

## Biology A AS Paper 2

Question Number	Acceptable Answer	Additional guidance	Mark
1 (a)	A		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
1 (b)	mitotic index is $(4 \div 40) \times 100 = 10\%$ (1) distance from tip = 0.1875 mm (1)	Allow full marks for correct answer, no working Allow answers between 0.1750 mm and 0.2000 mm	(2)

Question Number	Acceptable Answer	Additional guidance	Mark
1 (c) (i)	A		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
1 (c) (ii)	D		(1)

(Total for Question 1 = 5 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<b>2(a)</b>	The frequency of the recessive allele in the population is	0.02 (1)	
	The frequency of the dominant allele in the population is	0.98 (1)	
	The percentage of heterozygous individuals (carriers) in the population is	3.92% (1)	
	The number of babies in a sample of 100 000 that are likely to be carriers is	3920 (1)	

Question Number	Acceptable Answer	Additional guidance	Mark
<b>2(b)</b>	An explanation that makes reference to the following: <ul style="list-style-type: none"> <li>Identify changes in the allele frequency over time (1)</li> <li>if allele frequency stays the same, no evolution / if allele frequency changes, evolution (1)</li> </ul>		<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>2(c)</b>	C		<b>(1)</b>

(Total for Question 2 = 7 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
3(a)(i)	B		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
3(a)(ii)	C		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
3(b)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>translocation inhibited but transpiration stream not inhibited (1)</li> <li>phloem contains cytoplasm but xylem does not (1)</li> <li>cytoplasm has organelles/mitochondria involved in metabolism (1)</li> </ul>		(3)

(Total for Question 3 = 5 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
4(a)	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>starch has <math>\alpha</math>-glucose and cellulose has <math>\beta</math>-glucose (1)</li> <li>starch has a 1-4 glycosidic bonds and cellulose has <math>\beta</math> 1-4 glycosidic bonds (1)</li> <li>starch has branched chains and cellulose has straight chains (1)</li> <li>starch has no hydrogen bonds between chains and cellulose has hydrogen bonds between chains (1)</li> </ul>		(3)

Question Number	Acceptable Answer	Additional guidance	Mark
4(b)(i)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>because {pH / microorganism number / water} affect decomposition (1)</li> </ul>		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
4(b)(ii)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>wash off soil to ensure mass is accurate (1)</li> </ul>		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
4(c)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• bioplastic degrades faster than plastic made from crude oil (1)</li> <li>• bioplastic is a renewable resource whilst crude oil is finite (1)</li> <li>• correct manipulation of data (1)</li> </ul>	Allow responses that state that plastics made from crude oil do not degrade	(3)

(Total for Question 4 = 8 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
5(a)	<p>A description that makes reference to the following:</p> <ul style="list-style-type: none"> <li>species richness is the number of species in a habitat (1)</li> <li>whereas genetic diversity is the number of alleles in one species (1)</li> </ul>		(2)

Question Number	Acceptable Answer	Additional guidance	Mark
5(b)	$N(N-1) = 2652 \text{ (1)}$ $\text{Sum of } n(n-1) = 338 \text{ (1)}$ $D = 2652 \div 338 = 7.85 \text{ (1)}$		(3)

Question Number	Acceptable Answer	Additional guidance	Mark
5(c)	<ul style="list-style-type: none"> <li>Lialis burtonis is found in two locations therefore it is not endemic (1)</li> </ul>	No marks if only a definition of endemic is given.	(1)

(Total for Question 5 = 6 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
6(a)	$19 - 13 = 6$ (1) $(6 \times 100) / 13$ (1) $= 46\%$ (1)	Candidate must include percentage sign, or word to gain final marking point / full marks	(3)

Question Number	Acceptable Answer	Additional guidance	Mark
6(b)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• methylation of DNA base, therefore the expression of the gene is changed (1)</li> <li>• if histones are modified, this may affect binding of other proteins to DNA because DNA is wrapped around histones (1)</li> <li>• therefore genes may become activated or repressed (1)</li> </ul>		(3)

(Total for Question 6 = 6 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
7 (a) (i)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• 25 °C to prevent growth of human pathogens / 37 °C would encourage growth of human pathogens (1)</li> <li>• lower temperatures would inhibit growth / make results difficult to obtain (1)</li> <li>• very high temperatures would kill bacteria / no results would be obtained (1)</li> </ul>		(2)

Question Number	Acceptable Answer	Additional guidance	Mark
7 (a) (ii)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• because no bacteria were growing / present in the clear area (1)</li> <li>• therefore this indicates how effective the extracts were at killing or inhibiting the growth of the bacteria (1)</li> </ul>		(2)



Question Number	Acceptable Answer	Additional guidance	Mark
7 (b) (i)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>as diameter increases, the area increases much more dramatically (1)</li> <li>manipulate the data to demonstrate this e.g. diameter suggest that lavender is 50% or 1.5 times more effective than lemon balm but mean area suggests that it is 2.2 times more effective (1)</li> </ul>		(2)

Question Number	Acceptable Answer	Additional guidance	Mark
7 (b) (ii)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>it is not valid because concentrations of extracts are not known (1)</li> <li>therefore increased possibility of anomalous results / no indication of range (1)</li> </ul>		(2)

(Total for Question 7 = 8 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
8(a)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• bone marrow contains unspecialised cells (1)</li> <li>• and these are needed because they have the ability to differentiate into heart cells (1)</li> </ul>		(2)

Question Number	Acceptable Answer	Additional guidance	Mark
8(b)(i)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• pluripotent stem cells can differentiate and give rise to many cell types (1)</li> <li>• because genes in pluripotent stem cells are inactivated and therefore they cannot differentiate into all cell types (1)</li> </ul>		(2)

Question Number	Acceptable Answer	Additional guidance	Mark
8 (b) (ii)	<p>An explanation that makes reference to five of the following:</p> <ul style="list-style-type: none"> <li>• stem cells are from same patient, therefore no rejection (1)</li> <li>• these stem cells receive stimulus from surrounding heart cells (1)</li> <li>• which causes some genes to be activated (1)</li> <li>• these active genes are transcribed to mRNA (1)</li> <li>• this mRNA is translated on ribosomes to produce polypeptide chains / proteins (1)</li> <li>• these proteins ensure that these cells develop into heart cells (1)</li> </ul>		<b>(5)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
8(c)	<p>A description that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• regulatory bodies / laws / High Court (1)</li> </ul> <p>Plus any three from:</p> <ul style="list-style-type: none"> <li>• setting or considering ethical / moral aspects (1)</li> <li>• judging what is acceptable / follow a code of practice (1)</li> <li>• checking that source of stem cells is acceptable (1)</li> <li>• decide on maximum age of embryo allowed for research / nervous system develops / feels pain (1)</li> <li>• human cloning is illegal (1)</li> </ul>		<b>(4)</b>

(Total for Question 8 = 13 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
9(a)(i)	C		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
9(a)(ii)	C		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
9(b)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• less ATP means poor motility (1)</li> <li>• because movement of flagellum/tail requires ATP as a source of energy (1)</li> <li>• so some sperm are unable to reach / penetrate egg (1)</li> </ul>		(3)

Question Number	Indicative content						
<b>* 9(c)</b>	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <ul style="list-style-type: none"> <li>• sample size of {several / lots / many} males</li> <li>• sample selection of males of {same age / same mass / same health / same pre-treatment / same diet}</li> <li>• males given tablets and males given placebo</li> <li>• reference to time delay before measuring sperm motility</li> <li>• use of microscope to see sperm</li> <li>• sperm motility measured as distance moved / speed / <math>\mu\text{ms}^{-1}</math></li> <li>• reference to control of temperature (as it affects motility)</li> <li>• reference to clinical trials before testing on humans</li> </ul>						
<b>Level</b>	<table border="1"> <thead> <tr> <th>Mark</th> <th>Descriptor</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No awardable content</td> </tr> <tr> <td>1-2</td> <td> <p>A description of the investigation may be attempted but with limited analysis, interpretation and/or evaluation of the scientific information. Generalised comments made.</p> <p>The description will contain basic information with some attempt made to link knowledge and understanding to the given context.</p> </td> </tr> </tbody> </table>	Mark	Descriptor	0	No awardable content	1-2	<p>A description of the investigation may be attempted but with limited analysis, interpretation and/or evaluation of the scientific information. Generalised comments made.</p> <p>The description will contain basic information with some attempt made to link knowledge and understanding to the given context.</p>
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1-2	<p>A description of the investigation may be attempted but with limited analysis, interpretation and/or evaluation of the scientific information. Generalised comments made.</p> <p>The description will contain basic information with some attempt made to link knowledge and understanding to the given context.</p>						

Level	Mark	Descriptor
<b>Level 2</b>	3-4	A description of the investigation will be given with occasional evidence of analysis, interpretation and/or evaluation of the scientific information.
<b>Level 3</b>	5-6	The description shows some linkages and lines of scientific reasoning with some structure. A description of the investigation is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information. The description shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured.

(Total for Question 9 = 11 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
10(a)(i)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• above 10 ppm, copper ions inhibit growth of roots, as SDs between 10 and 25 do not overlap (1)</li> <li>• during mitosis (for growth) DNA / proteins need synthesised (1)</li> <li>• this may not occur because the process requires enzymes, which may have been (negatively) affected / denatured by copper ions (1)</li> </ul>	<p>Allow no significant difference after 75 ppm, as SDs overlap from then on (1)</p> <p>because majority of enzymes are denatured so further addition has no more effect (1)</p>	<b>(3)</b>



Question Number	Acceptable Answer	Additional guidance	Mark
10(a)(ii)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• increase the validity by ensuring repeats and controlling variables (1)</li> </ul> <p>Plus any two from the following:</p> <ul style="list-style-type: none"> <li>• variables controlled in order to ensure that the effect is only due to copper ions (1)</li> <li>• use more concentrations of copper ions particularly between 10-25 ppm (1)</li> <li>• increase time period of experiment to find out more of the effects of copper on root growth (1)</li> <li>• measure shoot growth to see whether effect is only on roots (1)</li> </ul>		<b>(3)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
10(b)	<p>A description that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• mutation has given rise to allele for copper tolerance, which allows survival in soil with greater concentration of copper ions (1)</li> <li>• selection pressure in that there is a greater concentration of copper ions in one area (1)</li> <li>• plants without the allele do not survive (1)</li> <li>• therefore there are fewer plants and reduced competition for resources (1)</li> <li>• plants that survive pass on the allele for copper tolerance to next generation, therefore the frequency of allele for copper tolerance is higher in areas of high copper ion concentration (1)</li> </ul>	Accept converse	<b>(5)</b>

(Total for Question 10 = 11 marks)

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