

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE

3430U40-1



S25-3430U40-1

TUESDAY, 13 MAY 2025 – AFTERNOON

SCIENCE (Double Award)

Unit 4 – BIOLOGY 2

FOUNDATION TIER

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	5	
3.	4	
4.	4	
5.	6	
6.	12	
7.	7	
8.	9	
9.	6	
Total	60	

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ADDITIONAL MATERIALS

A calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

Question **5** is a quality of extended response (QER) question where your writing skills will be assessed.



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Answer **all** questions.

1. **Image 1** shows a galago, a mammal that lives in Africa. Galagos hunt at night for insects.

Image 1



- (a) Sense organs are groups of receptor cells that respond to different stimuli. Use **Image 1** to identify the sense organs that help galagos to:

- (i) see insects flying in the dark;

[1]

.....

- (ii) hear insects in the undergrowth;

[1]

.....

- (iii) detect chemicals.

[1]

.....



(b) Complete the following sentences by using **some** of the words provided below.

[4]

receptor**chemical****electrical****brain****central**

When a cell senses a stimulus, the information is relayed to the nervous system as impulses. The central nervous system consists of the and spinal cord.

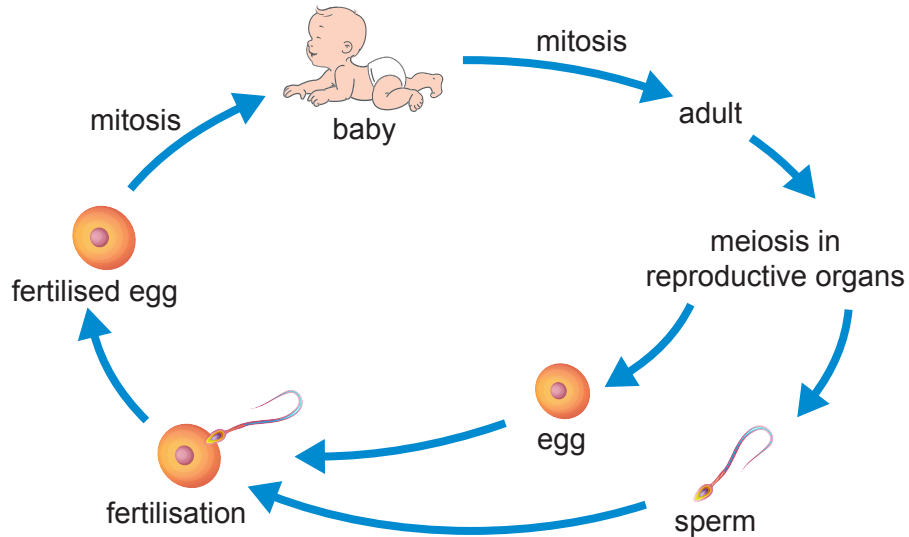
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2. There are two types of cell division: mitosis and meiosis.

Image 2.1 shows part of the human life cycle and where cell division occurs.

Image 2.1



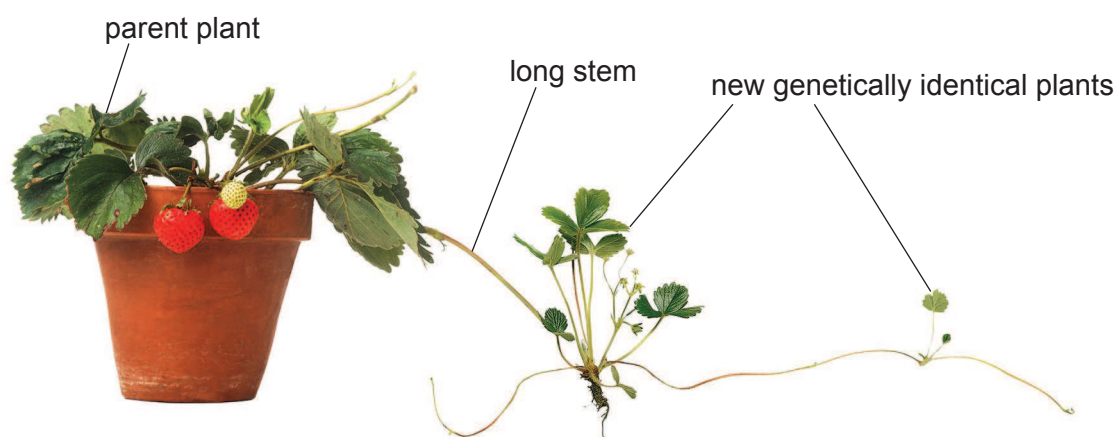
- (a) Use the information in **Image 2.1** and your own knowledge to complete the following table by writing true or false next to each statement. [3]

Statement	True or false
Mitosis halves the number of chromosomes	
Meiosis is used for growth	
Meiosis is used to make sex cells	
Mitosis occurs in body cells	



- (b) Strawberry plants can reproduce asexually by producing long stems. New plants can grow from the long stems as shown in **Image 2.2**.

Image 2.2



The new plants are genetically identical to each other and the parent plant.

- (i) State the term used to describe genetically identical organisms. [1]

.....

- (ii) State the type of cell division used to produce genetically identical organisms. [1]

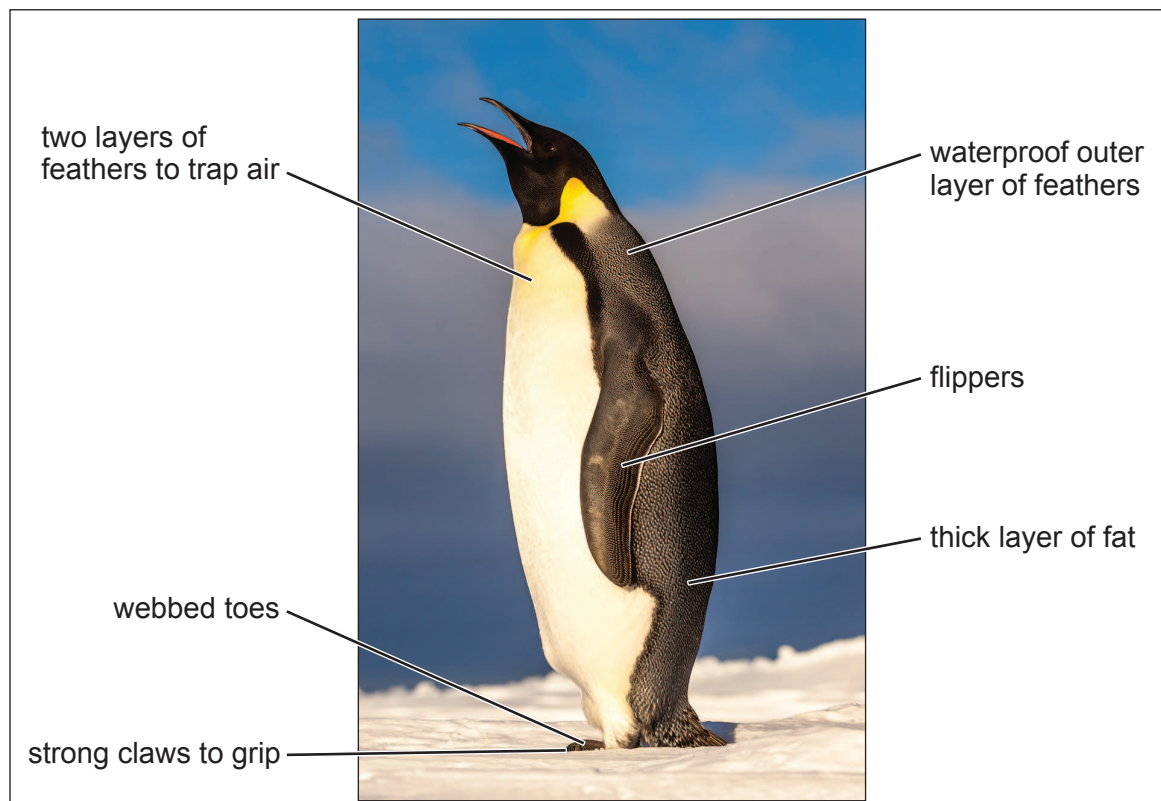
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3. Emperor penguins live in Antarctica. Temperatures in Antarctica can fall to -83°C and the land is covered in ice.

Image 3 shows an Emperor penguin.

Image 3



- (a) Use the information in **Image 3** to state **one** way in which Emperor penguins are adapted to:

(i) reduce heat loss;

[1]

.....

.....

(ii) swim in the sea.

[1]

.....

.....



- (b) (i) Circle the Kingdom to which penguins belong from the list below. [1]

bacteria

plant

animal

fungi

- (ii) Penguins are vertebrates.
State what is meant by the term **vertebrate**. [1]

4

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4. The cane toad is native to Central and South America.
- In 1935, sugar cane crops in Australia were being destroyed by a pest called the greyback cane beetle.
 - Cane toads were introduced to sugar cane farms to eat these beetles and reduce their population size.
 - This was an example of biological control.

Image 4.1 shows a cane toad.

Image 4.2 shows a greyback cane beetle (images not to scale).

Image 4.1 – Cane toad



Image 4.2 – Greyback cane beetle



- (a) Suggest **two** pieces of information scientists needed to know about the cane toads before they introduced them to the Australian sugar cane farms. [2]

I.

.....

II.

.....



- (b) The cane toads quickly out-competed the native Australian frogs. **Table 4.3** provides some facts about the cane toad and a native Australian frog.

Table 4.3

Facts	Cane toad	Native Australian frog
common predators	no successful predators	birds, snakes, foxes, tortoises, fish
food	insects, frogs, reptiles, small birds and mammals	insects, worms, mice
number of times they reproduce/year	twice	once
number of eggs laid	8000–30 000	5000
poisons	poisonous if eaten	not poisonous if eaten

Use **Table 4.3** to suggest **two** reasons why cane toads were able to out-compete the native Australian frogs. [2]

I.

.....

II.

.....



- 5.** The influenza virus easily spreads from person to person.

Image 5 shows how to reduce the spread of the influenza virus.

Image 5



Explain how **each** of the measures shown in **Image 5** helps to reduce the spread of the influenza virus. [6 QER]



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6. One species of snail, *Cepaea nemoralis*, can either have a banded shell or an unbanded shell, as shown in **Images 6.1** and **6.2**. They have many predators including frogs, hedgehogs and birds.

Image 6.1 – Banded shell



Image 6.2 – Unbanded shell



Two students, Aled and Samira, investigated the numbers of these snails in a field using quadrats. They used the following method:

1. Mark out an area to sample measuring 25 m by 25 m.
2. Use a random number generator to provide ten sets of co-ordinates for placing the quadrats.
3. At each co-ordinate, place a 1 m² quadrat.
4. Count the number of banded snails and the number of unbanded snails within each quadrat.

(a) State why it is important to place the quadrats randomly.

[1]

.....

.....



- (b) **Table 6.3** shows the results of the investigation.

Table 6.3

Quadrat	Number of banded snails	Number of unbanded snails
1	4	1
2	6	1
3	5	1
4	5	1
5	3	0
6	4	2
7	6	1
8	7	0
9	4	1
10	6	2
Mean number of snails in a 1 m ² quadrat.		1

- (i) I. Calculate the mean number of **banded snails** in a 1 m² quadrat. Write your answer in **Table 6.3**. [2]

- II. The sample area investigated measured 25 m by 25 m. Calculate the sample area investigated. [1]

Sample area = m²

- III. Use your answers to I. and II. and the following equation to estimate the population size of the **banded snails** in the sample area:

Population size = sample area in m² × mean number of snails in a 1 m² quadrat

Population size =



- (ii) The population size for the unbanded snail was smaller than the banded snail. Suggest a reason for this difference in population size. [1]

.....

.....

- (iii) State **one** way in which the students could improve their confidence in their results. [1]

.....

.....

- (c) In 2021, conservation methods were used to increase the bird population in an area of South Wales.

Table 6.4 shows the estimated number of snails in the area over a period of five years.

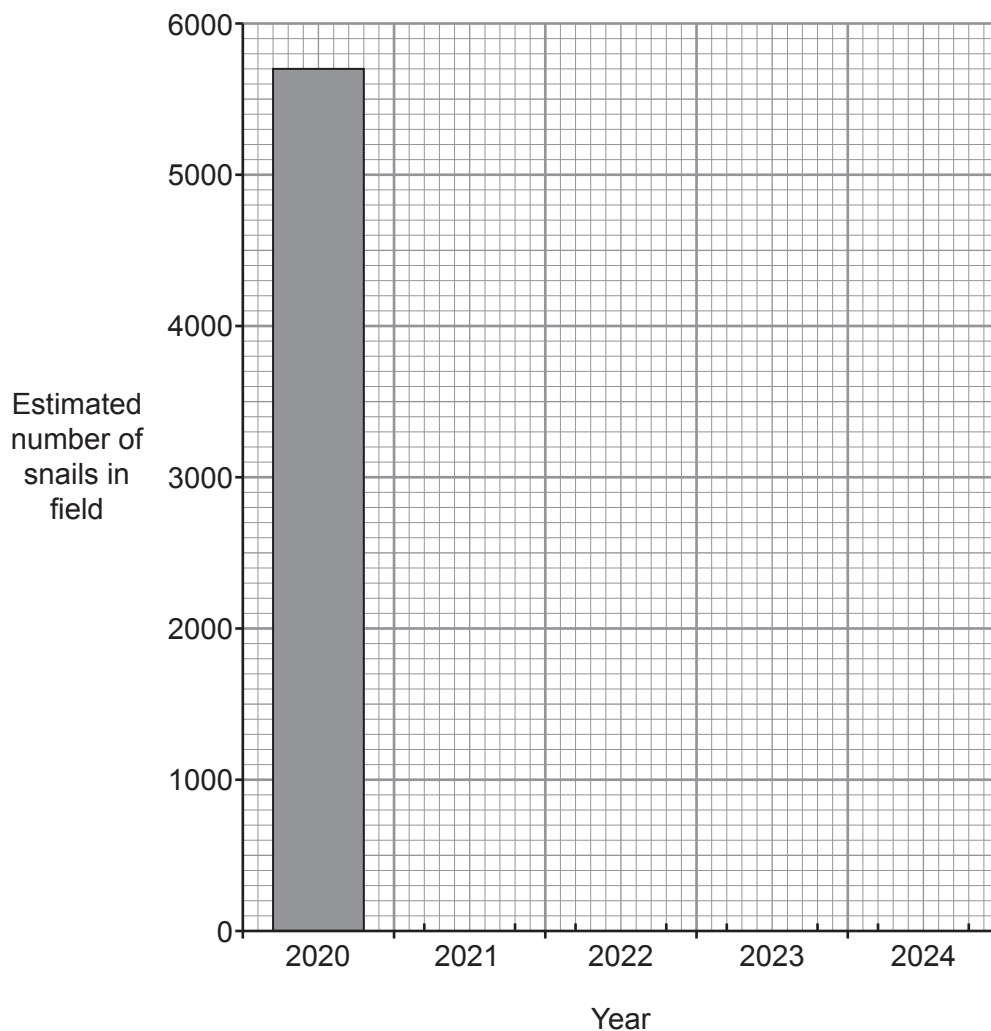
Table 6.4

Year	Estimated number of snails in field
2020	5700
2021	5600
2022	4800
2023	3700
2024	2900



- (i) Use **Table 6.4** to complete **Graph 6.5**. The first bar has been done for you. [2]

Graph 6.5



- (ii) The introduction of conservation methods for birds caused the snail population to decrease.
Suggest **one** reason for this change. [1]

.....

.....

- (iii) Suggest **two** factors that should have been controlled each time the quadrat sampling method was repeated over the five-year period. [2]

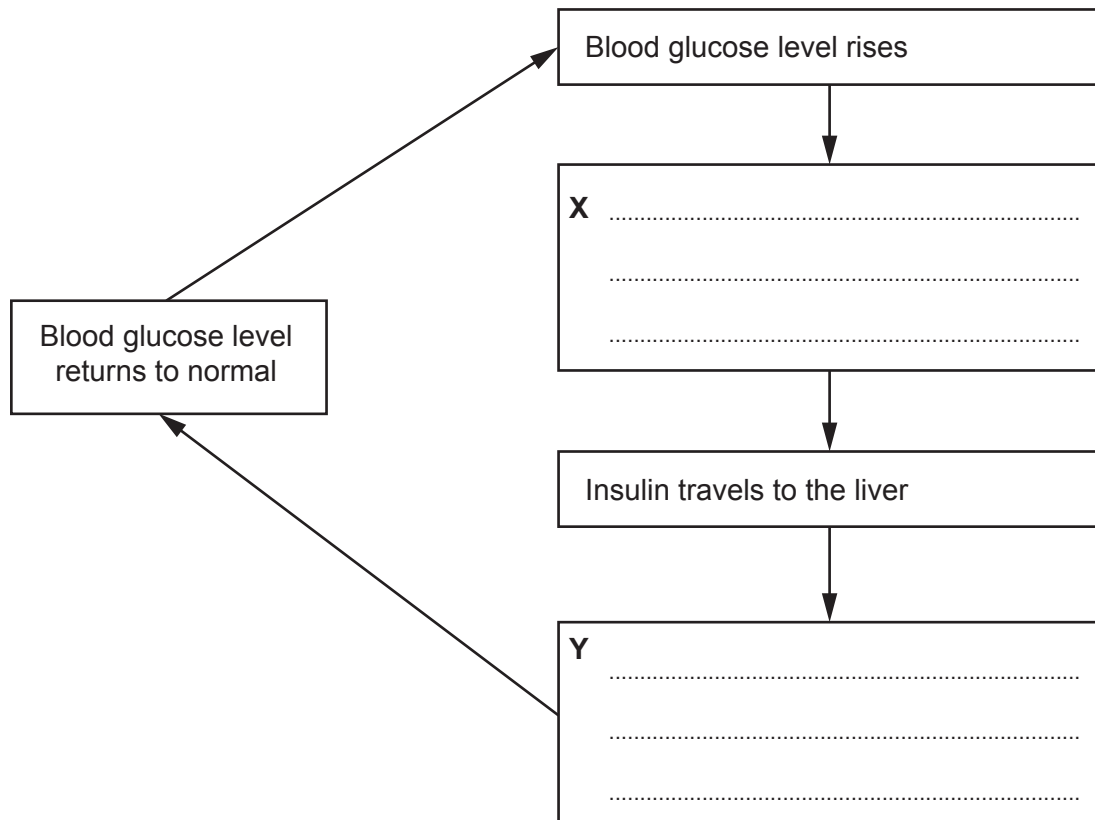
I.

II.



7. (a) **Image 7.1** shows some of the steps involved in monitoring and controlling the blood glucose level.

Image 7.1



Complete **Image 7.1** by **writing one** correct statement from the list below in **each** of boxes **X** and **Y**. [2]

Glucose is converted to glycogen.

Blood glucose level stays the same.

The liver converts glycogen to glucose.

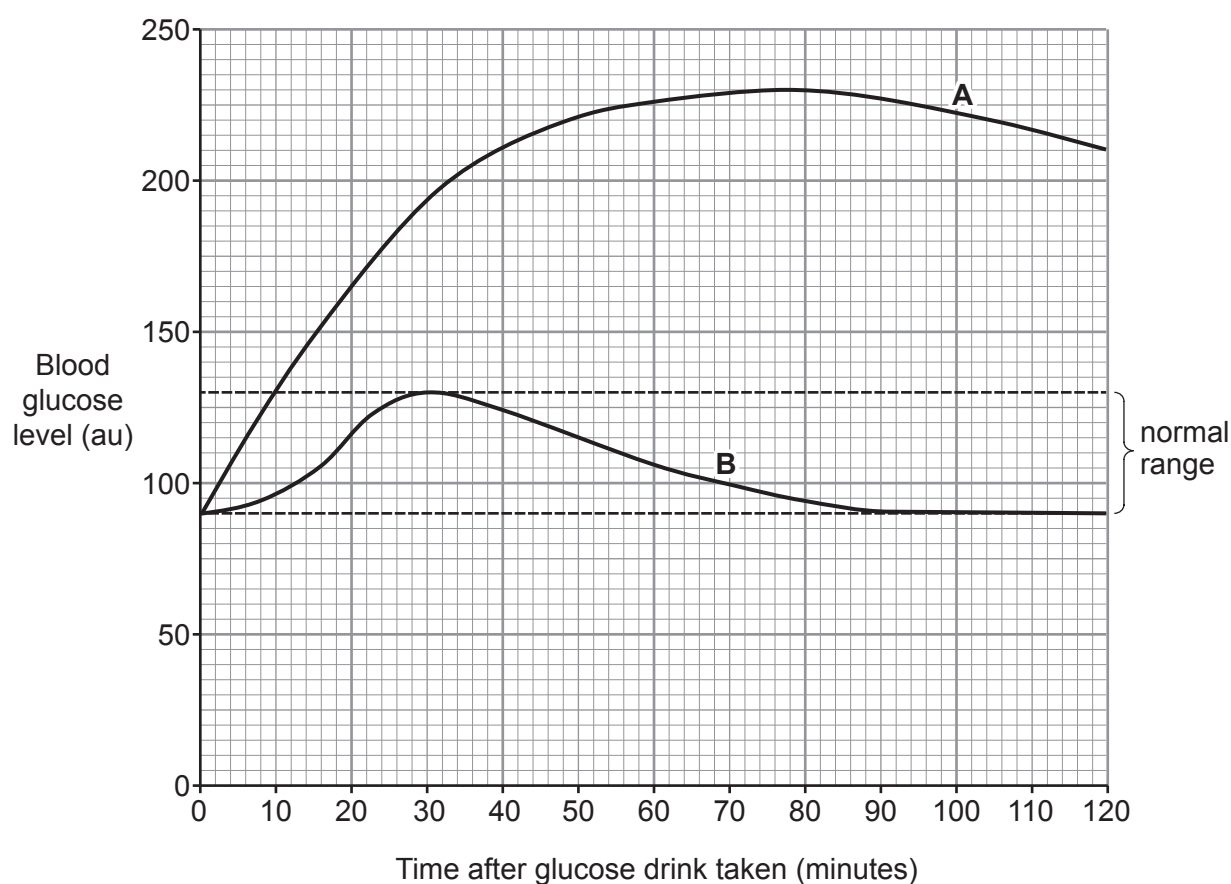
The pancreas releases insulin.



- (b) Two volunteers (**A** and **B**) were given identical glucose drinks. Their blood glucose levels were monitored over the following two hours.

Graph 7.2 shows the results of the blood glucose tests for both volunteers. It also shows the normal range of blood glucose levels.

Graph 7.2



- (i) Doctors suggested that volunteer **A** may have diabetes.
Give **two** pieces of evidence from **Graph 7.2** to support this suggestion. [2]

I.

.....

II.

.....



- (ii) Diabetes can be diagnosed by testing a patient's urine in the laboratory using the Benedict's test.
If volunteer **A** does have diabetes, state what the resulting colour change would be. [2]

Colour of Benedict's reagent will change from to

- (iii) State **one** way that diabetes can be treated. [1]

.....
.....



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8. Red kites (*Milvus milvus*) are birds of prey. Red kites live in woodland and build their nests in tall trees. **Image 8** shows a red kite.

Image 8



- (a) State the Genus of the red kite. [1]

.....

- (b) In 1903, red kites were almost extinct in the UK. There were only three breeding pairs left, all of which were in Wales. Due to conservation efforts, numbers of red kites increased and by 2022 it was estimated that there were 2100 breeding pairs in the UK.

- (i) State what is meant by the term **extinct**. [1]

.....
.....

- (ii) State **one** reason why it is important to conserve species. [1]

.....
.....

- (iii) State **two** methods by which endangered species could be conserved. [2]

I.

II.



- (iv) Use the information given and the equation below to calculate the percentage increase in breeding pairs of red kites in the UK from 1903 to 2022. [2]

$$\text{Percentage increase in breeding pairs} = \frac{\text{number of breeding pairs in 2022} - \text{number of breeding pairs in 1903}}{\text{number of breeding pairs in 1903}} \times 100$$

Percentage increase in breeding pairs =

- (v) Suggest **two** reasons why this increase is unlikely to continue in future years. [2]

I.

.....

II.

.....



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9. (a) A class of year 11 students investigated the following hypothesis:

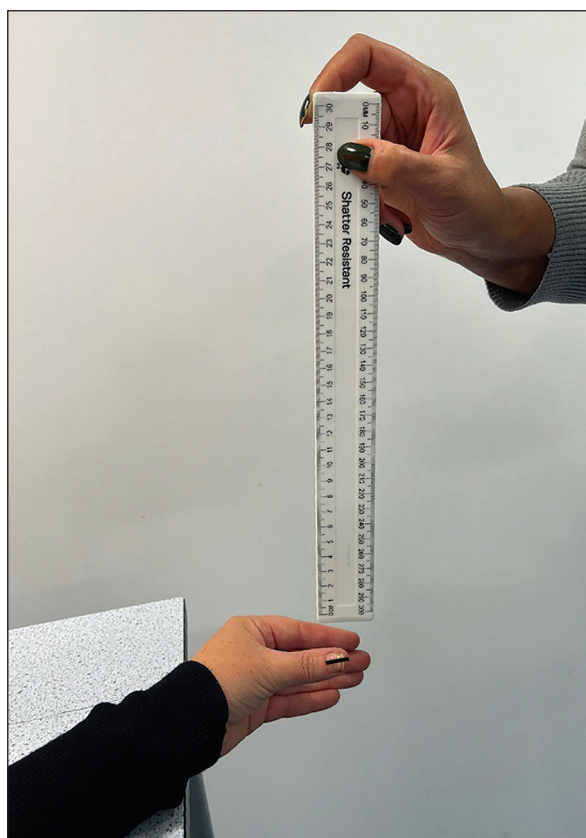
‘Reactions become faster with age’.

They tested three teachers and three year 11 students.

They used the following method:

- Mark a pencil line down the length of the thumb nail of the person to be tested, as shown in **Image 9.1**.
- Ask the person to place their forearm over the edge of the table.
- Hold a 30 cm ruler just above their hand.
- Drop the ruler without warning. The person then catches the ruler as quickly as possible.
- Record the catch distance by noting where the pencil line on the thumb meets the ruler.
- Repeat four more times.
- Calculate the mean catch distance and convert this to a reaction time in milliseconds (ms) using a conversion graph.

Image 9.1



The results are shown in **Table 9.2**.

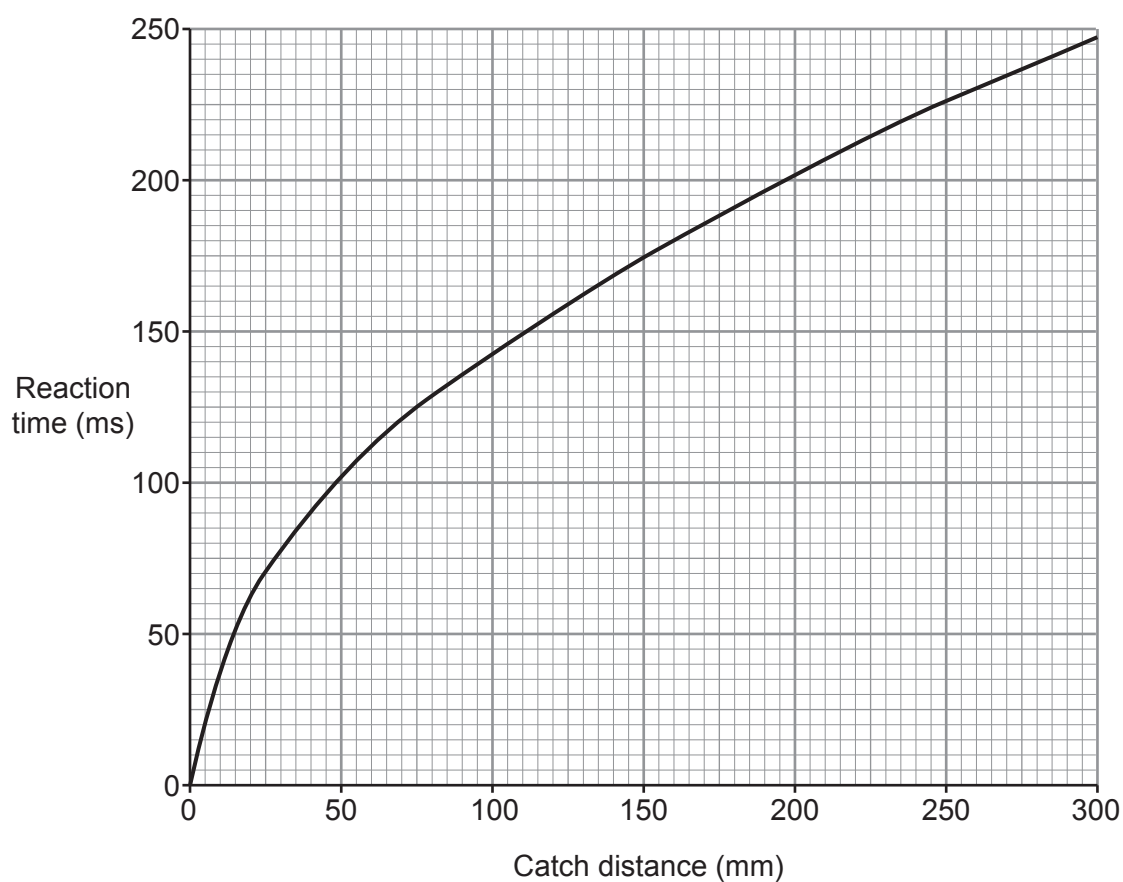
Table 9.2

Student	Mean catch distance (mm)	Reaction time (ms)
Amir	125	160
Ieuan	135	165
Rhian	160	180

Teacher	Mean catch distance (mm)	Reaction time (ms)
Mrs Williams	90	135
Mr Jones	170	
Mrs Davies	250	225

Graph 9.3 converts a catch distance into a reaction time.

Graph 9.3



- (i) Use **Graph 9.3** to convert the mean catch distance to a reaction time for Mr Jones.

Write your answer in Table 9.2.

[1]



- (ii) Evaluate the extent to which the results in **Table 9.2** support the hypothesis on **page 23**. [2]

Evidence that supports the hypothesis:

.....

.....

Evidence that does not support the hypothesis:

.....

.....

- (iii) One of the teachers said that this was not a fair test.
State **one** variable that should have been controlled. [1]

.....

- (b) (i) State the effect that drinking alcohol would have on reaction times. [1]

.....

.....

- (ii) State **one** long-term effect that drinking alcohol will have on physical health. [1]

.....

.....

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