AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.5.2

Farming techniques

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**6**
Available paper years	**2009–2024**

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.

4.7.5.2 Farming techniques

Answer 01 · Mark scheme June 2009 | BLY1BP | Original Q5 | Legacy

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

Answer 02 · Mark scheme June 2009 | BLY1BP | Original Q9 | Legacy

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

* This question has been removed

4.7.5.2 Farming techniques

Answer 03 · Mark scheme

Question 2

question	answers	extra information	mark
2(a)(i)	20		1
2(a)(ii)	one tenth / 0.1 / 10% / 1:9 / 1 in 10 / 1 out of 10 / $\frac{1}{10}$	for correct answer irrespective of working ignore any units accept equivalent fractions eg $\frac{4}{40}$ / $\frac{2}{20}$ do **not** allow eg 1:10 / 1 to 10 if answer is incorrect clear selection of 2 **and** 20, **or** equivalent **or** 1:4:5 / 1:5:4 gains **1** mark	2
2(b)	any **two f**rom: • (body) heat / maintaining body temperature • movement (max 2) • growth / cell division / repair / reproduction / building molecules • accept active transport	do **not** accept sweating / cooling / excretion allow keep warm allow **2 different** examples of movement, internally and / or externally eg breathing / exercise / eating / circulation allow muscle contraction if no other muscle action is credited movement + breathing = 1 mark allow examples eg making proteins (from amino acids) ignore 'chemical reactions' / digestion	2

Question 2 continues on the next page

BLY 2H

Question 2 continued

question	answers	extra information	mark
2(c)	more movement / have to hunt / catch food	allow converse if stated for herbivore eg herbivores food is all around ignore reference to size **or** predator unqualified	1
2(d)	any **two** from • less movement • less heat loss • less respiration	ignore reference to food allow no movement allow less space to move ignore less space unqualified allow no heat loss **or** they are kept warm	2
Total			**8**

4.7.5.2 Farming techniques

Answer 03 · Mark scheme

June 2010 | BLY2H | Original Q2 | Legacy

BLY 2H

4.7.5.2 Farming techniques

Answer 04 · Mark scheme

June 2013 | BL3HP | Original Q3 | Legacy

Question 3

question	Answers	extra information	mark
3(a)(i)	wheat → humans chain transfers 10 times more energy than wheat → pigs → humans chain or wheat → pigs → humans chain transfers 810 000 (kJ per hectare) less	allow 10% if given as a comparison e.g. one is 10% of the other ignore less unqualified	1
3(a)(ii)	any **one** reason for energy loss from pigs e.g.: • movement • (maintaining) body temperature • waste materials • not all parts of pig eaten by human • because there is an extra stage (pigs) in the food chain and energy is lost at each stage	ignore respiration, growth ignore heat unqualified allow named examples allow longer food chain so more energy lost	1

Question 3 continues on the next page . . .

Question 3 continued

3(b)	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.		6
0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
No relevant content.	There is a basic description of at least one factory farming method **or** identification of an advantage or disadvantage of factory farming.	There is a description of at least one factory farming method **and** an advantage or disadvantage is explained.	There is a description of factory farming methods **and** advantage(s) and disadvantage(s) are explained.

examples of biology points made in the response:

factory farming methods e.g.:

- Kept in cramped conditions / battery hens / calf crates / pig barns / fish tanks
- Controlled temperature / heating
- Controlled feeding / modified food given / growth hormones
- Controlled lighting
- Treated with prophylactic antibiotics

Advantages e.g.:

- Increased efficiency / profit / greater food production / cheaper food / faster growth
- Farmer can have more livestock
- Less energy is lost through movement
- Less energy is used keeping warm
- (Food is high in calories / protein) so animals will grow faster / lay more eggs
- Easier to vaccinate all the animals
- Easier to protect animals from predators
- Antibiotic treatment stops infections in animals

Disadvantages e.g.:

- Stress / cruelty / inhumane / unethical
- Restricted movement / overcrowding
- Faster spread of diseases
- Antibiotics in the food chain / residual chemicals in the food chain
- Wasting fossil fuels / increasing global warming
- Increased pollution from animal waste and from additional transport

Total			**8**

4.7.5.2 Farming techniques

Answer 05 · Mark scheme

November 2020 | 8461/2H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	$\frac{6.0}{1.6}$ 3.75	allow a range of 5.9 to 6.1 for 6.0 do **not** accept if a unit is given if no other marks awarded, allow a correct answer using a value of 5.8 or 6.2 for **1** mark	1 1	AO2 4.7.3.2
02.2	$\frac{2.5 - 1.6}{50}$ 0.018 (billion per year)	allow $\frac{0.9}{50}$	1 1	AO2 4.7.3.2
02.3 view with Figure 2	suitable extrapolation line on Figure **2** reading taken at 2050 from student's line	allow straight extrapolation allow a tolerance of ± ½ small square allow **1** mark for 10 billion if no extrapolation drawn	1 1	AO2 4.7.3.2
02.4	fewer fish caught **or** limit the number of fish caught (remaining fish) can reproduce	allow a method of doing this, eg increase mesh size **or** do not catch young fish allow more fish (survive to) reproduce	1 1	AO1 4.7.5.1 4.7.5.3

4.7.5.2 Farming techniques

Answer 05 · Mark scheme

November 2020 | 8461/2H | Original Q2

Question	Answers	Mark	AO / Spec. Ref.
02.5	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4-6	AO1 4.7.3.1 4.7.3.2 4.7.3.3 4.7.3.4 4.7.3.6 4.7.3.5 4.7.5.1 4.7.5.2
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content **human land use** • increasing population requires more food • crops / livestock for food • farming crops for biofuels • peat use as compost • peat use as fuel • increased use of pesticide / insecticide / herbicide / fertilisers • use of free-range / organic methods increases land use (for same yield) **link to biodiversity** • deforestation • monocultures • loss of hedgerows (to make fields larger) • loss of habitat • consequence of loss of habitat eg (change in) migration • fertiliser run off polluting water • use of pesticide / insecticide / herbicide reduces insects / plants which damages food chains • more soil erosion **link to atmospheric pollution** • more carbon dioxide (from farm animals / machinery) • more methane (from cows) • climate change **or** global warming • example of impact on biodiversity • acid rain • desertification Answers referring to only land use or only biodiversity are level 1		

02.6	golden rice has improved nutritional value		1	AO1 4.7.5.4
02.7	any **one** from: • gene may contaminate / enter other breeds / species • reduction / extinction of population of wild / traditional rice • reduction / extinction of population of flowers / insects • high cost of seeds • may have too much vitamin A (in diet)	ignore references to religious beliefs allow decrease in biodiversity allow decrease in gene pool allow may harm (human) health allow may cause side effects (on humans) ignore may harm humans unqualified	1	AO3 4.6.2.4
Total			**16**	

4.7.5.2 Farming techniques

Answer 05 · Mark scheme

November 2020 | 8461/2H | Original Q2

4.7.5.2 Farming techniques

Answer 06 · Mark scheme

June 2024 | 8461/2H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.1	46 000 **or** 16 400 **or** 12.8 **or** 0.8		1	AO2 4.7.2.1 4.7.4.3 4.7.5.2
	46 000 **and** 16 400 **or** 262 400		1	
	46 000 **and** 209 920 **or** 3593.75		1	
	2191.3 **or** $\frac{46\,000 \times 10\,000}{209\,920}$ **or** $\frac{3593.75 \times 10\,000}{16\,400}$		1	
	2190		1	

4.7.5.2 Farming techniques

Answer 06 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.2	suitable scale, symmetrical around 0 labels for *x*-axis **and** for bars correct values plotted: chickens 2200 maize 4200	 (biomass in) kg (bars) maize and chickens allow a tolerance of ±½ small square ignore height of bars	1 1 1	AO2 4.7.4.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.3	2200 4200 = 0.5238… : 1 **or** 11 : 21 **or** 1 : 1.9	 allow rounded value	1 1	AO2 4.7.4.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.4	lost via egestion / faeces	ignore urine / excretion / waste ignore not digested do **not** accept respiration do **not** accept not eaten do **not** accept movement **or** as heat **or** for keeping warm	1	AO1 4.7.4.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.5	lysine and tryptophan		1	AO3 4.4.2.3 4.7.5.2

4.7.5.2 Farming techniques

Answer 06 · Mark scheme

June 2024 | 8461/2H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.6	any **one** from: • chickens need low amounts of leucine (for growth) • (chicken) proteins contain low amount / proportion of leucine	do **not** accept leucine is not needed (for growth)	1	AO3 4.4.2.3 4.7.5.2

Total Question 7	13

4.7.5.2 Farming techniques

Answer 05 · Examiner comments

November 2020 | 8461/2H | Original Q2

Question 2 (standard demand)

The question was about human population increase and the problem of provision of sufficient food. For the calculation in **09.2**, both of the values required were given in the information, so it was not necessary to determine figures from the graph. Despite this, many students did attempt to, often incorrectly. For those who did show the correct numbers in their calculations, a large proportion used them incorrectly, often adding them and very few did the necessary calculation of dividing the difference by 50. Some just left the value at '0.9'. Others calculated the mean of the two given values rather than the mean annual increase. Fewer than half of the students were completely successful.

In **02.3** most students attempted to draw some sort of extrapolation on the graph; however, this was sometimes not linked to the trend shown by the line, rising a little, then plateauing or even taking a downturn. Students could still gain the second mark for reading the correct value from their own line. This was often not done accurately, particularly by students who continued their extrapolation beyond 2050 and read off the final population value. It was clear that students who simply read the scale, and gave answers such as '10' had not considered the implication that their answer of a human population of only 10, rather than 10 billion, is unlikely.

In **02.4** students showed some understanding of the term 'quota' and described limiting fishing in one way or another. However, this was as far as some got as they omitted the idea that the remaining fish would be able to reproduce, in order to maintain stocks. Lower-attaining students often suggested that a quota referred to the amount of fish that people could buy or eat. In **02.5** most students successfully linked the need for more farmland to an increasing population needing more food. References to the use of chemicals to enhance growth were only given very occasionally. In terms of reduced biodiversity, few students went beyond deforestation and habitat loss, although some suggested that the latter might result in migration of animals to find new habitats. There were only occasional references to methane and carbon dioxide production and an association of these with global warming. The question differentiated between students well.

4.7.5.2 Farming techniques

Answer 06 · Examiner comments

June 2024 | 8461/2H | Original Q7

Question 7 (standard/high and high demand)

07.1 Students were provided with data regarding chickens and farmland, and were asked to calculate the area of land needed to provide enough energy from maize seeds for 1000 chickens to grow to full size. The mark scheme is designed to benefit the logical mathematical use of the numbers that were provided in the stem of the question.

Almost 35% of students were able to attain the maximum five marks by calculating the correct answer of 2190 m^2. Students with a final answer showing an error to the power of 10 (such as 2.19, 21.9, 21900 etc.) gained four marks in line with the marking procedure for calculations (section 3.3 of the mark scheme).

A small number of students did not convert their answer to 3 significant figures so could only be awarded four marks. Despite the high level of challenge provided by this calculation, 40% of students were able to gain 1 or 2 marks.

Students are encouraged to show their working out for all calculations.

07.2 Students were asked to complete a pyramid of biomass for maize seeds and chickens, and it was clear that many students had a weak understanding of this. 20% of students gained all three marks, with 40% of students not gaining any mark at all or not attempting the question.

Students used a vast range of different scales, but only those that were symmetrical and used over half the available grid were able to gain marking point 1. A number of students did not notice that they needed to calculate the value for chickens and not simply plot 2.2 kg. This went on to provide problems devising a suitable scale.

07.3 Over 50% of students correctly calculated the ratio of chicken biomass to maize seed biomass. Common errors were using the mean mass of 1 chicken, and not calculating the value for 1000 chickens, inverting the correct values and giving an answer of 21:11 or 1.9:1. Students are reminded to check their ratio reflects the order given in the question.

07.4 Just under a quarter of students correctly articulated what happened to the remaining 20% of the biomass in the maize seeds. It was clear a far greater number of students knew the correct answer but gave vague responses such as ‘waste’ or used colloquial terms which were insufficient for credit at this level.

07.5 85% of students correctly identified lysine and tryptophan as the amino acids found in significantly higher proportions in the QPM seeds.

07.6 Only 15% of students were able to correctly suggest why a diet containing less leucine does not slow down the growth of chickens. Many students did not appear to read all the information provided and incorrectly suggested that leucine was not an essential amino acid, or not essential to growth.

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