AQA

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

Friday 9 June 2023 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 | |
| **TOTAL** | |

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**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Answer **all** questions in the spaces provided.

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**0 1** Hormones are important for controlling many processes in the human body.

Hormones are produced by glands.

**0 1 . 1** Which organ system has glands that produce hormones?

**[1 mark]**

Tick (✓) **one** box.

The circulatory system ☐

The endocrine system ☐

The nervous system ☐

**0 1 . 2** How are hormones transported around the body?

**[1 mark]**

Tick (✓) **one** box.

By the blood ☐

By the muscles ☐

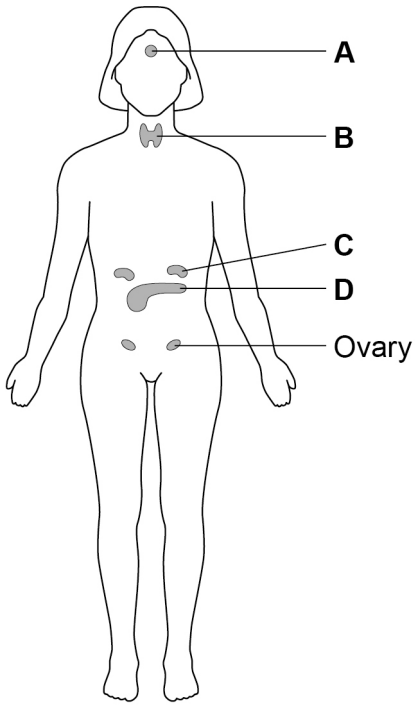
By the nerves ☐

**Question 1 continues on the next page**

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**Figure 1** shows glands in a woman's body.

**Figure 1**




**0 1 . 3** Draw **one** line from each gland to the name of that gland.

**[3 marks]**

| Gland | Name |
|---|---|
| **A** | Adrenal |
| **B** | Pituitary |
| **C** | Testes |
| | Thyroid |

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**0 1 . 4** Which gland in **Figure 1** produces insulin?

**[1 mark]**

Tick (✓) **one** box.

**A** ☐ **B** ☐ **C** ☐ **D** ☐

**0 1 . 5** Which organ does insulin mainly affect?

**[1 mark]**

Tick (✓) **one** box.

The brain ☐

The liver ☐

The ovary ☐

**0 1 . 6** Give **one** effect of insulin.

**[1 mark]**

_____

_____

**Question 1 continues on the next page**

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Some hormones control a woman's menstrual cycle.

**0 1 . 7** Which hormone causes an egg to mature in the ovary?

**[1 mark]**

Tick (✓) **one** box.

Adrenaline ☐

Follicle stimulating hormone (FSH) ☐

Testosterone ☐

**0 1 . 8** Which **two** are hormones that help to maintain the lining of the uterus during pregnancy?

**[2 marks]**

Tick (✓) **two** boxes.

Amylase ☐

Oestrogen ☐

Progesterone ☐

Protease ☐

Thyroxine ☐

*Do not write outside the box*

**0 1 . 9** Contraception prevents pregnancy.

Give **two** methods of contraception that use hormones.

**[2 marks]**

1 _____

_____

2 _____

_____

**13**

**Turn over for the next question**

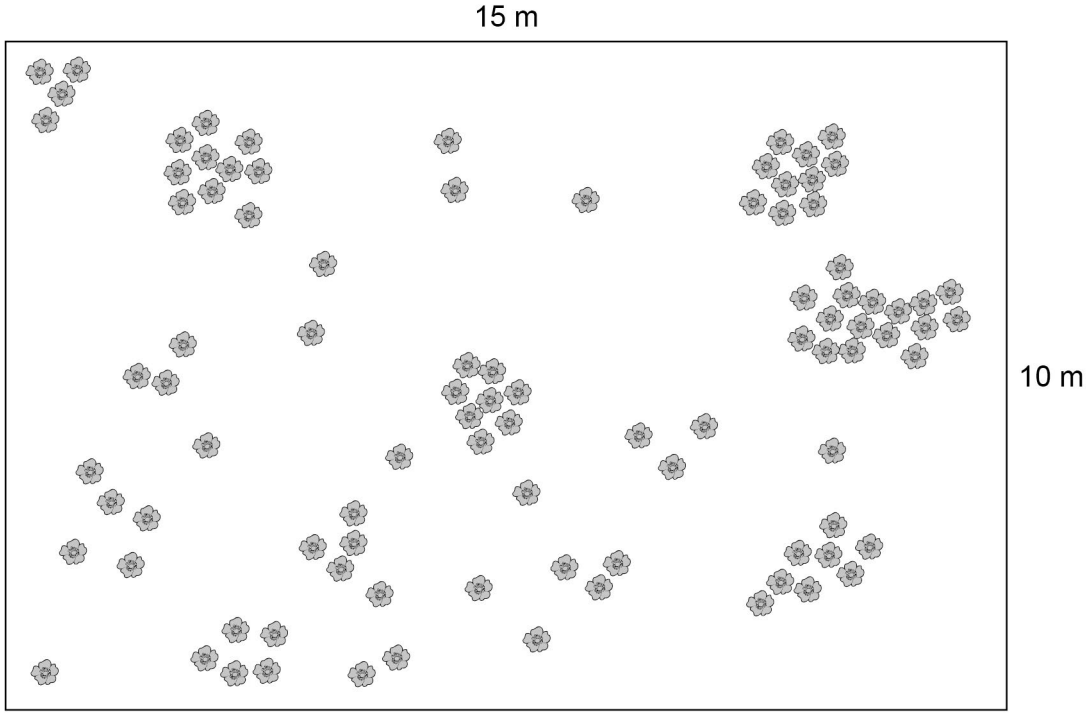
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**0 2** Students estimated the population of buttercup plants growing on a lawn.

The lawn is a rectangle measuring 15 m × 10 m.

**Figure 2** shows the lawn.

**Figure 2**




**Key**

Buttercup plant

This is the method used.

1. Measure the length and width of the lawn.
2. Choose five locations to sample.
3. Place a 1 m × 1 m square frame at each location.
4. Record the number of buttercup plants in each square frame.

*Do not write outside the box*

**0 2 . 1** Complete the sentences.

Choose answers from the box.

**[2 marks]**

| | | |
|---|---|---|
| **15 cm ruler** | | **30 m tape measure** |
| **balance** | **quadrat** | **transect** |

The length and width of the lawn should be measured

using a _____ .

The 1 m × 1 m square frame is called a _____ .

**0 2 . 2** How should the students choose the five locations to sample?

**[1 mark]**

Tick (✓) **one** box.

Choose locations at random. ☐

Choose locations at the corners of the lawn. ☐

Choose locations with lots of buttercup plants. ☐

Choose locations with no buttercup plants. ☐

**Question 2 continues on the next page**

*Do not write outside the box*

**Table 1** shows the results.

**Table 1**

| Sample number | Number of buttercup plants |
|---|---|
| 1 | 2 |
| 2 | 7 |
| 3 | 0 |
| 4 | 0 |
| 5 | 1 |

The students used their results to calculate the population of buttercup plants.

**0 2 . 3** Complete the sentences.

Choose answers from the box.

**[2 marks]**

| **area** | **mean** | **median** | **perimeter** | **volume** |
|---|---|---|---|---|

Multiply the length of the lawn by the width of the lawn to give the lawn's _____ .

Add up the total number of buttercup plants and divide by 5 to give the _____ .

*Do not write outside the box*

**0 2 . 4** The students calculated that the population of buttercup plants on the lawn was 300.

How did the students use the results in **Table 1** to calculate the population?

**[1 mark]**

**0 2 . 5** How could the students improve the accuracy of the estimate?

**[1 mark]**

Tick (✓) **one** box.

Count and record more samples. ☐

Select locations in the middle of the lawn. ☐

Use a square frame measuring 0.5 m × 0.5 m. ☐

**0 2 . 6** One **abiotic** factor that affects the number of buttercup plants on the lawn is soil pH.

Give **one** other **abiotic** factor that could affect the number of buttercup plants on the lawn.

Do **not** refer to soil pH in your answer.

**[1 mark]**

**8**

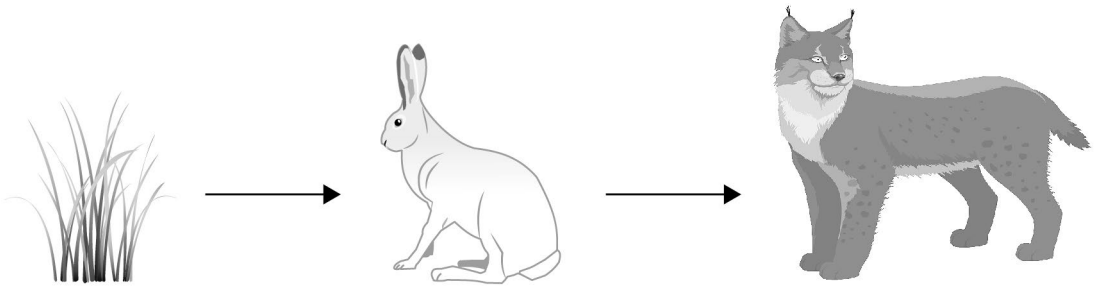
**Turn over for the next question**

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**0 3** Different species in a habitat may depend on each other for food.

**Figure 3** shows a food chain.

**Figure 3**




**0 3 . 1** The grass needs energy to grow.

What is the source of energy for the grass?

**[1 mark]**

*Do not write outside the box*

**0 3 . 2** **Table 2** lists different types of feeding relationship.

**Table 2**

| **Feeding relationship** | **Organism** |
|---|---|
| Secondary consumer | Lynx |
| Primary consumer | |
| Producer | |
| Herbivore | |
| Carnivore | |
| Prey | |
| Predator | |

Write the name of **one** organism from **Figure 3** in each box in **Table 2**.

**[3 marks]**

Each organism may be written in one box or in more than one box.

The first box has been completed for you.

**Question 3 continues on the next page**

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**Question 3 continues on the next page**

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**ANSWER IN THE SPACES PROVIDED**

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**0 3 . 3** **Figure 4** shows the appearance of the snowshoe hare in the summer and in the winter.

**Figure 4**

**Snowshoe hare in summer**



**Snowshoe hare in winter**



The snowshoe hare has a different fur colour in the summer than in the winter.

Explain how the different fur colour increases the chance of survival of the snowshoe hare.

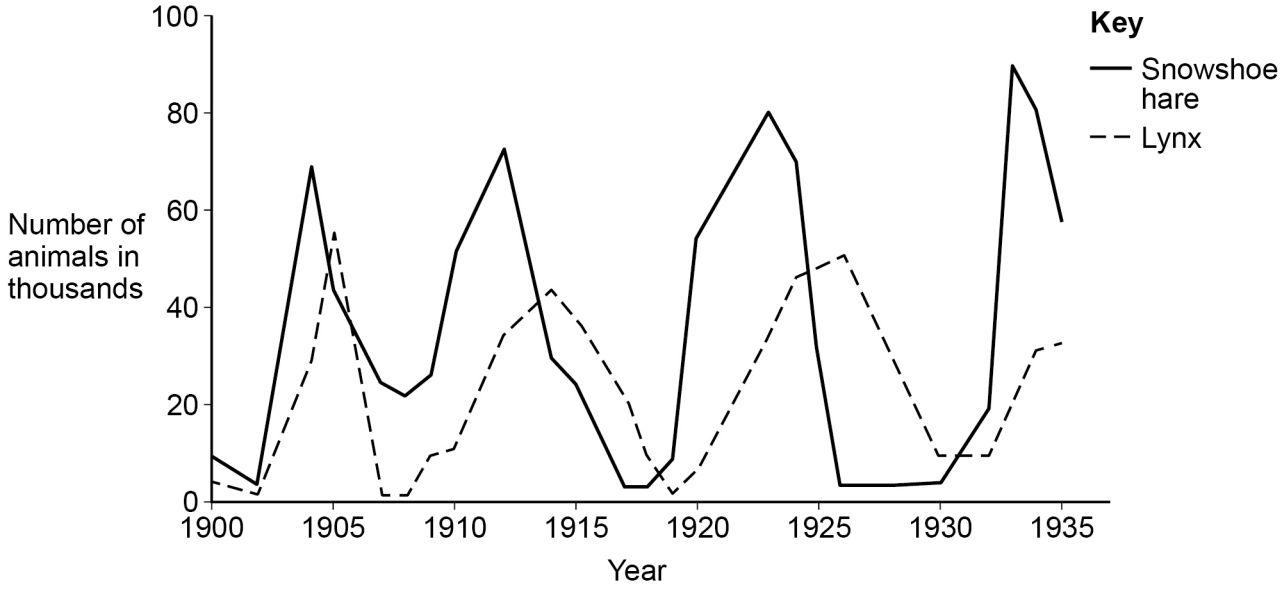
**[3 marks]**

**Question 3 continues on the next page**

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**Figure 5** shows how the number of snowshoe hares and the number of lynx varied in one area between 1900 and 1935.

**Figure 5**




**0 3 . 4** **Figure 5** shows that the number of snowshoe hares and the number of lynx increase and decrease several times.

Suggest **two** reasons why the number of **snowshoe hares** increases.

**[2 marks]**

1 _____

_____

2 _____

_____

*Do not write outside the box*

**0 3 . 5** The number of snowshoe hares increased and decreased four times between 1900 and 1935.

What effect does an **increase** in the number of snowshoe hares have on the number of lynx?

**[1 mark]**

**0 3 . 6** Suggest **one** reason why the number of lynx decreased from 1915 to 1919.

Use information from **Figure 5**.

**[1 mark]**

**0 3 . 7** When the snowshoe hare eats grass, about 90% of the biomass of the grass is lost.

Give **two** ways the biomass is lost.

**[2 marks]**

1

2

**13**

**Turn over for the next question**

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**0 4** Some farmers keep cows indoors in large sheds.

Other farmers keep cows outdoors in fields of grass.

**Figure 6** shows cows being kept indoors and outdoors.

**Figure 6**

**Cows kept indoors**



**Cows kept outdoors**



**Table 3** shows the energy inputs and energy outputs for keeping cows.

**Table 3**

| | Energy in kJ/m$^2$/year | |
|---|---|---|
| | **Indoors** | **Outdoors** |
| **Input as food** | 10 000 | 5 950 |
| **Input as fossil fuel** | 6 000 | 50 |
| **Output as meat and milk** | 40 | 2 |

**0 4 . 1** Calculate the total energy input for keeping cows **outdoors**.

Use data from **Table 3**.

**[1 mark]**

Total energy input = _____ kJ/m$^2$/year

*Do not write outside the box*

**0 4 . 2** The total energy input for keeping cows **indoors** is 16 000 kJ/m$^2$/year.

Calculate the percentage efficiency of keeping cows **indoors**.

Use the equation:

$$\text{percentage efficiency} = \frac{\text{energy output}}{\text{total energy input}} \times 100$$

**[2 marks]**

Percentage efficiency = _____ %

**0 4 . 3** The percentage efficiency of keeping cows outdoors is 0.03%.

Why is it more energy efficient to keep cows indoors than to keep cows outdoors?

**[2 marks]**

Tick (✓) **two** boxes.

- Cows are more stressed indoors. ☐
- Cows move less indoors. ☐
- It is noisier indoors. ☐
- It is warmer indoors. ☐
- There is less light indoors. ☐

Diseases in cows can cause problems for farmers.

**0 4 . 4** Suggest why diseases spread more quickly when the cows are kept indoors.

**[1 mark]**

*Do not write outside the box*

One species of bacterium causes a disease in cows.

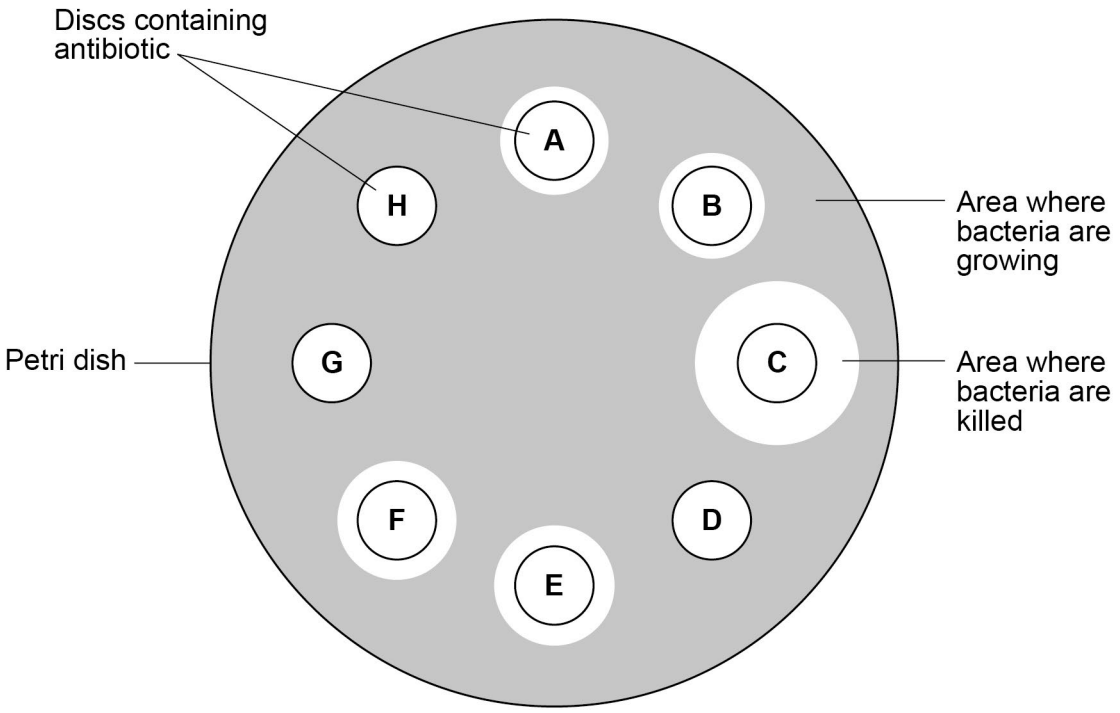
Scientists investigated the effect of eight different antibiotics on the growth of this species of bacterium.

The scientists put discs containing the different antibiotics onto a Petri dish containing the bacteria.

Antibiotics **A** to **H** were used in the investigation.

**Figure 7** shows what the Petri dish looked like after 2 days.

**Figure 7**




**0 4 . 5** This species of bacterium is resistant to some of the antibiotics.

Give the letter of **one** antibiotic the bacterium is resistant to.

**[1 mark]**

_____

*Do not write outside the box*

**0 4 . 6** Complete the sentence.

Choose the answer from the box.

**[1 mark]**

| carbohydrate | DNA | lipid |
|---|---|---|

Antibiotic resistance in a single bacterium is caused by a change in the bacterium's _____ .

**0 4 . 7** Complete the sentence.

Choose the answer from the box.

**[1 mark]**

| excretion | feeding | reproduction |
|---|---|---|

A change in one bacterium can cause millions of bacteria to become resistant to the antibiotic.

This is because bacteria have a high rate of _____ .

**0 4 . 8** Suggest why the production of millions of antibiotic-resistant bacteria is a problem for farmers.

**[2 marks]**

_____

_____

_____

_____

**11**

**Turn over for the next question**

*Do not write outside the box*

**0 5** Bacteria are one type of organism that cause decay.

**0 5 . 1** Which other type of organism causes decay?

**[1 mark]**

Tick (✓) **one** box.

Fungi ☐

Plants ☐

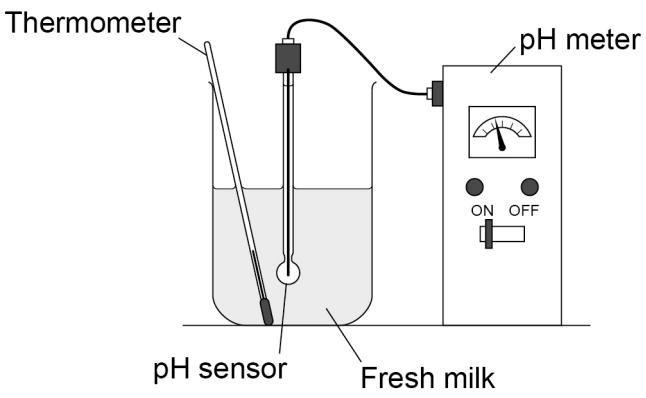
Viruses ☐

Students investigated the effect of temperature on the decay of milk.

The decay was caused by bacteria in the milk.

**Figure 8** shows the apparatus used.

**Figure 8**




This is the method used.

1. Set up the apparatus as shown in **Figure 8** with the milk at 20 °C.
2. Record the pH each day for 7 days.
3. Repeat with more samples of milk at 5 °C and at 30 °C.

*Do not write outside the box*

**0 5 . 2** What was the dependent variable in the investigation?

**[1 mark]**

Tick (✓) **one** box.

The pH of the milk ☐

The type of milk ☐

The volume of the milk ☐

**0 5 . 3** How could the students keep the milk at 30 °C for 7 days?

**[1 mark]**

Tick (✓) **one** box.

Put a lid on the beaker. ☐

Put the beaker in a water bath. ☐

Stir the milk continuously. ☐

Wrap cloth around the beaker. ☐

**0 5 . 4** As the milk decays, the bacteria digest fats in the milk.

What type of acid is produced by digestion of fats in the milk?

**[1 mark]**

Tick (✓) **one** box.

Amino acid ☐

Fatty acid ☐

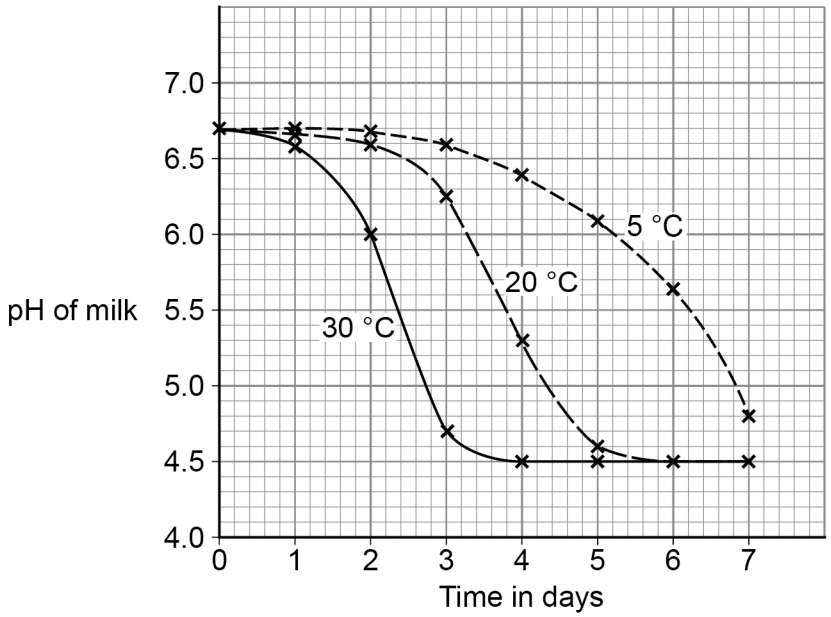
Hydrochloric acid ☐

**Question 5 continues on the next page**

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**Figure 9** shows the results.

**Figure 9**




**0 5 . 5** Why did the pH **not** fall below pH 4.5 at 20 °C?

**[1 mark]**

Tick (✓) **one** box.

All the fat had been digested. ☐

The reaction was too fast. ☐

The temperature was too low. ☐

*Do not write outside the box*

The digestion of fat was fastest at 30 °C and slowest at 5 °C.

**0 5 . 6** Give **one** reason why the rate of digestion was faster at 30 °C than at 5 °C.

**[1 mark]**

**0 5 . 7** Calculate the rate of digestion at 30 °C from day 2 to day 3.

Complete the following calculation.

Use data from **Figure 9**.

**[2 marks]**

At 30 °C, the pH at day 2 = _____

At 30 °C, the pH at day 3 = _____

Therefore the fall in pH at 30 °C from day 2 to day 3 = _____ pH units/day

**0 5 . 8** The rate of digestion at 5°C from day 2 to day 3 is 0.1 pH units/day.

How many times faster is the rate of digestion at 30°C than the rate of digestion at 5°C from day 2 to day 3?

**[2 marks]**

Use your answer to Question **05.7**.

Rate at 30 °C is _____ times faster

**10**

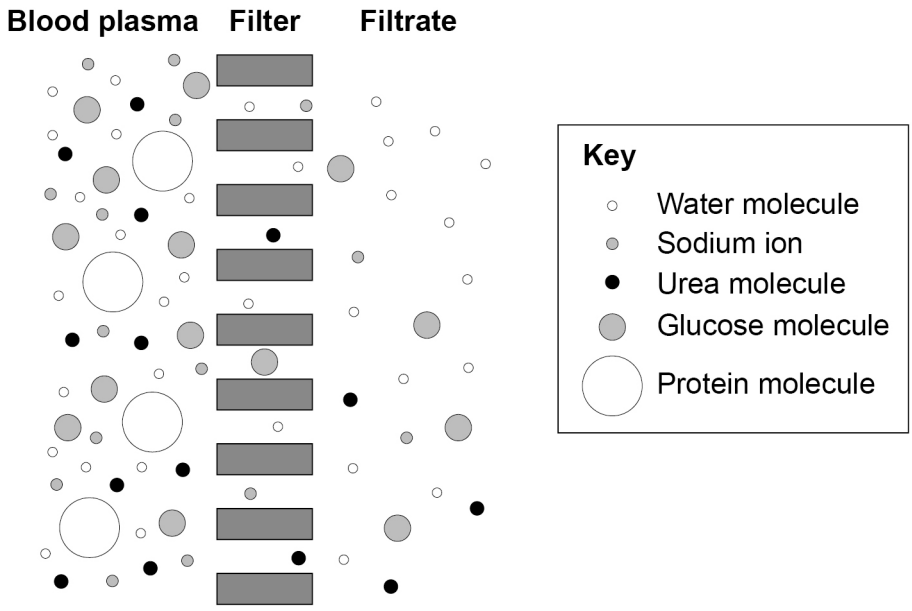
**Turn over for the next question**

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**0 6** The kidneys filter the blood.

**Figure 10** shows filtration in the kidney.

**Figure 10**




**0 6 . 1** Glucose molecules are found in the blood plasma **and** in the filtrate.

Protein molecules are **only** found in the blood plasma.

Draw **one** line from each substance to the reason for where the substance is found.

**[2 marks]**

| Substance | Reason |
|---|---|
| Glucose | The molecules are too large to pass through the filter |
| | The molecules are small enough to pass through the filter |
| Protein | |
| | The molecules are too small to pass through the filter |

*Do not write outside the box*

**0 6 . 2** The kidneys control the volume of water in the body.

**Table 4** shows information about a person on one day.

**Table 4**

| | **Volume in $dm^3$** |
|---|---|
| Water filtered from blood | 160.0 |
| Water lost in urine | 1.9 |

Calculate the volume of water reabsorbed into the blood.

**[1 mark]**

Volume = _____ $dm^3$

**Question 6 continues on the next page**

*Do not write outside the box*

**0 6 . 3** A person with kidney disease may be treated by dialysis or by having a kidney transplant.

**Figure 11** gives information about dialysis and kidney transplants.

**Figure 11**

**Dialysis**

- A person needs 3 dialysis sessions a week, with each session lasting about 8 hours.
- Most patients have dialysis in hospital.
- Protein and salt levels in food must be kept low.
- Dialysis costs £35 000 per year for each patient.

**Kidney transplant**

- In a surgical operation the use of a general anaesthetic can occasionally cause damage to other organs.
- After a transplant the patient must take drugs for the rest of their life to suppress the immune system.
- A transplant costs £17 000 in the first year and then £5 000 in each of the following years for drugs.
- The transplanted kidney will work well for about 10 years.

*Do not write outside the box*

A doctor states:

‘It is better to treat a person with kidney disease by using a kidney transplant rather than by dialysis.’

Evaluate the doctor’s statement.

Use information from **Figure 11**.

**[6 marks]**

**Question 6 continues on the next page**

*Do not write outside the box*

**0 6 . 4** A kidney transplant costs £17 000 in the first year and then £5 000 in each of the following years for drugs.

Calculate the total cost of treatment by kidney transplant over the first 5 years.

**[3 marks]**

Total cost = £ _____

**12**

*Do not write outside the box*

**0 7** Many different species can live together in the same habitat.

**0 7 . 1** What name is given to all of the organisms living in the same habitat?

**[1 mark]**

Tick (✓) **one** box.

A community ☐

A food chain ☐

A population ☐

An ecosystem ☐

**Question 7 continues on the next page**

*Do not write outside the box*

**Figure 12** shows four species of bird from the same habitat in the UK.

**Figure 12**



**Brambling (*Fringilla montifringilla*)**



**Bullfinch (*Pyrrhula pyrrhula*)**



**Chaffinch (*Fringilla coelebs*)**



**Goldfinch (*Carduelis carduelis*)**

*Do not write outside the box*

**0 7 . 2** Which species of bird in **Figure 12** do scientists think are most closely related?

**[1 mark]**

Tick (✓) **one** box.

Brambling and chaffinch ☐

Brambling and goldfinch ☐

Bullfinch and chaffinch ☐

Bullfinch and goldfinch ☐

**0 7 . 3** Scientists think the brambling and the bullfinch belong to different species.

What evidence is used by scientists to classify the brambling and the bullfinch as different species?

**[1 mark]**

Tick (✓) **one** box.

The brambling and the bullfinch are different sizes. ☐

The brambling and the bullfinch cannot breed together to give fertile offspring. ☐

The brambling and the bullfinch live in different parts of the habitat. ☐

The brambling eats mainly seeds and the bullfinch eats mainly insects. ☐

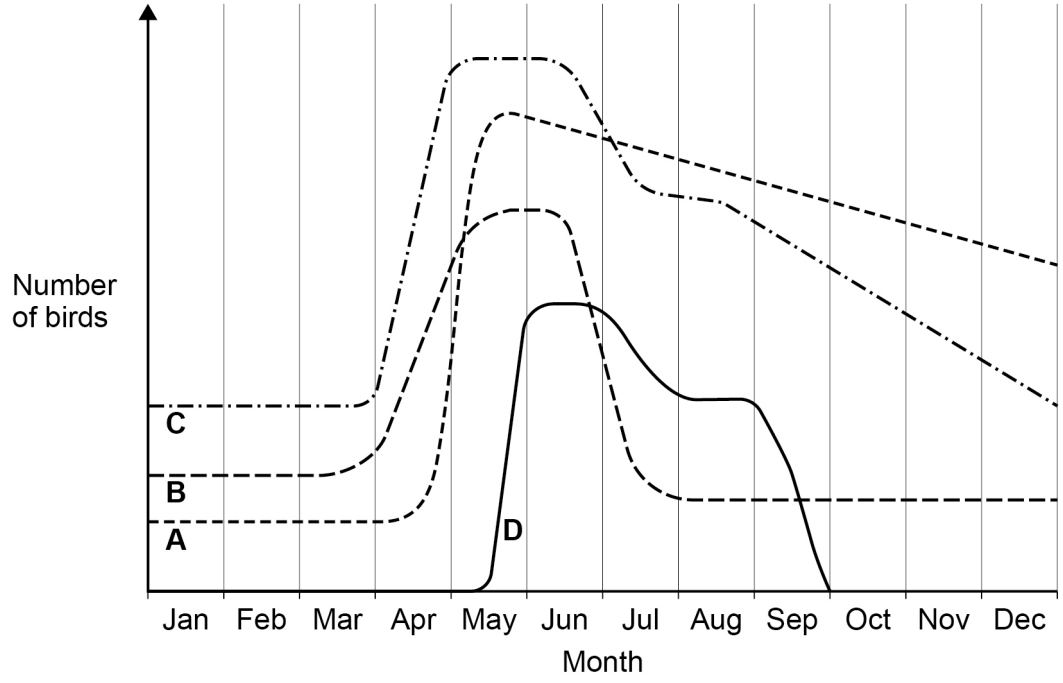
**Question 7 continues on the next page**

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Four other species of bird (**A**, **B**, **C** and **D**) live in a habitat in the UK.

**Figure 13** shows how the numbers of each species of bird varied during one year.

**Figure 13**




Use information from **Figure 13** to answer Questions **07.4** to **07.6**

**0 7 . 4** Describe what happens to the number of birds of species **A** during the year.

**[3 marks]**

*Do not write outside the box*

**0 7 . 5** In June and July, a disease affected the populations of some of the species.

Which species had the **lowest** resistance to the disease?

**[1 mark]**

Tick (✓) **one** box.

**A** ☐ **B** ☐ **C** ☐ **D** ☐

**0 7 . 6** One species migrates between the UK and other countries.

Which species migrates between the UK and other countries?

Give a reason for your answer.

**[1 mark]**

Species _____

Reason _____

_____

_____

**8**

**Turn over for the next question**

*Do not write outside the box*

**0 8** A person's eyes can focus on objects at different distances.

A person looks at a distant object.

The person then looks at a near object.

The person's eyes make adjustments so that the near object forms a clear image.

**0 8 . 1** Which term describes the adjustment of focus from the distant object to the near object?

**[1 mark]**

Tick (✓) **one** box.

Accommodation ☐

Adaptation ☐

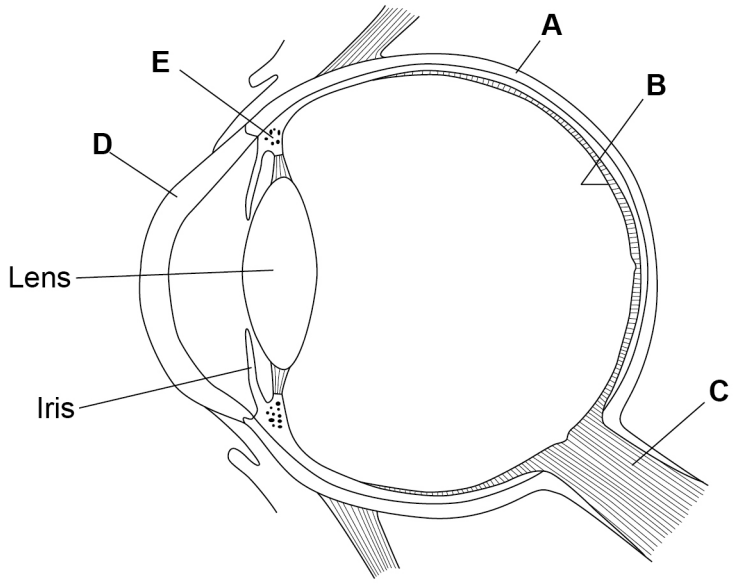
Hyperopia ☐

Myopia ☐

**Figure 14** shows the eye.

**Figure 14**

.



*Do not write outside the box*

**0 8 . 2** Which structure in **Figure 14** is where the image is focused?

**[1 mark]**

Tick (✓) **one** box.

**A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

**0 8 . 3** Which structure in **Figure 14** is a muscle that contracts when focusing on a near object?

**[1 mark]**

Tick (✓) **one** box.

**A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

**0 8 . 4** What happens to the shape of the lens when focusing on a near object?

**[1 mark]**

**0 8 . 5** The eyes can function in dimly-lit areas and in brightly-lit areas.

The iris contains muscles.

Describe how muscles in the iris help the person to see clearly when moving from a dimly-lit area to a brightly-lit area.

**[2 marks]**

**Question 8 continues on the next page**

*Do not write outside the box*

**0 8 . 6** It is important to be able to react quickly.

Many people think that drinking coffee decreases reaction time.

Plan an investigation to test the effect of drinking coffee on reaction time.

You should include:

- the test for reaction time that you would use
- how to make the investigation valid.

**[4 marks]**

**10**

*Do not write outside the box*

**Turn over for the next question**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

*Do not write outside the box*

**0 9** Reproduction can produce offspring which are:

- genetically different

  **or**

- genetically identical.

Farmers grow tomato plants in greenhouses.

The tomatoes are sold in supermarkets.

**0 9 . 1** Suggest **one** advantage of growing tomato plants that are genetically different.

**[1 mark]**

**0 9 . 2** Suggest **one** advantage of growing tomato plants that are genetically identical.

**[1 mark]**

**0 9 . 3** Scientists can grow genetically identical tomato plants using tissue culture.

What is tissue culture?

**[1 mark]**

**0 9 . 4** Genetically identical tomato plants growing in the same garden do **not** all grow to the same height.

Give **one** reason why.

**[1 mark]**

*Do not write outside the box*

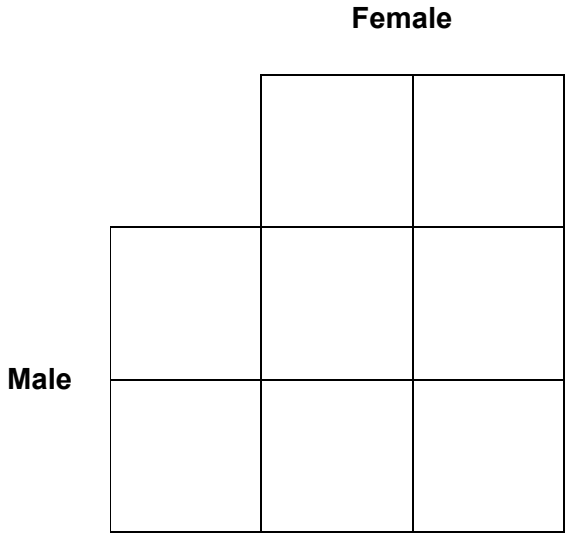
The sex of dogs is determined by **X** and **Y** chromosomes in the same way as in humans.

**0 9 . 5** Complete the Punnett square diagram in **Figure 15** to show the inheritance of sex in dogs.

Use the symbols **X** and **Y**.

**[3 marks]**

**Figure 15**




**0 9 . 6** A female dog gave birth to six offspring.

Why would you expect there to be three male offspring and three female offspring?

Use your answer to Question **09.5**.

**[1 mark]**

**Question 9 continues on the next page**

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Farmers keep chickens for:

- meat production
- egg production.

Some varieties of chicken grow more quickly and are more suitable for meat production.

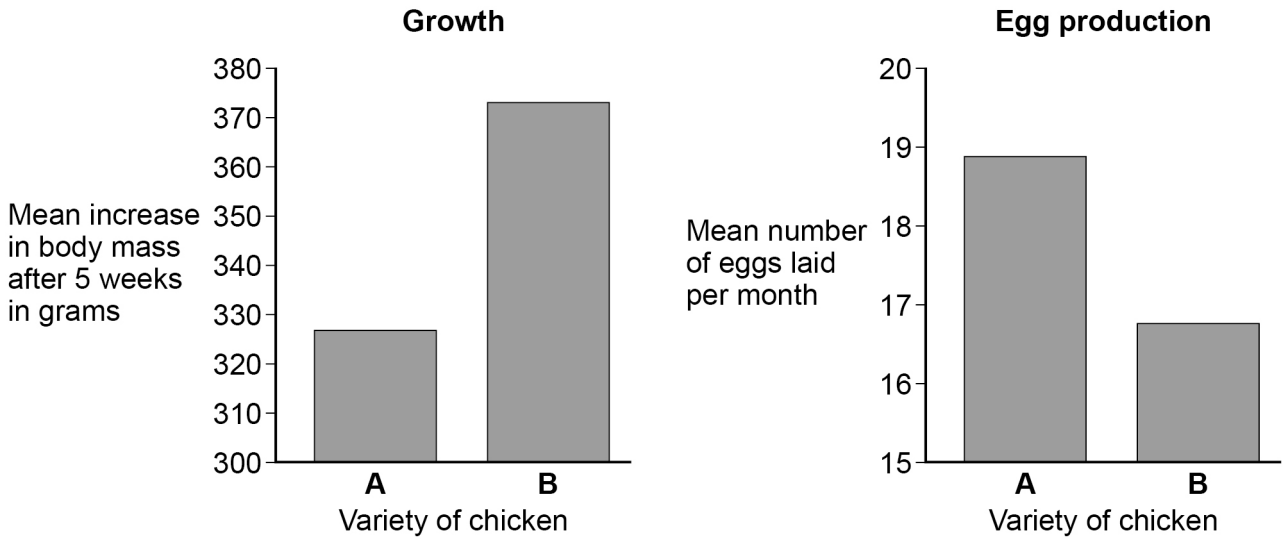
Other varieties of chicken produce more eggs.

A farmer keeps two varieties of chicken, **A** and **B**.

The farmer investigated the growth rates and egg-production rates of both varieties.

**Figure 16** shows the results.

**Figure 16**




**0 9 . 7** Suggest **two** control variables the farmer should have used in this investigation.

**[2 marks]**

1 _____

_____

2 _____

_____

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**0 9 . 8** **Figure 16** shows mean values from 500 chickens of each variety.

Give the reason the farmer used a large number of chickens.

**[1 mark]**

**0 9 . 9** The farmer wants to produce a new variety of chicken that is good for **both** meat production **and** egg production.

Describe how selective breeding of chicken varieties **A** and **B** can produce the new variety of chicken.

**[4 marks]**

**15**

**END OF QUESTIONS**

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