AQA GCSE Biology | 8461

SPECIFICATION POINT 4.5.2.1

Structure and function

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**27**
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 March 2007 | BLY1A | Original Q6 | Legacy

Six	**A**	antibiotics	**1**
	B	natural selection	**3**
	C	pandemic	**4**
	D	resistance	**2**

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

Answer 02 · Mark scheme June 2007 | BLY1A | Original Q6 | Legacy

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

Answer 03 · Mark scheme November 2007 | BLY1A | Original Q8 | Legacy

Eight	**4**	**3**	**4**	**4**

Answer 04 · Mark scheme January 2008 | BLY1H | Original Q3 | Legacy

Question 3

	answers	**extra information**	**mark**
(a)	**A** sensory (neurone)	ignore nerve	1
	B motor (neurone)	ignore nerve	1
	C spinal cord / central nervous system / grey matter		1
(b)	by chemical / substance	allow transmitter	1
(c)	muscle	allow extensor ignore muscle names	1
total			5

4.5.2.1 Structure and function

Answer 05 · Mark scheme March 2008 | BLY1AP | Original Q9 | Legacy

Nine	**4**	**1**	**2**	**2**

Answer 06 · Mark scheme June 2008 | BLY1AP | Original Q2 | Legacy

Two	**A** an impulse reaches the effector in the leg **4** **B** an impulse passes along a relay neurone **2** **C** an impulse passes along a sensory neurone to the central nervous system **1** **D** an impulse passes along a motor neurone **3**			
	A	**B**	**C**	**D**

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

Seven	**3**	**4**	**3**	**2**

4.5.2.1 Structure and function

Answer 08 · Mark scheme

January 2009 | BLY1H | Original Q4 | Legacy

question	answers	extra information	mark
4(a)(i)	receptor	allow named receptor eg light receptor ignore sensory neurone allow sense organ / named sensory organ eg skin / eye	1
4(a)(ii)	sensory (neurone)	allow afferent	1
4(a)(iii)	motor (neurone)	allow efferent	1
4(a)(iv)	effector / muscle / gland / named		1
4(b)	any **two** from: • impulse / information passes from one neurone to another **or** impulse / information passes across gap • chemical / transmitter involved • diffusion (across gap)		2
4(c)	brain / person not aware of pain / stimulus / can't feel possibility of (permanent / serious) damage / eg burning	allow brain/ person doesn't know / realise / unable to coordinate ignore reflex ignore information ignore danger	1 1
Total			**8**

4.5.2.1 Structure and function

Answer 08 · Mark scheme January 2009 | BLY1H | Original Q4 | Legacy

Biology BLY1H - AQA GCSE Mark Scheme 2009 January Series

COMPONENT NUMBER: BLY1H

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: January 2009

Answer 09 · Mark scheme March 2009 | BLY1AP | Original Q1 | Legacy

Question	Key	
One	**A** effector	**3**
	B receptor	**4**
	C relay neurone	**2**
	D synapse	**1**

Answer 10 · Mark scheme June 2009 | BLY1AP | Original Q1 | Legacy

Question	Key	
One	**A** motor neurone	**3**
	B muscle	**4**
	C sensory neurone	**1**
	D synapse	**2**

4.5.2.1 Structure and function

Answer 11 · Mark scheme

June 2009 | BLY2H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	(genotype / gametes from **T** / mother) h and h (accept h)	eg may be in punnett square	1
	(genotype / gametes from **U** / father) H and h	allow own upper and lower case symbols or allow any symbol correctly used with key	1
	offspring genotypes: correctly derived from correct gametes		1
	chance = 50% / ½ / 0 .5 / 1 : 1 / 1 out of 2	do **not** accept 1 : 2 allow irrespective of working	1
6(b)(i)	(cells from) embryo tested for particular allele / gene / (named) genetic condition / the disease / gender	ignore x-rays / ultra sound	1
6(b)(ii)	any **one** from: • possible harm to embryo **or** mother • sensible reference to abortion • hard to make moral / ethical decisions	ignore moral / ethical unqualified ignore not natural / playing God references to other ideas eg designer babies must be well argued	1
6(c)(i)	(cystic fibrosis is) recessive (allele / gene)	allow not dominant	1
	need two alleles / genes **or** need one allele / gene from each parent **or** both parents must have cystic fibrosis allele / gene		1

Question 6 continues on the next page…

4.5.2.1 Structure and function

BLY2H

Question 6 Continued

question	answers	extra information	mark
6(c)(ii)	any **three** from: • osmosis / diffusion • more concentrated solution outside cells / in mucus • water moves from dilute to more concentrated solution • partially permeable membrane (of cell)	do **not** accept reference to movement of ions / solution by osmosis / diffusion assume concentration is concentration of solute unless they tell us otherwise allow correct references to movement of water in relation to concentration gradient	3
6(c)(iii)	ribosomes		1
Total			**12**

4.5.2.1 Structure and function

Answer 12 · Mark scheme

November 2009 | BLY1AP | Original Q5 | Legacy

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

4.5.2.1 Structure and function

Answer 13 · Mark scheme

Question 8

question	answers	extra information	mark
8(a)	chromosomes	ignore gene / DNA	1
8(b)	**pros eg** any **two** from: • overcomes shortage of human eggs / rabbits produce lots of eggs • ethical / religious issues with using human embryos • reduces tests on (adult) humans • may provide cure for / cause of disease • embryo not allowed to develop beyond 14 days • no harm to rabbit • 99.5 % human genetic information so very similar to human or will react in the same way **cons eg** any **two** from: • ethical / religious objections to mixture of human and rabbit genes • ethical issues with experimenting with rabbits • ethical / religious objections to killing embryos • 0.5% of rabbit genetic information might affect results • 14 days too short a time to get results	to obtain **3** marks candidates must give **one** reasonable pro **and one** reasonable con ignore all embryos identical allow some people object to using rabbits / cruel to rabbits	max 2 max 2

Question 8b continues on next page

4.5.2.1 Structure and function

BLY1H

Question 8b continued

	plus **conclusion eg** • possibility of cure does / does not outweigh ethical / religious objections • cure does not justify mixing human and animal genes / killing embryos	**Note:** the conclusion mark cannot be given unless both an advantage and a disadvantage have (already) been given do **not** award the mark if the conclusion only states that advantages outweigh disadvantages	1
Total			**5**

4.5.2.1 Structure and function

Answer 14 · Mark scheme June 2010 | BLY1AP | Original Q5 | Legacy

Five	**3**	**3**	**2**	**1**

Answer 15 · Mark scheme November 2010 | BLY1AP | Original Q7 | Legacy

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

Answer 16 · Mark scheme November 2011 | BLY1AP | Original Q5 | Legacy

Five	**2**	**3**	**3**	**4**

4.5.2.1 Structure and function

Answer 17 · Mark scheme

January 2012 | BL1HP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)		ignore nerve / neuron(e) throughout	
	A sensory	accept afferent	1
	B motor	accept efferent	1
	C relay	accept intermediate	1
7(b)	stretch	allow pressure / pull / tension (in muscle) allow a hit at (point) **P** ignore pain	1
7(c)	any **three** from: • chemical (release) • diffuses (across the gap / synapse) • transmits impulse / information (across synapse) • between neurones / nerve cells / named	 accept neurotransmitter / acetylcholine allow transmits signal / message if named, must be either sensory / A to relay / C **or** relay / C to motor / B allow 'to the next neurone'	3
Total			**7**

4.5.2.1 Structure and function

Answer 17 · Mark scheme January 2012 | BL1HP | Original Q7 | Legacy

COMPONENT NUMBER: BL1HP

4.5.2.1 Structure and function

Answer 18 · Mark scheme

June 2013 | BL1HP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)		in this order only	
	A cytoplasm		1
	B (cell) membrane	do **not** accept (cell) wall	1
7(b)(i)	synapse		1
7(b)(ii)	(as) chemical	accept neurotransmitter or named ignore references to how the chemical is passed do **not** accept electrical	1
7(c)		ignore references to synapses accept 'nerve cell' for neuron(e) throughout penalise 'nerve' for neurone once only	
	(from light-sensitive cell to connecting neurone) to sensory neurone		1
	(sensory neurone) to brain / CNS	allow (sensory neurone) to relay neurone / spinal cord	1
	(brain / CNS) to motor neurone	allow (relay neurone / spinal cord) to motor neurone	1
	(motor neurone) to (eyelid) muscle	ignore effector	1
Total			**8**

4.5.2.1 Structure and function

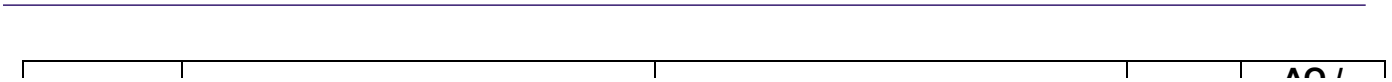
Answer 19 · Mark scheme June 2014 | BL1HP | Original Q5 | Legacy

5(a)	motor	allow efferent / postsynaptic allow **another** relay (neurone)	1	AO1 1.2.1d, e
5(b)	release of chemical (from relay neurone) chemical crosses gap / junction / synapse chemical attaches to X / motor / next neurone (causing impulse)	allow ecf for 'motor' neurone from (a) allow release of neurotransmitter / named example allow diffuses across allow chemical moves to X	1 1 1	AO1 / AO2 1.2.1e
5(c)	(curare) decrease / no contraction (strychnine) increase / more contraction	accept (muscle) relaxes if no other mark awarded allow 1 mark for (curare) decrease / no response **and** (strychnine) increase / more response	1 1	AO2 / AO3 1.2.1e
Total			**6**	

4.5.2.1 Structure and function

Answer 19 · Mark scheme

June 2014 | BL1HP | Original Q5 | Legacy



4.5.2.1 Structure and function

Answer 20 · Mark scheme

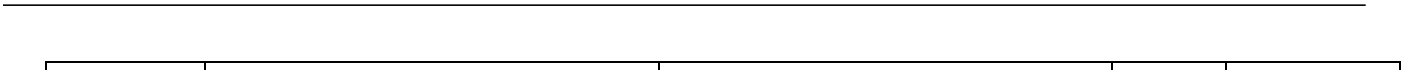
June 2015 | BL1HP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	detect changes in surroundings **or** detect stimuli convert information to impulse	allow any named stimulus for skin allow send impulse to sensory neurones / brain	1 1	AO1 1.2.1a/b
7(b)(i)	muscle – contract(ion) gland – release / secrete / produce chemical / hormone / enzyme	**1** mark for each effector **1** mark for each response response must match type of effector (if given) ignore examples ignore relax(ation) / movement for contraction do **not** allow expansion for muscles	4	AO1 1.2.1e
7(b)(ii)	any **one** from: • (maintain temperature at which) enzymes work best • so chemical reactions are fast(est) • prevent damage to cells / enzymes	allow prevent enzymes being denatured (by temperature being too high)	1	AO1 1.2.2a
Total			**7**	

4.5.2.1 Structure and function

Answer 20 · Mark scheme

June 2015 | BL1HP | Original Q7 | Legacy



4.5.2.1 Structure and function

Answer 21 · Mark scheme June 2016 | BL1HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	receptors detect / sense stimuli / change in surroundings **or** convert stimulus into an impulse	ignore send impulses to brain / spinal cord	1	AO1 1.2.1b/d/e
	example of a receptor	allow any appropriate organ or part of an organ, eg eye / retina or named type of receptor eg light receptor	1	
	effectors allow / make response **or** convert an impulse to an action	ignore receive impulses from brain / spinal cord	1	
	(effector) muscle / gland	allow an example ignore eg arm / leg	1	
4(b)(i)	junction	allow idea of a (small) gap / space do **not** allow if implication is that the neurones move	1	AO1 1.2.1e
	between neuron(e)s	allow named types of neurones	1	
4(b)(ii)		allow answers in terms of specific types of neurone		AO1 1.2.1e
	chemical	allow neurotransmitter / named neurotransmitter released	1	
	any **one** from: • (chemical released) from one neurone • (chemical) passes (across synapse) to next neurone to stimulate / cause (electrical) impulse	ignore produced allow diffuses for passes (across)	1	

4.5.2.1 Structure and function

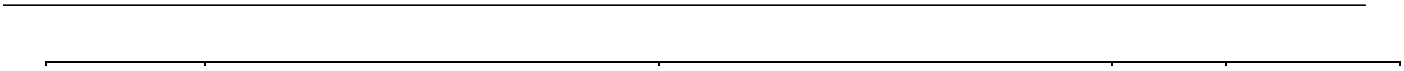
Answer 21 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(c)(i)	skin	ignore hand / leg	1	AO2 1.2.1b
4(c)(ii)	1.6 (cm per millisecond)	allow 2 if evidence of rounding up of 1.6	1	AO2 1.2.1d/e
4(c)(iii)	any **two** from: • synapses slow down transmission / impulse • fewer synapses (via brain) • (therefore) fewer delays	ignore length of neurones allow idea of movement of chemical being slower than electrical impulse allow one synapse compared to two **or** only one synapse allow impulse travels more slowly in relay neurones	2	AO3 1.2.1d/e
Total			**12**	

4.5.2.1 Structure and function

Answer 21 · Mark scheme

June 2016 | BL1HP | Original Q4 | Legacy



4.5.2.1 Structure and function

Answer 22 · Mark scheme

June 2017 | BL1HP | Original Q3 | Legacy

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>3(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>3(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 22 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(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

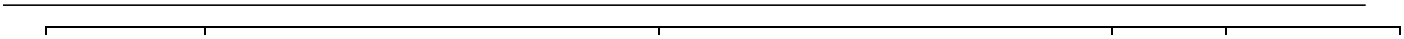
examples of biology points made in the response:	extra information:
• *(R & S)* (receptors in) skin detects pressure / pain / change in temperature	*(R & S)* = receptor and stimulus
• *(R & S)* (receptors in) eyes detect light	*(P)* = passage of information
• *(R & S)* (receptors in) ears detect sound	*(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 22 · Mark scheme

June 2017 | BL1HP | Original Q3 | Legacy



4.5.2.1 Structure and function

Answer 23 · Mark scheme

June 2018 | 8461/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	releasing saliva when food enters the mouth withdrawing the hand from a sharp object		1 1	AO2 4.5.2.1
01.2	bright light	allow described method of increasing light ignore light unqualified allow correctly named drug eg morphine / heroin	1	AO1 4.5.2.3
01.3	iris		1	AO1 4.5.2.3
01.4	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 23 · Mark scheme

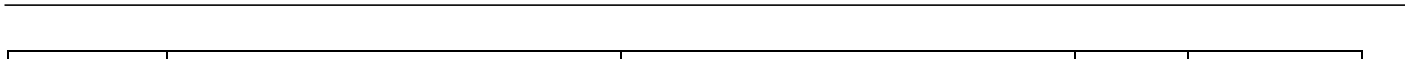
June 2018 | 8461/2H | Original Q1

Question	Answers	Mark	AO / Spec. Ref.
01.5	**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 23 · Mark scheme

June 2018 | 8461/2H | Original Q1



4.5.2.1 Structure and function

Answer 24 · Mark scheme

November 2021 | 8461/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1		ignore examples		AO1 4.5.2.1
	response / reaction	ignore action	1	
	automatic **or** no thinking **or** not conscious **or** involuntary	ignore reference to brain ignore quick	1	
06.2	receptor (in skin of finger / hand) detects stimulus / temperature change	allow receptor detects heat ignore pain	1	AO1 4.5.2.1
	(electrical) impulses pass along neurones	allow electrical signals pass along nerve cells ignore messages	1	
	(impulses pass from) sensory to relay to motor neurones		1	
	synapse between neurones where chemical crosses gap	allow neurotransmitter / acetylcholine for chemical allow by diffusion	1	
	(synapses) in spinal cord / CNS	ignore brain	1	
	muscle contraction (to pull hand away) **or** effector is a muscle		1	
06.3	coordination by endocrine system is:	allow converse points if clearly indicating nervous co-ordination answers must be comparative		
	slower		1	AO1
	longer-lasting		1	AO1
	(chemical / hormone) via blood instead of electrical / impulse / neurones		1	AO2 4.5.2.1 4.5.3.1

4.5.2.1 Structure and function

Answer 24 · Mark scheme

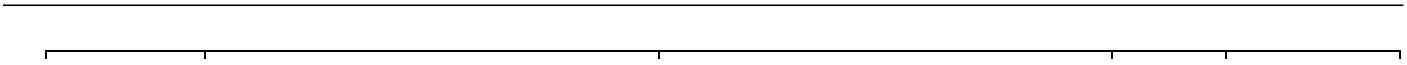
November 2021 | 8461/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4		ignore reference to days of menstrual cycle		
	FSH (release from pituitary) stimulates maturation of egg / ovum / follicle	allow FSH stimulates development / growth of egg	1	AO1 4.5.3.1 4.5.3.4
	oestrogen (release from ovary) inhibits FSH production **and** stimulates LH production		1	
	LH (release from pituitary) stimulates ovulation	allow LH stimulates release of egg	1	
	progesterone (release from ovary) inhibits FSH **and** LH production	allow (release from corpus luteum)	1	
	oestrogen **and** progesterone maintain the uterus lining	allow oestrogen **and** progesterone build up the uterus lining	1	
Total			**16**	

4.5.2.1 Structure and function

Answer 24 · Mark scheme

November 2021 | 8461/2H | Original Q6



4.5.2.1 Structure and function

Answer 25 · Mark scheme

June 2023 | 8461/2H | Original Q2

Question 2

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

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

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

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.4	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.
02.5	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

Question	Answers	Mark	AO / Spec Ref.
02.6	**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 2	**10**

4.5.2.1 Structure and function

Answer 26 · Mark scheme

June 2024 | 8461/2H | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.1	any **two** from: • same starting position of rule(r) • more precise scale • repeat **and** calculate mean **or** repeat **and** eliminate anomalies • convert distance to time • student (**B**) rests hand / arm on table	allow ensure the starting position of rule(r) is at 0cm allow other control variables allow two control variables for **2** marks allow rule(r) with mm scale ignore more accurate scale	2	AO3 4.5.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.2	any **two** from: *endocrine system:* • (hormones) via blood • chemical transmission • slower • longer-lasting	allow converse if clearly referring to nervous system allow not via neurones / cells allow not (electrical) impulses allow not electrical signals ignore messages ignore hormones answers must be comparative ignore reference to target organs	2	AO1 4.5.2.1 4.5.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.3	thyroxine	do **not** accept thyroxide ignore reference to TSH / TRH	1	AO1 4.5.3.1 4.5.3.7

4.5.2.1 Structure and function

Answer 26 · Mark scheme

June 2024 | 8461/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.4	any **one** from: • insulin • glucagon		1	AO1 4.5.3.1 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.5	any **two** from: • increases heart rate • increases breathing rate • increases oxygen delivery to cells / tissues / organs • increases glucose delivery to cells / tissues / organs • increases respiration / metabolism • increases sweat(ing)	allow increases blood flow allow examples of cells / tissues / organs allow increases energy release do **not** accept energy produced / made / created allow dilation of pupils allow vasoconstriction in skin **or** vasoconstriction in digestive system allow raises blood sugar / glucose level **or** increase conversion of glycogen to glucose allow vasodilation in (skeletal) muscles **/** brain allow increased blood pressure allow slows digestion allow other correct effects of adrenaline if no other marks awarded allow **1** mark for prepares for 'fight or flight'	2	AO1 4.5.3.7

4.5.2.1 Structure and function

Answer 26 · Mark scheme

Question	Answers	Mark	AO / Spec Ref.
05.6	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.5.3.4 4.5.3.5 4.5.3.6
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content **contraception:** • use of hormones oestrogen and progesterone **or** progesterone (only) o inhibition of FSH (production / release) - lack of FSH prevents follicle / egg development / maturation - therefore there is no egg to fertilise o inhibition of LH (production / release) - lack of LH prevents ovulation - therefore there is no egg to fertilise • contraceptive methods include oral contraceptive pill, injection, implant, skin patch, IUD / IUS with hormones **treatment of infertility:** • use of FSH o (FSH) stimulates **maturation** of (several) egg(s) / follicle(s) - (FSH) increases number of eggs matured • use of LH o (LH) stimulates ovulation - (LH) allows eggs / follicles to be collected (from ovary) - (so) increased chance of fertilising an egg - IVF and insertion of embryo(s) into uterus • use of progesterone o (to) maintain uterus lining - increased chance of implantation For **Level 3**, details of both contraception and infertility treatment are required.		

Total Question 5	14

4.5.2.1 Structure and function

Answer 27 · Mark scheme

June 2025 | 8461/2H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	15 cm		1	AO3 4.5.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2		allow correct conversion to milliseconds at any point in the calculation		AO2 4.5.2.1 RPA7
	substitution $t = \sqrt{\frac{2 \times 16}{980}}$ (seconds)	allow $t = \sqrt{\frac{32}{980}}$ (seconds)	1	
	correct answer t = 0.18070... (seconds)	all subsequent marks can be awarded using an incorrectly calculated value	1	
	conversion to milliseconds t = 180.7 (milliseconds)		1	
	rounding to 3 significant figures 181 (milliseconds)	allow student's incorrectly / not converted answer correctly rounded to 3 significant figures	1	

4.5.2.1 Structure and function

Answer 27 · Mark scheme

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	any **two** from: • use ruler with smaller / mm divisions • align 0 cm on ruler with **top** / **bottom** of (student's **B**'s) thumb • same distance between (student **B**'s) finger(s) and thumb • (student **B)** supports arm / hand / wrist / elbow on bench / table • use same hand (each time) • convert distance to time • allow drop ruler without warning **or** drop ruler at random time intervals	allow use a ruler with a more precise scale allow use a ruler with a better resolution ignore use a more accurate ruler allow same starting position of ruler above (student **B**'s) hand allow make sure (student **B**'s) hand is stationary allow use dominant **or** non-dominant hand each time allow use of mechanical / electronic device to hold and drop ruler allow idea of controlling distraction / caffeine / sleep / alcohol allow use a computer program (to measure reaction time)	2	AO3 4.5.2.1 RPA7

4.5.2.1 Structure and function

Answer 27 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	receptor (in eyes) detect stimulus / movement	allow retina detects stimulus / movement	1	AO1 4.5.2.1 4.5.2.2
	impulses generated / transmitted / travel	allow electrical signals generated / transmitted / travel ignore messages / information	1	4.5.2.3
	(from) sensory neurone (to relay neurone) to motor neurone		1	
	(along) optic nerve to brain	ignore CNS / spinal cord	1	
	chemical crosses synapses between neurones		1	
	effector / muscle in fingers / hand / arm contracts (to catch the ruler)		1	

Total Question 7	13

4.5.2.1 Structure and function

Answer 24 · Examiner comments

November 2021 | 8461/2H | Original Q6

Question 6 (standard, standard/high & high demand)

This question was about coordination by the nervous and endocrine systems. Most students were able to state that a reflex action was either a response (reaction) or that it was automatic with around one-third providing both points.

06.2 was worth 6 marks for describing how a person's nervous system would coordinate the withdrawal of a hand from a hot object by reflex action. A few students scored full marks and just under a half scored half-marks or more. Common errors included misnaming the neurones involved, using the term 'messages' instead of impulses, thinking that this reflex involved the brain, and referring to the spinal cord as the 'spine'. Omissions included the mechanism of synaptic transmission via a chemical crossing the gap and the location of the synapses in the spinal cord.

In **06.3**, very few students were able to give three differences between coordination by the endocrine and nervous systems, although just under half could give at least one. The most common correct answers were that endocrine coordination was generally slower and longer-lasting than nervous coordination. While many students alluded to a chemical, or hormone being involved in endocrine action, few explained that this was transmitted via the blood rather than along neurones. Some answers were inadequate as they were not comparative, eg hormonal coordination is not just 'slow' but slower than nervous coordination.

4.5.2.1 Structure and function

Answer 25 · Examiner comments

June 2023 | 8461/2H | Original Q2

Question 2

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.

02.1 Three-quarters of students correctly selected accommodation as the term relating to adjustment of focus.

02.2 An even higher proportion knew that the image would be focused on structure B in Figure 3 (the retina).

02.3 Almost all knew that structure E (the ciliary muscle) would contract to focus on a near object.

02.4 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. Around half the students gave acceptable answers.

02.5 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. 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. Most scored at least one mark but fewer than half gained two.

02.6 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. Although many students omitted such details, around 50 percent scored full marks.

4.5.2.1 Structure and function

Answer 26 · Examiner comments

Question 5 (standard, standard/high and high demand)

05.1 Almost 30% of students were able to suggest two ways to improve the student's method for measuring human reaction time, with a further 45% gaining one mark. Some students suggested extensions to the method rather than improvements, such as testing with caffeine or using a computer programme - which did not answer the question. A number of students gave vague responses such as 'repeat it' or 'put the ruler closer to the hand' which were insufficient for credit at this level.

05.2 Students were asked to give two ways that coordination by the endocrine system is different from coordination by the nervous system. The full range of available marking points were seen for this question, with over half of students gaining full marks. Most comparisons involved 'slower', 'longer lasting' or reference to 'electrical impulses' in the nervous system. The better answers included multiple comparisons in the same sentence ie 'endocrine is slower but longer lasting' and 'nervous involves electrical impulses carried along neurones whereas endocrine is chemicals carried in the blood.'

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4.5.2.1 Structure and function

Answer 26 · Examiner comments

05.3 Over 80% of students correctly identified thyroxine as the hormone produced by gland A. Common errors included naming the gland (thyroid) rather than the hormone, or naming hormones released from the pituitary gland such as FSH, LH or ADH.

05.4 Around 80% of students were able to name one hormone produced by gland B, with insulin being the most popular response. Common incorrect responses named hormones involved in the menstrual cycle. There were mostly good spellings for 'glucagon' which has not been the case in previous years.

05.5 Almost 55% of students could describe two effects of adrenaline on the human body, the most common of which were increased heart rate and increased breathing rate. Some answers lacked detail such as 'increased awareness' or 'they have more energy' which are insufficient for credit at this level. A significant number of students gave the fall-back mark relating to preparing the body for the flight or fight response, which was only credited if no other correct responses had been given.

05.6 This was an extended response question with three levels, the highest of which was set at high demand. Students were asked to explain the use of hormones in both contraception and the treatment of infertility. Less than 10% of students were able to access Level 3, commonly due poor articulation or use of vague scientific terminology. Those that did however, showed very clear links between the correct hormones, their roles in contraception/infertility treatment and the associated consequences of using them.

Around 45% of students obtained marks in Level 2, after correctly explaining the use of at least one hormone for both contraception and infertility. Students that did not include an explanation for both contraception and the treatment of infertility were restricted to Level 1. Students are reminded to read the question carefully and ensure all parts are answered to the same standard. It was noticeable that many students spent more time explaining the roles of hormones in contraception, and then went on to possibly rush their explanation for infertility.

Regarding contraception, many students could refer to progesterone and/or oestrogen, and the subsequent inhibition of FSH and LH, but then did not specifically indicate which hormone undertook which function, and so failed to link to a consequence for either hormone. The general consequence of 'no eggs to fertilise' was regularly seen in place of these.

Regarding infertility, the same pattern was seen, so very few consequential links were credited. However, many students described the process of IVF and insertion of the embryo into the uterus, to gain credit for a general consequence.

The use of progesterone to maintain the uterus lining was often muddled with contraception, and the idea of increased *chance* of implantation, or increased *chance* of fertilising an egg for the use of LH was rarely seen.

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4.5.2.1 Structure and function

Answer 27 · Examiner comments — June 2025 | 8461/2H | Original Q7

Question 7 (Standard/high and High demand)

07.1
Almost three quarters of students could identify the median result in Table 3.

07.2
Many students made a good attempt at calculating student B's reaction time, and .only made incorrect attempts to convert seconds to milliseconds.
75% of students scored at least 3 marks. Students were mostly able to substitute values into the equation and work this out correctly to gain mark points 1 and 2 quite easily.
Errors were seen when some used their median value from Question **07.1** rather than the mean from Table 3 when substituting into the equation. Students are reminded to read the question detail carefully. There was a significant number of students who were unable to convert numbers from one unit to another by the necessary factor. As part of their studies, students should regularly practise calculations involving prefixes and powers of ten for orders of magnitude.

07.3
Just under 20% of students were able to describe two ways the investigation could be improved, with a further 40% gaining one of the two marks available. It was clear that many students had completed the investigation, but as in previous years still found it a challenge to articulate their ideas clearly. For bullet point 2 in particular, students gave vague statements such as 'drop from same height' or 'start with ruler between the finger and thumb' which were not credited. A significant number of students incorrectly suggested adding another

Answer 27 · Examiner comments — June 2025 | 8461/2H | Original Q7

independent variable would improve the investigation, such as giving caffeine or alcohol or introducing a distraction.

07.4
This question was widely attempted, with about half of the students achieving 3 or 4 marks. Students generally identified the eye's function as a receptor and gave the correct sequence of impulse transmission via neurones. A notable error, however, incorrectly placing the receptor in the skin. The optic nerve's role and its connection to the brain were rarely mentioned. However, it was pleasing that many students successfully identified the role of chemicals, often specifying neurotransmitters, in synaptic transmission. For mark point 6, a significant number of responses did not gain the mark due to not giving a location for the specific muscle involved in the response. Similarly, some students mentioned the location of the muscle but did not state that it contracts.