

GCE

Biology

Unit **F212**: Molecules, Biodiversity, Food and Health

Advanced Subsidiary GCE

Mark Scheme for June 2014

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning
	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each additional page where there is no candidate response.
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Marking point partially met
	QWC* element met
	A response that would gain credit is associated with some clearly incorrect science. Do not award the mark.

Question			Answer	Mark	Guidance
1	(a)	(i)	fins ; streamlining / streamlined shape ;	1 max	Mark the first answer. If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = 0 marks ACCEPT reasonable attempt to describe streamlined shape ACCEPT aerodynamic ACCEPT articulated / flexible , spine
1	(a)	(ii)	eyes on top of head ;	1	Mark the first answer. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT the position of the eyes / eyes that can see above IGNORE eyes facing forward IGNORE fin IGNORE eyes close together IGNORE refs to shape
1	(b)		1 (cellulose) cell wall ; 2 chloroplast(s) ; 3 (large / permanent) vacuole ; 4 starch granules ;	2	Mark the first answer on each prompt line. If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = 0 marks 2 CREDIT plastids / dictyosomes / many small Golgi 3 IGNORE chlorophyll 3 CREDIT tonoplast 4 CREDIT druses / raphides / crystalline inclusions / Ca oxalate

Question		Answer	Mark	Guidance
1	(c)	<p>1 (similarities / differences in) genes / genetics / DNA / RNA / molecules / biochemistry ;</p> <p>2 (similarities / differences in) nucleotide / base , sequence / order ;</p> <p>3 (similarities / differences in) cytochrome c / haemoglobin / ATP synthase / RNA polymerase;</p> <p>4 (similarities / differences in) sequence / order , of amino acids (in proteins) ;</p> <p>5 <i>idea that</i> similarities between any of the above implies (close) relationship ; ora</p>	5 max	<p>1 ACCEPT molecular / biochemical evidence</p> <p>5 CREDIT if their genes are similar they must share a <u>recent</u> common ancestor 5 AWARD as a general statement or with an example, e.g. 'chimps and humans share large proportion of DNA and this means that they are related gets mp 1 and 5. 'Chimps and humans are closely related' = 0 marks unless linked to a marking point from 1 – 4.</p>
		<p>6 <i>idea of</i> evolution within human history ;</p> <p>7 similarities in / differences in / comparison of , embryology / morphology / anatomy / physiology / behaviour ;</p>		<p>6 CREDIT in the context of an example of evolution in action, e.g. MRSA resistance to antibiotics or as a general statement 6 CREDIT selective breeding (artificial selection) example</p> <p>7 CREDIT e.g. similar finches occupying different niches on neighbouring Galapagos islands 7 CREDIT e.g. vertebrate pentadactyl limb etc. 7 ACCEPT idea of vestigial organs ; 7 IGNORE appearance / features / adaptations</p>
		QWC ; One mark from 1-4 and 1 mark from 6-7	1	Marking point 5 is not part of QWC
			6	
		Total	10	

Question			Answer	Mark	Guidance
2	(a)		(works) outside cells ;	1	ACCEPT secreted / AW , from cells ACCEPT works in named extracellular environment e.g. digestive tract IGNORE doesn't work in cells
2	(b)	(i)	time / time taken ;	1	Mark the first answer. If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = 0 marks ACCEPT 'how long it took ...'

Question			Answer	Mark	Guidance
2	(b)	(ii)	<p><i>linear part of the graph means...</i></p> <p>1 <u>more</u> (successful) collisions with (amylase) <u>active site</u> (at increasing starch concentration) ; ora</p> <p>2 <u>more</u> ESC (at increasing starch concentration) ; ora</p> <p>3 so more product formation <u>in a given time</u> (at increasing starch concentration) ; ora</p> <p><i>curve / plateau , means...</i></p> <p>4 all / most , <u>active sites</u> (of amylase) are occupied ;</p> <p>5 enzyme / amylase , working , at / near, maximum rate / V_{max} ;</p> <p>6 (so) further increase in starch concentration has no effect (on rate) ;</p> <p>7 enzyme <u>concentration</u> , is / becomes , <u>limiting</u> factor ;</p>	5 max	<p>ACCEPT glucose / maltose for product throughout ACCEPT substrate for starch throughout</p> <p>1 ACCEPT few(er) active sites occupied at low starch concentrations</p> <p>2 ACCEPT ESC formed more easily</p> <p>3 AWARD only if linked to the context of marking points 1 or 2 e.g. 'more product formation <u>in a given time</u> because of more collisions with the enzyme' gets mp3 but not mp1 because active site not mentioned 3 IGNORE <u>rate</u> as this is a description of graph</p> <p>4 ACCEPT all active sites are full of substrate</p> <p>5 ACCEPT enzyme at full capacity</p> <p>6 Must link to 4 or 5 6 AWARD only if mp 4 or 5 given 6 DO NOT CREDIT rate decreases</p> <p>7 ACCEPT the increasing part of the graph is because starch <u>concentration</u> is the <u>limiting</u> factor</p>

Question			Answer	Mark	Guidance
2	(b)	(iii)	<p>1 (so) charges in active site do not change ; ora</p> <p>2 (so) hydrogen / ionic , bonds unaffected ; ora</p> <p>3 (so) tertiary structure / 3D shape / active site , unaltered ; ora</p> <p>4 (so) enzyme / tertiary structure , does not <u>denature</u> ; ora</p> <p>5 (so) substrate , fits / is complementary shape to , <u>active site</u> ; ora</p> <p>6 so the results are <u>valid</u> / as the <u>rate</u> (of reaction) will vary if pH varies / so that only one (independent) variable is changed ;</p>	3 max	<p>The mark points refer to a constant pH preventing damage to the enzyme. CREDIT throughout the appropriate marking point for an answer that describes what would happen if the pH changed.</p> <p>2 DO NOT CREDIT peptide / disulphide , bonds break</p> <p>2 DO NOT CREDIT in context of heat / vibration</p> <p>2 IGNORE hydrophobic / hydrophilic</p> <p>3 IGNORE ref to denaturing active site</p> <p>3 IGNORE tertiary structure breaks</p> <p>3 ACCEPT tertiary structure affected</p> <p>3 Cannot be inferred from mp5 – must be stated</p> <p>4 IGNORE ref to denaturing active site</p> <p>4 DO NOT CREDIT kill / die</p> <p>5 IGNORE enters / binds with</p> <p>6 IGNORE fair test / reliable / accurate</p>

Question			Answer	Mark	Guidance														
2	(b)	(iv)	<p>temperature (of the reaction mixture) ; enzyme / amylase , concentration ;</p> <p>(total) volume of (reaction) <u>solution</u> ;</p> <p>concentration of , cofactors / chloride ions / Cl⁻ ;</p>	2 max	<p>Mark the first answer on each prompt line. If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = 0 marks DO NOT CREDIT substrate / starch , concentration (as this is the independent variable)</p> <p>DO NOT CREDIT amount</p> <p>ACCEPT volume of enzyme solution DO NOT CREDIT amount</p> <p>ACCEPT concentration of coenzymes</p> <p>IGNORE time / agitation / inhibitors</p>														
2	(c)	(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Amylose</th> <th style="width: 50%; text-align: center;">Cellulose</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><i>coiled</i></td> <td style="text-align: center;"><i>no coiling</i></td> </tr> <tr> <td>(contains) α / alpha / A / a , -glucose</td> <td>(contains) β / beta / B / b , -glucose ;</td> </tr> <tr> <td>α / alpha / A / a 1-4 glycosidic bonds</td> <td>β / beta / B / b 1-4 glycosidic bonds ;</td> </tr> <tr> <td>all , monomers / AW , in same orientation</td> <td>alternate monomers at , 180° / AW , to each other ;</td> </tr> <tr> <td style="text-align: center;">granular / not fibrous</td> <td style="text-align: center;">fibrous / not granular ;</td> </tr> <tr> <td>H bonds within molecule / no (H) bonds (between molecules)</td> <td>(H) bonds between adjacent molecules ;</td> </tr> </tbody> </table>	Amylose	Cellulose	<i>coiled</i>	<i>no coiling</i>	(contains) α / alpha / A / a , -glucose	(contains) β / beta / B / b , -glucose ;	α / alpha / A / a 1-4 glycosidic bonds	β / beta / B / b 1-4 glycosidic bonds ;	all , monomers / AW , in same orientation	alternate monomers at , 180° / AW , to each other ;	granular / not fibrous	fibrous / not granular ;	H bonds within molecule / no (H) bonds (between molecules)	(H) bonds between adjacent molecules ;	3	<p>Mark the first 3 responses AWARD 1 mark for each correct row irrespective of boxes Three correct rows of responses written within the same box can be awarded 3 points.</p> <p>ACCEPT every second one is flipped</p> <p>ACCEPT fibres / microfibrils / fibrils / macrofibrils DO NOT CREDIT myofibrils ACCEPT grains</p> <p>ACCEPT '(cross)links' as AW for 'bonds'</p>
Amylose	Cellulose																		
<i>coiled</i>	<i>no coiling</i>																		
(contains) α / alpha / A / a , -glucose	(contains) β / beta / B / b , -glucose ;																		
α / alpha / A / a 1-4 glycosidic bonds	β / beta / B / b 1-4 glycosidic bonds ;																		
all , monomers / AW , in same orientation	alternate monomers at , 180° / AW , to each other ;																		
granular / not fibrous	fibrous / not granular ;																		
H bonds within molecule / no (H) bonds (between molecules)	(H) bonds between adjacent molecules ;																		

Question			Answer	Mark	Guidance
2	(c)	(ii)	(tensile) strength / strong ; (H) bonds / links , can form (between adjacent fibrils) ; insoluble ;	2 max	ACCEPT mechanical strength IGNORE fibrous / rigid ACCEPT fibres / microfibrils / fibrils / macrofibrils IGNORE refs to bonding with water IGNORE ionic / myofibrils ACCEPT crosslinks DO NOT CREDIT peptide / covalent / glycosidic / disulfide etc
			Total	17	

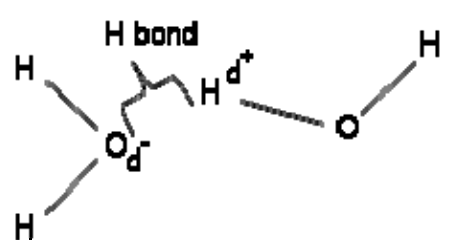
Question		Answer	Mark	Guidance
3	(a)	<u>Nymphaea</u> ;	1	NOTE: the first letter must clearly be in upper case and the others in lower case and the spelling correct
3	(b)	<p>1 (natural) <u>habitat / ecosystem</u> , lost due to / destroyed by / under threat from , climate change / (named) human activity ;</p> <p>2 number / population , (in natural habitat) is very low ;</p> <p>3 <i>idea that</i> in the wild, (sexual) reproduction is difficult (if numbers are low) ; ora</p> <p>4 (breeding <i>ex situ</i> can) maintain , the <u>gene pool</u> / genetic / allelic , diversity; ora</p> <p>5 <i>idea that</i> allows <u>protection</u> from , grazers / herbivores / plant collectors / competing species ; ora</p> <p>6 <i>idea of</i> <u>protection</u> from , pathogen / parasites / disease ; ora</p>	3 max	<p>IGNORE can be in optimum conditions throughout</p> <p>1 The essence of this marking point is <u>habitat</u> loss plus reason. Award tick when both these ideas have been seen. 1 ACCEPT natural disaster / deforestation , as reason for habitat loss</p> <p>2 IGNORE reference to , extinct / endangered</p> <p>3 ACCEPT e.g. fertilization can be carried out using a paintbrush</p> <p>5 ACCEPT habitat contains organisms that are a threat 5 ACCEPT protection from , predators / poachers / hunters</p> <p>6 ACCEPT pests</p>

Question		Answer	Mark	Guidance
3	(c)	<p>1 can be collected with minimal damage to (wild) , population / habitat / ecosystem ;</p> <p>2 take up little space / larger numbers can be stored ; ora</p> <p>3 can store great(er) , genetic / allelic , diversity ; ora</p> <p>4 low(er) maintenance / manpower costs / AW ; ora</p> <p>5 easy / cheaper, to transport / AW ; ora</p> <p>6 <i>idea of remaining viable</i> for long periods ; ora</p> <p>7 <i>less</i> , susceptible / vulnerable , to, disease / pests / environmental change ; ora</p> <p>8 <i>idea that</i> prevents fertilisation by undesired pollen ;</p>	3 max	<p>Mark as prose. Ignore numbered lines.</p> <p>2 ACCEPT easier to store a large amount</p> <p>4 CREDIT 'cheaper' only if supported by an explanation 4 IGNORE easier to keep unqualified 4 ACCEPT less labour-intensive 4 DO NOT CREDIT no maintenance costs</p> <p>6 CREDIT description / example – e.g. kept dry so that they do not rot / regular germination and new seed production 6 IGNORE 'last a long time' unqualified 6 ACCEPT 'stay , alive / fertile , for a long time'</p> <p>7 ACCEPT the adult plant might have a disease 7 IGNORE prevents</p>

Question		Answer	Mark	Guidance
3	(d)	<p>1 (use of) quadrat ;</p> <p>2a random (sampling) ;</p> <p>3a placing measuring tapes (at right angles) / use grid ;</p> <p>OR</p> <p>2b (use of) <u>transect</u> ;</p> <p>3b (quadrat / point frame) placed at regular intervals ;</p> <p>4 (use of identification) key ;</p> <p>5 example / detail , of method used to determine <u>abundance</u> ;</p> <p>6 repeat many times / <i>idea of</i> considering appropriate number of samples ;</p> <p>7 sample / AW , at different , seasons / times of year ;</p>	4 max	<p>1 ACCEPT description of a quadrat / point frame</p> <p>1 IGNORE quadrant</p> <p><i>AWARD either a or b for both marking points 2 and 3. Do not mix a and b marks. If both a and b marks are present ignore the lower scoring letter.</i></p> <p>2a ACCEPT bits of paper in a hat / random number generator</p> <p>2a DO NOT CREDIT throw</p> <p>3a ACCEPT e.g. bottom left hand corner of quadrat placed at coordinate / two students walk in a straight line from each tape measure</p> <p>3b ACCEPT systematic sampling</p> <p>5 ACCEPT percentage cover / percentage frequency / number of hits with point frame / ACFOR</p> <p>5 ACCEPT strategy for dealing with plants half in or out of quadrat</p> <p>5 IGNORE 'count' without further clarification</p> <p>6 ACCEPT calculate running mean</p> <p>6 IGNORE several / a few</p> <p>6 If number state must be at least 5</p> <p>7 ACCEPT throughout the year</p>

Question		Answer	Mark	Guidance
3	(e)	<p>1 reason for not having found all species ;</p> <p>2 may have become extinct , <u>recently</u> / <u>since recording</u> ;</p> <p>3 evolution is on-going / new species are being formed / AW ;</p> <p>4 <i>idea that</i> some (species) difficult to distinguish / some species may be reclassified / AW ;</p>	3 max	<p>IGNORE prompt lines and mark as prose</p> <p>1 ACCEPT e.g. some (named) habitats inaccessible / microscopic species missed / low numbers of individuals / habitat unexplored / some habitats rare / species are nocturnal</p> <p>2 ACCEPT organisms constantly become extinct</p> <p>3 ACCEPT new species are being created</p> <p>4 ACCEPT e.g. might mistake several species for one</p> <p>4 ACCEPT scientists might disagree about whether it is a species or not.</p>
Total			14	

Question			Answer	Mark	Guidance
4	(a)	(i)	<i>primary</i> B and D ;	1	DO NOT CREDIT if another letter is shown
		(ii)	<i>secondary</i> A and E ;	1	DO NOT CREDIT if another letter is shown
		(iii)	<i>tertiary</i> F and G ;	1	DO NOT CREDIT if another letter is shown
		(iv)	<i>quaternary</i> C;	1	DO NOT CREDIT if another letter is shown

Question		Answer	Mark	Guidance
4	(b) (i)	<p>1 between O and H (of adjacent molecules) ; 2 between , electropositive / δ^+ / delta⁺ (H), and , electronegative / δ^- / delta⁻ (O) ;</p> <p>3 water molecule , is polar / has charge separation ;</p>	3	<p>1 DO NOT CREDIT O/H molecules 2 ACCEPT slightly , positive / negative 2 IGNORE oxygen is negative / hydrogen is positive 2 DO NOT CREDIT ions AWARD mp 1 and 2 for diagram below, i.e. H bond can be drawn as dotted or dashed or labelled, but IGNORE solid line DO NOT AWARD mark if diagram contradicts text</p>  <p>3 ACCEPT electrons pulled closer to oxygen atom / water is a dipole 3 IGNORE electronegative / electropositive 3 IGNORE oxygen is negative / hydrogen is positive 3 DO NOT CREDIT ions</p>

Question			Answer	Mark	Guidance
4	(b)	(ii)	<p>1 medium for (metabolic) <u>reactions</u> ;</p> <p>2 (because) allows (named) ionic compound(s) to separate ;</p> <p>3 <u>transport</u> ;</p> <p>4 two named transport , systems / media OR one example of a transport , medium / system , with a named example of what is transported ;</p> <p>5 (organisms can) absorb / take in , (named) minerals / ions / (named) gas / food ;</p> <p>6 able to <u>dilute</u> toxic substances ;</p>	3 max	<p>1 ACCEPT reactions can happen in water</p> <p>1 ACCEPT supports metabolic reactions</p> <p>4 IGNORE nutrients</p> <p>5 ACCEPT apoplast / sap / blood / symplast / vacuolar pathway / blood / lymph / xylem / phloem / tissue fluid / CSF</p> <p>5 IGNORE nutrients / substances</p> <p>5 IGNORE get / obtain</p> <p>IGNORE refs to osmosis</p>
			Total	10	

Question		Answer	Mark	Guidance
5	(a)	characteristics / features / AW , are passed on to / inherited (by the next generation) ;	1	IGNORE genes / alleles / DNA as question asks about Darwin's conclusion ACCEPT 'appearance' for features DO NOT CREDIT answers that only refer to beneficial characteristics (as Darwin's other observations would need to be considered to arrive at this conclusion)
5	(b)	<p>1 B and C and D are <u>more</u> closely related (to each other than to A) ; ora</p> <p>2 <i>idea that</i> A is in different (taxonomic) group (from other 3) ; ora</p> <p>3 B and C and D , share more , <u>recent</u> common ancestor ;</p> <p>4 phylogeny / evolution , of B and C and D diverged at same point ; ora</p>	2 max	IGNORE references to relationship with organism (1) 1 IGNORE 'B, C and D are more similar' as this could refer to appearance rather than relationship 2 CREDIT named taxonomic group 3 IGNORE genes etc.
5	(c)	fits evidence ; <i>idea of more , evidence / research</i> (since nineteenth century) ;	1 max	CREDIT examples, e.g. DNA revolution / more fossils ACCEPT improved technology / molecular evidence IGNORE 'the theory has been proved' IGNORE Darwin provided more evidence ACCEPT <u>changes in</u> religious belief
5	(d)	(i) code for (one or more) polypeptide(s) ;	1	ACCEPT protein IGNORE amino acid sequence

Question			Answer	Mark	Guidance
5	(d)	(ii)	<p>1 double stranded ;</p> <p>2 each / both (strands) act as <u>template</u> ;</p> <p>3 hydrogen bonds , <u>easily</u> , break / form , between bases ;</p> <p>4 <u>complementary</u> (specified) base , pairing / AW ;</p> <p>5 purine (only able to) bind to pyrimidine ;</p> <p>6 (due to) different sizes of purines and pyrimidines ;</p> <p>7 hydrogen bonding different between A & T and C & G or 3 H bonds between C & G and 2 H bonds between A & T ;</p>	5 max	<p>AWARD marks from clearly annotated diagram</p> <p>1 ACCEPT double helix or two , polynucleotides / strands / chains or antiparallel strands</p> <p>1 IGNORE one old and one new strand</p> <p>2 IGNORE either</p> <p>NOTE 'there are 2 strands which act as templates' = 2 marks (mp 1 and 2)</p> <p>3 ACCEPT <u>weak</u> H bonds between bases break</p> <p>3 IGNORE refs to H bonds , breaking / forming , without qualification that the bonds are weak or , form / break , easily</p> <p>4 IGNORE complementary nucleotides unless qualified with examples of base-pairing</p> <p>7 ACCEPT names of bases with phonetic spellings</p> <p>7 DO NOT CREDIT thymine</p> <p>7ACCEPT A=T and C≡G without reference to hydrogen bonds</p>

Question			Answer	Mark	Guidance
5	(e)	(i)	<u>speciation</u> ;	1	
5	(e)	(ii)	<i>idea that</i> different islands have different , selection pressures / habitats / environments / vacant niches ; ora <i>idea of isolation</i> ; ora	1 max	CREDIT ‘ the Galapagos have a wider range of habitats’ IGNORE islands have different habitat(s) from the mainland e.g. the islands are separated from the mainland / no gene flow / geographic barrier / reproductive barrier ACCEPT allopatric (speciation) IGNORE sympatric IGNORE refs to succession or human habitat destruction on the mainland as the question is about evolution
			Total	12	

Question		Answer	Mark	Guidance
6	(a)	mental and physical well-being ; absence of disease ;	2	IGNORE social ACCEPT “not just the absence of disease”
6	(b) (i)	185.2 ; ;	2	Correct answer = 2 marks CREDIT either in the table or seen in the working space answer should be given to 1dp (to be consistent with the other calculated data) If answer incorrect or given to the incorrect number of d.p. ALLOW 1 mark for 185 / 185.18 / 185.19 / 185.185 / 185.1 seen anywhere
6	(b) (ii)	<p>1 death from , CHD / lung cancer / both , increased (in smokers) ;</p> <p>2 CHD has bigger increase in number (of deaths) due to smoking (than lung cancer) ; ora</p> <p>3 lung cancer has bigger , relative / percentage , increase (in deaths) due to smoking (than CHD) ; ora</p>	2 max	<p>IGNORE prompt lines – mark as prose</p> <p>1 ACCEPT AW 1 IGNORE figures – must be a comparative statement</p> <p>2 ACCEPT implication from correct (1388 and 360) calculated increases</p> <p>3 IGNORE figures – must be a comparative statement 3 IGNORE bigger impact</p>

Question		Answer	Mark	Guidance
6	(c)	<p>N1 nicotine ;</p> <p>N2 increases stickiness of platelets ;</p> <p>N3 thrombosis / formation of blood clot ;</p> <p>N4 causes release of adrenaline ;</p> <p>N5 causes constriction of , <u>arterioles</u> / small arteries ;</p> <p>N6 reduced , blood flow / oxygen supply , to <u>(named) extremities</u> ;</p> <p>C7 carbon monoxide / CO ;</p> <p>C8 combines (permanently) with haemoglobin / forms carboxyhaemoglobin ;</p> <p>C9 reduced oxygen carrying capacity of <u>blood</u> ;</p>	6 max	<p>N marking points</p> <p>N1 DO NOT CREDIT if any N mark is associated with a chemical other than nicotine</p> <p>N2 ACCEPT makes platelets sticky</p> <p>N3 ACCEPT thrombus formation</p> <p>N5 IGNORE narrowing of lumen</p> <p>C marking points</p> <p>C7 DO NOT CREDIT if any C mark is associated with a chemical other than carbon monoxide</p> <p>C8 IGNORE carbamino</p> <p>C9 ACCEPT reduced amount of oxygen in blood C9 IGNORE 'less oxygenated blood is delivered to tissues' as this could imply reduced cardiac output</p>

Question			Answer	Mark	Guidance
			<p>10 increased , heart rate / blood pressure ;</p> <p>11 damage to, lining / endothelium , (of blood vessels) ;</p> <p>12 <u>atherosclerosis</u> / <u>atheroma</u> ;</p> <p>13 coronary heart disease / CHD / heart attack / stroke / myocardial infarction / MI / angina ;</p>		<p>10 IGNORE heart must work harder</p> <p>11 ACCEPT epithelium</p> <p>12 IGNORE plaques</p> <p>13 IGNORE conary / chronic / part of heart dying / cardiac arrest / heart failure</p>
			<p>QWC - N1 and C7 plus another N mark or C mark and no discussion of tar</p>	1	<p>DO NOT AWARD QWC if candidate discusses a lung disease or any non-cardiovascular effects</p> <p>DO NOT AWARD QWC tar is <i>discussed</i> at all</p> <p>IGNORE nicotine is addictive</p> <p>IGNORE 'tar' if it appears as a list of chemicals</p>
				7	
			Total	13	

Question			Answer	Mark	Guidance
7	(a)	(i)	udder size / milk production / meat production / growth rate / muscle (as proportion of body mass) ;	1	ACCEPT number of offspring per birth IGNORE unqualified references to size IGNORE references to , horns / placidity , unless the answer links this with more energy diverted to productivity
7	(a)	(ii)	<p>1 artificial <u>selection</u> ;</p> <p>2 (selection of) named desired feature (linked to productivity) ;</p> <p>3 (cross)breed , selected / AW , cattle ;</p> <p>4 (cross)breed, best / selected / AW, offspring ;</p> <p>5 over (many) generations ;</p>	4 max	<p>1 IGNORE 'selective breeding' as mentioned in part (i)</p> <p>2 ACCEPT e.g. weigh them / measure them / see who produces the most milk / choose the biggest / udder size</p> <p>2 IGNORE select the best</p> <p>2 CREDIT marker assisted selection / progeny testing</p> <p>2 DO NOT CREDIT if clearly not in the context of selective breeding, e.g. change their diet to make them produce more milk'</p> <p>3 ACCEPT 'parents' as AW for 'cattle'</p> <p>3 ACCEPT 'reproduce / mate / <u>inter</u>breed' as AW for 'breed'</p> <p>3 DO NOT CREDIT inbreed</p> <p>2&3 'breed cattle with high milk productivity = 2 marks</p> <p>4 IGNORE 'crossbreed offspring' without qualification. Answer must imply some selection of offspring.</p> <p>5 DO NOT CREDIT few</p> <p>5 ACCEPT several</p>
7	(b)	(i)	<p>(contains) all / each , of , nutrients / food groups ;</p> <p>in correct proportions / AW ;</p>	2	<p>ACCEPT a list of food groups that contains at least – protein, fat, carbohydrate, vitamins, minerals</p> <p>IGNORE components</p> <p>ACCEPT right amount of</p>

Question			Answer	Mark	Guidance
7	(b)	(ii)	<p>A glycerol ;</p> <p>C <u>unsaturated</u> fatty acid ;</p> <p>D <u>ester</u> , bond / link ;</p>	3	<p>Mark the first answer on each prompt line. If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = 0 marks</p> <p>A IGNORE molecule</p> <p>C ACCEPT unsaturated hydrocarbon , tail / chain</p> <p>D IGNORE covalent</p>

Question			Answer	Mark	Guidance
7	(b)	(iii)	<p>1 contains , large amounts of energy / more energy than individual needs ;</p> <p>2 increased , fat / lipid , deposition / storage ;</p> <p>3 (associated with) <u>obesity</u> ;</p> <p>4 (lots of meat and dairy in diet could mean) lack of <u>other (named) food groups</u> / AW ;</p>	3 max	<p>1 ACCEPT contains , too many calories / excess energy</p> <p>1 ACCEPT contains a lot of <u>saturated</u> fat</p> <p>2 ACCEPT in context of arteries and adipose tissue</p> <p>2 ACCEPT cholesterol / LDL as AW for fat</p> <p>2 IGNORE build up</p> <p>3 IGNORE CHD (as not malnutrition)</p> <p>4 ACCEPT nutrients as AW for food groups</p> <p>4 IGNORE unbalanced diet</p> <p>4 IGNORE fat / protein</p>
7	(c)		<p>1 reduces , water potential / Ψ , outside , microbial / bacterial / fungal , cells ;</p> <p>2 (microbes) lose water and cannot , reproduce / survive / carry out metabolic reactions / AW ;</p> <p>3 water moves by osmosis ;</p>	3	<p>1 Cannot be implied from references to water potential gradient</p> <p>1 ACCEPT reduces beef water potential</p> <p>1 IGNORE solute potential</p> <p>1 IGNORE viruses</p> <p>2 ACCEPT bacteria lose water and die</p> <p>2 AWARD only in context of microbes dehydrating</p> <p>2 IGNORE viruses</p> <p>2 IGNORE beef losing water so microbes cant reproduce</p> <p>3 ACCEPT in any correct water potential context</p>
			Total	16	

Question		Answer	Mark	Guidance
8	(a)	antigen(s) ; specific ; memory ; strain ; mutation ;	5	
8	(b)	1 immunity involves / bacteria do not have , lymphocytes / white blood cells / antibodies / memory cells / plasma cells / an immune system ; 2 (correct term is) resistant ; 3 bacteria are unicellular / only multicellular organisms (can) have an immune response;	3	
Total			8	

APPENDIX 1 **Mark Scheme Conventions**

The following conventions appear in the Mark Scheme

1. Bracketed words. The words in brackets are there to 'set the scene' and indicate the context in which the answer is expected. They do not need to appear. Award the mark as long as the statement in the brackets is not contradicted.
2. Solidus /. A solidus indicates alternative ways that a mark might be gained for a given Mark Point.
3. Use of the comma in a mark point. This indicates that some information from either side of the comma or commas is needed. It is used in conjunction with the solidus.
4. Underlining.
 - solid underline. The word or part of word underlined is required but minor mis-spellings are acceptable as long as the word is phonetically the same
 - wavy underline. This indicates that whilst the word underlined is not precisely needed, alternative responses need to be closely related in meaning or be a clear description.
5. *idea of*. This is used as a prefix to marking points where there may be a fairly wide range of responses which cover the essence of the required response. This often requires examiner judgement. These often, but not exclusively, appear in questions such as those related to environmental or health issues.
6. Awarding of QWC mark. Every time an element of QWC is seen put QWC in the left hand margin. When all QWC criteria are met, put a tick next to the final QWC. If QWC not achieved, put a cross next to the pencil icon.
7. ora. Or reverse argument.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning

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Email: general.qualifications@ocr.org.uk

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553

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