Nervous Transmission

Question Paper 3

Level	A Level
Subject	Biology
Exam Board	Edexcel
Topic	Control Systems
Sub Topic	Nervous Transmission
Booklet	Question Paper 3

Time Allowed: **51 minutes**

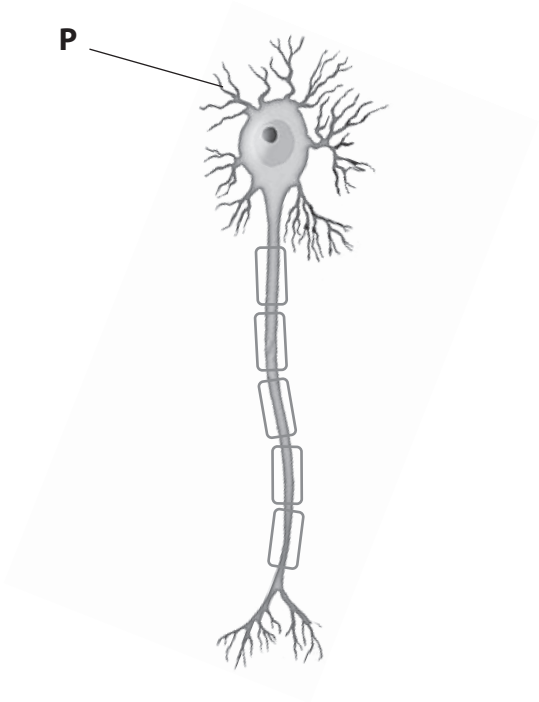
Score: **/42**

Percentage: **/100**

Grade Boundaries:

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

1 (a) The diagram below shows a motor neurone.



(i) Name the structure labelled **P**.

(1)

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(ii) Place a cross ☒ in the box to identify the direction of the nerve impulse in the axon of this motor neurone.

(1)

☒ **A** →

☒ **B** ↓

☒ **C** ←

☒ **D** ↑

(b) Eugenol is a drug that inhibits the movement of sodium ions through the cell surface membranes of sensory neurones.

The table below shows the effect of eugenol concentration on the percentage inhibition of sodium ion movement.

Concentration of eugenol / mmol dm^{-3}	Percentage inhibition of sodium ion movement (%)
0.2	30
0.4	50
0.6	65
1.0	80

(i) Describe the effect of eugenol on the percentage inhibition of sodium ion movement.

(2)

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(ii) Using information from the table, calculate the percentage inhibition of sodium ion movement at a concentration of eugenol of 0.8 mmol dm^{-3}.

Show your working.

(2)

Answer ..... %

*(c) Eugenol can be used to reduce pain.

Suggest an explanation for how eugenol affects the movement of sodium ions and reduces pain.

(6)

(Total for Question 1 = 12 marks)

2 The scientific article you have studied is adapted from several sources.

Use the information from the article and your own knowledge to answer the following questions.

(a) The sweet potato eaten by naked mole rats (paragraph 3) is very rich in starch. Starch can be a combination of amylose and amylopectin.

Give **two** structural differences between amylose and amylopectin.

(2)

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(b) Explain why a colony of naked mole rats is considered 'a eusocial society' (paragraph 4).

(2)

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(c) Naked mole rats show evidence of poikilothermy (paragraph 5).

(i) Explain what is meant by the term **poikilothermic**.

(1)

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(ii) Suggest how each of the following 'contribute to poikilothermic responses to changing temperature of this mammal'.

(2)

'Lack of an insulating layer' .....

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'A marked reduction in sweat glands' .....

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(d) Suggest a mechanism that could have been used to genetically modify cells from mice with cancer-causing genes (paragraph 13).

(2)

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*(e) Whilst naked mole rats are 'impervious to chemical pain' they do feel 'acute pain such as cuts and burns' (paragraph 31).

Touching something hot, which could lead to a burn, can cause nerve impulses to travel along myelinated sensory neurones very rapidly.

Explain how myelination increases the speed of transmission of nerve impulses in a sensory neurone.

(5)

(f) Explain how a heart attack can temporarily reduce the oxygen concentration in brain tissue (paragraph 36).

(3)

(g) Using the information in paragraph 48, name **one** hormone **and** state its function.

(1)

Hormone: .....

Function: .....

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(h) Suggest how a change in the mid region of the sperm may make it non-motile (paragraph 48).

(2)

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(i) Disperser naked mole rats 'are laden with fat' (paragraph 50).

Suggest why it may be advantageous for disperser naked mole rats to have high levels of fat.

(3)

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(j) Explain the statement that 'a preference by reproductively active females for unfamiliar males is interpreted as inbreeding avoidance' (paragraph 52).

(2)

(k) 'The naked mole rat hasn't yet had its genome sequenced' (paragraph 53).

Explain what is meant by the term **genome sequenced**.

(1)

(l) 'With so much to offer science, it is no surprise that naked mole rats are becoming more common in labs' (paragraph 53).

Using information from the article, describe **two** adaptations of naked mole rats. For each adaptation, explain why it could be of interest in a medical research laboratory.

(4)

(Total for Question 2 = 30 marks)