AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.7

Vaccination

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**31**
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.

4.3.1.7 Vaccination

Answer 01 · Mark scheme March 2007 | BLY1A | Original Q3 | Legacy

Three	**A**	flash of light	**4**
	B	palm of hand touched	**3**
	C	cheek stroked	**2**
	D	mouth touched by mother's finger	**1**

Answer 02 · Mark scheme June 2007 | BLY1A | Original Q3 | Legacy

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

Answer 03 · Mark scheme June 2007 | BLY1H | Original Q4 | Legacy

The full source mark scheme begins on page 34. Follow original question 4 in that document.

Answer 04 · Mark scheme November 2007 | BLY1A | Original Q6 | Legacy

Six	**3**	**3**	**1**	**1**

Answer 05 · Mark scheme November 2007 | BLY1A | Original Q7 | Legacy

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

4.3.1.7 Vaccination

Answer 06 · Mark scheme

Question 5

	answers	extra information	mark
(a)	any **three** from: • vaccine is inactive / dead form of (pathogen) • stimulates antibody production • stimulates antitoxin production • by white cells • antibodies kill (pathogen) • antitoxins neutralise poisons • antibodies quickly produced on reinfection • reference to ingestion by white cells	allow antigens ignore antibodies remain in blood	3
(b)(i)	(no) any **two** from • sample size small / only 12 • conclusion based on hearsay from parents • only 8 parents linked autism to MMR • no control used		2
(b)(ii)	(yes) being paid by parents / lawyers		1
total			6

4.3.1.7 Vaccination

Answer 06 · Mark scheme January 2008 | BLY1H | Original Q5 | Legacy

BLY1H

Answer 07 · Mark scheme March 2008 | BLY1AP | Original Q6 | Legacy

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

Answer 08 · Mark scheme June 2008 | BLY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	antibiotics	**2**
	B	painkillers	**4**
	C	antibodies	**3**
	D	vaccines	**1**

Answer 09 · Mark scheme June 2008 | BLY1AP | Original Q8 | Legacy

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

Answer 10 · Mark scheme November 2008 | BLY1AP | Original Q5 | Legacy

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

4.3.1.7 Vaccination

Answer 11 · Mark scheme

January 2009 | BLY1H | Original Q2 | Legacy

question	answers	extra information	mark
2(a)	antibodies	allow antitoxins / memory cells do **not** allow antigens	1
	immune	ignore protection allow resistant	1
2(b)(i)	fell		1
	numerical qualification to zero / nothing / by 100%	allow stopped in 1995	1
2(b)(ii)	(no) % vaccination fell **or** when no vaccination	ignore circle	1
	but autism numbers did not fall / stayed high / increased **or** '(yes) might support it if time lag between vaccination and autism symptoms' / 'time lag for diagnosis' (1) 6 year time lag quantified (1)		1
Total			**6**

4.3.1.7 Vaccination

Answer 11 · Mark scheme January 2009 | BLY1H | Original Q2 | Legacy

Biology BLY1H - AQA GCSE Mark Scheme 2009 January Series

COMPONENT NUMBER: BLY1H

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: January 2009

Answer 12 · Mark scheme March 2009 | BLY1AP | Original Q7 | Legacy

Seven	4	4	2	3

Answer 13 · Mark scheme March 2009 | BLY1AP | Original Q8 | Legacy

Eight	3	3	1	2

Answer 14 · Mark scheme June 2009 | BLY1AP | Original Q4 | Legacy

Four	2	1	2	1

Answer 15 · Mark scheme November 2009 | BLY1AP | Original Q2 | Legacy

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

Answer 16 · Mark scheme March 2010 | BLY1AP | Original Q3 | Legacy

Three	3	4	4	1

Answer 17 · Mark scheme June 2010 | BLY1AP | Original Q3 | Legacy

Three	4	1	3	1

Answer 18 · Mark scheme June 2010 | BLY1AP | Original Q6 | Legacy

Six	3	4	3	3

Answer 19 · Mark scheme November 2010 | BLY1AP | Original Q4 | Legacy

Four	3	2	4	2

Answer 20 · Mark scheme March 2011 | BLY1AP | Original Q4 | Legacy

Four	4	2	1	4

4.3.1.7 Vaccination

Answer 21 · Mark scheme

June 2011 | BLY1AP | Original Q4 | Legacy

Four	**2**	**2**	**4**	**1**

Answer 22 · Mark scheme

November 2011 | BLY1AP | Original Q8 | Legacy

Eight	**2**	**3**	**3**	**1**

4.3.1.7 Vaccination

Answer 23 · Mark scheme

January 2012 | BL1HP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	both lead to reduction / fall (in measles cases)	can be implied	1
	measles vaccine caused a big drop **or** correct use of figures		1
	MMR wipes out measles **or** drops to (almost) zero **or** doesn't fall as much as measles vaccine **or** correct use of figures.		1
2(b)	mump(s)	either order	1
	rubella / german measles	allow phonetic spelling	1
2(c)	white blood cells	allow lymphocytes / leucocytes ignore memory cells	1
	(wbc) produce antibodies	ignore antitoxins / antigens / antibiotics / engulfing	1
	in future / if re-infected antibody production rapid / fast(er) / quick(er)	allow ecf from antitoxins / antigens / antibiotics ignore engulfing ignore reference to specificity	1
Total			**8**

4.3.1.7 Vaccination

Answer 23 · Mark scheme

January 2012 | BL1HP | Original Q2 | Legacy

COMPONENT NUMBER: BL1HP

4.3.1.7 Vaccination

Answer 24 · Mark scheme

June 2012 | BL1HP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5 (a)(i)	dead / inactive / weakened	allow antigen / protein ignore ref to other components ignore small amount	1
	pathogen / bacterium / virus / microorganism	ignore germs / disease	1
5 (a)(ii)		antigen / antibiotic instead of antibody = max 2	
	white blood cells produce / release antibodies	accept lymphocytes / leucocytes / memory cells produce antibodies do **not** accept phagocytes	1
	antibodies produced quickly		1
	(these) antibodies destroy the pathogen	allow kill do **not** accept antibodies engulf pathogens	1
5 (b)(i)	(live) bacteria still in body	ignore numbers	1
	would reproduce	ignore mutation / growth	1
5 (b)(ii)	antibiotics / treatment ineffective **or** resistant pathogens survive	accept resistant out compete non-resistant	1
	these reproduce		1
	population of resistant pathogens increases	allow (resistant pathogens reproduce) rapidly	1
Total			**10**

4.3.1.7 Vaccination

Answer 24 · Mark scheme

June 2012 | BL1HP | Original Q5 | Legacy

BL1HP

4.3.1.7 Vaccination

Answer 25 · Mark scheme

January 2013 | BL1HP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	any **one** from: • (produce) toxins / poisons • (cause) damage to cells	 kill / destroy cells allow kills white blood cells	1
6(a)(ii)	produce antitoxins engulf / ingest / digest pathogens / viruses / bacteria / microorganisms	 accept phagocytosis or description ignore eat / consume / absorb for engulf ignore references to memory cells	1 1
6(b)(i)	dead / inactive / weakened (measles) pathogen / virus	accept idea of antigen / protein ignore bacteria	1 1
6(b)(ii)	(after infection) rise begins sooner / less lag time steeper / faster rise (in number) longer lasting **or** doesn't drop so quickly	accept converse if clearly referring to before vaccination idea of staying high for longer ignore reference to higher starting point	 1 1 1
6(b)(iii)	antibodies are specific or needs different antibodies	accept antigens are different **or** white blood cells do not recognise virus	1
6(c)	reduces spread of infection / less likely to get an epidemic	 accept idea of eradicating measles	1
Total			**10**

4.3.1.7 Vaccination

Answer 25 · Mark scheme

January 2013 | BL1HP | Original Q6 | Legacy

BL1HP

4.3.1.7 Vaccination

Answer 26 · Mark scheme

Question	Answers	Extra information	Mark	AO / spec ref.
4(a)	mumps rubella / German measles	in either order both needed for the mark ignore measles unqualified	1	AO1 1.1.2l
4(b)(i)	80(.0)	allow **1** mark for $\frac{504}{630}$ **or** 0.8	2	AO2 1.1.2
4(b)(ii)	less chance of epidemic / pandemic **or** less chance of spread of disease / measles / mumps / rubella	allow idea of herd immunity (increased protection for those who are not vaccinated) ignore less chance of getting the disease **or** to eradicate the disease	1	AO2 1.1.2e,l
4(c)(i)	dead / inactive pathogens / viruses / bacteria	allow antigens / proteins from pathogens / viruses / bacteria ignore microorganisms	1	AO1 1.1.2l
4(c)(ii)	white blood cells produce antibodies antibodies produced rapidly (on re-infection) **or** response rapid (on re-infection) these antibodies kill pathogens / viruses / bacteria	 allow ecf if antibodies incorrectly identified in first marking point do **not** accept idea that original antibodies remain in blood and kill pathogens	1 1 1	AO1 1.1.2c, d,e,l
4(d)(i)	antibiotics don't kill viruses (because measles) virus / pathogen lives inside cells	allow antibiotics only kill bacteria allow antibiotics do not work inside cells **or** killing virus / pathogen would kill / damage cell	1 1	AO1 / AO2 1.1.2h
4(d)(ii)	(bacteria / pathogens) develop resistance (to antibiotic)	ignore reference to immunity ignore viruses develop resistance	1	AO1 1.1.2i,j
Total			**11**	

4.3.1.7 Vaccination

Answer 26 · Mark scheme

June 2014 | BL1HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.3.1.7 Vaccination

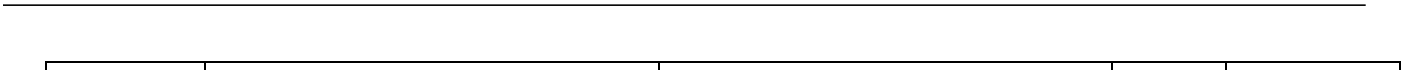
Answer 27 · Mark scheme June 2017 | BL1HP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	bacteria (in vaccine) are dead / inactive / weakened	allow converse for bacteria that cause the disease, if clear allow bacteria in vaccine are attenuated allow idea that only antigen from bacteria is in vaccine	1	AO1 1.1.2l
6(a)(ii)	for vaccinated person: idea that white blood cells have previously encountered (TB) bacteria so are ready to produce antibodies rapidly / immediately	allow converse for non-vaccinated person allow ref to memory cells allow idea of specificity of antibodies / white blood cells	1 1	AO2/3 1.1.2l
6(b)(i)	(most / all) non-resistant bacteria killed (by antibiotic) resistant bacteria reproduce so offspring are resistant	allow converse allow resistance allele passed on	1 1 1	AO1/2 1.1.2j
6(b)(ii)	infection is mild / non-serious (not using antibiotic) reduces (rate of) development of resistant strains	allow not life-threatening allow might be viral (1) and antibiotics do not kill viruses (1)	1 1	AO1/2 1.1.2i
Total			**8**	

4.3.1.7 Vaccination

Answer 27 · Mark scheme

June 2017 | BL1HP | Original Q6 | Legacy



4.3.1.7 Vaccination

Answer 28 · 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

4.3.1.7 Vaccination

Answer 28 · Mark scheme

June 2018 | 8461/1H | Original Q1

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

4.3.1.7 Vaccination

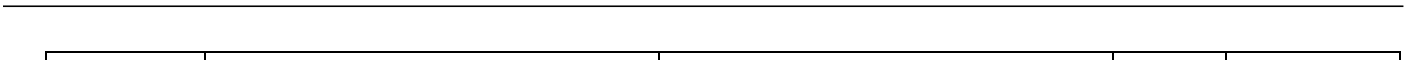
Answer 28 · Mark scheme

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**	

4.3.1.7 Vaccination

Answer 28 · Mark scheme

June 2018 | 8461/1H | Original Q1



4.3.1.7 Vaccination

Answer 29 · Mark scheme

June 2022 | 8461/1H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	any **one** from: • sexual contact / intercourse • exchange of body fluids	allow intercourse unqualified ignore kissing allow example of exchange such as (drug) users sharing needles **or** blood transfusion **or** passage from mother to foetus in uterus	1	AO1 4.3.1.1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	(number of cases) in women decreases then increases, then decreases (number of cases) in men increases then decreases	ignore use of figures allow **total** numbers (of men and women together) increase then decrease ignore reference to differences between men and women if no other marks awarded allow overall trend decreases in **both** for **1** mark	1 1	AO3 4.3.1.1 4.3.1.2

4.3.1.7 Vaccination

Answer 29 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	any **one** from: • better education (into prevention of spread of HIV) • condoms more widely available **or** condoms easier to source **or** condoms cheaper • new / better drugs (to prevent HIV infection / spread) • better / more testing / identification (of people with HIV)	allow increased awareness about HIV ignore contraception / protection unqualified allow PrEP / anti-retrovirals stop the virus being passed on ignore new treatments do **not** accept antibiotics allow less promiscuity ignore vaccination	1	AO3 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	$\frac{242}{1288}$		1	AO2 4.3.1.2
	0.1878…	allow a rounded answer	1	
	0.188 (:1)	allow a correctly rounded answer from student's incorrect division using numbers from **Table 8** do **not** accept if a unit is given	1	

4.3.1.7 Vaccination

Answer 29 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	any **one** from: • calculate as a percentage • give the numbers per 100 000 people	ignore calculate as a proportion allow any standard number eg 10 000 / 1000	1	AO3 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6		ignore reference to WBC unqualified		AO1 4.3.1.7 4.3.1.6 4.3.1.2
	inactive HIV / virus is injected (into bloodstream / muscle / body)	allow dead HIV / virus is injected (into bloodstream / muscle / body) allow (named) part of HIV / virus is injected (into bloodstream / muscle / body)	1	
	white bloods cells produce antibodies (against inactive virus)	allow lymphocytes produce antibodies (against inactive virus) do **not** accept phagocytes produce antibodies (against inactive virus)	1	
	(if infected with HIV) correct / specific antibodies are produced quickly		1	
	antibodies destroy the (active) virus / HIV	allow antibodies 'kill' the (active) virus / HIV	1	

4.3.1.7 Vaccination

Answer 29 · Mark scheme

June 2022 | 8461/1H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	HIV / antigen / protein injected into mouse	allow other correct small mammals eg rat	1	AO1 4.3.2.1
	extract / collect (mouse) lymphocytes that make a specific antibody to HIV / antigen / protein	allow extract specific lymphocytes from someone with HIV for **2** marks	1	
	lymphocytes are combined with a tumour cell to create a hybridoma	allow lymphocytes are combined with a myeloma / cancer cell to create a hybridoma	1	
	(hybridoma) cloned to create many cells that produce the antibody		1	
		alternative route HIV / antigen / protein injected into mouse (1) lymphocytes from mouse are combined with a tumour cell to create a hybridoma (1) the hybridoma that makes the specific / correct antibody is isolated (1) (hybridoma) cloned to create many cells that produce the antibody (1)		

4.3.1.7 Vaccination

Answer 29 · Mark scheme

June 2022 | 8461/1H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.8		allow 'the virus' for HIV throughout		AO3 4.3.2.1 4.3.2.2
	monoclonal antibody is complementary / specific to HIV antigen	allow correct description of complementarity	1	
	monoclonal antibodies attach to (all the) HIV antigens		1	
	(so) HIV cannot bind to (human) cell **or** (so) HIV genetic material cannot enter (human) cell	allow white blood cells **or** phagocytes identify (monoclonal) antibodies and engulf / destroy (antibody bound) HIV	1	
		alternative route monoclonal antibody is complementary / specific to HIV antigen (1) monoclonal antibody with (anti-retroviral) drug attached attaches to the HIV antigens (1) drug destroys the virus **or** drug destroys genetic material (1)		

Total Question 7		19

4.3.1.7 Vaccination

Answer 30 · 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.		

4.3.1.7 Vaccination

Answer 30 · 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

4.3.1.7 Vaccination

Answer 30 · Mark scheme

June 2023 | 8461/1H | Original Q3

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

4.3.1.7 Vaccination

Answer 30 · 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**

4.3.1.7 Vaccination

Answer 31 · Mark scheme

June 2025 | 8461/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.1	virus		1	AO1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.2	any **one** from: • (transfer of) droplets / saliva / mucus • sneezes • coughs	ignore other methods of transferring pathogens, unqualified such as touch or direct contact do **not** accept transfer through sexual intercourse	1	AO1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	willow	ignore parts of willow such as bark / leaves	1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	fever **or** (red skin) rash	allow high temperature allow (increased) sweating allow (red) spots / lumps / boils allow red / itchy skin allow cough / sneeze allow runny / blocked nose allow sore throat allow red / watery / sore eyes allow headache ignore flu-like symptoms, unqualified ignore pain unqualified do **not** accept nausea / diarrhoea	1	AO1 4.3.1.2

4.3.1.7 Vaccination

Answer 31 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5	**few(er)** people (in population) with pathogen / measles / disease (due to vaccination) (so) **less likely** for pathogen / measles / disease to be passed on **or** (so) **less likely** for pathogen / measles / disease to be spread / caught	allow named types of pathogen allow (provides) herd immunity allow **less likely** to come into contact with a person with pathogen / measles / disease ignore (so) spread of disease is reduced allow **2** marks for fewer people with measles, so **less likely** to spread	1 1	AO2 4.3.1.2 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	(graph reading) = 45 $\frac{45}{100} \times 240$ 108	 allow 0.45 × 240 allow for **1** mark an answer of 7 / 7.2 with evidence of having used 3(%) from **Figure 1** **or** allow for **1** mark an answer of 88 / 88.8 / 89 with evidence of having used 37(%) from **Figure 1**	1 1 1	AO2 4.3.1.2

4.3.1.7 Vaccination

Answer 31 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7		allow answers in terms of numbers of children or likelihood of getting disease		AO3 4.3.1.2
	a lower percentage of vaccinated children have severe measles / infection / disease **or** a higher percentage of unvaccinated children have severe measles / infection / disease **or** vaccination reduces severity of measles / infection / disease	allow converse	1	
	correct use of supporting comparative data from **Figure 9**	allow examples such as (severe disease is) 42% higher (in unvaccinated) **or** 15 times higher (than in vaccinated) **or** allow correct use of raw data used in a comparative way	1	

Total Question 1	11

4.3.1.7 Vaccination

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

4.3.1.7 Vaccination

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.

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Dr Michael Cresswell, Director General.

4.3.1.7 Vaccination

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.

4.3.1.7 Vaccination

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.

4.3.1.7 Vaccination

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	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	1
(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

4.3.1.7 Vaccination

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

4.3.1.7 Vaccination

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

4.3.1.7 Vaccination

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

4.3.1.7 Vaccination

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 <u>is</u> 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) <u>stimulates</u> 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) <u>stimulates</u> egg release	1 1
total			9

4.3.1.7 Vaccination

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

4.3.1.7 Vaccination

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

4.3.1.7 Vaccination

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

4.3.1.7 Vaccination

Answer 28 · 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.

4.3.1.7 Vaccination

Answer 28 · 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.

4.3.1.7 Vaccination

Answer 29 · Examiner comments

June 2022 | 8461/1H | Original Q7

Question 7 (Standard, standard/high and high demand)

07.1 Over 90% of students answered correctly, although occasional vague answers such as 'physical contact' were seen. References to sex or sexual contact / intercourse were the most commonly seen responses, but sharing needles or exchange of body fluids was also frequently seen. Some students talked about 'contraception' but did not qualify this as being a barrier method, which was not creditworthy.

4.3.1.7 Vaccination

Answer 29 · Examiner comments

07.2 Nearly 80% of students gained one mark in this question, either for referring to the number of cases increasing and then decreasing in men, or, for the fall-back mark of an overall decrease. A surprising number of students failed to read the figures correctly and suggested that cases in both men and women were decreasing or increasing until 2014. Several students identified a trend but failed to attribute it to men, women or both. Some did not attribute an overall decrease to **both** men and women or that the **total** number increased then decreased. Many compared the numbers of men and women, particularly saying that the number of cases in men was higher than in women, which was not incorrect, but not creditworthy. Several described the increase in 2014 as an anomaly. Students should be reminded to check the number of marks available for each question and to take care to consider each column of the table separately.

07.3 Just over half of students grained credit in his question. Those who fell short of the mark often gave vague answers such as 'education' or' contraception' without reference to an improvement, such as 'more', 'greater' or 'better'. Reference to vaccines was very common, which was the most common answer for zero marks, as well as several suggesting the development of herd immunity.

07.4 Over two thirds of students achieved full marks on this calculation question. Those that scored two marks often had the numerator and denominator reversed in their division or failed to round their answer to three significant figures, with the most common incorrect answer given being 0.19. The majority of students achieved 3 marks for a correct answer, sometimes given without any working shown and sometimes when the method of calculation was not clearly apparent. Some gave the figures as a ratio and did no calculation. Others gave the figures as a ratio but then produced figures which indicated that they had divided them. Many divided both numbers by 2, for no apparent reason. It was apparent that some students didn't have calculators, although some still managed a correct calculation.

07.5 Less than half of students gained this mark, with the most common incorrect answer being graphing the data to visually compare. It was also suggested frequently that the same number of men and women should be tested, considering this as a controlled investigation rather than gathered statistics. A significant number suggested presenting the results as a ratio, or presenting the total number, rather than just new cases.

07.6 A significant number of students were muddling the terms antibodies and antigens in their answer to this question about the process of vaccination. There was also some confusion around antibodies and antitoxins, and some suggesting the vaccine itself contained the antibodies. The most commonly achieved mark was mark point 1, although some students forgot to mention that the inactive virus needed to be injected into the body in some way. For MP2, some students failed to gain credit because they referred to the 'body' or 'immune system' producing the antibodies, which was not specific enough. For MP3, most students did not articulate the idea of specificity, just that antibodies were produced more quickly. There was occasionally confusion between white blood cells, lymphocytes and antibodies, with students saying that specific lymphocytes were produced, rather than specific antibodies. For this mark point, correct / specific antibodies could be inferred if it was stated that specific antibodies had been produced for MP2, and that these were produced on

4.3.1.7 Vaccination

Answer 29 · Examiner comments

infection. A few students talked about monoclonal antibodies suggesting they may have returned to this question after looking at questions 07.7 and 07.8. Surprisingly, MP4 was the least credited, as most students ended their account at the production of antibodies and failed to make any reference to what the antibodies do. Where there were references to the virus being destroyed / killed, this was equally likely to be in the context of the dead / inactive virus. There were also many references to preventing infection or 'fighting off', 'dealing with', 'tackling the virus' or other similar imprecise statements. There were frequent references to vaccination of a large proportion of the population providing herd immunity.

07.7 Many students were confident in describing the need for the mouse to be injected and understood that lymphocytes are combined with a tumour cell to create a hybridoma, however, many students went on to suggest that the antibodies were fused to the tumour cell, rather than the lymphocytes. The combination of ideas of extraction of lymphocytes and that these must be ones that produce specific antibodies to HIV was less well described. The most challenging part was that these hybridoma cells are then cloned to create many cells, and that it is these cells that produce the monoclonal antibodies. Vague references to 'injecting disease' were occasionally seen. The 'allowed' idea that specific lymphocytes were extracted from someone with HIV was not seen. Another common misconception highlighted by this question was the idea that the hybridoma is the monoclonal antibody. There were some very interesting attempts at spelling hybridoma in student answers.

07.8 Just over 50% of students scored marks on this question, with many not using the figure to scaffold their answer. Several answers referring to the idea of reducing the speed of spread of the virus resulting in less damage to the immune system (and therefore meaning that the patient's own immune system is better able to fight the virus for longer, reducing the chance of the viral load getting high enough to result in AIDs) were seen.
Most students missed mark point 1, and for those who did attempt it, many omitted to reference the idea that the shapes of the antibody and antigen were complementary, rather just giving the key word 'specific'.
There was further evidence of the misconception seen in question 07.7 regarding the hybridoma being given to people as the treatment (rather than isolating the antibodies), or that the hybridoma is the monoclonal antibody.
A number of students made references to the antigen or antigen binding site shape being changed which may be evidence of confusion with enzyme biology. There were also a lot of students describing the antigen being destroyed so that the HIV could not bind to the human cell. A reasonably sized group of students clearly do not understand the process of viral infection and talked about the antigen binding site allowing the human cell to take in the HIV DNA and 'learn it' so that they can produce antibodies to fight it off.
In some responses it appeared that students were identifying the human cell from the figure as a white blood cell which 'remembers' HIV, whilst others mistook the human cell for the monoclonal antibody. For the final mark point, many students thought that it was the monoclonal antibodies which engulfed / destroyed the HIV, or that the antibodies destroyed infected cells once the HIV genetic material had entered. Some thought that it was the human cell, or the antigen binding sites on it, that were doing the engulfing when invaded by HIV.

4.3.1.7 Vaccination

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Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

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

4.3.1.7 Vaccination

Answer 30 · 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.

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June 2023 | 8461/1H | Original Q3

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.

4.3.1.7 Vaccination

Answer 31 · Examiner comments

Question 1 (standard demand)

01.1 Over 80% of students gained credit for the answer of 'virus' in this question. Of the minority of incorrect answers, the most common was 'bacteria', followed by 'fungi', 'protist' and 'communicable'.

01.2 65% of students correctly stated how measles could be spread, but some referred more vaguely to 'direct contact' or 'through the air', neither of which gained credit. A few incorrectly believed that measles is a sexually transmitted disease.

01.3 Pleasingly, 85% of students were able to identify 'willow' in this question. A small number of students did not gain credit as they had included a second, incorrect answer alongside willow, such as foxglove.

01.4 90% of students achieved the mark in this question owing to the wide range of creditable symptoms listed in the mark scheme. Some students gave unnecessarily long lists of symptoms, which occasionally led to the mark being disqualified when symptoms such as nausea and diarrhoea were included.

01.5 Although students found this question accessible, very few (10%) managed to gain both marks. 45% of students achieved 1 mark, usually for the idea of herd immunity in MP1. Many students focused on how vaccination affects individuals, rather than the impact of vaccination on the population as a whole. This led to responses about personal immunity rather than a decrease in measles frequency at the population level. Occasionally, students stated that measles would not be passed on to the next generation, as if it was a genetic disorder. MP2 required the idea of reduced likelihood, chance or probability of measles being spread and not a simple rewrite of the question such as 'therefore spread would be reduced'.

01.6 90% of students scored full marks in this question. The most common error seen involved using data from more than one bar or calculating a percentage using values from two bars.

01.7 Most students made a reasonable attempt at this question, with those scoring marks realising that the data in the figure showed the percentages of vaccinated and unvaccinated children who all had measles, and the degree of severity of these cases. The data did not show information about the likelihood of the children catching measles in the first place. Students who achieved both marks (45%) typically used comparative language and precise data from the graph in one concise sentence. Terms like *only* were effectively used to emphasise differences, and some students successfully manipulated data to give clear, accurate responses. Those who achieved 1 mark had usually identified that vaccination reduces severity (MP1) whilst those that scored zero marks (31%) tended to give an answer which focused on the chance of contracting measles.