

Biology

Advanced Subsidiary GCE

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

Mark Scheme for January 2011

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Question			Expected Answer	Mark	Additional Guidance
1	(a)	(i)	human immunodeficiency virus / HIV ;	1	DO NOT CREDIT if there is any ref to AIDS
1	(a)	(ii)	<p>1 (infective agent), in blood / body fluids ;</p> <p>2 <i>idea of:</i> <u>used</u> needles are contaminated ; ora</p> <p>3 reduces chance of sharing needles ; ora</p>	2 max	<p>1 ACCEPT any infective agent even if incorrect as question asks for <i>mode of transmission</i></p> <p>2 ACCEPT e.g. 'used needles are infected'</p> <p>2 ACCEPT e.g. 'new needles are sterile'</p> <p>2 DO NOT CREDIT 'dirty' / 'clean' needles</p> <p>3 IGNORE 'prevents' / 'stops'</p>
1	(b)	(i)	<p><u>amino acid(s)</u> ;</p> <p><u>nucleotide(s)</u> ;</p>	2	<p><i>Answers must be on correct line</i></p> <p>ACCEPT phonetic spelling for both</p> <p>DO NOT CREDIT if ref to DNA / 'nucleosides'</p> <p>ACCEPT 'ribonucleotides'</p>
1	(b)	(ii)	<p>1 reverse transcriptase in (host) nucleus ;</p> <p>2 viral DNA, (inserted) in (host), chromosome / DNA ;</p> <p>3 <i>idea of:</i> (viral) RNA / mRNA produced / transcribed ;</p> <p>4 (to) code for / make / translate, <u>viral</u> proteins ;</p>	2 max	<p>4 IGNORE 'different protein'</p>

Question			Expected Answer	Mark	Additional Guidance
1	(c)	(i)	<p>1 not vaccinated against TB ;</p> <p>2 weakened immune system ;</p> <p>3 (lifestyle) e.g. poor diet / lack of protein / malnourished / smoking / alcoholism ;</p> <p>4 homelessness ;</p> <p>5 poor ventilation (of housing) / AW ;</p> <p>6 <u>overcrowding</u> ;</p> <p>7 close contact with people from / visiting, <u>area</u> where TB is common ;</p> <p>8 close / prolonged, contact with individual(s) with TB ;</p> <p>9 consumption of milk or beef, from infected cattle / in developing countries ;</p>	3 max	<p>Mark the first three answers only regardless of which line they are on</p> <p>1 IGNORE general refs to lack of medical care</p> <p>3 DO NOT CREDIT 'alcohol' unqualified IGNORE 'poor health'</p> <p>7 ACCEPT area where those with TB are not quarantined</p>

Question		Expected Answer	Mark	Additional Guidance
	(c) (ii)	<p>1 cytokine / interleukin / receptor has, specific / unique, shape ;</p> <p>2 (cytokine / interleukin), binds / attaches / bonds to / fits into, receptor ;</p> <p>3 receptor on (cell surface) membrane (of B lymphocyte) ;</p> <p>4 (receptor and cytokine have) <u>complementary</u> shapes ;</p> <p>5 <u>activates</u> / <u>stimulates</u>, clonal expansion / <u>mitosis</u> ;</p>	3 max	<p>1 DO NOT CREDIT 'cytokine is specific to receptor' as this is implied in question</p> <p>3 DO NOT CREDIT 'antibodies' (on cell surface)</p> <p>5 ACCEPT activates / releases 2nd messenger</p>
Total			13	

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	blue-black / black / dark blue ;	1	ACCEPT dark purple / purplish-blue DO NOT CREDIT blue or purple unqualified by darkness ACCEPT acceptable colour change
2	(a)	(ii)	1 between oxygen and hydrogen (atoms) ; 2 (between) electronegative / δ^- , and electropositive / δ^+ ;	2	CREDIT marking points from clearly labelled diagram max 1 if incorrect charges are on atoms 1 DO NOT CREDIT molecules / ions 2 DO NOT CREDIT ions / + and – 2 ACCEPT slight / partial (negative / positive), charge
2	(a)	(iii)	1 hydrogen / H, bonds break ; 2 helix, lost / unravels / AW ; 3 iodine, released / no longer in complex / AW ;	2 max	IGNORE refs to denaturation 2 ACCEPT spiral / coil 3 ACCEPT no longer contained in helix

Question		Expected Answer	Mark	Additional Guidance
2	(b)	1 take samples at a range of times / AW ;		<p>B2 must be in context of Benedict's test rather than reaction mixture</p> <p>B3 DO NOT CREDIT boil / warm</p> <p>B3 DO NOT CREDIT if Benedict's added to the mixture at the beginning</p> <p>C6 CREDIT description of method e.g. filtering / centrifuging / decanting</p> <p>8 IGNORE 'control'</p> <p>9 DO NOT CREDIT if colour of filter is incorrect</p> <p>T10 ACCEPT 'measure how much light, does / does not, pass through'</p> <p>11 if unfiltered Benedict's / precipitate is clearly indicated as being present in sample, ACCEPT 'less transmission / more absorbance, = more maltose present'</p> <p>11 DO NOT CREDIT if precipitate is added to colorimeter</p> <p>12 CREDIT 'serial dilutions'</p>
		<p>B2 same <u>volumes</u> (of solutions) added / removed (each time) ;</p> <p>B3 heat with, Benedict's (solution) / CuSO₄ and NaOH ;</p> <p>B4 (use of) excess Benedict's ;</p> <p>B5 changes to, green / yellow / orange / brown / (brick) red ;</p> <p>C6 remove precipitate / obtain filtrate ;</p> <p>C7 colorimeter ;</p> <p>8 calibrate / zero, using, a blank / water / (unreacted) Benedict's ;</p> <p>9 use (red / orange) filter ;</p> <p>T10 reading of, transmission / absorbance OR mass of precipitate ;</p> <p>11 more transmission / less absorbance, of filtrate, OR greater mass ppt, = more maltose present ; ora</p> <p>12 using, standard / known, concentrations (of maltose) ;</p> <p>13 (obtain) <u>calibration</u> curve ;</p> <p>14 <u>plot</u>, transmission / absorbance / mass of ppt, against (reducing sugar) concentration ;</p> <p>15 <u>use graph</u> to read off concentration of maltose / AW ;</p>		
		QWC – correct sequence ;	1	1 of mps B2 to B5 , then mp C6 or C7 , then mp T10

Question			Expected Answer	Mark	Additional Guidance																																																	
2	(c)	(i)	<p>1 increases / greater / faster ;</p> <p>2 reaction completed in / plateaus after / concentration is 100% after, <u>3.5 minutes</u> ;</p> <p>3 figures with units to support mp 1 ;</p>	2 max	<p>1 ACCEPT any time between 3.45 and 3.55 min.</p> <p>3 two maltose concentrations (+ or – chloride) for a given time or two times (+ or – chloride) for given maltose concentration.</p> <p>3 ACCEPT calculated difference</p> <p>3 DO NOT CREDIT if ‘%’ and ‘min.’ not given</p> <p>3 ACCEPT any concentration within $\pm 1\%$ and time within ± 0.05 min.</p>																																																	
			<table border="1"> <thead> <tr> <th rowspan="2">Presence or absence of chloride ions</th> <th colspan="9">The percentage concentration of maltose (%) present every half a minute</th> </tr> <tr> <th>0.0 min</th> <th>0.5 min</th> <th>1.0 min</th> <th>1.5 min</th> <th>2.0 min</th> <th>2.5 min</th> <th>3.0 min</th> <th>3.5 min</th> <th>4.0 min</th> </tr> </thead> <tbody> <tr> <td>Chloride ions present</td> <td>0</td> <td>24</td> <td>54</td> <td>70</td> <td>80</td> <td>88</td> <td>95</td> <td>100</td> <td>100</td> </tr> <tr> <td>Chloride ions absent</td> <td>0</td> <td>12</td> <td>20</td> <td>29</td> <td>36</td> <td>40</td> <td>45</td> <td>48</td> <td>50</td> </tr> <tr> <td>Difference in maltose concentration When chloride ions are either present or absent</td> <td>0</td> <td>12</td> <td>34</td> <td>41</td> <td>44</td> <td>48</td> <td>50</td> <td>52</td> <td>50</td> </tr> </tbody> </table> <p>Allow a + /- 1% for any concentration of maltose and a +/- 2% for the difference in maltose concentrations</p>	Presence or absence of chloride ions	The percentage concentration of maltose (%) present every half a minute									0.0 min	0.5 min	1.0 min	1.5 min	2.0 min	2.5 min	3.0 min	3.5 min	4.0 min	Chloride ions present	0	24	54	70	80	88	95	100	100	Chloride ions absent	0	12	20	29	36	40	45	48	50	Difference in maltose concentration When chloride ions are either present or absent	0	12	34	41	44	48	50	52	50		
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2	(c)	(ii)	<p>1 (acts as a) cofactor ;</p> <p>2 (Cl⁻) binds to, enzyme / amylase / amylose / substrate ;</p> <p>3 enzyme substrate complex / ESC, forms more, easily / quickly ;</p>	2 max	<p>1 IGNORE ‘coenzyme’</p> <p>2 ACCEPT binds to, active site</p> <p>3 ACCEPT description</p>																																																	

Question			Expected Answer	Mark	Additional Guidance
2	(c)	(iii)	<p>1 temperature ;</p> <p>2 pH ;</p> <p>3 enzyme / amylase / chloride, <u>concentration</u> ;</p> <p>4 substrate / starch / amylose, <u>concentration</u> ;</p> <p>5 constant / regular, stirring ;</p> <p>6 (fixed) <u>volume</u> of solution (removed each time for sampling) ;</p>	3 max	<p>Mark the first three answers only regardless of which line they are on DO NOT CREDIT refs to, time</p> <p>3 IGNORE 'amount' or 'volume' 3 DO NOT CREDIT 'concentration' unqualified</p> <p>4 IGNORE 'amount' or 'volume' 4 DO NOT CREDIT 'concentration' unqualified</p>
			Total	19	

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3	(a)	(i)	<p>1 (all), sub-arctic / all 4 named sub-arctic, species / birds, show decrease ;</p> <p>2 (all / most), other / non sub-arctic / all 4 named non sub-arctic, species / birds, show, increase / no change ;</p> <p>3 greater change / AW (in breeding success), in sub-arctic than in non sub-arctic species ;</p> <p>4 comparative figs (in 1970 AND 2000) ;</p>	3	<p>ACCEPT reference to numbers rather than breeding success throughout</p> <p>1 sub-arctic species = snow bunting + Lapland bunting + ptarmigan + dotterel</p> <p>2 non sub-arctic species = red grouse + wheatear + meadow pipit + ring ouzel</p> <p>4 number of young for one sub-arctic and one non sub-arctic species in 1970 and 2000 (or calculated subtraction between the two years)</p> <p>4 DO NOT CREDIT if figures are not from 1970 and 2000</p>																																							
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Question			Expected Answer	Mark	Additional Guidance
3	(a)	(ii)			
		1	climate change / global warming ;		1 IGNORE greenhouse effect 1 DO NOT CREDIT 'it is too warm' or 'it is not cold enough' without reference since 1970
		2	(environmental) change too rapid for adaptation ;		
		3	change in, flora / plants / food supply / insects / prey / predators / human activity ;		3 ACCEPT camouflage no longer appropriate / reduction in size of habitats
		4	disease (that affects sub-arctic species more than others) ;		
		5	sub-arctic species, less well-adapted than / have been outcompeted by, non sub-arctic species / AW ;	5 ACCEPT ora	
				2 max	
3	(b)	(i)	the <u>number</u> of <u>species</u> present (in a habitat) ;	1	DO NOT CREDIT range / amount

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(ii)	<p>1 <i>idea of:</i> unbiased method to selecting sampling area ;</p> <p>2 sample many times / AW, and calculate mean / average ;</p> <p>3 standardised sweeping procedure ;</p> <p>4 ensure insects do not escape (before being identified) ;</p> <p>5 method to prevent recounting ;</p> <p>6 sample at different times of, day / month / year / weather conditions ;</p>	3 max	<p>Mark the first <u>three</u> suggestions</p> <p>1 ACCEPT e.g. random selection of, areas / coordinates OR use of transect</p> <p>1 IGNORE 'random sampling' unqualified</p> <p>3 e.g. same type of movement / same length of time same number of sweeps</p> <p>3 ACCEPT sample at same time of day</p> <p>3 IGNORE same collector</p> <p>3 IGNORE refs to using alternative collecting techniques in order to collect more insect species</p> <p>4 ACCEPT use of pooter</p> <p>5 if ref to mark-release-recapture, IGNORE 'release and recapture' and look for idea for preventing recounting</p>

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(iii)	<p>1 (measures), abundance / numbers, of individuals in <u>each</u> species ;</p> <p>2 species evenness is more quantitative than species richness ; ora</p> <p>3 high(er) <u>species evenness</u> indicates high(er) <u>biodiversity</u> ; ora</p> <p>4 low <u>species evenness</u> indicates, dominance by / high abundance of, one / few, species ; ora</p> <p>5 used to calculate (Simpson's) Index of Diversity ;</p> <p>6 example used to illustrate explanation of mp 3 or 4 ;</p>		
				3 max	6 e.g. "Two areas have the same number of species. One with 90% of 1 species has less biodiversity than one where all species have an abundance of 5-20%"
			Total	12	

Question		Expected Answer	Mark	Additional Guidance
4	(a)	<p>1 free from, disease / illness ;</p> <p>2 physical and mental and social <u>wellbeing</u> / AW ;</p> <p>3 good nutrition ;</p> <p>4 suitably housed ;</p>	2 max	<p>1 ALLOW infection CREDIT 'not just the absence of disease'</p> <p>2 DO NOT CREDIT 'state' / 'condition'</p> <p>3 ACCEPT balanced diet</p> <p>4 ACCEPT ref to economic wellbeing</p>

Question		Expected Answer	Mark	Additional Guidance
4	(b)	<p>F1 skin ; E1 <i>idea of:</i> physical barrier to prevent entry of microorganisms ;</p> <p>F2 mucous <u>membrane(s)</u> / goblet cells ; E2 (produce) <u>mucus</u> to trap, pathogens / parasite ; OR F2 mucus ; E2 traps pathogens ;</p> <p>F3 cilia / ciliated epithelium ; E3 remove, pathogen / parasite, laden / AW, mucus ;</p> <p>F4 blood clotting ; E4 prevents, pathogens / parasite, entering bloodstream ;</p> <p>F5 ear wax / nasal hairs ; E5 traps, pathogens / parasite ;</p> <p>F6 lysozyme / tears / nasal secretions / saliva ; E6 kills bacteria / contains antibacterial agent ;</p> <p>F7 gastric juice / stomach acid ; E7 kills, pathogens / parasite ;</p>	4 max	<p>Mark first F mark on line and assume explanation relates to that ACCEPT named example(s) of pathogen or parasite CREDIT E marks if a reasonable, but non-creditworthy, attempt at an F mark has been made, e.g. 'lining of nasal passages' for F2</p> <p>E1 ACCEPT 'pathogens cannot pass through cells' E1 ACCEPT antibacterial effects of sebum or sweat E1 DO NOT CREDIT physical barrier unqualified</p> <p>F6 IGNORE lysosome(s) E6 ACCEPT contains antibodies</p> <p>F7 ACCEPT 'enzymes in the stomach' or 'acid in vagina'</p>

Question			Expected Answer	Mark	Additional Guidance
4	(c)	(i)	<p>1 lives, on / in / in contact with, and harms <u>host</u> ;</p> <p>2 takes nutrition from / feeds on (host) ;</p> <p>3 warmth ;</p> <p>4 protection / safe place / AW ;</p> <p>5 allows transmission / spread, to a new host / AW ;</p>	4 max	<p>1 living on / in must be stated, cannot be implied from feeding 1 IGNORE 'live off'</p> <p>3 ACCEPT 'incubate'</p> <p>5 ACCEPT 'distributed' / 'passed on' as implies new host</p>
4	(c)	(ii)	<p>1 wash / clean / disinfect / sterilize, hands ;</p> <p>2 not, scratching / touching, of anus ;</p> <p>3 drugs to, kill / remove, parasite / eggs ;</p>	2 max	<p>2 ACCEPT method to prevent scratching e.g. cutting nails 2 IGNORE 'wash anus'</p> <p>3 DO NOT CREDIT 'antibiotics' 3 IGNORE 'anti-bacterial'</p>
Total				12	

Question		Expected Answer		Mark	Additional Guidance
5	(a)				Award 1 mark for each correct row DO NOT CREDIT if more than one letter in a box
		statement	DNA only (D) or RNA only (R) or both DNA and RNA (B)		
		contains thymine	D		
		contains ribose	R	;	
		consists of 2 chains connected to each other with hydrogen bonds	D	;	
		has a sugar-phosphate backbone	B	;	
		has 4 different nitrogenous bases	B	;	
		contains a pentose sugar	B	;	
is found in the nucleus and cytoplasm	R	;			
				6	

Question			Expected Answer	Mark	Additional Guidance
5	(b)	(i)	<p>1 (information used to) decide which, group / taxon, organism / species / named example, fits in ;</p> <p>2 compare the proportion of (different) bases ;</p> <p>3 compare the DNA / genes / sequence of bases ;</p> <p>4 <i>idea of:</i> the more similar the, DNA / genes, the closer the relationship / AW ;</p>	2 max	<p>1 answers must refer to the information provided by the study of DNA, rather than simply the job of taxonomists, e.g. ACCEPT 'it can be used to put organisms into groups'</p> <p>1 IGNORE 'for classification' unqualified – look for idea of: groups</p> <p>1 CREDIT ref to belonging to same taxonomic group, e.g. 'to see if it belongs in the genus <i>Homo</i>'</p> <p>2 IGNORE 'examine proportion of bases'</p> <p>2 CREDIT idea for looking at similarities / differences</p> <p>3 IGNORE 'examine sequence of bases'</p> <p>3 CREDIT idea for looking at similarities / differences</p> <p>4 Must contain reference to similarity of DNA</p>
5	(b)	(ii)	<p>1 fossil record ;</p> <p>2 anatomy / physiology / behaviour ;</p> <p>3 embryology / AW ;</p>	2 max	<p>Mark the first <u>two</u> suggestions</p> <p>IGNORE ref to genetics as DNA is 'biochemical'</p> <p>2 ACCEPT AW for anatomy, e.g. observable / physical features / cell structure</p> <p>2 ACCEPT AW for physiology, e.g. method of reproduction</p>
5	(c)		<p>J ;</p> <p>T ;</p>	2	DO NOT CREDIT names

Question			Expected Answer	Mark	Additional Guidance
5	(d)	(i)	<p>1 no DNA from living specimens in Wales analysed ;</p> <p>2 population (may have) <u>evolved</u> / mutations have occurred / genetic variation, (since 1948) ;</p>	1 max	<p>2 ACCEPT description of evolved</p> <p>2 DO NOT CREDIT 'evolution' unqualified by context of pine marten population</p>
5	(d)	(ii)	<p>1 (introduced) pine martens might not be adapted to local conditions / AW ;</p> <p>2 (local) <u>habitat</u>, might have changed / is no longer suitable (for any pine martens) / AW ;</p> <p>3 introduced, pine martens, might <u>outcompete</u> native, population / pine martens ;</p> <p>4 introduced pine martens might bring disease ;</p> <p>5 Welsh pine marten would lose its, distinctiveness / identity, because of <u>interbreeding</u> ;</p>	1 max	<p>ACCEPT animals as AW for pine martens throughout answer</p> <p>1 ACCEPT not adapted to the habitat</p> <p>1 DO NOT CREDIT 'used to'</p> <p>3 ACCEPT introduced pine martens might kill native / Welsh pine martens</p> <p>3 IGNORE 'compete' unqualified</p>
Total				14	

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(i)	genes / genetic / mutation ; environment(al) ;	2	Mark the first answer on each line IGNORE inherited / DNA
6	(a)	(ii)	1 no defined categories ; 2 range of values / intermediate values ; 3 influenced by, environment / many genes / genes and environment ; 4 quantitative / has to be measured / cannot be counted ;	3 max	2 ACCEPT ref to bell-shaped curve / binomial distribution 3 ACCEPT any ref to 3 or more genes 4 ACCEPT metric
6	(a)	(iii)	B ;	1	DO NOT CREDIT if more than one letter is given
6	(a)	(iv)	1 growth too rapid ; 2 increased susceptibility to, disease / named abnormality ; 3 <u>inbreeding</u> ; 4 reduces <u>gene pool</u> / <u>genetic</u> variation / <u>genetic</u> diversity ;	2 max	2 e.g. bone / skeletal abnormalities or low immunity 3 DO NOT CREDIT if implies inbreeding causes mutations 4 IGNORE refs to biodiversity

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(v)	<p>1 maintain biodiversity ;</p> <p>2 aesthetic (reasons) / tourism ;</p> <p>3 ethical (reasons) ;</p> <p>4 part of a food chain / web ;</p> <p>5 maintain / increase <u>gene pool</u> ;</p> <p>6 genetic resource / availability to breed with domestic chickens ;</p>	2 max	<p>3 ACCEPT religious</p> <p>4 ACCEPT food source for local population</p> <p>6 CREDIT description, e.g. 'source of desirable genes' or 'source of genetic variation'</p> <p>6 ACCEPT specific example of genetic resource e.g. disease resistance / strong bones / longevity / heat tolerance / idea of domesticating wild population</p>

Question			Expected Answer	Mark	Additional Guidance
6	(b)	(i)	<p>1 reduces / prevents (infectious) disease ;</p> <p>2 prevent, problems / named problem, with gut ;</p> <p>3 digest food more, efficiently / easily / quickly ;</p> <p>4 greater proportion of, food / energy, can contribute to growth ;</p> <p>5 reduce risk of transmitting, pathogens / named pathogen, to humans ;</p>	2 max	<p>Mark the first two answers only</p> <p>1 IGNORE illness</p> <p>2 e.g. diarrhoea</p> <p>4 ACCEPT faster growth as AW for contribute to growth 4 IGNORE larger chickens</p> <p>5 ACCEPT 'meat less likely to be infected with bacteria'</p>
6	(b)	(ii)	<p>1 (antibiotic) resistant, pathogens / bacteria ;</p> <p>2 antibiotics kill useful, <u>bacteria</u> ;</p> <p>3 <i>idea of:</i> antibiotic passing into <u>human</u> food ;</p>	1 max	<p>1 ACCEPT microorganisms / microbes 1 IGNORE germs 1 DO NOT CREDIT immune</p> <p>2 DO NOT CREDIT if any ref to viruses</p>
Total				13	

Question		Expected Answer	Mark	Additional Guidance
7	(a)	<p>1 <u>sequence / chain</u>, of amino acids ;</p> <p>2 (amino acids) joined by peptide bonds ;</p> <p><i>secondary</i></p> <p>S1 alpha / α, helix ;</p> <p>S2 <u>small regions of</u>, beta / β, pleated sheet / fold ;</p> <p>S3 hydrogen / H, bonds ;</p> <p><i>tertiary</i></p> <p>T1 secondary structure / helix / polypeptide chain, undergoes further, coiling / folding ;</p> <p>T2 <i>3 bonds / interactions from:</i> disulfide / ionic / hydrogen / hydrophobic or hydrophilic ;</p> <p>T3 hydrophilic <u>R groups</u> on outside (of molecule) / hydrophobic <u>R groups</u> on inside (of molecule) ;</p> <p><i>quaternary</i></p> <p>Q1 <u>4</u>, polypeptides / subunits ;</p> <p>Q2 2, alpha / α, chains and 2, beta / β, chains ;</p> <p>Q3 1 haem (group) per polypeptide / 4 haems (per molecule) ;</p> <p>3 prosthetic group (is) haem, (which) contains Fe^{2+} ;</p>		<p>CREDIT marking points from a clearly labelled diagram</p> <p>1 IGNORE polypeptide</p> <p>S3 Must be in context of secondary structure</p> <p>T1 ACCEPT polypeptide chain folds further</p> <p>T2 IGNORE if clearly in context of secondary or quaternary structures</p> <p>T2 H bond must be in context of tertiary structure</p> <p>'contains 2 α and 2 β polypeptides' = 2 marks (Q1 and Q2)</p> <p>Q3 IGNORE protein in ref to 1 haem (group) per polypeptide</p> <p>3 ACCEPT iron ion / Fe^+ / Fe^{3+}</p> <p>3 DO NOT CREDIT iron / Fe unqualified</p>
		<p>QWC - correct refs to secondary, tertiary and quaternary structure ;</p>	6 max	<p>1</p>

Question		Expected Answer	Mark	Additional Guidance
7	(b)	<p>(collagen has)</p> <p>1 amino acid, <u>chain</u> / <u>sequence</u> ;</p> <p>2 peptide bonds ;</p> <p>3 helical / helix ;</p> <p>4 3 bonds / interactions from: disulfide / ionic / hydrogen / hydrophobic or hydrophilic ;</p> <p>5 quaternary structure ;</p> <p>6 more than one polypeptide / subunit ;</p>	4 max	<p>Assume answer refers to collagen unless stated If the answer mentions only collagen, assume that the candidate thinks any features mentioned also apply to haemoglobin.</p> <p>1 IGNORE polypeptide 1 IGNORE repeating units</p> <p>3 DO NOT CREDIT if candidate refers to collagen having an α helix</p> <p>5 IGNORE primary /secondary / tertiary</p> <p>6 ACCEPT polypeptides but DO NOT CREDIT 3 polypeptides if number in haemoglobin not specified</p>
Total			11	

Question		Expected Answer	Mark	Additional Guidance
8		<p>1 antibodies ;</p> <p>2 natural ;</p> <p>3 artificial ;</p> <p>4 natural ;</p> <p>5 antigen ;</p> <p>6 vaccination ;</p>	6	ACCEPT minor mis-spellings so long as word can not be confused with another word in the list
Total			6	

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