AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.3.3

The understanding of genetics (biology only)

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**4**
Available paper years	**2013–2024**

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.

4.6.3.3 The understanding of genetics (biology only)

Answer 01 · Mark scheme

January 2013 | BL2FP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	Mendel		1
5(b)(i)	**TT**		1
5(b)(ii)	a dominant allele		1
5(c)	1 : 1		1
5(d)	100 short plants		1
Total			**5**

4.6.3.3 The understanding of genetics (biology only)

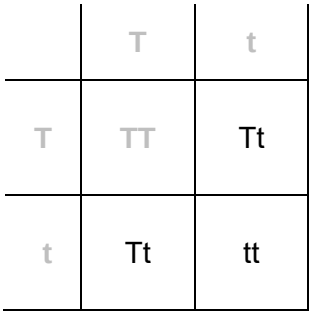
Answer 01 · Mark scheme

January 2013 | BL2FP | Original Q5 | Legacy

BL2FP

4.6.3.3 The understanding of genetics (biology only)

Answer 02 · Mark scheme June 2018 | 8461/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	Gregor Mendel		1	AO1 4.6.3.3
04.2	DNA		1	AO1 4.6.3.3
04.3	when the dominant allele is not present		1	AO1 4.6.1.6
04.4	tt	allow homozygous recessive	1	AO2 4.6.1.6
04.5		all 3 correct = **2** marks 2 correct = **1** mark 0 or 1 correct = **0** marks allow tT for Tt	2	AO2 4.6.1.6
04.6	circle drawn around either TT or tt on Figure 5	allow circles drawn round both	1	AO2 4.6.1.6
04.7	correct ratio from question **04.5** eg 3 : 1	allow multiples of stated ratio allow 3 : 1 if no answer to question **04.5**	1	AO3 4.6.1.6
Total			**8**	

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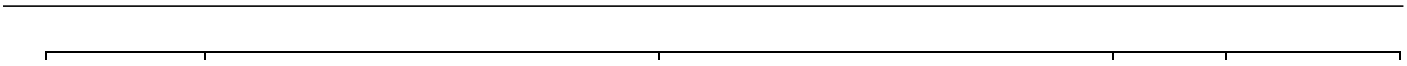
Answer 02 · Mark scheme

June 2018 | 8461/2F | Original Q4



4.6.3.3 The understanding of genetics (biology only)

Answer 03 · Mark scheme

November 2020 | 8461/2F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	4 / four		1	AO1 4.6.1.2
03.2	23 / twenty three	do **not** accept 23 pairs	1	AO1 4.6.1.2
03.3	a different form of a gene		1	AO1 4.6.1.6
03.4	heterozygous		1	AO2 4.6.1.6
03.5 mark with 3.6 and 3.7	<table><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td>**Dd / dD**</td></tr><tr><td></td><td>**dd**</td><td>**dd**</td></tr></table>	allow 2 correct for **1** mark	2	AO2 4.6.1.1 4.6.1.2 4.6.1.6
03.6 mark with 3.5 and 3.7	ring around any **Dd**	allow ecf from question **03.5**	1	AO2 4.6.1.6
03.7 mark with 3.5 and 3.6	percentage must match answer given to questions **03.5** and **03.6**	if no answer in question **03.5** allow 50 %	1	AO3 4.6.1.6
03.8	mutation / mutated	do **not** accept mutant	1	AO1 4.6.2.1

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03.9	any **one** from: • to help them prepare • to inform whether to consider having an abortion • to find out if they have passed on the disorder	allow to see if the child / embryo has the disorder allow answers referring to genetic disorders, or specific example such as Dupuytren's / cystic fibrosis	1	AO3 4.6.1.7
Total			**10**	

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Answer 03 · Mark scheme

November 2020 | 8461/2F | Original Q3

4.6.3.3 The understanding of genetics (biology only)

Answer 04 · Mark scheme

June 2024 | 8461/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.1	**r r**	allow homozygous recessive	1	AO2 4.6.1.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.2	male gametes correct: **R** and **r** all four offspring genotypes correctly derived from gametes (given)	 allow **1** mark for 2 or 3 correct	1 2	AO2 4.6.1.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.3	correct ratio from **Figure 11**	allow 3 : 1 if no answer to **08.2**	1	AO3 4.6.1.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.4	having (two) different alleles (of a gene)	ignore example(s) do **not** accept having two different genes	1	AO1 4.6.1.6

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Answer 04 · Mark scheme

June 2024 | 8461/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.5	any **two** from: • other scientists not aware of his work **or** work published in obscure journal • other theories accepted at the time • not considered to be a scientist **or** not eminent **or** not respected • Mendel's (mathematical) approach was novel concept • peas gave unusual results compared with other species • new discoveries made Mendel's work relevant	allow work lost for many years allow eg theory of blending inheritance ignore religion allow he was **only** a monk allow he was not believed allow his work was not understood **or** no other scientist had similar ideas allow his results were not corroborated (at the time) allow Mendel only worked on pea plants allow insufficient results / research allow specific discoveries	2	AO2 4.6.3.3

Total Question 8	8

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Answer 03 · Examiner comments November 2020 | 8461/2F | Original Q3

Question 3 (low & standard demand)

This question was about meiosis, chromosomes and an inherited disorder in humans. A little over one-third of students gave the correct answer of '4' cells being formed by meiosis in **03.1**. There were many other alternatives offered: '2' was, not unexpectedly, a common incorrect response and other suggestions included '8' and as many as '50 million' as these last students presumably either misread the question or misunderstood the process of meiosis.

For **03.6** most students ringed an appropriate offspring genotype although a significant minority (about 1 in 15) did not answer this question. The most likely reason for this is that students missed the question, rather than not understanding what they had to do. The lack of answer lines, spaces or boxes to tick should not be seen by students to mean that nothing needs to be done. Students should be reminded to read all of the words on the paper and respond accordingly. Those students who gave incorrect responses often ringed contradictory genotypes, showing a lack of understanding of genetic principles.

Answer 04 · Examiner comments June 2024 | 8461/2F | Original Q8

Question 8 (low and standard demand)

08.1 Half of students correctly interpreted the information given in the question and correctly used the given symbols to write the required genotype of 'rr'. Very occasionally the written terms of 'homozygous recessive' were seen, which was credited.

Some students gave only 'recessive' or only 'homozygous' which were insufficient in isolation.

08.2 Almost 50% of students gained all three marks for a correct Punnett square. Plenty of correct Punnett squares seen with some going on to also give the correct ratio. The most common mistake was using 'RR' for the male (although rr was also seen). Marking points 2 and 3 could still be gained for correct derivation of the offspring genotypes.

Some students incorrectly gave 2 alleles for the male gametes and/or 1 for each offspring. There were quite a lot of students who overwrote the letters or drew additional Punnett squares. In some cases, it was very difficult to determine which one they intended as their final answer. Students should be encouraged to cross out an incorrect answer and write another beside it if they change their mind.

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Answer 04 · Examiner comments June 2024 | 8461/2F | Original Q8

08.3 35% of students were able to give the correct ratio from their Punnett square in question 08.2. Many students did not realise that the offspring would all be round so gave an incorrect ratio of 1:1, 2:2 or even 50:50. Credit was still given if a sensible assumption could be made about the phenotype of offspring from incorrect Punnett squares using single alleles for the offspring, or even two alleles for the parent genotypes.

08.4 This question was not answered well and almost 20% of students did not attempt to answer it. Some students showed an understanding that there was some sort of difference, however, many found it different to express. Those that had a clear understanding often wrote the answer 'two different alleles', but others became confused and described different genes/chromosomes/parents, or that it was related to being female, none of which was creditworthy. Just under 20% of students gained this mark.

08.5 Fewer than 10% of students gained full marks in this question, with just over 35% gaining one mark. The question was well attempted, but many student responses were vague and did not quite reach the clarity necessary for credit. The most common reasons given for why Mendel's work had not being recognised was 'he was not believed' and 'not enough evidence'. Quite a few students referred to 'technology having not advanced at the time' which did not answer the question and was too vague for credit. Some pupils referred to scientific terms or discoveries that did not relate to the time period and thus could not be credited. A few said that Mendel was 'only a monk' or 'not a scientist' which earned them the mark. The other bullet points on the mark scheme were seen less frequently.