AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.2.1

Variation

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**10**
Available paper years	**2007–2022**

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.

4.6.2.1 Variation

Answer 01 · Mark scheme June 2007 | BLY1B | Original Q8 | Legacy

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

Answer 02 · Mark scheme June 2008 | BLY1BP | Original Q2 | Legacy

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

Answer 03 · Mark scheme November 2008 | BLY1BP | Original Q1 | Legacy

One	A observed that all species change over time **3** **B** had sufficient evidence to prove evolution **4** **C** thought that evolution was by natural selection **1** **D** changes that happen during an organism's lifetime are inherited by offspring **2**

Answer 04 · Mark scheme March 2009 | BLY1BP | Original Q9 | Legacy

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

4.6.2.1 Variation

Answer 05 · Mark scheme June 2009 | BLY1BP | Original Q2 | Legacy

Two	**A** Creationism **4** **B** Intelligent Design **3** **C** Lamarckism **1** **D** Darwinism **2**			
	A	**B**	**C**	**D**

Answer 06 · Mark scheme June 2011 | BLY1BP | Original Q1 | Legacy

Question	Key		
One	**A**	extinction	4
	B	mutation	2
	C	reproduction	3
	D	variation	1

Answer 07 · Mark scheme June 2011 | BLY1BP | Original Q2 | Legacy

Two	**A** each of the four species changes slowly over time **1** **B** none of the four species changes over time and some species die out **4** **C** none of the four species changes over time **3** **D** new species evolve over time **2**			
	A	**B**	**C**	**D**

Answer 08 · Mark scheme June 2011 | BLY1BP | Original Q9 | Legacy

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

The AQA UMS Conversion Calculator can be found at the following web address:

http://www.aqa.org.uk/umsconversion

4.6.2.1 Variation

Answer 09 · Mark scheme

November 2021 | 8461/2H | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	Classification group Kingdom Phylum Class Order Family Genus Species	all 4 correct = **2** marks 2 or 3 correct = **1** mark 0 or 1 correct = **0** marks	2	AO1 4.6.4
09.2	Geospiza fortis	ignore underlining or attempted italics or upper and lower case letters	1	AO2 4.6.4
09.3	offspring have similar beak depths to parents	ignore same beak depths ignore positive correlation / described	1	AO3 4.6.2.1
09.4	parents of a given beak depth produce offspring with several beak depths	allow spread of results for a given parental beak depth about line of best fit allow range of phenotypes for a given parental beak depth	1	AO3 4.6.1.6

4.6.2.1 Variation

Answer 09 · Mark scheme

November 2021 | 8461/2H | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	colonisers of Isabela have a range of beak depths	allow colonisers of Daphne have a range of beak depths	1	AO2
	due to different combinations of alleles of several genes **or** due to different alleles of one gene **or** due to mutation		1	AO1
	large range of (sizes / species of) seeds / food (on Isabela) **or** large(r) seeds (on Isabela)	allow small range of (sizes / species of) seeds / food on Daphne **or** allow small(er) seeds on Daphne	1	AO2
	more competition for seeds / food (on Isabela)	allow less competition for seeds / food on Daphne ignore competition unqualified	1	AO2
	birds with larger beaks get enough food to (survive and) reproduce (on Isabela)	allow birds with smaller / medium beak sizes get enough food to (survive and) reproduce on Daphne	1	AO2
	(survivors) pass on (beneficial) alleles to offspring	allow pass on genes / mutation ignore pass on chromosomes / characteristics	1	AO1 4.6.2.1 4.6.2.2 4.7.1.1 4.7.1.3

4.6.2.1 Variation

Answer 09 · Mark scheme

November 2021 | 8461/2H | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	Isabela is a large island with more species of plants **or** Isabela is a large island with more variety in seed / food sizes **or** Isabela is a large island with more plants / seeds / food		1	AO3 4.7.1.1 4.7.1.3
	less competition for seeds / food **or** enough seeds / food for both bird species		1	
Total			**13**	

4.6.2.1 Variation

Answer 10 · Mark scheme

June 2022 | 8461/2H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	echidna: 27 to 35 **or** by 8 (°C) **and** human: 36.2 to 37.2 **or** by 1 (°C)	allow a tolerance of ± 0.5 (°C) allow a tolerance of ± 0.1 (°C)	1	AO3 4.5.1 4.5.2.4
	echidna is more variable **or** human fluctuates less	allow echidna is 7 (°C) more variable for **2** marks allow echidna is 8 times more variable for **2** marks	1	

4.6.2.1 Variation

Answer 10 · Mark scheme

June 2022 | 8461/2H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2		do **not** accept energy produced / made / created do **not** accept energy used for respiration		AO2 4.5.2.4 4.5.3.2 4.4.2.1
	loses less energy (from its body)	allow loses / wastes less heat	1	4.4.2.3
	(so) body energy store lasts longer	allow glycogen / fat lasts longer allow stored food lasts longer	1	
	OR			
	lower temperature gradient (between echidna and air) (1)			
	(so) loses less energy (1)	allow loses less heat		
	OR			
	less energy transferred maintaining (higher) body temperature (1)	allow less energy transferred for keeping warm		
	(so) more energy available for processes vital for life (1)	allow more energy for eg heart / brain function ignore metabolism		

4.6.2.1 Variation

Answer 10 · Mark scheme

June 2022 | 8461/2H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	activity / movement requires energy from respiration (and) respiration / metabolism releases heat (which increases body temperature) **OR** respiration / metabolism releases heat (which increases body temperature) (1) (which) increases the rate of chemical reactions **or** increases enzyme activity (1)	do **not** accept energy produced / made / created **once** only	1 1	AO2 4.5.2.4 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	more blood flow near surface (of skin) **or** more blood flow to the skin (so) more heat / energy is lost (from the blood) cools blood which cools the body	do **not** accept blood vessels move nearer to surface of skin ignore cools blood / body unqualified	1 1 1	AO1 4.5.2.4

4.6.2.1 Variation

Answer 10 · Mark scheme

June 2022 | 8461/2H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	$\frac{20\,000 \times 40}{100 \times 2.5}$ **or** $\frac{8000}{2.5}$		1	AO2 4.5.2.4
	3 200 (cm^3)		1	
	3.2 (dm^3)	allow an incorrectly calculated value correctly divided by 1000	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	to replace ions / salt lost (in sweat)	allow named example such as Na^+ allow because ions / salt lost in sweat allow to prevent (muscle) cramp	1	AO2 4.5.2.4 4.5.3.3

Total Question 8		13

4.6.2.1 Variation

Answer 09 · Examiner comments

November 2021 | 8461/2H | Original Q9

Question 9 (standard, standard/high & high demand)

This question was about Galapagos Island finches. In **09.1**, one-quarter of students were able to give the names of all four of the taxa missing from the table. Once again, probably because there were no answer lines and answers had to be written in the table, a quarter of students did not attempt this question.

In **09.2**, fewer than one-third of students were able to select *Geospiza fortis* from the table as the binomial name of the medium ground finch. It was evident that many did not know that the binomial name consisted of genus + species, while some did not appreciate that binomial indicated a two-word answer: 'fortis' being a common response.

Very few students scored the mark in **09.3**. Most described a 'positive correlation' in the results or stated that the beak depths of the offspring were 'proportional to' those of the parents but did not mention that the offspring beak sizes were approximately the same as those of the corresponding parents. Around one in seven students scored a mark.

Just over 1% of students gave a creditworthy answer to **09.4**. Common incorrect answers were that there was 'a range' of beak depths in the offspring, not stating that this was so for each parental value. There were also vague references to 'anomalies' and 'outliers' and some gave numerical values that were beyond the scales on the graph.

09.5 also proved to be very difficult and it was evident that many students did not understand the question, assuming that it was about speciation which it was not. Better answers attempted to relate beak size to the sizes of seeds produced by plants on the two islands and whether or not there was competition from the second species. Mutations were correctly mentioned quite often as a cause of variation in beak size but this concept then had to be applied to selection on the basis of availability of suitable foods (seeds). The highest mark scored was 4 out of 6, with few gaining half-marks. More than half the students scored no marks at all.

A third of students scored any marks in **09.6**, mainly for stating that competition for food might be reduced on the larger island. However, most did not relate this to the potentially greater abundance or greater variety of plants and seeds on the larger island and many did not qualify the concept of competition with it being for food, despite the relationship between beak size and seed size having been given in the stem before **09.5**.

4.6.2.1 Variation

Concluding Remarks

Overall, this November's paper was broadly comparable in demand to last year's, but this year's students appeared to be weaker on average and so found a number of questions more difficult.

Areas of the Specification about which knowledge was acceptable were:

- 4.6.1.5 DNA structure
- 4.7.4.1 Trophic levels.

Particular areas of the Specification about which knowledge seemed limited were:

- 4.5.2.4 Control of body temperature
- 4.5.3.4 Hormones in human reproduction
- 4.6.1.6 Genetic inheritance
- 4.6.4 Classification of living organisms
- 4.7.1.2 and 4.7.1.3 Abiotic factors and biotic factors
- 4.7.2.2 and 4.7.2.3 How materials are cycled and decomposition .

Students struggled to apply knowledge and understanding of Specification sections:

- 4.6.1.6, 4.6.2.1 and 4.6.3.1 Genetic inheritance, variation and evolution
- 4.7.5.3 Sustainable fisheries.

This year, as in previous years, certain general problems have been perpetuated, such as:

- not paying sufficient attention to information given in the introductory stem to a question
- needless repetition of information given in the stem of the question
- imprecise use of technical vocabulary
- not giving a comparative answer to a comparative question
- not necessarily paying attention to both sides of an argument in an evaluation question
- poor layout of working in mathematical problems, struggling with the interconversion of units and lack of consideration regarding whether the answer obtained is reasonable
- failing to answer a question where there were no answer lines, but where the answer needing to be inserted into a table or diagram.

4.6.2.1 Variation

Mark Ranges and Award of Grades

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

4.6.2.1 Variation

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Question 8

This question compared temperature regulation in a primitive mammal, the echidna, with that of a human.

08.1 Since a comparison of temperature variation in the echidna and the human was required, using data from the graphs in **Figures 11** and **12**, it was essential to quote or manipulate numbers from the graphs and to state which variation was the greater. Fewer than a quarter of students were completely successful. Some misread the figures on one or both graphs, others selected the cold-weather data for the echidna whereas warm weather had been asked for, and others did not state which organism's variation was the greater.

08.2 Many students struggled to understand why a low body temperature for hibernation in cold weather would benefit the echidna. Although just over half appreciated the animal would lose less energy, or heat, from its body, few could go on to explain that this was because of the lower temperature gradient between the echidna and its environment or explain that its body energy stores would last longer as a result.

08.3 Two different approaches to answering this question were given credit: to explain how activity could cause an increase in body temperature or to explain why an increase in body temperature would enable the animal to be more active. Either of these hinged on the vital point that energy was released by *respiration*, which was not mentioned by many students and thus only one-third scored any marks.

08.4 Explanations of how dilation of blood vessels in the skin could result in a decrease in body temperature were generally deficient in two respects: a misunderstanding of vasodilation and the omission of how cooling the blood in the skin resulted in a lowering of the temperature of the rest of the body. Some just stated that more blood flowed through dilated vessels or stated incorrectly that the vessels rose up through the skin. Hardly any students could explain that blood cooled at the skin would flow round the rest of the body

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and so remove heat from the other parts of the body. The one point generally scored was that more heat would be lost from the blood through the skin.

08.5 This proved to be a straightforward calculation for three-quarters of students, who scored full marks. A common error was the failure to convert correctly an answer in cm^3 to dm^3, even with the fact, given in the question, that 1000 cm^3 equalled 1 dm^3. Some left their answers as 3200 cm^3 of sweat lost by the athlete per day, others incorrectly coverted this to the somewhat improbable answer of 3 200 000 dm^3 per day.

08.6 The need to take salt tablets was related to replenishment of the salt lost in sweat by fewer than half of the students. Many thought that the extra salt in the blood would help to retain water in the body.