AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.8

Antibiotics and painkillers

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**28**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.3.1.8 Antibiotics and painkillers

Answer 01 · Mark scheme

March 2007 | BLY1A | Original Q1 | Legacy

One	**A**	ear	**4**
	B	eye	**2**
	C	nose	**3**
	D	skin	**1**

Answer 02 · 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 03 · Mark scheme

November 2007 | BLY1A | Original Q9 | Legacy

Nine	**3**	**2**	**1**	**3**

4.3.1.8 Antibiotics and painkillers

Answer 04 · Mark scheme January 2008 | BLY3H | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
(a)(i)	ref. access of <u>fungus</u> to reactants / food / oxygen **or** maintain even temperature throughout **or** prevents sedimentation of fungus		1
(a)(ii)	any **two** from: • maintain constant / suitable / optimum temperature • prevent denaturation of enzymes / prevent death of microorganisms • microorganisms release / produce heat / energy **or** respiration releases / produces heat / energy	ignore 'to cool' – needs qualification re. <u>reason</u> for cooling do **not** allow death of enzymes **or** denaturation of microorganisms	2
(b)(i)	66 – 72		1
(b)(ii)	glucose concentration falls first	allow falls faster	1

continued…

4.3.1.8 Antibiotics and painkillers

BLY3H

Question 7 continued…

question	answers	extra information	mark
(b)(iii)	description:		
	glucose concentration falls as biomass / fungus / Cephalosporium increases		1
	Cephalosporin C increases after biomass increase	must imply after	1
	explanation:		
	glucose used in respiration / as source of energy for Cephalosporium **or** glucose used as material to make cells / to make hyphae	**not** just 'used for growth'	1
	Cephalosporin C is a product from Cephalosporium (so Cephalosporium must be present to produce it) **or** Cephalosporium not produced until growth has ceased		1
total			9

4.3.1.8 Antibiotics and painkillers

Answer 05 · Mark scheme

June 2008 | BLY1AP | Original Q1 | Legacy

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

4.3.1.8 Antibiotics and painkillers

Answer 06 · Mark scheme

June 2008 | BLY1H | Original Q4 | Legacy

question	answers	extra information	mark
4(a)	(bacteria) produce toxins / poisons (viruses) damage / kills cells **or** toxins released from cell		1 1
4(b)	any **two** from: • viruses live inside cells • viruses inaccessible to drug • drug would damage body cells / tissue		2
4(c)	any **four** from: • overuse of antibiotics • bacteria mutate • antibiotics kill non-resistant strains **or** idea of selection • reduced competition • resistant bacteria reproduce	do **not** allow antibiotic causes mutation	4
Total			**8**

4.3.1.8 Antibiotics and painkillers

Answer 06 · Mark scheme June 2008 | BLY1H | Original Q4 | Legacy

COMPONENT NUMBER: BLY1H

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: June 2008

Answer 07 · Mark scheme November 2008 | BLY1AP | Original Q4 | Legacy

Four	3	1	3	3

Answer 08 · Mark scheme November 2008 | BLY1AP | Original Q5 | Legacy

Five	1	2	1	2

Answer 09 · Mark scheme March 2009 | BLY1AP | Original Q3 | Legacy

Three	2	3	3	3

Answer 10 · Mark scheme March 2009 | BLY1AP | Original Q8 | Legacy

Eight	3	3	1	2

Answer 11 · Mark scheme June 2009 | BLY1AP | Original Q6 | Legacy

Six	1	4	1	4

Answer 12 · Mark scheme March 2010 | BLY1AP | Original Q4 | Legacy

Four	3	1	1	2

Answer 13 · Mark scheme March 2010 | BLY1AP | Original Q6 | Legacy

Six	4	3	4	4

Answer 14 · Mark scheme June 2010 | BLY1AP | Original Q3 | Legacy

Three	4	1	3	1

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

Seven	4	4	4	2

Answer 16 · Mark scheme June 2011 | BLY1AP | Original Q5 | Legacy

Five	1	3	1	4

Answer 17 · Mark scheme November 2011 | BLY1AP | Original Q4 | Legacy

Four	1	1	1	3

4.3.1.8 Antibiotics and painkillers

Answer 18 · Mark scheme June 2012 | BL1HP | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1 (a)	don't kill pathogens / bacteria / viruses / microbes / microorganisms	allow don't contain antibiotics ignore antibodies / attack / fight allow only treat symptoms / pain ignore kill disease / germs	1
1 (b)	any **two** from: • age • gender • extent / severity of pain **or** how long had pain before trial • type of pain / illness / site of pain • (body) mass / weight / height • other medical issues / drugs taken / health / fitness • ethnicity	accept 'the pain' for **1** mark, if neither extent or type given ignore pain threshold allow body size / physique	2
1 (c)(i)	75	ignore calculations / %	1
1 (c)(ii)	faster pain relief / decrease	allow pain relief sooner **or** it works quicker **or** more pain relief at start / in first hour / $1\frac{3}{4}$ hours	1
1 (c)(iii)	decrease of pain higher / more decrease of pain is longer lasting	ignore more effective unless qualified by time >$1\frac{3}{4}$ hours allow effect lasts longer	1 1

Question 1 continues on the next page . . .

4.3.1.8 Antibiotics and painkillers

Answer 18 · Mark scheme

June 2012 | BL1HP | Original Q1 | Legacy

BL1HP

Question 1 continued

question	answers	extra information	mark
1 (d)	any **three** from: **(Yes because)** • rapid pain relief (from A) • long lasting pain relief (from B) • and it costs less • the sum of the pain relief (from A + B) is greater (than X) **(No because)** • drug X gives more pain relief • (A + B / they) might interact with each other • could result in overdose • could be more / new side effects	ignore yes or no if neither points gained allow (more) dangerous	3
Total			**10**

4.3.1.8 Antibiotics and painkillers

Answer 18 · Mark scheme

June 2012 | BL1HP | Original Q1 | Legacy

BL1HP

4.3.1.8 Antibiotics and painkillers

Answer 19 · 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**

4.3.1.8 Antibiotics and painkillers

Answer 19 · Mark scheme

June 2012 | BL1HP | Original Q5 | Legacy

BL1HP

4.3.1.8 Antibiotics and painkillers

Answer 20 · Mark scheme June 2014 | BL1HP | Original Q4 | Legacy

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 <u>antibodies</u> 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**	

4.3.1.8 Antibiotics and painkillers

Answer 20 · Mark scheme

June 2014 | BL1HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.3.1.8 Antibiotics and painkillers

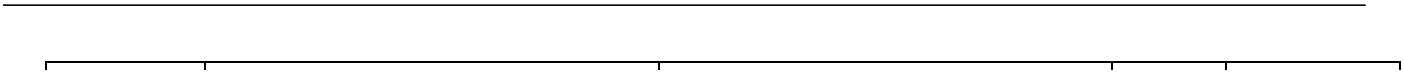
Answer 21 · Mark scheme June 2015 | BL1HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	microorganism / bacteria / virus / fungus that causes (infectious) disease		1	AO1 1.1.2a
4(b)	reduce / stop use of (current) antibiotics (reduce / stop use) for non-serious / mild / viral infections	allow ensure course is completed allow use of variety of antibiotics	1 1	AO1 1.1.2j/k/ 1.8.1f
4(c)(i)	40 °C		1	AO2 1.1.2o
4(c)(ii)	any **one** from: • microorganisms grow / reproduce / work / act faster • results / product acquired sooner		1	AO1 1.1.2o
Total			**5**	

4.3.1.8 Antibiotics and painkillers

Answer 21 · Mark scheme

June 2015 | BL1HP | Original Q4 | Legacy



4.3.1.8 Antibiotics and painkillers

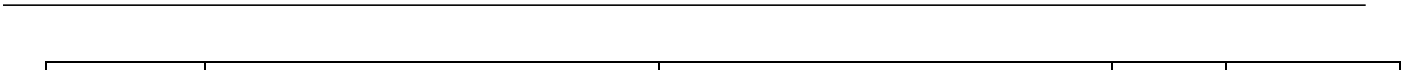
Answer 22 · Mark scheme June 2017 | BL1HP | Original Q6 | Legacy

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**	

4.3.1.8 Antibiotics and painkillers

Answer 22 · Mark scheme

June 2017 | BL1HP | Original Q6 | Legacy



Answer 23 · Mark scheme

November 2020 | 8461/1H | Original Q5

The full source mark scheme begins on page 46. Follow original question 5 in that document.

4.3.1.8 Antibiotics and painkillers

Answer 24 · Mark scheme November 2021 | 8461/1H | Original Q2

02.1	any **two** from: • sterilise equipment / surfaces (before use) • (use) sterilised agar • secure lid of the Petri dish with (adhesive) tape • only lift lid of Petri dish a little (when setting up plate) **or** lift lid of Petri dish at an angle (when setting up plate)	ignore 'clean' unqualified ignore wash hands allow description of how to sterilise equipment allow description of how to sterilise agar	2	AO1 4.1.1.6 RPA2
02.2	B **and** it kills the fewest bacteria **or** it has the smallest area where no bacteria were growing	 allow it has the smallest clear / white area	1	AO3 4.1.1.6 RPA2

4.3.1.8 Antibiotics and painkillers

Answer 24 · Mark scheme

02.3		an incorrect answer for one step does not prevent allocation of marks for subsequent steps ignore calculation and subtraction of filter paper disc area from total area		AO2 4.1.1.6 RPA 2
	(correct measurement) r = 1.1 (cm) **or** r = 11 (mm)	allow d = 2.2 (cm) **or** d = 22 (mm) allow a tolerance of ±1 mm	1	
	(recall of the equation) πr^2		1	
	(calculation/substitution) 3.14 x 1.1^2 **or** 3.14 x 11^2	allow correct calculation / substitution using an incorrect measurement	1	
	= 3.799(4) (from 3.14 x 1.1^2) **or** = 379.9(4) (from 3.14 x 11^2)	allow 3.8 allow 380	1	
	correct unit (3.7994) cm^2 **or** (379.94) mm^2	do **not** accept unit with no attempt at working / answer	1	
02.4	any **one** from: • repeat **and** calculate a mean • repeat **and** eliminate anomalies • use a control disc • use different types of bacteria	 allow description of control disc e.g. disc with water / nothing ignore set up a control	1	AO3 4.1.1.6 RPA2
Total			**9**	

4.3.1.8 Antibiotics and painkillers

Answer 24 · Mark scheme

November 2021 | 8461/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.3.1.8 Antibiotics and painkillers

Answer 25 · Mark scheme June 2023 | 8461/1H | Original Q1

Question 1

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

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

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

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

4.3.1.8 Antibiotics and painkillers

Answer 25 · Mark scheme

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

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

4.3.1.8 Antibiotics and painkillers

Answer 25 · Mark scheme

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

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

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

Total Question 1	**13**

4.3.1.8 Antibiotics and painkillers

Answer 26 · 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.		

4.3.1.8 Antibiotics and painkillers

Answer 26 · 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

4.3.1.8 Antibiotics and painkillers

Answer 26 · 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

4.3.1.8 Antibiotics and painkillers

Answer 26 · 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**

4.3.1.8 Antibiotics and painkillers

Answer 27 · Mark scheme

June 2024 | 8461/1H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.1	penicillin	allow other named antibiotics ignore penicillium	1	AO1 4.3.1.3 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.2	the bacterium is killed (by antibiotic **C**)	allow there is a zone of inhibition (around antibiotic **C**)	1	AO2 4.3.1.8 4.1.1.6 RPA2
	if the bacterium was resistant, bacteria would be right up to the (edge of the) antibiotic disc	allow resistance means that the bacterium is not killed (by antibiotic(s)) allow if the bacterium was resistant there would be no zone of inhibition ignore no white area	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.3	any **two** from: • current / available antibiotics do not kill (certain) bacteria • diseases become more common **or** there will be some diseases that cannot be cured / treated • new antibiotics need to be developed which takes time / money	allow current / available antibiotics have no effect on (certain) bacteria ignore more people become ill allow some diseases become more difficult to treat	2	AO2 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.4	viruses **only** exist / reproduce inside (living) cells	allow viruses **need** (living) cells to exist / reproduce allow viruses exist / reproduce inside (living) cells **and** agar is not made of cells ignore names of cell types	1	AO2 4.3.1.8 4.3.1.1

4.3.1.8 Antibiotics and painkillers

Answer 27 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.5	(these) drugs (can) damage (body) cells / tissues **or** it is hard to get (these) drugs into (living) cells	allow viruses often / frequently mutate (giving resistance to these drugs)	1	AO1 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.6	AIDS		1	AO1 4.3.1.2

Total Question 6	**8**

4.3.1.8 Antibiotics and painkillers

Answer 28 · Mark scheme

June 2025 | 8461/1H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.1	bacterial cells are prokaryotic and yeast cells are eukaryotic		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.2	any **two** from: • nucleus • vacuole • mitochondria	allow chromosomes allow large ribosomes if no other mark awarded allow **1** mark for membrane bound sub-cellular structures	2	AO3 4.1.1.1 4.1.1.2

4.3.1.8 Antibiotics and painkillers

Answer 28 · Mark scheme

Question	Answers	Mark	AO / Spec Ref.
08.3	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.	3-4	AO3 4.1.1.6
	Level 1: Relevant features are identified and differences noted.	1-2	
	No relevant content.	0	
	Indicative content: • all three antibiotics have similar / no effect in the first 4 / 5 hours *antibiotic **A*** • **A** is least / less effective o because **A** starts to reduce the number of bacteria latest o because **A** reduces the number of bacteria the slowest o because the (maximum) number of bacteria using **A** is the highest o because **A** does not reduce the number of bacteria as much as **C** and / or **B** o because with **A** there is still a (much) larger number of bacteria left at 16 hours *antibiotic **B*** • **B** is more effective than **A** • **B** is less effective than **C** o because **B** starts to reduce the number of bacteria after **C** o because **B** starts to reduce the number of bacteria before **A** o because **B** reduces the number of bacteria more than **A** o because **B** reduces the number of bacteria quicker than **A** o because **B** reduces the number of bacteria slower than **C** *antibiotic **C*** • **C** is most / more effective o because **C** starts to reduce the number of bacteria soonest o because **C** reduces the number of bacteria the fastest o because the (maximum) number of bacteria with **C** is the lowest o because **C** is the (only) antibiotic to reduce the number of bacteria to zero For **Level 2**, all three antibiotics must be compared.		

4.3.1.8 Antibiotics and painkillers

Answer 28 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.4	dilute each sample and count the number of bacteria (using a microscope) find the mean number of bacteria and scale / multiply up	 allow find the mean number of bacteria and multiply by 50 allow find the total number of bacteria and multiply by 5	1 1	AO1 4.1.1.6 4.2.2.5

Total Question 8	**9**

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

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

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

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

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

4.3.1.8 Antibiotics and painkillers

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.

4.3.1.8 Antibiotics and painkillers

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.

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

BLY1H Question 3

	answers	extra information	mark
	adaptation and <u>linked advantage</u> 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 <u>sandy</u> soil (1)		
total			4

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

AQA

GCSE
BIOLOGY
8461/1H

Paper 1 Higher Tier

Mark scheme

June 2020

Version: 1.0 Final

206G8461 1H/MS

4.3.1.8 Antibiotics and painkillers

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

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

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

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

Copyright information

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

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

Information to Examiners

1. General

The mark scheme for each question shows:

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

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

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

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

2. Emboldening and underlining

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

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

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

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

3. Marking points

3.1 Marking of lists

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

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

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

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

[1 mark]

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

Example 2: Name two planets in the solar system.

[2 marks]

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

3.2 Use of chemical symbols / formulae

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

3.3 Marking procedure for calculations

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

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

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

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

3.6 Phonetic spelling

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

3.7 Brackets

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

3.8 Allow

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

3.9 Ignore

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

3.10 Do <u>not</u> accept

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

4. Level of response marking instructions

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

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

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

4.3.1.8 Antibiotics and painkillers

Step 1: Determine a level

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

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

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

Step 2: Determine a mark

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

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

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

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

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

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

02.3	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.1.3.1 4.2.2.2 4.2.2.3
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	

	Indicative content
	• (many) alveoli
	  • provide a large(r) surface area (**:** volume)
	
	• capillaries are thin
	  or alveoli / capillary walls are thin **or** one cell thick
	  or capillaries are close to the alveoli
	  • which provides short diffusion path (for oxygen / carbon dioxide)
	
	• breathing (mechanism) moves air in and out
	or lungs are ventilated
	  • to bring in (fresh) oxygen
	  • to remove carbon dioxide
	  • to maintain a concentration / diffusion gradient
	
	• large capillary network (around alveoli)
	or good blood supply
	  • to remove oxygen(ated blood) quickly
	  • to bring carbon dioxide to the lungs quickly
	  • to maintain a concentration / diffusion gradient		

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

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

4.3.1.8 Antibiotics and painkillers

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

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

4.3.1.8 Antibiotics and painkillers

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

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

Total			**15**

4.3.1.8 Antibiotics and painkillers

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

07.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.		4-6	AO1 4.3.1.9
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.		1-3	
	No relevant content		0	
	Indicative content • given first to healthy volunteers o at (very) low dose o to test it is safe **or** to test for toxicity **or** to check for any side effects • then to some patients (with the disease) **or** people with the disease o to test for the correct / optimum dose o to check for any side effects o to test for efficacy **or** to test if it works o in a double blind trial o where neither patients nor doctors know who has the mAbs and who has a placebo (or alternative treatment) • reference to large trial **or** long duration **or** control variables			
07.4	any **one** from: • (the body will) not reject the mAbs **or** (the body is) less likely to reject the mAbs • mouse mAbs are (more likely to be) rejected • the human lymphocytes have already responded to that infection / cancer cell so they are known to work against the disease	do **not** accept idea of rejection of cells	1	AO3 4.3.2.2 4.3.2.1 4.3.1.6
Total			**12**	

4.3.1.8 Antibiotics and painkillers

Answer 23 · Examiner comments November 2020 | 8461/1H | Original Q5

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

Some students referred incorrectly to herbivores as predators in **05.2**. In **05.4**, many students were able to correctly name two reasons for the symptoms, but explanations were either not worded well or underdeveloped. Several students were unclear about the distinctions between chlorosis, chloroplasts and chlorophyll.

Very few students answered **05.5** correctly (89% scored zero marks), because they were so focussed on the nitrates mentioned in the question that they missed the other requirements of the bacteria. Many students found the novel context regarding root nodules perplexing and didn't score any marks.

Answer 24 · Examiner comments November 2021 | 8461/1H | Original Q2

Question 2 (standard demand)

Many students were able to demonstrate the mathematical skills and understanding assessed in **02.3**. Generally, the accuracy of the measurement of the radius (or equivalent) was good, however, some students used the Pi button on their calculator in their calculation, despite being given a value to use. A number of students calculated the area of the paper disc and subtracted this from their calculated value, which is neither required nor correct.

Answer 25 · Examiner comments June 2023 | 8461/1H | Original Q1

Question 1 (Standard demand)

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

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

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

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

4.3.1.8 Antibiotics and painkillers

Answer 25 · Examiner comments June 2023 | 8461/1H | Original Q1

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

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

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

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

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

4.3.1.8 Antibiotics and painkillers

Answer 26 · Examiner comments June 2023 | 8461/1H | Original Q3

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.

4.3.1.8 Antibiotics and painkillers

Answer 26 · Examiner comments 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.

4.3.1.8 Antibiotics and painkillers

Answer 27 · Examiner comments June 2024 | 8461/1H | Original Q6

Question 6 (standard, standard/high demand and high demand)

06.1 83% of students were able to name an appropriate antibiotic. Commonly seen incorrect answers included aspirin, ibuprofen and paracetamol.

06.2 65% of students scored one mark on this question, with the majority achieving the first marking point. 6% of students scored two marks.

The vast majority of responses referenced a zone of inhibition, rather than a description of an area where the bacteria had been killed, both of which were creditworthy. However, references to a 'clear' or 'white' area were not. A number of students missed out on the mark, however, for offering vague references to bacteria 'not growing' rather than describing the effect the antibiotic had on them. For marking point 2, the majority of students went on to simply repeat what they had said for marking point 1 in a different way; that because the bacteria were killed, or because there was a zone of inhibition, they cannot be resistant, rather than what would happen if the bacteria *were* resistant. Frequently, reference to the antibiotic being resistant was seen.

06.3 74% of students scored zero marks on this question, largely due to not accurately articulating their ideas. The most commonly seen response related to marking point 3, regarding the difficulty of developing new antibiotics in terms of cost or time, with nearly a quarter of students achieving one mark. Some students began a sentence about the difficulty of developing new antibiotics, but offered no further clarification and therefore could not be awarded a mark. For marking point 2, many students began to try to express the idea that diseases would become more common and/or diseases would be more difficult to treat. However, they struggled to articulate themselves in a way that was creditworthy, with the emphasis on (individual) illnesses or infection, rather than diseases generally.

06.4 36% of students were awarded the mark in this question. The majority of students were aware that viruses only exist inside living cells although many had difficulty expressing this clearly enough to gain the mark. The most commonly seen correct response referred to viruses needing cells to reproduce, rather than viruses *only* reproducing inside cells.

06.5 43% of students achieved the mark in this question. A significant number of students understood that drugs used to destroy viruses would also damage the body cells, with vastly fewer recognising that it was hard to get these drugs into cells. Those who did not gain credit for this idea often stated that 'antibiotics only kill bacteria', 'viruses are small, so are difficult to find' or 'it is hard/expensive to research and develop new drugs'.

Those student who referenced mutation usually did not gain credit because they described viruses mutating 'more' or 'faster', rather than frequently. Often, students used the term 'they' in their answer as referring to 'the drugs', when in fact 'they', in the context of the question, refers to 'the scientists'. Students should be encouraged to look at the subject of the question before answering in terms of 'they' or 'it' for example, or better still, not use such terms in their answer.

06.6 84% of students correctly identified AIDS as a viral disease that damages white blood cells.

© 2024 AQA and its licensors. All rights reserved.

4.3.1.8 Antibiotics and painkillers

Answer 28 · Examiner comments

June 2025 | 8461/1H | Original Q8

Question 8 (standard/high demand and high demand)

08.1 90% of students achieved the mark in this question.

08.2 This question was answered well with 82% of students achieving 2 marks and less than 2% scoring zero. All three of the possible answers were seen, with vacuole sometimes being correctly qualified as 'large' or 'permanent'. The most common uncreditworthy

4.3.1.8 Antibiotics and painkillers

Answer 28 · Examiner comments

answer was 'ribosome' not being qualified with 'large'. Some students also gave chloroplasts as an uncreditworthy answer, with a few stating 'cell wall'.

08.3 This was a levelled response question with the command word compare. In comparison to question 03.1 where students struggled to evaluate, the vast majority were able to make valid comparisons in this question. The majority of students (59%) gained 2 marks as there were many routes to achieve more than the minimum requirement to enter Level 1 without giving enough detail to enter Level 2. Those who were able to enter Level 2 most commonly had given enough supporting evidence to gain 4 marks (11% of students). Most students were able to identify A as the least, and C as the most effective antibiotic and give supporting evidence from the graph for those comparisons. They often also stated or implied that the effectiveness of B was 'in between' but were limited to Level 1 because they did not give any explicit evidence for this, most commonly just describing the line for B, without including comparisons with A and / or C. 16% of students gained zero marks. These students had usually misinterpreted the graph completely, getting the comparative order the wrong way around. Others did no comparisons, but just described the three lines, and so students should be reminded to pay attention to the command word in the question. A few disqualified themselves by contradicting statements they had made by using the wrong letter for the antibiotic, possibly by accident. This may have been corrected if they had read their answer back through. There were some answers that were very difficult to read due to illegible handwriting at this late stage of the paper, but the majority of students found the answer space sufficient, not needing to use additional pages.

08.4 57% of students scored no marks in this question and, of those that did, the majority achieved MP2 only**.** Very few students realised the need to dilute the samples in order to be able to count the bacteria and therefore, MP1 was awarded very rarely. Students were more successful with MP2, with both routes to carry out the calculation seen. Many students gave a method to calculate the mean (which was not necessary for the mark to be awarded), and also the correct multiplier for the mean. Some students referred to scaling up the individual counts and then calculating a mean. This is a valid way of getting the correct answer, so was also creditworthy. The most common reason for students not to be awarded MP2 was the counting of just one sample and then scaling that up. Some students referred to multiplying by 50^3, presumably assuming that volume was important in some way, and a few more referred to measuring the area of the bacteria rather than the number, presumably confusing this question with the required practical and questions in previous years.

4.3.1.8 Antibiotics and painkillers

Answer 28 · Examiner comments

Mark Ranges and Award of Grades

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