AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.3.1.2

Viral diseases

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**4**
Available paper years	**2018–2024**

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.

4.3.1.2 Viral diseases

Answer 01 · Mark scheme

June 2018 | 8464/B/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any **one** from: • not everyone would go to the doctor • sample will not always be sent for analysis • some cases not tested / diagnosed / confirmed	allow not all cases recorded allow only medically confirmed cases recorded ignore some cases are unknown allow idea that doctor may make a judgemental error or mis-diagnosis	1	AO2 4.3.1.2
05.2	$\frac{1939}{2030} \times 100$ 96 / 95.5	an answer of 96 / 95.5 scores **2** marks allow **1** mark only for 95 or other incorrect rounding allow for **1** mark: $\left(\frac{91}{2030} \times 100 =\right) 4.5\%$ allow **2** marks for correct rounding of 95.51724138 allow **1** mark for correct calculation using incorrect subtraction **only** if working shown	1 1	AO2 4.3.1.2
05.3	most people are **immune** so do **not become ill** (from infection) less chance of **non-immune** / **unvaccinated** individuals being exposed to pathogen / measles / virus	allow herd / community immunity so do not become ill (from infection) allow most people are immune so do not become infected ignore most people are immune so don't get / catch it reference to an organism is needed allow 'it' for the measles virus allow fewer people to pass it on to non-immune people	1 1	AO1 4.3.1.1 4.3.1.7

4.3.1.2 Viral diseases

Answer 01 · Mark scheme

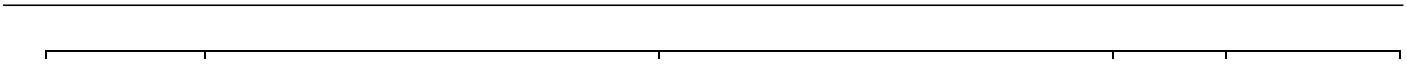
June 2018 | 8464/B/1H | Original Q5

Question	Answers	Mark	AO / Spec. Ref.
05.4	**Level 3:** Relevant points (comparisons / reasons) are identified, given in detail and logically linked to form a clear account.	5–6	AO1
	Level 2: Relevant points (comparisons / reasons) are identified and there are attempts at logical linking. The resulting account is not fully clear.	3–4	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	AO2
	No relevant content	0	
	Indicative content **differences (after exposure to measles virus):** • greater number / higher concentration of antibodies produced • quantitative statement, eg 9 times higher **or** 0.8 to 7.2 • antibodies produced sooner – idea of immediate response • antibodies produced quicker • antibodies stay (in higher concentration) for longer **explanation** • white blood cells / leucocytes / lymphocytes / B cells ignore phagocytes / macrophages • reference to previous exposure (of white blood cells) to pathogen / virus • (white blood cells) recognise pathogen / virus / antigen • memory cells • production of specific / correct antibodies		4.2.2.3 4.3.1.2 4.3.1.6 4.3.1.7
Total			**11**

4.3.1.2 Viral diseases

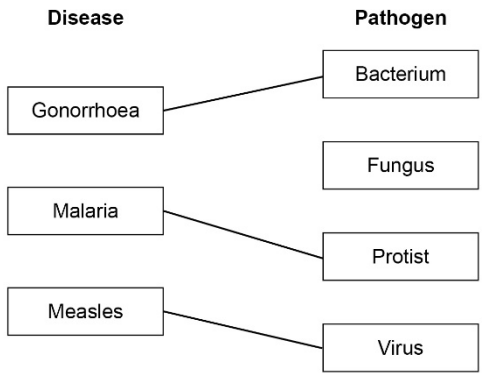
Answer 01 · Mark scheme

June 2018 | 8464/B/1H | Original Q5



4.3.1.2 Viral diseases

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	 do **not** accept more than one line from a box on the left		1 1 1	AO1 4.3.1.1 4.3.1.2 4.3.1.3 4.3.1.5
04.2	reduces breeding / reproduction (in mosquitos) (so) fewer mosquitos to bite people **or** (so) fewer mosquitos to pass on pathogen / protist	allow fewer (mosquito) eggs fertilised allow no offspring produced (by sterile mosquitos) allow (so) less likely to be bitten by mosquitos ignore fewer mosquitos to pass on malaria / disease	1 1	AO2 4.3.1.1 4.3.1.5
04.3	electron microscope	ignore microscope unqualified ignore scanning / transmission do **not** accept light microscope	1	AO2 4.1.1.5 4.3.1.2

4.3.1.2 Viral diseases

Answer 02 · Mark scheme

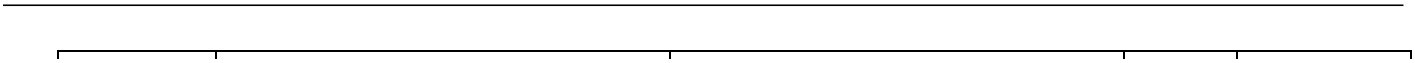
04.4	(fungal spore) (16 μm =) 1.6×10^{-5} m **or** (virus) (2.5×10^{-7} m =) 0.25 μm		1	AO2 4.1.1.1 4.1.1.5 4.3.1.2 4.3.1.4
	$\frac{1.6 \times 10^{-5}}{2.5 \times 10^{-7}}$ **or** $\frac{16}{0.25}$	allow $\frac{0.000\,016}{0.000\,000\,25}$ allow incorrect attempt at conversion or not converted value for length correctly substituted	1	
	(=) 64	allow a correctly calculated value using an incorrectly or not converted value for length allow **1** mark **only** for $\frac{16}{2.5} = 6.4$	1	

04.5		the idea of less is only needed once		
	discolouration in leaves **or** less chlorophyll in leaves	ignore mosaic pattern of leaves unqualified	1	AO1
	(so) reduced photosynthesis	allow less light absorbed	1	AO1
	(so) less glucose produced so less amino acids / proteins / cellulose made	allow (so) less glucose so less energy for synthesis of chemicals **or** allow (so) less glucose for respiration (so) less energy transferred for growth	1	AO2 4.3.1.2 4.4.1.1 4.4.1.2 4.4.1.3 4.4.2.1
Total			**12**	

4.3.1.2 Viral diseases

Answer 02 · Mark scheme

November 2021 | 8464/B/1H | Original Q4



4.3.1.2 Viral diseases

Answer 03 · Mark scheme

June 2023 | 8464/B/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	cancer		1	AO1 4.2.2.7 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	any **one** from: • (coronary) heart disease / CHD / cardiovascular disease • diabetes	ignore cancer allow atherosclerosis ignore heart attack allow high blood pressure allow stroke / asthma / depression / gallstones / (osteo)arthritis allow sleep apnoea	1	AO1 4.2.2.4 4.2.2.5 4.2.2.6

4.3.1.2 Viral diseases

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	any **one** from: • taxes on high energy / fat / sugar foods • education (about diet and health) • (government) advertising • restrict media advertising of high energy / fat / sugar foods • information on food labels • help / advice / groups for obese people via the NHS • calorie information on restaurant / takeaway menus • regulation of supermarket offers on high sugar / fat / energy foods • regulation of type of foods for sale near checkouts • exercise campaigns	allow increase the price on high energy / fat / sugar foods	1	AO3 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	BMI = $\frac{69}{1.64^2}$	allow BMI = $\frac{69}{1.64 \times 1.64}$ allow BMI = $\frac{69}{2.6896}$	1	AO2
	BMI = 25.6(5437….)	allow 26 or 25.7	1	AO2
	(the person's BMI category is:) overweight	must be consistent with their calculated BMI value	1	AO3 4.2.2.5 4.2.2.6

4.3.1.2 Viral diseases

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	any **one** from: • women will gain mass / weight (during pregnancy) • (developing) baby will increase mass / weight of woman	allow BMI (of woman) will increase (during pregnancy)	1	AO3 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	any **two** from: • smokers had babies with lower birth mass • women / smokers / non-smokers with higher BMI had heavier babies • smoking had the greatest effect on birth mass in underweight women • smoking had the least effect on birth mass in overweight women • smoking had less effect on birth mass in overweight and obese women (than in underweight and healthy weight women)	statements must be comparative allow converse statements allow weight for mass allow obese women have the heaviest / heavier babies allow underweight women have the lightest / lighter babies allow there is only a 365 g difference between the smallest and largest babies	2	AO3 4.2.2.5 4.2.2.6

4.3.1.2 Viral diseases

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	coughs / sneezes (spread virus in droplets)	assume 'it' refers to the virus allow breathing out (spreads virus in droplets)	1	AO1 4.3.1.1 4.3.1.2
	droplets / virus are inhaled	allow droplets / virus are breathed in ignore contact with infected person unqualified allow touch a contaminated surface **and** then touch your mouth / nose / eyes for **1** mark if no other marks awarded allow kissing for **1** mark only	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	$\frac{17}{100}$ × 67 961 900	allow 0.17 x 67 961 900	1	AO2 4.3.1.4
	= 11 553 523	allow 11 553 500	1	

4.3.1.2 Viral diseases

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.9	any **one** from: • dry feet thoroughly (after washing) • do not share socks / tights / shoes / towels • use a fungicide • do not walk around barefoot in public / contaminated areas	allow use foot powder ignore keep feet dry ignore wash feet regularly allow named fungicide allow wear silver(-impregnated) socks allow wear flip flops in public / contaminated areas ignore avoid moist conditions	1	AO2 4.3.1.1 4.3.1.4

Total Question 1	14

4.3.1.2 Viral diseases

Answer 04 · 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

4.3.1.2 Viral diseases

Answer 04 · 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

4.3.1.2 Viral diseases

Answer 04 · Mark scheme

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

4.3.1.2 Viral diseases

Answer 01 · Examiner comments

June 2018 | 8464/B/1H | Original Q5

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

05.1 76% of students achieved this mark. Common correct responses included not all cases of measles being recorded or diagnosed, or people not going to see the doctor. There were some confused ideas that deaths would not be recorded.

05.2 34% of students were awarded both marks. The most common error was in rounding the final answer, for example an answer of 95 gained one mark only.

Quite a lot of students used the alternative method given on the right hand side of the mark scheme. Many gave an answer of 4.5% for one mark. Only a few continued and subtracted this value from 100 to give the correct final answer.

05.3 This was a demanding question targeting the highest-attaining students. 8% of students achieved at least one mark. The question asked for an explanation of why vaccinating a large proportion of a population reduced the spread of the measles virus.

The first marking point required a reference to most people being immune and linking this to the fact that they would not become ill. Students usually missed this mark because they said they would not catch the virus, which is incorrect. Many were familiar with the term ‘herd immunity’, but few could clearly explain it.

The second marking point was for the idea that there would then be fewer people with the disease to pass the virus on to unvaccinated people. This mark did need a reference to the chance of an organism being passed on, disease was insufficient.

Many responses included correct biological facts, but they were not relevant to the question being asked. For example, many students gave a description of what a vaccine is, or described the immune response in general terms.

4.3.1.2 Viral diseases

Answer 01 · Examiner comments June 2018 | 8464/B/1H | Original Q5

05.4 This was a 'level marked', 'extended response' question. The command word was 'Explain', so the main discriminator between the three different levels was the quality of linking ideas. Students were asked to explain the differences between antibody production after the injection of a vaccine and after exposure to the measles virus. Therefore comparisons between the two exposures and clear explanations in terms of the immune response were needed for level 3.

Students who only gave simple statements or a description of the graph, without comparisons or explanations, could only attain level 1. 53% of students gave a level 1 response.

Some students only gave comparisons. These could achieve three marks, if sufficient comparisons were made. The most common comparisons given were that more antibodies were produced at a faster rate after exposure. On their own these comparisons achieved two marks. If a correct quantitative statement was also given this was sufficient for three marks.

To achieve four marks explanations for the differences were required. 34% of students achieved three or more marks. Very few students gave a level 3 response, but this was targeted at grades 8–9.

Many responses showed a misunderstanding of antibodies, antigens, antitoxins and phagocytosis. Incorrect graph readings were often seen.

Answer 02 · Examiner comments November 2021 | 8464/B/1H | Original Q4

Question 4 (standard, standard/high and high demand)

This question was about diseases in humans and plants caused by pathogens. More than half of the students scored full marks for linking human diseases to the type of pathogen that each was caused by. Almost half scored 1 mark for saying that releasing sterile mosquitos into the environment would decrease reproduction in mosquitos. Few went on to explain how this would reduce the spread of malaria. As is often the case in questions about communicable diseases, students did not make it clear that reducing the spread of a disease is due to reducing the transfer of pathogens.

A third of students said an electron microscope would be used to view the virus; most just said microscope, which was insufficient. About a third of students knew what type of calculation was required to work out how many times longer the spore was compared to the virus. Few students realised that both measurements had to be converted to the same unit, and errors were seen when unit conversions were attempted. No student gave a full explanation why plants infected with TMV grow slowly. Some said there would be less photosynthesis or that the leaves would have less chlorophyll.

4.3.1.2 Viral diseases

Answer 03 · Examiner comments

Question 1

Question 1 was common to both tiers and was set at standard demand.

01.1 Almost all students on the Higher tier identified cancer as a non-communicable disease.

01.2 Almost all students named a non-communicable disease that obesity is a risk factor for. Diabetes or coronary heart disease, which are both listed in the specification, were the most common responses. References to heart attack or heart conditions were ignored as a named disease was required.

01.3 Fewer than half the students suggested a national policy that could help people to lose weight. The most common suggestions related to increasing taxes on unhealthy foods. This was usually phrased as increase the cost of unhealthy foods. A few suggested decreasing the cost of healthy foods.
Quite a lot of students suggested providing free gym memberships, or more public sports facilities. Some referred to mandatory PE lessons in school. References to labelling the energy content of foods and meals on packaging and menus were also made.
A common mistake was to give lifestyle changes that an individual could make, rather than a policy that a national organisation or the Government could make. Exercise regularly and eat a balanced diet were often stated, but these did not gain credit. Saying increase the recommended amount of daily exercise a person should do would gain credit, as this suggests a national policy.

01.4 In this BMI calculation 1 mark was for the correct substitution into the equation. The second mark was for a correct calculation, which was usually given as 25.65. Most students did show their working, which was good to see. The final mark was for selecting the correct BMI category that matched their final answer. Therefore, if a student did an incorrect calculation, they could still score the third mark. This was sometimes seen if they didn't square 1.64, and gave an answer of 42.07 with the BMI category obese. On the Higher tier the vast majority of students scored full marks.

01.5 Three fifths of students scored the mark for saying that women gain weight when pregnant, or that their mass will increase due to the baby. A clear reference to the weight, mass or BMI of the woman increasing was needed, so saying the woman's weight would change was insufficient. Incorrect responses included saying the BMI category was calculated before the woman became pregnant to check on her health or the baby's health, to see the change in the woman's BMI during pregnancy or for comparison. Some described the harmful effects of smoking on a developing baby, which did not answer the question.

01.6 Two conclusions were needed, so smoking or BMI of the mother had to be linked to the birth mass, or weight, of the babies. Comparative statements were needed. Almost half the students scored both marks, and two fifths scored 1 mark. The most common correct response was that non-smokers had heavier babies. Some students repeated this conclusion, and also stated the converse, saying smokers had lower birth mass babies. These two statements could only score 1 mark. A reference to a healthier weight was often seen, which was insufficient. The main misunderstanding was that smoking affected the woman's mass, and not the birth mass of the baby.

01.7 The first marking point was for how the measles virus is transferred out of an infected person. Two thirds of students scored this mark for saying by coughing or sneezing. The second mark was for how the virus is taken in by a second person. Fewer than a fifth of students scored both marks. Many thought the virus was transferred by direct contact. Some said the virus is airborne, but did not describe how it left one person and entered another.

4.3.1.2 Viral diseases

Answer 03 · Examiner comments

June 2023 | 8464/B/1H | Original Q1

01.8 The majority of students scored full marks for the percentage calculation to estimate the number of people with athlete's foot. Some students incorrectly converted 17% to 0.017, rather than to 0.17 Other students calculated 10%, 1% and then 7% of 67 961 900, then added the values for 10% and 7% together to find 17%.

01.9 Fewer than a fifth of students scored a mark for suggesting one way a person could reduce their chance of catching athlete's foot. References to changing socks or washing feet regularly were ignored. Saying keep your feet dry was too vague, a reference to drying feet thoroughly, properly or between the toes after washing was required, which was rarely seen. Use talcum powder was seen occasionally, which was allowed. The idea of covering the feet when walking around at a public swimming pool was suggested by some students, but saying don't walk around barefoot, without qualification, was ignored.

Answer 04 · 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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4.3.1.2 Viral diseases

Answer 04 · 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.