

## Biology B AS Paper 1


Question Number	Acceptable Answer	Additional guidance	Mark
<b>1(a)</b>	A		<b>(1)</b>
Question Number	Acceptable Answer	Additional guidance	Mark
<b>1(b)</b>	<p>An explanation that that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• if antibiotic worked then bacterium is Gram positive / if antibiotic does not work then bacterium is Gram negative (1)</li> <li>• because Gram positive bacteria have cell wall with more peptidoglycan / Gram negative bacteria have a thin cell wall with less peptidoglycan}(1)</li> <li>• therefore there is a target site for the antibiotic / no target site for the antibiotic (1)</li> </ul>		<b>(3)</b>

(Total for Question 1 = 4 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<b>2(a)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• DNA unzips because hydrogen bonds are broken using helicase (1)</li> <li>• mRNA made by {complementary base pairing / transcription / using RNA polymerase} (1)</li> <li>• mRNA leaves nucleus and attaches to {ribosomes / rRNA} (1)</li> <li>• tRNA anticodon attaches to mRNA codon (1)</li> <li>• amino acids form peptide bonds in translation (1)</li> </ul>		<b>(5)</b>

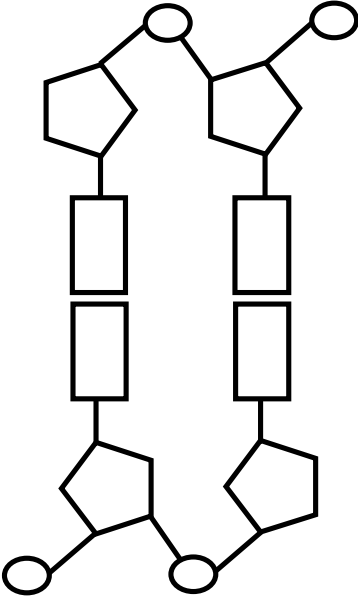
Question Number	Acceptable Answer	Additional guidance	Mark
<b>2(b)</b>	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• mutation would affect the {specificity / active site} of the enzyme (1)</li> <li>• change in the {sequence of amino acids / primary structure} (1)</li> <li>• glucose would not {fit / bind} to active site so no {enzyme substrate complex / no fructose / no product} would be made (1)</li> </ul>		<b>(2)</b>

(Total for Question 2 = 7 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<b>3(a)(i)</b>	A		<b>(1)</b>
Question Number	Acceptable Answer	Additional guidance	Mark
<b>3(a)(ii)</b>	B		<b>(1)</b>
Question Number	Acceptable Answer	Additional guidance	Mark
<b>3(b)</b>	<ul style="list-style-type: none"> <li>folded so the two hydrophobic amino acids are in the centre surrounded by hydrophilic ones (1)</li> <li>single layer of hydrophilic amino acids on the outside (1)</li> <li>polypeptide completely surrounded by water (1)</li> <li>example of diagram</li> </ul> 	Accept first bullet two hydrophobics above water, second all hydrophilics in water, third two hydrophilics on one side and 6 on the other	<b>(3)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>3(c)</b>	<p>A description that makes a reference to the following:</p> <ul style="list-style-type: none"> <li>• polypeptides fold up into a helix or <math>\beta</math>-pleated sheet arrangement (1)</li> <li>• two or more polypeptides join together by {H bonds/disulfide bridge} (1)</li> </ul>		<b>(2)</b>

(Total for Question 3 = 7 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<p><b>4(a)</b></p>	<ul style="list-style-type: none"> <li>• a nucleotide correctly drawn containing base phosphate and pentose (1)</li> <li>• strands antiparallel joined by bases (1)</li> </ul> <p>Example:</p> 		<p><b>(2)</b></p>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>4(b)(i)</b>	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• <math>(22 \div 100) \times 250 = 55</math> guanine (1)</li> <li>• Since guanine pairs with cytosine, 55 bases are cytosine (1)</li> <li>• Therefore 110 bases are guanine plus cytosine, the rest must be adenine plus thymine = 140 (1)</li> <li>• Since adenine pairs with thymine the number of adenine/thymine = <math>140 \div 2 = 70</math> (1)</li> </ul>	All bases named gains 1 mark: guanine, cytosine, adenine, thymine	<b>(4)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>4(b)(ii)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• some are start/stop codons (1)</li> <li>• some parts of the gene are introns (1)</li> </ul>	Accept answers that correctly refer to ribosome binding sites, promoter, operon	<b>(2)</b>

(Total for Question 4 = 8 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<b>5(a)</b>	<ul style="list-style-type: none"> <li>• correct drawing to show glycosidic bond in maltose (1)</li> <li>• evidence that a water molecule has been removed (1)</li> </ul>		<b>(2)</b>
<b>5(b)</b>	<p>max potential energy = 76 kJ (1)</p> <p>activation energy = 76 – 60 = 16 kJ (1)</p>	Correct answer gains full marks with no working	<b>(2)</b>
<b>5(c)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• rate for amylopectin is faster than amylose (1)</li> <li>• active site is more complementary to amylopectin (1)</li> <li>• all amylopectin hydrolysed by 2.5 minutes (1)</li> <li>• amylopectin has side branches / has more terminal glycosidic bonds / amylose has only two terminal glycosidic bonds (1)</li> </ul>	<p>Allow converse argument for amylose</p> <p>Accept more sophisticated answers that refer to competition for the active site</p>	<b>(4)</b>

(Total for Question 5 = 8 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<b>6(a)(i)</b>	C		<b>(1)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>6(a)(ii)</b>	B		<b>(1)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>6(b)</b>	<p>An explanation that makes reference to five of the following:</p> <ul style="list-style-type: none"> <li>liposomes can be made bigger than normal pores to prevent drug contact with healthy cells (1)</li> <li>remain stable in circulation at 37°C but destabilized at higher temperatures in tumour microenvironment so drug only released at cancer (1)</li> <li>phospholipids protect drug from being broken down by chemicals in plasma and only release drug at target site (1)</li> <li>reduce need for other treatments such as radiotherapy / reduce possible side effects of other treatments (1)</li> <li>able to fuse with tumour cell membrane to release drug by endocytosis (1)</li> <li>high dose of cytotoxic drug can be delivered / not diluted in plasma (1)</li> </ul>		<b>(5)</b>



Question Number	Acceptable Answer	Additional guidance	Mark
<b>6(c)(i)</b>	A	2 <sup>6</sup>	<b>(1)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>6(c)(ii)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• fibres unable to contract (1)</li> <li>• contraction of fibres is needed to cause {daughter chromosomes / chromatids} to separate / centromere to split (in anaphase) (1)</li> <li>• therefore {daughter chromosomes / chromatids} cannot be pulled {towards opposite pole of the cell / away from the equator} (in anaphase) so new cells cannot be made(1)</li> </ul>		<b>(3)</b>

(Total for Question 6 = 11 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<b>7(a)</b>	B		<b>(1)</b>

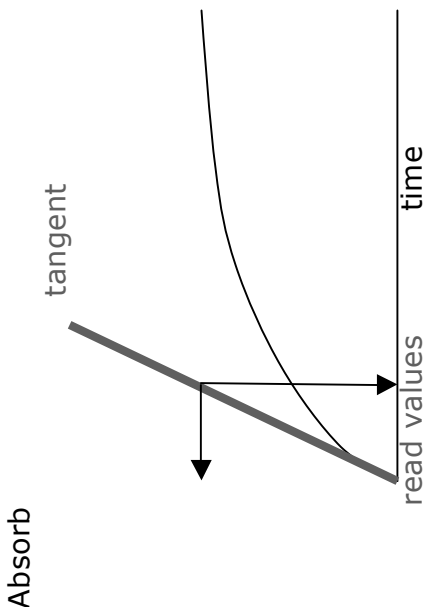
Question Number	Acceptable Answer	Additional guidance	Mark
<b>7(b)(i)</b>	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• Pattern is that DNA total mass is doubled for each cycle (1)</li> <li>• Therefore the mass of DNA for 5 cycles = 32, mass of DNA for 6 cycles = 64 (1)</li> </ul>	<p>Cycle 1 mass = 2, cycle 2 = 4, cycle 3 = 8, cycle 4 = 16 (1)</p> <p>Correct answer gains full marks with no working shown</p>	<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>7(b)(ii)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• DNA is replicated semi-conservatively (1)</li> <li>• because the graph shows that the heavy DNA has disappeared in the first cycle (1)</li> <li>• after 1 replication DNA is an intermediate as one strand comes from {original / heavy DNA} and one from a newly constructed {light DNA strand} (1)</li> <li>• as you get more DNA being formed, the increase is all due to newly formed strands, which are all light DNA (1)</li> </ul>		<b>(4)</b>

(Total for Question 7 = 7 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<b>8(a)(i)</b>	$1.3 - 0.2 = 1.1$ (1) $1.1 \div 20 = 0.055$ (1) units a.u. $s^{-1}$ (1)		<b>(3)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>8(a)(ii)</b>	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>enzyme controlled reactions are very rapid (1)</li> <li>therefore the {substrate / catechol} concentration is rapidly {reducing / used up} in the first 10s (1)</li> <li>less substrate means fewer collisions and therefore the rate slows (1)</li> <li>all the substrate has been converted to product by 50 seconds (1)</li> </ul>		<b>(3)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<p><b>8(a)(iii)</b></p>	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• draw a tangent to the curve of the graph (1)</li> <li>• tangent drawn following only the first 5-10 seconds of the curve (1)</li> <li>• read off single values of change in absorbance and time (1)</li> <li>• calculate gradient of tangent to find the rate (1)</li> </ul> <p>Absorb</p> 	<p>Points can be given by reference to annotations on a diagram</p>	<p><b>(3)</b></p>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>8(b)(i)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• substrate and enzyme contained within cells {so do not mix / have restricted oxygen supply} (1)</li> <li>• therefore reaction only takes place when cells are broken so enzyme substrate and oxygen mix (1)</li> </ul>		<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>8(b)(ii)</b>	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• enzymes are proteins that are sensitive to pH (1)</li> <li>• because changes in pH disrupt ionic bonding in protein (1)</li> <li>• these changes in bonding change the shape of the active site (1)</li> <li>• change in shape of the active site means the catechol will not bind with PPO and therefore no browning (1)</li> </ul>		<b>(3)</b>

(Total for Question 8 = 14 marks)

Question Number	Acceptable Answer	Additional guidance	Mark
<b>9(a)(i)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>groups B, C and D show a decrease in the percentage of root cells in mitosis compared to group A (1)</li> <li>this is because the supply of minerals is limiting (1)</li> <li>however in groups B, C and D some cells are still showing mitosis (1)</li> <li>because {they have stored minerals / they have already synthesised materials needed} (1)</li> </ul>		<b>(4)</b>
Question Number	Acceptable Answer	Additional guidance	Mark
<b>9(a)(ii)</b>	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>lack of water (1)</li> <li>handling e.g. damage to root hairs (1)</li> <li>exposure to light (1)</li> </ul>	Accept other appropriate changes e.g. effects on temperature	<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>9(a)(iii)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>lowers percentage (of cells) in prophase (when stressed) (1)</li> <li>(because) when stressed cells will remain in interphase (and not progress to prophase) (1)</li> </ul>	Accept more sophisticated answers that give an explanation as to why prophase has not occurred e.g. no DNA synthesis	<b>(2)</b>

Question Number	Indicative content
<b>*9(b)</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>Reference to {3 / more} different light intensities used as this is the independent variable</li> <li>Validity ensured by detailing how light intensity varied, e.g. moving light source further way</li> <li>Repeats at each light intensity to improve reliability of data</li> <li>Example of similarity of plants, e.g. clones, same age to ensure validity of method</li> <li>Control of other named variable to ensure validity, e.g. CO<sub>2</sub> levels, duration of light exposure, pH of mineral ion solution</li> <li>Safety aspect explained e.g. {cut finger when cutting root tip + cut way from finger/ cut on a hard surface} / {HCl or stain harmful to eyes + wear safety goggles} / {heat is harmful + use tongs} / (cut finger on glass during squash + wrap in soft material)</li> </ul>



Level	Mark	Descriptor
	0	No awardable content
<b>Level 1</b>	1-2	An explanation of how the investigation should be modified may be attempted but with limited analysis, interpretation and/or evaluation of the scientific information. Generalised comments made.  The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.
<b>Level 2</b>	3-4	An explanation of how the investigation should be modified will be given with occasional evidence of analysis, interpretation and/or evaluation of the scientific information.  The explanation shows some linkages and lines of scientific reasoning with some structure.
<b>Level 3</b>	5-6	An explanation of how the investigation should be modified is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information.  The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured.

(Total for Question 9 = 14 marks)