



Please write clearly in block capitals.

Centre number

Candidate number

Surname \_\_\_\_\_

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

I declare this is my own work.

# GCSE BIOLOGY

# F

Foundation Tier Paper 2F

Monday 1 June 2020

Afternoon

Time allowed: 1 hour 45 minutes

### Materials

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.
- Fill in the boxes at the top of this page.
- 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.

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



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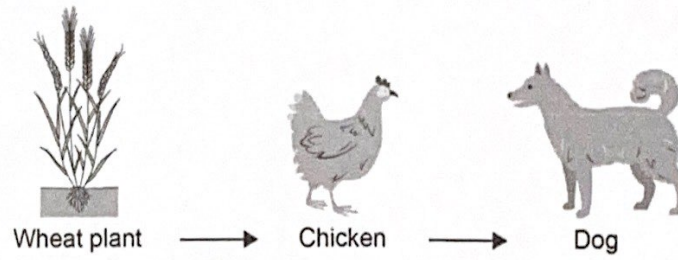
Answer all questions in the spaces provided.

0 1

A food for pet dogs contains meat from chickens.

Figure 1 shows the food chain.

Figure 1



0 1 . 1

What is the trophic level of the dog?

[1 mark]

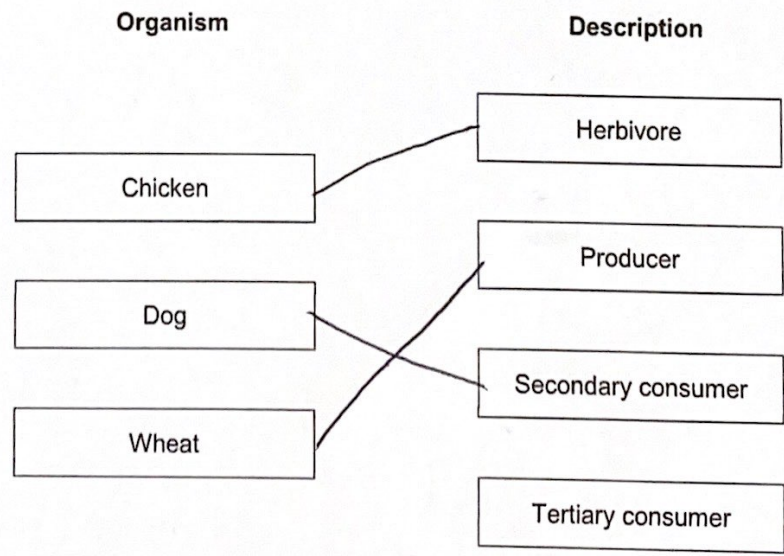
Tick (✓) one box.

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]





0 1 . 3 Name the process wheat plants use to make glucose.

[1 mark]

photosynthesis

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

Question 1 continues on the next page

Turn over ►



A new dog food has been developed.

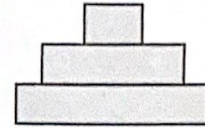
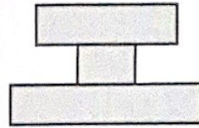
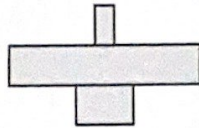
The new dog food is made from insects.

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.





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

Turn over for the next question

Turn over ►

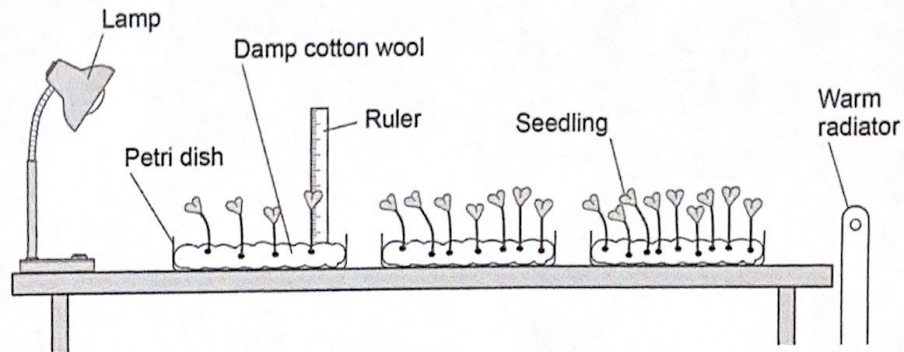


0 2

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.

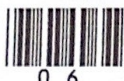
Give more water to the seedlings nearest the lamp

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





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 Light

2 Water

Question 2 continues on the next page

Turn over ►

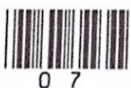
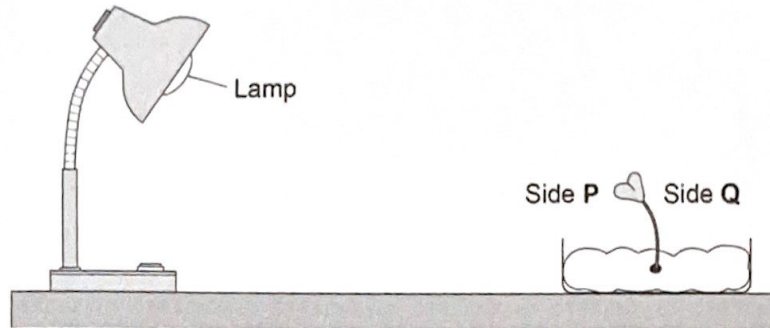


Figure 3 shows a seedling growing towards a lamp.

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





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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

Turn over for the next question

Turn over ►



03

Sperm cells and egg cells are formed by meiosis.

03.1

During meiosis a cell divides twice.

How many sperm cells are formed when a cell divides by meiosis?

[1 mark]

4

03.2

Human body cells contain 46 chromosomes.

How many chromosomes are in each human egg cell?

[1 mark]

23





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

Question 3 continues on the next page

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	(Dd)
	d	dd	dd

- 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]

mutation

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]

To find out if they have passed on the disorder  
so the family has time to prepare

10

Turn over for the next question

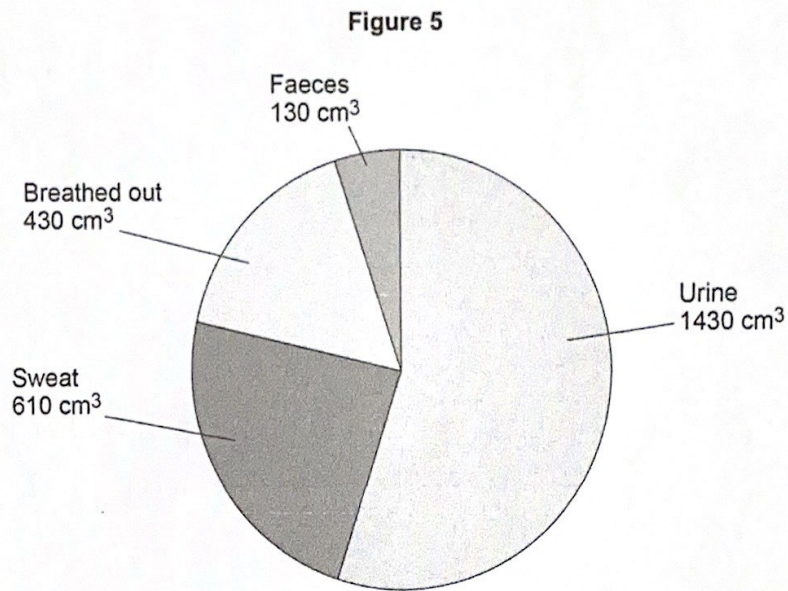
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0 4

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



0 4 . 1

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

Calculate the percentage of the total water loss that was lost as urine.

**[2 marks]**

$$\frac{1430}{2600} \times 100 = 55$$

Percentage lost as urine = 55 %

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]

The volume of sweat increases

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

Drink a lot

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

Choose answers from the box.

digestion

excretion

fertilisation

filtration

reabsorption

Blood entering the kidneys goes through the process of

filtration.

Glucose is **not** found in urine because of reabsorption.

Urine is removed from the body in the process of excretion.

Question 4 continues on the next page

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]

Having a kidney transplant means there will no longer be a need for long, regular visits to the hospital for dialysis which gives the patient a much more flexible lifestyle. They may also save money on transport costs when not having regular visits to the hospital. There will be a reduced risk of infection from less frequent needle usage and less need to control the diet. It is cheaper for the NHS in the long term. It can be ~~rejected~~ <sup>rejected</sup> by the body so patients will have to keep taking immunosuppressants. Suitable transplant donors can be hard to find and not available so could be on a long waiting list. The surgery itself can be risky and recovery will take a long time.

11

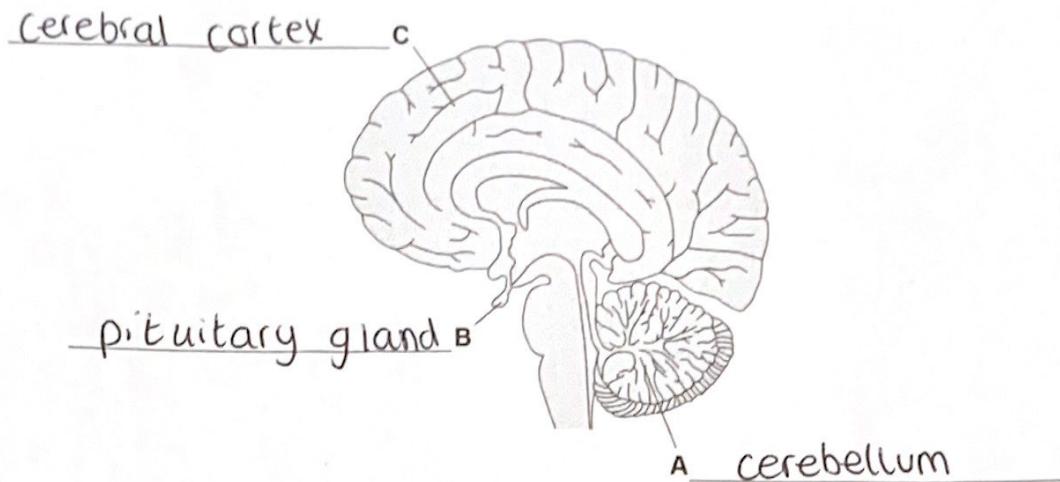




0 5

Figure 6 shows the brain.

Figure 6



0 5 . 1

Label A, B and C on Figure 6.

[3 marks]

Choose answers from the box.

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

Question 5 continues on the next page

Turn over ►



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]

neurone

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



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]

They will be able to see the ~~food~~  
fruit more easily and get more food.

Question 5 continues on the next page

Turn over ►





Figure 7 shows a student reading a book.

Figure 7



There are trees on the far side 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

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]

Short-sightedness

12

Turn over for the next question

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]

fighting with other rhinoceros and competing  
for mates.

Question 6 continues on the next page

Turn over ►



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]

Bones did not decay but soft tissues did decay.

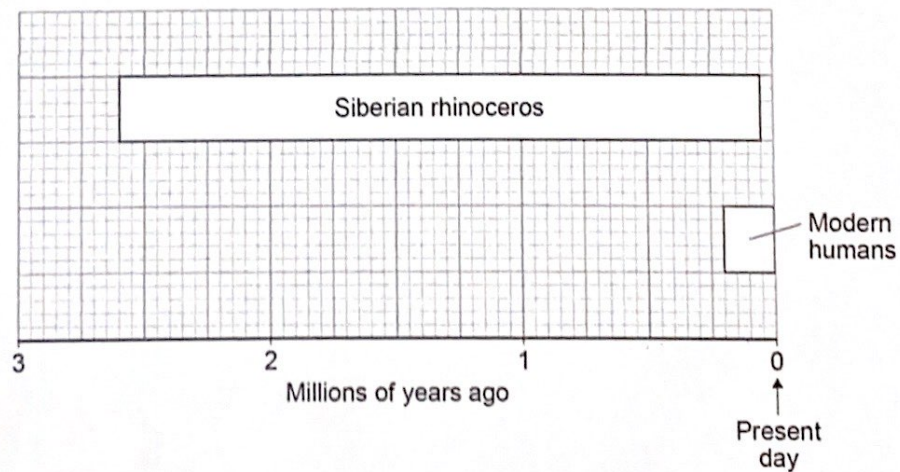
0 6 . 6 Suggest how scientists can estimate when the Siberian rhinoceros was alive.

[1 mark]

Comparison with fossils of known age.

**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]

0.05 million years ago

06.8

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]

~~0.2~~  $0.2 - 0.05 = 0.15$  million  
 $= 150\,000$  years

Time = 150 000 years

06.9

Suggest **two** factors that may have caused the extinction of the Siberian rhinoceros.

[2 marks]

- 1 Drought
- 2 Ice age

12

Turn over for the next question

Turn over ►





07

This question is about DNA.

07.1

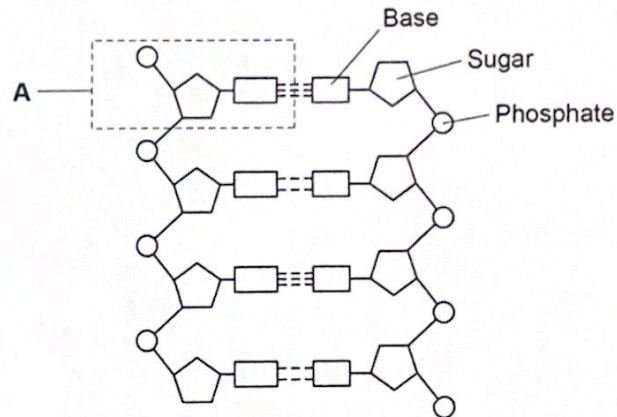
Describe the shape of a DNA molecule.

[2 marks]

DNA is made of 2 strands ~~and~~ coiled  
into a double helix structure.

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



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

Question 7 continues on the next page

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]

$$6000 \times 0.34 = 2040$$

Length = 2040 million nm

- 07.6** Give your answer to Question 07.5 in metres.

1 metre =  $1 \times 10^9$  nanometres

[1 mark]

$$2040000000 \div 1000000000$$

Length = 2.04 m

- 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]

To determine if the cancer is genetic so  
relatives can be warned.

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 Bacteria2 Fungi

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]

Fatty acids

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]

Universal indicator

0 8 . 4 Give **two** control variables the student should have used in this investigation.

[2 marks]

1 volume of milk

2 exposure to air

Question 8 continues on the next page

Turn over ►

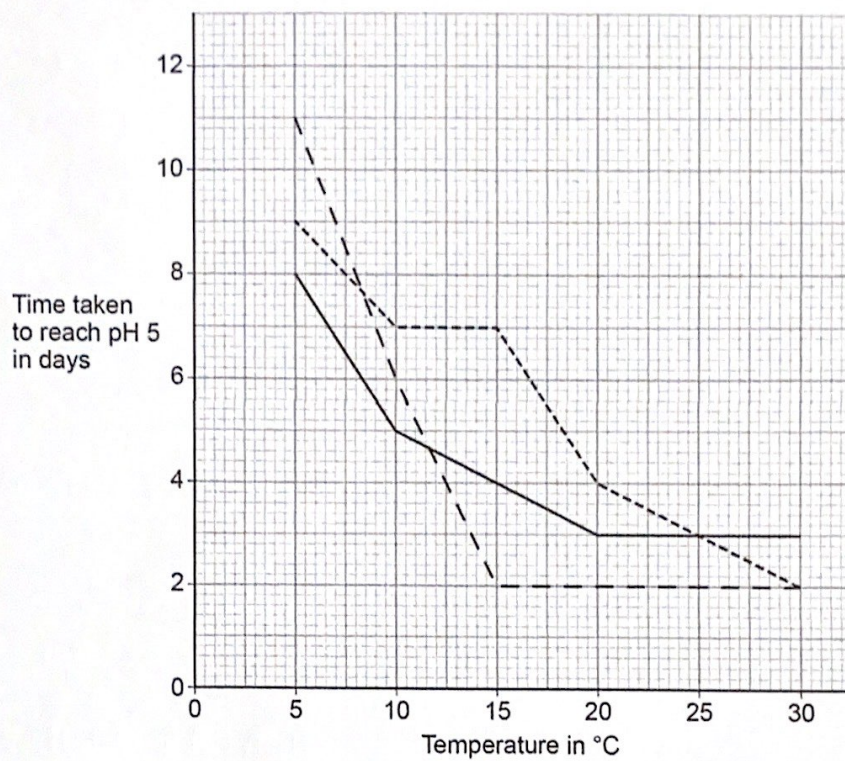




The student improved the investigation to produce valid results.

Figure 11 shows the results.

Figure 11



Key

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

0 8 . 5

Which type of milk stays fresh the longest at 10 °C?

[1 mark]

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]

The ~~temperature~~ increase in temperature (up to 15°C) decreases the time it takes for the milk to decay. Above 15°C the time it takes to decay stays the same.

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]

Bacteria in the milk are dividing faster due to the increased temperature.

0 8 . 8 Suggest two reasons why the different types of milk took different lengths of time to reach pH 5.

[2 marks]

- 1 They may have had different starting pH
- 2 They may contain different concentrations of fats and proteins

Question 8 continues on the next page

Turn over ►



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

13

Question 9 starts on page 36

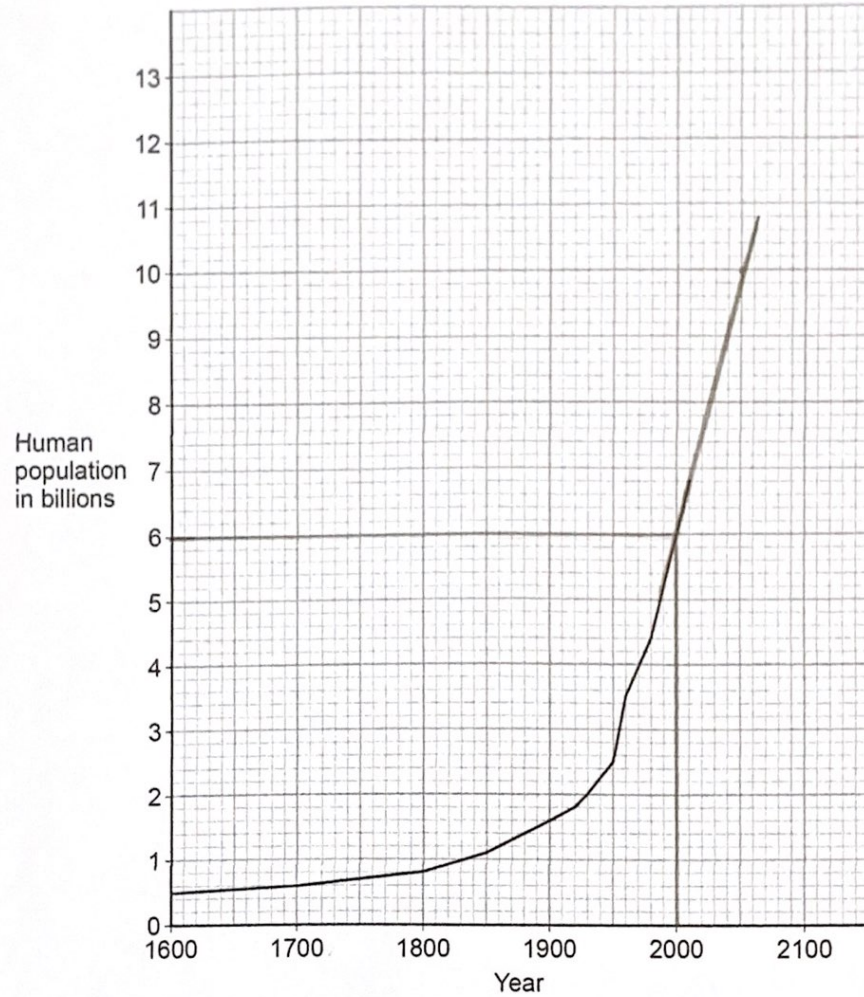




09

Figure 12 shows the human population from 1600 to 2010.

Figure 12



In 1900 the human population was 1.6 billion.

09.1

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

[2 marks]

$$\frac{6}{1.6} = 3.75$$

Number of times greater = 3.75





09.2 In 1950 the human population was 2.5 billion.

Calculate the mean annual increase in the human population between 1900 and 1950.

[2 marks]

$$2.5 - 1.6 = 0.9$$

$$\frac{0.9}{50} = 0.018$$

Mean annual increase = 0.018 billion per year

09.3 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 = 10 billion

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]

Fewer fish can be caught so the remaining fish can reproduce and bring fish stocks back up to a sustainable level.

Question 9 continues on the next page

Turn over ►



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]

The growing human population means there is an increased demand for food and fuel. Deforestation occurs to clear land for growing crops for food and biofuel and for rearing livestock for food. Deforestation causes habitat loss and consequently migration and extinction and therefore decreased biodiversity. Peat is also ~~is~~<sup>used</sup> for compost and burnt for fuel. Peat contains lots of carbon which is released into the atmosphere when burnt or disturbed as carbon dioxide which contributes to global warming. If species are unable to survive the changes in climate caused by this then they could become extinct and biodiversity will reduce. The use of pesticides and fertilisers to grow more crops can have disastrous consequences for insect population and marine ecosystems and can damage whole food chains. Hedgerows between fields are often destroyed to make room for more crops which removes habitats and encourages migration to find alternative food and shelter which decreases biodiversity in the area. Global warming is also worsened by the increase of carbon dioxide from farm animals and machinery which may affect biodiversity if species struggle to survive in the changing climates and become extinct or have to migrate.





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]

Gene may contaminate other breeds/species  
of rice.

16

END OF QUESTIONS

