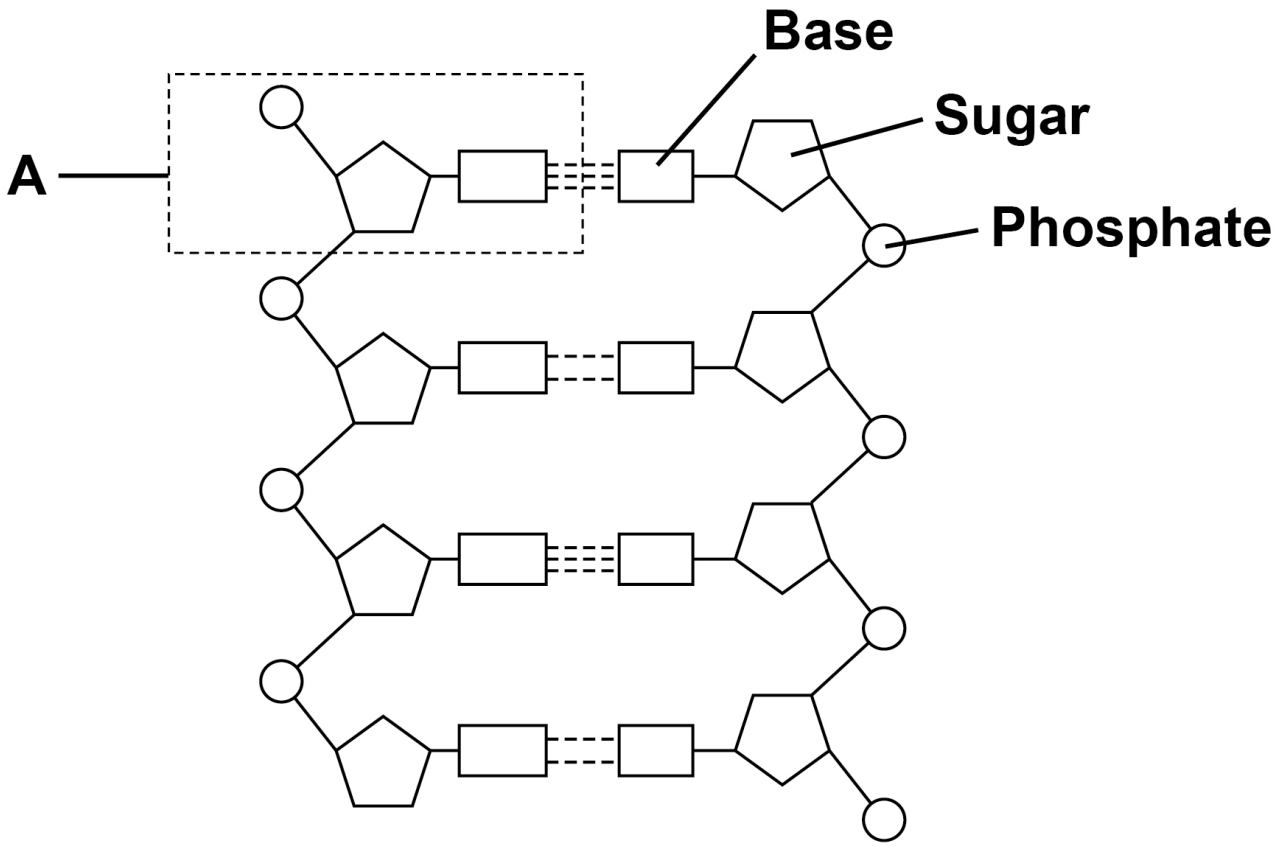
Which part of DNA forms the code for a particular amino acid? [1 mark]

Tick (✓) ONE box.

- ☐ **Bases**
- ☐ **Phosphates**
- ☐ **Sugars**

[Turn over]

REPEAT OF FIGURE 10



0 7 . 3 Which substance is produced when amino acids are joined together? [1 mark]

Tick (✓) ONE box.

- ☐ **Carbohydrate**
- ☐ **Fat**
- ☐ **Protein**

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

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

Tick (✓) ONE box.

- ☐ **Chromosome**
- ☐ **Enzyme**
- ☐ **Nucleotide**

[Turn over]

0 7 . 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]

Length = _____ million nm

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

1 metre = 1×10^9 nanometres [1 mark]

Length = _____ m

0 7 . 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]

_____

_____

_____

[Turn over]

9

0 8 **This question is about the decay of milk.**

0 8 . 1 **Name TWO types of microorganism that cause decay. [2 marks]**

1 _____

_____

2 _____

_____

0 8 . 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 8 . 3 **Give ONE way the pH can be measured. [1 mark]**

_____

_____

0 8 . 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.

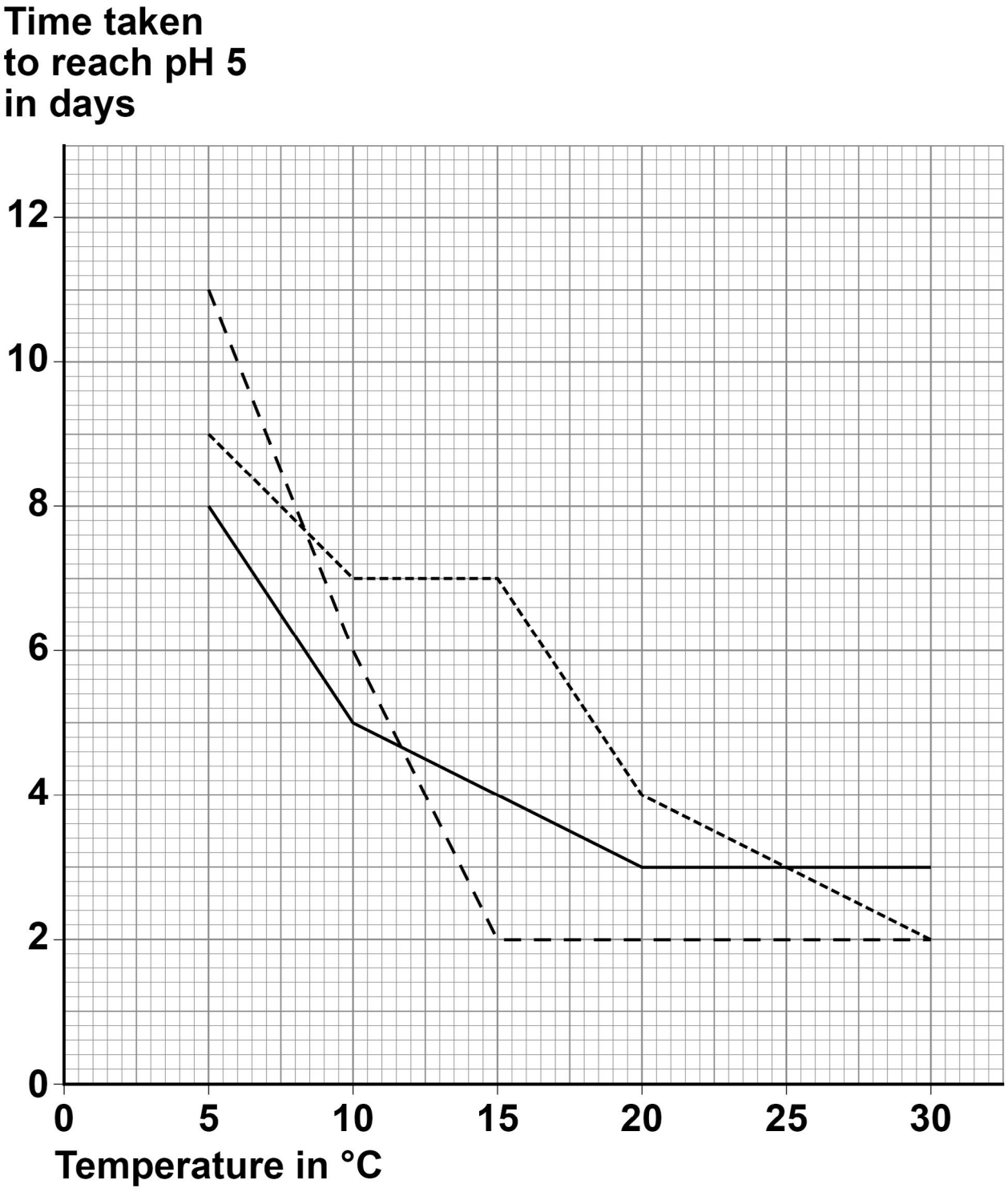
FIGURE 11, on the opposite page, shows the results.

0 8 . 5 **Which type of milk stays fresh the longest at 10 °C? [1 mark]**

0 8 . 6 **Describe the effect of temperature on the time taken for GOATS' milk to reach pH 5.**

Use data from FIGURE 11, on page 57, in your answer. [2 marks]

FIGURE 11



[Turn over]

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

1

2

0 8 . 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]

13

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

_____

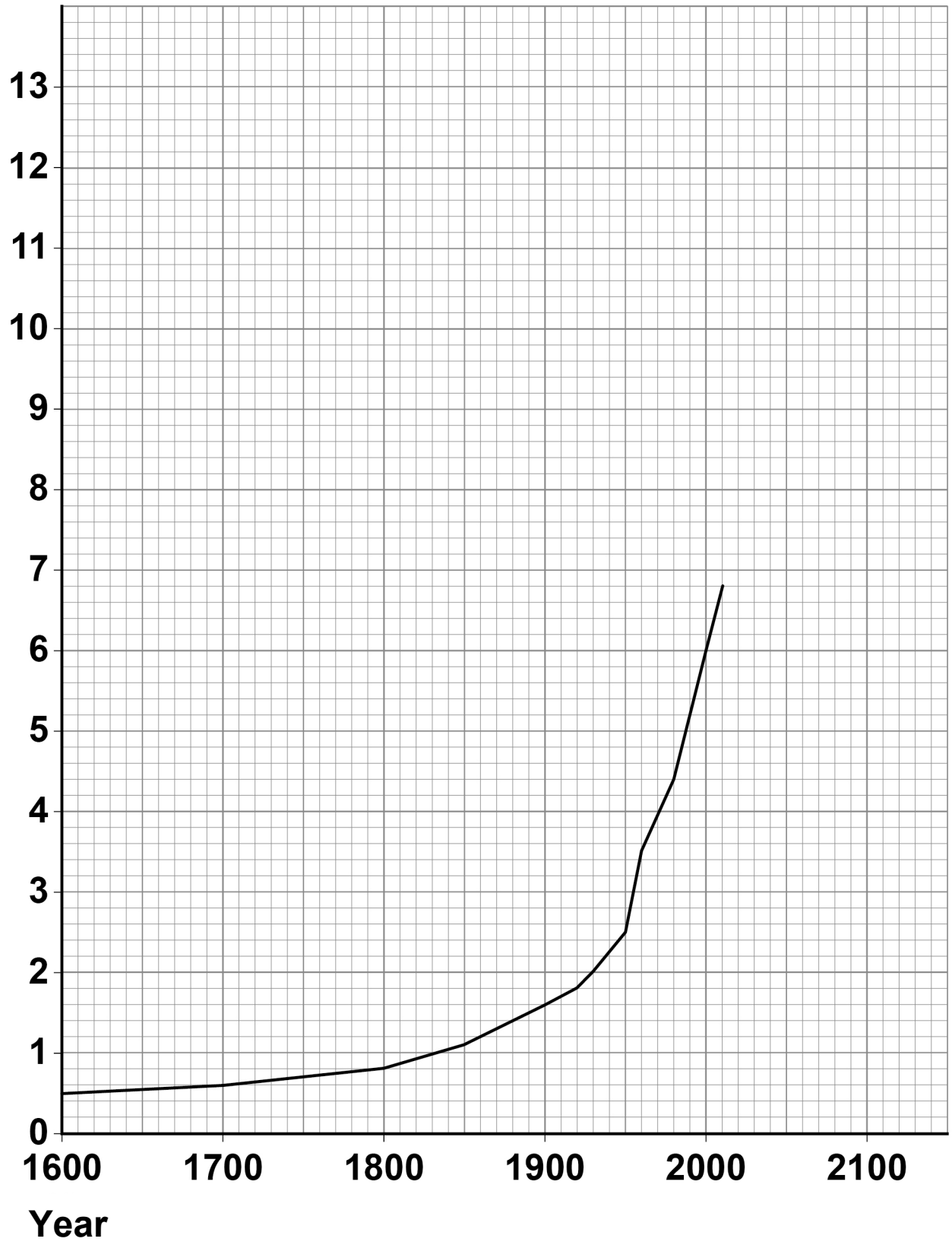
_____

_____

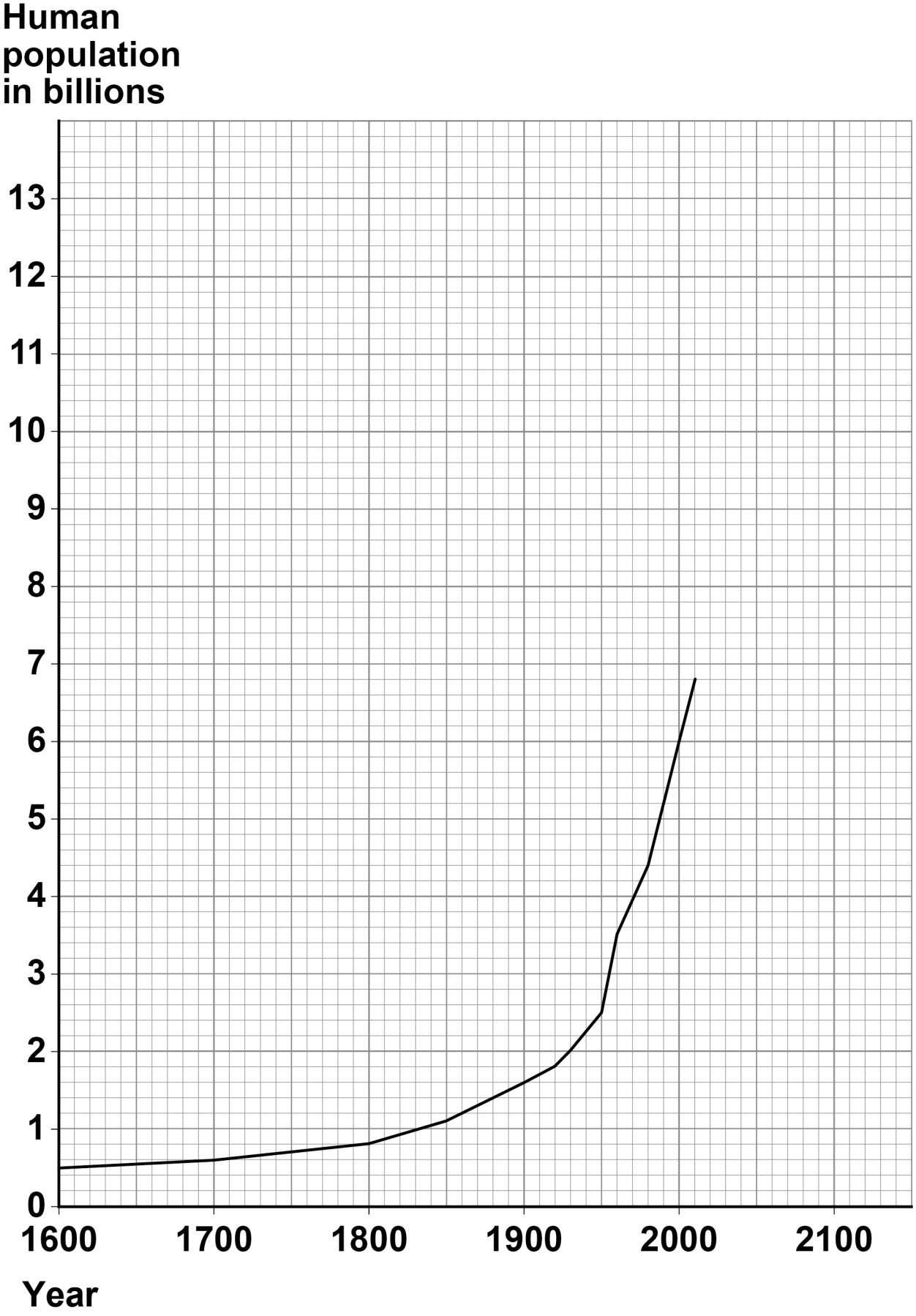
_____

Number of times greater = _____

FIGURE 12


Human population in billions
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1600
1700
1800
1900
2000
2100
Year

REPEAT OF FIGURE 12



0 9 . 2 **In 1950 the human population was 2.5 billion.**

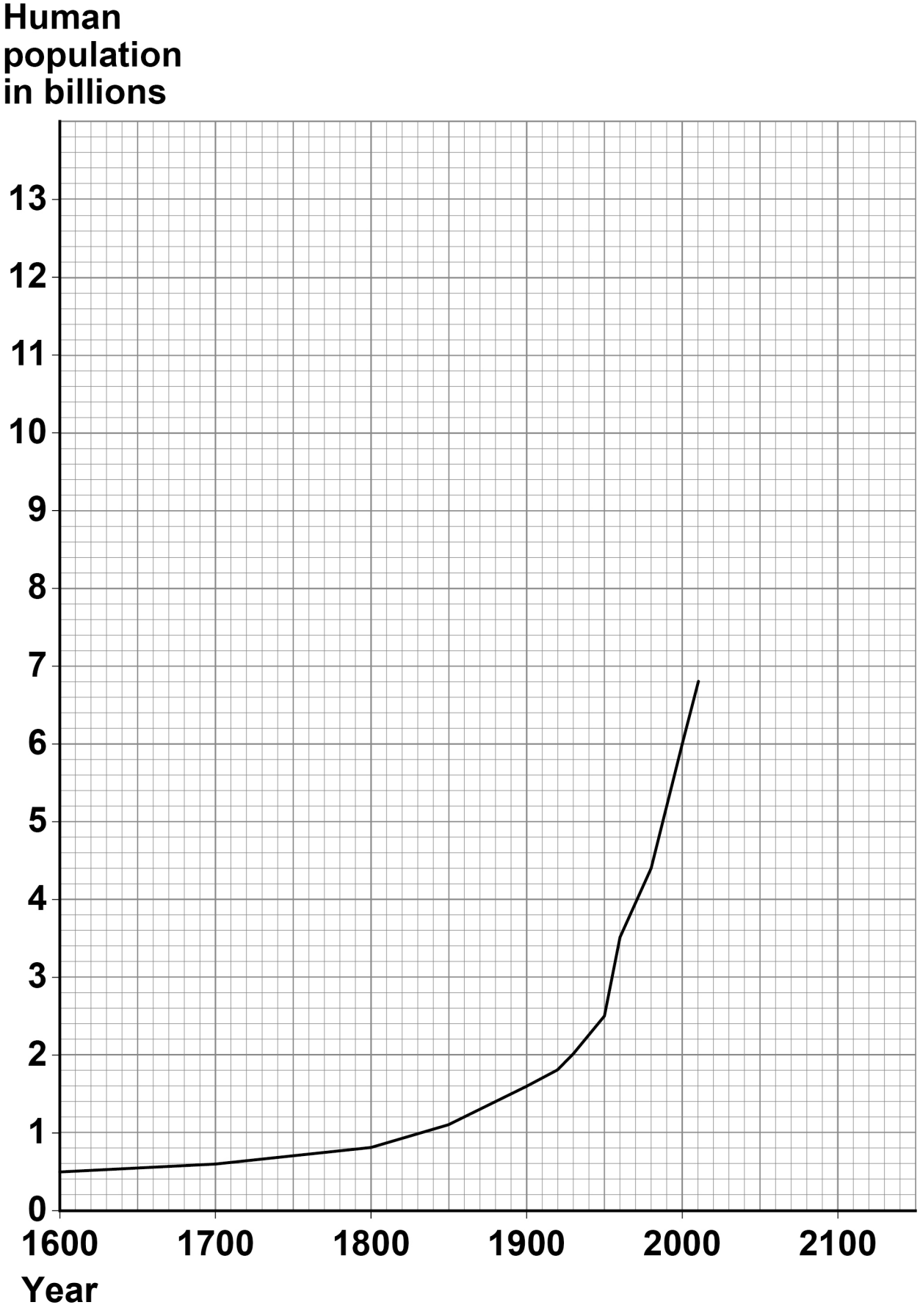
Calculate the mean annual increase in the human population between 1900 and 1950.
[2 marks]

Mean annual increase =

billion per year

[Turn over]

REPEAT OF FIGURE 12



0 9 . 3 **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]

Predicted human population =

[Turn over]

0 9 . 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 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]

0 9 . 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 9 . 7 **Suggest ONE reason why some people are concerned about the use of golden rice. [1 mark]**

_____

_____

_____

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.

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For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	