AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.3.5

Global warming

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**33**
Available paper years	**2007–2023**

Using this booklet

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

Name: _____ **Date:** _____

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

4.7.3.5 Global warming

Answer 01 · Mark scheme March 2007 | BLY1B | Original Q3 | Legacy

Three	**A**	carbon dioxide	**1**
	B	greenhouse	**2**
	C	ice caps	**3**
	D	sea	**4**

Answer 02 · Mark scheme June 2007 | BLY1B | Original Q2 | Legacy

Two	**A**	biodiversity	**2**
	B	carbon dioxide	**1**
	C	energy	**4**
	D	methane	**3**

Answer 03 · Mark scheme November 2007 | BLY1B | Original Q1 | Legacy

One	**A**	carbon dioxide	**4**
	B	sewage	**2**
	C	pesticide	**1**
	D	sulfur dioxide	**3**

Answer 04 · Mark scheme November 2007 | BLY1B | Original Q9 | Legacy

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

4.7.3.5 Global warming

Answer 05 · Mark scheme

June 2008 | BLY1F | Original Q7 | Legacy

question	answers	extra information	mark
7(a)(i)	carbon dioxide absorbs / traps / re-radiates / insulates	allow reflects	1
	energy / heat / radiation	do **not** allow this mark if energy / heat / direct from sun ignore ozone	1
7(a)(ii)	global warming / melting icecaps / climate change / rise in sea levels / flooding	allow primary effects only allow temperature change	1
7(b)(i)	customers concerned with the environment / green issues (will be attracted) owtte	allow idea of helping the world	1
7(b)(ii)	reduces transport of food		1
	less carbon dioxide / greenhouse gas / emissions / harmful gases / lower carbon footprint (from transport)	allow less fuel used ignore pollution unqualified	1
Total			**6**

4.7.3.5 Global warming

Answer 06 · Mark scheme

November 2008 | BLY1BP | Original Q2 | Legacy

Two	**A**	herbicide	**3**
	B	methane	**2**
	C	sulfur dioxide	**1**
	D	carbon dioxide	**4**

Answer 07 · Mark scheme

June 2009 | BLY1BP | Original Q7 | Legacy

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

Answer 08 · Mark scheme

November 2009 | BLY1BP | Original Q2 | Legacy

Two	**A**	Carbon dioxide taken in by plants	**3**
	B	Methane released by cow	**1**
	C	Oil used in the factory	**4**
	D	Sulfur dioxide released by the chimney	**2**

Answer 09 · Mark scheme

March 2010 | BLY1BP | Original Q2 | Legacy

Two	**A**	biodiversity	**2**
	B	pollution	**4**
	C	global warming	**3**
	D	deforestation	**1**

Answer 10 · Mark scheme

June 2010 | BLY1BP | Original Q5 | Legacy

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

4.7.3.5 Global warming

Answer 11 · 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**

4.7.3.5 Global warming

Answer 11 · Mark scheme June 2010 | BLY1F | Original Q7 | Legacy

BLY 1F

Answer 12 · Mark scheme January 2011 | BLY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	methane		1
6(b)	fertiliser		1
6(c)	fuel		1
6(d)	the greenhouse effect		1
Total			4

Answer 12 · Mark scheme January 2011 | BLY1F | Original Q6 | Legacy

BLY1F

Answer 13 · Mark scheme March 2011 | BLY1BP | Original Q2 | Legacy

Two	**A**	carbon dioxide	**2**
	B	herbicide	**3**
	C	sulfur dioxide	**1**
	D	pesticide	**4**

Answer 14 · Mark scheme June 2011 | BLY1BP | Original Q2 | Legacy

Two	**A**	burning fuels that release carbon dioxide	3
	B	building new houses	4
	C	spraying crops with pesticides	2
	D	using weedkillers on crops	1

4.7.3.5 Global warming

Answer 15 · Mark scheme

June 2011 | BLY1F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	carbon dioxide		1
1(a)(ii)	sulfur dioxide		1
1(b)(i)	reduces land available for animals and plants		1
1(b)(ii)	metals		1
1(c)(i)	pesticide		1
1(c)(ii)	kill other animals		1
Total			6

4.7.3.5 Global warming

Answer 15 · Mark scheme

June 2011 | BLY1F | Original Q1 | Legacy

BLY1F

4.7.3.5 Global warming

Answer 16 · Mark scheme

June 2011 | BLY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	warmer / dryer	allow greenhouse effect / global warming ignore wind	1
7(b)(i)	genes / alleles / chromosomes / DNA / genetic material / genetics	allow inheritance allow nutrition / food / metabolism / growth rate ignore environment	1
7(b)(ii)	natural selection / evolution	allow survival of the fittest	1
Total			**3**

4.7.3.5 Global warming

Answer 16 · Mark scheme June 2011 | BLY1F | Original Q7 | Legacy

BLY1F

Answer 17 · Mark scheme June 2011 | BLY2F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	add mineral ions to the soil	extra box ticked cancels the mark	1
2(b)	increasing the temperature turning lights on at night	each extra box ticked cancels **1** mark	1 1
Total			**3**

BLY2F

Answer 18 · Mark scheme November 2011 | BLY1BP | Original Q3 | Legacy

Three	**A**	greenhouse gases re-radiate heat back to Earth	**4**
	B	energy directly from the Sun	**1**
	C	the Earth warms up	**2**
	D	heat is radiated from the Earth into the atmosphere	**3**

Answer 19 · Mark scheme November 2011 | BLY1BP | Original Q6 | Legacy

Six	**4**	**2**	**1**	**4**

Answer 20 · Mark scheme November 2011 | BLY1BP | Original Q7 | Legacy

Seven	**3**	**4**	**2**	**3**

4.7.3.5 Global warming

Answer 21 · Mark scheme

June 2012 | BL1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6 (a)	insects don't eat / damage crop	allow idea of insects carrying plant disease	1
6 (b)(i)	60		1
6 (b)(ii)	lower (yield) by 8 (arbitrary units)	accept 'higher' if answer clearly refers to wheat with transferred gene allow yield is only 52 **or** goes down to 52 accept ecf from (b)(i) for **2** marks	1 1
6 (b)(iii)	grow / use wheat without insect poison (gene) higher yield (in fields)	 accept bigger crop / more wheat ignore grows better	1 1
6 (c)	 (concerned about) effect on populations of (wild) flowers / insects effect of eating GM crops on human health	ignore unnatural / unethical / against religion unqualified accept specific examples given ignore harms the environment allow harmful to humans if eaten	 1 1
Total			8

4.7.3.5 Global warming

Answer 21 · Mark scheme

June 2012 | BL1FP | Original Q6 | Legacy

BL1FP

4.7.3.5 Global warming

Answer 22 · Mark scheme

June 2012 | BL2FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	(LHS) water / H_2O	allow H2O do **not** accept H^2O	1
	(RHS) glucose / sugar / $C_6H_{12}O_6$	allow starch / carbohydrate allow C6H12O6 do **not** accept $C^6H^{12}O^6$	1
6(b)(i)	1 arbitrary unit	extra box ticked – cancel	1
6(b)(ii)	210		1
6(b)(iii)	carbon dioxide / CO_2 / CO2 **or** temperature / heat / warmth	do **not** accept CO^2 ignore mineral ions ignore water	1
Total			**5**

4.7.3.5 Global warming

Answer 22 · Mark scheme

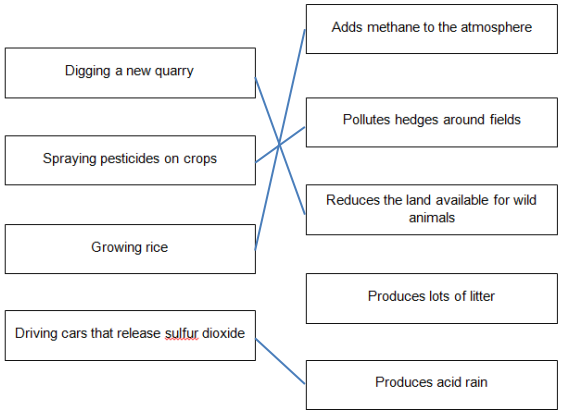
June 2012 | BL2FP | Original Q6 | Legacy

BL2FP

4.7.3.5 Global warming

Answer 23 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)		**1** mark for each correct line extra line from box in left hand column cancels mark	4
1(b)	any **two** from: • climate change • more extreme weather / changes to weather (patterns) / described • rise in sea level • melting of ice caps • reduced biodiversity • changes to migration patterns • changes in distribution of species	ignore 'Earth warmer' accept faster plant growth / tropical species can be grown in UK accept tropical diseases / example spread to temperate regions	2
Total			**6**

4.7.3.5 Global warming

Answer 24 · Mark scheme

7			6	AO1 3.3.1

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 5 and apply a 'best-fit' approach to the marking.

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 reason for deforestation **or** an attempt at a description of at least one way deforestation is affecting the atmosphere.	There is at least one reason for deforestation **and** a description of the way deforestation is affecting one gas in the atmosphere **or** the process that causes an effect.	There are reasons for deforestation **and** a clear description of the way deforestation is affecting one gas in the atmosphere **and** the process that causes this.

examples of the points made in the response	**extra information**
Reasons for deforestation • timber for construction / furniture / boat building / paper production • growing plants for biofuels for motor fuel / aviation / lawnmowers • use of wood as a fuel • land for building or agriculture to provide food, such as rice fields and cattle ranching	

Effects of deforestation
• increase in carbon dioxide in atmosphere
  ○ due to burning
  ○ due to activities of microbes
  ○ less carbon dioxide taken in / locked up (by trees)
  ○ less photosynthesis
• increase in methane in atmosphere
  ○ due to rice production / cattle
	ignore references to oxygen
	
	accept explanations of the effect of water (vapour)

4.7.3.5 Global warming

Answer 25 · Mark scheme

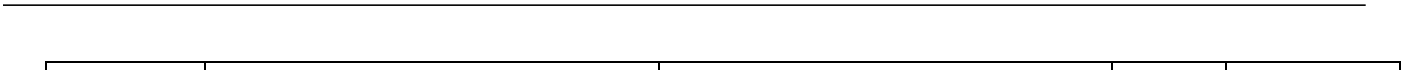
June 2015 | BL2FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	LHS = water RHS = oxygen	accept H_2O do **not** accept H^2O / H2O accept O_2 do **not** accept O / O^2 / O2	1 1	AO1 2.3.1a,b
4(a)(ii)	light / sunlight	ignore solar / sun / sunshine do **not** allow thermal / heat	1	AO1 2.3.1a,b
4(a)(iii)	chloroplasts	allow chlorophyll	1	AO1 2.3.1b
4(b)(i)	20		1	AO2 2.3
4(b)(ii)	any **one** from: • light (intensity) • temperature		1	AO2 2.3, 2.3.1c,d
4(c)(i)	To increase the rate of growth of the tomato plants		1	AO2 2.3, 2.3.1c,d
4(c)(ii)	Because it would cost more money than using 0.08% Because it would not increase the rate of photosynthesis of the tomato plants any further		1 1	AO2 2.3, 2.3.1c,d
Total			**9**	

4.7.3.5 Global warming

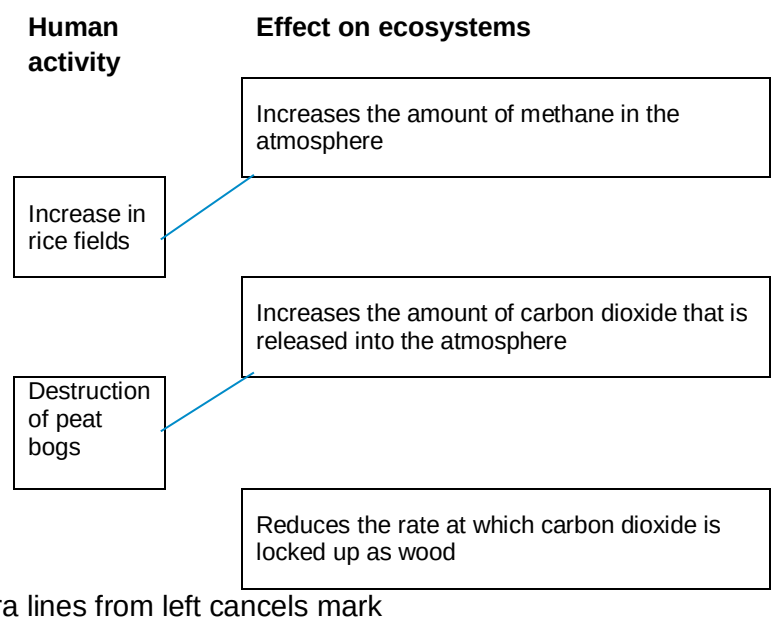
Answer 25 · Mark scheme

June 2015 | BL2FP | Original Q4 | Legacy



4.7.3.5 Global warming

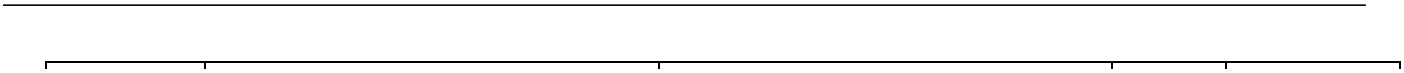
Answer 26 · Mark scheme June 2016 | BL3FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	 extra lines from left cancels mark		2	AO1 3.4.2c/d
6(b)(i)	any **two** from: • (to provide land) for farming / agriculture • (to provide land) for quarrying • (to provide land) for building • to provide wood for building materials • to provide fuel • to provide paper		2	AO1 3.4.2c
6(b)(ii)	any **two** from: • changes in earth's climate, ie droughts, flooding, hurricanes • rise in sea levels • reduce biodiversity • change in migration patterns • may change distribution of species	ignore acid rain **and** the ozone layer **and** forest fires ignore temperature rise allow ice caps melt	2	AO1 3.4.2a
Total			**6**	

4.7.3.5 Global warming

Answer 26 · Mark scheme

June 2016 | BL3FP | Original Q6 | Legacy



4.7.3.5 Global warming

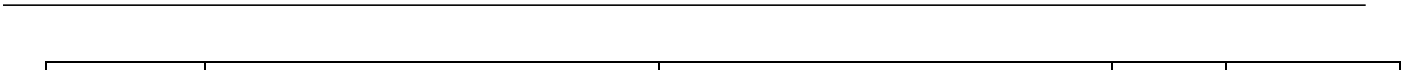
Answer 27 · Mark scheme June 2017 | BL1FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	any **one** from: • garden waste • (organic) kitchen waste	allow named examples eg food allow other appropriate materials	1	AO1 1.6
4(a)(ii)	The material in the bottom tray will be in smaller pieces.		1	AO3 1.6.1b
4(a)(iii)	microorganisms	allow bacteria / fungi / fungus / mould / microbe ignore worms / insects ignore decomposers do **not** allow virus(es)	1	AO1 1.6.1b
4(b)	any **one** from: • take off lid • put hole(s) in lid or sides of trays		1	AO3 1.6.1b
4(c)(i)	any **one** from: • variety / type of tomato • volume of water **and** liquid • temperature • light (intensity) • type / amount of soil	allow spacing of plants ignore number of plants allow amount of water **and** liquid	1	AO3 1.6.1
4(c)(ii)	1500	allow **1** mark for 12 x 125 with no or incorrect answer	2	AO2 1.6.1
4(c)(iii)	(more) minerals / ions / salts / nutrients (in liquid from composter)	allow correctly named minerals ignore 'food'	1	AO2 1.6.1c/d
Total			**8**	

4.7.3.5 Global warming

Answer 27 · Mark scheme

June 2017 | BL1FP | Original Q4 | Legacy



4.7.3.5 Global warming

Answer 28 · Mark scheme

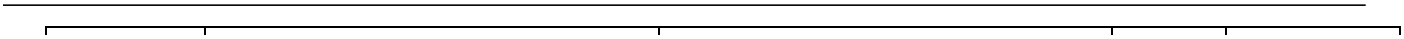
June 2017 | BL3FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	8.0		1	AO2 3.4.2
1(a)(ii)	To provide land to grow crops. To provide space for building.		1 1	AO1 3.4.1c 3.4.2a/c
1(b)	Carbon dioxide Methane		1 1	AO1 3.4.3a
Total			**5**	

4.7.3.5 Global warming

Answer 28 · Mark scheme

June 2017 | BL3FP | Original Q1 | Legacy



4.7.3.5 Global warming

Answer 29 · Mark scheme June 2017 | BL3FP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	Causes acid rain		1	AO1 3.4.1b
8(b)(i)	66(%) or 65.7(%)	allow 1 mark for 920 **or** ecf from first line	2	AO2 3.4.1b
8(b)(ii)	it rises **and** then falls maximum level in 2005 **or** maximum reached at 400 (thousand tonnes)		1 1	AO2 3.4.1b
Total			**5**	

4.7.3.5 Global warming

Answer 30 · Mark scheme June 2018 | 8461/2F | Original Q10

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>10.1</td><td>
<table>
<tr><th></th><th>1960–1977</th><th>1977–2003</th><th>2003–2015</th></tr>
<tr><td>trend in carbon dioxide concentration</td><td></td><td>increasing</td><td>increasing</td></tr>
<tr><td>trend in air temperature</td><td>decreasing</td><td>increasing</td><td>constant / decreasing</td></tr>
</table>
allow synonyms eg level / goes up / goes down
</td><td></td><td>1

1</td><td>AO3
4.7.3.5</td></tr>
<tr><td>10.2</td><td>traps heat / energy or (long-wavelength / IR) radiation
or
less loss of heat

or
insulates</td><td>do not accept light / UV

allow stops (some) heat escaping
do not accept stops all heat escaping

ignore greenhouse effect
ignore reference to ozone layer</td><td>1</td><td>AO1
4.7.3.5</td></tr>
</table>

Answer 30 · Mark scheme

Question	Answers		Mark	AO / Spec. Ref.
10.3	**Level 2**: Some logically linked reasons are given. There may also be a simple judgement.		3–4	AO3 4.7.3.5
	Level 1: Relevant points are made. They are not logically linked.		1–2	
	No relevant content		0	
	Indicative content **for the theory:** • (overall increased CO_2 parallels) overall increased temperature (eg by 0.4 (°C)) • CO_2 traps (long-wave) radiation / IR / heat **against the theory:** • in some years (eg 1960–1977) temperature falls (while CO_2 is rising) • many (large and small) erratic rises and falls in temperature • overall correlation does not necessarily mean a causal link • other (unknown) factors may be involved in temperature change to access level 2 there must be evidence both for and against the theory **and** use of data from the graph			
10.4	burning of (fossil) fuels	allow eg coal / oil / gas allow driving cars allow any activity which leads to burning fuels – eg using central heating ignore power stations unqualified ignore burning / fires unqualified ignore deforestation	1	AO2 4.7 4.7.2.2 4.7.3.5
10.5	photosynthesis	allow full description or full equation allow a symbol equation which is not balanced	1	AO2 4.4.1.2 4.7 4.7.2.2 4.7.3.5

4.7.3.5 Global warming

Answer 30 · Mark scheme

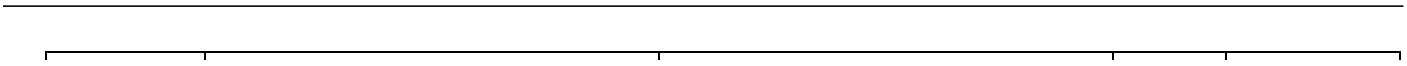
June 2018 | 8461/2F | Original Q10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.6	any **two** from: • (some) plants grow faster / higher yield • loss of habitat • migration **or** change in distribution • extinction	allow points made using examples if neither is given allow alters biodiversity for **1** mark allow (in terms of extinction) death due to eg lack of water / food or increased disease ignore death unqualified	2	AO1 4.7.3.1 4.7.3.5
Total			**11**	

4.7.3.5 Global warming

Answer 30 · Mark scheme

June 2018 | 8461/2F | Original Q10



4.7.3.5 Global warming

Answer 31 · Mark scheme

November 2021 | 8461/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(overall) increase (in concentration of CO_2)		1	AO2
	(overall increase) by 54 (arbitrary units) **or** from 364 to 418 (arbitrary units)	allow in range 45 to 65 (arbitrary units) allow from 357 to 422 (arbitrary units) allow other correct data	1	AO3
	peaks and troughs	allow description	1	AO3
	each cycle is 1 year **or** variation per cycle is 8 to 16 (arbitrary units)	allow multiples such as 5 cycles every 5 years allow answer in range 8 to 16 (arbitrary units)	1	AO3 4.7.3.5
07.2	combustion	allow a named example such as burning (named) fuels **or** driving cars **or** power stations ignore factories unqualified	1	AO1 4.7.2.4 4.7.3.3 4.7.3.4 4.7.3.5 4.4.1.1
	deforestation	allow a description allow human activities that decrease carbon dioxide concentration such as tree-planting **or** growing crops if no other mark awarded allow respiration for **1** mark	1	

4.7.3.5 Global warming

Answer 31 · Mark scheme

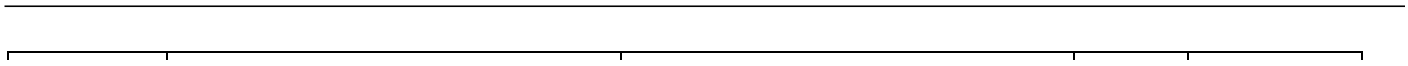
November 2021 | 8461/2F | Original Q7

Question	Answers	Mark	AO / Spec. Ref.
07.3	**Level 2:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO3 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 AO1
	No relevant content	0	
	Indicative content • (higher CO_2 concentration causes) global warming • plants photosynthesise faster ○ due to more CO_2 ○ due to higher temperature • temperature rise causes changes in rainfall patterns **or** extreme weather conditions such as storms • less rainfall causes desertification ○ many plant species die out ○ many animal species lack food and die ○ other (drought-adapted) plants become more common • more rainfall causes flooding ○ loss of habitat ○ may lead to extinction • temperature rise melts (polar) ice caps **or** glaciers ○ causes flooding ○ loss of habitat ○ may lead to extinction • changes in animal / bird migration patterns / times **or** changes in distribution of animals		4.7.2.4 4.7.3.5 4.4.1.1
Total		**10**	

4.7.3.5 Global warming

Answer 31 · Mark scheme

November 2021 | 8461/2F | Original Q7



4.7.3.5 Global warming

Answer 32 · Mark scheme

June 2022 | 8461/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **two** from: • temperature • size of tomato plants **or** size / number of leaves • light • (volume of) water • (amount / type of) fertiliser / minerals / ions / nutrients (given to plants) • time before rate readings are taken	allow age of plant allow (amount of) water allow (type of) compost / soil allow named example of mineral ion such as nitrate / magnesium ignore time unqualified ignore type of tomato plant ignore type of greenhouse	2	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	from 0.02% to 0.04%		1	AO3 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	repeat each reading three times and calculate a mean		1	AO3 4.4.1.2 RPA6

4.7.3.5 Global warming

Answer 32 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	(the rate of photosynthesis) increases (because) carbon dioxide is needed for photosynthesis	ignore values allow **2** marks for (there is) more carbon dioxide for (more) photosynthesis	1 1	AO2 4.4.1.1 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	any **two** from: • it would not increase the rate (of photosynthesis) • it would not increase the growth of tomatoes • it would cost more	 allow it would not change the rate (of photosynthesis) allow photosynthesis would not increase allow idea of profit will not increase allow reference to avoiding global warming	2	AO3 4.4.1.2

Total Question 3		8

4.7.3.5 Global warming

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	any **one** from: • variation of a named / described (desirable) characteristic • not all susceptible to the same disease / pathogen • maintain / increase gene pool	allow eg different flavour / colour allow different customer preferences	1	AO2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	any **one** from: • they have the same named /(desirable) characteristic(s) • they grow at the same rate • they ready to harvest at same time	allow eg all high yield **or** all disease-resistant **or** same (desirable) flavour	1	AO2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	(a group of) cells are grown (into a new organism)	ignore clones	1	AO1 4.6.2.5

4.7.3.5 Global warming

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	any **one** from: different • water • minerals / ions • light • herbivores • disease • plant density • soil pH	 allow rain allow named example ignore nutrients ignore sun unqualified allow named example allow named example allow different temperature allow different environmental conditions	1	AO2 4.6.2.1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	male gametes = **X** + **Y** female gametes = **X** + **X** offspring genotypes correctly derived from gametes	if neither mark awarded, allow **1** mark for male = **X** + **X and** female = **X** + **Y** allow correct for chromosome assignment in mp1 & mp2	1 1 1	AO1 AO1 AO2 4.6.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	any **one** from: • half are XX and half are XY • equal probability of X or Y sperm fertilising an egg • (the Punnett square shows) 50% (chance of) male / female		1	AO2 4.6.1.8

4.7.3.5 Global warming

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7	any **two** from: • temperature • type / amount of food • light • whether chickens are kept indoors or outdoors • amount of movement / space (allowed) • time of year	 allow (volume / amount of) water allow same stocking density allow same number of each type ignore same number unqualified allow mass at start allow age of chicken(s) allow same medication **or** all healthy	2	AO2 4.6.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.8	any **one** from: • (more) valid / representative **or** reduce the effect of anomalies • (more) accurate mean	 allow can calculate a valid mean allow (more) accurate results allow (more) reliable mean / results	1	AO2 4.6.2.3

4.7.3.5 Global warming

Answer 33 · Mark scheme

June 2023 | 8461/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.9	breed best of **A** and **B** (together)	allow cross / mate best of **A** and **B**	1	AO2
	select offspring with highest egg numbers **and** heaviest / fastest growing	allow select the best offspring for both desired characteristics	1	AO1
	breed (these) offspring together		1	AO1
	repeat over many / several generations	do **not** accept reference to repeated breeding of the original parents	1	AO1 4.6.2.3

Total Question 9	**15**

4.7.3.5 Global warming

Answer 32 · Examiner comments

June 2022 | 8461/1F | Original Q3

Question 3 (Low and standard demand)

03.1 When faced with the concept of understanding photosynthesis in a context other than that of the Required Practical Activity, some students faltered. Most students were able to name one control variable in the investigation, with the most common response being light (intensity). Many students gave 'type of tomato plant', despite the stem of the question indicating that the investigation was only carried out on one type of plant. A number of students confused the independent variable and the control variable, stating the percentage of carbon dioxide would be a control variable.

03.2 Over 80% of students were able to identify where the greatest change in rate occurred.

03.3 Over 85% of students understood that repeating readings would improve the validity of the results.

03.4 Very few students appeared to understand that the command word 'explain' required them to do just that. A number of students gave the values for the rate of photosynthesis at 0.00% and 0.08% carbon dioxide, but did not get credit for their answer as they did not go on to describe the increase. Very few students made the link between the increased rate and carbon dioxide being needed for the reaction, with less than 10% of students achieving both marks. It is worth noting here that a significant proportion of students continue to give the formula molecules such as carbon dioxide; if they do, the formula must be correct. CO2, CO^2 and Co2 are all incorrect.

03.5 Many students were able to articulate the idea that the rate of photosynthesis would not increase beyond 0.08% carbon dioxide, but making further links as to why this would influence the famer's decision were rarely seen, with less than 10% of students achieving both mark points. Occasionally, reference to global warming was seen, but often this was not linked to the increased concentration of carbon dioxide. This question was another example of where poor articulation and lack of explanatory detail cost some students marks; for example, phrases such as 'he would get the same result' was not enough to gain the mark.

Answer 33 · Examiner comments

June 2023 | 8461/2F | Original Q9

Question 9

This was the third of the three questions common to both the Foundation and Higher Tier papers. The topic was reproduction and selective breeding.

09.1 The most common advantage given for growing genetically-different tomatoes was that some might be less susceptible to disease, although others, such as producing different-sized tomatoes, were also given. Just over one-third of students gave a suitable answer.

4.7.3.5 Global warming

Answer 33 · Examiner comments

June 2023 | 8461/2F | Original Q9

09.2 Deciding on an advantage for growing genetically-identical tomatoes proved more problematic and only one-fifth could suggest a feature such as all growing at the same rate or all having the same named desirable feature such as high yield, disease resistance or flavour.

09.3 Very few students could successfully describe what is meant by tissue culture. Use of tissue as the starting material was deemed inadequate and required amplification in terms of cells being grown. Only around 2 percent gave an appropriate answer.

09.4 Almost half of all students were able to suggest why genetically-identical tomatoes growing in a garden might not all attain the same height – for example, due to variations in light intensity, ions, water or temperature in different areas of the garden.

09.5 This question was about sex determination in dogs. Students had to use the symbols X and Y to complete a blank Punnett square. Most knew that the male dog would produce gametes containing either an X or a Y chromosome, and that all the female gametes would contain an X chromosome, and over a quarter were successful in the completion of all aspects of the Punnett square.

09.6 The explanation of why a litter of six puppies might be expected to consist of three males and three females was straightforward for only a minority of students: either in terms of the expected 1:1 ratio of males and females or the inheritance of a Y chromosome by only half of the offspring (as demonstrated in a correct answer to the previous question).

09.7 This question was about the breeding of chickens for meat production and egg production. Given the results of an investigation in Figure 5 which showed that chicken variety A had high egg production while variety B grew more quickly, students had to suggest two control variables for the investigation. Many answers were rather vague – such as the same ‘living conditions’ / ‘environment’. More specific conditions, such as temperature, lighting, amount or type of food, all being kept indoors or all outdoors, were required. The most common correct answer related to the chickens’ food. Fewer than half of the students could suggest at least one suitable control variable, and only 1 in 8 could give two.

09.8 The data in the investigation had come from 500 chickens of each variety and students had to give a reason why such a large number had been used. Acceptable answers included the idea this would be more representative, or would give a more valid mean, or would reduce the effects of any anomalies (and not that it would ‘eliminate’ anomalies). A little over one-third of students were successful.

09.9 In this question, students had to describe how selective breeding of the two chicken varieties might produce a new variety of chicken that was good for both meat production and egg production. Many answers lacked precision: thus it was not often evident that only the best from varieties A and B would be mated and that the best (for both qualities) from the offspring would then be selected and mated, and that this would be continued over several generations. Often, it was impossible to tell from students’ answers which generation of chickens was being used: the original parents, the first generation offspring or subsequent generations of offspring. The term ‘repeat’ was often used in an ambiguous context. Thus only 1 in 500 students scored all 4 marks, and only 1 in 25 gained at least half-marks.

4.7.3.5 Global warming

Mark Ranges and Award of Grades

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