1.21 The Nervous System and Reflexes: Test Pack

AQA 8464 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Give the name of the cell that transmits electrical impulses away from the central nervous system to effectors such as muscles.

(Total for Question 1 is 1 mark)

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2 Name the receptor cells that detect change in light intensity in the human eye.

(Total for Question 2 is 1 mark)

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3 State the role of a synapse in nervous transmission.

(Total for Question 3 is 1 mark)

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4 Put the following structures of a simple reflex arc in the correct order, starting with the receptor: A receptor, B motor neuron, C sensory neuron, D effector, E spinal cord

- ☐ A -> C -> E -> B -> D
- ☐ A -> E -> C -> B -> D
- ☐ A -> C -> B -> E -> D
- ☐ A -> E -> B -> C -> D

(Total for Question 4 is 2 marks)

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5 A student times the reaction of a classmate to a visual stimulus. The student snaps a ruler and the classmate catches it. The student records five reaction times: 0.22 s, 0.25 s, 0.21 s, 0.80 s, 0.24 s.

(a) Calculate the mean reaction time excluding the obvious outlier. Show your working. **(2)**

(b) Suggest one procedural change to reduce the effect of random variation when measuring reaction time, and explain why it would help. **(1)**

(Total for Question 5 is 3 marks)

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6 An isolated motor nerve is stimulated and an impulse takes 0.024 s to travel 1.20 m along the axon. Use the equation speed = distance / time in your calculation. Show the equation, substitution, and the final answer with correct units and to three significant figures. (4 marks)

(Total for Question 6 is 4 marks)

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7 Describe one ethical consideration that must be addressed when human volunteers are used to measure reaction time in a class practical, and give one measure a teacher should take to address it.

(Total for Question 7 is 3 marks)

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8 In a nerve conduction practical, students measure the time for an electrical impulse to travel 0.90 m along an isolated nerve bundle. A student measures a time of 0.018 s.

(a) Calculate the speed of the nerve impulse in metres per second. Give your answer to two significant figures. **(2)**

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(b) State one biological factor that increases the speed of conduction along a neuron and explain how it increases speed. **(1)**

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(Total for Question 8 is 3 marks)

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9 A student uses an online reaction-time test and consistently records values about 0.10 s faster than the class mean. Suggest two possible sources of systematic error in the student's measurements and for each suggest a way to reduce that error. (4 marks)

(a) First source of systematic error and how to reduce it. **(2)**

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(b) Second source of systematic error and how to reduce it. **(2)**

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(Total for Question 9 is 4 marks)

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Mark scheme · 1.21 The Nervous System and Reflexes: Test Pack

Question 1

motor neuron (motor neurone) cao **B1**

Answer: Motor neuron

Question 2

rod cells (rods) cao **B1**

Answer: Rod cells

Question 3

a gap between neurons across which neurotransmitters pass (or where impulse crosses between neurons) **B1**

Answer: A gap between neurons across which neurotransmitters pass

Question 4

correct ordering A -> C -> E -> B -> D cao **M1**

sequence given correctly with arrows or commas cao **A1**

Answer: A -> C -> E -> B -> D

Question 5

(a) adds the four non-outlier times: 0.22 + 0.25 + 0.21 + 0.24 = 0.92 and divides by 4 (shows calculation) **M1**

(a) 0.230 s or 0.23 s cao **A1**

(a) Answer: 0.23 s

(b) any one valid change with explanation e.g. repeat the test more times and take the mean, so random errors average out **B1**

(b) Answer: Repeat the test more times and use the mean, because random variations will average out and give a more reliable value.

Question 6

quotes the equation speed = distance / time or v = d / t **M1**

substitutes values correctly: v = 1.20 / 0.024 **M1**

50.0 (correct numerical value to three significant figures) **A1**

includes correct unit m/s cao **A1**

Answer: 50.0 m/s

Question 7

identifies one ethical consideration e.g. informed consent, risk of distress, or privacy/confidentiality **B1**

gives a realistic measure to address it e.g. obtain written/verbal consent, allow withdrawal at any time, anonymise results **B1**

links the measure to the consideration e.g. consent ensures participation is voluntary, anonymising protects privacy **B1**

Answer: Any one ethical consideration (e.g. informed consent) and a linked measure (e.g. obtain consent and allow participants to withdraw so participation is voluntary and no one is forced to take part).

Question 8

(a) substitutes into speed = distance / time: speed = 0.90 / 0.018 **M1**

(a) 50 m/s cao (0.90 / 0.018 = 50.0 m/s, to two significant figures 50 m/s) **A1**

(a) Answer: 50 m/s

(b) myelination: myelin sheath causes saltatory conduction so impulses jump between nodes, increasing speed, oe **B1**

(b) Answer: Myelination: the myelin sheath allows saltatory conduction so impulses jump between nodes of Ranvier and travel faster.

Question 9

(a) identifies a plausible systematic error e.g. the online test has a calibration offset or different input latency **M1**

(a) gives an appropriate reduction e.g. use a calibrated timer or the same device as the rest of the class, cao **A1**

(a) Answer: Possible systematic error: the online test or device introduces a calibration offset (input latency). Reduce by using a calibrated, standardised device or the same hardware and browser as classmates so timings are comparable.

(b) identifies a second plausible systematic error e.g. the student anticipates the stimulus and so reacts faster consistently **M1**

(b) gives an appropriate reduction e.g. randomise the time between trials or use a practice block to reduce anticipation, cao **A1**

(b) Answer: Possible systematic error: the student anticipates the stimulus. Reduce by randomising intervals between trials and giving practice trials so anticipation is reduced.

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