AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.3.5

Global warming

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**31**
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 June 2007 | BLY1B | Original Q2 | Legacy

Two	**A** trees	**3**	
	B cattle	**4**	
	C lichens	**1**	
	D invertebrates	**2**	

	A	B	C	D

Answer 02 · Mark scheme June 2007 | BLY1B | Original Q7 | Legacy

Seven	**2**	**1**	**4**	**2**

Answer 03 · Mark scheme November 2007 | BLY1B | Original Q4 | Legacy

Four	**2**	**2**	**3**	**3**

4.7.3.5 Global warming

Answer 04 · Mark scheme January 2008 | BLY1H | Original Q6 | Legacy

Question 6

	answers	extra information	mark
(a)	3.2	award **both** marks for correct answer irrespective of working if answer incorrect (55 + 55 + 1.2 +5) – (110 + 3) **or** 116.2 –113 **or** (55 + 55 + 1.2 +5 + 90) – (110 + 93) gains **1** mark	2
(b)	any **one** from: • less carbon dioxide taken in by trees • less photosynthesis • burning trees releases carbon dioxide • decay releases carbon dioxide	ignore carbon dioxide released by trees **or** trees store carbon dioxide	1
(c)	heat / infra red / radiation / energy radiated by Earth carbon dioxide absorbs / traps / radiates	must be in correct context ignore light do **not** accept reflection allow reflects ignore absorbs radiation / heat / light from Sun ignore ozone	1 1 1
total			6

4.7.3.5 Global warming

Answer 04 · Mark scheme January 2008 | BLY1H | Original Q6 | Legacy

BLY1H

Answer 05 · Mark scheme March 2008 | BLY1BP | Original Q2 | Legacy

Two	**A**	competition	**3**
	B	environmental change	**1**
	C	survival	**4**
	D	extinction	**2**

	A	B	C	D

Answer 06 · Mark scheme March 2008 | BLY1BP | Original Q5 | Legacy

Five	**1**	**3**	**4**	**1**

Answer 07 · Mark scheme June 2008 | BLY1BP | Original Q8 | Legacy

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

4.7.3.5 Global warming

Answer 08 · Mark scheme

June 2008 | BLY1H | Original Q2 | Legacy

question	answers	extra information	mark
2(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
2(a)(ii)	global warming / melting icecaps / climate change / rise in sea levels / flooding	allow primary effects only allow temperature change	1
2(b)(i)	customers concerned with the environment / green issues (will be attracted) owtte	allow idea of helping the environment / world	1
2(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 08 · Mark scheme

COMPONENT NUMBER: BLY1H

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: June 2008

4.7.3.5 Global warming

Answer 09 · Mark scheme

January 2009 | BLY2H | Original Q4 | Legacy

question	answers	extra information	mark
4(a)	any **one** from: • increase / give light • increase temperature / make warmer • increase / give CO_2 • add fertiliser / nutrients / minerals / named	award marks if the method by which these could be done is given eg leave lights on all night **or** use a heater allow nitrogen ignore 'food'	1
4(b)(i)	any **two** from: • cheaper • better quality / flavour • available all year	accept converse if clear that answer refers to use of British tomatoes allow grow faster / more grown ignore size allow 'Fair Trade'	2
4(b)(ii)	any **two** from: • greater distance **or** more food miles **or** more transport • transport needs (more) energy / fuel • reference to eg greenhouse effect / global warming / pollution / CO_2 release / carbon footprint	idea of more needed only once ignore ozone	2
Total			**5**

4.7.3.5 Global warming

Answer 09 · Mark scheme January 2009 | BLY2H | Original Q4 | Legacy

COMPONENT NUMBER: BLY2H

COMPONENT NAME: Additional Science / Biology

STATUS: Final

DATE: January 2009

Answer 10 · Mark scheme June 2009 | BLY1BP | Original Q6 | Legacy

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

Answer 11 · Mark scheme June 2009 | BLY1BP | Original Q9 | Legacy

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

* This question has been removed

Answer 12 · Mark scheme November 2009 | BLY1BP | Original Q2 | Legacy

Two	**A**	Some heat energy escapes into space.	**3**
	B	Heat energy is re-radiated by greenhouse gases.	**4**
	C	Heat energy is radiated into the atmosphere.	**2**
	D	Solar radiation warms the Earth's surface.	**1**

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

Answer 13 · Mark scheme November 2009 | BLY1BP | Original Q5 | Legacy

Five	**3**	**1**	**4**	**1**

4.7.3.5 Global warming

Answer 14 · Mark scheme March 2010 | BLY1BP | Original Q8 | Legacy

Eight	**2**	**4**	**2**	**3**

Answer 15 · Mark scheme June 2010 | BLY1BP | Original Q1 | Legacy

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

Answer 16 · Mark scheme June 2010 | BLY1BP | Original Q8 | Legacy

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

4.7.3.5 Global warming

Answer 17 · Mark scheme

January 2011 | BLY1H | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
8(a)	two species / types involved		1
8(b)	any **three** from: pros (max **two** pros) • useful if species difficult to breed • prevents extinction / continues genetic line cons (max **two** cons) • low success rate **or** figures given • development problems • diverts attention from habitat conservation / poaching / pollution / climate change • cloning reduces gene pool conclusion argued conclusion	full marks only if at least **one** pro, **one** con and an attempt at a conclusion ignore reference to ethical issues / cruelty must include references to **both** pros and cons and must be at end of answer	3 1
Total			**5**

4.7.3.5 Global warming

Answer 18 · Mark scheme March 2011 | BLY1BP | Original Q7 | Legacy

Seven	3	4	2	2

Answer 19 · Mark scheme March 2011 | BLY1BP | Original Q9 | Legacy

Nine	1	1	3	3

Answer 20 · Mark scheme June 2011 | BLY1BP | Original Q8 | Legacy

Eight	3	3	3	2

4.7.3.5 Global warming

Answer 21 · Mark scheme

June 2011 | BLY1H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6	mutation **or** variation **or** range of sizes	do **not** accept deliberate mutation **or** factor caused mutation	1
	warm(er) / dry(er) now	allow global warming	1
	if warmer more smaller lambs / sheep survive winter **or** if warmer sheep do not need fat / wool / fur to keep warm **or** if warmer smaller sheep can lose heat more readily / do not overheat / keep cool (so survive) **or** if warmer smaller sheep have larger SA / V ratio (so survive) **or** if dryer smaller lambs / sheep need less grass (to survive)	award 'survival' point only if linked to warmer / dryer conditions do **not** accept smaller sheep retain more heat do **not** accept smaller sheep have smaller SA / V ratio ignore small sheep feed easier on grass	1
	small sheep breed / pass genes / mutations / characteristics to next generation	do **not** accept if Lamarckian ignore competition / predation / human influence	1
Total			**4**

4.7.3.5 Global warming

Answer 21 · Mark scheme

June 2011 | BLY1H | Original Q6 | Legacy

BLY1H

4.7.3.5 Global warming

Answer 22 · Mark scheme

June 2011 | BLY2H | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2	any **three** from: advantages: (max 2) • less transport / example of transport **or** less fuel used • less pollution / example • support of local / UK economy / farmers disadvantages: (max 2) • not available all year • may require use of heat / light • (production of) heat / light causes pollution	maximum **2** marks if only advantages **or** only disadvantages given ignore references to cost unqualified ignore reference to fresher accept implication eg less food miles allow no transport / fuel costs accept eg less carbon dioxide / smaller carbon footprint allow no pollution / example	3
Total			**3**

4.7.3.5 Global warming

Answer 22 · Mark scheme June 2011 | BLY2H | Original Q2 | Legacy

BLY2H

Answer 23 · Mark scheme November 2011 | BLY1BP | Original Q8 | Legacy

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

4.7.3.5 Global warming

Answer 24 · Mark scheme

June 2012 | BL2HP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	LHS: carbon dioxide **AND** water	in either order accept CO_2 **and** H_2O allow CO2 and H2O if names given ignore symbols do **not** accept CO^2 / H^2O / Co / CO ignore balancing	1
	RHS: sugar(s) / glucose / starch / carbohydrate(s)	accept $C_6H_{12}O_6$ allow C6H12O6 do **not** accept $C^6H^{12}O^6$	1
5(b)(i)	light is needed for photosynthesis **or** no photosynthesis occurred (so no oxygen produced)		1
5(b)(ii)	oxygen is needed / used for (aerobic) respiration	full statement respiration occurs **or** oxygen is needed for anaerobic respiration gains **1** mark	2
5(c)(i)	(with increasing temperature) rise then fall in rate use of figures, ie max. production at 40 °C **or** maximum rate of 37.5 to 38		1 1

Question 5 continues on the next page . . .

4.7.3.5 Global warming

BL2HP

Question 5 continued

question	answers	extra information	mark
5(c)(ii)	25 – 35 °C **either** faster movement of particles / molecules / more collisions **or** particles have more energy / enzymes have more energy **or** temperature is a limiting factor over this range 40 – 50 °C denaturation of proteins / enzymes	 ignore denaturation of cells ignore stomata	 1 1
5(d)	above 35 °C (to 40 °C) – little increase in rate **or** >40 °C – causes decrease in rate so waste of money **or** less profit / expensive because respiration rate is higher at >35 °C **or** respiration reduces the effect of photosynthesis		1 1 1
Total			**12**

4.7.3.5 Global warming

Answer 24 · Mark scheme June 2012 | BL2HP | Original Q5 | Legacy

BL2HP

Answer 25 · Mark scheme June 2014 | BL3HP | Original Q2 | Legacy

2			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 2014 | BL3HP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.7.3.5 Global warming

Answer 26 · Mark scheme June 2015 | BL3HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	(rapid) growth in population (size) increase in the standard of living	 accept description of increased standard of living, eg more packaging, more food thrown away or overbuying resources	1 1	AO1 341a
4(b)(i)	41.5	allow 1 mark for 9733 ÷ 23454 **or** allow 1 mark for 0.415 **or** allow 1 mark for 41.49 **or** 41 **or** 41.4	2	AO2 341
4(b)(ii)	any **four** from: arguments for: • there has been a reduction in total waste • there has been an increase in (total mass of) recycling • there has been an increase in the percentage of waste recycled • it (may) not be possible to achieve zero waste arguments against: • there is still a lot of waste (not recycled) • there has only been a small reduction in total waste • there was one year (2006) where total waste went up • the rate of increase of percentage recycled is slowing down • no information on materials reused • no information on waste from factories / industry	max 3 marks for a one sided argument allow as reason against if clear allow still more than half or 56.8% of waste (not recycled)	4	AO3 341

4.7.3.5 Global warming

Answer 26 · Mark scheme

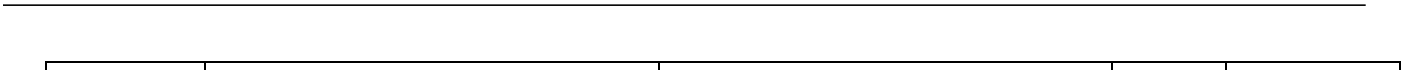
June 2015 | BL3HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(c)(i)	any **two** from: • reduce biodiversity **or** extinction • change in migration patterns • change in species distribution • change in climate	ignore rise in sea levels ignore temperature change accept correct examples of climate change eg storms, flooding, drought references to weather changing is insufficient allow ice caps melting or habitat destruction	2	AO1 343a
4(c)(ii)	any **one** from: • absorbed by oceans / ponds / lakes • peat bogs	allow used for skeletons / shells of sea creatures allow in fossil fuels / limestone	1	AO1 343b
Total			**11**	

4.7.3.5 Global warming

Answer 26 · Mark scheme

June 2015 | BL3HP | Original Q4 | Legacy



4.7.3.5 Global warming

Answer 27 · Mark scheme

June 2016 | BL3HP | Original Q9 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(a)(i)	fewer cows any **one** from: • less methane • less CO_2 in the atmosphere because of less deforestation **or** less plants consumed.	 do **not** allow CH^4 allow less CO_2 released into the atmosphere because less fuel used e.g. to heat cowsheds **or** to transport meat do **not** allow CO^2	1 1	AO2/3 3.4.2c 3.4.3a
9(a)(ii)	any **two** from: • could be mass produced to feed an increasing population • disease free meat • no / low fat • no harm to animals or less intensive farming • antibiotic free meat • more land available for farming crops	 allow (may be) suitable for vegetarians allow no energy loss along a food chain	2	AO3 3.4.4a/b
9(b)	 fungus / *Fusarium* with glucose (syrup) in aerobic conditions **or** in presence of oxygen mycoprotein is harvested / purified	ignore stirring / mixing and temperature ignore air allow ammonia added (as source of nitrogen)	 1 1 1 1	AO1 3.4.4d
Total			**8**	

4.7.3.5 Global warming

Answer 28 · Mark scheme

June 2017 | BL2HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	carbon + water ⟶ glucose + oxygen dioxide	LHS = 1 mark RHS = 1 mark allow sugar instead of glucose, ignore starch allow correct formulae: H_2O, CO_2, $C_6H_{12}O_6$ and O_2 if words **and** formulae given, accept correct words and ignore incorrect formulae ignore balancing ignore light / heat / energy / chlorophyll on LHS do **not** allow light / heat / energy on RHS	2	AO1 2.3.1a
4(b)(i)	16	allow answers in range 15.8 to 16.2	1	AO2 2.3 2.3.1c
4(b)(ii)	25 (%)	ignore 0.25 allow ecf from answer to **bi**	1	AO2 2.3 2.3.1c
4(b)(iii)	no extra photosynthesis **or** maximum rate is reached (so) no extra yield **or** less profit **or** not cost-effective **or** waste of money	ignore graph levels off allow CO_2 not limiting **or** another factor is limiting (the rate of photosynthesis) ignore cost unqualified	1 1	AO2/AO3 2.3 2.3.1c

4.7.3.5 Global warming

Answer 28 · Mark scheme

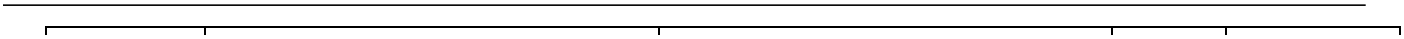
June 2017 | BL2HP | Original Q4 | Legacy

4(b)(iv)	increased temperature increased light (intensity)	allow use of a heater allow turn on lamps allow increased minerals / ions / salts / water / correct named example if no other marks awarded allow one mark for temperature **and** light	1 1	AO1 2.3, 2.3.1c,d
Total			**8**	

4.7.3.5 Global warming

Answer 28 · Mark scheme

June 2017 | BL2HP | Original Q4 | Legacy



4.7.3.5 Global warming

Answer 29 · Mark scheme June 2017 | BL3HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	less CO_2 absorbed / taken in (by trees from the atmosphere)	allow release / increase of CO_2 from burning / use of (heavy) machinery ignore less photosynthesis unqualified	1	AO1 3.4.2a
1(b)(i)	0.8		1	AO2 3.4.2
1(b)(ii)	anywhere in range: 3(.0) – 3.4		1	AO2 3.4.2
1(c)	microorganisms respire **and** release CO_2	allow bacteria / fungi / decomposers allow anaerobic decay / respiration releases methane	1 1	AO1 3.4.2a
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.7.3.5 Global warming

Answer 29 · Mark scheme

2(a)(i)	left ventricle		1	AO1 3.2.1c
2(a)(ii)	aorta	ignore artery allow aortic (artery)	1	AO1 3.2.1d
2(a)(iii)	(to keep) blood flowing in the right / one direction **or** prevent backflow (of blood)	ignore ref to veins	1	AO1 3.2.1e

Answer 29 · Mark scheme

2(b)	Reasons for: • less likely to die (44% cf. 59%) • lower risk of death from having a second operation • lower risk of heart infections • less chance of the valve stopping working • longer lasting • doesn't cause rejection • avoids religious issues of using organs from a pig **or** no ethical issue from using part of a living organism Reasons against: • chance of death by bleeding is increased • offers no advantage against clots **or** equal risk of blood clots • have to take anti-clotting drugs for life • can be noisy	max 3 marks if only reasons for or reasons against given allow converse for each point if clearly referring to the pig tissue valve ignore cost allow doesn't stop working allow been used for a longer period of time ignore religion **or** ethical unqualified	4	AO3 3.2

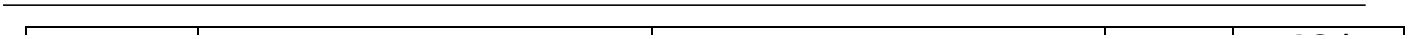
2(c)	(inserted to) keep the (coronary) artery / arteries open allows more blood to flow (to the heart muscle) **or** return blood flow to normal	do **not** allow veins allow (more) glucose / oxygen to reach the heart (muscle)	1 1	AO1 3.2.1f

Total		**9**

4.7.3.5 Global warming

Answer 29 · Mark scheme

June 2017 | BL3HP | Original Q1 | Legacy



4.7.3.5 Global warming

Answer 30 · Mark scheme

June 2018 | 8461/2H | Original Q2

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>02.1</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>02.2</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.
02.3	**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			
02.4	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
02.5	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

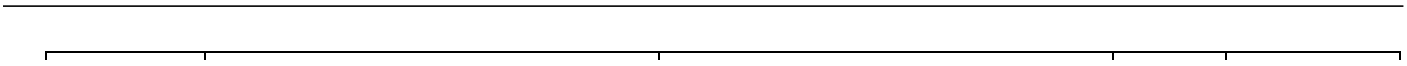
Answer 30 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	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 | 8461/2H | Original Q2



4.7.3.5 Global warming

Answer 31 · Mark scheme

June 2023 | 8461/2H | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	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.
03.2	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.
03.3	(a group of) cells are grown (into a new organism)	ignore clones	1	AO1 4.6.2.5

Answer 31 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	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.
03.5	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.
03.6	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 31 · Mark scheme

June 2023 | 8461/2H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	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.
03.8	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 31 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.9	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 3	**15**

4.7.3.5 Global warming

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

Question 3

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

4.7.3.5 Global warming

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

03.1 The advantage given by most for growing genetically-different tomatoes was that some might be less susceptible to disease. Almost two-thirds of students gave a suitable answer.

03.2 Deciding on an advantage for growing genetically-identical tomatoes proved more problematic and only one third 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.

03.3 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. Fewer than 1 in 5 gave an appropriate answer.

03.4 More than two-thirds of 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.

03.5 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 three-quarters were successful in the completion of the Punnett square.

03.6 The explanation of why a litter of six puppies might be expected to consist of three males and three females was straightforward for most: 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).

03.7 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. While most students could suggest at least one suitable control variable, fewer than half could give two.

03.8 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). Three-quarters of students were successful.

03.9 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 20 students scored all 4 marks, and only a third gained half-marks.