A Level AQA Biology

21 Inheritance – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	the (observable) expression of , genes / a gene; (and) their / its , interaction with the environment;		2	AO1 3.7.1
01.2	(allele is located on) autosome; *idea that* the syndrome affects men and women equally; (allele is) dominant; all affected individuals have an affected parent / an affected parent has a 50% (approximately) chance of having an affected offspring;	Accept not found on a sex chromosome / not sex-linked Accept 5 women and 5 men have the condition	4	AO3 3.7.1
02.1	(recessive) epistasis;		1	AO2 3.7.1
02.2	allele C codes for pigment , intermediate / precursor **OR** *idea that* allele C codes for enzyme needed at an earlier step in pigment production; allele , A / a , codes for enzyme; that converts product of C to pigment;		2 max	AO2 3.7.1
02.3	9 agouti : 3 black : 4 white	AWARD 3 MARKS for the correct phenotypic ratios (written in any order) If the final answer is incorrect, award one mark for the correct offspring genotypes (e.g., shown in a Punnett square): AACC, AACc, AaCC, AaCc, AACc, AAcc, AaCc, Aacc, AaCC, AaCc, aaCC, aaCc, AaCc, Aacc, aaCc, aacc	3	AO2 3.7.1

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		Award one mark for one correct phenotype number (e.g., '4 white, 8 agouti, 4 black' would score 1 mark).		
03.1	prediction is supported / null hypothesis is rejected; (chi-squared =) 1.64;;;	If final answer is incorrect, award one mark for each of the following: • $(O - E)^2$ = 16, 25, 25, 16 • $\frac{(O - E)^2}{E}$ = 0.32, 0.5, 0.5, 0.32 (allowing ECF from the first step)	4	AO2 x 3 AO3 x 1 3.7.1
03.2	RrGg **AND** rrgg;		1	AO2 3.7.1
04.1	ratio 1 : 1; females with fragile X syndrome : healthy males;	Accept 50 : 50 ratio	2	AO2 3.7.1
04.2	females (usually) have one dominant allele and one recessive allele for fragile X; *idea that* recessive allele reduces the severity of the syndrome;	Accept males lack a recessive allele for fragile X Accept no recessive allele to reduce the severity of the syndrome in males	2	AO2 3.7.1
04.3	two genes located on the same , chromosome / autosome; linked alleles inherited together (as a single unit); expected offspring phenotypic ratios (based on independent assortment) are altered; crossing over can separate linked allele combinations;		3 max	AO1 3.7.1
05.1	both alleles are expressed; in a heterozygous genotype;		2	AO1 3.7.1

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Question	Answers	Extra information	Mark	AO Spec reference
05.2	(offspring will be blood group) A or B; ratio 1 : 1;	Accept 50 : 50 ratio of A : B	2	AO2 3.7.1
05.3	I^o I^o **AND** I^A I^o/ I^B I^o;		1	AO2 3.7.1
05.4	rough ER / ribosome; Golgi apparatus;		2	AO2 3.2.1.1
05.5	B , glycoproteins / red blood cells , recognised as (foreign) antigens; antibodies produced (against B antigens);		2	AO2 3.2.4
06.1	2 : 1 : 1; pink flowers :red flowers : white flowers;	Accept 50 : 25 : 25 ratio of pink : red : white	2	AO2 3.7.1
06.2	C^W C^W **AND** C^R C^R;		1	AO2 3.7.1

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<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO
Spec reference</th></tr>
<tr><td>07</td><td>The following are suitable topic areas from the specification that could be used to describe how variation is produced in the phenotypes within a population.

In order to fully address the question and reach the highest mark bands students must also include at least five topics in their answer, to demonstrate a synoptic approach to the essay.

<table>
<tr><th>Specification reference</th><th>Topic area</th></tr>
<tr><td>3.4.3</td><td>Genetic diversity …</td></tr>
<tr><td>3.4.4</td><td>Genetic diversity and adaptation</td></tr>
<tr><td>3.7.1</td><td>Inheritance</td></tr>
<tr><td>3.7.2</td><td>Populations</td></tr>
<tr><td>3.7.3</td><td>Evolution …</td></tr>
<tr><td>3.8.1</td><td>Alteration of the sequence of bases …</td></tr>
<tr><td>3.8.2.2</td><td>Regulation of transcription and translation</td></tr>
</table>

Students may be able to show the relevance of other topics from the specification.

Note, other topics from beyond the specification can be used, providing they relate to the title and contain factually correct material of at least an A-level standard. Credit should not be given for topics beyond the specification which are below A-level standard.</td><td></td><td>25</td><td>AO1
3.4.3
3.4.4
3.7.1
3.7.2
3.7.3
3.8.1
3.8.2.2</td></tr>
</table>

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Skills box answers

<table>
<tr><th>Question</th><th>Answers</th></tr>
<tr><td>1</td><td>a homozygous recessive plant, in this case a plant with green wrinkled seeds, yyrr.</td></tr>
<tr><td>2</td><td>YyRr</td></tr>
<tr><td>3</td><td>
<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="4">Yellow round parent – YyRr</th></tr>
<tr><th>Gametes</th><th>YR</th><th>Yr</th><th>yR</th><th>yr</th></tr>
<tr><td rowspan="4">Green wrinkled parent – yyrr</td><td>yr</td><td>YyRr</td><td>Yyrr</td><td>yyRr</td><td>yyrr</td></tr>
<tr><td>yr</td><td>YyRr</td><td>Yyrr</td><td>yyRr</td><td>yyrr</td></tr>
<tr><td>yr</td><td>YyRr</td><td>Yyrr</td><td>yyRr</td><td>yyrr</td></tr>
<tr><td>yr</td><td>YyRr</td><td>Yyrr</td><td>yyRr</td><td>yyrr</td></tr>
</table>
YyRr – yellow round
yyRr – green round
yyrr – green wrinkled
Yyrr – yellow wrinkled
</td></tr>
<tr><td>4</td><td>
<table>
<tr><th>Class</th><th>Observed (O)</th><th>Expected (E)</th><th>$E - O$</th><th>$(O - E)^2$</th><th>$\frac{(O - E)^2}{E}$</th></tr>
<tr><td>green round</td><td>47</td><td>49</td><td>−2</td><td>4</td><td>0.08</td></tr>
<tr><td>green wrinkled</td><td>53</td><td>49</td><td>4</td><td>16</td><td>0.33</td></tr>
<tr><td>yellow round</td><td>51</td><td>49</td><td>2</td><td>4</td><td>0.08</td></tr>
<tr><td>yellow wrinkled</td><td>45</td><td>49</td><td>−4</td><td>16</td><td>0.33</td></tr>
</table>
$\chi^2 = 0.82$
Four classes, so 3 degrees of freedom. 0.82 falls between probability p of 0.99 and 0.75. Therefore the difference between the observed and expected results is not significant, so we cannot reject the null hypothesis.
</td></tr>
</table>