

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	distance the ruler fell (in mm)		1	AO2 4.5.2.1
01.2	any one from: <ul style="list-style-type: none"> drop the ruler from the same height each time let the ruler drop without using any force use same ruler each time thumb should be same distance from the ruler at the start carry out the experiment with the lower arm resting in the same way on the table 		1	AO2 4.5.2.1
01.3	0.39		1	AO2 4.5.2.1
01.4	0.25	allow 0.264	1	AO2 4.5.2.1 MS 2b, 2e
01.5	the conclusion is incorrect as there is no difference between the left-handed and right-handed results the conclusion can only be made for the students being tested / because the sample size was small, a general conclusion cannot be formed	if 0.264 given in 01.4 , award 2 marks for: the conclusion is correct as the results for the right hand are faster than for the left hand	1 1 1	AO3 4.5.2.1

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01.6	voluntary reaction time		1	AO2 4.5.2.1
01.7	reflex actions are automatic / this was a conscious action / required thought		1	AO2 4.5.2.1
01.8	any three from: <ul style="list-style-type: none"> it takes time for an impulse to travel along neurones the nervous system has synapses it takes time for chemicals to diffuse across synapses which further adds to the reaction time 		3	AO2 4.5.2.1
02.1	maintenance of a constant internal environment		1	AO1 4.5.1
02.2	pH temperature	award a maximum of 1 mark for enzyme concentration / substrate concentration	1 1	AO1 4.5.1 4.2.2.1
02.3	occur without thought / conscious activity		1	AO1 4.5.1

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02.4	any six from; <ul style="list-style-type: none"> • consist of receptors, co-ordination centres and effectors • receptors detect stimuli • example for receptor stated such as light / sound / temperature / pressure / other named receptor • co-ordination centre processes information • co-ordination centre named – brain / spinal cord / pancreas / other named control centre • effectors bring about a change • named effector – muscle /gland • response described – muscle contracts / gland secretes hormone 		6	AO1 4.5.1
03.1	so body can respond rapidly to a dangerous situation, e.g. burning		1	AO1
03.2	breathing rate / blinking		1	AO1

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03.3	any six from: <ul style="list-style-type: none"> • heat detected by temperature receptor / thermoreceptor • sends an electrical impulse • along sensory neurone • to a relay neurone • in CNS • sends an impulse along motor neurone • to muscle in arm • muscle contracts pulling the arm away from the radiator 		6	AO2 4.5.2.1
04.1	sensory neurone		1	AO2 4.5.2.1
04.2	0.012 s	award 1 mark for $\frac{0.9 \text{ m}}{76 \text{ m/s}}$ award 2 marks for 12 ms	3	AO2 4.5.2.1 MS 1c, 3d
04.3	contains (2) synapses electrical impulse triggers a chemical / neurotransmitter to be released this diffuses across the synapse / between the two neurones slower than electrical impulse		1 1 1 1	AO2 4.5.2.1

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05.1	independent: practice / number of repeats dependent: reaction time		1 1	AO2 4.5.2.1
05.2	any two from: <ul style="list-style-type: none"> • same person • same computer software • strike same key • same ambient conditions • leave same gap between repeats 	accept other valid suggestion	2	AO2 4.5.2.1
05.3	repeat 7 distraction / tiredness		1 1	AO2 4.5.2.1
05.4	the conclusion is true for these data it is not possible to conclude in general: <ul style="list-style-type: none"> • if reaction time continues to improve for more repeats • if reaction time improves for any activity • if an improvement in reaction time to a situation is permanent, or short lived / temporary 		1 1 1	AO3 4.5.2.1
06.1	0.15 s	award 1 mark for $\sqrt{\frac{11.5}{490}}$ award 2 marks for 0.153 s	3	AO2 4.5.2.1 MS 1c, 3d

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06.2	any four from: <ul style="list-style-type: none"> • give student caffeine / coffee drink • wait 15 minutes / sensible time period • at least two named control variables, e.g. drop from same height, use same person each time, use same hand to catch ruler • drop ruler; note drop distance • repeat (at least) five times and calculate mean drop distance 		4	AO2 4.5.2.1
06.3	reaction time would be faster / shorter caffeine is a stimulant it speeds up body reactions / the nervous system		1 1 1	AO2 4.5.2.1

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06.4	<p>any three from:</p> <p>supporting conclusion:</p> <ul style="list-style-type: none"> • person A and person b both reacted more quickly when using their dominant hand • the pattern was consistent with both sets of data <p>casting doubt on conclusion:</p> <ul style="list-style-type: none"> • differences between results are very small and could be attributed to experimental error • only two students were tested / sample size was very small • only two results were collected for each hand • there appears to be a 'learned' effect – the second repeat result is always lower than the first for each hand <p>evaluation: the student should not form a general conclusion based on these data</p>	to gain 3 marks, answers should include at least one marking point to support the conclusion and at least one marking point to cast doubt on the conclusion	3	AO3 4.5.2.1
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07	any six from: <ul style="list-style-type: none"> • noise detected by sound receptor • sends an electrical impulse • along sensory neurone • to a relay neurone • in central nervous system (CNS) • sends an impulse along motor neurone • to muscle in leg • muscle contracts, making person jump 		6	AO2 4.5.2.1
08.1	stimulus		1	AO2 4.5.1 4.5.2.1
08.2	brain		1	AO2 4.5.1 4.5.2.1
08.3	driver would have reacted faster to the insect as responded with a reflex action brain not involved / impulse relayed via CNS		1 1 1	AO2 4.5.2.1
09.1	sensory neurone		1	AO1 4.5.2.1

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09.2	any six from: <ul style="list-style-type: none"> • pain receptor sends an electrical impulse along the sensory neurone • this triggers the release of chemical / neurotransmitter from the end of the sensory neurone • this diffuses across the synapse • procaine is the same shape as chemical / neurotransmitter • procaine binds to receptor on the next neurone / post synaptic membrane • chemical cannot bind • no electrical impulse / action potential is generated • impulse does not travel to the brain • so no pain is detected / felt 	credit higher-level knowledge of synapses and terminology	6	AO3 / AO2 4.5.2.1
10.1	myelin sheath		1	AO1 4.1.1.3 4.5.2.1

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10.2	any six from: (in a healthy person) <ul style="list-style-type: none"> • myelin sheath acts as insulator • it speeds up nerve impulses • ensures nerve impulses travel to the correct destination (in a person with MS) <ul style="list-style-type: none"> • impulse may be blocked from reaching a muscle • stopping a muscle contracting / numbness • impulse may be scrambled / transmitted to incorrect neurones • which could cause tingling • impulse travels too slowly • this could cause numbness / muscle slow to react 		6	AO3 4.1.1.3 4.5.2.1
11.1	receptor AND effector		1	AO1 4.5.2.1
11.2	spinal cord		1	AO1 4.5.2.1

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11.3	any two from: <ul style="list-style-type: none"> • sensory neurones carry information to the brain / CNS, motor neurones carry information from the brain / CNS (to other parts of the body) • sensory neurones have their cell body along one side of the axon, motor neurones have their cell body at one end of the axon • sensory neurones receive information from receptors, motor neurones transmit information to effectors / muscles / glands 		2	AO1 4.5.2.1
11.4	any two from: <ul style="list-style-type: none"> • the senses • the speed of the impulse travelling to the brain • the processing time in the brain • the speed of the impulse sent to the muscles 		2	AO2 4.5.2.1
12.1	Tom's Diner		1	AO2 4.3.1.1 4.3.1.3

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12.2	any two from: <ul style="list-style-type: none">• food could become contaminated as open to the air• 30 °C is not hot enough to kill most bacteria• bacteria likely to reproduce rapidly at 30 °C		2	AO2 4.3.1.1 4.3.1.3
12.3	any one from: <ul style="list-style-type: none">• water• rest• antibiotics	accept any sensible suggestion	1	AO1 4.3.1.8
12.4	bacteria require moisture to reproduce		1	AO2 4.3.1.1 4.3.1.3

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12.5	<p>any four from:</p> <ul style="list-style-type: none">• keep the person who has the disease in isolation• which prevents spread through droplet infection / touching• clean surfaces with an antiseptic• which kills / destroys the pathogen• wash hands when touching materials that have been in contact with contagious person• to minimise risk of ingesting pathogen• wear gloves / mask / protective clothing• to minimise risk of inhaling / ingesting pathogen	to award 4 marks, answers should include two suggested approaches and two explanations of how these minimise the risk of pathogen transmission	4	AO2 4.3.1.1 4.3.1.3