AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.1.3

Biotic factors

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**36**
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.

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

Answer 02 · 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**

4.7.1.3 Biotic factors

Answer 03 · 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

4.7.1.3 Biotic factors

Answer 03 · Mark scheme January 2008 | BLY1F | Original Q6 | Legacy

BLY1F

Answer 04 · Mark scheme March 2008 | BLY1AP | Original Q2 | Legacy

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

Answer 05 · Mark scheme March 2008 | BLY1BP | Original Q1 | Legacy

One	**A**	Large eyes	**1**
	B	Sticky pads on feet	**4**
	C	Long hind legs	**3**
	D	Green and brown skin	**2**

Answer 06 · 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**

Answer 07 · Mark scheme June 2008 | BLY1BP | Original Q5 | Legacy

Five	**A**	extinction	**4**
	B	natural selection	**1**
	C	mutation	**3**
	D	variation	**2**

Answer 08 · Mark scheme November 2008 | BLY1BP | Original Q6 | Legacy

Six	**3**	**1**	**4**	**1**

4.7.1.3 Biotic factors

Answer 09 · Mark scheme

June 2009 | BLY1BP | Original Q1 | Legacy

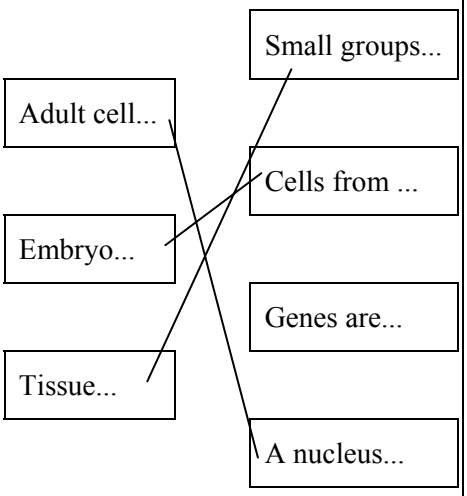
One	**A** wide, to stop the bird sinking into the sand	**4**
	B long, to reach animals buried deep in the sand	**1**
	C long, to help the bird to see predators approaching	**3**
	D thick, to provide an insulating layer	**2**

4.7.1.3 Biotic factors

Answer 10 · Mark scheme

June 2009 | BLY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	killed by poachers / killed for tusks less trees / leaves to eat land available disappearing	 ignore feed on lots of leaves 	1 1 1
4(b)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	max 3
Total			**6**

4.7.1.3 Biotic factors

Answer 10 · Mark scheme June 2009 | BLY1F | Original Q4 | Legacy

BLY1F

4.7.1.3 Biotic factors

Answer 11 · Mark scheme

June 2009 | BLY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	streamlined / aerodynamic / swept-back / arrow-shaped / dart-shaped wings / tail OR large / long wings	allow pointed / curved wings ignore pointed tail / beak ignore large tail	1
6(b)	no / fewer insects / food (in winter)	allow **too** cold ignore not adapted to cold ignore day length	1
6(c)(i)	any **two** from • feed / hunt at different heights **or** swifts feed higher up • feed / hunt at different times **or** swifts feed at night • arrive / depart at different times		2
6(c)(ii)	nesting sites / territory / habitat	allow homes / space ignore food unqualified allow well qualified food answers eg insects / food near the ground **or** insects / food when it's light **or** insects / food between early May and early August	1
Total			**5**

4.7.1.3 Biotic factors

Answer 11 · Mark scheme

June 2009 | BLY1F | Original Q6 | Legacy

BLY1F

4.7.1.3 Biotic factors

Answer 12 · 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**

4.7.1.3 Biotic factors

Answer 12 · Mark scheme January 2010 | BLY3F | Original Q5 | Legacy

BLY3F

Answer 13 · Mark scheme March 2010 | BLY1BP | Original Q1 | Legacy

Question	Key		
One	**A**	Excellent eyesight	**3**
	B	Sharp beak	**4**
	C	Strong powerful claws	**2**
	D	Powerful wings	**1**

4.7.1.3 Biotic factors

Answer 14 · Mark scheme

June 2010 | BLY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	predation / eaten	ignore competition	1
7(b)	could run faster / jump higher / climb better to escape / or escape describe		1 1
7(c)(i)	natural selection		1
7(c)(ii)	Darwin		1
Total			**5**

4.7.1.3 Biotic factors

Answer 14 · Mark scheme

June 2010 | BLY1F | Original Q7 | Legacy

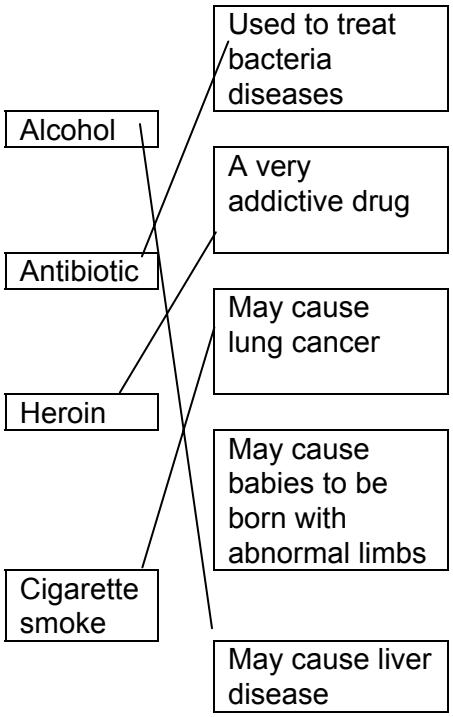
BLY 1F

4.7.1.3 Biotic factors

Answer 15 · 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**

4.7.1.3 Biotic factors

Answer 15 · Mark scheme January 2011 | BLY1F | Original Q3 | Legacy

BLY1F

Answer 16 · Mark scheme March 2011 | BLY1AP | Original Q7 | Legacy

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

Answer 17 · Mark scheme March 2011 | BLY1BP | Original Q1 | Legacy

Question	Key		
One	**A**	long beak	**3**
	B	wide-spread toes	**1**
	C	short wings	**4**
	D	brown feathers	**2**

Answer 18 · Mark scheme March 2011 | BLY1BP | Original Q4 | Legacy

Four	**A**	the organism is now a better competitor	**2**
	B	the mutated gene is passed on to offspring	**3**
	C	a gene mutates	**1**
	D	a new species is produced	**4**

Answer 19 · Mark scheme November 2011 | BLY1AP | Original Q2 | Legacy

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

4.7.1.3 Biotic factors

Answer 20 · Mark scheme

January 2012 | BL1FP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	diagram to show root growing down	allow single lines **or** not attached **or** open ends for both marks all branches must go down	1
	diagram to show shoot growing up	all branches must go up	1
2(b)	gravity		1
2(c)	Auxin		1
2(d)(i)	rooting / cuttings	accept other suggestions, eg fruit set / ripening do **not** accept weed killers	1
2(d)(ii)	any **three** from: • light • water / moisture • nutrients / ions / minerals • space / area	 ignore sun / energy accept one named mineral ignore nutrition / food ignore soil / land / territory / volume ignore reference to gases	3
Total			**8**

4.7.1.3 Biotic factors

Answer 20 · Mark scheme

January 2012 | BL1FP | Original Q2 | Legacy

BL1FP

Answer 21 · Mark scheme

June 2012 | BL1FP | Original Q8 | Legacy

Question 8

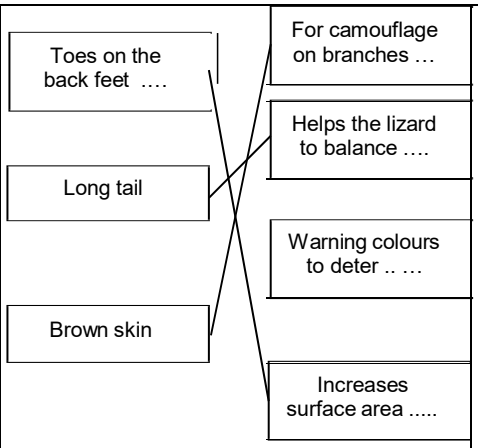
question	information		mark
8	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2, and apply a 'best-fit' approach to the marking.		6
0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
No relevant content.	There is at least one example of an adaptation of either an animal **or** a plant. However it may not be clear how the adaptation helps the organism to avoid being eaten.	There is a description of an adaptation of at least one animal **and** at least one plant. It is clear how at least one of these adaptations helps the organism to avoid being eaten.	There are clear and detailed descriptions of a range of adaptations of named animals **and** named plants. It is clear how most of these adaptations help the organisms to avoid being eaten.
examples of clear and detailed biology points made in response: • **camouflage** – the method of camouflage should be described plus a statement that the predator is less likely to see the prey • **mimicry / warning colouration** – the method should be described plus a statement that the predator is likely to confuse the prey with e.g. a poisonous organism • **thorns / prickles / spines / horns** – a statement that these are sharp and are likely to hurt a predator • **long limbs / streamlining** – a statement that these increase speed and make it more likely that prey will outrun predator • **bad taste** / **poison** – a statement that predator will find this unpleasant and 'spit out' prey / not attack same prey again • **large ears / position of eyes** – a statement that predators will be detected earlier so the prey can escape sooner			
Total			**6**

UMS Conversion Calculator www.aqa.org.uk/umsconversion

4.7.1.3 Biotic factors

Answer 22 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)		one mark for each line do **not** award mark for an adaptation if lines are drawn from it to more than one advantage	3
1(b)	escape (predators)	accept faster than swimming allow chase prey allow it stops them from drowning	1
1(c)	food territory	deduct **one** mark for each tick in excess of two	1 1
Total			**6**

4.7.1.3 Biotic factors

Answer 22 · Mark scheme

January 2013 | BL1FP | Original Q1 | Legacy

BL1FP

4.7.1.3 Biotic factors

Answer 23 · 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

4.7.1.3 Biotic factors

Answer 23 · Mark scheme

January 2013 | BL1FP | Original Q3 | Legacy

BL1FP

4.7.1.3 Biotic factors

Answer 24 · Mark scheme

June 2013 | BL1FP | Original Q2 | Legacy

Question 2

question	Answers	extra information	Mark
2(a)	looks like a leaf so predator less likely to / won't see it	 allow 'camouflage' as alternative to either point	1 1
2(b)(i)	thorns (of acacia tree) hurt (predators)	allow idea that fewer animals / predators live in trees **or** ground living animals can't reach them (in the trees)	1
2(b)(ii)	(giraffe) avoids being bitten by ants	allow ants are poisonous / have unpleasant taste	1
2(c)	looks like / mimics a wasp **or** has warning colouration so predators think it has a sting		1 1
Total			**6**

4.7.1.3 Biotic factors

Answer 25 · Mark scheme

June 2013 | BL1FP | Original Q3 | Legacy

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**

4.7.1.3 Biotic factors

Answer 26 · 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**	

4.7.1.3 Biotic factors

Answer 26 · Mark scheme

June 2016 | BL1FP | Original Q5 | Legacy

4.7.1.3 Biotic factors

Answer 27 · 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

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

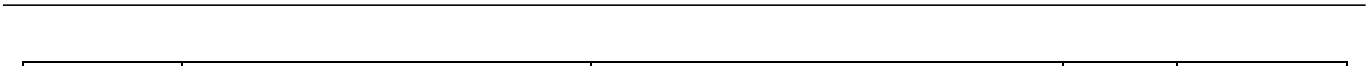
Answer 27 · Mark scheme

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**	

4.7.1.3 Biotic factors

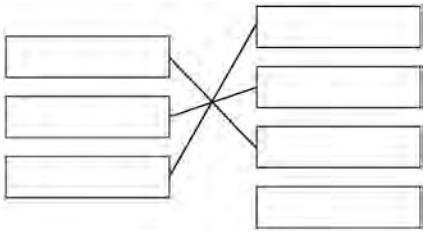
Answer 27 · Mark scheme

June 2017 | BL1FP | Original Q5 | Legacy



4.7.1.3 Biotic factors

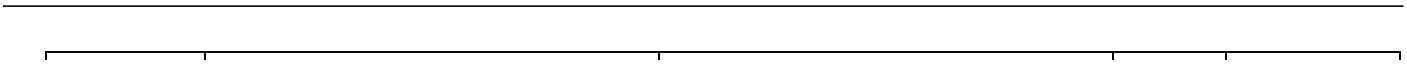
Answer 28 · Mark scheme June 2018 | 8461/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		extra line from a scientific term cancels the mark	1 1 1	AO2 4.7.4.1
01.2	$\frac{10}{200} \times 100$ 5 / 5.0	an answer of 5 / 5.0 scores **2** marks	1 1	AO2 4.7.4.3
01.3	digestion respiration excretion	in this order only	1 1 1	AO2 4.5.3.3 4.7.4.3
01.4	fewer are eaten (by small fish)	allow there are fewer (small) fish eating them do **not** accept none are eaten	1	AO2 4.7.4.1
Total			**9**	

4.7.1.3 Biotic factors

Answer 28 · Mark scheme

June 2018 | 8461/2F | Original Q1



Answer 29 · Mark scheme

November 2020 | 8461/1F | Original Q3

The full source mark scheme begins on page 48. Follow original question 3 in that document.

4.7.1.3 Biotic factors

Answer 30 · Mark scheme

June 2022 | 8461/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	**abiotic** any **two** from: • water • oxygen / air (in soil) • pH (of soil) • minerals / ions • temperature • size of soil particles **or** texture / type of soil	 allow moisture / humidity / rain(fall) allow dryness ignore carbon dioxide allow acidity / alkalinity (of soil) allow salts allow named example of an ion ignore nutrients allow named example of soil type ignore space / toxins / weather	2	AO1 4.7.1.1 4.7.1.2 4.7.1.3
	biotic any **two** from: • food • predators / consumers / carnivores • disease / pathogens / bacteria / fungi	 allow amount of dead / decaying matter (in soil) ignore nutrients allow example – such as birds allow microorganisms / microbes / parasites if **no** other marks awarded allow **2** marks for **four** factors in reverse categories	2	

Answer 30 · Mark scheme

June 2022 | 8461/2F | Original Q9

Question	Answers	Mark	AO / Spec. Ref.
09.2	**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	AO2
	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
	No relevant content	0	
	Indicative content • same concentration of chemical / **X** applied to the soil • same volume / amount of chemical / **X** applied to the soil • same size of area sampled – eg 1 m^2 or 0.25 m^2 • use of a quadrat • same time between application and collecting worms • same time allowed for collecting worms after application • each sample area selected randomly • method of achieving randomness – eg random coordinates • (collect and) count worms in each of areas **A** and **B** • at least 5 repeats in each of areas **A** and **B** • calculate mean (per unit area) **or** total for each of areas **A** and **B** • compare means / totals for areas **A** and **B**		4.7.2.1 RPA9

Total Question 9		**10**

Answer 31 · Mark scheme

June 2023 | 8461/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.1	any **one** from: • sun • light	ignore photosynthesis	1	AO1 4.7.2.1 4.7.4.3

Question	Answers	Mark	AO / Spec Ref.
03.2	<table><tr><th>Feeding relationship</th><th>Organism</th></tr><tr><td>Secondary consumer</td><td>lynx</td></tr><tr><td>Primary consumer</td><td>(snowshoe) hare</td></tr><tr><td>Producer</td><td>grass</td></tr><tr><td>Herbivore</td><td>(snowshoe) hare</td></tr><tr><td>Carnivore</td><td>lynx</td></tr><tr><td>Prey</td><td>(snowshoe) hare</td></tr><tr><td>Predator</td><td>lynx</td></tr></table> if no other mark awarded allow **1** mark for 3 correct answers	1 1 1	AO3 4.7.2.1 4.7.4.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	camouflaged / hidden **or** not (easily) seen	allow description eg blends in with surroundings	1	AO3
	from lynx / predator / carnivore		1	AO2
	not killed / eaten	allow less likely to be killed / eaten	1	AO2
				4.7.1.2 4.7.1.3 4.7.1.4 4.7.2.1

4.7.1.3 Biotic factors

Answer 31 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.4	any **two** from: • fewer lynx (to eat them) • more food / grass (available) • hares reproduce / breed / multiply	allow not many predators / lynx do **not** accept no lynx / predators allow a lot of food / grass	2	AO2 4.7.1.3 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.5	(number of lynx) increases		1	AO3 4.7.1.3 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.6	less food **or** fewer (snowshoe) hares (to eat) **or** fewer prey	ignore the lynx were hunted do **not** accept no food	1	AO2 4.7.1.3 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.7	any **two** from: • (lost in) respiration (of snowshoe hare) • egestion / faeces • excretion / urea / urine • not all eaten	allow as carbon dioxide allow not all digested allow not all (named) parts eaten if no other mark awarded, allow **1** mark for waste	2	AO1 4.7.2.1 4.7.4.3

Total Question 3	13

Answer 32 · 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

4.7.1.3 Biotic factors

Answer 32 · 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

4.7.1.3 Biotic factors

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.1	a community		1	AO1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.2	brambling and chaffinch		1	AO2 4.6.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.3	the brambling and the bullfinch cannot breed together to give fertile offspring		1	AO1 4.6.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.4		allow answers in terms of month numbers ignore seasons		AO3 4.7.1.1
	constant (from Jan) to Mar / (mid-)Apr	ignore straight	1	
	increases (from mid-)Apr to / and May		1	
	decreases from May / Jun to Dec		1	
		if no other marks awarded allow for **1** mark constant, **then** increase **then** decrease		

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.5	B		1	AO3 4.7.1.1 4.7.1.4

4.7.1.3 Biotic factors

Answer 33 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.6	D (because) present only May to Sep	allow D (because) present only May to Oct allow D (because) **not** present Oct to Apr / May allow D (because) present only in summer allow D (because) **not** present in winter allow D (because) not present for all the year allow D (because) only present for some of the year	1	AO3 4.7.1.1 4.7.1.4

Total Question 7	**8**

4.7.1.3 Biotic factors

Answer 34 · Mark scheme

June 2024 | 8461/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec Ref.
09.1	a change in: • DNA • base code **or** nucleotide sequence • base (in DNA) • gene / allele • part of a chromosome • number of chromosomes • genetic code / material	ignore genetic information / variation ignore reference to amino acids or proteins	1	AO1 4.6.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
09.2	any **three** from: • variation (between members of a species) • better adapted survive • (better adapted or survivors) reproduce • pass on (favourable) allele(s) / gene(s) / mutation(s)	allow in terms of an example ignore mutation allow survival of the fittest allow converse ignore passing on genetic material **or** chromosomes **or** characteristic	3	AO1 4.6.2.1 4.6.2.2 4.6.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
09.3	Alfred Wallace and Charles Darwin		1	AO1 4.6.2.2 4.6.3.1 4.6.3.2

4.7.1.3 Biotic factors

Answer 34 · Mark scheme

June 2024 | 8461/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec Ref.
09.4	hoverfly looks like a wasp	allow pattern of the markings is similar (on the hoverfly and wasp) ignore predator / animal thinks the hoverfly is a wasp	1	AO3 4.6.3.2 4.7.1.1 4.7.1.4
	predator / animal avoids **wasps** so it does not get stung		1	
	(so) predator / animal does not attack / eat hoverfly	allow correctly named predator ignore bite / harm	1	

Total Question 9	8

4.7.1.3 Biotic factors

Answer 35 · 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

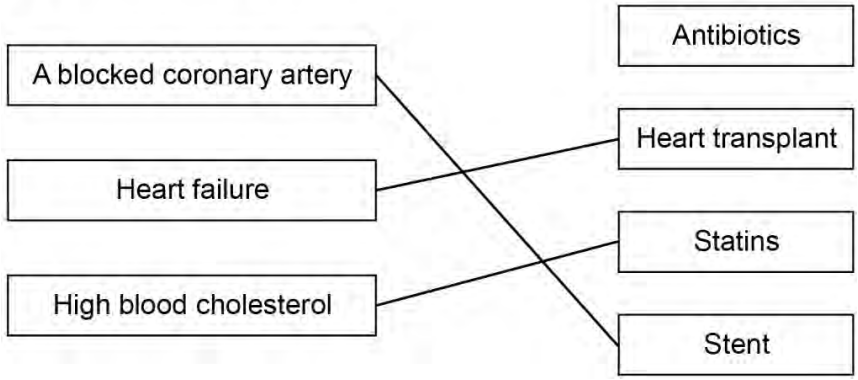
Question	Answers	Extra information	Mark	AO / Spec Ref.
03.2	*measurement* 60 (mm) *conversion* 60 000 (µm) *substitution* $= \frac{60\,000}{4\,000}$ *real width* 15 (µm)	allow measurement in the range 59 (mm) to 61 (mm) allow correct conversion from incorrect measurement allow correct substitution using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

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**

Answer 36 · Mark scheme

June 2025 | 8461/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **two** from: • (ichthyosaur died and) is buried in sediment / sand / mud / silt • (only) soft parts decayed / eaten **or** bones were not decayed / eaten • bone(s) / remains replaced by minerals	allow skeleton **or** hard parts for bones throughout ignore compression ignore reference to oxygen do **not** accept (icthyosaur died and) is buried in rock(s) allow mineralisation of bones allow bone(s) left imprint in mud / sand / sediment (that then hardened to rock) ignore bones turned to stone / rock	2	AO2 4.6.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	120 × 17 2040 (mm) 2.04 (metres)	allow conversion to metres at any stage allow correct conversion of incorrectly calculated length	1 1 1	AO2 4.6.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	phylum family	in this order only	1 1	AO1 4.6.3.5 4.6.4

4.7.1.3 Biotic factors

Answer 36 · Mark scheme

June 2025 | 8461/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	any **two** from: • ice age • global warming • volcanic activity • asteroid collision • new predators • (new) disease / pathogen • competition for mates • lack of habitat **or** habitat change	 } if neither of these, allow climate change for **1** mark ignore weather } if neither of these, allow catastrophic event **or** natural disaster for **1** mark allow named example allow hunters allow named example allow lack of mates ignore competition unqualified ignore environment change allow competition between **ichthyosaurs** for food ignore isolation ignore pollution ignore lack of food	2	AO1 4.6.3.6

Total Question 8	9

4.7.1.3 Biotic factors

AQA

GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2020

Version: 1.0 Final Mark Scheme

jun2084611F/MS

4.7.1.3 Biotic factors

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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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.

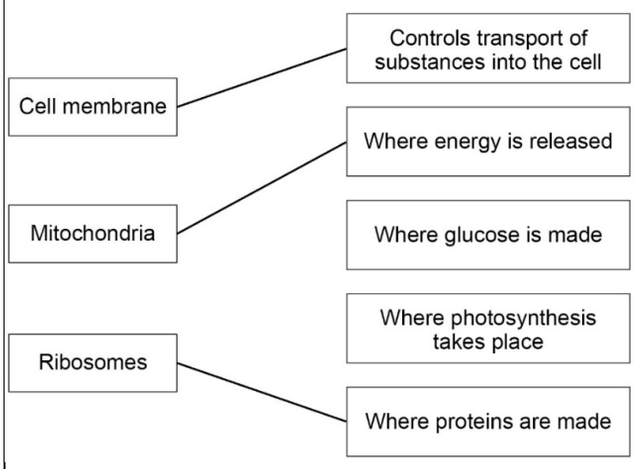
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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.

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

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**	

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

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**	

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

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**	

4.7.1.3 Biotic factors

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

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**

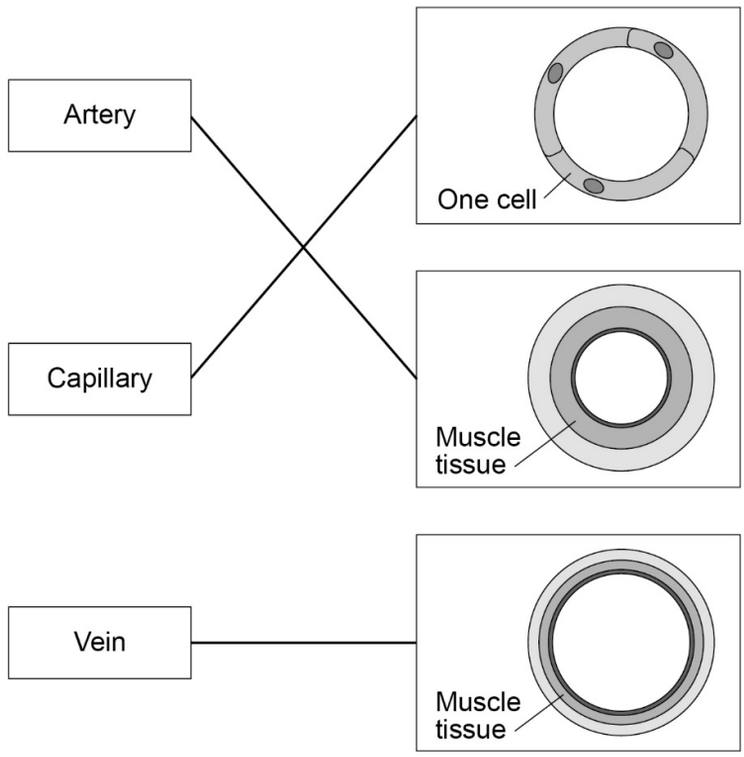
4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

05.9	placebos		1	AO1 4.3.1.9
Total			**14**	

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

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**	

4.7.1.3 Biotic factors

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		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	
07.2		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	
07.3	$\frac{(18.5 + 19.3 + 19.5)}{3}$ **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	
07.4	a ring around 14.2	allow clear indication of correct result	1	AO3 4.4.1.2 RPA 6

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

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**	

4.7.1.3 Biotic factors

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	

4.7.1.3 Biotic factors

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		

4.7.1.3 Biotic factors

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**	

4.7.1.3 Biotic factors

Answer 29 · 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 30 · Examiner comments June 2022 | 8461/2F | Original Q9

Question 9

This was the second of three questions common to both the Foundation and Higher Tier papers. The topic was biotic and abiotic factors that affected the populations of earthworms in two habitats.

09.1 Only one in forty students were able to identify four relevant factors. The most commonly suggested were water, oxygen and temperature for abiotic factors and food and predation for biotic factors. Most students appeared to have little understanding of the distinction between the two types of factor and it was common to find at least some factors in the incorrect category. A significant proportion of weaker students appeared to have a poor understanding of what was required and copied out the four bullet points regarding features of earthworms into the four available spaces or sometimes decided on a couple of factors and wrote them in both sections to gain one or two marks.

09.2 While it was clear that a significant proportion of students had spent time completing fieldwork, there were also many who made no attempt at an answer. There were also students who appeared to misunderstand the question and gave often accounts of why the earthworm populations might be different in the different areas.

Some students included sufficient detail regarding control variables, randomising test areas, counting worms and how to deal with the results for both areas to gain access to Level 3. However some omitted vital components of this, in particular randomising the sampling areas or using chemical **X**, and could only gain a mark at Level 2. Those students who omitted reference to both areas were limited to Level 1.

A small but significant number of students determined the number of earthworms in the whole of the field and lawn and then compared these. This was not an appropriate comparison (and may have reflected practice at a related question from the November 2021 examination) as the question specifically referred to the number of worms per m^2.

A considerable minority of students suggested that throwing quadrats is a suitable way of achieving randomness, which is not only potentially dangerous but also is unlikely to achieve randomness and appropriate representation of the whole area.

Fewer than one in eight achieved level 3 although another third wrote answers worthy of level 2.

4.7.1.3 Biotic factors

Answer 31 · Examiner comments

June 2023 | 8461/2F | Original Q3

Question 3

This question was about a simple food chain and predator-prey relationships.

03.1 This was generally well done, with sun and light being very common correct answers as the source of energy for the grass. Some students included extra suggestions, such as water which was incorrect and thus disqualified the mark.

4.7.1.3 Biotic factors

Answer 31 · Examiner comments June 2023 | 8461/2F | Original Q3

03.2 Completion of Table 2 to name one organism from the food chain in Figure 3 that matched each of the given descriptions (secondary consumer, producer, herbivore, etc) was done successfully by two-thirds of students. However, those who did not read the question carefully used the names of other organisms, such as 'lions' and 'cows' which could not be credited.

03.3 The two photographs in Figure 4 of the snowshoe hare, respectively in the summer and in the winter, showed its different fur colour in these different seasons. Students had to explain how this change in fur colour would increase the hare's chance of survival. Many students realised that the change of fur colour was important for camouflage and described this in a variety of ways. These students often went on to explain that this would help the hare to avoid being seen by predators. However, the most common omission was a description of why avoiding being seen was important for survival, with large numbers of students only restating the question '…so they survive', which was not creditworthy. Only 1 in 10 students scored all 3 marks in this question, although around a half included the ideas of camouflage and not being seen by predators such as the lynx.

03.4 Figure 5 showed students how the populations of snowshoe hare and lynx oscillated over the course of 35 years. Appropriate suggestions about why the hare population increased at various times included the decline in population of the lynx, the abundance of food for the hares and the fact that the hares reproduced. One-third of students were able to suggest two of these reasons.

03.5 Students were required to look at the relationship shown in Figure 5 to see that an increase in the number of hares resulted in an increase in the number of lynx – just over one-half were able to describe this.

03.6 A reason why the lynx population fell over the given years should have been evident from Figure 5 which showed the fall in hare population immediately before it – around 60 percent of students realised this.

03.7 This question was very poorly answered. Few students (around 1 in 20) gained both marks and the majority struggled to gain even one. Suitable reasons for the loss of biomass in the food chain between the grass and the snowshoe hare would be respiration of the hare or egestion or excretion.

4.7.1.3 Biotic factors

Answer 32 · Examiner comments

June 2023 | 8461/2F | Original Q4

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.

Answer 32 · Examiner comments

June 2023 | 8461/2F | Original Q4

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.

4.7.1.3 Biotic factors

Answer 33 · Examiner comments

June 2023 | 8461/2F | Original Q7

Question 7

This was the first of three questions common to both the Foundation and Higher Tier papers. It was about different species of bird living in the same habitat

07.1 Just over a quarter of students selected the term community for describing all of the organisms living in the same habitat. Ecosystem was a very strong distracter and was selected by twice as many as those who chose the correct answer.

07.2 Nearly all students selected the pair of birds with a common generic name, the brambling and the chaffinch, as those being most closely related.

07.3 The fact that the two species named in the question could not breed together to give fertile offspring was recognised by just over half as the criterion for them being different species.

07.4 In this question, students had to describe one of the patterns from the graph showing how the number of birds of four species varied throughout one year. Students were expected to make reference to the months given on the horizontal axis. A suitable answer included the number being constant from January to April, then increasing during April and May and finally decreasing over the remainder of the year. Many answers were less precise and fewer than one-fifth gained all 3 marks, although a similar proportion of the students gave at least two valid points.

07.5 Half of the students were able to select species B as the one with the lowest resistance to the disease as its numbers fell the most during the given months of June and July.

07.6 In this question, students had to decide which species migrated between the UK and other countries, giving the reason for their choice. Around one-third correctly selected species D, giving its presence on the graph only between May and September (or being present only in the summer, or absent the rest of the year) as their reason.

4.7.1.3 Biotic factors

Answer 34 · Examiner comments

June 2024 | 8461/2F | Original Q9

Question 9 (standard demand)

09.1 Students struggled to articulate their answer to this question with 20% of students defining a mutation correctly. Many students knew that it was something to do with 'a change', but this was anything from a cell or a particular characteristic of a phenotype to a whole species changing.

09.2 Fewer than 5% of students were able to give a full description of natural selection to gain full marks. 20% of students did not attempt the question at all, and a further 50% of students failed to gain any marks. Very few students talked about variation for the first mark. Survival of the fittest was not well described but some picked up the mark by using the phrase. The third bullet point was most often awarded for the implication that those that survived went on to breed, and this may have been by mentioning 'offspring' in marking point 4. Vague references to 'traits' or 'characteristics' being passed on were not creditworthy in bullet point four. Students who were able to give an example of natural selection had better structures to their answers, with giraffe necks being the most common example given.

09.3 Just over 50% of students were able to identify Alfred Wallace and Alexander Fleming as the scientists that suggested the theory of evolution by natural selection.

09.4 Over 50% of students managed to gain a mark in this question, most commonly for stating 'the hoverfly looks like the wasp'. Marking point 2 was rarely awarded as students failed to explicitly refer to the wasp. Some incorrect answers referred to the hoverfly's colours enabling it to camouflage which did not gain credit. Overall, the main reason marks were not awarded was because of vagueness, or poor articulation of ideas.

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Answer 35 · Examiner comments

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.

4.7.1.3 Biotic factors

Answer 35 · Examiner comments

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'.

4.7.1.3 Biotic factors

Answer 36 · Examiner comments

June 2025 | 8461/2F | Original Q8

Question 8 (Standard demand)

08.1

This question required students to apply their knowledge of fossil formation to the specific example of an ichthyosaur fossil.

Only two steps in the fossilisation process were required to score full marks, so misunderstanding or omission of one step, was not critical. Only 7% of students achieved the full 2 marks, with 60% scoring no marks or not attempting the question.

Students that gained credit often did so for showing an understanding of the first step in fossil formation, by referring to sediment, or an appropriate synonym. However, several also referred to the dead animal being buried in 'rock' or in 'rocks' which disqualified this idea. Whether this burying occurred before or after decay was not important in the award of the mark.

Although some students were aware that the dead ichthyosaur had decayed, they were often imprecise in terms of what had decayed. Some described the whole 'body' or the 'tissues' decaying, which implied that both soft and hard material decays. Very few students referred to the soft tissues being eaten (by detritivores).

4.7.1.3 Biotic factors

Answer 36 · Examiner comments

June 2025 | 8461/2F | Original Q8

08.2

Students were provided with the length of the fossil image and the relevant magnification factor and were required to calculate the real length of the fossil.

Many students completed this calculation well with 40% gaining all 3 available marks. The most common error was in converting millimetres to metres, where a conversion factor of 100 was not uncommon. Some students completed the conversion in two steps, first converting to centimetres, then to millimetres, perhaps showing a lack of confidence.

A not uncommon error was for students to use the magnification equation, with the two values as numerator and denominator. It was rare then, for students to attempt to convert their answer to metres.

08.3

Students were required to recall the classification hierarchy, completing a partial classification using given terms.

This was very well attempted with over half of students gaining at least 1 mark. It was clear that many students had remembered the sequence by using a mnemonic. However, many students confused population for phylum, presumably due to the same initial letter.

08.4

Students were required to suggest causes for the extinction of ichthyosaurs, and over 50% of students gained at least one of the available 2 marks.

Although this should not be an unfamiliar question to students who have practised from previous examination papers, the context of the information provided meant that some general answers were insufficient. The information in the question was that ichthyosaurs lived in the sea, consequently 'drought' was not credited. Similarly, the information provided stated that ichthyosaurs were in competition with other predators for food, thus a 'lack of food' was ignored, as was the presence of 'predators'. For this last idea, a mark could only be awarded if any predators were described as being 'new'.

Common correct responses included reference to 'disease' and 'habitat loss', although all of the possible answers were seen.