8 A series of studies on rats have shown that the phenotype of an organism is the result of an interaction between the genotype and the environment.

(a) An investigation was carried out to study the ability of rats to run through a maze.

Rat at start of maze
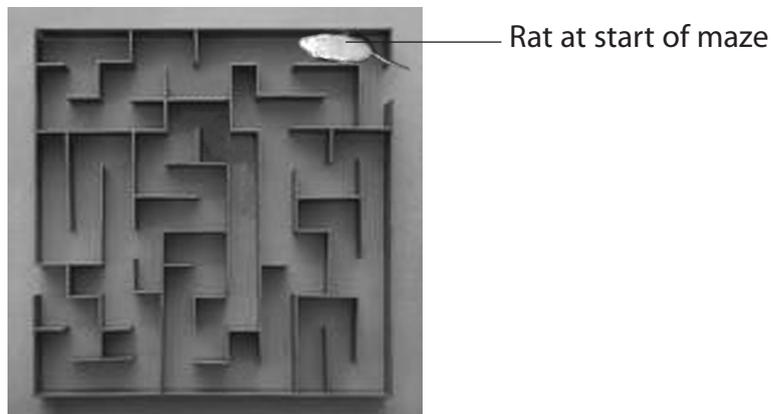
A rat was placed at the start of the maze and the number of errors it made was recorded as it ran through the maze.

This was repeated using many rats and the results are shown in the graph below.

Number of errors made in the maze
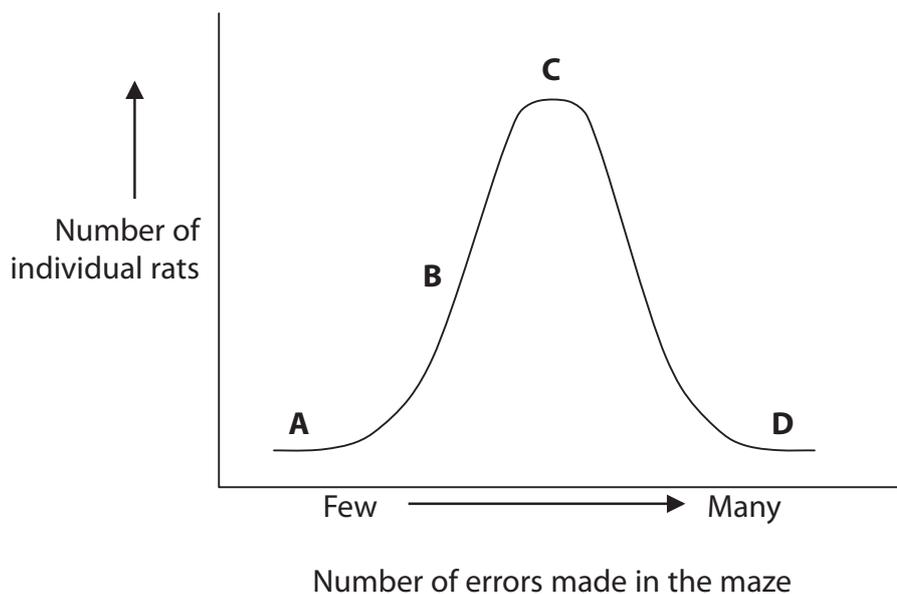
(i) Using the information in the graph, place a cross ☒ in the box that correctly identifies rats that are **least** good at running through a maze.

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

Place a cross ⊠ in the box next to the correct word to complete each of the following statements.

(ii) The shape of this graph suggests that the type of variation shown is

(1)

⊠ **A** categoric

⊠ **B** continuous

⊠ **C** discontinuous

⊠ **D** discrete

(iii) The distribution of the data in this graph is

(1)

⊠ **A** causal

⊠ **B** irregular

⊠ **C** normal

⊠ **D** proportional

P 3 9 5 0 4 A 0 1 9 2 4

(b) In another investigation, rats that were very good at running through mazes (maze-bright) were selected. These were allowed to breed amongst themselves for several generations to produce more maze-bright rats.

When these rats were young, they were split into three groups.
Each group was raised in one of three cage conditions. These conditions are described in the table below.

Cage condition	Description
Poor	Cages with no toys
Normal	Cages with a few toys
Enriched	Cages with many toys

When adult, these rats then ran through a maze and the number of errors made was recorded. The mean error rate per rat was calculated.

This investigation was repeated with rats that were least good at running through mazes (maze-dull).

The results are shown in the graph below.
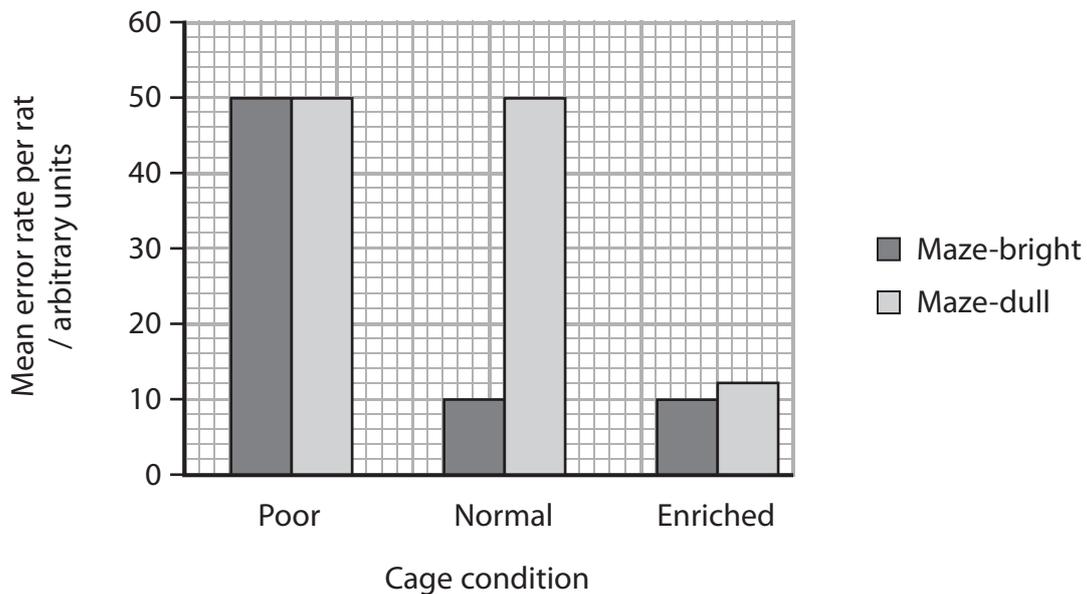
(i) State the phenotype of the rats being studied in this investigation.

(1)

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(ii) Suggest **two** factors that need to be controlled in this investigation.

(2)

1 ....

2 ....

(iii) Compare the mean error rate per rat for maze-bright rats and maze-dull rats in poor cage conditions and enriched cage conditions.

(3)

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(iv) Describe and explain the differences in the mean error rate per rat for maze-dull rats when they grew up in normal cage conditions and enriched cage conditions.

(2)

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(v) Describe and explain the effect on the mean error rate per rat for maze-bright rats when they grew up in normal cage conditions and enriched cage conditions.

(2)

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(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS