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1. (a) Name the region of the human brain involved in control of heart rate.

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(1)

(b) Heart rate increases during exercise. Explain the mechanisms involved in controlling this increase in heart rate.

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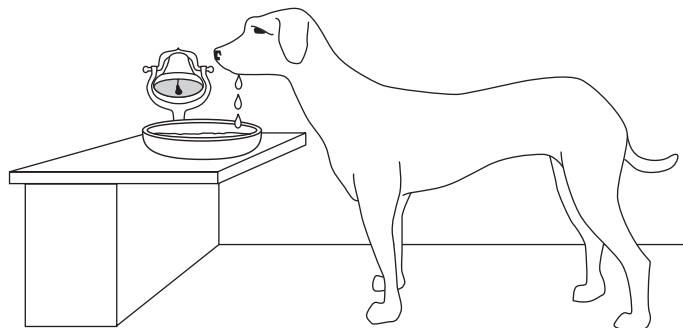
(4) **Q1**

**(Total 5 marks)**

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2. (a) Pavlov carried out experiments on dogs to investigate classical conditioning.



Explain how the dogs became conditioned to salivate at the sound of a bell in Pavlov's experiments.

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(3)

(b) Using operant conditioning, pigeons were presented with coloured keys and taught to peck one particular key. Suggest how this operant conditioning was achieved.

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(c) Briefly discuss the extent to which the study of learning in animals can help us to understand learning in humans.

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(d) Explain how functional magnetic resonance imaging (fMRI) can improve our knowledge of human brain function.

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Q2

(Total 9 marks)



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3. Muscle paralysis is common in many cases of poisoning, often as a result of interference with chemical transmission from the motor neurones to the muscles at the neuromuscular junctions. Studies of venomous snakes, such as the Prugasti krait (*Bungarus fasciatus*) have played a part in the investigation of this chemical transmission.

(a) Describe the normal sequence of events that occurs **within a muscle fibre** after stimulation of a neuromuscular junction.

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(b) Bungarotoxin can be isolated from the venom of the Prugasti krait. In minute amounts, it can cause paralysis of the diaphragm and intercostal muscles by its effects at synapses. Suggest how bungarotoxin causes these effects.

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(3)

Q3

(Total 8 marks)







5. The picture below shows the response of a cat's pupil to bright light.



(a) (i) Describe how the nervous system controls the pupil reflex in a mammal such as a cat, in response to bright light.

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(ii) Describe and explain how myelination of neurones is an advantage in this reflex pathway.

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**(3)**

(b) Hubel and Weisel covered one eye of kittens of different ages to investigate the timing of visual development in mammals.

Kittens which had one eye covered from the fourth to the fifth week subsequently had very poor vision in that eye. Kittens which had one eye covered at earlier or later times had normal vision. Suggest an explanation for these observations.

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(c) Some people have ethical objections to animal experiments. Suggest how a biologist might justify the use of animals in experiments.

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(Total 12 marks)

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Q5

**TOTAL FOR PAPER: 40 MARKS**

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