Neuronal communication – 2021/20 GCE Biology A Component 01

1. Nov/2021/Paper_H420/1/No.7

Which row in the table correctly describes the events occurring during the action potential?

	Position on graph	Na^+/K^+-pump is operating	Voltage-gated Na^+ channels are open	Voltage-gated K^+ channels are open
A	1	yes	no	yes
B	2	yes	yes	no
C	3	no	no	yes
D	4	no	yes	no

Your answer ☐ **[1]**

2. Nov/2021/Paper_H420/1/No.8

Which of the statements about the graph is correct?

A Depolarisation is occurring at 4 and hyperpolarisation is occurring at 6.

B Depolarisation is occurring at 2 and hyperpolarisation is occurring at 5.

C Hyperpolarisation is occurring at 5 and repolarisation is occurring at 6.

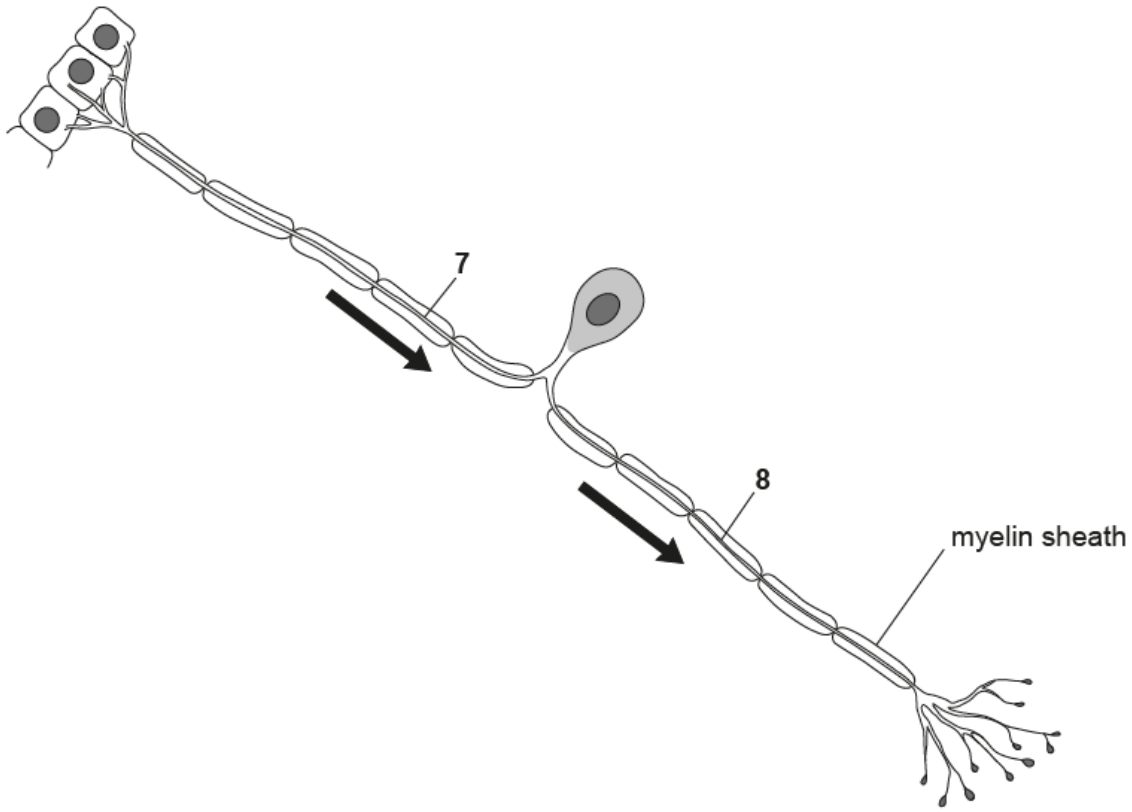
D Repolarisation is occurring at 4 and hyperpolarisation is occurring at 6.

Your answer ☐ **[1]**

3. Nov/2021/Paper_H420/1/No.10

Below is a diagram of a neurone.

The arrows show the direction of the nerve impulse.



Which row in the table correctly identifies structures **7** and **8** and the type of neurone shown in the diagram?

	Structure 7	Structure 8	Type of neurone
A	axon	dendron	sensory
B	axon	dendron	motor
C	dendron	axon	sensory
D	dendron	axon	motor

Your answer ☐ **[1]**

4. Nov/2021/Paper_H420/1/No.11

Which of the following statements about nervous transmission is **not** correct?

A Breakdown of the myelin sheath can lead to uncoordinated movement.

B Saltatory conduction increases the rate of propagation of a nerve impulse.

C The myelin sheath is formed from Schwann cells.

D The nodes of Ranvier act as electrical insulators.

Your answer ☐ **[1]**

5. Nov/2021/Paper_H420/1/No.12

Which of the following statements is/are correct?

1 The autonomic nervous system contains sensory and motor neurones.
2 Somatic and parasympathetic motor neurones use different neurotransmitters.
3 Somatic motor neurones stimulate skeletal muscles whereas autonomic motor neurons stimulate only glands.

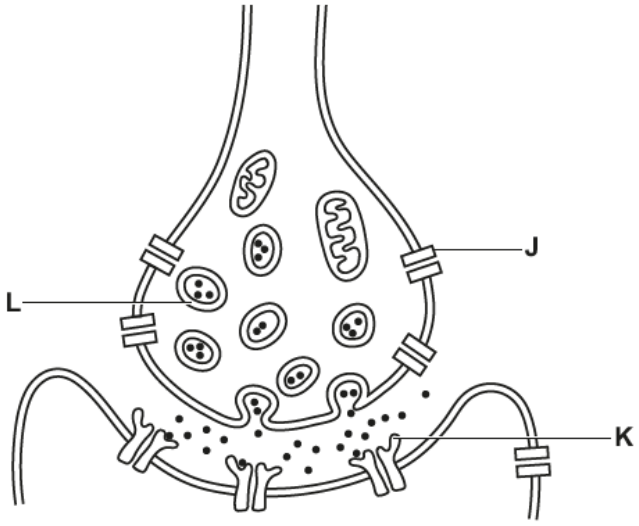
A 1, 2 and 3 are correct

B only 1 and 2 are correct

C only 2 and 3 are correct

D only 1 is correct

6. Nov/2020/Paper_H420/1/No.14



Which of the following statements, **A** to **D**, describes events occurring at a synapse?

A Acetylcholine is broken down by enzymes so that it can bind to structure **K**.

B An action potential causes structure **J** to close.

C Structure **J** is a voltage gated Ca^{2+} channel.

D Structure **L** is released by exocytosis.

Your answer ☐ **[1]**

7. Nov/2020/Paper_H420/1/No.15

GABA is a neurotransmitter.

GABA reduces the number of action potentials in the postsynaptic neurone by opening chloride ion channels in the post-synaptic membrane.

Which of the following statements, **A** to **D**, describes the action of GABA?

A GABA binds to structure **K** in competition with acetylcholine.

B GABA causes hyperpolarisation of the post-synaptic membrane.

C GABA causes depolarisation of the post-synaptic membrane.

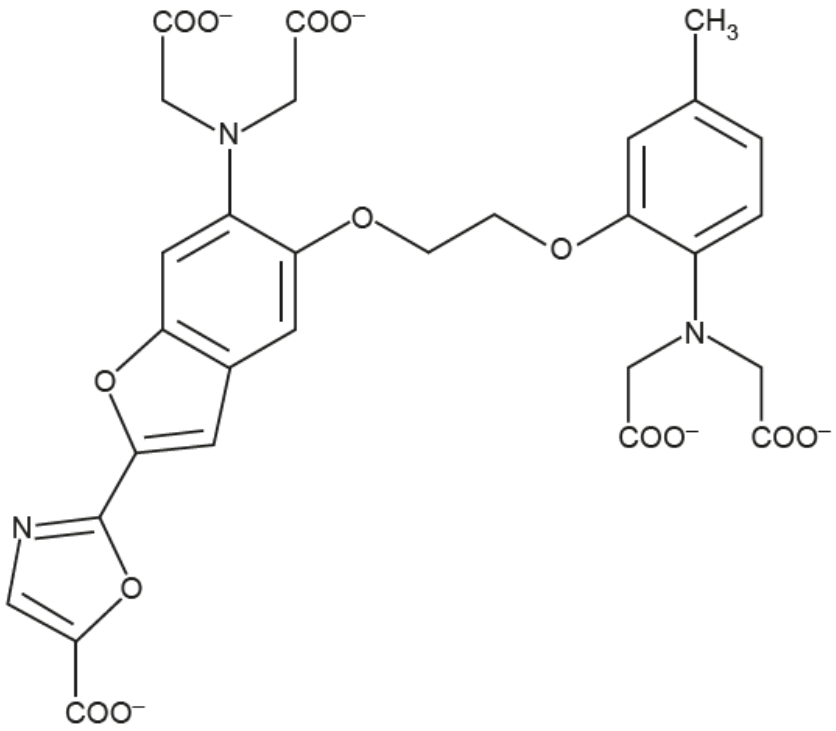
D GABA inhibits release of neurotransmitter from structure **L**.

Your answer ☐ **[1]**

8. Nov/2020/Paper_H420/1/No.18

FURA-2 is a fluorescent dye that can be used to measure the concentration of Ca^{2+} ions inside cells.

(a) The structure of FURA-2 is shown below.



Use the information in the figure to explain why FURA-2 is unable to cross cell membranes.

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(b) Scientists have used FURA-2 to study the role of Ca^{2+} ions in the synapses of living nerve tissue.

FURA-2 was injected into a single sensory neurone that was connected by a synapse to a relay neurone.

FURA-2 fluorescence inside the neurone was observed using a confocal microscope.

(i) Explain **one** advantage of using a confocal microscope in this study.

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(ii) The sensory neurone was stimulated electrically and the FURA-2 fluorescence in the synaptic bulb was measured. At the same time, an electrode recorded the membrane potential in a postsynaptic neurone.

The results of this study are shown in the table.

Strength of electrical stimulation	FURA-2 fluorescence in synaptic bulb	Highest membrane potential in postsynaptic neurone (mV)
Low	Low	–60
Medium	Medium	+40
High	High	+40

The intensity of FURA-2 fluorescence is proportional to the concentration of Ca^{2+} ions.

The scientists concluded that changes in the concentration of Ca^{2+} ions in the presynaptic neurone caused an action potential in the postsynaptic neurone.

Evaluate and explain the scientists' conclusion.

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