AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.3.1.9

Discovery and development of drugs

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**3**
Available paper years	**2019–2024**

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 June 2019 | 8464/B/1H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	**B**		1	AO2 4.2.2.2
01.2	right atrium		1	AO1 4.2.2.2
01.3	foxgloves		1	AO1 4.3.1.9
01.4		an answer of 54 (cm^3) scores 3 marks		AO2 4.2.2.2
	X = 2800 / 52		1	
	53.846153		1	
	54 (cm^3)	allow correct rounding of an incorrectly calculated value of stroke volume	1	

4.3.1.9 Discovery and development of drugs

Answer 01 · Mark scheme

June 2019 | 8464/B/1H | Original Q1

Question	Answers	Mark	AO / Spec. Ref.
01.5	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3 4.2.2.2 4.2.2.4 4.4.2.1 4.4.2.2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2 AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content effect of exercise • during exercise body needs to transfer (more) energy • energy transferred during respiration • rate of respiration increases during exercise • (so) more oxygen is needed effect of beta blockers • beta blockers reduce (the increase in) heart rate (during exercise) • beta blockers reduce stroke volume (or described) • beta blockers reduce cardiac output • (so) heart cannot supply oxygen fast enough / in sufficient quantity to muscle cells effect on breathing rate • breathing rate increases to increase rate / amount of oxygen absorbed • breathing rate increases to increase rate / amount of carbon dioxide removed from body • (but) increased breathing rate cannot fully compensate for changes in heart function A level 3 response should make links between all three sections of indicative content A level 2 response should attempt to link effect of exercise with oxygen / energy requirement **and** beta blockers to effect on heart function. .		
Total		**12**	

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Answer 01 · Mark scheme

June 2019 | 8464/B/1H | Original Q1



4.3.1.9 Discovery and development of drugs

Answer 02 · Mark scheme

November 2020 | 8464/B/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	3 years		1	AO2 4.3.1.9
06.2	any **one** from: • to reduce any risk	allow idea (if it is unsafe) less harm will be caused with a lower dose ignore that it may be unsafe / dangerous unqualified	1	AO1 4.3.1.9
	• to look for side effects	ignore unknown side effects unqualified		
06.3	too great a risk for ill person / patient	allow may make their condition worse allow less risk to healthy person ignore references to immune system	1	AO2 4.3.1.9
	patient might be taking another drug **or** side effects of drug are easier to identify	allow unhealthy person might be taking another drug ignore to see side effects unqualified	1	
06.4	any **one** from: • to prevent false claims • to make sure the results / conclusions are correct / valid • to avoid bias	ignore references to accuracy, reliability or precision	1	AO2 4.3.1.9

4.3.1.9 Discovery and development of drugs

Answer 02 · Mark scheme

November 2020 | 8464/B/1H | Original Q6

Question	Answers	Mark	AO / Spec.
06.5	**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
	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 **arguments for use:** • will save the NHS money • (approximately) 20 times as many people or 19 more people can be treated compared to Drug A • (approximately) 29 times as many people can be treated compared to Drug B (allow 28 times **or** 28 / 27 more people) • more people can be treated for the same cost • patients will be treated sooner • improves patient choice • used in other countries so likely to be effective • used in other countries so likely to be safe • likely to have been tested in other countries **arguments against use:** • injections of drug not tested (in UK) • cannot be sure it is as effective as Drug A / Drug B • cannot be sure if it is safe to use • may have unknown side effects • doctors cannot be confident in prescribing Drug C • goes against regulations / laws regulating drug development / use • might set a precedent for other drugs not to be fully tested • might set a precedent for other non- approved / unlicensed drugs to be used Need advantages and disadvantages for Level 2		

Total			11

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Answer 03 · Mark scheme

June 2024 | 8464/B/1H | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	virus(es)		1	AO1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	any **two** from: • isolation (of people with measles) • cover your nose / mouth when you cough / sneeze • frequent handwashing / sanitiser	allow wear face coverings allow frequent cleaning of surfaces ignore PPE unqualified ignore public health education programmes unqualified ignore social distancing unqualified	2	AO2 4.3.1.1 4.3.1.2

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Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	any **four** from: • (vaccine / injection) contains dead / inactive (measles) pathogen / virus • white blood cells produce antibodies • the antibodies produced are specific / correct (for the measles virus / pathogen) • reference to memory cells made • on secondary exposure antibodies are produced faster	 allow vaccine / injection contains weakened / attenuated pathogen / virus allow vaccine / injection contains (measles) antigens ignore vaccine contains dead measles allow leucocytes / lymphocytes produce antibodies do **not** accept phagocytes produce antibodies allow description of memory cells allow on secondary exposure larger quantities of antibodies are produced ignore herd immunity ignore antitoxins if no other marks awarded allow **1** mark for antibodies are produced	4	AO1 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	viruses enter cells (so) cells are damaged / killed	allow viruses exist / reproduce inside cells allow viruses inject genetic material into cells allow cells burst open	1 1	AO1 4.3.1.1

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Answer 03 · Mark scheme

June 2024 | 8464/B/1H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	to check the drugs are not toxic / poisonous	allow to check for side-effects allow to check the drugs are not harmful ignore dangerous	1	AO1 4.3.1.9
	to check efficacy **or** to see if the drugs work **or** check if the drugs treat the disease		1	
	to determine dosage **or** to find out how much is needed		1	
		allow to check interaction with other drugs		

Total Question 3	12

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Answer 01 · Examiner comments

June 2019 | 8464/B/1H | Original Q1

Question 1 (standard demand)

01.1 Around 64% of students correctly identified the blood vessel that carries deoxygenated blood away from the heart to the lungs. The most common incorrect response was vessel C, which carries oxygenated blood away from the heart to the body.

01.2 Around 37% of students knew that pacemaker cells are found in the right atrium. Almost as many students thought that these cells are found in the left ventricle.

01.3 Half of the students knew that digitalis originates from foxgloves. The most common incorrect response was willow.

Answer 01 · Examiner comments

June 2019 | 8464/B/1H | Original Q1

01.4 Around 72% of students gained full marks for calculating stroke volume and correctly rounding their answer to two significant figures. More students are showing their working for calculations which helps them achieve compensation marks should their final answer be incorrect.

The first marking point was for reorganisation of the equation. This could be written in words, but writing out the equation as a triangle was not creditworthy. 96% of students gained two or more marks. This was usually for the first two marking points. There were some errors seen in the rounding of the answer, either to 53 or to more than two significant figures.

01.5 Around 13% of students gave a detailed account and achieved Level 3 in this extended response question. They logically linked the effect of beta blockers to the supply of oxygen to respiring muscles, and the need to breathe faster or deeper. Some went on to explain that anaerobic respiration might occur, leading to a build-up of lactic acid and an oxygen debt.

Half of the students were limited to a Level 2 response because they did not explain why the breathing rate would need to increase.

Answer 03 · Examiner comments

June 2024 | 8464/B/1H | Original Q3

Question 3 (standard & standard/high demand)

03.1 62% got this question correct. Common incorrect answers were bacteria, mosquitos and pathogen.

03.2 Many students mixed up measles with malaria, with answers such as 'use a bed net' or 'drain swamps' seen frequently. A common mistake was missing out the idea of cells and being more generic with the use of the word 'body', which was not creditworthy. References to poor hygiene and handwashing alone were insufficient to gain credit but were seen very often. Students very often gave the same marking point twice, such as 'cover your face when sneezing' and 'wear a face mask', which only gained 1 mark.

The most common correct answer was 'isolation'; students who gained 2 marks often gave 'wearing a mask' as their second answer. Some students referred to sneezing into elbows which was synonymous with covering your mouth when sneezing.

03.3 Often students missed the first marking point by stating that the vaccine contains dead measles, which was insufficient at this level. Students also missed out on the final marking point by saying that the white blood cells respond rapidly but did not say that it was quick*er* at producing antibodies. The most awarded marks were for 'white blood cells make antibodies' and correct references to memory cells.

There was a lot of confusion with antibodies surrounding and engulfing pathogens which was seen several times. Many students confused the words antigen and antibody when talking about the specificity.

03.4 Most students were able to articulate that viruses entered cells and damaged them for 2 marks. Several students incorrectly stated that viruses released toxins, which damaged cells and in this case only 1 mark was awarded for the damage to cells. Many stated that viruses specifically infect white blood cells, which is incorrect.

03.5 For this question, many students gave answers that matched the same marking point ('check to see if it's harmful' and 'to see if there are side effects' are equivalent to 'check the drugs are not toxic'), which would only be credited with 1 mark. We are seeing an increase in students writing simple one-word answers (such as 'side-effects' or 'toxicity') that don't answer the question. Answering the question 'Why are clinical trials needed?' simply with 'side effects' doesn't tell the examiner if the student understands that the drug must be tested to see if it will give side effects or prevent them. It's not clear enough to answer the question and therefore not creditworthy.

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4.3.1.9 Discovery and development of drugs

Answer 03 · Examiner comments

June 2024 | 8464/B/1H | Original Q3

0 3 . 5 Drugs can help to reduce the symptoms of the norovirus infection.

New drugs must go through clinical trials before being licensed for use.

Give **three** reasons why clinical trials are needed.

[3 marks]

1 To understand the side effects.

2 So you know the correct volume or concentration of the medicine to take.

3 to ensure it is safe for people with the infection.

This student gained 2 marks because responses 1 and 3 were repeats of the same marking point. The description of correct dosage is enough to be awarded a second mark.