AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.8

Antibiotics and painkillers

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**40**
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 January 2007 | BLY1F | Original Q4 | Legacy

Question 4

	answers	extra information	mark
(a)	antibodies antitoxins antibiotics		1 1 1
(b)	any **two** from: • measles • mumps • rubella / German measles		2
(c)	less / low / no chance of getting named / all condition(s) if vaccinated quantitative figure(s) e.g. 5 times less likely to get convulsions	must be comparative	1 1
(d)	enzymes genes		1 1
total			9

4.3.1.8 Antibiotics and painkillers

Answer 02 · Mark scheme

March 2007 | BLY1A | Original Q5 | Legacy

Five	**A**	can be used to treat the symptoms of some diseases	**2**
	B	can lead to addiction to hard drugs	**3**
	C	contains carbon monoxide	**4**
	D	often leads to lack of self-control	**1**

Answer 03 · Mark scheme

March 2007 | BLY1A | Original Q6 | Legacy

Six	**A**	antibiotics	**1**
	B	natural selection	**3**
	C	pandemic	**4**
	D	resistance	**2**

	A	**B**	**C**	**D**

Answer 04 · Mark scheme

June 2007 | BLY1F | Original Q2 | Legacy

The full source mark scheme begins on page 53. Follow original question 2 in that document.

4.3.1.8 Antibiotics and painkillers

Answer 05 · Mark scheme

January 2008 | BLY1F | Original Q6 | Legacy

Question 6

	answers	extra information	mark
(a)(i)	lives inside cells		1
(a)(ii)	inactive		1
(a)(iii)	antibodies		1
(b)(i)	1950		1
(b)(ii)	8 (years)		1
(b)(iii)	any **one** from: eg • disease could be reintroduced (from abroad) • disease would spread if it came back • protection on holiday abroad • high proportion of immune people needed to prevent epidemic	disease might come back insufficient	1
total			6

4.3.1.8 Antibiotics and painkillers

Answer 05 · Mark scheme

January 2008 | BLY1F | Original Q6 | Legacy

BLY1F

Answer 06 · Mark scheme

March 2008 | BLY1AP | Original Q2 | Legacy

Two	**A**	cannabis	**2**
	B	painkiller	**4**
	C	antibiotic	**1**
	D	statin	**3**

Answer 07 · Mark scheme

June 2008 | BLY1AP | Original Q6 | Legacy

Six	**A**	antibiotics	**2**
	B	painkillers	**4**
	C	antibodies	**3**
	D	vaccines	**1**

	A	**B**	**C**	**D**

4.3.1.8 Antibiotics and painkillers

Answer 08 · Mark scheme June 2008 | BLY3F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)	heat at 120°C for 30 minutes		1
5(b)	no bacteria near the mould **or** nothing grows near Penicillium **or** gap between bacteria and Penicillium **or** bacteria gone / killed / destroyed near Penicillium		1
5(c)(i)	valid / reliable / representative	**not** 'accurate' ignore 'fair'	1
5(c) (ii)	6		1
5(c) (iii)	2		1
5(c) (iv)	48 to 60		1
5(d)	any **two** from: • temperature / heat / suitable temperature range eg 25–40°C • pressure • (concentration of) oxygen • food / nutrients • ions / correct eg / NH_3 / NH_4^+ / nutrients • wastes / named wastes eg. carbon dioxide / lactic acid	do **not** allow keep cool ignore water / nutrient agar allow nutrients only once	2
Total			**8**

4.3.1.8 Antibiotics and painkillers

Answer 08 · Mark scheme June 2008 | BLY3F | Original Q5 | Legacy

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: June 2008

Answer 09 · Mark scheme November 2008 | BLY1AP | Original Q9 | Legacy

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

Answer 10 · Mark scheme January 2009 | BLY3F | Original Q5 | Legacy

The full source mark scheme begins on page 64. Follow original question 5 in that document.

Answer 11 · Mark scheme March 2009 | BLY1AP | Original Q8 | Legacy

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

Answer 12 · Mark scheme June 2009 | BLY1AP | Original Q1 | Legacy

Question	Key	
One	**A** kills bacteria	**2**
	B linked to lung disease	**1**
	C an addictive, illegal drug	**3**
	D relieves some disease symptoms	**4**

4.3.1.8 Antibiotics and painkillers

Answer 13 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	measles mumps rubella		1 1 1
3(b)	antibodies		1
3(c)(i)	any **two** from: • fell • then rose • any reasonable amplification eg until 2004 / to 80% • flattens off *(*between 1999–2000*)*		2
3(c)(ii)	eg fear of side effects **or** cost of vaccine **or** lack of vaccine **or** complacency / disease less common		1
Total			**7**

4.3.1.8 Antibiotics and painkillers

Answer 13 · Mark scheme

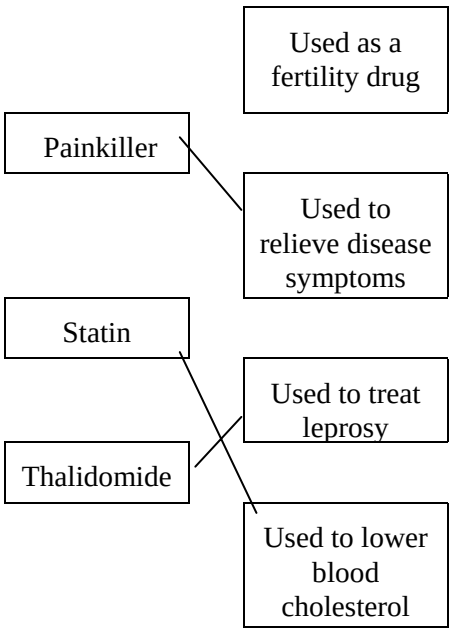
January 2010 | BLY1F | Original Q3 | Legacy

BLY1F

4.3.1.8 Antibiotics and painkillers

Answer 14 · Mark scheme

January 2010 | BLY1F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	3
5(b)(i)	8		1
5(b)(ii)	3210		1
5(c)(i)	if it is toxic		1
5(c)(ii)	if it has side effects		1
Total			**7**

4.3.1.8 Antibiotics and painkillers

Answer 14 · Mark scheme

January 2010 | BLY1F | Original Q5 | Legacy

BLY1F

4.3.1.8 Antibiotics and painkillers

Answer 15 · Mark scheme

Question 4

question	answers	extra information	mark
4(a)	very little of the biogas generator will be seen the temperature inside will not change much	cancel **1** mark for each extra box ticked	1 1
4(b)(i)	methane		1
4(b)(ii)	60	correct answer with or without working 100 – (35 + 1.5 + 1.5 + 2) but incorrect answer allow **1** mark	2
Total			**5**

4.3.1.8 Antibiotics and painkillers

Answer 15 · Mark scheme

January 2010 | BLY3F | Original Q4 | Legacy

BLY3F

4.3.1.8 Antibiotics and painkillers

Answer 16 · Mark scheme

Question 5

question	answers	extra information	mark
5(a)(i)	E + F	either order	1
5(a)(ii)	D		1
5(b)(i)	any **2** from: • rises **or** a description • falls / levels off + **or** a description • further details		2
5(b)(ii)	maximum yield		1
Total			**5**

4.3.1.8 Antibiotics and painkillers

Answer 16 · Mark scheme January 2010 | BLY3F | Original Q5 | Legacy

BLY3F

Answer 17 · Mark scheme March 2010 | BLY1AP | Original Q7 | Legacy

Seven	**1**	**3**	**1**	**4**

Answer 18 · Mark scheme March 2010 | BLY1AP | Original Q9 | Legacy

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

Answer 19 · Mark scheme June 2010 | BLY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	used to treat a headache	2
	B	used to treat infections	1
	C	used to treat leprosy	4
	D	used to treat high cholesterol	3

Answer 20 · Mark scheme June 2010 | BLY1AP | Original Q8 | Legacy

Eight	**4**	**1**	**3**	**1**

Answer 21 · Mark scheme November 2010 | BLY1AP | Original Q2 | Legacy

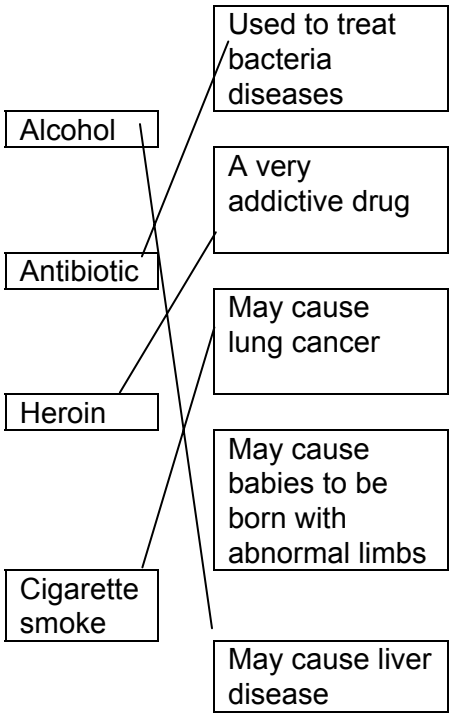
Two	**A**	painkiller	**4**
	B	penicillin	**1**
	C	thalidomide	**3**
	D	vaccine	**2**

4.3.1.8 Antibiotics and painkillers

Answer 22 · Mark scheme

January 2011 | BLY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)		**1** mark for each correct line mark each line from left hand box two lines from left hand box cancels mark for that box	4
3(b)(i)	ecstasy		1
3(b)(ii)	(no) any **one** correct difference eg Ecstasy in Class A but least harmful according to scientists	accept reference to figures	1
3(c)	for pleasure		1
Total			**7**

4.3.1.8 Antibiotics and painkillers

Answer 22 · Mark scheme January 2011 | BLY1F | Original Q3 | Legacy

BLY1F

Answer 23 · Mark scheme June 2011 | BLY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	statins	3
	B	painkillers	4
	C	heroin and cocaine	2
	D	tobacco and alcohol	1

Answer 24 · Mark scheme November 2011 | BLY1AP | Original Q2 | Legacy

Two	**A**	antibodies	**3**
	B	antibiotics	**2**
	C	toxins	**1**
	D	painkillers	**4**

Answer 25 · Mark scheme November 2011 | BLY1AP | Original Q9 | Legacy

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

4.3.1.8 Antibiotics and painkillers

Answer 26 · Mark scheme

June 2012 | BL1FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7 (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
7 (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
7 (c)(i)	75	ignore calculations / %	1
7 (c)(ii)	faster pain relief / decrease	allow pain relief sooner **or** it works quicker **or** more pain relief at start / in first 1 / $1\frac{3}{4}$ hours	1
7 (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 7 continues on the next page . . .

4.3.1.8 Antibiotics and painkillers

BL1FP

Question 7 continued

question	answers	extra information	mark
7 (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 26 · Mark scheme

June 2012 | BL1FP | Original Q7 | Legacy

BL1FP

4.3.1.8 Antibiotics and painkillers

Answer 27 · Mark scheme January 2013 | BL1FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	pathogens		1
3(b)(i)	A disease affecting people in many countries		1
3(b)(ii)	birds fly / migrate OR human contact with birds more likely OR there are more birds (than pigs)	accept converse birds not contained / difficult to control movement	1
3(c)(i)	antibiotics (only) kill bacteria OR antibiotics don't kill viruses	ignore flu is caused by a virus unqualified ignore virus resistant / immune	1
3(c)(ii)	painkillers	accept any correct named painkiller, eg aspirin or paracetamol allow antivirals / Tamiflu ignore medicine / tablets	1
3(c)(iii)	resistant bacteria	in this order	1 1
Total			7

4.3.1.8 Antibiotics and painkillers

Answer 27 · Mark scheme

January 2013 | BL1FP | Original Q3 | Legacy

BL1FP

4.3.1.8 Antibiotics and painkillers

Answer 28 · Mark scheme

Question 3

question	answers	extra information	Mark
3(a)(i)	25 °C		1
3(a)(ii)	pathogens		1
3(b)	**D** more / most bacteria killed	 accept biggest area / ring where no bacteria are growing	1 1
3(c)	viruses live inside cells		1
Total			**5**

4.3.1.8 Antibiotics and painkillers

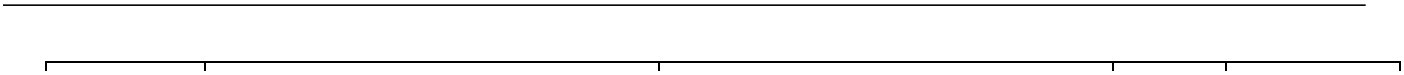
Answer 29 · Mark scheme June 2015 | BL1FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	64		1	AO2 1.1
2(a)(ii)	36	allow e.c.f from (a)(i) i.e. 100 – answer given in (a)(i)	1	AO2 1.1
2(a)(iii)	any **one** from: • only considers 16-year-olds • only about some / 5 countries	ignore lack of evidence allow does not refer to all ages allow does not refer to all countries	1	AO3 1.1
2(b)	the more exercise done the healthier a person is	allow the more exercise done the higher the health rating allow the less exercise done the lower the health rating	1	AO3 1.1.1e
2(c)	having a high cholesterol level		1	AO1 1.1.1d
2(d)(i)	antibodies		1	AO1 1.1.2c/d/e
2(d)(ii)	antibiotics		1	AO1 1.1.2i
Total			**7**	

4.3.1.8 Antibiotics and painkillers

Answer 29 · Mark scheme

June 2015 | BL1FP | Original Q2 | Legacy



4.3.1.8 Antibiotics and painkillers

Answer 30 · Mark scheme June 2016 | BL1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	hand-washing		1	AO1 1.1.2f
5(a)(ii)	small amounts of dead pathogens		1	AO1 1.1.2l
5(a)(iii)	decrease by 60 (%)	 allow from 70(%) to 10(%) allow other correct data treatment	1 1	AO2 1.1.2
5(b)(i)	penicillin		1	AO1 1.1.2h
5(b)(ii)	any **two** from: • antibiotics only kill bacteria • some bacteria are resistant (to antibiotics) • (correct) antibiotics not always used • deficiency disease(s) not caused by bacteria **or** cannot be treated by antibiotics • inherited disease(s) not caused by bacteria **or** cannot be treated by antibiotics • 'lifestyle' diseases not caused by bacteria **or** cannot be treated by antibiotics	 allow antibiotics do not kill viruses allow MRSA not killed by antibiotics allow course not completed eg heart disease / cancer if no other mark given allow **1** mark for not all diseases are caused by bacteria **or** some diseases are caused by viruses	2	AO2 / AO3 1.1.2h/i/j/k 1.1.1a/d
5(c)	bacteria grow faster	allow this is body temp (at which pathogens grow)	1	AO1 1.1.2o
Total			**8**	

4.3.1.8 Antibiotics and painkillers

Answer 30 · Mark scheme

June 2016 | BL1FP | Original Q5 | Legacy

4.3.1.8 Antibiotics and painkillers

Answer 31 · Mark scheme June 2017 | BL1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)		reason must be consistent with safety precaution mark together		AO2 1.1.2m
		ignore germs		
		ignore other safety precautions		
		do **not** allow viruses		
	either			
	Petri dish / culture medium sterile	allow agar sterile	1	
	so no other / harmful microorganisms grow		1	
	OR			
	Petri dish / lid secured (with adhesive tape) (1)			
	so microorganisms cannot leave (1)	allow so other / harmful microorganisms cannot enter ignore spread unqualified		
	OR			
	incubated at 25 °C (1)			
	to prevent / reduce growth of pathogens (1)			
5(b)(i)	any **one** from: • largest / larger area where no microorganisms are growing • most / more microorganisms killed	allow largest clear / white area	1	AO3 1.1.2h/i/j

4.3.1.8 Antibiotics and painkillers

Answer 31 · Mark scheme

5(b)(ii)	*idea of* E may not be best on all / other (types of) microorganism eg tested on only one type of microorganism	allow antibiotics do not kill viruses allow (other) bacteria / microorganisms may be / become resistant (to E) allow deficiency diseases are not caused by microorganisms allow disease may be minor / not life threatening allow only tested once **or** not repeated allow (patient) may be allergic to E allow idea of investigation not carried out at body temperature	1	AO3 1.1.2h/i/j 1.1.1a
5(c)(i)	B **and** C **and** D	all three required in any order for mark additional letters will cancel the mark	1	AO2 1.1.2

4.3.1.8 Antibiotics and painkillers

Answer 31 · Mark scheme

5(c)(ii)	Healthy animals will produce a higher yield.		1	AO3 1.1.2
5(c)(iii)	Microorganisms become resistant to the antibiotic.		1	AO1 1.1.2h/i
5(d)(i)	white	allow phagocytes / lymphocytes / leucocytes do **not** allow other types of blood cell	1	AO1 1.1.2c/d
5(d)(ii)	These blood cells produce antibodies. These blood cells ingest pathogens.		1 1	AO1 1.1.2d
Total			**10**	

4.3.1.8 Antibiotics and painkillers

Answer 31 · Mark scheme

June 2017 | BL1FP | Original Q5 | Legacy

4.3.1.8 Antibiotics and painkillers

Answer 32 · Mark scheme June 2019 | 8461/1F | Original Q5

05.1	gonorrhoea		1	4.3.1.3 AO1
05.2	the bacteria are resistant to the antibiotics		1	4.3.1.3 AO2
05.3	abstain from sex(ual intercourse) **or** wash hands after touching penis / urinating / using the toilet	allow abstinence ignore wash hands unqualified	1	4.3.1.1 4.3.1.3 AO2
05.4	**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.		4–6	4.1.1.6 AO3 x3 AO2 x3
	Level 1: Relevant features are identified and differences noted.		1–3	
	No relevant content		0	
	Indicative Content: **qualitative statements** • **3** works best on **A** • **1** works best on **B** • **2** works best on **C** • **1** is least effective on **A** • **3** is least effective on **B** • **3** is least effective **or** has no effect on **C** **quantitative statements** • **1** kills more of **B** and **C** compared to **A** • **2** kills more of **C** than **A** / **B** • **3** kills more of **A** than **B** and **C** • **2** kills the same amount of **A** and **B** • **2** and **3** killed similar amounts of **B** • **C** are resistant to **3** • only **2** worked well on all of the bacteria • for **A**, **3** works best, **2** is next and **1** is least effective • for **B**, **1** works best, **2** is next and **3** is least effective • for **C**, **2** works best, **1** is next and **3** is least effective for **level 2** reference to qualitative and quantitative statements is required			

Answer 32 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	sample **E**		1	4.1.1.6 AO2
05.6	$\frac{15 + 12 + 13 + 16}{4}$ **or** $\frac{56}{4}$ 14	an answer of 14 scores **2** marks	1 1	4.1.1.6 AO2
05.7	(area = 0.1 × 0.1 =) 0.01 (volume = 0.01 × 0.01 =) 0.0001 (number = $\frac{14}{0.0001}$ =) 140 000	an answer of 140 000 scores **3** marks an incorrect answer for one step does not prevent allocation of marks for subsequent steps allow 1×10^{-2} allow 1×10^{-4} allow ecf from question **05.6** allow 1.4×10^{5} do **not** accept 14×10^{4}	1 1 1	4.1.1.6 AO2
05.8	Q		1	4.1.1.6 AO2
05.9	(bacteria) could make humans ill **or** (bacteria) could kill humans **or** (bacteria) could release toxins	allow reverse argument allow (bacteria) cause infection / disease allow (bacteria) cause appropriately named disease ignore harmful	1	4.3.1.1 AO2
Total			**17**	

4.3.1.8 Antibiotics and painkillers

Answer 32 · Mark scheme

June 2019 | 8461/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.

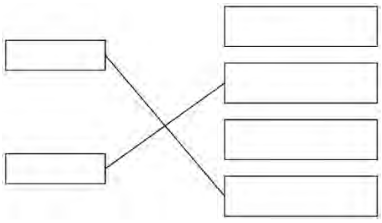
4.3.1.8 Antibiotics and painkillers

Answer 33 · Mark scheme June 2019 | 8461/1F | Original Q6

06.1	circulatory / circulation (system)	allow cardiovascular (system) ignore blood (system) ignore cardiorespiratory system	1	4.2.2.2 4.2.1 AO1
06.2	any valve ringed 	allow more than one valve separately ringed	1	4.2.2.2 AO1
06.3	prevent backflow (of blood) **or** ensure one-way flow	allow correct description of backflow allow maintains (correct) direction of blood	1	4.2.2.2 4.2.2.4 AO1
06.4	vein	allow correctly named veins	1	4.2.2.2 AO1
06.5	any **two** from: (referring to mechanical valves) • long lasting **or** durable **or** does not break / tear **or** does not wear out • do not need to go into hospital / surgery again • no ethical issues (surrounding use of living / animal tissue) • no risk of rejection • no need for anti-rejection / immunosuppressant drugs • no risk of transmission of disease	allow reliable allow less likely to need a replacement (after 5 years) ignore no need for a replacement	2	4.2.2.4 AO3

4.3.1.8 Antibiotics and painkillers

Answer 33 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec.Ref.
06.6	no need to take anti-clotting medication	allow can't hear a pig valve allow can get a better fit with a pig valve allow less leaky with a pig valve allow less likely to get a heart attack / stroke ignore will not get blood clots (around the valve)	1	4.2.2.4 AO3
06.7		an additional line from a medical condition negates the mark	2	4.2.2.2 AO1
Total			**9**	

4.3.1.8 Antibiotics and painkillers

Answer 33 · Mark scheme

June 2019 | 8461/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.

Answer 34 · Mark scheme

November 2020 | 8461/1F | Original Q3

The full source mark scheme begins on page 77. Follow original question 3 in that document.

4.3.1.8 Antibiotics and painkillers

Answer 35 · Mark scheme November 2021 | 8461/1F | Original Q8

08.1	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
08.2	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 35 · Mark scheme

08.3		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) 3.14×1.1^2 **or** 3.14×11^2	allow correct calculation / substitution using an incorrect measurement	1	
	= 3.799(4) (from 3.14×1.1^2) **or** = 379.9(4) (from 3.14×11^2)	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	
08.4	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 35 · Mark scheme

November 2021 | 8461/1F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.3.1.8 Antibiotics and painkillers

Answer 36 · Mark scheme

June 2023 | 8461/1F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.1	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.
06.2	meristem (tissue)		1	AO1 4.1.1.4 4.1.2.3 4.2.3.1

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

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.4	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 36 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.5		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.
06.6	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 36 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.7	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.
06.8	(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.
06.9	have the claims peer reviewed		1	AO1 4.3.1.9

Total Question 1	**13**

4.3.1.8 Antibiotics and painkillers

Answer 37 · Mark scheme

June 2023 | 8461/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	6000 (kJ/m^2/year)		1	AO2 4.7.5.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	$\frac{40}{16\,000} \times 100$ 0.25 (%)		1 1	AO2 4.7.5.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	cows move less indoors it is warmer indoors		1 1	AO1 4.7.5.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	cows are close(r) together	allow cows are in an enclosed space	1	AO2 4.7.5.2 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	any **one** from: • D • G • H		1	AO3 4.6.3.7 4.1.1.6 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	DNA		1	AO1 4.6.3.7

4.3.1.8 Antibiotics and painkillers

Answer 37 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7	reproduction		1	AO2 4.6.3.7 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8	any **two** from: • many animals will become ill • resistant bacteria passed from animal to animal • animals cannot be cured (by the antibiotic) • animals may be less productive / efficient • farmer may lose profit / money	ignore reference to crops allow many animals may die allow disease passed from animal to animal **or** other animals infected allow antibiotic will not work allow less meat / milk produced allow less growth allow cannot sell infected produce / animals	2	AO2 4.3.1.1 4.6.3.7 4.7.5.2

Total Question 4	**11**

4.3.1.8 Antibiotics and painkillers

Answer 38 · Mark scheme

June 2025 | 8461/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.1	pathogens antitoxins	in this order only	1 1	AO1 4.3.1.1 AO1 4.3.1.6 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.2	*measurement* 60 (mm) *conversion* 60 000 (µm) *substitution* $= \frac{60\,000}{4\,000}$ *real width* 15 (µm)	allow measurement in the range 59 (mm) to 61 (mm) allow correct conversion from incorrect measurement allow correct substitution using incorrect conversion allow correct calculation using incorrectly converted value	1 1 1 1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	capillary		1	AO3 4.2.2.2 4.2.2.3

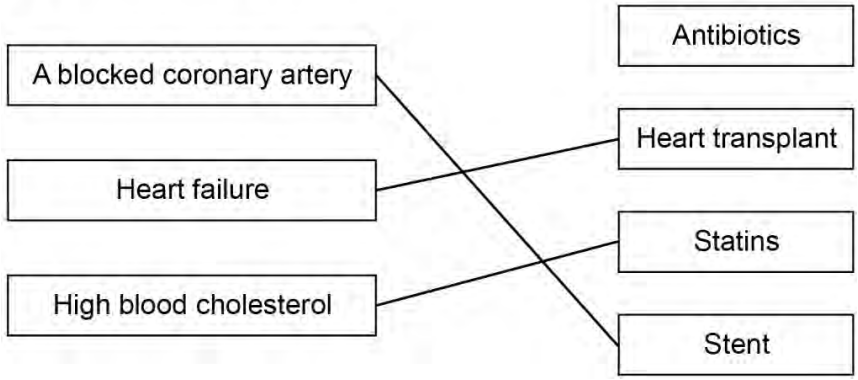
Question	Answers	Extra information	Mark	AO / Spec Ref.
03.4	(blood in arteries) has high pressure (so need thick walls) to withstand / maintain the pressure **or** (so need thick walls) to prevent bursting	 ignore to increase the pressure allow **2** marks for to withstand / maintain high pressure	1 1	AO3 4.2.2.2

4.3.1.8 Antibiotics and painkillers

Answer 38 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.5	deposits / build-up / increase of fat(ty material)	allow deposits / build-up / increase of cholesterol allow deposits / build-up / increase of plaque	1	AO1 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.6	less / no blood flow (so) less / no oxygen / glucose transported (to heart / body)	 allow **2** marks for less oxygenated blood flows if no other marks awarded allow **1** mark for idea that it will lead to a heart attack	1 1	AO1 4.2.2.4

Question	Answers	Mark	AO / Spec Ref.
03.7	**Cardiovascular disease** / **Treatment**  do **not** accept more than one line from a box on the left	1 1 1	AO1 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.8	because it cannot be spread / passed on (from one person to another) **or** because it is not caused by a pathogen / bacterium / virus / fungus / protist / microorganism / microbe	allow not contagious / infectious ignore because it is a lifestyle disease	1	AO2 4.2.2.4

Total Question 3	**16**

4.3.1.8 Antibiotics and painkillers

Answer 39 · Mark scheme

June 2025 | 8461/1F | Original Q4

Question 4

Question	Answers	Mark	AO / Spec Ref.
04.1	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5-6	AO2
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3-4	AO1
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1-2	AO1 4.1.1.6 RPA2
	No relevant content.	0	

4.3.1.8 Antibiotics and painkillers

	Indicative content: *preparation of agar plate* • melt agar • pour agar into Petri dish • allow agar to cool / set *transfer of bacteria* • transfer bacteria to agar / Petri dish **or** spread bacteria on agar / Petri dish • transfer bacteria using (inoculating) loop **or** by pouring (liquid) bacterial culture *techniques to ensure sterile conditions (aseptic technique)* • wipe table with a disinfectant / antibacterial solution **or** sanitise hands using sanitiser gel • sterilise agar by heating **or** using autoclave / UV **or** pressure cooker • sterilise Petri dish by heating **or** using autoclave / UV **or** pressure cooker **or** ethanol • sterilise neck of agar / bacteria bottle by passing through a flame • only open lid of agar bottle minimally **or** only lift lid of Petri dish minimally • work next to a Bunsen flame • sterilise inoculating loop before use by dipping in alcohol / ethanol • sterilise inoculating loop before use by passing through a flame *growth of bacteria* • incubate Petri dish upside down • tape lid (correctly) • incubate at 25 °C **or** leave bacteria to grow For **Level 3**, a valid method must include preparation of the agar plate and transfer of the bacteria using sterile techniques. For **Level 2**, a method must include preparation of the agar plate and transfer of the bacteria.		

4.3.1.8 Antibiotics and painkillers

Answer 39 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	to prevent growth of pathogens	allow to prevent growth of harmful bacteria / fungi / microorganisms	1	AO2 4.1.1.6 RPA2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	to show the effect of no antibiotics		1	AO2 4.1.1.6 RPA2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4		ignore ring drawn around blank / water disc ignore shading / hatching within rings		AO3 4.1.1.6 RPA2
	larger ring drawn around antibiotic **A** than **B**		1	
	smaller ring drawn around antibiotic **C** than **B**	ignore no ring drawn around antibiotic **C**	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	none of the bacteria would have been killed		1	AO3 4.1.1.6 4.3.1.8

Total Question 4	11

4.3.1.8 Antibiotics and painkillers

Answer 40 · Mark scheme

June 2025 | 8461/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	bases		1	AO1 4.6.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	3 / three		1	AO2 4.6.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	mutation		1	AO1 4.6.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	*figures from graph* 40 and 1 *correct equation* $\frac{40 - 1}{12}$ *correct answer* 3.25 (cases per million people per year)	 allow $\frac{39}{12}$ 	 1 1 1	AO2 4.6.3.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	resistant		1	AO1 4.6.3.7

4.3.1.8 Antibiotics and painkillers

Answer 40 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	any **one** from: • discovery of a new antibiotic / drug / treatment • vaccination • isolation of patients • better / improved education about MRSA • better hygiene	 allow social distancing allow increased awareness of MRSA allow examples such as more / better hand washing (in hospitals)	1	AO2 4.6.3.7

Total Question 5	**8**

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

BLY1F 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.

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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.

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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;

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

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

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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

BLY1F Question 1

	answers	extra information	mark
(a)(i)	any **two** from: • light • water • space • nutrients / ions / minerals / named • carbon dioxide / CO_2	list principle ignore oxygen / food / sun	2
(ii)	less competition for water **or** more water / nutrients / minerals available	ignore space / light / food	1
(b)	camouflage / same shape as leaf / looks like a leaf	allow ‘blends in’ ignore colour	1
total			4

4.3.1.8 Antibiotics and painkillers

BLY1F Question 2

	answers	extra information	mark
(a)	any **three** from: • water • ions / minerals / salts • temperature • blood sugar • heart rate • blood pressure	 allow breathing / oxygen / carbon dioxide allow sodium / chloride, other ions neutral allow heat ignore urea	3
(b)	contraceptive drug fertility drug		1 1
(c)(i)	eg nicotine, alcohol, cocaine, heroin, painkillers, tranquilisers, LSD	allow cannabis / weed or other alternative names allow tobacco ignore smoking / ecstasy	1
(ii)	alters body chemistry **or** craving / needing / dependence withdrawal symptoms on stopping	allow psychological dependence allow withdrawal described allow ‘feel ill without it’	1 1
total			8

4.3.1.8 Antibiotics and painkillers

BLY1F Question 3

	answers	extra information	mark
	joining		1
	sexual		1
	identical		1
	asexual		1
	clones		1
total			5

BLY1F Question 4

	answers	extra information	mark
(a)	7.8		1
(b)	14 / 13.6	allow answer 13 without working for **1** mark 7500 ÷ 550 gains **1** mark	2
(c)	produces / increases blood cholesterol	ignore obesity	1
	affects heart **or** affects blood vessels **or** affects blood pressure	 accept clogs blood vessels	1
(d)	(increases) blood pressure	ignore references to heart / blood vessels	1
total			6

4.3.1.8 Antibiotics and painkillers

BLY1F Question 5

	answers	extra information	mark
(a)	fossils / teeth / bones / skeleton / foot prints	allow cave drawings do **not** accept scientists have seen them	1
(b)	only (some) bones remain / soft parts have decayed	accept 'no-one has ever seen one' allow no photos, no pictures, no drawings	1
(c)	any **two** from: • hunted by human • (new) predator • (new) competitor • (new) disease • environment changed / named environmental change • prey extinct / loss of food supply	 allow more predators allow natural disaster ignore not enough food	2
total			4

4.3.1.8 Antibiotics and painkillers

BLY1F Question 6

	answers	extra information	mark
(a)(i)	56	accept 54 – 58	1
(ii)	increased		1
	reasonable qualification eg slowly then more quickly **or** to 174 / 176 **or** by 138 / 140		1
(b)	any **two** from:		2
	• no immunity **or** antibodies ineffective	accept no resistance	
	• no vaccines **or** humans not immunised		
	• idea of large scale contact **or** large scale travel	do **not** accept passed on ignore no cure	
total			5

4.3.1.8 Antibiotics and painkillers

BLY1F Question 7

	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

BLY1F Question 8

	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

Version 1: 0109

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Biology 4411

BLY3F Unit Biology 3

Mark Scheme

2009 examination – January series

4.3.1.8 Antibiotics and painkillers

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4.3.1.8 Antibiotics and painkillers

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4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
1(a)(i)	artery		1
1(a)(ii)	capillary		1
1(b)	alveoli		1
	red blood cells		1
	nucleus		1
Total			**5**

4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
2(a)(i)	energy		1
2(a)(ii)	microorganisms		1
2(b)(i)	25°C		1
2(b)(ii)	pathogens		1
Total			**4**

4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

<table>
<tr><th>question</th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>3(a)</td><td>178</td><td>ignore working or lack of working

correct working: 180 – 2 but no answer / wrong answer = 1 mark</td><td>2</td></tr>
<tr><td>3(b)</td><td><table><tr><th>Man A</th><th>Man B</th></tr><tr><td>higher</td><td>lower</td></tr><tr><td>lower</td><td>higher</td></tr><tr><td>lower</td><td>higher</td></tr></table></td><td>all 4 cells correct = 2 marks
2 or 3 cells correct = 1 mark
0 or 1 cells correct = 0 mark</td><td>2</td></tr>
<tr><td>Total</td><td></td><td></td><td>4</td></tr>
</table>

4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
4(a)	yeast		1
4(b)(i)	**two** sensible suggestions, each linked to correct explanation:	max **4** marks	
	does not release CO		1
	gas is toxic / harms living organisms		1
		allow ethanol <u>only</u> releases CO_2 and H_2O for **1** mark	
	does not release NO_x / SO_2	do **not** allow more pollution / more gases released	1
	gas(es) cause acid rain / eq / harms organisms		1
	or		
	does not cause acid rain (1)		
	(acid rain) damages building / harms organisms (1)		
	made from crops / not a fossil fuel (1)		
	crops can re-grow / source is renewable / fossil fuels are non-renewable (1)		
4(b)(ii)	any **one** from • releases less energy (per litre) • need to burn more to cover same distance / travel shorter distance • land not being used for food crops / less food available • raises food prices		1
Total			**6**

4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
5(a)	40–60 hours		1
5(b)(i)	decrease 1st slowly then faster / appropriate detail from the graph eg from 7.8 to 0 / faster after 4-10 h		1 1
5(b)(ii)	oxygen after glucose oxygen less than glucose	extra box ticked cancels **1** mark	1 1
5(b)(iii)	aerobic respiration		1
Total			**6**

4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
6(a)(i)	kill / destroys (micro)organisms / bacteria / fungi / living things	do **not** allow get rid of microorganisms	1
6(a)(ii)	entered from environment / already in flask **or** insufficient heating to kill all microorganisms		1
6(b)	any **two** from: • heated more thoroughly / for longer / higher temperature • destroyed / killed all microorganisms • sealed better eg flask melted / sealed immediately after heating / no pouring through air • microorganisms unable to enter (from air) / can only enter when neck broken / open		2
6(c)	biogenesis		1
Total			**5**

4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
7(a)(i)	19 800	for correct answer ignore working or lack of working 165 × 120 but no answer / wrong answer = **1** mark (ignore extras)	2
7(a)(ii)	any **two** from: • for respiration • energy released • prevents anaerobic respiration • prevents build-up of lactic acid	 ignore oxygen debt allow energy produced	2
7(b)	any **two** from: • increased breathing rate • increased depth of breathing **or** deep breathing • dilation of arteries / vasodilation • blood diverted from elsewhere	 } more breathing is max **1** mark ignore increase in heart rate allow heavier breathing do **not** allow harder breathing allow blood vessels dilate do **not** allow veins / capillaries dilate ignore name of organ	2
Total			**6**

4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
8(a)	transpiration / evaporation / diffusion	ignore osmosis	1
8(b)(i)	D		1
8(b)(ii)	any **two** from: • more / faster diffusion **or** evaporation **or** transpiration • molecules move faster • maintains concentration gradient **or** keeps water concentration low in the air **or** brings in more dry air **or** removes damp air / water		2
Total			**4**

4.3.1.8 Antibiotics and painkillers

COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
9(a)	prevents denaturation / change / damage of proteins / enzymes **or** prevents bacteria being killed / destroyed	allow protein is 'destroyed' do **not** allow 'bacteria denatured' **or** 'protein killed'	1
9(b)(i)	any **two** from: • anaerobic respiration • lactic (production) • acid (produced)	do **not** allow 'bacteria are acidic' allow max **1** mark if incorrect named acid	2
9(b)(ii)	any **one** from: • thickens / clots / solidifies (milk) • kills other microorganisms **or** prevents other microbes growing • preserves yoghurt **or** prevents yoghurt going off **or** makes yoghurt last longer **or** keeps it fresh • reference to (improved) flavour	allow reference to germs	1
9(c)	reduce / prevent growth / reproduction of microorganisms **or** to prevent decay **or** to preserve it **or** to keep it fresh **or** to prevent it becoming <u>too</u> sour	allow reference to germs ignore curdling	1
Total			**5**

4.3.1.8 Antibiotics and painkillers

AQA

GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2020

Version: 1.0 Final Mark Scheme

jun2084611F/MS

4.3.1.8 Antibiotics and painkillers

MARK SCHEME – GCSE BIOLOGY – 8461/1F – 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

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

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.

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.

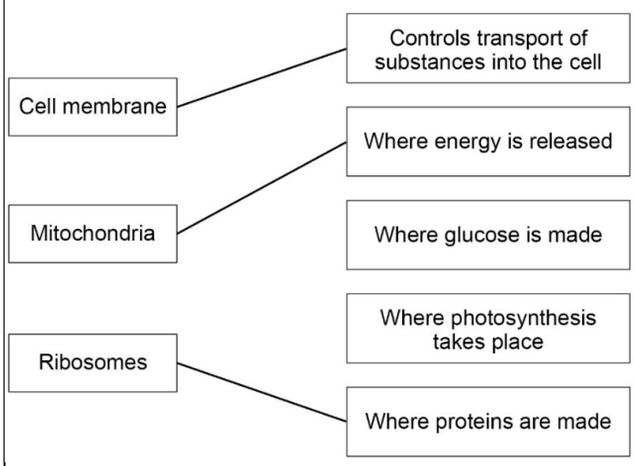
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	bacterium		1	AO2 4.1.1.1
01.2	to strengthen the cell		1	AO1 4.1.1.1 4.1.1.2
01.3	chloroplast		1	AO2 4.1.1.2 4.2.3.1
01.4	**Structure** **Function**  additional line from a box on the left negates the mark for that box		3	AO1 4.1.1.2 4.1.3.1
01.5	adjust the focus knob		1	AO3 4.1.1.2 RPA1
01.6	(A =) 15 (mm) (B =) 60 (mm)	allow a tolerance of ± 1mm	1 1	AO2 4.1.1.2 RPA 1
01.7	$\frac{60}{15} = 4(.0)$	allow ecf from question **01.6**	1	AO2 4.1.1.2 RPA 1

4.3.1.8 Antibiotics and painkillers

01.8	$\frac{40}{0.1}$ 400	 do **not** accept if a unit is given	1 1	AO2 4.1.1.5 RPA 1
Total			**12**	

4.3.1.8 Antibiotics and painkillers

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	mitosis		1	AO1 4.1.2.2
02.2	all lines correct = **2** marks 1 or 2 lines correct = **1** mark **Stage of cell cycle** / **What happens during that stage** Stage 1 → The cell grows and the chromosomes replicate Stage 2 → One set of chromosomes is pulled to each end of the cell Stage 3 → The cytoplasm and cell membrane divide to form two new cells additional line from a box on the left negates the credit for that box		2	AO1 4.1.2.2
02.3	$\frac{7}{10} \times 100$ 70(%)	allow $\frac{252}{300} \times 100$ allow answer calculated from angle in range 250° to 254° if no other mark awarded, allow 0.7 for **1** mark	1 1	AO2 4.1.2.2
02.4	3		1	AO2 4.1.2.2
02.5	DNA	allow deoxyribonucleic acid	1	AO1 4.1.2.1 4.1.2.2
02.6	a gene		1	AO1 4.1.2.1

4.3.1.8 Antibiotics and painkillers

02.7	(bone marrow) cells differentiate into many / other types of (named) cell (so) will cure diseases where new cells are needed **or** will cure diseases where cells are damaged	allow (bone marrow) cells can become many / other types of (named) cell allow (so) will cure anaemia / leukaemia **or** blood cancer **or** blood disorders allow (so) will cure paralysis / diabetes	1 1	AO1 AO2 4.1.2.3
Total			**10**	

4.3.1.8 Antibiotics and painkillers

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • bacteria • fungi • protists	allow singular allow names of pathogens e.g. Salmonella ignore virus / germ	1	AO1 4.3.1.1 4.3.1.3 4.3.1.5
03.2	hydrochloric acid is produced by the stomach the skin is a barrier covering the whole body		1 1	AO1 4.2.2.1 4.3.1.6
03.3	white blood cells engulf the microorganisms.		1	AO1 4.2.2.3 4.3.1.6
03.4	weakened fast	in this order only	1 1	AO1 4.3.1.7
03.5	by coughs / sneezes	allow 'by droplets in the air' do **not** accept other means of transmission e.g. touch	1	AO1 4.3.1.1 4.3.1.2
03.6	(from day) 10 (to day) 18	allow (from day) 18 (to day) 10	1	AO2 4.3.1.2
03.7	14 (days)	allow in the range 13 to 15 (days)	1	AO3 4.3.1.2
03.8	any **one** from: • they had been vaccinated • they already had antibodies • they were immune • they had had it before • they did not get any / enough virus from infected child • they did not play (much) with the infected child	 ignore they were resistant ignore they wore a mask unqualified	1	AO3 4.3.1.2 4.3.1.7

4.3.1.8 Antibiotics and painkillers

03.9	antibiotics do not kill viruses	allow antibiotics do not work on viruses allow antibiotics only kill bacteria	1	AO3 4.3.1.8
Total			**11**	

4.3.1.8 Antibiotics and painkillers

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	increased (at first) until 4 minutes **or** 50 breaths per minute (then) stayed constant (from 4 minutes **or** at 50 breaths per minute)		1 1 1	AO2 4.4.2.2
04.2	175 (beats per minute)		1	AO2 4.4.2.2
04.3	140 (beats per minute)		1	AO2 4.4.2.2
04.4	because his rate is lower than the maximum safe rate	allow ecf for incorrect values in question **04.2** and question **04.3**	1	AO3 4.2.2.2 4.4.2.2

4.3.1.8 Antibiotics and painkillers

04.5	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO2
	No relevant content	0	

	Indicative content
	
	• heart rate increased
	  ○ to increase blood flowing to muscles / lungs
	  ○ to provide more oxygen (to muscles)
	  ○ to provide more glucose (to muscles)
	  ○ to remove carbon dioxide more quickly (from the muscles / blood)
	  ○ to remove lactic acid more quickly (from the muscles)
	
	• breathing rate increased
	  ○ supplies more oxygen / air to lungs
	  ○ so more oxygen to blood
	  ○ more carbon dioxide removed
	
	• more oxygen to muscles
	  ○ needed for (increased) respiration
	  ○ to release / provide energy
	  ○ for muscle contraction
	
	• anaerobic respiration occurs
	  ○ due to lack of oxygen
	  ○ which causes a build-up of lactic acid
	  ○ oxygen debt
	  ○ muscle fatigue / pain
	
	To reach **Level 3**, there must be reference to heart rate, breathing rate and respiration
			4.2.2.2
			4.2.2.3
			4.4.2.1
			4.4.2.3
			4.4.2.2

Total			**12**

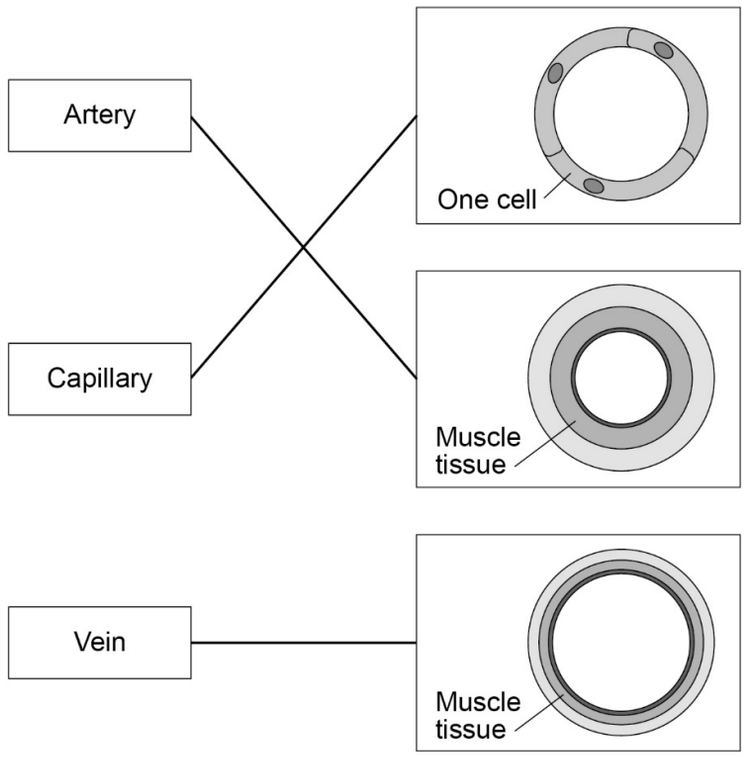
4.3.1.8 Antibiotics and painkillers

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	will stop animals / herbivores eating it	allow it will not be eaten	1	AO3 4.3.3.2
05.2	chemical		1	AO1 4.3.3.2
05.3	thorns / spikes / spines / prickles (to stop animals / herbivores eating it)		1	AO3 4.3.3.2
05.4	for respiration to store as starch		1 1	AO1 4.4.1.3 4.4.2.1
05.5	add Benedict's (solution / reagent to the liquid) boil / heat (if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red	 allow any temperature of 65 °C or above	1 1 1	AO1 4.2.2.1 RPA 4
05.6	(nitrate ions are needed) to make proteins / amino acids which are needed for growth / enzymes / new cells	allow to make chlorophyll / DNA / ATP / nucleic acid allow correct process for named molecule in mp1	1 1	AO1 AO2 4.1.3.3 4.4.1.3 4.4.2.3
05.7	in / on the (soil) water	allow through air (spaces) in the soil	1	AO3 4.3.1.1 4.3.1.4
05.8	dosage toxicity		1 1	AO1 4.3.1.9

4.3.1.8 Antibiotics and painkillers

05.9	placebos		1	AO1 4.3.1.9
Total			**14**	

4.3.1.8 Antibiotics and painkillers

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	all lines correct = **2** marks 1 **or** 2 lines correct = **1** mark **Type of blood vessel** / **Structure of blood vessel**  additional line from a box on the left negates the credit for that box		2	AO2 4.2.2.2

4.3.1.8 Antibiotics and painkillers

06.2	any **one** from: • thick(er) (muscle) walls / tissue (1) to push blood (all) around the body (1) **or** • thick(er) elastic walls / tissue (1) to maintain / withstand high (blood) pressure **or** to retain / regain shape (1) **or** • narrow lumen (1) to maintain high (blood) pressure (1)	allow to withstand high (blood) pressure do **not** accept to pump blood (all) around the body	2	AO1 4.2.2.2
06.3	(A) – white (blood) cell(s) (B) – platelet(s)	allow any named white (blood) cell(s)	1 1	AO2 4.2.2.3
06.4	(no nucleus) more space for haemoglobin / oxygen (has haemoglobin) to bind / carry oxygen	allow to carry more oxygen ignore carries carbon dioxide	1 1	AO3 4.1.1.2 4.1.1.3 4.2.2.3
06.5	plasma		1	AO1 4.2.2.3
06.6	platelets		1	AO3 4.2.2.3

4.3.1.8 Antibiotics and painkillers

06.7	any **one** from: • (continued) bleeding • (more) bruising	allow described allow blood does not clot (at cuts) allow ecf from answer to question **06.6**	1	AO3 4.2.2.3
Total			**11**	

4.3.1.8 Antibiotics and painkillers

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	*before arrow* carbon dioxide **and** water *after arrow* glucose	allow correct chemical symbols ignore any attempt at balancing equation ignore light / chlorophyll either order ignore sugar / carbohydrate do **not** accept starch	 1 1	AO1 4.4.1.1
07.2	<u>light</u> (light) is captured / trapped / absorbed by chlorophyll / chloroplasts	ignore description of subsequent parts of the photosynthesis reaction allow sun<u>light</u> ignore sun allow (light) is used by chlorophyll / chloroplasts	1 1	AO1 4.1.1.2 4.4.1.1
07.3	$\frac{(18.5 + 19.3 + 19.5)}{3}$ **or** $\frac{57.3}{3}$ 19.1 (cm^3/hour)	 allow an answer correctly calculated using only two correct values	1 1	AO2 4.4.1.2 RPA 6
07.4	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

07.5	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
07.6	did not use it in calculation (of mean)		1	AO3 4.4.1.2 RPA 6
07.7	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
07.8	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

07.9	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.
08.1	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	
08.2	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

08.3	**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

08.4	Osmosis	allow diffusion	1	AO1 4.1.3.1 4.2.3.2 4.1.3.2
08.5	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

Answer 34 · Examiner comments November 2020 | 8461/1F | Original Q3

Question 3 (low & standard demand)

Throughout this question, students commonly used the term ‘infection’ as a synonym for bacteria, resulting in many unclear answers. **03.9** differentiated well between lower- and higher-attaining students.

Answer 36 · Examiner comments June 2023 | 8461/1F | Original Q6

Question 6 (Standard demand)

06.1 Whilst most students could describe a tissue as being ‘a group of cells’, with many of these going on to state that these cells were ‘working together’; this was insufficient for credit. Further qualification in respect of the cells being ‘similar’ or of the cells ‘having a particular function’ was required to gain this mark. Thus, relatively few students were rewarded. It was evident that some students struggled, as ideas such as tissues being ‘parts of organs’ were not uncommon. Almost 79% of students failed to gain the mark.

06.2 Many answers referred to parts of the plant, such as xylem or root hairs. Knowledge of ‘meristem’ as being the tissue in plants where stem cells are found was by no means widespread. Some students had not read the question carefully enough and suggested animal tissues, most commonly ‘bone marrow’. Just over 10% of students knew that meristem tissue contains stem cells and gained the mark.

06.3 A wide variety of plants were suggested, along with some suggestions of plant tissues and even fictitious plants such as ‘the aspirin tree’, perhaps as students struggled to recall the answer and had been trained to write down something, rather than nothing – that said, 17% of students did not attempt a response at all. Of the plants given in responses, ‘willow’ was

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by far the most common and gained the mark for over 18% of students. Others such as 'foxglove' were mentioned, indicating a recollection of plants named in the specification.

06.4 Many answers simply repeated information given in the table, such as 'berries have the least mass of the chemical', but this was not sufficient as it does not explain why the berries are picked in preference to leaves or roots. Vague answers such as there being 'more berries' were also insufficient to gain credit. Around a quarter of students gain the mark, with common correct answers referring to the idea that picking berries would not harm the plant, that berries would be 'easier to collect' or that 'the chemical would be easier to extract'.

06.5 Relatively few students managed to complete the calculation correctly, with only 4% gaining all 4 marks. The most common error was by students who did not know the conversion factor for grams to milligrams. Fortunately, this usually only cost students 1 of the 4 marks, as answers which had used the incorrect conversion factor (whether this involved multiplying or dividing by an incorrect multiple of 10) were still able to gain the final mark. Students often got only part way through the calculation, stopping at 0.72 or 2.4, for 1 mark only; however, the 3rd and 4th marking points could still be gained if correctly addressed. Some students divided values, rather than multiplying, as was needed, whilst others arrived at somewhat unlikely answers equivalent to many hundreds of grams, far exceeding the 200 g mass of plant tissue it was extracted from. Nearly half of all responses gained no credit – either because it was not attempted – or completely incorrect.

06.6 Around 30% of students gained the mark in this question. A lack 'of magnesium' or 'of chlorophyll' was quite well known and many students gained this mark. Answers often implied a degree of speculation by students, but those who did attempt an answer may have been rewarded for this, as, for example, a lack 'of light' or of water' were both credited. A description of 'an infection' along with naming any plant disease also gained credit, as students are not expected to know, for example, that the tobacco mosaic virus does not infect nightshade plants. A not infrequent suggestion was that having chlorosis would 'put animals off from eating them', as students interpreted the question as asking for an advantage of having chlorosis, rather than what had caused the condition.

06.7 There were many good answers to this question, with frequent references to toxicity, dosage and efficacy. Some students, though, offered two ideas relating to toxicity, with descriptions regarding safety and side effects: thus, gaining only the one mark. However, over 90% of students gained some marks in this question, which was pleasing.

06.8 Many responses referred to writers of the report, or companies who might want the public to use or avoid the drug, however relatively few references to one party or another making financial loss or gain were made and as such only around 10% of students were awarded the mark. Other insufficient responses referred to ethics of using plants or the possibility that habitats might be destroyed by large nightshade plantations. Students only needed to refer to people 'buying' or someone 'selling' the product, to gain the mark or alternatively the idea that the writer of the biased report might have been 'paid' for their work.

06.9 Nearly 64% of students correctly indicated that scientists should 'have the claims peer reviewed' to be sure claims are valid.

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Question 4

This question was about energy balances for cattle raised indoors and outdoors, and problems caused by the development of antibiotic resistance in bacteria that might cause disease in the cattle.

04.1 This was a simple sum that required selection of appropriate data from Table 3. Although many students used the data correctly, it was clear that many did not read the question or the table headings correctly, as a variety of answers such as '6002' (adding all the values) and '5900' (subtracting, rather than adding) were given instead of the required value: 6000.

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04.2 Many students were able to substitute the correct values into the equation, thus gaining the first mark. However, when it came to giving a final answer, it was not uncommon for students to multiply the answer by 100 again, giving an answer of '25%', rather than 0.25%, thus showing a weak understanding of percentages. Fewer than half the students arrived at the correct answer.

04.3 Half the students were able to select both less movement indoors and it being warmer indoors as two reasons why it was more energy efficient to keep cattle indoors.

04.4 This question was generally well done with more than three-quarters of students stating that the cows were 'closer together' indoors and hence diseases would spread more rapidly. The idea of being 'in an enclosed space' was seen occasionally.

04.5 From Figure 7, it was evident to two-thirds of students that the antibiotic discs with no zone of inhibition (either D, G or H) were ones to which the bacterium was resistant.

04.6 The vast majority also understood that a change in a bacterium's DNA (rather than carbohydrate or lipid) was responsible for antibiotic resistance.

04.7 Most students also understood that a change in one bacterium could cause millions more to become resistant due to the bacteria having a high rate of reproduction.

04.8 The fact that antibiotic resistance in bacteria could become a problem to farmers was variously attributed to illness in the farmer's cattle, their productivity decreasing and them not being able to be cured of their illness by antibiotic treatment and hence the farmer's profits being decreased. Some students struggled to be able to express themselves sufficiently clearly in their answers and only one-quarter scored both of the available marks.

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Question 3 (low demand)

03.1 85% of students scored both marks in this question. The most commonly seen error was confusion between antitoxins and antibiotics.

03.2 Over half of all students scored full marks in this question, with the next most common mark being 3, indicating that the majority of students found this question easy to access. Guidance was provided through the use of scaffolding for each of the steps involved and this allowed many students to access at least 3 marks. A mistake made in one step did not necessarily preclude credit being awarded elsewhere. Common errors included:

- incorrect measurements of the white blood cell, giving answers in cm or inches, or referring to the vertical line rather than to the horizontal line for width.
- incorrectly carrying out the conversion by dividing, rather than multiplying, by 1000
- incorrectly transferring numbers from one step to another by omitting or adding zeros
- using the original pre-conversion width, rather than the calculated one in micrometres, in the final substitution.

03.3 Just under half of all students were able to identify the capillary shown in the figure.

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03.4 Although some students had a clear appreciation of why arteries needed to have thick walls, many (40%) were unable to gain even one mark here. The reasons behind this reflected both a lack of understanding and ineffective expression. MP1 required reference to high pressure, i.e. the conditions that made thick walls essential, and not just to 'pressure' without qualification that the pressure was 'high'. References to volume, rate of flow, direction of flow or the concentration of blood were also not creditworthy. To achieve MP2, responses then had to go on further, with an explanation of what the thick walls allowed or prevented. Responses that did not gain credit here were either:

- too vague, such as 'to stop damage', 'to prevent bleeding' or 'to keep the blood inside'.
- incorrect, such as 'to pump blood around', 'stop backflow' or 'protect from pathogens'.

03.5 10% of students did not attempt this question and a further 60% did not score credit. Many misinterpreted what was being asked for and answered in terms of risk factors, such as 'smoking', outcomes such as 'reduced blood flow' or treatments such as 'stents'. In some cases, responses were too vague to be creditworthy, such as 'blockages occur'. Incorrect answers included 'muscles in the walls contract', 'they shrink' or 'fatty acids build up'.

03.6 Many students gave answers which matched MP1 but fewer gained MP2 and as such, 50% of students scored one mark, with a further 15% scoring two marks. Responses such as 'it will create a blockage', 'it can lead to a reduction (or increase) in blood pressure', 'it causes blood to clot', 'it leads to blood flowing backwards' or 'the vessels are more likely to burst' were either insufficient or incorrect and gained no credit.
A significant number of students gained the fall-back mark by referring to the idea of the narrowed arteries leading to a heart attack.

03.7 Nearly half of all students scored full marks in this question, with the most common being a link between 'high blood cholesterol' and 'antibiotics'. The majority of students correctly associated 'heart failure' with 'heart transplant'.

03.8 Nearly three quarters of students gained credit in this question. Responses which were unable to gain credit included 'it cannot be treated', 'it is caused by the build-up of plaque', 'it has symptoms which are not easy to see' and 'it happens inside the body'.

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Question 4 (low and standard demand)

04.1 This was a levelled, extended response question based on a required practical. Students were asked to describe a method to grow bacteria on a sterile agar plate. Around 20% of responses were awarded a mark within Level 3, 50% in Level 2 and 15% in Level 1. Students achieving Level 1 gave one or more appropriate points from the indicative content, but these were insufficient to allow a valid outcome to their method.

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To enter Level 2, students had to make clear how an agar plate could be prepared to grow a sample of bacteria. This was the minimum requirement to match the Level 2 descriptor of 'identifying most steps in the method'.
To enter Level 3, students had to go further and give examples of aseptic techniques; by doing this, they were able to fulfil the other requirements of the question, including preparing a plate that was 'sterile' and growing a sample of 'uncontaminated' bacteria. Those students who matched the Level 3 criteria generally showed excellent knowledge and understanding of the steps involved. Their descriptions were detailed and appropriately sequenced. The responses of many students, however, remained in Level 2. They appreciated the fundamental steps of preparing and inoculating a plate but struggled to give clear mention of the aseptic techniques that should be followed. Reference to heating the inoculating loop (or some other, identifiable, description) was frequently seen but, without further points, Level 3 was not achievable. Other indicative content was often hinted at but was too vague to be considered. So, answers such as 'other bacteria from the air should be prevented from entering the plate', 'the rod should be sterilised' or 'the bench should be cleaned' were all insufficient as they did not describe how these steps should actually be carried out.

Fewer answers remained in Level 1 and those that did were either very limited in content or made confused comments such as using the Bunsen burner to heat the plate after bacteria had been added. The statements students make in these extended response questions do not need to be long or complex and it is never necessary to include all the points listed in the indicative content on the mark scheme to achieve the highest level. Neither do responses have to be written in complete sentences - succinct bullet points often suffice and may even help students to organise their ideas more effectively. As is always the case with extended response questions, however, answers are considered holistically and always in a positive framework. It was pleasing here to see some students entering Level 3 and achieving high marks.

04.2 Few students (just under 10%) gave a correct answer to this question. The reference to temperature triggered lines of thought which were inappropriate and gained no credit such as:

- a higher temperature could lead to faster growth of bacteria and this could be dangerous.
- a higher temperature might be too high and cause the bacteria to be killed / enzymes to be denatured / the antibiotics not to work.
- a higher temperature might cause the agar to melt.

Answers which suggested that the higher temperature might cause the bacteria to 'become' dangerous were also not creditworthy.

04.3 65% of students were able to identify the purpose of the control disc in the investigation.

04.4 Some students struggled to appreciate that the *difference* in the effectiveness of each antibiotic had to be reflected in their answers and simply drew rings, as requested, around A and C but without any distinctions at all. Others gave a smaller ring around A

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but a larger one around C. Many, however, clearly understood this RPA and gave clear and correct answers. Students should be encouraged to use a pencil, at least in the first instance, when answering questions involving drawing. Answers often showed that students had changed their minds but were unable to erase and correct a first attempt. It was, therefore, difficult for examiners to appreciate their final intentions. Over 11% of students did not attempt this question and students are encouraged to check that all questions have been answered, particularly where no answer lines are provided.

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Question 5 (Low and Standard demand)

05.1
Almost 75% of students knew that A, C, G and T are called bases.

05.2
Only 40% of students correctly calculated that 3 amino acids were coded for by the section of DNA given. The most common wrong answers were 2, 4 and 9. Some students who gave 2 as their answer had highlighted the two copies of AGTA within the sequence.

05.3
Almost three quarters of students knew that a change in DNA is called a mutation.

05.4
Students were given a graph showing cases of MRSA in one country and asked to calculate the mean rate of increase for a period of 12 years. There was a lot of confusion about how to do this calculation and only 10% of students achieved full marks.
The most common incorrect answer was seen when students chose to add up the cases per million for each year from 1993 to 2003 and divide by either 12 (years) or 7 (number of readings). Although their list of readings from the graph would have included 1 and 40, MP 1 could only be awarded if the student went on to indicate that these were the relevant readings for this question.

There was a number of incorrect readings from the graph that could not gain credit for mark point 1 – but did not preclude the student from gaining subsequent mark points. Other common errors were forgetting to subtract the 1 or reading the graph as 1 million and 40 million rather than 1 and 40. Many students gained mark point 1 for the correct readings from the graph but then proceeded to do the wrong calculation. Some students gained mark point 1 for getting 39 by adding together the increase between each straight section of the graph; '5 + 5 + 2 + 6 + 6 + 15' rather than doing 40 – 1.
10% of students chose not to attempt this calculation.

05.5
Nearly 60% of students knew that the word resistant describes bacteria that are not killed by antibiotics.

05.6
Students were asked to suggest a reason for the decrease in MRSA cases after 2006. A pleasing 60% of students were able to do so with all bullet points seen across the range of responses. By far the most common correct answer was to do with vaccination. Many students also implied the discovery of a new antibiotic/drug by referring to one that works to kill the bacteria (as opposed to the current ones that do not). Some students missed out on the mark by just referring to 'a cure being found' – which was too vague.