

CHERRY HILL TUITION EDEXCEL (B) BIOLOGY A2 PAPER 23 MARK SCHEME

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	<ol style="list-style-type: none"> <li>1. Molecule P - water / H<sub>2</sub>O ;</li> <li>2. Molecule Q - oxygen / O<sub>2</sub> ;</li> </ol>		(1)

Question Number	Answer	Mark
1(a)(ii)	D ATP and reduced NADP ;	(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	<ol style="list-style-type: none"> <li>1. reference to RUBISCO as an {enzyme / catalyst} ;</li> <li>2. in the Calvin cycle ;</li> <li>3. involved in {carbon fixation / bonding of CO<sub>2</sub> to RuBP / reaction between CO<sub>2</sub> and RuBP / eq} ;</li> <li>4. to form GP / eq ;</li> <li>5. GP converted to GALP / eq ;</li> <li>6. using ATP and {reduced NADP / NADPH} (CO<sub>2</sub> to GALP / GP to GALP) ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT catalyses</li> <li>3. ACCEPT formation of 6C intermediate from RuBP</li> <li>5. ACCEPT reduced to NB Award formation of GALP from reaction between CO<sub>2</sub> and RuBP if mp 4 not awarded</li> </ol>	(4)

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Question Number	Answer	Mark																																																			
1 (b) (i)	C stroma	<b>(1) COMP</b>																																																			
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1 (b) (ii)	<p>1. (image length) 76 / 76.5 / 77 (mm) ;</p> <p>2. (correct calculation = length /7500) / eq ;</p> <p>3. (correct units for given answer) <math>\mu\text{m}</math> / eq ;</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>length</th> <th>answer in <math>\mu\text{m}</math></th> <th>answer in mm</th> <th>answer in cm</th> <th>answer in m</th> </tr> </thead> <tbody> <tr> <td>7.6 (cm)</td> <td>10</td> <td>0.01</td> <td>0.001</td> <td>0.00001</td> </tr> <tr> <td>76 (mm)</td> <td>10.1</td> <td>0.0101</td> <td>0.00101</td> <td>0.0000101</td> </tr> <tr> <td>76000 (<math>\mu\text{m}</math>)</td> <td>10.13</td> <td>0.01013</td> <td>0.001013</td> <td>0.00001013</td> </tr> <tr> <td>7.65</td> <td>10</td> <td>0.01</td> <td>0.001</td> <td>0.00001</td> </tr> <tr> <td>76.5</td> <td>10.2</td> <td>0.0102</td> <td>0.00102</td> <td>0.0000102</td> </tr> <tr> <td>76500</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.7</td> <td>10</td> <td>0.01</td> <td>0.001</td> <td>0.00001</td> </tr> <tr> <td>77</td> <td>10.3</td> <td>0.0103</td> <td>0.00103</td> <td>0.0000103</td> </tr> <tr> <td>77000</td> <td>10.27</td> <td>0.01027</td> <td>0.001027</td> <td>0.00001027</td> </tr> </tbody> </table>	length	answer in $\mu\text{m}$	answer in mm	answer in cm	answer in m	7.6 (cm)	10	0.01	0.001	0.00001	76 (mm)	10.1	0.0101	0.00101	0.0000101	76000 ( $\mu\text{m}$ )	10.13	0.01013	0.001013	0.00001013	7.65	10	0.01	0.001	0.00001	76.5	10.2	0.0102	0.00102	0.0000102	76500					7.7	10	0.01	0.001	0.00001	77	10.3	0.0103	0.00103	0.0000103	77000	10.27	0.01027	0.001027	0.00001027	<p>Correct answer with units = 3 marks</p> <p>2. CE applies</p> <p>3. CE applies ACCEPT as standard form</p>	<b>(3) EP</b>
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1(b)(iii)	1. idea of compartmentalisation (from stroma) ; 2. site of light-dependent reaction ; 3. credit named molecules {within / on / eq} membrane ; 4. idea of {ATPase / eq } in (thylakoid) membranes ; 5. idea that (thylakoid) membranes provide a space for accumulation of H <sup>+</sup> ; 6. reference to photophosphorylation ;	1. ACCEPT description of separation  3. e.g. photosynthetic pigments / chlorophyll / carotenoids / photosystems / electron carrier proteins IGNORE electron acceptors 4. ACCEPT {ATP synthase / synthetase}, NADP reductase  6. ACCEPT chemiosmosis	<b>(3)</b>

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Question Number	Answer	Additional Guidance	Mark
2(a)	<ol style="list-style-type: none"> <li>1. (structure G is {glycoprotein / gp120} ;</li> <li>2. used for {attachment / eq} to CD4 (molecules / receptors /antigens) ;</li> <li>3. on T helper {cells / lymphocytes} ;</li> </ol>	<ol style="list-style-type: none"> <li>1. IGNORE gp 41 and gp 160 and other wrong numbers</li> <li>3. ACCEPT macrophages / dendritic cells / CD4 cells</li> </ol>	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	<ol style="list-style-type: none"> <li>1. they are globular proteins ;</li> <li>2. it has an active site ;</li> <li>3. idea of {charged R groups on outside of molecules / composed of many small R groups} ;</li> </ol>	<ol style="list-style-type: none"> <li>2. idea of active site R groups enable binding of substrate</li> <li>3. idea of hydrophilic on the outside</li> </ol>	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
<b>*2(b)(ii)</b>	<p>(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> <li>1. idea that drugs would prevent viral replication ;</li> <li>2. idea that T (helper) { cells / lymphocytes} will not be { killed / burst / destroyed} (by virus particles leaving cell) ;</li> <li>3. idea of {inhibition / eq} of reverse transcriptase ;</li> <li>4. idea that (viral) DNA could not be made;</li> <li>5. from the (viral) RNA ;</li> <li>6. idea of {inhibition / eq} of integrase ;</li> <li>7. idea that (viral) DNA cannot integrate into (host) {DNA / genome} / eq ;</li> </ol>	<p>QWC emphasis on clarity of expression</p> <ol style="list-style-type: none"> <li>1. ACCEPT description of virus formation</li> <li>3. ACCEPT drugs prevent action of reverse transcriptase</li> <li>4. reject idea that RNA is {turned into / converted into} DNA</li> <li>6. ACCEPT drugs prevent action of integrase</li> <li>7. ACCEPT idea that drugs would prevent {latency / formation of provirus / eq} ;</li> </ol>	<b>(5)</b>

Question Number	Answer	Additional Guidance	Mark
*3(a)(i)	<p>(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> <li>1. multiple copies of DNA made / eq ;</li> <li>2. using {PCR / <i>polymerase chain reaction</i>} ;</li> <li>3. credit any correct detail of PCR ;</li> <li>4. reference to <i>restriction</i> {<i>enzymes</i> / <i>endonucleases</i>} to produce DNA {<i>fragments</i> / eq} ;</li> <li>5. reference to (<i>gel</i>) <i>electrophoresis</i> ;</li> <li>6. idea of {loading / eq} the DNA onto the {<i>gel</i> / named <i>gel</i>} ;</li> <li>7. idea that an {<i>electric current</i> / charge} is applied ;</li> <li>8. reference to use of {<i>dye</i> / <i>fluorescent tag</i> / <i>UV light</i> / <i>Southern blotting</i> / <i>gene probes</i> / <i>radioactive labelling</i> / eq} ;</li> </ol>	<p>QWC emphasis on spelling</p> <ol style="list-style-type: none"> <li>1. IGNORE refs to amplification, large amounts</li> <li>3. e.g. step 1: 90 to 95 °C, step 2: 50 to 65 °C, step 3: 70 to 80 °C, use of {<i>primers</i> / DNA <i>polymerase</i> / <i>nucleotides</i>}, many repetitions</li> <li>6. e.g. <i>agarose</i>, <i>agar</i></li> <li>7. ACCEPT apply <i>potential difference</i></li> </ol>	<p><b>(6)</b></p>

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	<ol style="list-style-type: none"> <li>1. idea of comparing total number of {bands / eq} ;</li> <li>2. idea of comparing position of {bands / eq} ;</li> <li>3. idea of comparing {size / width} of {bands / eq} ;</li> </ol>	ACCEPT idea of comparing bands for 1 mark if mps 1, 2 or 3 cannot be awarded ACCEPT bars / blocks	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
3(b)	<ol style="list-style-type: none"> <li>1. {scientific / peer reviewed} {papers / journals / magazines / article} ;</li> <li>2. (scientific) {conferences / lecture / forums} ;</li> <li>3. media reports ;</li> </ol>	3. e.g. TV, radio, newspaper, internet	<b>(2)</b>

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Question Number	Answer	Additional Guidance	Mark
4(a)	<ol style="list-style-type: none"> <li>idea that {bacteria / pathogen / virus / eq} have to be taken into macrophage / eq ;</li> <li>idea of fusion of {phagosome / eq} with lysosome ;</li> <li>idea that {bacteria/ pathogen / virus / eq} are {digested / broken down / eq} (by enzyme) ;</li> <li>credit named enzyme other than lysozyme ;</li> <li>idea that part of the {bacteria/ pathogen / virus / eq} has to be on {membrane / (outer) surface} (of the macrophage) ;</li> </ol>	<ol style="list-style-type: none"> <li>IGNORE phagocytosis unqualified</li> <li>ACCEPT phagocytic vesicle</li> <li>IGNORE destroy / killed</li> <li>e.g. protease.</li> <li>ACCEPT antigen / protein</li> </ol>	(4)

Question Number	Answer	Additional Guidance	Mark
4(b)	<ol style="list-style-type: none"> <li>idea of macrophage {binding/ eq} to T (helper) {cell / lymphocyte} ;</li> <li>reference to {MHC / major histocompatibility complex } (on macrophage) ;</li> <li>reference to CD4 (receptor on T cell) ;</li> </ol>		(2)



Question Number	Answer	Additional Guidance	Mark
4(c)	<ol style="list-style-type: none"> <li>1. idea that a mutation has occurred (in the DNA) ;</li> <li>2. idea that there is a change in {antigen /outer surface / cell wall / slime layer} (of bacteria) ;</li> <li>3. idea that memory (T) cells will not recognise the (new) antigen ;</li> <li>4. idea that another (primary) immune response needed e.g. (new) antigen needs to be presented (to the T helper cell) ;</li> <li>5. to activate (another) population of T (helper) cells / eq ;</li> <li>6. idea that {phagocytes / macrophages} unable to {recognise / engulf / phagocytose / digest / destroy / eq} the {<i>Mycobacterium tuberculosis</i> / bacteria} ;</li> <li>7. idea that antigen presentation is not possible ;</li> </ol>	1. NOT a mutation of the antigen	<b>(3)</b>

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Question Number	Answer	Mark
5(a)(i)	A carbon dioxide and methane	(1)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	<ol style="list-style-type: none"> <li>1. idea that {using / burning} {fossil fuels / petrol / diesel} releases carbon dioxide ;</li> <li>2. reference to {carbon dioxide / CO<sub>2</sub>} as a greenhouse gas ;</li> <li>3. idea that carbon dioxide is taken in for {photosynthesis / light-independent reaction / carbon fixation / eq} (during production of plants for biofuels) ;</li> <li>4. idea of no net change of carbon dioxide in the atmosphere when biofuels are burnt / eq ;</li> </ol>	<ol style="list-style-type: none"> <li>1. NOT methane Ignore burning biofuels releases carbon dioxide</li> <li>4. ACCEPT biofuels are carbon neutral</li> </ol>	(3)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	(plant) fibres / woody parts / xylem (vessels / tissue) / sclerenchyma (fibres / tissue) / lignified tissue / eq ;	ACCEPT vascular bundles / tissue	(1)

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Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	<ol style="list-style-type: none"><li>1. idea that bacteria cannot breakdown cellulose fast enough ;</li><li>2. idea that {enzymes / cellulase} needed to break down cellulose into (<math>\beta</math>) glucose ;</li><li>3. by hydrolysing (1,4) glycosidic bonds / eq ;</li><li>4. idea of {respiration / fermentation} of {glucose / eq} (by bacteria) ;</li></ol>	<ol style="list-style-type: none"><li>2. NOT hydrogen bonds</li><li>3. ACCEPT breaking</li></ol>	<b>(2)</b>



Question Number	Answer	Additional Guidance	Mark
7(a)(i)	<ol style="list-style-type: none"> <li>1. levels of antibody rise sooner after infection / eq ;</li> <li>2. levels of antibody rise faster after infection / eq ;</li> <li>3. levels of antibody rise higher after infection / eq ;</li> <li>4. credit comparative manipulation of data ;</li> </ol>	<p><b>do not piece together</b> ACCEPT converse for mps 1, 2 and 3 in context of vaccination</p> <p>4. e.g. increase after infection is {10 (au) more / 1.83 times more} peak after infection is 13 (au) higher rate of increase after infection is 1.27 au day<sup>-1</sup> faster</p>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	<ol style="list-style-type: none"> <li>1. secondary (immune) response ;</li> <li>2. reference to memory cells ;</li> <li>3. idea that (on infection / second exposure) memory cells are {activated / cloned / stimulated / eq};</li> <li>4. idea that (in secondary response) antibodies are released from plasma cells ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT secondary immunity</li> <li>3. ACCEPT B memory cells differentiate into plasma cells</li> </ol>	<b>(3)</b>

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Question Number	Answer	Additional Guidance	Mark
<b>7(b)(i)</b>	1. idea that antibodies will only be present if antigen present ; 2. idea that antigen B is not present in vaccine ; 3. vaccination failed to stimulate immune response / eq ;		<b>(2)</b>

Question Number	Answer	Mark
<b>7(b)(ii)</b>	<b>C</b> natural active	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
<b>7(c)</b>	1. idea that {a comment cannot be made / caution in interpreting results should be taken / eq} ; 2. no indication of number of rats used / eq ; 3. no data points / eq ; 4. no error bars (on graph) / no indication of variability / eq ; 5. no statistical evidence / eq ; 6. idea that no indication of {experimental details / control variables / control group / eq} ; 7. idea that mean has been used therefore there must have been some repeats / eq ;	1. IGNORE not reliable or is reliable 2. IGNORE no repeats / sample was small ACCEPT number of repeats not known / sample size not known	<b>(3)</b>

## CHERRY HILL TUTORIAL EDEXCEL (B) BIOLOGY A2 PAPER 23 MARK SCHEME

Question Number	Answer	Mark
<b>8(a)</b>	<b>C</b> hydrolysis	<b>(1)</b>

Question Number	Answer	Mark
<b>8(b)(i)</b>	<b>B</b> to give a range of values for the independent variable	<b>(1)</b>

Question Number	Answer	Mark
<b>8(b)(ii)</b>	<b>B</b> one	<b>(1)</b>





Question Number	Answer	Additional Guidance	Mark
8(b)(iv)	<ol style="list-style-type: none"> <li>1. idea that an increase in temperature would increase the rate of decomposition (up to an optimum temperature) ;</li> <li>2. reference to enzymes (in decomposition) ;</li> <li>3. idea that increased {heat / kinetic} energy results increase in {number of collisions / energy of collisions (between enzymes and substrate) / enzyme-substrate complexes} ;</li> <li>4. idea that increased temperature increases rate at which bacteria increase ;</li> <li>5. idea that above a certain temperature rate of decomposition would {decrease / stop} ;</li> <li>6. idea that at higher temperatures enzymes become denatured OR bacteria killed ;</li> </ol>	<p>6. NOT enzymes start to denature NB need the term 'denaturing' or its derivative</p>	<b>(4)</b>