

**Biology**

Advanced GCE F212

Molecules, Biodiversity, Food and Health

**Mark Scheme for June 2010**

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Telephone: 0870 770 6622  
Facsimile: 01223 552610  
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Question			Expected Answer				Mark	Additional Guidance																														
1	(a)	(i)	<table border="1"> <thead> <tr> <th>reagent</th> <th>observation</th> <th>molecule</th> <th>present or absent</th> <td></td> <td></td> </tr> </thead> <tbody> <tr> <td>ethanol and water</td> <td>white emulsion</td> <td>lipid</td> <td>present</td> <td></td> <td></td> </tr> <tr> <td>Benedict's solution</td> <td>brick-red precipitate</td> <td>reducing sugar / lactose / glucose / galactose / monosaccharides</td> <td>present</td> <td>;</td> <td></td> </tr> <tr> <td>biuret I and II</td> <td>lilac colour</td> <td>protein / named milk protein</td> <td>present</td> <td>;</td> <td></td> </tr> <tr> <td>iodine solution</td> <td>yellow / brown</td> <td>starch / amylose</td> <td>absent</td> <td>;</td> <td></td> </tr> </tbody> </table>				reagent	observation	molecule	present or absent			ethanol and water	white emulsion	lipid	present			Benedict's solution	brick-red precipitate	reducing sugar / lactose / glucose / galactose / monosaccharides	present	;		biuret I and II	lilac colour	protein / named milk protein	present	;		iodine solution	yellow / brown	starch / amylose	absent	;		3	<p>One mark per correct row.  <b>IGNORE</b> 'yes', 'no' and ticks and crosses  <b>DO NOT CREDIT</b> if anything incorrect is written in any box in the molecule column.            e.g. 'starch or cellulose' = 0 mark</p> <p><b>ACCEPT</b> maltose  <b>DO NOT CREDIT</b> sucrose</p> <p><b>ACCEPT</b> casein / lactoglobulin / lactalbumin / polypeptide</p> <p><b>IGNORE</b> amylopectin</p>
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1	(a)	(ii)	milk is already, cloudy / an emulsion / white / AW ;				1	<b>ACCEPT</b> idea of difficulty in detecting change because of the appearance of milk																														
1	(a)	(iii)	<p>(one) glycerol / glyceride ;            3 fatty acids ;</p> <p>ester bond (between glycerol and fatty acid) ;</p>				3	<p><b>ACCEPT</b> marking points from clearly labelled diagram but <b>DO NOT CREDIT</b> if contradicted in text.  <b>IGNORE</b> individual atoms on diagram and look for correct position of labels  <b>MAX 2</b> if phosphate group included (as could be confused with phospholipid)</p> <p><b>ACCEPT</b> on diagram if 3 shown and at least one labelled  <b>ACCEPT</b> triglycerides are esters</p>																														

Question	Expected Answer	Mark	Additional Guidance
1 (b)	<p>1 (thermal) insulation ;</p> <p>2 energy, store / source / release ;</p> <p>3 protection ;</p> <p>4 membranes / phospholipid bilayer / control entry and exit into cells ;</p> <p>5 (steroid) hormones / named steroid hormone ;</p> <p>6 buoyancy ;</p> <p>7 waterproofing ;</p> <p>8 source of water (from respiration) ;</p> <p>9 (electrical insulation) in myelin / around neurones / around axons / around dendrons ;</p> <p>10 aid, absorption / storage / production, of, fat soluble / A / D / E / K, vitamins ;</p>	3	<p><b>MARK THE FIRST RESPONSE ON EACH NUMBERED LINE</b></p> <p><b>1 ALLOW</b> 'warmth'</p> <p><b>2 CREDIT</b> answers that refer to the idea of lipid as a respiratory substrate but <b>DO NOT CREDIT</b> 'for respiration' unqualified <b>IGNORE</b> 'fat contains energy' without further qualification <b>DO NOT CREDIT</b> refs to producing energy or to quick energy release <b>ACCEPT</b> 'provides energy'</p> <p><b>4 CREDIT</b> ref to cholesterol in membranes</p> <p><b>9 CREDIT</b> nerve fibres / saltatory conduction <b>IGNORE</b> nerves</p>
1 (c) (i)	<p>saturated ;</p> <p>(fatty acids have) no / fewer, double bonds ;</p> <p>solid at room temperature ;</p>	1 max	<p>Assume answers refer to animal fats unless otherwise stated</p> <p><b>ACCEPT</b> reverse argument</p> <p><b>IGNORE</b> ref to fats and oils (as stated in question)</p> <p><b>ACCEPT</b> 'fatty acids are not kinked'</p> <p><b>ACCEPT</b> reasonable temperature quoted</p>

Question		Expected Answer	Mark	Additional Guidance
1	(c) (ii)	<p>1 (death rate for) men greater (at any concentration) / AW ;</p> <p>2 (death rates) rise with increasing cholesterol / AW ;</p> <p>3 death rate for men, initially / AW, falls ;</p> <p>4 steep(er) / AW, rise (in, males / both) at higher cholesterol levels ;</p> <p>5 comparative figures with unit for (blood) cholesterol to support any of the above points ;</p>	3 max	<p>1 <b>ACCEPT</b> ora</p> <p>2 <b>ACCEPT</b> 'positive correlation' (between death and cholesterol)</p> <p>3 <b>ACCEPT</b> 4.8 or below as 'initially'.</p> <p>4 Answers must refer to latter part of graph only (5.7 or above). <b>ACCEPT</b> difference (between sexes) greater at high concentration</p> <p>5 There are 3 ways of getting this mark:</p> <ul style="list-style-type: none"> <li>• values for both sexes at single concentration</li> <li>• two values for single sex at two concentrations</li> <li>• subtraction / calculation, that shows comparison</li> </ul> <p><b>IGNORE</b> terms like 'about'</p> <p>See table for acceptable examples of x and y values – if intermediate cholesterol values are used, refer to the graph for the data</p>

blood cholesterol (mmol dm <sup>-3</sup> )	deaths per 10 000	
	women	men
3.6	13.2 - 14.1	31.2 - 32.1
4.3	15.0 - 15.9	26.0 - 26.9
4.8	14.0 - 14.9	24.0 - 24.9
5.2	15.1 - 16.0	24.6 - 25.5
5.7	17.4 - 18.3	25.8 - 26.7
6.2	17.8 - 18.7	33.2 - 34.1
6.7	23.5 - 24.3	31.3 - 32.2
7.3	22.0 - 22.9	44.1 - 45.0
8.2	31.7 - 32.6	59.5 - 60.4

Must include (blood) cholesterol units

Any figure within a particular range is acceptable

Question			Expected Answer	Mark	Additional Guidance
1	(c)	(iii)	<p>1 coronary heart disease / CHD / cardio-vascular diseases / heart attack / cardiac arrest / myocardial infarction / MI / angina ;</p> <p>2 <u>a</u>therosclerosis / atheroma ;</p> <p>3 stroke ;</p> <p>4 <u>T</u>ype 2 diabetes ;</p>	2	<p><b>Mark first two in list</b></p> <p><b>1 DO NOT CREDIT</b> heart disease alone or 'conary' <b>ACCEPT</b> hypertension / high blood pressure</p> <p><b>2 DO NOT CREDIT</b> arteriosclerosis</p>
			<b>Total</b>	<b>16</b>	

Question	Expected Answer	Mark	Additional Guidance
2 (a)	placing, living things / organisms / named organisms, into, groups / categories / taxa / named taxonomic groups ; based on / AW, similarity / difference ;	2	<b>ACCEPT</b> 'grouping living things'  Look for the idea of similar organisms being placed in the same group or different organisms being placed in different groups
2 (b) (i)	<p>1 morphology / anatomy / (observable / physical) features / appearance / AW ;</p> <p>2 biochemistry / cytochrome C ;</p> <p>3 genes / DNA / genetics / RNA ;</p> <p>4 behaviour / physiology / embryology ;</p> <p>5 idea of shared, evolutionary past / phylogeny ;</p>	3 max	<p><b>ACCEPT suitable examples for mps 1 to 4</b></p> <p>1 <b>CREDIT</b> cell features e.g. nucleus / membrane-bound organelles / cell wall / prokaryotic-eukaryotic features / unicellular</p> <p>2 <b>CREDIT</b> component of cell wall</p> <p>3 <b>IGNORE</b> chromosomes</p> <p>4 <b>ACCEPT</b> 'how they feed' / nutrition / 'how they reproduce'</p> <p>5 <b>ACCEPT</b> 'how closely related' <b>IGNORE</b> refs to interbreeding / fertile offspring</p>
2 (b) (ii)	T S R W U Q ; ; ;	3	<p><b>Mark the order of letters</b> (ignoring the dotted lines)</p> <p>All 6 in correct order = 3 marks</p> <p>If any incorrect, then credit</p> <p>T S in order at beginning = 1 mark</p> <p>U Q in order at end = 1 mark</p> <p>R before W anywhere in the sequence = 1 mark</p>

Question	Expected Answer	Mark	Additional Guidance
2 (c)	<p>1 <u>3</u> domains <b>AND</b> <u>5</u> kingdoms ;</p> <p>2 domains are, bacteria / eubacteria, <b>AND</b>, archaea / archaeobacteria, <b>AND</b>, eukarya / eukaryotes ;</p> <p>3 kingdoms are prokaryotes <b>AND</b> protocists <b>AND</b> fungi <b>AND</b> plants <b>AND</b> animals ;</p> <p>4 eukaryotes split into different kingdoms / all eukaryotes are in the same domain ;</p> <p>5 all prokaryotes are in the same kingdom / prokaryotes split into different domains ;</p> <p>6 domain classification based on, rRNA / ribosomes / RNA polymerase / protein synthesis / enzymes / flagella / membrane structure ;</p>	4 max	<p><b>ACCEPT</b> phonetic spellings throughout <b>ACCEPT</b> alternative terms for names of kingdoms and domains throughout (e.g. plants / plantae)</p> <p><b>2 ACCEPT</b> 'eukaryota'</p> <p><b>3 DO NOT CREDIT</b> protists / protozoa</p> <p><b>6 IGNORE</b> RNA unqualified <b>DO NOT CREDIT</b> other forms of RNA <b>ACCEPT</b> any detail of protein synthesis</p>
	<b>Total</b>	<b>12</b>	



Question	Expected Answer	Mark	Additional Guidance
3 (a)	<p>young / elderly / HIV infected / malnourished / post-operative / on immunosuppressants / leukaemia / undergoing cancer treatment / anorexics ;</p> <p>immature / compromised / weak / AW, immune system ;</p>	2	<p><b>IGNORE</b> prompt lines and mark the answer as a whole</p> <p><b>ACCEPT</b> AW for young / elderly etc</p> <p><b>IGNORE</b> 'ill' or 'unfit'</p> <p><b>IGNORE</b> any reference to populations e.g. those living in vicinity of outbreak</p> <p><b>ACCEPT</b> description</p> <p><b>ACCEPT</b> no immunity</p>
3 (b) (i)	<p><b>1</b> bacteria / (bacterial) cells, divide / increase in number / multiply / reproduce / proliferate / replicate ;</p> <p><b>2</b> (secrete) enzymes / named enzyme ;</p> <p><b>3</b> food, digested / broken down ;</p> <p><b>4a</b> protein / named protein / polypeptides → peptides / amino acids <b>OR</b></p> <p><b>4b</b> fat / triglycerides → fatty acids <b>OR</b></p> <p><b>4c</b> starch / amylose / glycogen → glucose / sugar ;</p> <p><b>5</b> production / release / excretion / secretion, of, toxins / named toxin / waste products ;</p> <p><b>6</b> (causes) change in, appearance / smell / texture / taste ;</p>	3 max	<p><b>DO NOT CREDIT</b> 'mould' – penalise once only</p> <p><b>1 IGNORE</b> 'growth' <b>DO NOT CREDIT</b> 'mitosis'</p> <p><b>2 DO NOT CREDIT</b> excrete Answer should <b>not</b> imply intracellular enzymes</p> <p><b>4b IGNORE</b> cholesterol</p> <p><b>4c ACCEPT</b> other correct carbohydrate breakdown</p> <p><b>6 CREDIT</b> suitable example e.g. 'goes mushy'</p>

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(ii)	<p>1 bacteria, reproduce / AW, more rapidly / faster ;</p> <p>2 (so) more bacteria present ;</p> <p>3 more, toxins / waste, produced / released / AW ;</p> <p>4 more enzymes, secreted / AW ;</p> <p>5 enzyme, action faster / works better / more effective, at higher temperatures ;</p> <p>6 (substrate and enzymes have) more <u>kinetic</u> energy ;</p> <p>7 more, enzyme-substrate complexes / ESC / (successful) collisions <u>between substrate and active site</u> ;</p>	3 max	<p>Idea of 'more' is needed for all marking points but it can be stated once and linked to more than one point.</p> <ul style="list-style-type: none"> <li>e.g. 'more bacteria secreting enzymes' = mp 2 and 4</li> </ul> <p><b>ACCEPT</b> converse argument throughout</p> <p><b>ACCEPT</b> 'fungi' / 'mould' in place of bacteria as question stem does not specify</p> <p><b>1 IGNORE</b> 'grow' <b>IGNORE</b> 'more easily' or 'effectively' <b>DO NOT CREDIT</b> if the candidate thinks there is no reproduction at 5°C</p> <p><b>4 DO NOT CREDIT</b> excreted</p> <p><b>5 IGNORE</b> optimum</p>

Question	Expected Answer	Mark	Additional Guidance
3 (b) (iii)	<p>max 2 for 2 distinct methods max 2 for 2 <b>correctly linked</b> explanations Only credit the explanation mark if the method mark has been awarded.</p> <p><b>M1</b> salting ; <b>E1</b> lack of <u>water</u> due to, osmosis / low water potential (outside cell) ;</p> <p><b>M2</b> sugar ; <b>E2</b> lack of <u>water</u> due to, osmosis / low water potential (outside cell) ;</p> <p><b>M3</b> (air / freeze) drying ; <b>E3</b> <i>idea that enzymes cannot mobilise /</i> intracellular transport impaired / reactions have no medium in which to occur / (microbes) cannot move ;</p> <p><b>M4</b> pickling / (use of) vinegar ; <b>E4</b> (low pH) denatures / changes tertiary structure of / changes 3D shape of, enzymes / proteins <b>OR</b> substrate no longer fits active site / active site shape changes / prevents ESC ;</p> <p><b>M5</b> heat treatment / cooking ; <b>E5</b> denatures / changes tertiary structure of / changes 3D shape of, enzymes / proteins <b>OR</b> substrate no longer fits active site / active site shape changes / prevents ESC ;</p> <p><b>M6</b> irradiation / UV / gamma rays / X-rays / <u>ionising</u> radiation ; <b>E6</b> destroys / damages / changes / mutates, DNA / genes / genetic material ;</p> <p><b>M7</b> smoking ; <b>E7</b> (so exposed to) antibacterial / named antibacterial, chemical(s) ;</p> <p><b>M8</b> vacuum packing / canning / bottling ; <b>E8</b> microorganisms cannot respire <u>aerobically</u> ;</p>	<b>4</b>	<p>Where more than one method is given, mark first on line and assume explanation linked with that <b>DO NOT CREDIT</b> chilling or freezing (as in question)</p> <p><b>M1 IGNORE</b> drying <b>E1 ALLOW</b> low <math>\Psi</math> / high solute potential</p> <p><b>M2 IGNORE</b> drying <b>E2 ALLOW</b> low <math>\Psi</math> / high solute potential</p> <p><b>E4 DO NOT CREDIT</b> high pH</p> <p><b>M5 ACCEPT</b> pasteurising <b>IGNORE</b> canning for this mp</p> <p><b>E5, E 6 &amp; E7</b> <b>ACCEPT</b> 'kills bacteria' or 'kills microbes' as a reason supporting heat treatment, irradiation or smoking <b>only once</b></p> <p><b>M6 CREDIT</b> radiation if correctly qualified in explanation</p> <p><b>M7 CREDIT</b> addition of, sulphites / sodium benzoate / alcohol</p> <p><b>E8 IGNORE</b> 'denaturing' as a consequence of canning / bottling</p>

Question	Expected Answer	Mark	Additional Guidance
3 (c)	<p><b>This is a QWC question</b></p> <p><b>Ignore sections and mark as continuous prose</b></p> <p>1 low(er) / less, <u>energy</u> (than beef) ;</p> <p>2 useful for, slimming / weight control / AW ;</p> <p>3 low(er) / less, (total) fat ;</p> <p>4 (very) low / (much) less, saturated fat ;</p> <p>5 lower, cholesterol</p> <p><b>OR</b></p> <p>lower risk of, (coronary) heart disease / CHD / cardio-vascular diseases / heart attack / cardiac arrest / myocardial infarction / MI / angina / <u>atherosclerosis</u> / atheroma / stroke / hypertension ;</p> <p>6 contains carbohydrate / AW ;</p> <p>7 low(er) / less, iron content ;</p> <p>8 (increased risk of) anaemia / fewer RBCs / less haemoglobin / reduced oxygen carrying capacity of blood ;</p> <p>9 low(er) / less, protein ;</p> <p>10 (mycoprotein provides) more <u>balanced</u> diet ;</p> <p>11 need larger intake to meet requirements / AW ;</p>	7 max	<p>Assume candidate is talking about mycoprotein unless otherwise stated.</p> <p><b>CREDIT</b> ora for beef throughout.</p> <p><b>IGNORE</b> use of figures alone when awarding mps 1, 3, 6, 7, 9 – look for <b>descriptive statement</b>, e.g.</p> <ul style="list-style-type: none"> <li>• '12 g of protein' = no mark</li> <li>• 'only 12 g protein' = 1 mark (mp 9)</li> </ul> <p>2 <b>ACCEPT</b> preventing obesity <b>ACCEPT</b> 'less energy to burn off <i>during exercise</i>' <b>DO NOT CREDIT</b> 'burn off' unqualified</p> <p>6 <b>ACCEPT</b> 'more carbohydrate than beef' <b>IGNORE</b> 'carbs'</p> <p>8 <b>IGNORE</b> answers phrased in terms of role of iron alone e.g. 'haemoglobin contains iron' = 0 Answers must show consequence of deficiency e.g. 'less haemoglobin' = 1</p>
	<p><b>QWC</b> – award for 2 clear references to the table ;</p>	1	<p>Award for 2 sets of comparative figures (stated or calculated) with units – 'content per 100g' not needed <b>IGNORE</b> vague terms like 'about' as long as figs are correct</p>
	<b>Total</b>	<b>20</b>	

Question			Expected Answer	Mark	Additional Guidance
4	(a)	(i)	<p>1 (m)RNA is single stranded / DNA is double stranded ;</p> <p>2 (m)RNA is non helical / DNA is helical ;</p>	1	<p><b>Mark the first response</b> but do not award the mark if a further answer is incorrect or contradictory  <b>DO NOT CREDIT</b> refs to length as given in stem</p> <p>1 <b>ACCEPT</b> DNA is a double helix (as stranded is implied) <b>for this mp</b>  <b>DO NOT CREDIT</b> DNA is a double <i>molecule</i></p> <p>2 <b>ACCEPT</b> (mRNA) not twisted / not coiled / not spiral / straight / ora</p>
4	(a)	(ii)	<p>1 RNA contains ribose <b>and</b> DNA contains deoxyribose ;</p> <p>2 RNA contains, uracil / U, <b>and</b> DNA contains, thymine / T ;</p> <p>3 3 / more than 1, forms of RNA ;</p> <p>4 RNA is, single <u>stranded</u> / non helical,  <b>and</b> DNA is, double <u>stranded</u> / helical ;  <i>if not already <b>awarded</b> as answer in (i)</i></p>	1	<p><b>Mark the first response to (a)(ii)</b> – but do not award the mark if a further answer is incorrect or contradictory</p> <p>2 <b>DO NOT CREDIT</b> thymine</p> <p>3 <b>ACCEPT</b> ‘one form of DNA’</p>
4	(a)	(iii)	<u>gene</u> ;	1	<b>IGNORE</b> allele / operon
4	(a)	(iv)	too big to / does not, fit through <u>pore</u> (in nuclear envelope) ;	1	<b>ACCEPT</b> ‘too long to fit ... pore’
4	(a)	(v)	<p><i>idea that</i> only copies one, gene / section / part / AW, (of DNA) ;</p> <p><i>idea that</i> DNA comprises many, genes / alleles ;</p>	2	<p>e.g. mRNA only codes for 1 protein</p> <p><b>DO NOT CREDIT</b> ‘1 DNA molecule contains <u>all</u> the genes’  ‘mRNA only codes for 1 protein but DNA codes for many proteins’ = 2 marks</p>

Question		Expected Answer	Mark	Additional Guidance
4	(b) (i)	<p>1 <u>non</u>-competitive (inhibitor) ;</p> <p>2 (<math>\alpha</math>-amanitin / inhibitor / toxin) fits into, allosteric site / a place other than active site ;</p> <p>3 <u>active site</u> changes, shape / configuration / conformation / structure ;</p> <p>4 substrate no longer, fits / complementary to, <u>active site</u> ;</p>	2 max	<p>3 <b>ACCEPT</b> 'distortion of active site'</p> <p>4 Mark to be awarded in context of active site (although need not be repeated if stated in mp 3) <b>IGNORE</b> ESC</p>
4	(b) (ii)	<p>1 inhibits production of mRNA / mRNA not produced ;</p> <p>2 prevents protein synthesis / AW ;</p> <p>3 e.g. of, specific named protein / (vital) process, that may be affected ;</p>	2 max	<p>1 <b>CREDIT</b> prevents transcription</p> <p>2 <b>CREDIT</b> translation</p> <p>3 e.g. respiration / photosynthesis (as question refers to 'an organism') / haemoglobin / cytochrome C oxidase</p>
4	(c) (i)	sequence / order, of amino acids ;	1	<b>IGNORE</b> number / organisation
	(c) (ii)	<p>A = ionic ;</p> <p>B = hydrogen ;</p> <p>C = <u>disulfide</u> (bond / bridge) ;</p>	3	<p><b>ALLOW</b> phonetic spelling</p> <p><b>DO NOT CREDIT</b> <u>disulfate</u></p>
4	(d)	<p>1 increased <u>kinetic</u> energy ;</p> <p>2 (any part of protein molecule) vibrates ;</p> <p>3 hydrophilic / hydrophobic / hydrogen / ionic, bonds / interactions, break ;</p> <p>4 change in, <u>3D</u> shape / conformation (of protein) ;</p> <p>5 <u>denatures</u> ;</p>	3 max	<p>1 must contain the idea of <u>more</u> than normal</p> <p>3 <b>IGNORE</b> Van der Waals <b>DO NOT CREDIT</b> if disulfide / covalent / peptide bonds are included</p> <p>4 <b>IGNORE</b> tertiary / structure (as in question) <b>IGNORE</b> refs to, active site / enzymes</p>
<b>Total</b>			<b>17</b>	

Question			Expected Answer	Mark	Additional Guidance
5	(a)	(i)	<p>mucus traps, bacteria / microbes / pathogens / microorganisms / viruses / spores ;</p> <p>cilia, sweep / move / waft, mucus / bacteria / pathogens / microorganisms / viruses / spore, upwards / AW ;</p>	2	<p>For both marking points <b>ACCEPT</b> ora for what would happen if they didn't work</p> <p><b>IGNORE</b> ref to dirt / dust / etc</p> <p><b>ACCEPT</b> answers that imply out of airways e.g. to the throat / coughed / swallowed</p>

Question			Expected Answer	Mark	Additional Guidance
5	(a)	(ii)	<p><i>stage A</i></p> <p>1 phagocyte, attaches / binds / AW, to bacterium / pathogen ;</p> <p>2 <u>receptor</u> (on phagocyte), attaches to / binds to / recognises / AW, <u>antigen</u> (on bacterium) ;</p> <p><i>stage B</i></p> <p>3 bacterium, engulfed / enters by endocytosis / enters by phagocytosis / AW ;</p> <p>4 (formation of) <u>phagosome</u> / phagocytic vacuole ;</p> <p><i>stage C</i></p> <p>5 <u>lysosomes</u>, fuse with / join with / move towards (phagosome) ;</p> <p>6 release / secrete, enzymes / lysins / named enzyme / hydrogen peroxide / free radicals (into phagosome) ;</p> <p><i>stage C/D</i></p> <p>7 bacterium, digested / broken down / hydrolysed ;</p> <p>8 (to) amino acid / sugar / glucose / fatty acid / glycerol ;</p> <p><i>stage D</i></p> <p>9 absorbed / AW, into, <u>cytoplasm</u> / <u>cytosol</u> ;</p> <p>10 by, (facilitated / simple) diffusion / active transport ;</p>	6 max	<p><b>IGNORE</b> stage letters and look for correct sequence <b>DO NOT CREDIT</b> steps that are biologically out of sequence, e.g. mp6 before mp5. Penalise once only. <b>ACCEPT</b> 'bacteria' throughout</p> <p><b>2 CREDIT</b> PAMP / antibody marker / complement marker, as AW for antigen</p> <p><b>3 DO NOT CREDIT</b> 'eaten' <b>IGNORE</b> pseudopodia or any other structure</p> <p><b>5 DO NOT CREDIT</b> 'binds with'</p> <p><b>7 DO NOT CREDIT</b> destroyed (as in the question)</p> <p><b>IGNORE</b> refs to antigen presentation as this happens after the stage shown in the diagram</p>
5	(b)	(i)	plasma (cell) ;	1	<p><b>ACCEPT</b> B lymphocyte <b>ACCEPT</b> effector <u>cell</u> <b>DO NOT CREDIT</b> lymphocyte unqualified</p>



Question	Expected Answer	Mark	Additional Guidance
5 (b) (ii)	<p><b>This is a QWC question</b></p> <p>1 Y-shaped molecule / light and heavy chains / disulfide bonds / 4 polypeptide chains ;</p> <p>2 <u>constant</u> region ;</p> <p>3 marker for / binds to, phagocytes / AW ;</p> <p>4 <u>variable</u> region ;</p> <p>5 (antibody) <u>specificity</u> ;</p> <p>6 (has) <u>complementary shape</u> to antigen (on pathogen) ;</p> <p>7 <u>hinge</u> (region) ;</p> <p>8 allows flexibility ;</p> <p>9 more than one variable region :</p> <p>10 allows, agglutination / description of agglutination <b>or</b> attachment to more than one, pathogen / antigen ;</p> <p>11 neutralisation / blocking pathogen's binding sites ;</p>	6 max	<p><b>CREDIT</b> a correctly labelled diagram that is clearly an antibody <b>CON</b> if diagram and text are contradictory MPs 3, 5, 6, 8, 10 are stand alone but <b>DO NOT CREDIT</b> if context is clearly incorrect. e.g. 'constant region gives specificity' <b>AWARD</b> mp 2 but not mp 5</p> <p><b>3 ACCEPT</b> ref to opsonisation</p> <p>'Complimentary shape to specific antigen' = 2 marks (mps 5 &amp; 6)</p> <p><b>8 IGNORE</b> 'movement' unqualified</p> <p><b>9 DO NOT CREDIT</b> from diagram unless more than one is explicitly labelled or clearly keyed (e.g. by shading)</p> <p><b>11 ACCEPT</b> ref. to antitoxin</p>
	<p><b>QWC</b> – award when 2 marks are given in any two of the grouped sections ;</p>	1	<p>2 marks had been awarded from 2 of the following groups of marks (4 marks in total)</p> <p>mps 2 &amp; 3 mps 4 &amp; 5/6 mps 7 &amp; 8 mps 9 &amp; 10</p>

Question			Expected Answer	Mark	Additional Guidance
5	(b)	(iii)	<p><i>type of immunity</i></p> <p><i>artificial active</i> <input type="checkbox"/></p> <p><i>artificial passive</i> <input type="checkbox"/></p> <p><i>natural active</i> <input type="checkbox"/></p> <p><i>natural passive</i> <input checked="" type="checkbox"/> ;</p>	1	<p><b>DO NOT CREDIT</b> if more than 1 box is ticked</p> <p><b>DO NOT CREDIT</b> a cross</p> <p><b>DO NOT CREDIT</b> a tick that has been crossed out and is a 'hybrid' tick</p>
			<b>Total</b>	<b>17</b>	

Question	Expected Answer	Mark	Additional Guidance
6 (a)	<p>1 <u>biodiversity</u> (of heathland) ;</p> <p>2 rare / endangered, species / plants / animals / fungi / organisms / named organism ;</p> <p>3 rarity of (this) <u>habitat</u> ;</p> <p>4 example of current <i>legal</i> status ;</p> <p>5 (likely) <u>reduction in size</u> of, habitat / ecosystem / heathland ;</p> <p>6 effect of reduced size on <u>viability</u> (of whole ecosystem) ;</p> <p>7 effect on, movement / spread, of, species / named species / plants / animals ;</p> <p>8 a method of minimizing impact / AW / named example ;</p>	3 max	<p>4 e.g. National Park / SSSI / protected species / National Nature Reserves / NNR / other <i>legal</i> example</p> <p>5 <b>IGNORE</b> 'habitat destruction' alone. Must refer to extent or size of destruction.</p> <p>7 <b>CREDIT</b> effect on wildlife corridors Answers could refer to limiting species spread or introduction of species</p> <p>8 e.g. 'toad tunnels' / relocation of population</p> <p>'build toad tunnels so that the toads can still move between the two areas of heathland' = 2 marks (mps 7 and 8)</p>
6 (b) (i)	<p>1 <i>idea of</i> (collect in) different / wider, area ;</p> <p>2 (collect at) different, times of day / times of year / weather conditions ;</p> <p>3 use of named, collecting / identifying, technique ;</p> <p>4 method of ensuring that individuals <u>not counted again</u> ;</p> <p>5 mark-release-recapture / capture-recapture, technique ;</p>	3 max	<p>1 <b>ALLOW</b> several transects e.g. another path</p> <p>3 e.g. (sweep) net / photographs / feeding stations <b>IGNORE</b> pooter (as could only catch larvae) / light trap / use of key / single transect</p> <p>4 This mark refers to an initial or the only sample – it is <b>not</b> linked to mp 5</p> <p>5 <b>CREDIT</b> count marked individuals in 2<sup>nd</sup> sample / population = <math>\frac{\text{no. in 1}^{\text{st}} \text{ sample} \times \text{no. in 2}^{\text{nd}} \text{ sample}}{\text{no. retrapped in 2}^{\text{nd}} \text{ sample}}</math></p>

Question	Expected Answer	Mark	Additional Guidance																																				
6 (b) (ii)	<table border="1"> <thead> <tr> <th>species</th> <th>n</th> <th>n/N</th> <th>(n/N)<sup>2</sup></th> </tr> </thead> <tbody> <tr> <td>Grayling (<i>Hipparchia semele</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Large Heath (<i>Coenonympha tullia</i>)</td> <td></td> <td><b>0.3548</b></td> <td></td> </tr> <tr> <td>Gatekeeper (<i>Pyronia tythonus</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Green Hairstreak (<i>Callophrys rubi</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Silver-studded Blue (<i>Plebeius argus</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Small Heath (<i>Coenonympha phamhylus</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>Sum (<math>\Sigma</math>)</td> <td><b>0.31633</b> <b>OR</b> <b>0.31217</b></td> </tr> <tr> <td></td> <td></td> <td>1 - <math>\Sigma</math></td> <td>D = <b>0.68367</b> <b>OR</b> <b>0.68783</b></td> </tr> </tbody> </table>	species	n	n/N	(n/N) <sup>2</sup>	Grayling ( <i>Hipparchia semele</i> )				Large Heath ( <i>Coenonympha tullia</i> )		<b>0.3548</b>		Gatekeeper ( <i>Pyronia tythonus</i> )				Green Hairstreak ( <i>Callophrys rubi</i> )				Silver-studded Blue ( <i>Plebeius argus</i> )				Small Heath ( <i>Coenonympha phamhylus</i> )						Sum ( $\Sigma$ )	<b>0.31633</b> <b>OR</b> <b>0.31217</b>			1 - $\Sigma$	D = <b>0.68367</b> <b>OR</b> <b>0.68783</b>	3	<p>Original table on question paper had incorrect figure in (n/N)<sup>2</sup> column for Grayling row. Answers for mps 2 &amp; 3 take this into account.</p> <p><b>ACCEPT</b> ecf from incorrect answer for <math>\Sigma</math> (whether decimal places or rounding)</p>
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6 (b) (iii)	<p>1 many species present / high species richness / all species evenly represented / high species evenness / high biodiversity ;</p> <p>2 (so) should not be developed / development should be modified / development should be reconsidered / should be conserved / AW ;</p>	2	<p><b>IGNORE</b> refs to relative robustness of habitat</p> <p>1 <b>ACCEPT</b> 'types of butterfly' as AW for species <b>IGNORE</b> 'individuals' or 'organisms'</p> <p>2 <b>DO NOT CREDIT</b> ref to 'planning' alone (as given in question)</p> <p>2 <b>IGNORE</b> responses that imply uncertainty about the development. e.g. 'could' 'might' 'may'</p>																																				

Question			Expected Answer	Mark	Additional Guidance														
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Small Heath ( <i>Coenonympha phamhylus</i> )	E																		
6	(c)	(ii)	1 (is) same <u>genus</u> ;	2 max	<b>1 DO NOT CREDIT</b> vague statements like 'could be in the same genus' <b>IGNORE</b> <i>Coenonympha</i>  <b>2 IGNORE</b> 'similar' on its own <b>DO NOT CREDIT</b> 'same' <b>IGNORE</b> specific examples (e.g. orange wings / large spot)  <b>3 ACCEPT</b> closely related ;														
			2 have, features / characteristics / appearance / behaviour / biochemistry / physiology / anatomy / genes / genetic makeup / DNA, that are, similar / in common ;																
			3 (share a) common, ancestor / phylogeny ;																
<b>Total</b>				<b>18</b>															

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