A Level AQA Biology

13 Genetic variation and adaptation – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	mitochondrion;	Allow mitochondria	1	AO2 3.2.2.1
01.2	Any two from: (site of) aerobic respiration; provides / produces ATP; to move the flagellum;		2	AO2 3.2.2.1
01.3	Any three from: chromatids of each pair cross over / form a chiasma; sections of chromatids are broken off; broken sections (of chromatids) re-join with chromatids of the homologous partner; alleles swap / new allelic combinations / maternal and paternal alleles mix to form chiasmata;	Allow parts for sections	3 max	AO1 3.4.3
01.4	Any three from: halves the number of chromosomes / forms haploid cells; at fertilisation, diploid cells are formed that are all; independent segregation occurs of homologous pairs of chromosomes / single chromosomes; gametes all genetically different, leading to genetic variation in offspring;		3 max	AO1 3.4.3
02.1	change in sequence of bases / nucleotides in DNA; (different DNA base sequences cause) a different mRNA base sequence to be formed; (different mRNA base sequence), can code for a different amino acids;		3	AO1 3.4.2 3.4.3

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Question	Answers	Extra information	Mark	AO Spec reference
02.2	*Agree, because:* increased ultraviolet light increases erythema; (processing data); **OR** *Disagree, because:* increased ultraviolet light increases vitamin D levels; correlation does not mean causation for links to mutagenic agents; (processing data);	For example: At 4 **mW cm^{-2}** the amount of Vitamin D increases nearly 8 times per mm of erythema, but at 6 **mW cm^{-2}** it is only just over 3 times per mm of erythema. So around 4 **mW cm^{-2}** has the most relative benefit;	3 max	AO3 3.4.3
02.3	(tumour suppressor genes switch) off; cell division is not controllable; apoptosis does not occur;	Allow uncontrolled mitosis	3	AO2 3.8.2.3
02.4	6:1;		1	AO2 3.4.3 MS 2.4
03.1	Any four from: grow a lawn of pseudomonas; put a wire loop in a flame; place antibiotic discs at equal distances on agar; leave to incubate at 37 °C; measure the zone of inhibition by calculating area of the circle that has no growth;	Allow alternative wording	4 max	AO1 3.4.4
03.2	antibiotic resistant bacteria survive; antibiotic resistant bacteria multiply/divide/reproduce; increased population of antibiotic resistant bacteria;	Allow by binary fission	3	AO1 3.4.4
03.3	$3 \times \frac{10^8}{20}$; $1.5 \times 10^7\ \text{min}^{-1}$;		2	AO2 3.4.4 MS 3.3

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04.1	Any five from: random mutation for longer legs; lizard with longer legs have a selective advantage; (because) they can survive when there is flooding; breeding between lizards with longer legs; advantageous allele for longer legs passed to offspring; allele frequency for long legs increases (in the population);		5 max	AO2 3.4.4
04.2	Any two from: competition for (mates, food and shelter); disease; predation;		2 max	AO1 3.7.3
04.3	population is small so affected by random change in allele frequency; alleles could disappear if individuals do not reproduce;		2	AO3 3.7.3
05.1	Any four from: dark green beetles are camouflaged/not easily seen by predators; breeding between dark green beetles; advantageous allele for dark green beetles passed to offspring; allele frequency for dark green beetles increases (in the population); light green beetles less abundant in population as more easily targeted by predators;		4 max	AO2 3.4.4
05.2	$p^2 + 2pq + q^2 = 1$; $p = 0.3$ and $q = 0.7$; 9% AA, 42% Aa and 49% aa;		3	AO2 3.7.2 MS 5.2

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Question	Answers	Extra information	Mark	AO Spec reference
05.3	Any two from: random mating; no mutation; large population size; no selection / no migration ;		2 max	3.7.2 AO1
06.1	Any four from: crossing over; (crossing over) swaps sections of non-sister chromatids; independent segregation of homologous pairs; (independent assortment provides a new combination of maternal and paternal alleles; mutation; (mutation causes) formation of new alleles;		4 max	AO1 3.4.3
06.2	24;		1	AO2 3.4.3 MS 6.2
06.3	$0.3\,cm^3 = 300\,mm^3$ (no mark) $\frac{4.20}{300}$; $1.4 \times 10^{-2}:1$;	Allow 0.07:5	2	AO2 3.3.1 MS 6.3
06.4	for gas exchange; wasps have tracheal gas exchange system; not so efficient;		3	3.3.1 AO3
06.5	as the surface area : volume ratio decreases; the number of chromosomes increases;		2	AO2 3.3.2 3.4.2

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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 explain the importance of cycles in biology.

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 areas</th></tr>
<tr><td>3.2.2</td><td>All cells arise from other cells</td></tr>
<tr><td>3.4.3</td><td>Genetic diversity can arise as a result of mutation or during meiosis</td></tr>
<tr><td>3.3.4.1</td><td>Mass transport in animals</td></tr>
<tr><td>3.5.1</td><td>Photosynthesis</td></tr>
<tr><td>3.5.2</td><td>Respiration</td></tr>
<tr><td>3.5.4</td><td>Nutrient cycles</td></tr>
</table>

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
3.2.2
3.3.4.1
3.4.3
3.5.1
3.5.2
3.5.4</td></tr>
</table>

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Skills box answers

Question	Answer
1	**A** = 0.03 **B** = 4.5 **C** = 2.3 **D** = 0.07 **E** = 0.6 control = 0.0
2	**B**
3	antibiotic **B** may only be inhibiting growth rather than killing the bacteria; it may be more soluble than the other antibiotics, so it diffused further
4	to check that bacterial growth was not inhibited by a chemical in the paper disc; a suitable control would be a paper disc soaked in sterile, distilled water