

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

INTERNATIONAL GCSE COMBINED SCIENCE

Paper 1 Biology Extension

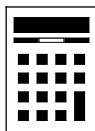
E

Wednesday 26 October 2022 07:00 GMT Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a pencil and a ruler
- a scientific calculator.



Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- 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.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You are expected to use a scientific calculator where appropriate.

For Examiner's Use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



N 0 V 2 2 9 2 0 4 B E 0 1

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0	1
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Streamlined body shape

Smooth, waterproof feathers

Sharp beak

Backward-pointing spikes on tongue

Layer of fat under the skin

Flipper-like wings

0	1	.	1
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[6 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

0 1 . 2 Adult penguins show parental care for their offspring.

Give **two** reasons why parental care is a successful evolutionary strategy for penguins.

[2 marks]

1

2

0 1 . 3 Penguins stand very close together in large groups.

What is the name of this behavioural adaptation?

[1 mark]

Question 1 continues on the next page

Turn over ►

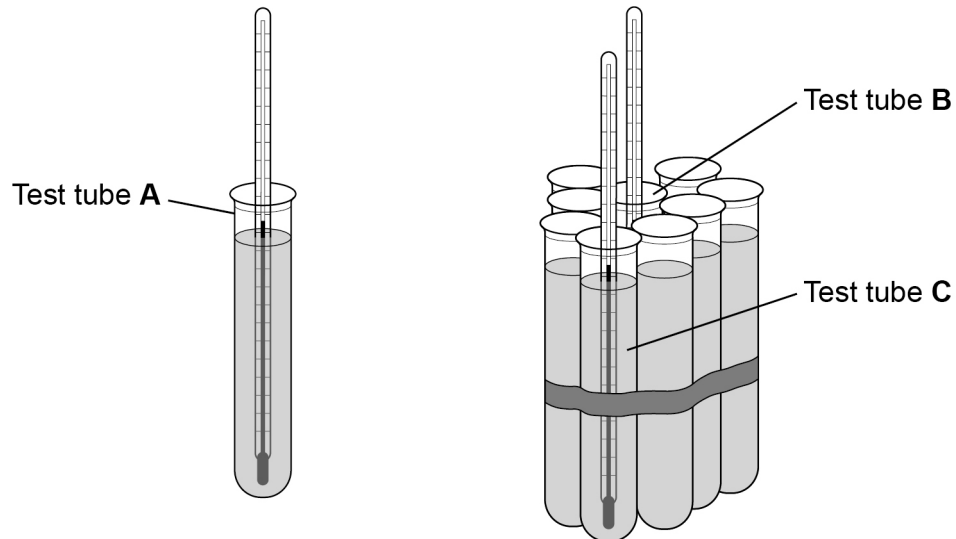


A student investigated if penguins that stand close together stay warmer than penguins that stand alone.

The student used test tubes filled with hot water to represent the penguins.

Figure 2 shows a single test tube and a group of test tubes.

Figure 2



0 1 . 4

The student added the same volume of water to each test tube at the start.

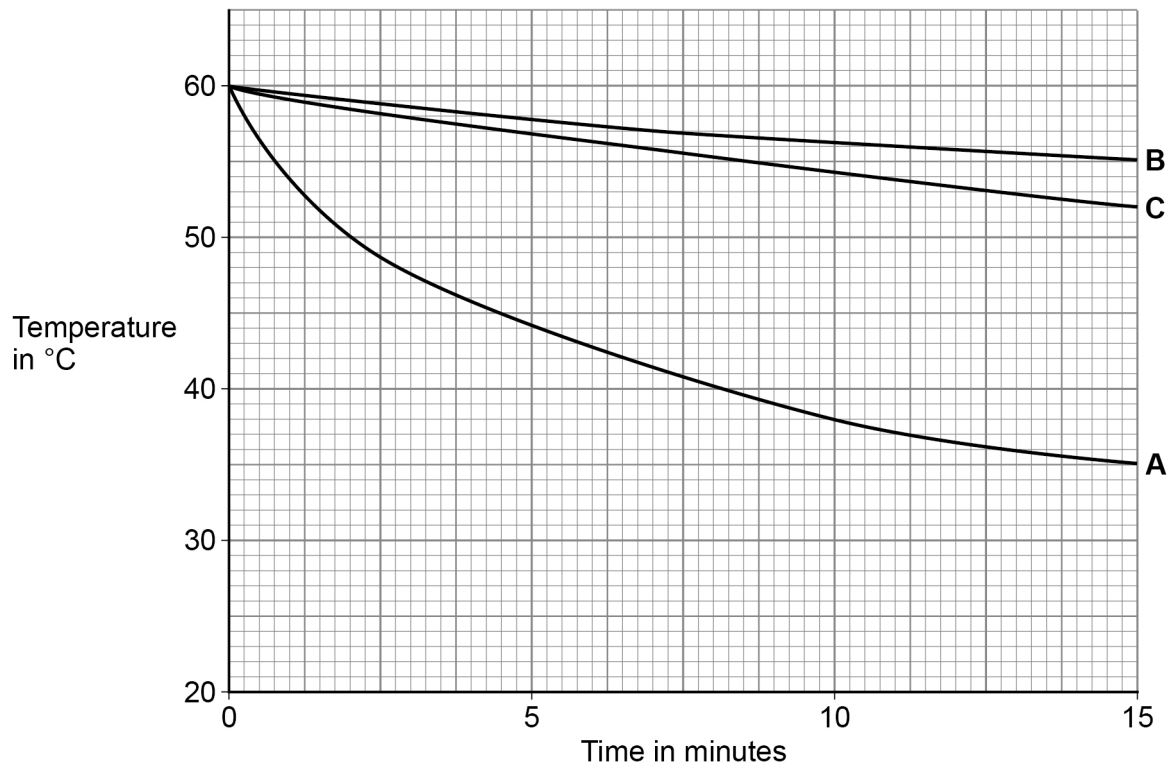
Describe a method the student could use to make a valid comparison of the temperature **changes** in test tubes **A**, **B** and **C**.

[4 marks]



Figure 3 shows the results.

Figure 3



0 1 . 5

Give **one** reason why standing close to each other in a group benefits penguins more than standing alone.

Use **Figure 3**.

[1 mark]

Question 1 continues on the next page

Turn over ►



0 1 . 6

The temperature of the water in all the test tubes eventually decreased to the same temperature as the environment.

The body temperature of penguins in a group is **always higher** than the temperature of the environment.

Give **one** reason why the body temperature of the penguins **does not** decrease to the same temperature as the environment.

[1 mark]

0 1 . 7

Suggest **one** advantage of using laboratory equipment instead of living organisms to study animal behaviour.

[1 mark]

16

Turn over for the next question

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outside the
box*

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ANSWER IN THE SPACES PROVIDED**

Turn over ►



0 2

A student investigated the effect of different antibiotics on the growth of one species of bacteria.

The student used agar plates spread with the bacteria.

This is the method used.

1. Soak 3 paper discs in antibiotic **A**.
2. Use forceps to place the discs onto the agar plate.
3. Repeat steps 1–2 for antibiotic **B** and for antibiotic **C**.
4. Repeat steps 1–2 with discs soaked in distilled water.
5. Incubate the agar plates at 25 °C for 24 hours.
6. Measure the diameter of the clear zone around each disc.

0 2 . 1

Describe **two** aseptic techniques to avoid contamination during a practical activity using bacteria.

[2 marks]

- 1 _____

2 _____

0 2 . 2

There was no clear zone around the disc soaked in distilled water.

Suggest **one** reason why discs soaked in distilled water were used.

[1 mark]

- _____



0 2 . 3 Complete **Table 1** to identify variables in the experiment.

Put **one** tick (✓) in each row.

[3 marks]

Table 1

	Dependent variable	Independent variable	Control variable
Diameter of clear zone around antibiotic disc			
Incubation temperature			
Species of bacteria used			
Type of antibiotic used			

Question 2 continues on the next page

Turn over ►



The student calculated the area of the clear zone around each disc soaked in antibiotic.

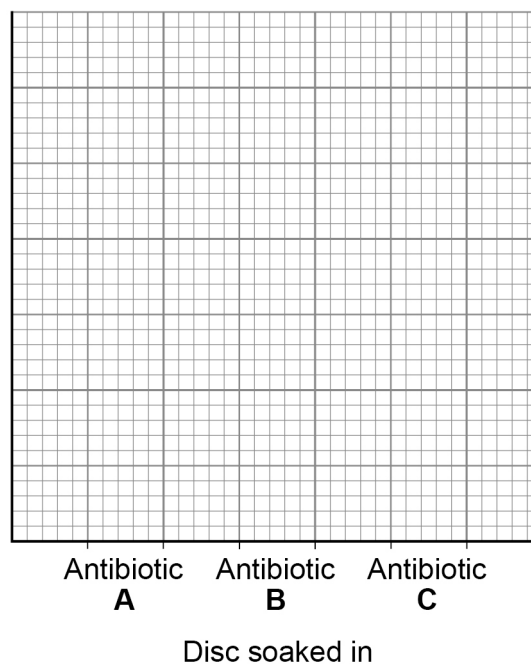
Table 2 shows the results.

Table 2

Disc	Mean area of clear zone in mm ²
Antibiotic A	120
Antibiotic B	10
Antibiotic C	88

0 2 . 4 **Figure 4** is an incomplete bar chart for the data in **Table 2**.

Figure 4



Complete **Figure 4**.

You should:

- label the y-axis
- add the correct scale to the y-axis
- plot the data from **Table 2**.

[4 marks]



0	2	5
---	---	---

Which antibiotic in **Table 2** should be used to treat an infection by this species of bacteria?

Give the reason for your answer.

[1 mark]

Antibiotic _____

Reason _____

Question 2 continues on the next page

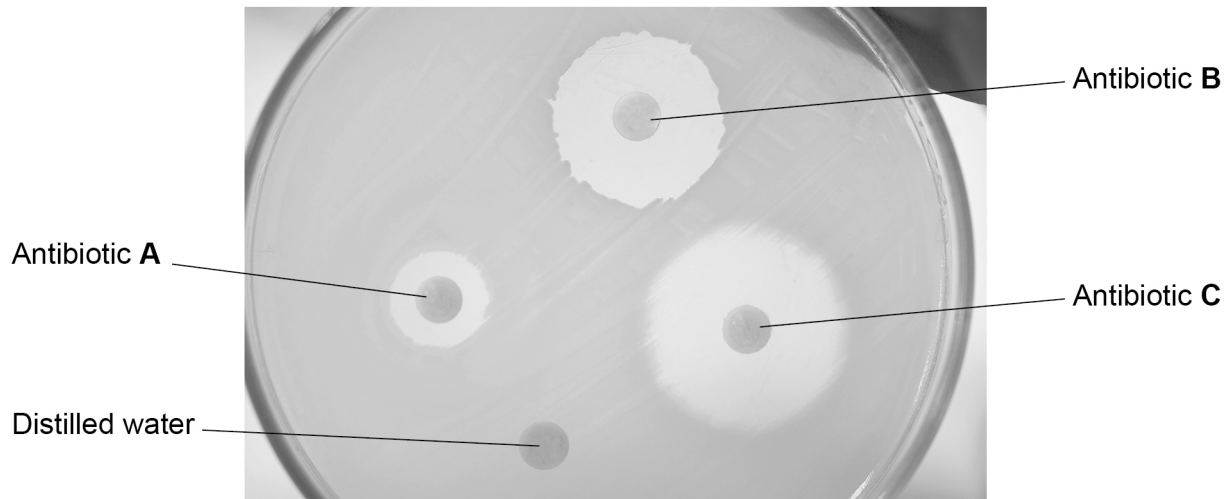
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The student investigated the effect of the antibiotics on a different species of bacteria.

Figure 5 shows the agar plate after incubation.

Figure 5



0 2 . 6 Calculate the area of the clear zone for Antibiotic **A**.

The diameter of the clear zone for Antibiotic **A** is 12.0 mm.

Give your answer to **3** significant figures.

$$\text{Area} = \pi r^2$$

Use $\pi = 3.14$

[3 marks]

Area (3 significant figures) = _____ mm²



0	2	.	7
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The student did **not** need to measure all the clear zones to conclude which antibiotic was the most effective.

Suggest why.

[1 mark]

15

Turn over for the next question

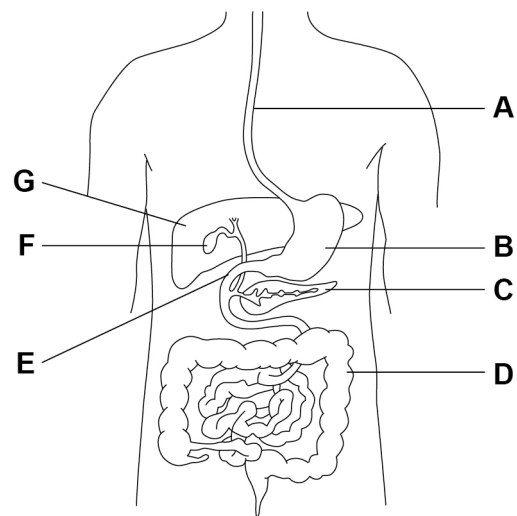
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0 3

Figure 6 shows the human digestive system.

Figure 6



0 3

1

Complete **Table 3** to identify some of the organs in **Figure 6**.

[3 marks]

Table 3

Organ	Letter in Figure 6
Duodenum	
Gall bladder	
Pancreas	



Describe the roles of enzymes **and** the other chemicals produced in the digestive system.

[illegible]

Turn over ►



0 3 . 3 Human body temperature is kept at 37 °C.

Explain why keeping body temperature constant is important for the efficient digestion of food.

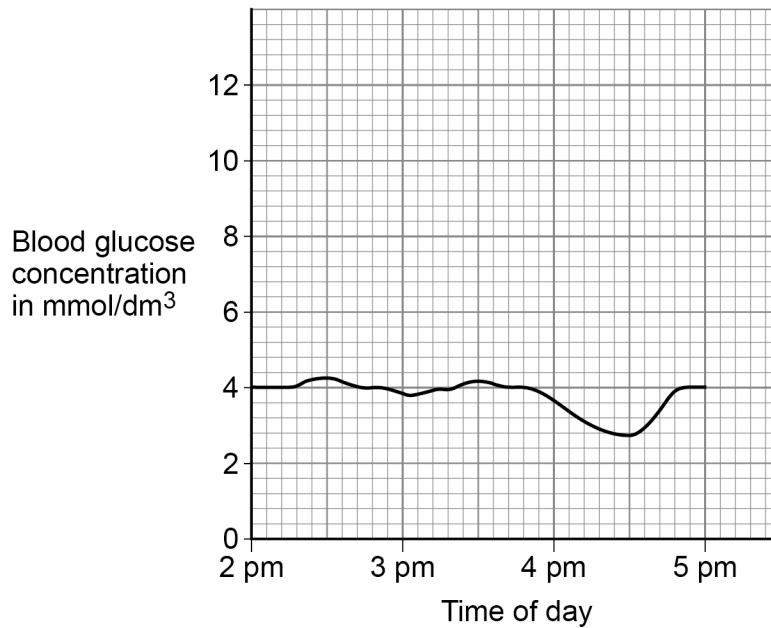
[3 marks]



0 3 . 4

Figure 7 shows a person's blood glucose concentration between 2 pm and 5 pm.

Figure 7



The person does **not** eat or drink anything between 2 pm and 5 pm.

Explain why the blood glucose concentration increases **after 4.30 pm**.

[4 marks]

16

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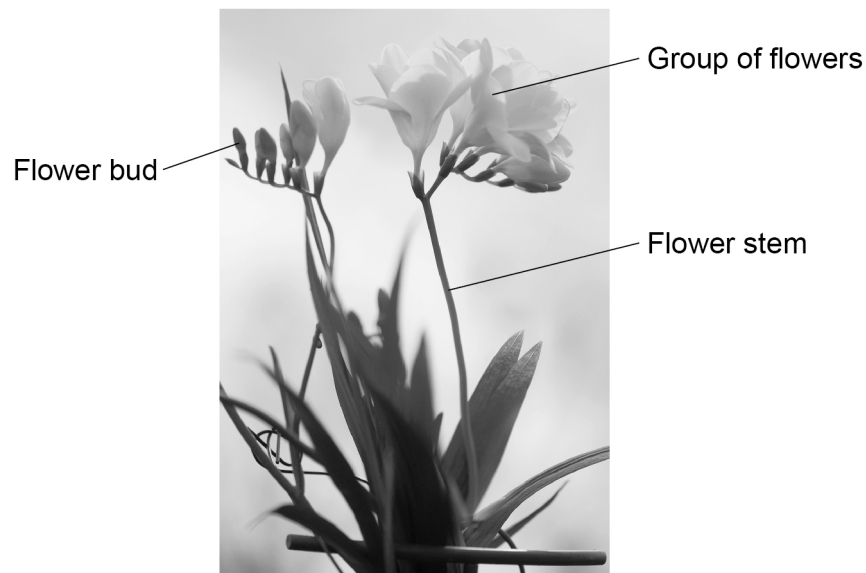
0 4

Freesias are flowering plants that can be grown using two different techniques:

1. from seeds
2. using tissue culture techniques.

Figure 8 shows a freesia plant.

Figure 8

**0 4 . 1**

Seeds are produced by sexual reproduction in plants.

The seeds from a single freesia plant were planted.

Explain why there was genetic variation between the freesia plants that grew from different seeds.

[2 marks]



0	4	.	2
---	---	---	---

Flower farms grow millions of flowers for shops to sell.

Suggest **one** advantage of using tissue culture instead of seeds to produce large numbers of freesia plants.

[1 mark]

Farmers use fertilisers that contain ions to increase the growth of plants.

0	4	.	3
---	---	---	---

Name **one** ion absorbed by plants to make protein.

[1 mark]

Question 4 continues on the next page

Turn over ►



A farmer investigated the effect of temperature on the growth of freesia plants.

The farmer:

- produced 400 young plants from **one** parent plant using tissue culture
- divided the young plants into five equal groups of 80 plants
- planted each group of plants in a different greenhouse
- kept each greenhouse at a different temperature
- recorded measurements and observations as the plants were growing.

0 4 . 4

Complete **Table 4** to give a reason for each method of selecting plants to be measured.

[3 marks]

Table 4

Selection of plants	Reason
Only a sample of plants were measured, not all of them.	
20 plants from each greenhouse were measured.	
Plants were selected randomly from each greenhouse.	



Table 5 shows the results.

Table 5

Characteristic	Temperature inside greenhouse in °C				
	12	15	18	21	24
Mean flower stem length in mm	255	336	545	573	375
Mean number of days after planting that the first flower bud started to form	104	92	86	112	138
Mean number of flowers on each plant	23	29	32	33	14
Mean number of flowers on each stem	9	11	12	14	14
Quality of flower score (10 is the best score)	7	8	10	9	6

0 4 . 5 The farmer concluded that 18 °C was the best temperature to grow freesia plants.

Evaluate the farmer's conclusion.

[4 marks]

Question 4 continues on the next page

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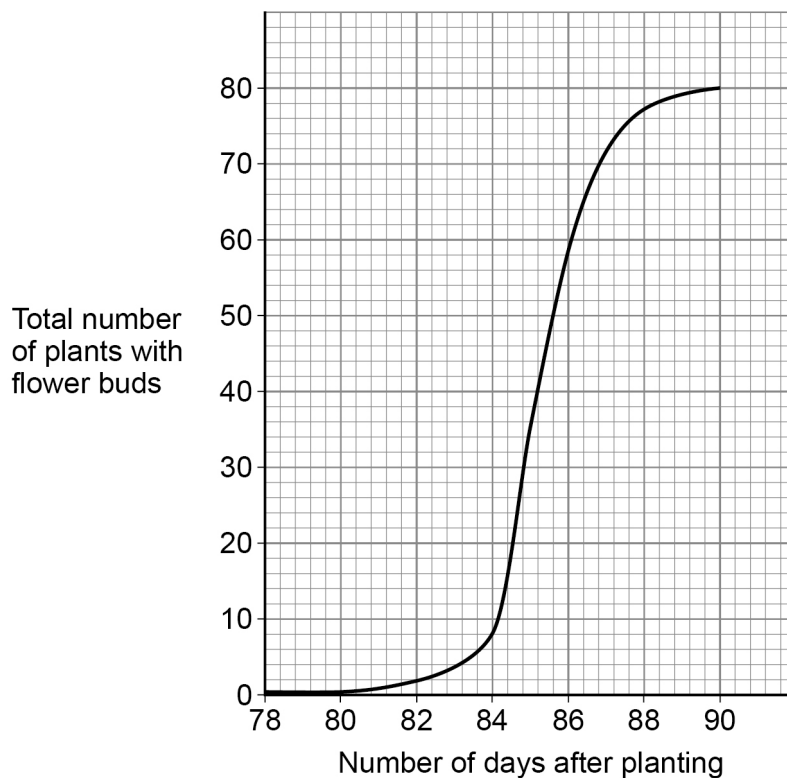


0 4 . 6

The farmer recorded the total number of plants that had flower buds each day.

Figure 9 shows the results for the plants grown at 18 °C.

Figure 9



The farmer needed to know the number of days over which most of the plants produced flower buds.

Determine the number of days between the 10th percentile and the 90th percentile.

[3 marks]

_____ days



0 4 . 7

The farmer plants groups of freesia plants every week during the growing season.

The flowers are harvested when flower buds start to form.

Suggest **two** factors the farmer can control so that all the plants in a group are ready to harvest at the same time.

Do **not** refer to temperature in your answer.

[2 marks]

1 _____

2 _____

16

Turn over for the next question

Turn over ►



0 5

Disorders and diseases are conditions that affect many people.

0 5 . 1

Complete **Table 6** to give the cause of each condition.

[2 marks]

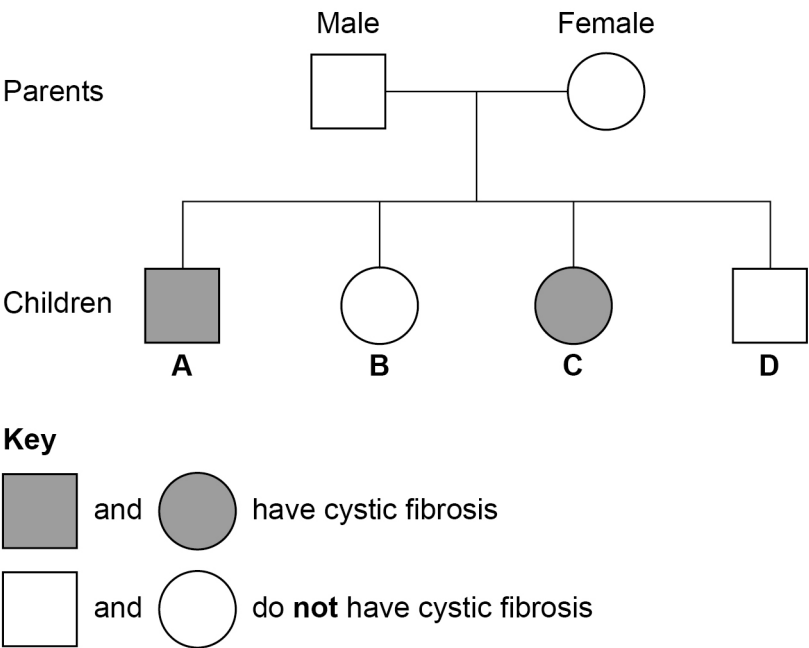
Table 6

Condition	Cause
Down's syndrome	
Rubella	

Cystic fibrosis is an inherited disorder.

Figure 10 shows the inheritance of cystic fibrosis in one family.

Figure 10



Cystic fibrosis is caused by a mutation in a gene. The gene has two alleles:

- **N** is the allele for **not** having cystic fibrosis
- **n** is the allele for having cystic fibrosis.



0 5 . 2

What term describes the genotype of a person with two **different** alleles?

[1 mark]

0 5 . 3

Give the genotype of the female parent and the genotype of child **A**.

Use **Figure 10**.

[2 marks]

Female parent _____

Child **A** _____

0 5 . 4

Explain why it is **not** possible to determine the genotype of child **B** using the information in **Figure 10**.

[2 marks]

Question 5 continues on the next page

Turn over ►

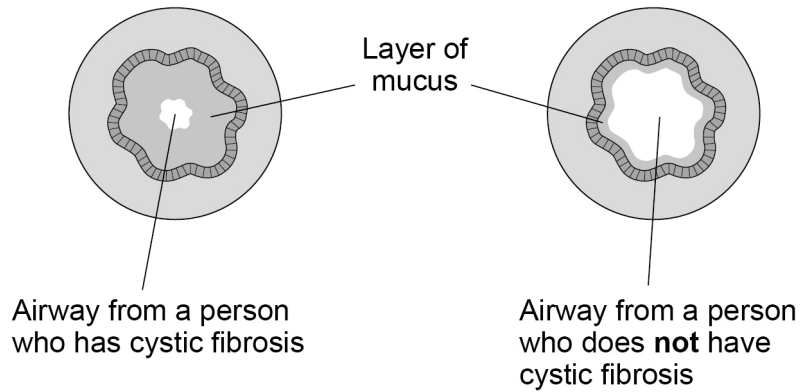


0 5 . 5

Cystic fibrosis affects mucus production in the airways in the lungs.

Figure 11 shows the airways from two different people.

Figure 11



Describe **one** effect cystic fibrosis has on the **function** of the lungs.

Use **Figure 11**.

[1 mark]

0 5 . 6

The **N** allele codes for a protein in lung cells resulting in the production of normal mucus.

Describe how genetic engineering could be used to treat people who have cystic fibrosis.

[4 marks]



0 5 . 7

Scientists produce human organs from stem cells in laboratories.

Treatments for cystic fibrosis were tested on organs produced in a laboratory.

Suggest **one** reason why the treatments were tested on organs before being used on patients.

[1 mark]

13

Turn over for the next question

Turn over ►



0 6

Processes in the human body use different molecules.

0 6 . 1

Antigens are protein molecules.

Name the part of a cell where antigens are found.

[1 mark]

0 6 . 2

Antibodies are proteins produced by white blood cells.

Explain how genes code for specific antibodies.

[4 marks]



0	6	.	3
---	---	---	---

Chemicals are used in the human nervous system.

Describe the function of the chemical released at a synapse.

[1 mark]

0	6	.	4
---	---	---	---

A chemical in the blood is involved in the blood clotting process.

Describe how a blood clot forms.

[2 marks]

8

Turn over for the next question

Turn over ►



0	7
---	---

Respiration takes place in all living cells.

0	7	.	1
---	---	---	---

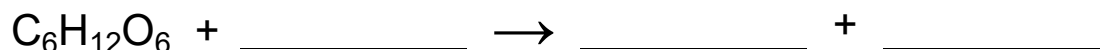
What is the role of enzymes in respiration?

[1 mark]

0	7	.	2
---	---	---	---

Complete the balanced **symbol** equation for aerobic respiration.

[2 marks]



Red blood cells are **not able** to carry out aerobic respiration.

0	7	.	3
---	---	---	---

Suggest why red blood cells are **not able** to carry out aerobic respiration.

[1 mark]

0	7	.	4
---	---	---	---

Suggest **one** reason why the absence of aerobic respiration allows red blood cells to function more efficiently.

[1 mark]

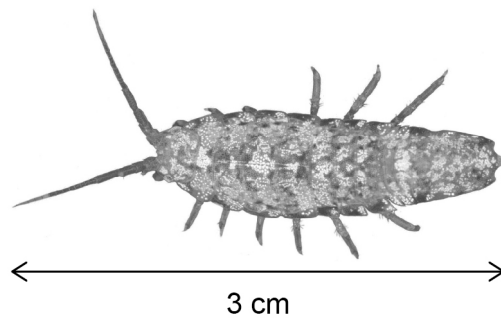


Scientists investigated the effect of temperature on respiration in isopods.

Isopods are small animals that live in the sea.

Figure 12 shows an isopod.

Figure 12



Two different species of isopod were investigated, species **A** and species **B**.

This is the method used.

1. Collect 15 isopods of each species from the sea.
2. Place the isopods in water at 10 °C for 20 days.
3. Place one species **A** isopod into each of five boiling tubes containing water at 5 °C.
4. After 4 hours, measure the rate of oxygen uptake in each boiling tube.
5. Repeat steps 3 and 4 at 10 °C and at 15 °C.
6. Repeat steps 3, 4 and 5 for species **B**.

0 7 5

Suggest **one** way the scientist can minimise the risk of harm to the animals during the investigation.

Do **not** refer to temperature in your answer.

[1 mark]

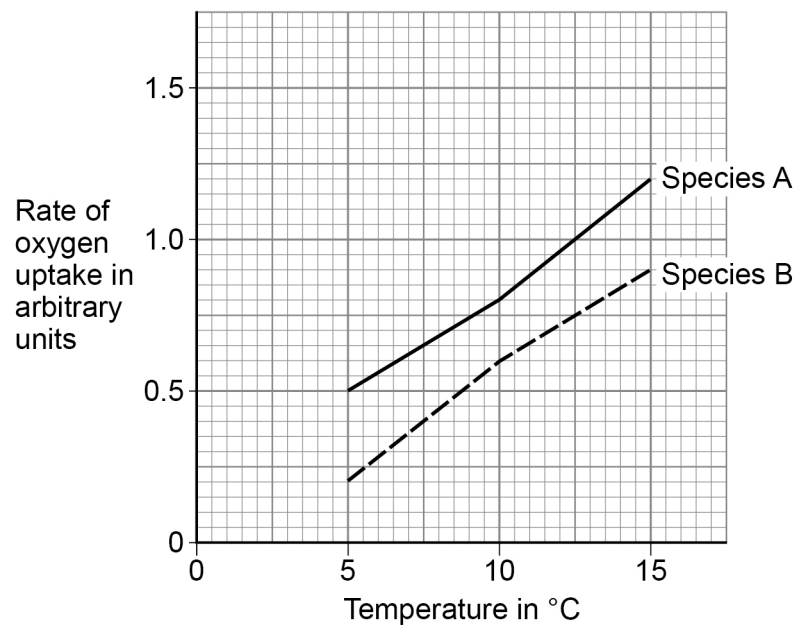
Question 7 continues on the next page

Turn over ►



Figure 13 shows the results.

Figure 13



0 7 . 6 Give **two** conclusions from the results in **Figure 13**.

[2 marks]

1 _____

2 _____



0 7 . 7

The temperature coefficient (Q_{10}) is used to determine the effect of changing temperature on the rate of a reaction.

Q_{10} for oxygen uptake compares rate of oxygen uptake at two temperatures, (T_1 and T_2).

The Q_{10} for rate of oxygen uptake can be determined using the formula:

$$Q_{10} = \left[\frac{\text{Rate of oxygen uptake at } T_2}{\text{Rate of oxygen uptake at } T_1} \right]^{\frac{10}{T_2 - T_1}}$$

Determine Q_{10} for the rate of oxygen uptake of species **A** when:

- $T_1 = 5\text{ }^{\circ}\text{C}$
- $T_2 = 10\text{ }^{\circ}\text{C}$.

Use **Figure 13**.

[3 marks]

$Q_{10} =$ _____

0 7 . 8

Suggest **one** reason why calculating Q_{10} is a useful tool for investigating the effect of temperature on different biological processes.

[1 mark]

Question 7 continues on the next page

Turn over ►



07.9

Species **A** live in shallow water.

Species **B** live in deep water.

Describe how the two species of isopod may have arisen from one original species.

[4 marks]

16

END OF QUESTIONS



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