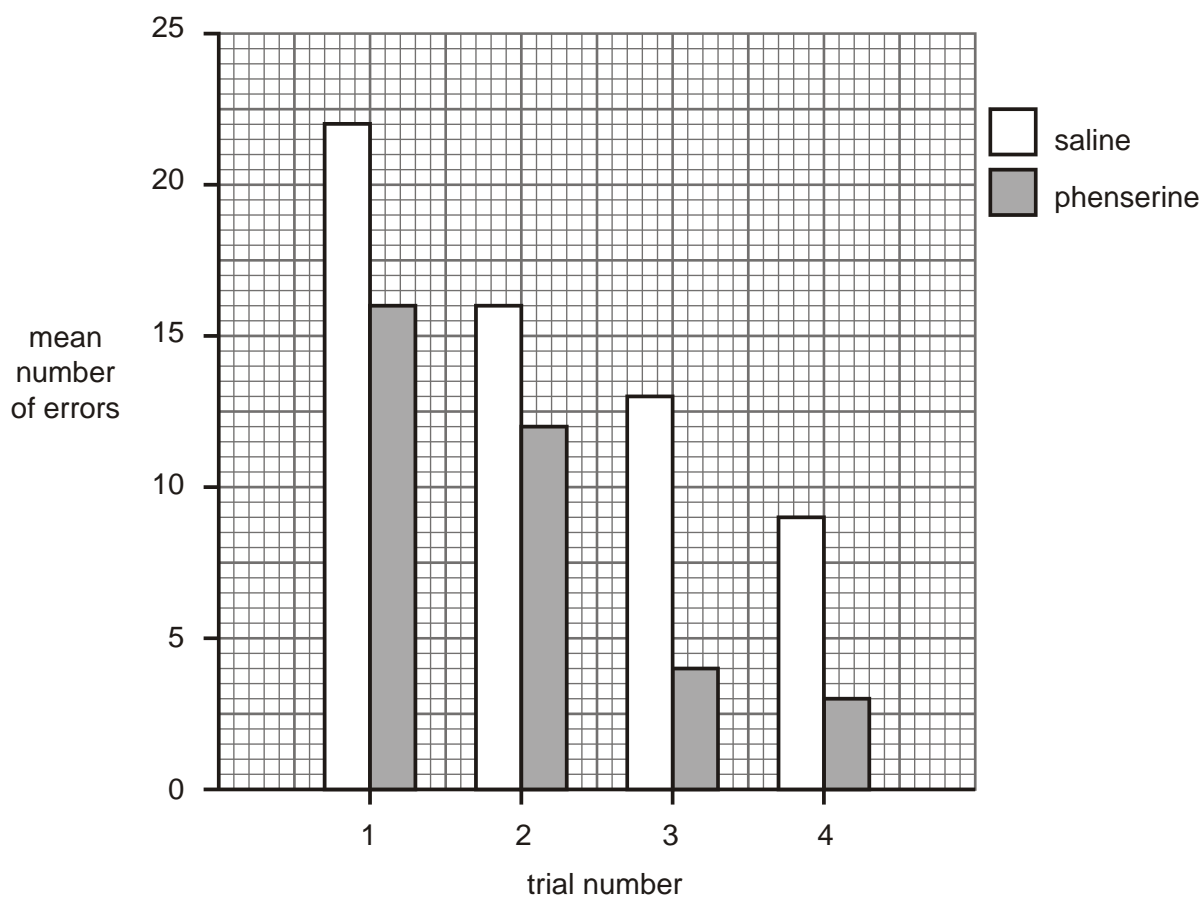


1. One form of treatment for people with Alzheimer's disease is to use drugs that act on acetylcholinesterase.

A study using one of these drugs, phenserine, was carried out on elderly rats.

- Ten rats were given injections of saline and another ten were given injections of phenserine.
- Each rat was placed in a maze and the entrance was shut.
- Each rat was allowed to find its way to the exit.
- The number of errors made was recorded.
- The experiment was repeated a further three times with each rat.

The results of the experiment are shown in the following figure.



- (i) Explain why some rats were given an injection of saline.

.....  
.....

(ii) Describe the results shown in the figure above.

.....  
.....  
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.....

[2]

(iii) Explain briefly the type of learning taking place.

.....  
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.....

[3]

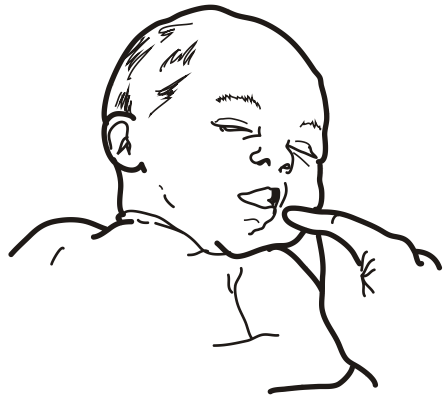
(iv) Suggest how phenserine may work in the brain.

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[3]

[Total 9 marks]

- 2. If the cheek of a newborn baby is brushed with a finger, as shown in the figure below, the baby will turn its head towards the finger.



Describe the type of behaviour shown by the baby and suggest an advantage of this response.

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[Total 4 marks]

3. Classical conditioning concerns learning by association and was discovered by the Russian scientist Ivan Pavlov, using dogs.

A study was carried out on a group of people to test classical conditioning.

- Each person was given a slight electric shock on the hand, which caused the arm to be jerked back.
- The procedure was carried out again but this time a red light was shone just before the electric shock was applied.
- This was repeated many times.
- Eventually, when presented with a red light, most people withdrew their arms even though a shock was not applied.

For **this** study state precisely:

- (i) the conditioned stimulus .....
- (ii) the conditioned response .....

[Total: 2 marks]

4. Operant conditioning was initially investigated by the scientist B.F. Skinner, using rats.

Explain briefly how a rat can learn to press a lever in its cage.

.....

.....

.....

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.....

.....

[Total: 3 marks]

5. Ten lambs, nine months old, were placed in an enclosure. A scientist entered the enclosure carrying an umbrella which was opened and closed repeatedly in front of the lambs. The lambs' reaction was to back away nervously from the umbrella. It was noticed that as the activity continued, the behaviour of the lambs changed until they ignored the umbrella.

(i) State the type of learning behaviour displayed by the lambs at the end of the experiment.

.....

[1]

(ii) Suggest **two** advantages to the lambs of this change in their behaviour.

.....  
.....  
.....  
.....

[2]

[Total 3 marks]

6. Parkinson's disease is a disorder of the nervous system. People with this condition are unable to produce enough of the neurotransmitter substance dopamine. This chemical is required in neurone circuits in the brain that control movement.

(a) Outline **two** roles of synapses in the nervous system.

1 .....

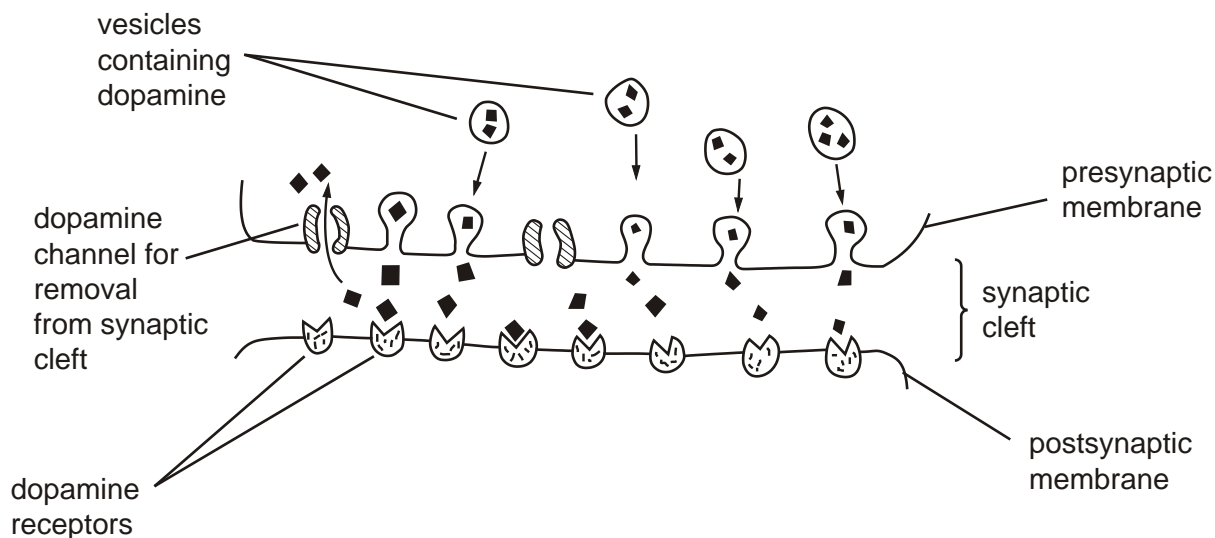
.....

2 .....

.....

[2]

The figure below illustrates the events at a synapse where the neurotransmitter is dopamine.



(b) Using **only** the information above, list **three** ways in which the events occurring at this synapse are the same as at a cholinergic synapse.

- 1 .....
- 2 .....
- 3 .....

[3]

(c) For the proper functioning of neurone circuits, neurotransmitters have to be removed from the receptors in the postsynaptic membrane and from the synaptic cleft. Explain why this is so.

- .....
- .....
- .....
- .....
- .....

[2]

[Total 7 marks]

7. Fig. 1 shows an apparatus called a double-choice learning box with sound-proofed walls and doors.

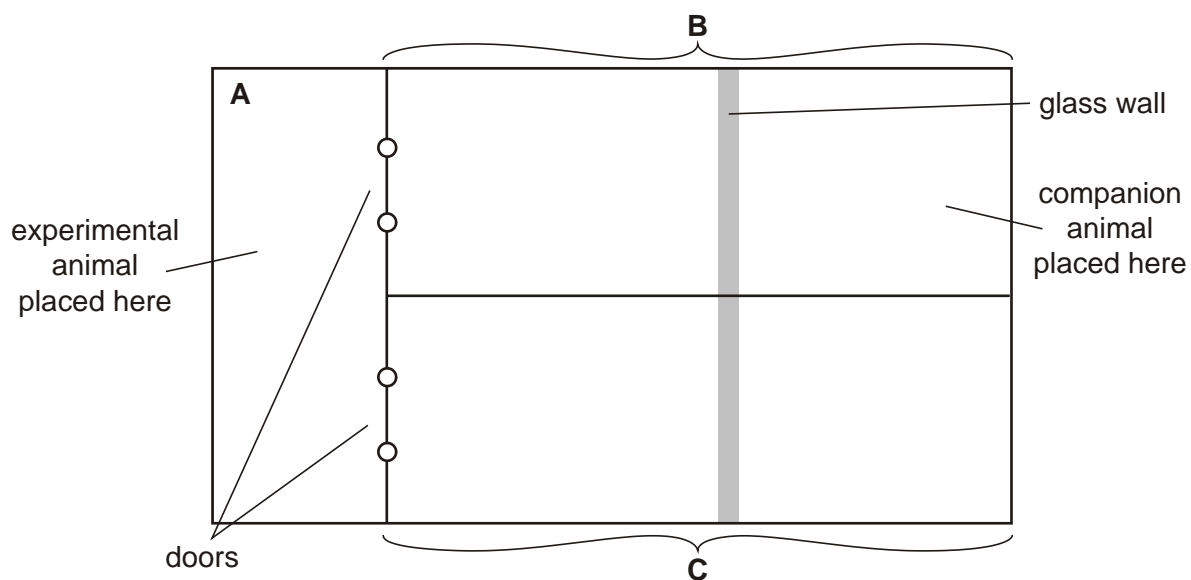


Fig. 1

- Two young mice were kept in separate, identical home cages and were accustomed to being handled.
- One mouse was used as the experimental subject and the other acted as a companion.
- The companion mouse was placed in chamber **B** behind a glass wall.
- Chamber **C** was left empty.
- The experimental mouse was placed in chamber **A** and the stop clock was started.
- The time taken for the experimental mouse to enter chamber **B** or **C** was noted.
- The experimental mouse was allowed to explore chamber **B** or **C** for 10 seconds and was then removed.
- The experiment was repeated a further 14 times with the same two mice.

Fig. 2 shows the results of this experiment.

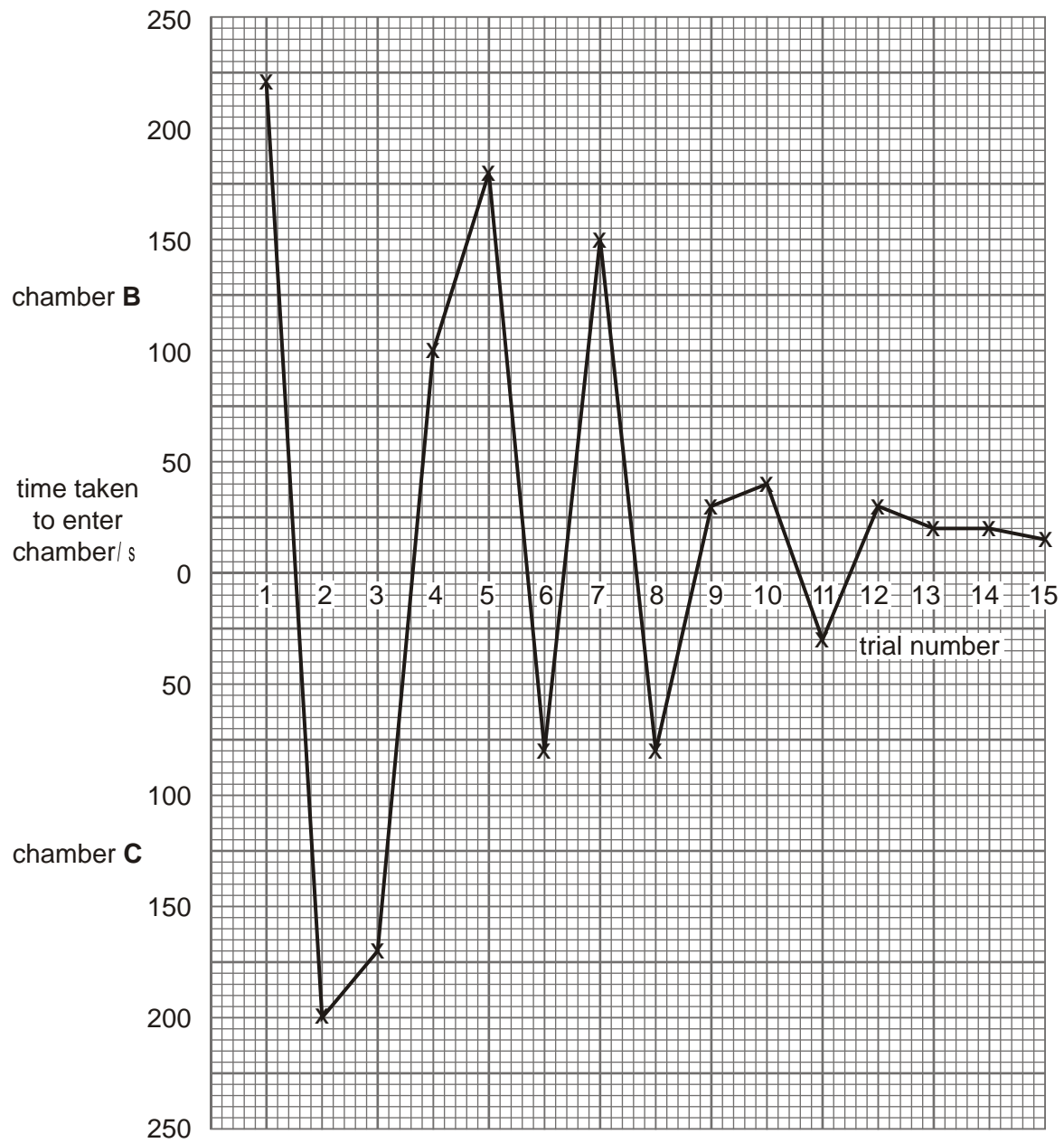


Fig. 2



(i) Using information in Fig. 2, describe the results of this investigation.

.....  
.....  
.....  
.....

[2]

(ii) Describe how you would carry out a control experiment for this investigation.

.....  
.....  
.....  
.....  
.....  
.....

[3]

(iii) Suggest the results you would expect from such a control experiment.

.....  
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.....

[1]

(iv) State what type of learning has taken place in this investigation **and** explain how this type of learning differs from classical conditioning.

.....  
.....  
.....  
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.....

[3]

[Total 9 marks]

8. Reflexes are automatic, stereotyped responses to stimuli that can also be conditioned.

(a) Explain the meaning of the terms

(i) *automatic*;

.....  
.....

[1]

(ii) *stereotyped*;

.....  
.....

[1]

(iii) *conditioned*.

.....  
.....

[1]

(b) Describe **one** example of a reflex response to a **named** stimulus.

stimulus

.....

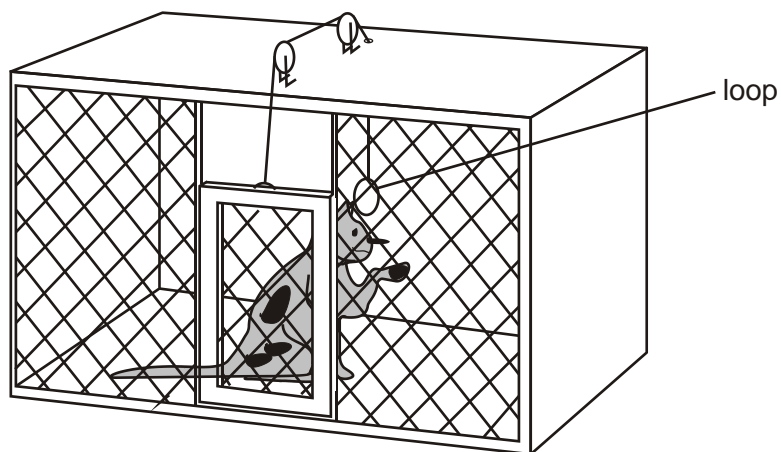
response

.....

.....

[1]

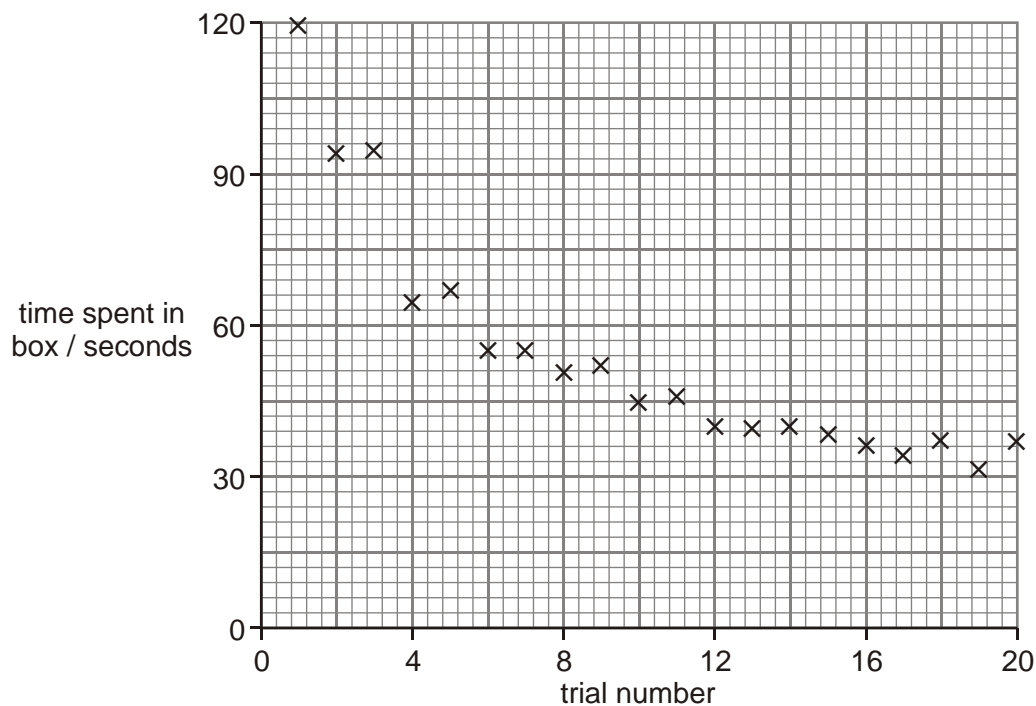
Fig. 1 shows a piece of apparatus called a puzzle box, used by Edward Thorndike to investigate operant conditioning in animals.



**Fig. 1**

During an experimental trial, a cat was placed inside the puzzle box. If the cat pulled the loop with its mouth or a paw, the door opened and it could escape. The time taken for the cat to escape was recorded. The experiment was then repeated several times with the same cat.

Fig. 2 shows a graph of the time taken for the cat to escape from the puzzle box during repeated trials.



**Fig. 2**

- (c) In this question, one mark is available for the quality of spelling, punctuation and grammar.

Describe **and** explain the data shown in Fig. 2.

Include in your answer a reason why the type of learning shown by the cat is operant conditioning.

*(Allow one line page)*

[7]

Quality of Written Communication [1]

(d) State **two** differences between operant conditioning and classical conditioning.

1 .....

.....

.....

2 .....

.....

.....

[2]

[Total 14 marks]