AQA GCSE Biology | 8461

SPECIFICATION POINT 4.5.2.1

Structure and function

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**35**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.5.2.1 Structure and function

Answer 01 · Mark scheme

January 2007 | BLY1F | Original Q2 | Legacy

Question 2

	answers	extra information	mark
	alcohol - affects the nervous system by slowing down reactions		1
	cocaine - a very addictive drug		1
	nicotine - the addictive substance in tobacco smoke		1
	thalidomide - drug which caused many children to be born with abnormal limbs		1
total			4

4.5.2.1 Structure and function

Answer 02 · Mark scheme January 2007 | BLY1F | Original Q3 | Legacy

Question 3

	answers	extra information	mark
	A – muscle		1
	B – receptor		1
	C – neurone		1
	D – spinal cord		1
total			4

Answer 03 · Mark scheme March 2007 | BLY1A | Original Q3 | Legacy

Three	**A**	flash of light	**4**
	B	palm of hand touched	**3**
	C	cheek stroked	**2**
	D	mouth touched by mother's finger	**1**

Answer 04 · Mark scheme June 2007 | BLY1A | Original Q3 | Legacy

Three	**A**	brings about a change in the body	**4**
	B	carries nerve impulse	**2**
	C	coordinates a response	**3**
	D	detects changes	**1**

4.5.2.1 Structure and function

Answer 05 · Mark scheme November 2007 | BLY1A | Original Q5 | Legacy

Five	**A**	muscle	**2**
	B	neurone	**3**
	C	pain receptor	**1**
	D	spinal cord	**4**

Answer 06 · Mark scheme March 2008 | BLY1AP | Original Q4 | Legacy

Four	**A**	muscle	**1**
	B	neurone	**4**
	C	central nervous system	**3**
	D	receptor	**2**

Answer 07 · Mark scheme March 2008 | BLY1AP | Original Q7 | Legacy

Seven	**2**	**3**	**1**	**1**

Answer 08 · Mark scheme June 2008 | BLY1AP | Original Q4 | Legacy

Four	**A**	blinking	**2**
	B	cells in the eye	**4**
	C	insect	**3**
	D	muscle in the eye lid	**1**

4.5.2.1 Structure and function

Answer 09 · Mark scheme

January 2009 | BLY1F | Original Q1 | Legacy

question	answers	extra information	mark
1(a)	eye / sight / eyesight ear / hearing	either order ignore light	1 1
1(b)	ear		1
1(c)(i)	reflex		1
1(c)(ii)	neurones		1
Total			**5**

4.5.2.1 Structure and function

Answer 09 · Mark scheme January 2009 | BLY1F | Original Q1 | Legacy

Biology BLY1F - AQA GCSE Mark Scheme 2009 January Series

COMPONENT NUMBER: BLY1F

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: January 2009

Answer 10 · Mark scheme March 2009 | BLY1AP | Original Q5 | Legacy

Five	**A** effector	**3**
	B receptor	**4**
	C relay neurone	**2**
	D synapse	**1**

	A	**B**	**C**	**D**

Answer 11 · Mark scheme June 2009 | BLY1AP | Original Q2 | Legacy

Two	**A** has receptors that are sensitive to the smell of the pasta sauce	**2**
	B has receptors that would detect heat if the girl touched the pan	**3**
	C has receptors that are sensitive to the taste of the pasta sauce	**4**
	D has receptors that enable the girl to read the recipe for the pasta sauce	**1**

Answer 12 · Mark scheme June 2009 | BLY1AP | Original Q5 | Legacy

Five	**A** motor neurone	**3**
	B muscle	**4**
	C sensory neurone	**1**
	D synapse	**2**

	A	**B**	**C**	**D**

4.5.2.1 Structure and function

Answer 13 · Mark scheme

June 2009 | BLY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	receptor		1
3(a)(ii)	sensory neurone		1
3(a)(iii)	motor neurone		1
3(a)(iv)	muscle		1
3(b)(i)	eye(s)	allow retina ignore sight	1
3(b)(ii)	ear(s)	ignore hearing do **not** allow ear drum	1
3(b)(iii)	ear(s)	ignore balance	1
Total			**7**

4.5.2.1 Structure and function

Answer 13 · Mark scheme June 2009 | BLY1F | Original Q3 | Legacy

BLY1F

Answer 14 · Mark scheme November 2009 | BLY1AP | Original Q1 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 15 · Mark scheme March 2010 | BLY1AP | Original Q6 | Legacy

Six	**4**	**1**	**1**	**2**

Answer 16 · Mark scheme June 2010 | BLY1AP | Original Q3 | Legacy

Three	**A**	muscles	4
	B	stimuli	1
	C	receptors	2
	D	neurones	3

Answer 17 · Mark scheme June 2010 | BLY1AP | Original Q7 | Legacy

Seven	**2**	**1**	**2**	**3**

Answer 18 · Mark scheme March 2011 | BLY1AP | Original Q2 | Legacy

Two	**A**	an effector	**4**
	B	a receptor	**2**
	C	a response	**3**
	D	a stimulus	**1**

Answer 19 · Mark scheme March 2011 | BLY1AP | Original Q7 | Legacy

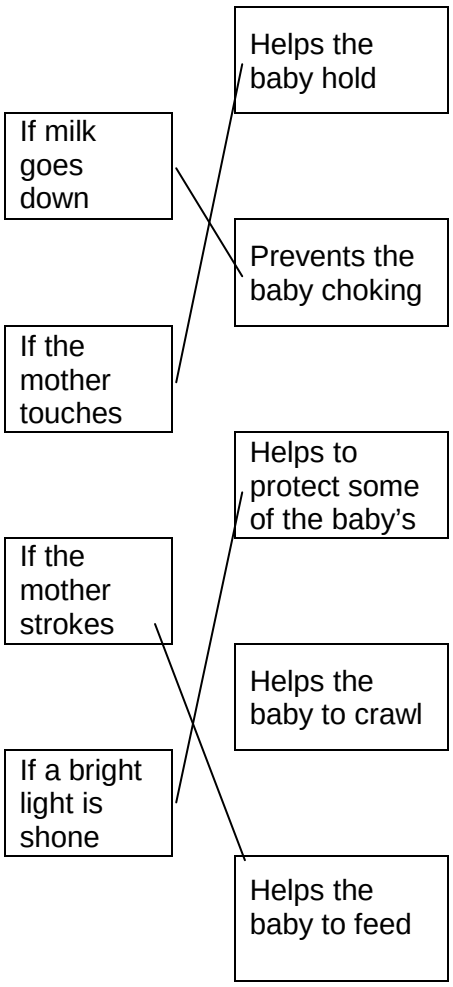
Seven	**2**	**1**	**3**	**3**

4.5.2.1 Structure and function

Answer 20 · Mark scheme

June 2011 | BLY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)		all four correct = **4** marks three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	4
4(b)	glands muscles	**1** mark for each correct tick each extra box ticked cancels **1** mark	1 1
Total			**6**

4.5.2.1 Structure and function

Answer 20 · Mark scheme

June 2011 | BLY1F | Original Q4 | Legacy

BLY1F

Answer 21 · Mark scheme

November 2011 | BLY1AP | Original Q6 | Legacy

Six	**4**	**2**	**2**	**3**

4.5.2.1 Structure and function

Answer 22 · Mark scheme

January 2012 | BL1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	addictive	allow addicting / addict / addicted / addiction or similar allow phonetic spelling do **not** accept **/** additive / addition	1
6(a)(ii)	junction / gap / space between neurones	allow nerve cells / nerves for neurones allow idea where neurones / nerve cells / nerves meet / join	1
6(b)(i)	tablet with no drug	accept answers that convey this idea eg fake / dummy / sugar pill allow injection with no drug ignore drugs that don't work.	1
6(b)(ii)	for comparison	accept to see if drug / it works allow to see psychological effect **or** make sure, it is not all in the mind allow as a control ignore 'to make test fair / unbiased'	1
6(b)(iii)	Neither doctors nor volunteers		1

Question 6 continues on the next page . . .

BL1FP

Question 6 continued

question	answers	extra information	mark
6(b)(iv)	any **two** from: • age (range) • sex / gender (mix) • previous smoking habits **or** eg number smoked (before trial) **or** length of time smoked • number in the group • other drugs being taken **or** general health **or** height / weight / BMI / lifestyle / fitness	ignore factors already controlled ignore reference to all smokers **or** all want to give up	2
6(c)	higher percentage / number of smokers who had stopped smoking (than Drug B)	answers must refer to data and be comparative allow best results / most effective ignore best drug unqualified ignore references to 12 weeks / 1 year	1
Total			**8**

4.5.2.1 Structure and function

Answer 22 · Mark scheme

January 2012 | BL1FP | Original Q6 | Legacy

BL1FP

4.5.2.1 Structure and function

Answer 23 · Mark scheme

June 2012 | BL1FP | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1 (a)	a stimulus		1
1 (b)(i)	**A**		1
1 (b)(ii)	**C** **D**	either order	1 1
1 (b)(iii)	**E**		1
1 (c)	brain	allow spinal cord / CNS / central nervous system do **not** allow spine	1
Total			**6**

4.5.2.1 Structure and function

Answer 23 · Mark scheme June 2012 | BL1FP | Original Q1 | Legacy

BL1FP

4.5.2.1 Structure and function

Answer 24 · Mark scheme

June 2013 | BL1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	Mark
6(a)	sexual reproduction		1
6(b)(i)	genes		1
6(b)(ii)	gametes		1
6(c)(i)	any **two** from: • more meat (per cow) • more milk each day • can be milked for more time after giving birth / greater proportion of time	answers must be comparative ignore bigger unqualified accept '(produce) more milk', for **1** mark, if neither more milk each day nor can be milked for more time after giving birth are given	2
6(c)(ii)	(milk contains) more protein less time before having a calf when no milk produced	answers must be comparative	1 1
6(d)(i)	genes from one organism are transferred to a different organism		1
6(d)(ii)	(possible) harm to babies' long term health	allow don't know long-term / side effects (on baby) accept idea that there may be other things in (genetically engineered) cow's milk that might harm babies' health e.g. bacteria ignore ethical / religious arguments	1
Total			**9**

4.5.2.1 Structure and function

Answer 25 · Mark scheme

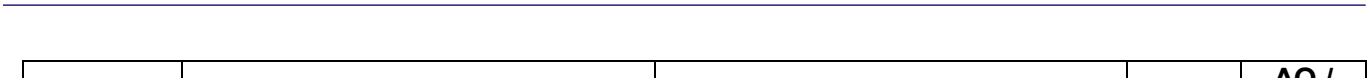
June 2014 | BL1FP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.
7(a)	sensory neurone		1	AO1 1.2.1e
7(b)(i)	synapse		1	AO1 1.2.1e
7(b)(ii)	a chemical		1	AO1 1.2.1e
7(c)	(What happens to the muscle) any **one** from: • contraction / contracts • gets shorter (How this helps the body) idea of protection for body (from damage / pain)	mark both parts of the question together ignore relaxation / relaxes / tenses eg moves finger / arm away (from pin / stimulus / source of pain)	 1 1	AO1 / AO2 1.2.1e
Total			**5**	

4.5.2.1 Structure and function

Answer 25 · Mark scheme

June 2014 | BL1FP | Original Q7 | Legacy



4.5.2.1 Structure and function

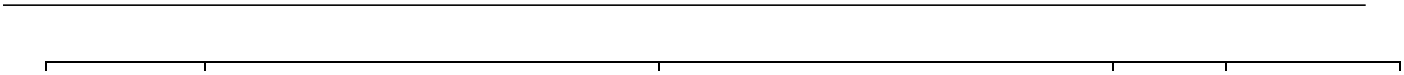
Answer 26 · Mark scheme June 2015 | BL1FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	stimulus		1	AO1 1.2.1b
1(a)(ii)	cytoplasm		1	AO1 1.2.1c
1(b)(i)		in this order only		AO2
	ear(s)		1	1.2.1b
	eye(s)	accept retina	1	
	skin	ignore extra detail	1	
1(b)(ii)	A muscle		1	AO2 1.2.1e
Total			**6**	

4.5.2.1 Structure and function

Answer 26 · Mark scheme

June 2015 | BL1FP | Original Q1 | Legacy



4.5.2.1 Structure and function

Answer 27 · Mark scheme June 2016 | BL1FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	receptor cells		1	AO1 1.2.1b
2(a)(ii)	eye(s)	accept retina	1	AO1 1.2.1b
2(b)(i)	any **one** from: • gender / sex • quality of eyesight • eg of factor that might affect reaction times	 eg wearing glasses eg alcohol consumption / distractions / tiredness / health / time of day / amount of practice (at this test) do not allow time / age	1	AO3 1.2.1
2(b)(ii)	182	allow 182.0	1	AO2 1.2.1
2(b)(iii)	Any anomalies can be identified.		1	AO3 1.2.1
2(b)(iv)	reaction time (too) long **or** reactions (too) slow (so) more likely to have / cause an accident	allow reaction time (too) slow allow examples of data quoted **or** derived from Table1, eg (mean) reaction time for 90 year olds is 162 ms longer than for 75 year olds	1 1	AO3 1.2.1
Total			**7**	

4.5.2.1 Structure and function

Answer 27 · Mark scheme

June 2016 | BL1FP | Original Q2 | Legacy

4.5.2.1 Structure and function

Answer 28 · Mark scheme

June 2017 | BL1FP | Original Q9 | Legacy

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>9(a)(i)</td><td><table><tr><th>Liquid</th><th>Organ</th></tr><tr><td>urine</td><td>kidney</td></tr><tr><td>sweat</td><td>skin</td></tr></table></td><td>award 1 mark for each liquid
award 1 mark for each organ correctly linked to the liquid
allow bladder instead of kidney
ignore water as a liquid</td><td>4</td><td>AO1
1.2.2a</td></tr>
<tr><td>9(a)(ii)</td><td>in food / diet / eating</td><td>allow in drinks / water</td><td>1</td><td>AO1
1.1.1a</td></tr>
</table>

4.5.2.1 Structure and function

Answer 28 · Mark scheme

June 2017 | BL1FP | Original Q9 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(b)			6	AO1 1.2.1a/b/c/d/e

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content	identifies one type of receptor **or** the stimulus it detects **or** refers to at least one type of neurone **or** refers to passage of information **or** at least one response by an effector	identifies at least one link between: one type of receptor **and** the stimulus it detects **and / or** refers to at least one type of neurone **and / or** refers to passage of information **and / or** at least one response by an effector	identifies one type of receptor **and** the stimulus it detects **and** refers to different types of neurone **and** refers to passage of information **or** at least one response by an effector

examples of biology points made in the response:	extra information:
• *(R & S)* (receptors in) skin detects pressure / pain / change in temperature	*(R & S)* = receptor and stimulus
• *(R & S)* (receptors in) eyes detect light	*(P)* = passage of information
• *(R & S)* (receptors in) ears detect sound	*(N)* = type of neurone
• *(R& S)* (receptors in) ears detect changes in position	*(E)* = response by effector
• *(R& S)* (receptors on) tongue detects chemicals / taste	
• *(R & S)* (receptors in) nose detects chemicals / smell	
• *(N)* sensory / relay / motor neurone	
• *(P)* neurones carry impulses / electrical information	allow electrical signals ignore messages
• *(P)* ref to synapse	
• *(P)* (release of) chemical information at / across synapse	allow neurotransmitter or named neurotransmitter
• *(E)* muscle contracts	
• *(E)* gland releases hormone / chemical / enzyme	

Total		11

4.5.2.1 Structure and function

Answer 29 · Mark scheme June 2018 | 8461/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	releasing saliva when food enters the mouth withdrawing the hand from a sharp object		1 1	AO2 4.5.2.1
09.2	bright light	allow described method of increasing light ignore light unqualified allow correctly named drug eg morphine / heroin	1	AO1 4.5.2.3
09.3	iris		1	AO1 4.5.2.3
09.4	muscle contraction	allow muscles shorten ignore radial / circular ignore muscles relax / constrict do **not** accept muscles expand do **not** accept ciliary muscle contracts	1	AO1 4.5.2.3

4.5.2.1 Structure and function

Answer 29 · Mark scheme

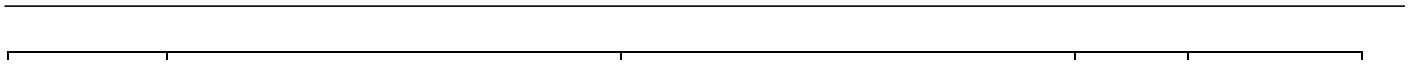
June 2018 | 8461/2F | Original Q9

Question	Answers	Mark	AO / Spec. Ref.
09.5	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.5.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content • receptor detects stimulus • eg receptor detects pressure • receptor generates impulses / electrical signals • neurones conduct impulses / electrical signals • neurone A conducts impulses to spinal cord • neurone A = sensory neurone • synapse between neurones • chemical (/ neurotransmitter) crosses synapse • chemical stimulates impulse(s) in neurone B • neurone B = relay neurone • neurone C = motor neurone • effector carries out response • eg muscles of the arm / leg contract • muscles contract **or** gland secretes chemicals to access **level 2**, candidates need to consider, in terms of the indicative content, the receptor, the neurones and the effector in the correct sequence		
Total			**11**

4.5.2.1 Structure and function

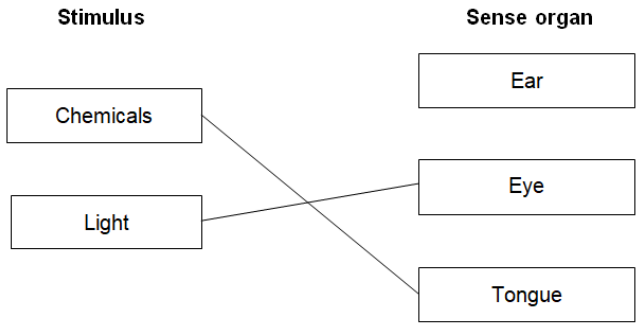
Answer 29 · Mark scheme

June 2018 | 8461/2F | Original Q9



4.5.2.1 Structure and function

Answer 30 · Mark scheme June 2019 | 8461/2F | Original Q1

01.1		additional lines from a stimulus negates the mark for that stimulus	1 1	AO1 4.5.2.1
01.2	any **two** from: • fast / rapid • protect (from danger / harm) • a response / a reaction • automatic / involuntary **or** not under conscious control	ignore 'action' allow not coordinated by conscious part of the brain **or** allow does not involve thought / thinking ignore not coordinated by the brain	1 1	AO1 4.5.2.1
01.3	the muscle contracts		1	AO1 4.5.2.1
01.4	(10) (14) 8 11 13	in this order all 3 correct = 2 marks 2 correct = 1 mark 0 or 1 correct = 0 mark	2	AO2 4.5.2.1 8.2.7
01.5	(after drinking coffee) ruler falls less far (before being caught)	allow mean before = 17 **and** mean after = 11(.2) **or** mean after is only 11(.2) allow (ruler is) caught more quickly	1	AO3 4.5.2.1 8.2.7

4.5.2.1 Structure and function

Answer 30 · Mark scheme

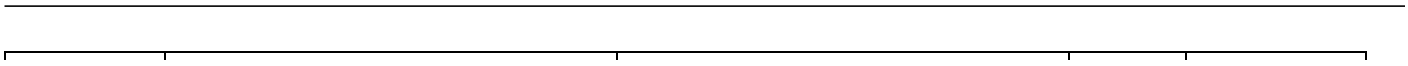
June 2019 | 8461/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	any **two** from: • more repeats • test more students • use ruler with more precise scale – eg mm scale • drop from same height (above the hand) • make sure student **B**'s hand is stationary • same distance between finger(s) and thumb	ignore accurate allow alternative method – eg use of computer to measure reaction time	2	AO3 4.5.2.1 8.2.7
Total			**10**	

4.5.2.1 Structure and function

Answer 30 · Mark scheme

June 2019 | 8461/2F | Original Q1



4.5.2.1 Structure and function

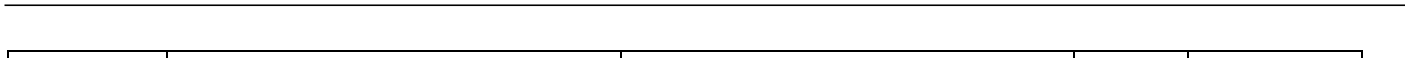
Answer 31 · Mark scheme November 2021 | 8461/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	A = cornea B = lens C = optic nerve		1 1 1	AO1 4.5.2.3
04.2	by becoming thicker		1	AO1 4.5.2.3
04.3	ciliary muscles suspensory ligaments		1 1	AO1 4.5.2.3
04.4	retina	allow rods / cones / fovea	1	AO1 4.5.2.3
04.5	retina brain muscles	in this order only 3 correct = **2** marks 1 or 2 correct = **1** mark	2	AO2 4.5.2.1
Total			**9**	

4.5.2.1 Structure and function

Answer 31 · Mark scheme

November 2021 | 8461/2F | Original Q4



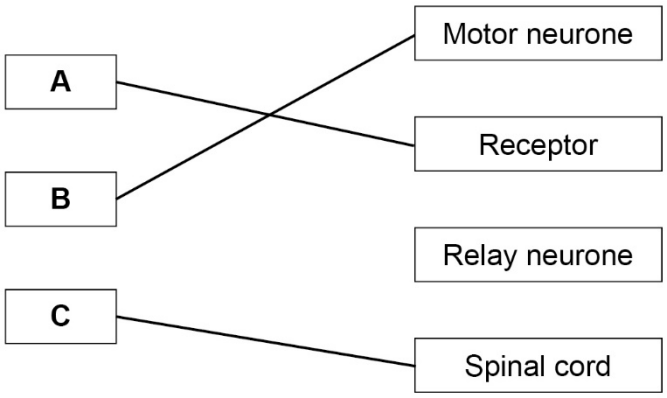
4.5.2.1 Structure and function

Answer 32 · Mark scheme

June 2022 | 8461/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	a reflex action is automatic		1	AO1 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	 do **not** accept more than one line from a box on the left		1 1 1	AO1 4.5.1 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	blinking when an insect flies into the eye removing the hand from a hot object		1 1	AO2 4.5.2.1

Answer 32 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4 *View with Table 1 Mark with 02.5*	$\frac{320 + 304 + 315 + 308 + 313}{5}$ 312	allow $\frac{1560}{5}$ if no other mark awarded allow **1** mark for $\frac{315 + 307 + 357}{3} = 326(.3)$	1 1	AO2 4.5.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5 *View with Table 1 Mark with 02.4*	ring drawn around 635 in Table 1	allow 635 or test 5 (next to question) if no ring drawn on Table 1	1	AO3 4.5.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	any **two** from: • age • drugs • tiredness / sleep • sex	allow a named example of a drug such as alcohol / caffeine allow gender allow practice at the test **or** playing computer games allow distractions	2	AO1 4.5.2.1 RPA7

Total Question 2		11

4.5.2.1 Structure and function

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.1	accommodation		1	AO1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.2	B		1	AO1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.3	E		1	AO1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.4	becomes fatter / thicker / wider	allow more convex / curved / rounded ignore larger / smaller	1	AO1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.5	any **two** from: • (muscles in the iris) contract • reduce size of pupil • reduces (amount of) light entering	 allow (muscles in the iris) shorten ignore circular / radial muscles ignore (muscles in the iris) relax do **not** accept ciliary muscles contract allow constrict pupil allow reduce size of aperture / gap / hole allow reduces (amount of) light reaching retina	2	AO1 4.5.2.3

4.5.2.1 Structure and function

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q8

Question	Answers	Mark	AO / Spec Ref.
08.6	**Level 2:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	3–4	AO2
	Level 1: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	1–2	AO1
	No relevant content	0	
	Indicative content • identification of method eg ruler drop • correct details of method chosen eg hold ruler above thumb • repetitions – at least two more times • repeat with (at least 2 more) other students • tested without coffee **and** with coffee **or** with different amounts of coffee • calculate mean value with coffee and without coffee • compare results with and without coffee • correct control variables for method chosen, eg: o same age o sex o BMI o amount of sleep o volume / concentration / type of coffee o time interval between drinking and testing o control variable within method described For **level 2** reference to collecting results with and without coffee along with how the investigation is designed to create valid results is required		4.5.2.1 RPA7

Total Question 8	**10**

4.5.2.1 Structure and function

Answer 34 · Mark scheme

June 2024 | 8461/2F | Original Q1

Question 1

Question	Answers	Mark	AO / Spec Ref.
01.1	(stimulus) → receptor → coordinator → effector → (response) allow receptor → coordinator for **1** mark allow coordinator → effector for **1** mark	2	AO1 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.2	any **two** from: • fast / rapid • a response / reaction • automatic / involuntary **or** not under conscious control • protects (from danger / harm)	ignore action allow not coordinated by the conscious part of the brain **or** allow does not involve thought / thinking ignore not coordinated by the brain	2	AO1 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	blinking in sudden bright light		1	AO2 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	muscle		1	AO1 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5	B		1	AO1 4.5.3.1

4.5.2.1 Structure and function

Answer 34 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	A		1	AO1 4.5.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7	balance		1	AO1 4.5.2.2

Total Question 1	**9**

4.5.2.1 Structure and function

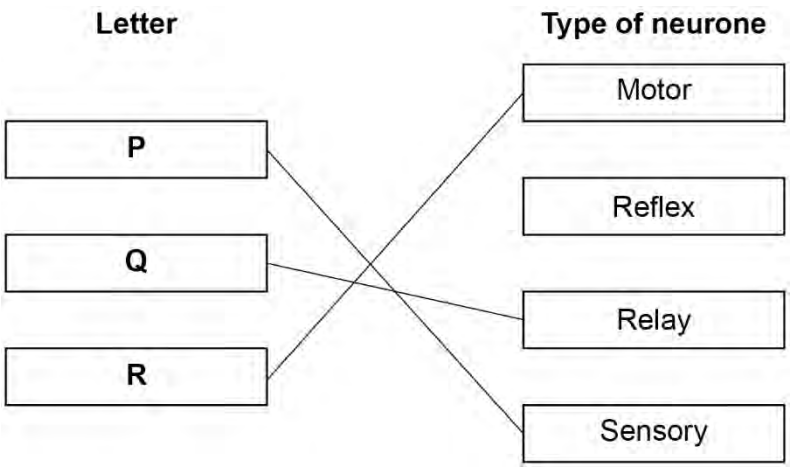
Answer 35 · Mark scheme

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Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	any **two** from: • fast / rapid • protects (from danger / harm) • a response / reaction • automatic / involuntary **or** not under conscious control	allow prevents harm ignore action allow not coordinated by the conscious part of the brain **or** allow does not involve thought / thinking	2	AO1 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	receptor effector	in this order only	1 1	AO2 4.5.2.1

Question	Answers	Mark	AO / Spec. Ref.
02.3	 do **not** accept more than one line from a box on the left	1 1 1	AO1 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	as a chemical		1	AO1 4.5.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	$\frac{18 + 17 + 13}{3}$ 16 (cm)	allow $\frac{48}{3}$	1 1	AO2 4.5.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	shorter time in each (successive) test **or** shorter distance in each (successive) test	ignore speed / it improved	1	AO3 4.5.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	any **one** from: • use more repetitions • test more students • use ruler with smaller / mm divisions • same starting position of ruler (above student **B**'s hand) • same distance between finger(s) and thumb • student **B** supports arm / hand / wrist / elbow on bench / table • use same hand (each time) • use of mechanical / electronic device to hold and drop ruler	 allow use a ruler with a more precise scale allow use a ruler with a better resolution ignore use a more accurate ruler allow make sure student **B**'s hand is stationary allow use dominant **or** non-dominant hand each time allow drop ruler without warning allow drop ruler at random time intervals allow idea of controlling distraction / caffeine / sleep / alcohol allow use a computer program	1	AO3 4.5.2.1 RPA7

Total Question 2	12

4.5.2.1 Structure and function

Answer 32 · Examiner comments

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Question 2

This question was about reflexes and an investigation into the measurement of reaction times.

02.1 Nearly all students correctly selected the option that a reflex action is automatic.

02.2 There was some confusion over the naming of the various components of the reflex arc shown in **Figure 3** and, although the vast majority got at least one correct, only one fifth correctly selected the names of all three.

02.3 Although the instruction was to select *two* examples of reflexes from the five actions listed, one percent of students selected just one. However, almost 90 percent correctly selected both blinking when an insect flies into the eye and removing the hand from a hot object.

02.4 Around three-quarters of students were able to calculate the correct mean value for the reaction time from the data in **Table 1**. Those who did not, sometimes calculated the mean of the other mean values and so gained just one of the two marks available for demonstrating the method of calculating a mean. A few students transferred the numbers from the table incorrectly, ending up with the wrong answer and so could gain no credit.

02.5 Most students correctly ringed '635' in the table as the anomalous result, although some ringed the mean for student **R**, possibly believing that the mean value had been incorrectly calculated from the raw data.

02.6 Tiredness, or a synonym thereof, and drugs were the most common correct answers as possible factors affecting a person's reaction time. Some students suggested two named drugs, such as caffeine and alcohol, but only gained one mark as these were considered to be too closely related. Several suggested 'distractions' or gave an example of one.

4.5.2.1 Structure and function

Answer 33 · Examiner comments

June 2023 | 8461/2F | Original Q8

Question 8

This was the second of three questions common to both the Foundation and Higher Tier papers. It was about the functioning of the eye and included a description of an investigation of reaction time.

08.1 Only a quarter of students correctly selected accommodation as the term relating to adjustment of focus. Adaptation was chosen by many more.

08.2 Around one-third of students knew that the image would be focused on structure B in Figure 3 (the retina).

08.3 Just over half knew that structure E (the ciliary muscle) would contract to focus on a near object.

08.4 Students experienced some difficulty in describing what happened to the shape of the lens when focusing on a near object. Acceptable terms included becoming fatter / thicker / rounder or more convex or more curved. Terms such as ‘larger’ were considered ambiguous and ‘more concave’ (used by many) was simply incorrect. Only 1 in 7 gave acceptable answers.

08.5 Given that the iris contains muscles, students had to desribe the role of these muscles for assisting in clear vision when moving into a brightly-lit area. Some evidently did not read the question carefully and described the precise opposite – moving into a dimly-lit area. Many were confused between iris muscles and ciliary muscles. Reference to radial and circular muscles were ignored as this went beyond the detail required by the Specification.
A surprising number suggested that, in brightly-lit areas, having more light entering the eye would be necessary, to see more.

Students were required to give two details from the muscles contracting, reducing the size of the pupil and a decrease in the amount of light entering the eye. Approximately one-third scored one mark but only 1 in 10 gained two.

08.6 This was an Extended Response style of question in which students had to plan an investigation to test the effect of drinking coffee on reaction time. Most opted for the ruler drop practical but the level of detail included was highly variable. The instruction in the question was ‘You should include...how to make the investigation valid’ which incorporates the concepts of control variables, repetitions and the calculation of mean values. Many students omitted such details, and only 1 in 7 scored full marks.
Some insisted on measuring the time taken for the ruler to be caught using a stop-clock. And it appeared that some students had omitted this practical from their revision as ideas about timing catching a ball thrown at them were not uncommon.

4.5.2.1 Structure and function

Answer 34 · Examiner comments June 2024 | 8461/2F | Original Q1

Question 1 (low demand)

01.1 Over 50% of students correctly completed the order of structures and gained two marks.

01.2 Almost 80% of students gained credit in this question, with the majority gaining full credit with very simple statements such as ‘a fast reaction’. A common reason for not gaining credit was by giving an example of a reflex action rather than defining it.

01.3 95% of students knew that blinking in sudden bright light is an example of a reflex action.

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Answer 34 · Examiner comments June 2024 | 8461/2F | Original Q1

01.4 Almost 95% of students knew that muscle is the type of tissue that causes movement.

01.5 Around two thirds of students correctly identified the pituitary gland.

01.6 Half of students correctly identified the cerebral cortex.

01.7 Almost 65% of students knew that balance is the function of the cerebellum.

Answer 35 · Examiner comments

June 2025 | 8461/2F | Original Q2

Question 2 (Low demand)

02.1
25% of students gained both available marks for this question. Many students who did so by using phrases like 'fast reaction' or 'quick response'. However, there were numerous instances where the question was misunderstood. A common error was giving examples of reflex actions such as flinching, blinking, or sneezing, with some students even detailing the entire reflex arc pathway.

02.2
Around 70% of students gained at least one of the two available marks for this question, most commonly for knowing that the arm muscle was the effector. Some chose the correct words but put them in reverse order.

02.3
Only a fifth of students were able to correctly connect all 3 boxes. Just over a third of students were able to score 1 mark, mostly by correctly identifying P as a sensory neurone. A significant number incorrectly identified R as a reflex neurone.

02.4
Two thirds of students knew that information travels across a synapse as a chemical.

02.5
Over 80% of students correctly calculated the mean value as 16 and gained both marks with a pleasing number of those showing their working. A few students gave 39.3 as their answer (presumably because they forgot to add the values before dividing by 3 and entered 18 + 17 + 13 ÷ 3 into their calculator – resulting in only the 13 being divided by 3). Others simply chose the middle value of 17. A common incorrect answer was 48, for adding the values correctly but not dividing by 3.

02.6
Almost two thirds of students gave correct evidence for the student's conclusion. A minority of students misread the question and answered *why* practice improves the speed, however, those that gained the mark generally did so for simply stating 'the reading on the ruler went down'. Unfortunately, some students went on to contradict themselves by saying that the reaction time increased.

02.7
Half the students gave a correct improvement to the investigation and gained credit here. Most answers expressed the idea of repeating the experiment (either more times or with other students). Using the same starting position and resting the student's arm on the bench was also commonly seen. A few mentioned the use of an online test or computer program to test reaction times which was pleasing to see considered.
Many students incorrectly thought that an improvement would be to change the experiment by introducing a new variable – such as using the other hand or having a caffeinated drink. A notable number suggested using a stopwatch instead of the ruler, which again was not creditworthy, as this would introduce additional reaction times to the measurement.