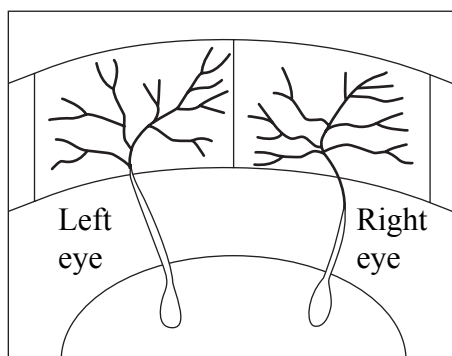




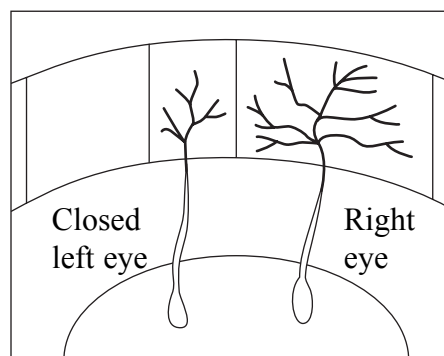
**Answer ALL questions in the spaces provided.**

1. Research on visual development in cats has led to knowledge of how information is processed in the visual cortex of the brain. The diagrams below show the growth of neurones in part of the visual cortex after normal visual development and when the left eye has been deprived of sensory information.

**Normal Visual Development**



**Sensory Deprivation in the Left Eye**



- (a) Use the diagrams above to describe differences in the visual cortex after sensory deprivation.

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**(2)**



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(b) Explain how this type of experiment has provided evidence which shows the need for exposure to sensory information in normal visual development.

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(2)

(c) Describe **one** other piece of evidence which suggests that humans must be exposed to particular stimuli if they are to develop normal vision.

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(1)

(Total 5 marks)

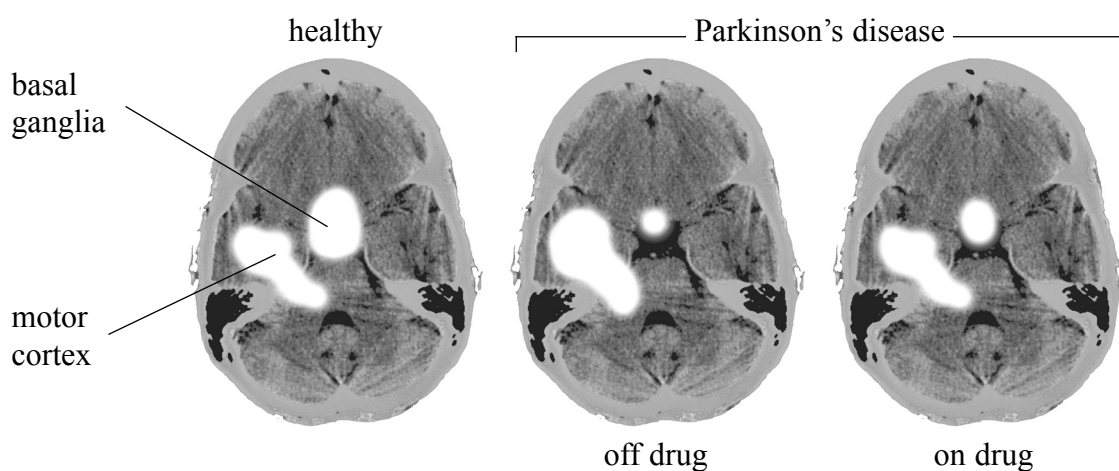
Q1



2. People with Parkinson's disease have poor control over their skeletal muscles, caused by a lack of the neurotransmitter dopamine. Large numbers of neurones secreting dopamine are found in the basal ganglia region of the brain.

Parkinson's disease can be diagnosed and monitored using brain scans. The fMRI scans below show the results of a study where subjects did a standard finger-tapping activity to investigate the effectiveness of a new drug treatment.

The results below are from a healthy brain, a patient with Parkinson's disease without drug treatment and a patient with Parkinson's disease taking drug treatment. The scan shows a horizontal section with the front of the head at the top. The most active areas are white.



- (a) Using the fMRI scans above, discuss the effects of this new drug on brain activity.

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(b) Explain how neurotransmitters, such as dopamine, stimulate neurones.

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(4)

(c) People with Parkinson's disease have much less dopamine in their brain than other people. Using the information already given in this question and your own knowledge, suggest and explain how Parkinson's disease can be treated using drugs.

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**(Total 11 marks)**

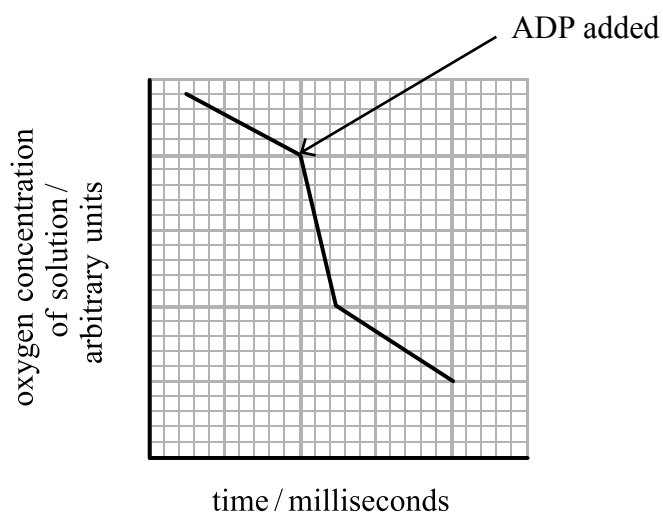
**Q2**

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3. Isolated mitochondria in a solution containing inorganic phosphate and an electron donor can be used to study respiration. An electrode is used to record changes in oxygen concentration while mitochondria respire. The graph below shows changes in oxygen concentration for some isolated mitochondria.



(a) (i) Describe and explain the trends shown on the graph above.

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(ii) Name an electron donor used in the electron transport chain in mitochondria.

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(1)

(iii) State the location of the electron transport chain in mitochondria.

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(1)



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(iv) Describe how ATP is synthesised in the electron transport chain.

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(b) ATP is used to provide an immediate supply of energy for biological processes. Describe the role of ATP in the following processes.

(i) Nerve impulse transmission

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**(2)**

(ii) Hyperpolarisation of rod cells in the retina

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**(2)**

**(Total 12 marks)**

**Q3**

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4. Animals which are predators often show bursts of very fast movement. Their prey tend to be able to carry out sustained movement over longer periods of time. Close examination shows that the muscles of predator and prey show a different composition of fast and slow twitch fibres.

(a) (i) Outline the differences between fast and slow twitch muscle fibres.

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**(2)**

(ii) State whether predator or prey would show a higher proportion of slow twitch fibres.

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**(1)**

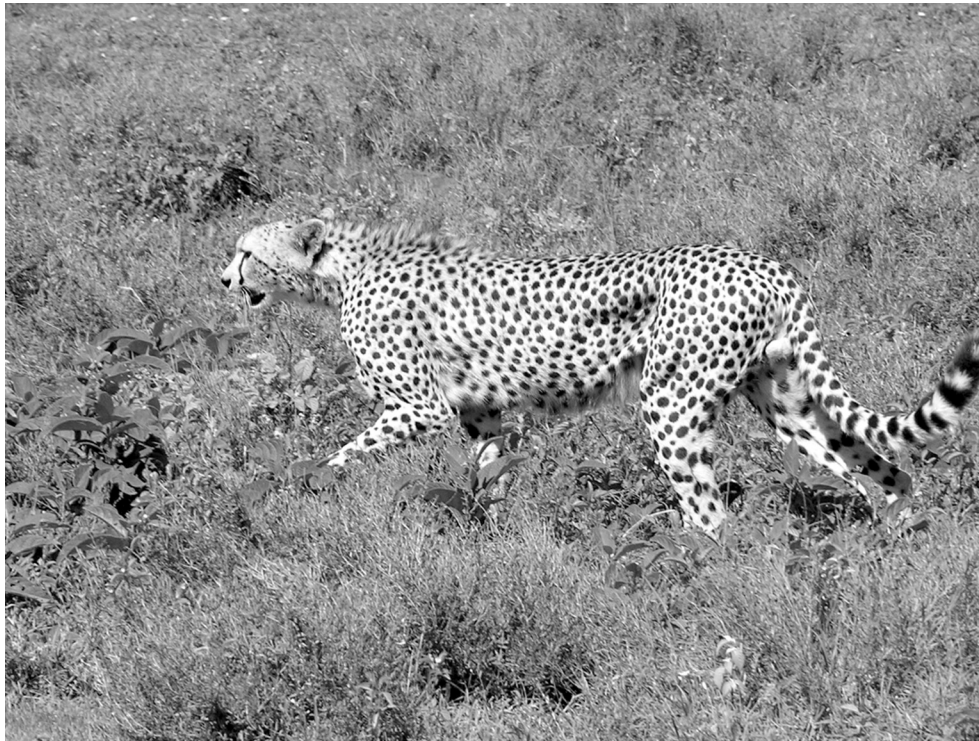
(iii) Discuss why predators show different proportions of fast and slow twitch muscle fibres from their prey.

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A predator in pursuit of its prey

- (b) During fast movement, lactate builds up in the muscles of the predator. Explain what happens to this lactate after the chase has ended.

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Hyenas feeding on a zebra they have recently killed

- (c) During the chase, the core body temperature of both predator and prey rises. Describe how changes in blood circulation help to return their core body temperatures to normal.

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(4)

Q4

(Total 12 marks)

**TOTAL FOR PAPER: 40 MARKS**

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