AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.9

Discovery and development of drugs

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**28**
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.

4.3.1.9 Discovery and development of drugs

Answer 01 · Mark scheme January 2007 | BLY1H | Original Q8 | Legacy

Question 8

	answers	extra information	mark
(a)	inhibits FSH (production / secretion)		1
	(therefore) no eggs mature / released **or** effect of FSH on ovary described	if no other marks gained allow 1 mark for no eggs produced references to LH are neutral	1
(b)	Pros max 2marks from 4 marks e.g. • large scale trial gave better results • chose uneducated women so that if these women could use it correctly, women elsewhere would be able to cons max 3 marks from 4 marks e.g. • used pill with high dose of hormone – **either** so results not valid for general use of hormone **or** dangerous • side effects ignored • women not told pill was experimental / pill might have side effects • no placebo • should have tried a range of doses • should have done pre-trial to check for side effects conclusion 1 mark e.g. trials flawed therefore cons outweigh pros accept reverse e.g. trials flawed but pros outweigh cons	maximum 4 marks if no conclusion	max 2 from 4 max 3 from 4 1
total			7

4.3.1.9 Discovery and development of drugs

Answer 02 · Mark scheme June 2007 | BLY1A | Original Q7 | Legacy

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

Answer 03 · Mark scheme June 2007 | BLY1H | Original Q7 | Legacy

The full source mark scheme begins on page 39. Follow original question 7 in that document.

Answer 04 · Mark scheme March 2008 | BLY1AP | Original Q3 | Legacy

Three	**2**	**1**	**4**	**3**

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

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

4.3.1.9 Discovery and development of drugs

Answer 06 · Mark scheme

June 2008 | BLY1AP | Original Q9 | Legacy

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

Answer 07 · Mark scheme

November 2008 | BLY1AP | Original Q6 | Legacy

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

4.3.1.9 Discovery and development of drugs

Answer 08 · Mark scheme

January 2009 | BLY1H | Original Q3 | Legacy

question	answers	extra information	mark
3(a)(i)	does not contain drug / chemical	allow eg fake / sugar pill / dummy drug ignore control	1
3(a)(ii)	as control **or** to see if the effects are psychological **or** allows blind testing	allow 'to compare (with NRT)' ignore fair test	1
3(b)(i)	gum	allow gum placebo allow placebo	1
3(b)(ii)	high / highest number of participants / people **or** correct number given ie gum 16706, gum placebo 9319, placebo 16458		1
3(c)(i)	nasal spray		1
3(c)(ii)	highest <u>percentage</u> of people stopped / 24% stopped biggest difference between treatment and placebo	 allow 'highest by 4%' for **2** marks	1 1
Total			**7**

4.3.1.9 Discovery and development of drugs

Answer 08 · Mark scheme

January 2009 | BLY1H | Original Q3 | Legacy

COMPONENT NUMBER: BLY1H

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: January 2009

Answer 09 · Mark scheme

March 2009 | BLY1AP | Original Q5 | Legacy

Five	**3**	**4**	**2**	**1**

4.3.1.9 Discovery and development of drugs

Answer 10 · Mark scheme

January 2019 | BLY1H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	testing for toxicity / see if it is safe / see if it is dangerous / to see if it works	ignore side effects unqualified	1
4(b)(i)	testing for side effects / testing for reactions (to drug)	ignore to see if it works do **not** accept dosage	1
4(b)(ii)	any **one** from • dose too low to help patient • higher risk for patient • might conflict with patient's treatment / patient on other drug • effect might be masked by patient's symptoms / side effects clearer	ignore immune system	1
4(c)	to find optimum dose	allow testing on larger sample **or** it makes results more reliable allow to find out if drug is effective / find out if drug works on ill people (not just if drug works)	1
4(d)(i)	(tablet / drug / injection) that does not contain drug	allow control / fake / false allow tablet / injection that does not affect body do **not** accept drug that does not affect body	1
4(d)(ii)	neither patients nor doctors		1
Total			**6**

4.3.1.9 Discovery and development of drugs

Answer 10 · Mark scheme January 2010 | BLY1H | Original Q4 | Legacy

BLY1H

Answer 11 · Mark scheme March 2010 | BLY1AP | Original Q4 | Legacy

Four	3	1	1	2

Answer 12 · Mark scheme June 2010 | BLY1AP | Original Q8 | Legacy

Eight	3	4	3	2

4.3.1.9 Discovery and development of drugs

Answer 13 · Mark scheme

June 2019 | BLY1H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	any **two** from: • arthritis • diabetes • high blood pressure • strokes • allow breathing difficulties	 allow damaged joints accept high blood sugar allow blocked blood vessels / thrombosis ignore cancer ignore high cholesterol	2
4(b)(i)	any **two** from: • lower number of women deaths up to age of 75-80 • higher number of women deaths after 80 • men's peak higher • men's peak at an earlier age • men's death start earlier than women • more men than women die of heart disease	to gain marks there must be a comparison ignore comparison at single age ignore women die older **or** men die younger	2

Question 4 continues on the next page

4.3.1.9 Discovery and development of drugs

BLY1H

Question 4 continued

question	answers	extra information	mark
4(b)(ii)	any **two** from: • men smoke more (cigarettes) • more men smoke • men under more stress • men less active • more men overweight / eat more / less diet conscious **or** different fat distribution • genetic factors • men might have lower metabolic rate • men less likely to visit doctor even though they have symptoms	ignore alcohol ignore reference to body size ignore references to hormones	2
4(c)	laboratory tests / tests on tissues **or** tests on animals **or** tests for toxicity tests for side effects on volunteers / healthy people / small numbers widespread testing **or** testing for optimum dose ***or*** test on patients / sick people ***or*** test to see if it is effective	points can be in any order ignore computer simulations accept use of placebo	1 1 1
Total			**9**

4.3.1.9 Discovery and development of drugs

Answer 13 · Mark scheme June 2010 | BLY1H | Original Q4 | Legacy

BLY1H

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

Five	3	2	3	4

Answer 15 · Mark scheme March 2011 | BLY1AP | Original Q7 | Legacy

Seven	4	4	4	2

Answer 16 · Mark scheme March 2011 | BLY1AP | Original Q8 | Legacy

Eight	2	4	2	3

Answer 17 · Mark scheme June 2011 | BLY1AP | Original Q7 | Legacy

Seven	1	4	3	3

4.3.1.9 Discovery and development of drugs

Answer 18 · Mark scheme

June 2011 | BLY1H | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	any **two** from: • (high) CRP / protein • (no) heart condition • (not high) LDL • over 50 / age • number of tablets (each day)	allow health ignore time ignore placebo / rosuvastatin ignore number of people	2
2(b)	any **one** from: • tablet with no drug • tablet that has no effect • tablet without chemicals • tablet that people thought contained statin **or** reference to psychological effect	allow fake (pill) / dummy (pill) / sugar / chalk (pill) allow drug that has no effect ignore vitamin / mineral pill ignore control / different statin	1
2(c)	17802 / large number of people **or** enough people	ignore control group / fair test / control variables ignore time / repeats	1

Question 2 continues on the next page

Question 2 continued . . .

question	answers	extra information	mark
2(d)	any **one** from: • placebo group at risk of heart attack **or** to allow statin to be given to everyone • statin group 54% less likely to get heart attack **or** showed that statin worked **or** showed trial (very) successful • sufficient information gained / results conclusive • unethical / unfair to carry on trial	ignore cost ignore reliable ignore got results early	1
2(e)	to avoid bias **or** show impartiality **or** show results independent	allow manufacturers could cheat ignore reliability ignore could be sued / blamed if trial went wrong ignore manufacturer would know which group got statin / placebo	1
2(f)	any **two** from: • reduction in LDL • reduction in (saturated) fats • reduces deposition of fat / cholesterol / LDL in walls of blood vessels **or** blood vessels less likely to be blocked with fat / cholesterol / LDL	allow improves LDL:HDL balance **or** LDL and HDL concentrations equal ignore less cholesterol ignore more HDL do **not** accept less HDL	2
Total			**8**

4.3.1.9 Discovery and development of drugs

Answer 18 · Mark scheme June 2011 | BLY1H | Original Q2 | Legacy

BLY1H

Answer 19 · Mark scheme November 2011 | BLY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	Drugs are tested on animals to see if the drugs work	**2**
	B	… tested on volunteers to detect any side effects	**3**
	C	… are tested on cells to see if the drugs are safe to test on organisms	**1**
	D	Drugs are tested on patients to find the best dose	**4**

4.3.1.9 Discovery and development of drugs

Answer 20 · Mark scheme

January 2012 | BL1HP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	any **one** from: • cells • tissues • (live) animals / named	 allow mammals	1
6(a)(ii)	any **three** from: (to test for) • toxicity / check not poisonous / not harmful • interaction with other drugs • efficacy **or** to see if they work **or** check if they treat the disease • dosage **or** how much is needed	 allow side-effect allow converse allow converse	3

Question 6 continues on the next page . . .

Question 6 continued

question	answers	extra information	mark
6(b)	**argued evaluation** any **six** from: • statin can damage / muscles / kidneys / organs but cholesterol blockers don't • statins can cause death but cholesterol blockers don't • cholesterol blockers can interfere with action of other drugs but statins don't • statins are for a life time but cholesterol blockers are not • statins (might) reduce cholesterol to zero but cholesterol blockers only reduce it **or** statins reduce cholesterol more • statins better for people with inherited high cholesterol • cholesterol blockers better for people with dietary cholesterol problems • taking/using statins/cholesterol blockers is better than dying from heart attack or build up of fat in blood vessels or reduced blood flow	comparison can be written anywhere in evaluation allow use of 'only' for implied comparison for each point eg **only** statins damage muscles / kidneys / organs ignore liver if neither of the first 2 points are given accept for **1** mark statins are more dangerous than cholesterol blockers **or** statins have more side effects allow statins (might) stop membrane / hormone production but cholesterol blockers don't	6
Total			**10**

4.3.1.9 Discovery and development of drugs

Answer 20 · Mark scheme January 2012 | BL1HP | Original Q6 | Legacy

COMPONENT NUMBER: BL1HP

4.3.1.9 Discovery and development of drugs

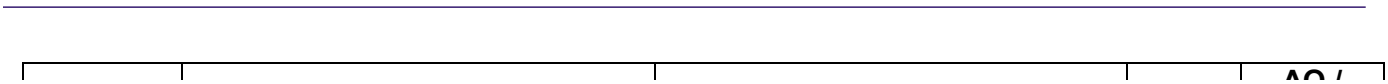
Answer 21 · Mark scheme June 2014 | BL1HP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.
6(a)(i)	idea of poor sleeping	allow as a sleeping pill	1	AO1 1.3.1d
6(a)(ii)	(for) morning sickness (in pregnant women)	ignore sickness unqualified ignore leprosy	1	AO1 1.3.1d
6(a)(iii)	limb abnormalities / defects	accept description e.g. short / no arms / legs ignore disabled / deformed	1	AO1 1.3.1d
6(a)(iv)	drug not tested / trialled on pregnant animals / women	allow not tested for treatment of morning sickness	1	AO3 1.3.1b,d
6(b)(i)	changes to chemical processes	ignore addiction	1	AO1 1.3.1h
6(b)(ii)	dependency on (some) legal drugs is more than / equal to on (some) illegal drugs example of a named legal drug for which dependency is equal to **or** greater than a named illegal drug	allow idea of no / little consistency between dependency and classification allow two pairs of named examples for 2 marks	1 1	AO3 1.3.1e
6(b)(iii)	any **one** from: • the harm it does / harmfulness • effect on health • side effects	ignore cost / addiction / dependency accept (severity of) withdrawal symptoms accept named health effects e.g. mental illness **or** effect on heart / circulatory system	1	AO3 1.3.1f,g
Total			**8**	

4.3.1.9 Discovery and development of drugs

Answer 21 · Mark scheme

June 2014 | BL1HP | Original Q6 | Legacy



4.3.1.9 Discovery and development of drugs

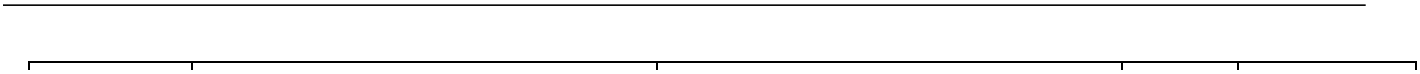
Answer 22 · Mark scheme June 2015 | BL1HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	leprosy	allow bone / blood cancer ignore cancer	1	AO1 1.3.1d
1(b)(i)	6 / six		1	AO2 1.3.1a
1(b)(ii)	from 1120 to 5600	allow from 5600 to 1120 allow 4480 (alone)	1	AO2 1.3.1a
1(c)	any **one** from: • (test for) toxicity • (test for) dosage • (test for) efficacy	ignore side effects, eg allergies ignore safety / harm unqualified allow poisonous allow idea of amount allow to see if it works allow to check for interaction with other drugs	1	AO1 1.3.1b
1(d)(i)	any **two** from: • more people take / use legal / non-prescribed drugs • legal / non-prescribed drugs are (more) readily available • alcohol causes liver/brain damage **or** tobacco causes cancer	ignore reference to cost / addiction allow harmful effects of other named legal non-prescribed drugs	2	AO1 / AO3 1.3.1g
1(d)(ii)	addiction / dependency	allow withdrawal or examples of symptoms of withdrawal (if attempting to stop)	1	AO1 1.3.1h
Total			**7**	

4.3.1.9 Discovery and development of drugs

Answer 22 · Mark scheme

June 2015 | BL1HP | Original Q1 | Legacy



4.3.1.9 Discovery and development of drugs

Answer 23 · Mark scheme June 2017 | BL2HP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	any **two** from: • to avoid a psychological effect **or** avoid cyclists trying harder in one session **or** avoid cyclists pedalling for longer • to avoid bias(ed results) • to show the true effect of consuming glucose **or** to give a valid comparison		2	AO2/3 2.6 2.6.1b/f

4.3.1.9 Discovery and development of drugs

Answer 23 · Mark scheme

5(b)(i)	any **four** from: Pro: • exercise is standardised / same intensity / same cyclists • results show blood glucose level doesn't fall too low with glucose drink • extra hour of cycling **or** cycle longer with glucose drink / with higher blood glucose • it was a blind trial **or** cyclists don't know if they are taking a placebo Con: • sample size is too small **or only** 7 • no other athletes tested **or only** tested on cyclists • **only** tested once / no repetition • effect may be due to hydration level (as opposed to glucose) • other factors before / outside of the sessions may not be controlled, e.g. diet, training regime, drugs, health • no data concerning variation between individuals' results • should have been a double-blind trial	max 3 marks for only pros or cons given points must clearly relate to a pro or con allow with glucose drink, blood glucose stays high or stays higher than placebo allow suggested improvement – e.g. should have some cycling with and some without glucose at same time, then swap for 2nd session	4	AO3 2.6 2.6.1b/f 2.6.2d

4.3.1.9 Discovery and development of drugs

Answer 23 · Mark scheme

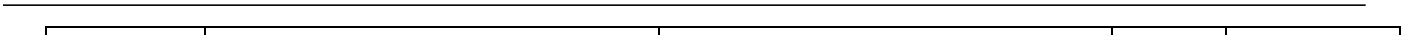
June 2017 | BL2HP | Original Q5 | Legacy

5(b)(ii)		‘increased’ / ‘more’ must be given at least once for full marks		AO1 2.6.1b/f/g/h 2.6.2d
	increased <u>oxygen</u> supply		1	
	increased removal of <u>carbon dioxide</u>	allow idea of less lactic acid **or** less (muscle) fatigue **or** less oxygen debt **or** less anaerobic respiration	1	
	increased <u>respiration</u>	do **not** allow increased anaerobic respiration	1	
	so increased <u>energy</u> release for muscle contraction / action	do **not** allow makes (more) energy	1	
Total			**10**	

4.3.1.9 Discovery and development of drugs

Answer 23 · Mark scheme

June 2017 | BL2HP | Original Q5 | Legacy



4.3.1.9 Discovery and development of drugs

Answer 24 · Mark scheme June 2019 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **one** from: • (chemical which) catalyses / speeds up reactions in living organisms • (chemical which) catalyses / speeds up biological reactions	allow biological catalyst allow reduces activation energy (of reactions) in living organisms	1	4.2.2.1 AO1
	idea of specificity **or** (is a) protein	allow made of amino acids	1	
08.2	salivary gland	ignore mouth ignore liver	1	4.2.2.1 AO1
	small intestine	allow duodenum / ileum ignore intestine unqualified do **not** accept large intestine	1	

4.3.1.9 Discovery and development of drugs

Answer 24 · Mark scheme June 2019 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	reduced / no enzyme production / release (from pancreas)	allow named example of enzymes ignore reference to hormones	1	4.2.2.1 4.4.2.3 4.4.2.1 AO2
	food is not broken down fully **or** food is not digested fully	allow no food is broken down / digested allow example	1	
	plus any **one** of the following routes for max **2** marks:	mark as pairs		
	less glucose / sugar absorbed **or** less glucose / sugar passes into the blood(stream)		1	
	(so) less glucose available for respiration so more (body / stored) fat used up in metabolism / respiration **or** fewer amino acids absorbed **or** fewer amino acids pass into the blood(stream) (1) (so) fewer amino acids are available for making new protein for repair / replacement (1) **or** fewer fatty acids absorbed **or** fewer fatty acids pass into the blood(stream) (1) (so) fewer fatty acids available so less fat is stored in the body (1) **or** chemotherapy / radiotherapy causes nausea / loss of appetite (1) (so) less intake of food (1)	ignore glycerol ignore glycerol	1	

4.3.1.9 Discovery and development of drugs

Answer 24 · Mark scheme June 2019 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	(cancer) cells cannot divide **or** (cancer) cells are destroyed / killed	do **not** accept reference to the drug killing (cancer) cells	1	4.2.2.7 AO3
	(so) tumour doesn't grow / get bigger **or** tumour less likely to spread **or** tumour less likely to form secondary tumours	allow cancer cells less likely to spread / metastasise	1	
	(because) enzymes **A** and **B** are not working / active / effective / present **or** (because) enzymes **A** and **B** are inhibited	allow reference to both enzymes ignore enzymes unqualified	1	
08.5	(functional) enzyme **B** would still be made / present	allow enzyme **B** is not inhibited	1	4.2.2.7 AO3
	(therefore cancer) cells would still divide uncontrollably **or** (therefore cancer) cells would not be destroyed **or** (therefore) the tumour will (continue to) grow / get bigger / spread **or** the tumour will form secondary tumours		1	
08.6	any **two** from: • to avoid the patients thinking they feel better with the drug **or** to take into account a psychological effect • as a control / comparison • to avoid bias(ed results)	ignore to make it more valid unqualified ignore to provide an independent variable	2	4.3.1.9 AO2
08.7	testing on volunteers with the disease		1	4.3.1.9 AO1

4.3.1.9 Discovery and development of drugs

Answer 24 · Mark scheme June 2019 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.8	monoclonal antibody is attached to radioactive substance / toxin / drug / chemical monoclonal antibody will (only) attach to / target (antigen on) cancer cells / tumour (so) radioactive substance / toxin / drug / chemical will (bind to cancer cells and) stop them growing / dividing	allow radioactive substance / toxin / drug / chemical will kill / destroy the cancer cells **OR** monoclonal antibody interrupts the cell cycle **or** monoclonal antibody aids immune response (1) monoclonal antibody will (only) target cancer cells / tumour (1) (so) action of monoclonal antibody stops cancer cells growing / dividing **or** (so) action of monoclonal antibodies helps immune system kill / destroy cancer cells (1)	1 1 1	4.3.2.2 AO1 AO1 AO1
Total			**19**	

4.3.1.9 Discovery and development of drugs

Answer 25 · Mark scheme

November 2020 | 8461/1H | Original Q7

The full source mark scheme begins on page 51. Follow original question 7 in that document.

4.3.1.9 Discovery and development of drugs

Answer 26 · Mark scheme

June 2023 | 8461/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.1	a group of the same / similar cells **or** a group of cells with a (similar / specific) function	ignore a group of cells unqualified ignore examples of tissue functions	1	AO1 4.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.2	meristem (tissue)		1	AO1 4.1.1.4 4.1.2.3 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	willow	ignore named parts of willow	1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	any **one** from: • (berries are) easy to access / pick • easier to extract chemical • taking berries will not harm the plant	ignore berries are not underground allow taking leaves / roots might damage / kill the plant (so it cannot produce more chemical) allow idea that the lower mass / amount (of chemical) will be less toxic / harmful allow greater mass of berries than of leaves / roots	1	AO3 4.2.3.1

4.3.1.9 Discovery and development of drugs

Answer 26 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5		allow conversion to mg at any point in calculation		AO2 4.3.3.1
	(0.6 × 1.2 =) 0.72		1	
	(0.72 × 2 =) 1.44		1	
	1.44 × 1000	allow conversion of a correct mass calculated for berries / roots	1	
	1440 (mg)	allow a correct answer using an incorrect conversion factor of a multiple of 10	1	
	alternative route (2 × 1.2 =) 2.4 (1) (2.4 × 0.6 =) 1.44 (1) 1.44 × 1000 (1) 1440 (mg) (1)			

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	any **one** from: • lack of chlorophyll • lack of magnesium (ions)	allow lack of chloroplasts allow lack of mineral (ions) **or** named example such as iron / nitrate / potassium / zinc (ions) ignore lack of nutrients / nitrogen allow lack of water allow incorrect pH of soil allow acidic / alkaline soil allow (named) infection allow lack of light allow other correct suggestions	1	AO1 4.3.3.1 4.3.1.2 4.3.1.4

4.3.1.9 Discovery and development of drugs

Answer 26 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7	any **two** from: • to check toxicity • to check dosage • to check its efficacy	allow to check it is safe allow to check for side effects allow to check it is not poisonous / dangerous / harmful allow to check how much is needed allow to check it works allow to check it does not interact with other drugs	2	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.8	(writers / companies may get) financial gain **or** (competitor may suffer) financial loss	ignore because the report has not been peer reviewed ignore have not used a double-blind trial	1	AO3 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.9	have the claims peer reviewed		1	AO1 4.3.1.9

Total Question 1	**13**

4.3.1.9 Discovery and development of drugs

Answer 27 · Mark scheme

June 2024 | 8461/1H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.1	any **one** from: • (cell **or** sub-cellular structures) grows • increase in (number of) sub-cellular structures • increase in (number of) mitochondria • increase in (number of) ribosomes	do **not** accept nucleus ignore increase in cell parts / components allow increase in respiration allow increase in protein (synthesis) do **not** accept changes that occur as the cell divides	1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.2	(cell) membrane		1	AO1 4.1.2.2 4.1.1.2

4.3.1.9 Discovery and development of drugs

Answer 27 · Mark scheme

June 2024 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.3		allow use of π button on calculator for 3.14 allow use of $\frac{22}{7}$ for 3.14		AO2 4.1.1.5
	substitution length = $\frac{24\ 500\ 000}{3.14 \times 125^2}$		1	
	(length =) 499.363 (nm)	allow 499 (nm)	1	
	recall of equation magnification = $\frac{\text{image size}}{\text{real size}}$		1	
	correct conversion of mm to nm **or** nm to mm (4 mm = 4 000 000 nm)	allow conversion at any point	1	
	$\frac{4\ 000\ 000}{499.363}$	allow use of correctly rounded calculated value for length	1	
	×8010	allow ×8010.205 do **not** accept if unit given allow an answer consistent with an incorrectly rounded / calculated value for length	1	

4.3.1.9 Discovery and development of drugs

Answer 27 · Mark scheme

June 2024 | 8461/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.4	chromosomes cannot be pulled (by the fibres) to each end of the cell (so) nucleus cannot divide	ignore chromosomes cannot be separated unqualified allow **two** (genetically identical) cells cannot be formed ignore cytokinesis ignore the cell cannot divide	1 1	AO3 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.5	tumour cannot grow / proliferate / spread	allow stops secondary tumours forming allow stops metastasis ignore stops uncontrolled cell division do **not** accept the cancer / tumour cannot become malignant	1	AO2 4.1.2.2 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.6	testing the drugs on live tissues in a laboratory		1	AO1 4.3.1.9

Total Question 8	**12**

4.3.1.9 Discovery and development of drugs

Answer 28 · Mark scheme

June 2025 | 8461/2H | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1		allow converse allow answers in terms of likelihood of having / getting (Type 2) diabetes		AO3 4.5.3.2
	(percentage of people with Type 2) diabetes increases with age	allow more old people have (Type 2) diabetes	1	
	(percentage of people with Type 2) diabetes increases with increased (body) mass / weight	allow more obese people have (Type 2) diabetes allow (percentage of people with type 2) diabetes increases with obesity	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	7.65%		1	AO3 4.3.1.9 4.5.3.2

Question	Answers	Mark	AO / Spec. Ref.
09.3	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.3.1.9 4.5.3.2
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	

Indicative content

allow 'investigation 1' for drug **A** and 'investigation 2' for drug **B** throughout

Methods

Methods are not comparable because:

- different methods are used to administer the drugs - injection (drug **A**) and pill (drug **B**)
  or drug **A** acts more quickly (than drug **B**)
- dosage for drug **A** and drug **B** might differ (as dosage is not stated)
- drug **A** and drug **B** are tested for different time periods
  or B is given for a longer period (24 weeks) (than **A** - 12 weeks)
- placebo / control only included when testing drug **B**
- only drug **B** has intermediate readings
  or fewer readings were taken when testing drug **A**
- different sample sizes were used
  or greater sample size used when testing drug **B**
  (**A** = 175, **B** = 631 / 1261)
- different scientists carried out each investigation
- no double-blind trial for drug **A**

Methods may be similar because:

- neither drug trial was double-blind
- quantitative tests in both trials
- (relatively) large sample size used for both drugs

Usefulness of drug A and drug B

allow 'blood glucose' for Hb-G throughout

- o both lower Hb-G (levels)
- o both lower Hb-G to similar levels
- o drug **A** reduced Hb-G more than drug **B**
- o neither drug reduced Hb-G to an acceptable value (<7%)
- o Hb-G increases after 18 weeks with drug **B**
- o no information on side effects for either drug
- o no information on the trend for drug **A**

For **Level 1**, details about the method **or** usefulness of the drugs must be given.

For **Level 3**, details about the method **and** usefulness of the drugs must be given.

Total Question 9	**9**

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Biology 4411

BLY1H Unit Biology 1

Mark Scheme

2007 examination - June series

4.3.1.9 Discovery and development of drugs

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2007 AQA and its licensors. All rights reserved.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334). Registered address: AQA, Devas Street, Manchester M15 6EX.
Dr Michael Cresswell, Director General.

4.3.1.9 Discovery and development of drugs

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.3.1.9 Discovery and development of drugs

BLY1H Question 1

	answers	extra information	mark
(a)	scientists figures based on research / calculations / data **or** scientists sample whole area	ignore reasons based on bias	1
	fishermen based on impression / hearsay / experience **or** fishermen fish in well-stocked / limited areas		1
		scientists sample a wider area = **2** marks fishermen only fish in well-stocked areas = **2** marks if no marks gained fishermens' opinion **and** scientists' opinion gains **1** mark	
(b)	any **two** from: • economic considerations • political impact • pressure groups **or** fears of extinction	 eg fear for jobs, profits, big demand for cod eg allow EU / government decide or laws will be passed	2
total			4

4.3.1.9 Discovery and development of drugs

BLY1H Question 2

	answers	extra information	mark
(a)	any **two** from: • area of bed sampled • sampling time • size of net • kicking action • net position	control variables from information given	2
(b)	any **two** from: • some animals not dislodged • some animals missed / through / escaped net • invertebrates difficult to identify • invertebrates from outside area	must be ideas related to a sample ignore reliability etc	2
(c)	10 to 99 **or** 10 – 99 **or** 99 to 10 **or** 99 – 10		1
(d)	any **two** from: • increased / goes up • 0 at sample 4 • to (more than) 100	allow increase implied from all data described	2
(e)	mayfly because not found downstream of point where sewage enters stream **or** only in the unpolluted water		1 1
total			9

4.3.1.9 Discovery and development of drugs

BLY1H Question 3

	answers	extra information	mark
	adaptation and linked advantage eg	max **2** for 3 adaptations	max 2 max 2
	• roots widespread / long (1) to collect water from large area (1)	ignore large roots accept to collect more water	
	• some roots deep / long (1) to collect water from deep down (1)	ignore large roots accept to collect more water	
	• absence of leaves (1) reduces water loss (1)		
	• swollen stem (1) to store water (1)		
	• roots near surface (1) to absorb rainwater (1)		
	• roots widespread (1) support in sandy soil (1)		
total			4

4.3.1.9 Discovery and development of drugs

BLY1H Question 4

	answers	extra information	mark
(a)(i)	viruses live inside cells		1
	viruses inaccessible to antibiotic	allow drug / antibiotic (if used) would (have to) kill cell	1
(ii)	mutation	ignore mutation caused by antibiotic	1
	natural selection **or** no longer recognised by antibiotics	accept description of natural selection	1
(b)	(stimulate) antibody production	ignore antitoxin	1
	(by) white cells		1
	<u>rapidly</u> produce antibody on re-infection	ignore antibodies remain in blood	1
total			7

4.3.1.9 Discovery and development of drugs

BLY1H Question 5

	answers	extra information	mark
(a)	ovary or ovaries		1
(b)	(hormone) implant		1
(c)	do not have to remember to take		1
(d)	does not involve hormone **or** it is a mechanical method	allow coil may be dislodged allow egg is fertilised / released allow not preventing egg fertilisation / release	1
(e)	involves death of fertilised egg **or** (regard) fertilised egg as human **or** stops fertilised egg developing	allow embryo / baby for fertilised egg ignore against religion only allow fertilised egg is alive ignore side effects	1
(f)(i)	inhibit FSH (production) so no eggs mature / develop / are produced	allow inhibits LH allow (LH) stimulates egg release ignore progesterone	1 1
(ii)	contains FSH which causes egg to mature / develop / be produced **or** in women whose FSH is low	allow contain LH allow (LH) stimulates egg release	1 1
total			9

4.3.1.9 Discovery and development of drugs

BLY1H Question 6

	answers	extra information	mark
(a)	asexual reproduction / mitosis **or** no fusion of gametes **or** division after fusion **or** from fertilised egg **or** from same embryo **or** from same egg **and** sperm	ignore cloning	1
	each embryo has identical genetic information / genes / DNA / chromosomes		1
(b)	any **two** from: • experimental subject and control are identical **or** fair test since monkeys identical • monkeys similar to humans, so effect of drugs likely to be similar • all identical so will have same reaction to drugs / disease • it's better than catching wild ones	allow closely related so… ignore evolved from	2
total			4

4.3.1.9 Discovery and development of drugs

BLY1H Question 7

	answers	extra information	mark
(a)	any **two** from: • balance between two important for good heart health • high LDL causes heart disease / high cholesterol • high HDL reduces heart disease / cholesterol	ignore blood pressure do **not** accept converse argument do **not** accept converse argument	2
(b)	heart attacks greater amongst patients with low HDL levels statins reduce heart attacks of patients **or** placebo is less effective	ignore statins cause heart disease ignore comparative effects of the two statins allow pravastatin is more effective supported by appropriate calculations eg pravastatin > 39 33% < 39 31.4% Average 32.4 > 39 32% < 39 28.2% Average 30.05%	1 1
total			4

4.3.1.9 Discovery and development of drugs

BLY1H Question 8

	answers	extra information	mark
(a)	present day organisms have evolved from simpler organisms	ignore answers in terms of natural selection	1
	over long periods of time **or** millions / billions of years		1
(b)	(natural selection operates on successful) characteristics produced by chance / (random) mutation		1
	in this experiment caused by hormones / environment	allow this example indicates inheritance of acquired characteristics for **2** marks allow this is Lamarckism only for **1** mark	1
total			4

AQA

GCSE
BIOLOGY
8461/1H

Paper 1 Higher Tier

Mark scheme

June 2020

Version: 1.0 Final

206G8461 1H/MS

4.3.1.9 Discovery and development of drugs

MARK SCHEME – GCSE BIOLOGY – 8461/1H – JUNE 2020

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Copyright information

For confidentiality purposes acknowledgements of third-party material are published in a separate booklet which is available for free download from www.aqa.org.uk after the live examination series.

Copyright © 2020 AQA and its licensors. All rights reserved.

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement
- the Assessment Objectives, level of demand and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

4.3.1.9 Discovery and development of drugs

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

4.3.1.9 Discovery and development of drugs

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		allow correct chemical symbols ignore any attempt at balancing equation ignore light / chlorophyll		AO1 4.4.1.1
	before arrow carbon dioxide **and** water	either order	1	
	after arrow glucose	ignore sugar / carbohydrate do **not** accept starch	1	
01.2		ignore description of subsequent parts of the photosynthesis reaction		AO1 4.1.1.2 4.4.1.1
	<u>light</u>	allow sun<u>light</u> ignore sun	1	
	(light) is captured / trapped / absorbed by chlorophyll / chloroplasts	allow (light) is used by chlorophyll / chloroplasts	1	
01.3	$\frac{18.5 + 19.3 + 19.5}{3}$ **or** $\frac{57.3}{3}$		1	AO2 4.4.1.2 RPA 6
	19.1 (cm^3/hour)	allow an answer correctly calculated using only two correct values	1	
01.4	a ring around 14.2	allow clear indication of correct result	1	AO3 4.4.1.2 RPA 6

4.3.1.9 Discovery and development of drugs

01.5	any **one** from: • scale / value was misread • there was air / oxygen in the syringe / measuring cylinder / apparatus • the lamp / light was moved • temperature changed • had different mass / length of pondweed • pondweed had not acclimatised	ignore human error ignore references to counting bubbles or time allow measurement error allow light intensity changed ignore different bulb / lamp unqualified	1	AO3 4.4.1.2 RPA 6
01.6	did not use it in calculation (of mean)		1	AO3 4.4.1.2 RPA 6
01.7	any **one** from: • light (intensity) • carbon dioxide (concentration) • pondweed size / amount • pondweed species	do **not** accept temperature ignore time allow distance / power / colour of lamp / light allow same (piece of) pondweed	1	AO3 4.4.1.2 RPA 6
01.8	enzyme(s) lose the shape of the active site	allow enzyme(s) (start to) denature allow enzyme(s) destroyed / damaged do **not** accept enzyme(s) killed	1	AO2 4.2.2.1

4.3.1.9 Discovery and development of drugs

01.9	y-axis labelled '(rate of) photosynthesis in cm^3/hour'		1	AO2 4.4.1.2 RPA 6
	suitable scale on y-axis	must take up half or more of grid provided	1	
	all points plotted to within ± ½ small square	allow 3 or 4 correct plots for **1** mark ignore any attempt to plot a point at 20 °C	2	
	correct curved line of best fit	ignore line joined point to point with straight lines ignore extrapolation	1	
Total			**16**	

4.3.1.9 Discovery and development of drugs

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	movement / spreading out of molecules / particles	allow movement / spreading out of (named) substances / chemicals / gases / liquids ignore reference to membranes / cells	1	AO1 4.1.3.1
	from (an area of) high(er) concentration to (an area of) low(er) concentration	allow down / with the concentration gradient ignore along / across the concentration gradient do **not** accept movement from / to a concentration gradient	1	
02.2	increased carbon dioxide concentration in the air		1	AO2 4.1.3.1 4.2.3.2
	increased number of stomata that are open		1	

4.3.1.9 Discovery and development of drugs

02.3	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.1.3.1 4.2.2.2 4.2.2.3
	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
	• (many) alveoli
	  • provide a large(r) surface area (**:** volume)
	
	• capillaries are thin
	  or alveoli / capillary walls are thin **or** one cell thick
	  or capillaries are close to the alveoli
	  • which provides short diffusion path (for oxygen / carbon dioxide)
	
	• breathing (mechanism) moves air in and out
	or lungs are ventilated
	  • to bring in (fresh) oxygen
	  • to remove carbon dioxide
	  • to maintain a concentration / diffusion gradient
	
	• large capillary network (around alveoli)
	or good blood supply
	  • to remove oxygen(ated blood) quickly
	  • to bring carbon dioxide to the lungs quickly
	  • to maintain a concentration / diffusion gradient		

4.3.1.9 Discovery and development of drugs

02.4	osmosis	allow diffusion	1	AO1 4.1.3.1 4.2.3.2 4.1.3.2
02.5	active transport (because) energy is needed (to move nitrate ions) from a low(er) concentration (in the soil) to a high(er) concentration (in the root / cell)	 allow (to move nitrate ions) against / up the concentration gradient allow (because) there is a lower concentration (of nitrate ions) in the soil **or** (because) there is a higher concentration (of nitrate ions) in the root / cell ignore reference to amount / number of nitrate ions ignore along / across the concentration gradient do **not** accept if reference to molecules / atoms moving	1 1 1	AO3 AO2 AO2 4.1.1.3 4.2.3.2 4.1.3.3
Total			**14**	

4.3.1.9 Discovery and development of drugs

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **two** from: (both have) • cytoplasm • (cell) membrane • DNA / genetic material • ribosomes	ignore reference to shape allow RNA ignore genetic information if no other mark awarded allow sub-cellular structures for **1** mark if no other mark awarded allow correct cellular process, e.g. respiration for **1** mark	2	AO2 4.1.1.1 4.1.1.2 4.1.2.1
03.2	any **three** from: • prokaryotic cell is smaller • prokaryotic cell has no mitochondria • prokaryotic cell has no nucleus **or** DNA is free in the cytoplasm **or** genetic material is free in the cytoplasm • prokaryotic cell has a single loop of DNA **or** prokaryotic cell has a single loop of genetic material • prokaryotic cell has plasmids	allow converse for eukaryotic cells allow reference to bacterium instead of prokaryotic cell ignore reference to features not shown in Figure **5** if neither mark awarded, allow prokaryotic cell has no membrane-bound organelles ignore genetic information ignore genetic information ignore circular / rings of DNA allow prokaryotic cells have smaller ribosomes	3	AO2 4.1.1.1 4.1.1.2 4.1.2.1

03.3	1 µm = 0.001 mm **or** 1 mm = 1000 µm **or** 0.05 mm = 50 µm **or** 0.05 × 1000 (1:) 50	 do **not** accept if a unit is given	1 1	AO2 4.1.1.1 4.1.1.2
03.4	mitosis	correct spelling only	1	AO1 4.1.2.2
03.5	35%		1	AO2 4.1.2.2
03.6	 (stage 1) DNA / chromosomes replicate / duplicate mitochondria / ribosomes / sub-cellular structures increase in number **or** mitochondria / ribosomes / sub-cellular structures replicate (stage 2) one set of chromosomes is pulled / moved to each end of the cell (stage 3) the cytoplasm **and** cell membrane divides (to form two cells)	ignore names of the stages of the cell cycle ignore genetic material ignore DNA / chromosomes double / reproduce allow cytoplasm increases ignore cell grows unqualified allow one of each chromosome is pulled / moved to each end of the cell ignore nucleus divides allow cytoplasm divides **and** (new) cell membranes form ignore nucleus divides	 1 1 1 1	AO1 4.1.2.2
Total			**13**	

4.3.1.9 Discovery and development of drugs

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	fatty acids		1	AO1 4.2.2.1
	glycerol		1	4.4.2.3
04.2	enzyme binds to the substrate because they are complementary (shapes)	allow enzyme joins to the substrate because they fit together exactly allow enzyme joins to the substrate because the substrate fits the active site ignore reference to specificity do **not** accept same shape	1	AO2 4.2.2.1
	(so) substrate is broken down (into products)	allow (so) substrate splits (into products) ignore products are formed, unqualified	1	
	(so) products are released **or** enzyme is not changed	allow enzyme is not used up allow reference to activation energy for either marking point 2 **or** marking point 3	1	
04.3	each <u>active site</u> has a specific shape (so only fits one type of lipid molecule)	allow each <u>active site</u> is a different shape do **not** accept reference to the substrate having an active site	1	AO2 4.2.2.1
04.4	add Benedict's (solution / reagent to the liquid)		1	AO1 4.2.2.1 RPA 4
	boil / heat	allow any temperature of 65 °C or above	1	
	(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red		1	

04.5	add iodine solution / reagent (to the liquid) (if starch is present) it changes colour to blue / black (from yellow / orange / brown)	allow add a drop of iodine ignore iodine unqualified	1 1	AO1 4.2.2.1 RPA 4
04.6	glucose from photosynthesis (excess) glucose converted to starch	do **not** accept starch made in photosynthesis allow (excess) glucose is stored as starch	1 1	AO2 4.2.2.1 4.4.1.1 4.4.1.3 4.4.2.3
04.7	starch (stores) have been converted to glucose (so the glucose can be) used for respiration / (named) metabolic reactions **or** (so the glucose can be) used to release energy (because) there is no light to make (new / more) glucose by photosynthesis	ignore reference to residual glucose from previous photosynthesis do **not** accept idea of energy being produced / created / made	1 1 1	AO3 4.4.1.1 4.4.2.1 4.4.1.3
04.8	any **one** from: • test roots / stems of plants (in the light and dark) • test other species of plant • measure the concentrations of glucose **and** starch • vary the time in the dark / light • test variegated leaves	do **not** accept reference to changing the independent variable allow test other parts of the plants allow test other types of plant ignore mass / amount allow any other valid extension ignore repeats	1	AO3 4.4.1.2 4.4.1.3
Total			**17**	

4.3.1.9 Discovery and development of drugs

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	mechanical	allow physical allow structural	1	AO3 4.3.3.2
05.2	any **one** from: • to deter herbivores • to prevent animals damaging it	ignore to injure animals, unqualified allow to deter animals eating it do **not** accept to deter predators	1	AO2 4.3.3.2
05.3	chemical		1	AO3 4.3.3.2

4.3.1.9 Discovery and development of drugs

05.4	any **two** from : • lack of magnesium (ions) (1) (so) not enough chlorophyll for (efficient) photosynthesis (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • infection by pathogen / bacteria / virus / fungus (1) (so) leaves become discoloured / yellow so less photosynthesis (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • infected by aphids (1) (which) remove sugars from phloem (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • lack of (available) light (1) (so) chlorophyll breaks down (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)	allow (so) lack of chlorophyll produced causes yellow leaves (1), (so) not enough photosynthesis to produce glucose which is used to make proteins for growth (1) allow correctly named pathogen allow has rose black spot / TMV allow other symptoms of named pathogens / disease award once only award once only award once only	5	AO2 4.3.3.1 4.3.1.1 4.3.1.2 4.3.1.4 4.4.1.1 4.4.1.2 AO1 4.4.2.3 4.4.1.3

4.3.1.9 Discovery and development of drugs

05.5	(bacteria) obtain glucose / sugar (from the plant) (glucose used) for respiration **or** (glucose used) for making other named substances	 allow (glucose used) to release energy	1 1	AO3 AO2 4.2.3.2 4.4.1.3
05.6	(gorse plant) obtains nitrate (ions) needed for amino acids / proteins	 allow needed to make chlorophyll / DNA	1 1	AO2 4.1.3.3 4.4.2.3 AO1 4.3.3.1
05.7	willow bark		1	AO2 4.3.1.9
Total			**13**	

4.3.1.9 Discovery and development of drugs

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	any **two** from: • BMI / morphology / obesity level • smoking habits • diet • medication • family history of liver disease • fitness levels • ethnicity • area of UK they live in	ignore genetic factors allow mass / weight **and** height allow previous drinking habits allow medical conditions allow drug use allow level of exercise allow race	2	AO3 4.2.2.6
06.2	2.55 – 1.60 (= 0.95) $\left(\frac{0.95}{2.55} \times 100 = \right)$ 37 (.2549019608…) (%)	allow 1.60 – 2.55 (= –0.95) allow value for with meals in range 1.60 to 1.65 (for 1.60) allow answer correctly calculated from values in ranges 1.60 to 1.65 and 2.50 to 2.60 allow – 37(.2549019608...)(%)	1 1	AO2 4.2.2.6
06.3	12 × 2 × 7 = 168 (g/week) 1.8	 allow in range 1.8-1.9 allow correct reading from a calculation that omits the 2 **or** the 7 do **not** accept if a unit is given	1 1	AO2 4.2.2.6

4.3.1.9 Discovery and development of drugs

06.4	any **two** from: • consuming alcohol increases the RR (with / without meals) **and** supporting data • consuming less than 50 g/week of alcohol with meals does not increase the RR • even (small amounts of alcohol at) 25 g/week increases the RR if not with meals	allow risk for RR throughout allow data in terms of number of glasses of wine allow increasing alcohol consumption increases the RR at an increasing rate allow any value between 35 and 60 g/week	2	AO3 4.2.2.6
06.5	any **two** from: • large number in survey • long term / 15 year survey • well controlled	allow 800 000 in survey if neither mark awarded allow large study allow many controls	2	AO3 4.2.2.6
06.6	any **one** from: • people underestimate / overestimate alcohol consumption • people may change (lifestyle / drinking) habits over time • some people may drink all their weekly alcohol at once	allow people lie about alcohol consumption **or** people lie about other named control variables ignore survey only tested women	1	AO3 4.2.2.6

06.7	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3-4	AO2 4.4.2.3 4.2.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1-2	AO1 4.4.2.2 4.2.2.6 4.2.2.5 4.5.3.3
	No relevant content	0	
	Indicative content Responses may refer to either total or partial liver failure • no bile made (in the liver) ○ fats / lipids are not emulsified ○ surface area of fats / lipids not increased ○ pH of small intestine will not be alkaline / neutralised ○ enzymes (in small intestine) will not work effectively **or** (named) food not digested / absorbed ○ so may lose weight • lactic acid not broken down / oxidised ○ accumulation of lactic acid in blood / body ○ lactic acid is toxic **or** body will be poisoned ○ oxygen debt higher / prolonged ○ so muscle pain / fatigue • proteins / amino acids will not be broken down (in liver) ○ (amino acids) not deaminated ○ amino acids not made into urea **or** will not form ammonia ○ (however) any ammonia formed is toxic ○ so accumulation of amino acids in blood / body • liver does not break down / remove other toxins (like alcohol) ○ toxins accumulate in blood / body ○ body will be poisoned ○ so pain **or** jaundice **or** swollen liver **or** portal hypertension occurs • glycogen stores will not be formed ○ cannot control blood glucose ○ so hyperglycaemia / hypoglycaemia / diabetes / coma may occur		

Total			**15**

4.3.1.9 Discovery and development of drugs

Question	Answers	Extra information	Mark	AO / Spec.Ref.
07.1		ignore add mAbs and dye to slide (unbound)		AO2 4.3.2.2
	bind fluorescent dye to mAbs		1	
	put (bound) fluorescent mAbs on the slide (and rinse off)		1	
	mAbs will bind to Candida albicans / pathogens and show up under the microscope	allow mAbs will bind to Candida albicans / pathogens and show up under UV (lamp)	1	
07.2	more Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells	allow Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells more quickly do **not** accept white blood cells produce antibodies do **not** accept lymphocytes engulf Candida albicans	1	AO2 4.2.2.3 4.3.1.6 4.3.1.7
	therefore less damage to cells / tissues / organs	ignore less toxin released (by Candida albicans)	1	

07.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.		4-6	AO1 4.3.1.9
	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 • given first to healthy volunteers o at (very) low dose o to test it is safe **or** to test for toxicity **or** to check for any side effects • then to some patients (with the disease) **or** people with the disease o to test for the correct / optimum dose o to check for any side effects o to test for efficacy **or** to test if it works o in a double blind trial o where neither patients nor doctors know who has the mAbs and who has a placebo (or alternative treatment) • reference to large trial **or** long duration **or** control variables			
07.4	any **one** from: • (the body will) not reject the mAbs **or** (the body is) less likely to reject the mAbs • mouse mAbs are (more likely to be) rejected • the human lymphocytes have already responded to that infection / cancer cell so they are known to work against the disease	do **not** accept idea of rejection of cells	1	AO3 4.3.2.2 4.3.2.1 4.3.1.6
Total			**12**	

4.3.1.9 Discovery and development of drugs

Answer 25 · Examiner comments November 2020 | 8461/1H | Original Q7

Question 7 (standard/high & high demand)

Many students unnecessarily explained how monoclonal antibodies were produced for **07.1**, and very few scored marks on this question. Many students misunderstood the context of the question, and indicated that the mAbs would be injected into the slide. Some students thought that the mAbs were made of lymphocytes. In **07.2**, several students incorrectly stated that the mAbs themselves or lymphocytes would engulf the pathogen.

In **07.3**, many students were able to access Level 2, however, a number of students made blanket statements about clinical trials that applied to all participants. Several students were unable to clarify the difference between patients and healthy volunteers, with some using confusing terminology such as ‘healthy patients’.

Concluding Remarks

Generally, the standard of this paper was broadly comparable to previous years. Students generally scored well on simple recall of knowledge questions (AO1) and the topics of cell structure, photosynthesis and movement across membranes were well answered. Most students were able to apply their knowledge effectively in straightforward questions (AO2), but some found application of knowledge to new situations more difficult. Many student's understanding of the structure and function of enzymes is limited and a lack of clear knowledge meant that some students articulated answers poorly on paper. Many students struggle to answer AO3 questions, particularly where complex data needs to be analysed or improvements to practical techniques need suggesting. A lack of precision when quoting, plotting or describing data is common.

As in previous years, details of the Benedict's test for sugar and iodine solution test for starch had not been recalled well, indicating that many students understanding of this practical activity was below expectations. Students continue to find the role of the liver in the human body a challenge.

4.3.1.9 Discovery and development of drugs

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.3.1.9 Discovery and development of drugs

Answer 26 · Examiner comments

Question 1 (Standard demand)

01.1 Whilst a large majority of students knew that a tissue consists of 'a group of cells', often adding 'working together'; these were insufficient to gain the mark. In order to be credited, students also needed to qualify this answer in terms of structure or appearance (ie 'being similar') or their functions being similar, and around 67% of students successfully gained the mark. As the question was asked in general terms, answers which gave the roles of specific tissues were not credited.

01.2 67% of students knew the name of this tissue. Common answers that failed to gain the mark included other cells or tissues that might be found in roots, such as 'root hairs' and 'xylem'.

01.3 63% of students were able to name 'willow' as the plant from which aspirin originates. Many students qualified their answers with specific parts of the willow, such as 'bark' or 'leaves' or just added 'tree' These details were ignored as being beyond expected knowledge. Incorrect answers included 'foxgloves' and 'fungus' as students mixed up the original sources of traditional drugs. Those who appeared not to have revised this area of the specification could only come up with improbable guesses such as 'the aspirin tree'.

01.4 Just over half of students gave correct responses in this question, with the most common correct responses referring to not causing damage or harm to the plant, or the idea that berries are easier to access. A number of students suggested that the berries would be 'easier to extract', which fell between the ideas of the berries being easier to access and the chemical being easier to extract; this idea was considered to be just sufficient to gain the mark. Suggestions that berries would 'grow back' after picking were insufficient as this would also be true of leaves and to some extent, of roots.

4.3.1.9 Discovery and development of drugs

Answer 26 · Examiner comments June 2023 | 8461/1H | Original Q1

01.5 The most problematic part of this calculation was the conversion of grams to milligrams. Many students made no attempt at the conversion, stopping at '1.44', gaining 2 marks or alternatively '0.72' or '2.4', either of which gained just the first mark.
Students who attempted a conversion, using factors such as 100, 10 or even 0.001, were able to gain the fourth mark, provided their answers matched this conversion factor.
Unlike for more complicated calculations, most students laid out their calculations in a way that made interpretation fairly straightforward. Only a small minority of students appeared to have no idea of how to go about the calculation.

01.6 Many students were able to quote from their revision, that a 'lack of magnesium' would cause chlorosis. Whether this was expressed as a small deficiency or the plant getting no magnesium was not critical in gaining the mark. Other students were likely to offer ideas such as a 'lack of chlorophyll' or a 'lack of sunlight'. Only 17% of students failed to give a correct response with some suggesting that chlorosis might have been 'caught' or passed on' from other plants, without reference to a pathogen or infection.

01.7 Students were generally well-versed in the need for drug tests or trials, and 82% of students gained full marks. The most common error was to offer both the idea of checking toxicity and checking for side effects, as these amount to the same thing so could only be credited once. For many students the technical term 'efficacy' was well used, although some offered the idea of 'checking for efficiency', for which a mark was not awarded.

01.8 Although there may be many possible subordinate reasons for the writing of a biased report, all of these come down to one party or another being affected financially. Thus, only this idea was credited and the various reasons for this, such as 'disagreeing with the ethics' of the company were ignored.

01.9 A pleasing 90% of students correctly identified the need to have the claims peer reviewed.

Answer 27 · Examiner comments

Question 8 (standard, standard/high demand and high demand)

08.1 59% of students achieved the mark in this question, with most stating that the cell grows in size or increases its number of organelles. The increase in number was expressed in many different ways (replication, duplication, multiplication, etc.), all of which were creditworthy.

The most common incorrect answers contained descriptions of what happens during mitosis, such as the chromosomes being pulled to either end of the cell, or of the cell membrane and cytoplasm dividing.

08.2 78% of students answered this question correctly. The most common incorrect answers seen were cell wall and nucleus/nuclear membrane.

08.3 There were many ways in which students achieved a variety of marks in this question. 34% of students achieved 6 marks, and 33% achieved 5 marks, with the conversion from nm to mm being the difference between them. The conversion method was not well understood, with both divisions and multiplications with a large range of factors of 10 seen. Some students began by trying to convert the volume given in the question, which often led to further mistakes later on. Many students were able to substitute the numbers from the question into the equation given and calculate an answer, thus gaining two marks if they went no further (13% of students). Answers using any representation of *pi* (3.1, π or $^{22}/_{7}$) were accepted and seen, despite students being told to use 3.14 in the question.

Students could gain credit for quoting the magnification equation or for showing its use without writing it out in words. However, just quoting the triangular representation of the equation was not creditworthy. A significant minority of students gave the equation upside down and so were not awarded marking point 3 and, if they used it in that incorrect form, were not able to access marking point 5 or marking point 6, either.

© 2024 AQA and its licensors. All rights reserved.

4.3.1.9 Discovery and development of drugs

Answer 27 · Examiner comments June 2024 | 8461/1H | Original Q8

08.4 47% of students scored no marks in this question, with 11% scoring full marks and 40% scoring one mark. A simple description of what normally happens during mitosis was not creditworthy, yet was seen regularly. Of the two marking points, marking point 1 was achieved more commonly than marking point 2. Where the mark for marking point 1 was not achieved, the most common errors included: a simple description of chromosomes not being pulled apart with no destination described; vague references to the edges/sides of the cell; or an implication that chromosomes were unable to move (unaided), rather than be moved. Attempts at marking point 2 were often too vague to be creditworthy, with a large number of answers just repeating that the cell couldn't divide, as was given in the question stem.

08.5 16% of students gained credit in this question and, as in question 08.4, a reference to what would be unable to happen in the situation described was required. Many students gave a simple statement linking cancer to uncontrolled cell division and those that went on to say that this could not happen often just paraphrased what had been written in the question, which was not creditworthy. Those that did score the mark mainly mentioned the prevention of the tumour growing, with a minority stating that secondary tumours would be stopped from forming. References to individual cancer cells rather than tumours were seen frequently and were not creditworthy. Some answers referred to preventing the formation of tumours rather than stopping the spread of tumours that were already there and thus did not answer the question.

08.6 83% of students answered this question correctly.

© 2024 AQA and its licensors. All rights reserved.

4.3.1.9 Discovery and development of drugs

Answer 27 · Examiner comments

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

© 2024 AQA and its licensors. All rights reserved.

4.3.1.9 Discovery and development of drugs

Answer 28 · Examiner comments

June 2025 | 8461/2H | Original Q9

Question 9 (Standard, Standard/high and High demand)

09.1

This question required students to provide two conclusions about the percentage of people with Type 2 diabetes, from data provided in the form of a bar chart. Two thirds of students scored 2 marks on this question.

Referring to 'diabetes' was sufficient for credit to be awarded, although 'it' was insufficiently clear without some qualification. Any student referring to Type 1 diabetes could not gain credit, but this was extremely rare.

Most students gained at least one mark, with nearly all describing the effect of age on the prevalence of Type 2 diabetes. This could be phrased in terms of an overall trend or a

Answer 28 · Examiner comments

description of one or other end of the age range. Some students referred to both ends of the age range as their two conclusions but could only be awarded one mark.

Descriptions of the effect of body weight on the prevalence of diabetes proved to be a little more problematic, with some suggesting that 'overweight people' have the highest percentage of diabetes; unfortunately, these students had not used the key sufficiently well, as 'overweight' was the middle category of body weight. Hence, students who described one or other end of the body weight scale were most successful, with answers such as 'diabetes is more common in obese people'.

Some students were confused by the information and wrote about the effect of age on body weight, 'people get more obese as they get older', which was not supported by the information and gained no credit. Other students attempted to describe both trends in one statement, often not clearly describing either trend.

09.2

Two thirds of students correctly identified the mean percentage of Hb-G after 12 weeks as being 7.65%

09.3

Around a third of students did not gain any marks in this extended response question. For credit, students were required to analyse information about two clinical studies on diabetes treatments. Students were expected to evaluate both the methods used and the effectiveness of the treatments in detail to be awarded a mark in Level 3 – achieved by just 20% of students.

The high demand of this question meant that a single statement for each of the usefulness of the drugs and the methods used was insufficient to access the lower mark in Level 1.

Many students did attempt to compare the usefulness of the drugs, with answers such as 'both drugs lower Hb-G levels', which even if seen in reference to the two drugs in statements well apart in the response, were still credited. Furthermore, a correct comparison of the relative impact of the two drugs in lowering Hb-G levels could gain credit for both drugs lowering Hb-G levels and for drug A having a greater effectiveness in this respect. However, many students referred only to the drugs 'changing Hb-G levels' or even for 'drug A changing Hb-G levels more than drug B' and could not gain credit for either of these statements.

In terms of comparing the methods used in the investigations, many students simply restated the methods or suggested alternative methods, such as 'investigation 1 should have used a placebo' which was not a clear comparison of the methods and gained no credit.

Some students were confused by the numbers of patients involved in Investigation 2, believing that only 1 patient had taken the drug, and 630 patients had been given the placebo.

Students should practise questions of this type in their studies and revision, as the command word 'evaluate' was not well understood in many cases. This requires students to make comparisons; in this case of the two investigations.

4.3.1.9 Discovery and development of drugs

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.