AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.3

Bacterial diseases

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**2**
Available paper years	**2018–2023**

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.

4.3.1.3 Bacterial diseases

Answer 01 · Mark scheme June 2018 | 8461/1H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	toxins / poisons (secreted by / from / in bacteria)		1	AO1 4.3.1.3
01.2	any **two** from: • wash hands after using toilet / being sick **or** wash hands before preparing / handling food **or** do not prepare food (whilst infected) • isolate yourself • disinfect clothes / surfaces • do not share utensils / cutlery / towels	ignore 'wash hands' unqualified ignore reference to coughing / sneezing allow examples of how isolation could be achieved	2	AO2 4.3.1.1
01.3	antibiotics	allow named examples of antibiotics	1	AO1 4.3.1.8
01.4	immune system is damaged / weakened **or** immune system doesn't function properly white blood cells cannot kill bacteria / *Salmonella* (as effectively)	allow immunocompromised allow lack of / no white blood cells allow no / fewer antibodies so bacteria not killed **or** less phagocytosis so bacteria not killed **or** no / fewer antitoxins to counter toxins	1 1	AO2 4.3.1.2

4.3.1.3 Bacterial diseases

Answer 01 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	any **one** from: • (give chickens) antibiotics • don't sell infected chickens / eggs • keep infected chickens isolated / indoors • slaughter the infected chickens	allow (give chickens) monoclonal antibodies allow don't sell the chickens / eggs ignore don't sell chickens / eggs allow keep the chickens indoors ignore keep chickens indoors ignore vaccination / chlorination / disinfection	1	AO1 4.3.1.3
01.6	(cleaning liquid) B **and** greater reduction in number of bacteria (after cleaning) in both locations	ignore few bacteria in both locations allow neither / both **and** idea of experimental error	1	AO3 4.1.1.6 4.3.1
01.7	radius (of area with no bacteria growing)	allow diameter (of the area with no bacteria growing) ignore πr^2 unqualified allow idea of placing agar plate onto graph paper and counting the squares not covered with bacteria	1	AO2 4.1.1.6

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Answer 01 · Mark scheme

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	repeat **and** look to see if results are similar	ignore repeat unqualified allow repeat **and** look to see if results are different allow repeat and see if there are anomalies ignore repeat and identify anomalies ignore repeat and compare unqualified	1	AO3 4.1.1.6
01.9	any **one** from: • toxicity / side / health effects • effect on other types of bacteria / pathogens • interaction with other cleaners • ease of use • dilution factor of each cleaner (vs. cost) • time cleaner is effective for	 ignore harmful / dangerous allow reference to allergies allow not tested on other types of bacteria ignore germs ignore concentration unqualified ignore how long the cleaner lasts for allow reference to odour of cleaning liquid ignore reference to cost unqualified ignore environmental effects / flammability	1	AO3 4.1.1.6
Total			**11**	

4.3.1.3 Bacterial diseases

Answer 01 · Mark scheme

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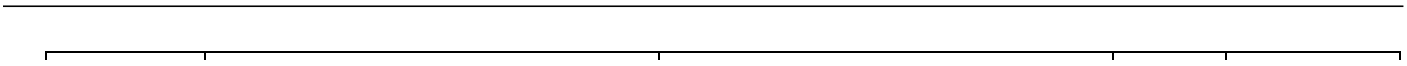

4.3.1.3 Bacterial diseases

Answer 02 · Mark scheme

June 2023 | 8461/1H | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.1	(bacteria) release / produce toxins	allow (bacteria) release / produce poisons ignore toxins unqualified	1	AO1 4.3.1.3 4.3.1.1

Question	Answers	Mark	AO / Spec Ref.
03.2	**Level 2**: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	3-4	AO2
	Level 1: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	1-2	AO1 4.3.1.3 4.3.1.7
	No relevant content	0	
	Indicative content: *Vaccination of animal* • (animal's) white blood cells / lymphocytes produce antibodies (against *Salmonella* / vaccine / antigens) • antibodies are specific / complementary / correct to *Salmonella* / antigens • (specific) antibodies bind to *Salmonella* / antigens *Secondary response in animal* • if infected (specific) antibodies are produced quickly **or** in large numbers • (so) white blood cells **or** antibodies would kill (live) *Salmonella* • (so) fewer / no bacteria / pathogens / *Salmonella* in animals **or** in animal products (meat / milk / eggs) *Prevention of food poisoning in humans* • (so) fewer / no bacteria / pathogens / *Salmonella* eaten **or** in (named) food • (so) number of bacteria never reaches a high enough level for infection to develop • (so) fewer toxins produced (in humans). For **Level 2** students must link immune response in animals to prevention of an outbreak in humans.		

4.3.1.3 Bacterial diseases

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	any **two** from: • disinfect hands / work surface • sterilise Petri dish **or** culture medium (before use) • pass inoculating loop / forceps through a flame (before use) • work near a flame **or** work in a fume cupboard • tilt lid (of Petri dish) when placing discs on agar (to minimise contact with air / breath) • secure lid of Petri dish with adhesive tape	allow alternative descriptions of sterilising equipment such as UV light ignore clean / wash surfaces / hands / equipment allow sterilise agar (before use) ignore sterilise equipment allow example of other method to minimise contact with air / breath ignore store dish upside-down	2	AO1 4.1.1.6 RPA2

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.4	(37 °C) 37 °C is human / body temperature *Salmonella* / bacteria grows best / better at 37 °C (25 °C) 25 °C reduces / prevents the growth of bacteria that are harmful to humans / students	 allow (so) bacteria grow best / better at human body temperature allow because it is too low for growth of human pathogens	 1 1 1	AO2 4.1.1.6 4.3.1.3 RPA2

4.3.1.3 Bacterial diseases

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.5	(acts as a) control	allow for comparison allow to show that the results are not due to the paper disc allow to show that the results are due to the antibiotic ignore to show the effect / effectiveness of the antibiotic do **not** accept as a control variable	1	AO2 4.1.1.6 RPA2

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.6	(they) killed the most bacteria	allow prevented most bacteria growing / replicating allow largest zone of inhibition (of bacteria) ignore largest clear area unqualified ignore antibiotic **B** killed the most bacteria	1	AO2 4.1.1.6 RPA2

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.7	measure the diameter / radius of each clear area **or** calculate / measure the area of each clear area	allow measure the diameter / radius of each region where the bacteria are killed allow calculate the area of each region where the bacteria are killed	1	AO3 4.1.1.6 RPA2

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Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.8	bacteria must be resistant (to antibiotic **B**)	do **not** accept bacteria must be immune	1	AO3 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.9	water enters the (bacterial) cell		1	AO2 4.3.1.8 4.1.3.2 4.1.1.1
	(water enters) by osmosis	allow (water enters) by diffusion through a partially / selectively / semi permeable membrane do **not** accept if description of concentrations is incorrect	1	
	(so) damaged / incomplete / no cell wall cannot withstand pressure (of water)	allow (so remaining) cell membrane cannot stretch further	1	

Total Question 3	17

4.3.1.3 Bacterial diseases

Answer 01 · Examiner comments

June 2018 | 8461/1H | Original Q1

Question 1 (standard demand)

01.1 A correct answer had to refer to toxins or poisons, which are the cause of symptoms of a *Salmonella* infection. Though it was not required, if a source was given for the toxins or poisons, it had to be correct. Thus, an answer which referred to 'toxins from the virus' was not awarded the mark.

Other students who did not achieve this mark often referred vaguely to *Salmonella* interacting with the stomach or intestine.

01.2 The most common response from students which received no credit was simply 'washing hands'. A little more than this was required for a mark to be awarded ie **when** hands should be washed to help prevent the spread of the bacteria to other people eg after using the toilet.

Another common misconception was that the *Salmonella* bacteria are spread by droplet infection and hence an answer suggesting covering your nose or mouth when coughing and sneezing was not creditworthy.

Many students achieved credit for the suggestion of isolation as a method of preventing the spread of the pathogen between people. Many of these students suggested how this isolation could be achieved eg keeping away from other people.

01.3 The correct answer, 'antibiotics' was very well known with 94% of students achieving this mark.

01.4 The first mark required the idea that the immune system is not functioning correctly in a person with AIDS. This could be expressed in a variety of ways, such as the immune system being weakened.

The second mark was awarded for a reason the person with AIDS does not recover as quickly which could, for example, be achieved by explaining that white blood cells can't kill the bacteria.

More students gained the first marking point than the second one eg they knew that AIDS weakens the immune system but then did not go on to explain fully why this meant recovery from the *Salmonella* infection would take longer. A common misconception was the idea that the immune system would be too busy with AIDS, so unable to deal with the *Salmonella* infection.

4.3.1.3 Bacterial diseases

Answer 01 · Examiner comments

01.5 The question required students to suggest what the farmer could do to prevent the spread of the transmission of *Salmonella* bacteria from chickens to humans. It was not what a person could do to avoid contracting the bacteria.

Despite vaccination already having been described in the question stem as one method, many students gave this as their response. This highlights the importance to students of reading every question stem very carefully.

Answers that simply referred to 'chickens' being (for example) isolated were not given credit, as it was not clear if students were referring to the infected chickens or to the healthy ones. Suggestions of improved hygiene or disinfecting were ignored. 46% of students correctly suggested killing or isolating the infected chickens.

01.6 Students needed to study the figure carefully and give a full answer if they were to achieve this mark. It was insufficient for them to refer loosely to liquid B 'killing more bacteria', or simply to the numbers of bacteria present after use of the liquids, as there are situations where this is not true. Further qualification was necessary, with a reference to both surfaces.

01.7 Many students made good and correct use of the term 'zone of inhibition'. This question was answered well with 57% of students correctly quoting either 'radius' or 'diameter'.

A number of students misinterpreted the question and gave answers explaining how to calculate the area rather than what measurement had to be made. Some students gave the formula πr^2 and did not explain that r was the radius of the area with no bacteria growing.

01.8 Many students did not show an understanding of the term 'repeatable' as stated in the AQA science subject vocabulary. They answered by suggesting that another scientist should carry out the investigation or that different bacteria or a different temperature should be used.

Some students just said 'repeat' or 'repeat and compare', neither of which were sufficient as the question also needed a reference to the idea of seeing **if** the results were similar.

01.9 Most students who achieved this mark did so by referring to possible toxicity of the cleaning liquid. Answers such as 'checking if it is harmful' were insufficient.

Students who had followed the theme of the question through also often referred to the effect on other types of microorganism. Students who did not achieve the mark often gave the factor that had already been investigated, the extent to which the liquid kills the (Salmonella) bacteria or referred to 'cost', despite having been told that the liquids cost the same per dm^3.

4.3.1.3 Bacterial diseases

Answer 02 · Examiner comments

Question 3 (Standard, standard/high and high demand)

03.1 A little over half of students correctly stated how *Salmonella* bacteria cause the symptoms of vomiting and diarrhoea. While the word 'toxin' was commonly used, many students failed to gain credit as they didn't refer to toxins being released or produced which was essential for the mark, but there was some confusion between the terms excrete and secrete.

03.2 This levelled response question required students to make links between the immune response in an animal (following vaccination), and the prevention of a food poisoning outbreak in humans. The high demand required to enter level 2 resulted in less than 6% of students making the leap, with just under 62% of students failing to even enter level 1, thus gaining no credit.
For many students lack of adequate technical language was a barrier to gaining credit with vague statements eg the body or immune system makes antibodies or the body can react faster when the bacteria re-infects. Common errors included poor understanding of what memory cell specifically are – suggesting they act as antibodies, or that antibodies make white blood cells. There appeared to be less confusion about the difference between antibodies, antitoxins and antigens than in previous years. The 2% minority of students who were able to answer both parts of the question skilfully gained full marks in level 2.

03.3 It was encouraging to read that most students had experience of the practical, allowing over 70% of students to gain 1 or more marks. Although many students gave precise answers, 'sterilise equipment' or 'flame equipment' was deemed too vague at this level.

03.4 This question proved a challenge for the majority of students, with only 1% gaining the full 3 available marks, and just under 43% gaining no marks at all. Very few students identified 37°C as being human body temperature, perhaps thinking this was unnecessary or assumed. Some responses identified the potential growth of harmful bacteria but did not specify that it may be harmful to humans in relation to the 25°C being used in school laboratories.

03.5 Generally well answered with around 66% of students gaining the mark. The incorrect term 'control variable' was not infrequent.

03.6 75% of students gave a correct answer here. Where students failed to gain this mark, it was often due to a lack of precision in their response, with a lack of a comparative term or weak description of the area where bacteria had been killed. Some students were unsuccessful as they referred to just one of the antibiotics, and the question clearly asks why should either A or B be prescribed so both had to be included in the response.

4.3.1.3 Bacterial diseases

Answer 02 · Examiner comments

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03.7 Generally well answered with most students being able to make an attempt at the answer, and around 56% of students gaining credit. Where students failed to gain this mark, it was often due to a lack of precision, for example simply referring to the circle rather than the clear area or the area where bacteria had been killed.

03.8. It was pleasing to see over 66% of students giving correct responses as they were clear on the idea of developing resistance. Numerous students muddled resistance and immunity and some commented that animals become immune to antibodies and as such could not be credited. Sadly, some students correctly described the development of resistance but went on to negate the mark with comments such as 'now the bacteria are immune to the antibiotic'.

03.9 This high demand question was not accessible to most students, and indeed over three quarters of students failed to gain any marks. Many students simply rewrote information from the stem of the question without saying that this was due to pressure from water and linking it to the impact this had on either the cell wall or cell membrane. A sizeable minority thought that the antibiotic entered the bacteria by osmosis causing it to burst. As anticipated some students negated correct detail on water movement, by giving incorrect definitions of osmosis, and in particular incorrect references to water potential or diffusion gradients. If water concentration is not specified, it is assumed that solute concentration is being described and this often results in an incorrect answer (for example, 'water moves from an area of high concentration to an area of low concentration' is not correct). We continue to also see confusion regarding the role of the cell wall and cell membrane in a cell, as well as lack of understanding around the role antibiotics play in bacterial infections.