Coordination

Question Paper

Level	International A Level
Subject	Biology
Exam Board	Edexcel
Topic	Respiration, Internal Environment, Coordination and Gene Technology
Sub-Topic	Coordination
Booklet	Question paper

Time Allowed: **47 minutes**

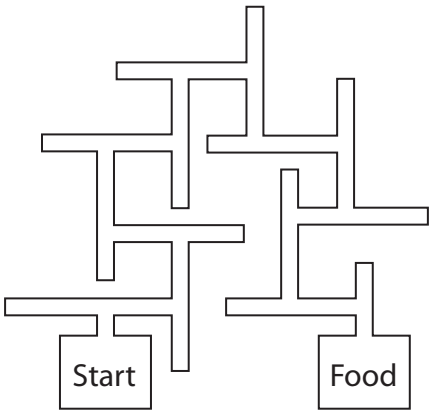
Score: **/39**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1 The diagram below shows a maze.



When a rat is placed in this maze, it explores and searches for food. If the rat is placed in the maze again, it takes less time to find the food. This shows that the rat learns the way through the maze.

A student wondered whether animals with larger brains are better at learning. She investigated five types of small mammal. These mammals and their typical brain mass are listed below:

- Cavy (3.8 g)
- Gerbil (1.4 g)
- Hamster (0.9 g)
- Mouse (0.4 g)
- Rat (2.1 g)

The student used three of each type of mammal. She placed Cavy A in the 'Start' area of the maze and recorded the time taken for it to find the food. She carried out 10 trials for Cavy A. She then repeated the procedure with Cavy B and Cavy C.

The student then repeated this procedure with the other four types of mammal.

Using the times taken for the first and tenth trial, she calculated the percentage decrease in time taken.

Her results are shown below.

Cavy A	18%	Cavy B	12%	Cavy C	7%
Hamster A	29%	Hamster B	37%	Hamster C	23%
Gerbil A	27%	Gerbil B	33%	Gerbil C	42%
Mouse A	46%	Mouse B	51%	Mouse C	35%
Rat A	52%	Rat B	37%	Rat C	61%

(a) Write a suitable null hypothesis for this investigation.

(2)

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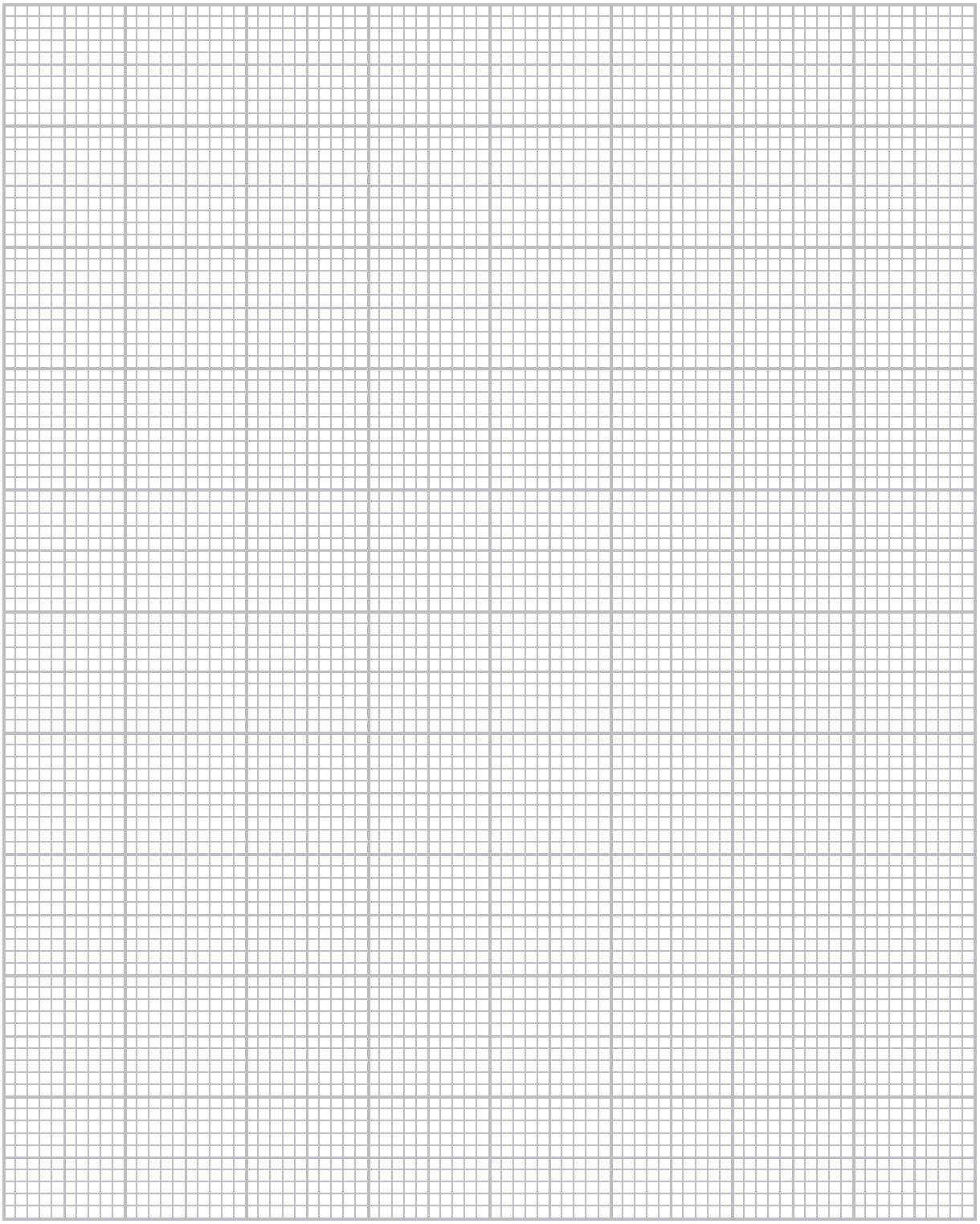
(b) Calculate the mean percentage decrease in time taken for each type of mammal in this investigation.

Draw a suitable table to display the typical brain mass and your calculated mean for each type of mammal.

(3)

(c) On the graph paper below, draw a suitable graph to show the relationship between brain mass and the mean percentage decrease in time taken to find food. Include an indication of the variability of the data.

(3)



(d) The student used a statistical test to assess the strength of the relationship between brain mass and mean percentage decrease in time taken to find food.

She calculated a value of 0.403.

For this statistical test, the number of degrees of freedom is equal to (n – 2), where n is the number of types of mammal tested.

The table below shows some critical values for this statistical test.

Degrees of freedom	Level of significance			
	0.10	**0.05**	**0.01**	**0.005**
1	0.951	0.988	0.9995	0.9999
2	0.800	0.900	0.980	0.990
3	0.687	0.805	0.934	0.959
4	0.608	0.729	0.882	0.917
5	0.551	0.669	0.833	0.875
6	0.507	0.621	0.789	0.834
7	0.472	0.582	0.750	0.798
8	0.443	0.549	0.715	0.765
9	0.419	0.521	0.685	0.735
10	0.398	0.497	0.658	0.708
11	0.380	0.476	0.634	0.684
12	0.365	0.457	0.612	0.661
13	0.351	0.441	0.592	0.641
14	0.338	0.426	0.574	0.623
15	0.327	0.412	0.558	0.606

What conclusion can be drawn from this investigation?
Use your graph and the information in the table to explain your answer.

(4)

(e) Suggest reasons why it may not be possible to draw valid conclusions from the results of this investigation.

(3)

(Total for Question 1 = 15 marks)

2 Serotonin is a neurotransmitter found in the human brain.
A reduced level of this neurotransmitter has been linked to depression.

(a) Explain what is meant by the term **neurotransmitter**.

(2)

(b) A serotonin selective reabsorption inhibitor (SSRI) may be given to patients to reduce depression.

Suggest how this helps to reduce depression.

(2)

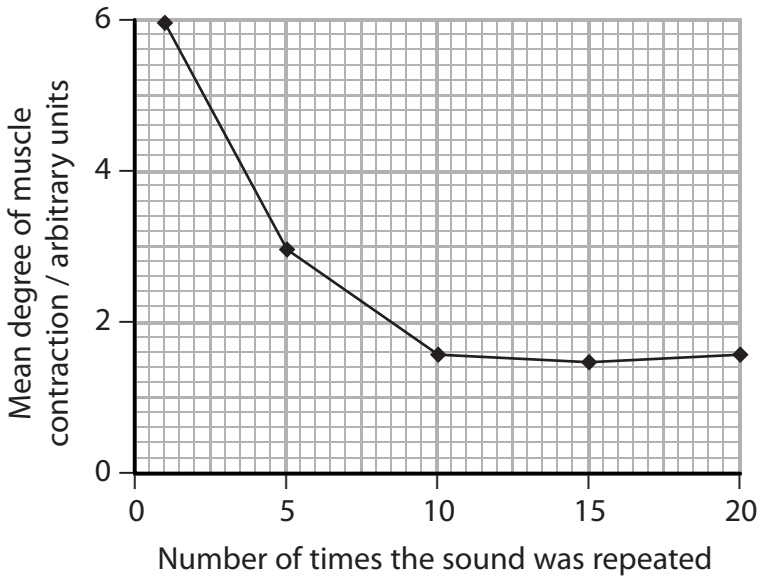
(c) An investigation was carried out to study habituation in a group of people.

Each person wore a pair of headphones through which a short sound was played once. This sound made each person blink their eyes.

The degree of contraction of one muscle involved in blinking was recorded. The mean degree of muscle contraction was calculated for the group.

This was repeated with the sound played 5 times, 10 times, 15 times and 20 times. The mean results for the group were recorded.

The results are shown in the graph below.



(i) Suggest an explanation for the change in the mean degree of muscle contraction.

(3)

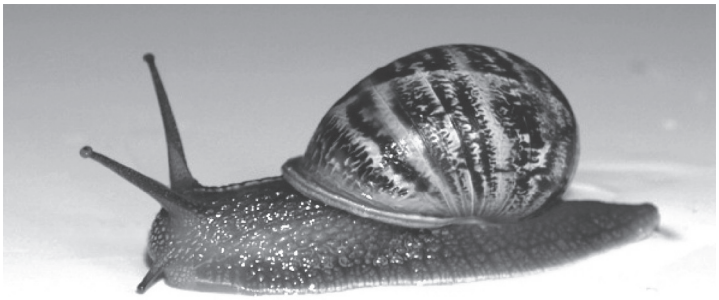
(ii) Describe how this investigation could be extended to obtain valid and reliable data on how the volume of the sound could affect habituation.

(4)

(Total for Question 2 = 11 marks)

3 Snails can respond to a variety of stimuli, including touch. When a snail experiences an unfamiliar stimulus, it will withdraw into its shell.

After repeated exposure to the same stimulus, the snail will stop responding to the stimulus. This behaviour is called habituation.



A Snail – Magnification × 2

(a) Describe how you could investigate the habituation of a snail to a stimulus.

(5)

(b) (i) State **two** variables, other than the stimulus, which could affect the investigation.

(2)

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(ii) Choose **one** of these variables. Suggest how this variable could be controlled.

Describe the effect the variable could have on the results if it is not controlled.

(2)

Variable .....

How to control the variable .....

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Effect on the results if the variable is not controlled .....

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(c) Suggest how calcium ions are involved in habituation in snails.

(4)

(Total for Question 3 = 13 marks)