

Nervous System – Mark Scheme

Q1.

[AO1 = 3]

1 mark for each of the following:

- A = Sensory Neuron
- B = Relay Neuron (accept interneurons / connector neuron)
- C = Motor Neuron

[3]

Q2.

[AO1 = 3]

Award 1 mark for each of the following points (up to 3 marks):

- the synaptic vesicles containing the neurotransmitter are **only** present on / released from the presynaptic membrane
- the receptors for the neurotransmitters are **only** present on the postsynaptic membrane
- it is the binding of the neurotransmitter to the receptor which enables the signal / information to be passed / transmitted on (to the next neuron)
- diffusion of the neurotransmitters mean they can only go from high to low concentration, so can only travel from the presynaptic to the postsynaptic membrane.

[3]

Q3.

[AO1 = 4]

Level	Marks	Description
2	3 – 4	Excitation and inhibition are explained clearly with reference to synaptic transmission. The answer is generally coherent with effective use of terminology.
1	1 – 2	There is limited/partial explanation of excitation and inhibition with reference to synaptic transmission or only excitation or inhibition has been outlined. The answer may lack coherence. Use of terminology may be either absent or inappropriate.
	0	No relevant content.

Possible Content:

- Neurotransmitters can be excitatory or inhibitory (most can be both but GABA is purely inhibitory).
- If the neurotransmitter is excitatory then the post synaptic neuron is more likely to

- fire an impulse.
- If the neurotransmitter is inhibitory then the post synaptic neuron is less likely to fire an impulse.
- The excitatory and inhibitory influences are summed, if the net effect on the post synaptic neuron is inhibitory, the neuron will be less likely to 'fire' and if the net effect is excitatory, the neuron will be more likely to fire.

Students are likely to name neurotransmitters but this is not essential for full credit.

For full credit there should be some understanding of 'summation.'

Q4.

Please note that the AOs for the new AQA Specification (Sept 2015 onwards) have changed. Under the new Specification the following system of AOs applies:

- AO1 knowledge and understanding
- AO2 application (of psychological knowledge)
- AO3 evaluation, analysis, interpretation.

[AO1 = 2, AO2 = 2]

AO1

Up to two marks for outlining the role of the CNS and the ANS in behaviour. One mark for each. This will probably be embedded in the application to Martha.
 For CNS, possible points might include brain and role in life functions / psychological processes / higher mental functions and spinal cord and its role in transmitting information to and from the brain. Controls reflex behaviours.
 For ANS, possible points might cover that it controls life-maintaining processes such as heart rate; transmits information to and from internal organs; sympathetic division of ANS prepares body for action; parasympathetic division conserves / stores energy.

AO2

Up to two marks for application of the role of the CNS and the ANS to Martha. One mark for each.

Likely answers for CNS:

Brain / cerebral cortex in higher mental functions / conscious awareness (I realised that...); decision making (...I decided to run.); auditory cortex / temporal lobe in processing auditory information (... I heard footsteps behind me...); visual cortex / occipital lobe in processing visual information (I saw a bus...).

Less likely but accept:

Cerebellum in regulating movement and sense of balance - 'walking' and '...leapt on the bus'.

Likely answers for ANS will relate to the sympathetic division of ANS and to fight / flight response: increased heart rate in emergency action (...my heart was beating so fast...); increased action of adrenal glands and energising effect (...moved with such speed / shaking); blood vessels to limbs dilate (... sweating).

Q5.**[AO2 = 6]**

Level	Marks	Description
3	5 – 6	The explanation of how each type of neuron would function in this situation is clear and with effective and generally well-detailed application. The answer is coherent with effective use of terminology.
2	3 – 4	The explanation of how types of neurons would function in this situation is partial. There is partial appropriate application. The answer is generally coherent with some appropriate use of terminology.
1	1 – 2	The explanation of how types of neurons would function in this situation is limited. Application is limited. The answer lacks coherence and/or appropriate use of terminology.
	0	No relevant content.

Possible application as follows:

- Sensory neurons send information from the senses to the brain – here receptors in Jeremy’s hand would sense the jolt of the spade hitting the rock and send that information via the peripheral nervous system to his brain/CNS.
- Relay neurons connect with other neurons, mostly found in the brain/CNS - here they would be involved in analysis of the sensation, what it means, deciding about how to respond to it, thus acting between the sensory and motor neurons.
- Motor neurons send messages via long axons from the brain to the muscles or effectors – here the message from the brain instructs Jeremy’s arm muscles to stop working and stop the digging action.

Credit other relevant application.

Q6.**[AO2 = 3]**

Content:

1 mark for any three of the following points:

- Transmission involves impulses crossing a space or gap between an axon terminus and the adjacent neuron (the synapse/synaptic cleft)
- Neurotransmitters are chemicals released from vesicles on the presynaptic neuron
- They travel/diffuse across the synapse and lock onto receptor sites on receiving/postsynaptic neuron
- Some neurotransmitters increase the rate of firing in the receiving neurons and others decrease the rate of firing

- Psychoactive drugs work by affecting (increasing or inhibiting) the transmission of neurotransmitters across the synapse

For full marks there must be some reference to drugs affecting synaptic transmission.

Credit diagrams in so far as they contribute to the explanation.