RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced Subsidiary GCE

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

Mark Scheme for January 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded
	Contradiction

**Quality of Written Communication*

Subject-specific Marking Instructions

- Use **CON** when a correct response is associated with a piece of clearly incorrect science within the same statement and award no mark.
- For questions in which the command word is 'suggest' ignore incorrect responses and credit a correct response wherever it occurs.
- Accept phonetic spellings unless otherwise indicated.
- All marks are stand-alone unless otherwise stated in Additional Guidance.
- For 'idea of' marking points a wide range of wording is acceptable. The mark is to be awarded for the idea.

Question			Answer	Marks	Guidance
1	(a)	(i)	**A** mayfly (larva) **B** damsel fly (larva) **C** stonefly (larva) **D** caddisfly (larva) **E** diving beetle **F** bloodworm **;;**	2	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks *All 6 correct = 2 marks* *4 (or 5) correct = 1 mark*
1	(a)	(ii)	(each question has) two options / AW **;** each question has yes or no option / AW **;**	1	**ACCEPT** alternating
1	(b)		**1** gills **;** **2** streamlined (shape) / absence of wings **;** **3** flattened shape **;** **4** tail(s) / hind legs , for , propulsion / swimming / moving **;** **5** blood pigment for storing oxygen ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks Answers must relate to adaptations for living in an aquatic environment. **4 IGNORE** 'tail(s)' unqualified
1	(c)	(i)	nucleus **;** membrane bound organelles / named organelle **;** 80S / 22nm / large(r) **,** ribosomes **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** lack of named prokaryotic feature **ACCEPT** big(ger) ribosomes

Question			Answer	Marks	Guidance
1	(c)	(ii)	chloroplast(s) **;** large / permanent **,** vacuole **;** tonoplast **;** starch (grains) **;** AVP **;**	2	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** chlorophyll **ACCEPT** cell wall (even though not actually inside a cell)
			Total	**7**	

Question			Answer	Marks	Guidance
2	(a)		**1** pathogen causes disease / not all parasites cause disease **;** **2** (influenza) virus causes a disease / influenza is a disease **;** **3** parasite gains , nutrition / energy , from host **;** **or** (influenza virus) does not gain , nutrients / energy , from host **;** **4** virus takes over / AW , (host cell) DNA / genetic material **;**	3	**ACCEPT** damage to health / illness , as AW for 'disease' **1 IGNORE** 'parasites do not cause disease' **2 DO NOT CREDIT** 'virus is a disease' / 'influenza causes disease' **2 ACCEPT** '(swine) flu is a disease' **Note:** the influenza virus is a pathogen because it causes disease = 2 marks (mp1 and mp2) **3 ACCEPT** AW for 'gains nutrition from', e.g. 'feeds on' **3 IGNORE** 'lives off host' / 'benefits from host' **3 ACCEPT** idea of 'host' in context of suitable example
2	(b)	(i)	(response) to an antigen **;** involves , lymphocytes / production of antibodies **;**	2	

Question			Answer	Marks	Guidance
2	(b)	(ii)	**1** antibodies are proteins **;** **2** DNA unable to leave nucleus **;** **3** (m)RNA , copies / is a copy of **,** gene(s) / part of DNA **;** **4** (RNA) passes , out of nucleus / through nuclear pore / into cytoplasm **;** **5** to / at **,** ribosome / RER **;** **6** ribosome made of (r)RNA **;** **7** (RNA needed for) protein synthesis / formation of polypeptides / AW **;** **8** amino acids brought by (t)RNA **;**	5	The type of RNA does not need to be specified but, if stated, **AWARD** only if used in the correct context. **1** Must be a clear statement **1 ACCEPT** proteins make antibodies **1 ACCEPT** antibodies are polypeptides **3 ACCEPT** (m)RNA involved in transcription of DNA **3 IGNORE** transcription unqualified **3 ACCEPT** 'a section of DNA acts as a template for RNA' if the idea of RNA copying part of DNA is clearly present **5 ACCEPT** in context of mRNA or tRNA **6 IGNORE** 'ribosomal RNA' unqualified **7 IGNORE** translation unqualified
			QWC: 2 roles of RNA **;** *Award if one mark is given from each of the shaded areas*	1	**AWARD** if marking point **3** or **4 plus** marking point **6** or **7** or **8** are seen

Question			Answer	Marks	Guidance
2	(b)	(iii)	*if no other marks have been awarded, credit one mark max for* **Z** antibodies bind to antigens (on pathogen) **;** *otherwise, mark as follows:* **N1** neutralisation **;** **N2** antibodies , cover binding sites on pathogen / bind to toxins **;** **N3** prevent **,** binding / entry **,** to (host) cell **;** **A1** agglutination **;** **A2** clump / bind together , (many) pathogens **;** **A3** (clump) too large to enter host cell / increase likelihood of being consumed by (named) phagocyte**;** *the following could be credited* **O1** opsonisation **;** **O2** activation of complement **;** **O3** increase likelihood of being consumed by (named) phagocyte **;** **L1** lysins **;** **L2** destroy / AW **,** pathogens **;**	4	With the exception of L2, if name does not match description, **IGNORE** description and mark name **N1 CREDIT** derived term eg neutralised **N3 IGNORE** 'harm host cell' unqualified **N3 ACCEPT** 'prevent (host) cell becoming infected' **A1 CREDIT** derived term eg agglutinated **A1 ACCEPT** 'agglutinisation' **A3 IGNORE** 'white blood cell' **A3 DO NOT CREDIT** lymphocyte **A3 ACCEPT** neutrophils / macrophages / monocytes **O3 IGNORE** white blood cell **O3 DO NOT CREDIT** 'lymphocyte' **O3 ACCEPT** neutrophils / macrophages / monocytes **L2** Must be in context of lysins

Question			Answer	Marks	Guidance
2	(c)	(i)		4	**E** marks can be awarded without awarding corresponding **G** mark unless clearly incorrect in context *Mark the first two groups of people mentioned max 2 marks for each group*
			G1 patients with , HIV^+ / AIDS / transplant / chemotherapy **;**		**G1 ACCEPT** 'patients with weak immune system' **but do not** also credit for E1, **G1 ACCEPT** 'cancer' **IGNORE** 'homeless people'
			E1 weak immune system / cannot produce (many) antibodies ;		
			G2 pregnant women **;**		**G2 IGNORE** babies (as close to stem)
			E2 foetus / embryo , has undeveloped immune system **or** antibodies can cross placenta **;**		**E2 ACCEPT** 'baby as AW for embryo' **E2 IGNORE** weak immune system **E2 ACCEPT** underdeveloped immune system **E2 IGNORE** foetus gets antibodies from mother
			G3 health workers **or** people , living / working , close to outbreak **;**		**G3 ACCEPT** suitable named professional eg nurse / doctor **G3 ACCEPT** 'people who have been in contact with disease' unqualified **G3 IGNORE** refs to overcrowding **G3 IGNORE** 'working with animals' unless it is clear that the animals are infected
			E3 likely to be at (increased) risk (of disease) **;**		**E3 ACCEPT** ref to health workers being important in control of outbreak
			G4 those with (named) chronic diseases **;**		**G4** eg asthma / diabetic / heart disease / TB / autoimmune disease **G4 IGNORE** 'lung disease' **G4 IGNORE** 'homeless people'
			E4 *idea of* inability to withstand further disease / already being in poor health **;**		**E4 ACCEPT** idea of weakened immune system for this marking point **if not credited in E1 or G1**

Question			Answer	Marks	Guidance
2	(c)	(ii)	*idea of* days lost at work / effect on economy **;** *idea of* costing more to deal with the ill people (than the cost of vaccination) **; ora** *idea of* response to public opinion **;** *idea of* health service unable to cope **;** *idea of* eliminating a disease **;**	1	**DO NOT CREDIT** ref to antibiotics treating viruses
2	(c)	(iii)	*idea of:* being too busy / can't be bothered / feel it is unnecessary **;** lack of trust in government **;** media scare stories **;** concerned about side effects **;** cost implication to individuals **;** allergic to vaccine **;** altruistic reason / other people more deserving **;** fear of needles ; religious / cultural / ethical , reasons **;**	1	**IGNORE** 'risk' unqualified throughout **ACCEPT** 'conflicting research' **IGNORE** 'not natural'
			Total	**21**	

Question			Answer	Marks	Guidance
3	(a)		globular **;** catalysts **;** intracellular **;** extracellular / hydrolytic **;** inhibitors **;**	5	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** metabolic (as given in Q) **DO NOT CREDIT** digestive (as given in Q)

Question			Answer		Marks	Guidance
3	(b)		1	carry out with and without , Ca^{2+} / cofactor ;	5	**1 ACCEPT** 'use a control with no calcium' **1 ACCEPT** calcium as AW for Ca^{2+} as the question is testing AO3 **1 IGNORE** increase / decrease , concentration
			2	*idea of* using at least three concentrations (of Ca^{2+}) (other than zero) ;		**2 ACCEPT** implication of 3 or more concentrations, e.g. 'use several concentrations'
			3	keep , concentration / volume of , enzyme / rennin, constant ;		**3 IGNORE** amount
			4	keep , concentration / volume of , caseinogen / substrate / milk, constant ;		**4 IGNORE** amount
			5	keep , temperature / pH , constant ;		**5 IGNORE** 'use a water bath' unqualified
			6	measure / AW , appearance of , product / casein **or** measure disappearance of , substrate / caseinogens **or** assess cloudiness (of solution) ;		**6** *This mp is for measurement of the dependent variable* **6 ACCEPT** observe as AW for measure appearance disappearance **6 ACCEPT** filter **and** weigh **6 ACCEPT** 'assess degree of solubility / insolubility'
			7	over time intervals / after fixed time / end point time ;		**7** 'measure how much substrate is left after 30 min' = 2 marks (mp 6 and 7)
			8	replicates / repeats ;		**8 IGNORE** repeat / replicate on its own – must imply minimum of 3 in total, i.e. original plus two

Question			Answer		Marks	Guidance
3	(c)		1	*idea of* cofactors / minerals , being **,** recycled / used again **;**	1	
			2	*idea that in enzyme action* total mass of **,** cofactor / coenzyme **,** very small compared to total mass of protein **;**		**2 AWARD** only if the enzyme context is clearly stated
			3	*idea that* proteins are used for purposes other than enzymes **;**		**3 CREDIT** stated example, e.g. muscle / hormones / antibodies. **3 IGNORE** growth / repair / replace
			4	proteins are not stored in the body but vitamins and minerals are **;**		
			5	some enzymes don't need cofactors **;**		
				Total	**11**	

Question			Answer	Marks	Guidance
4	(a)		(contains) all of the / every / each , nutrient(s) / food groups / components / constituents **or** (contains the), nutrients / food groups / components / constituents, needed for health **or** (contains) fat and protein and carbohydrate and minerals and vitamins (and , fibre / roughage , and water) **;** in correct / right / suitable, proportions / amount / quantity / level **;**	2	**IGNORE** factors / things , as AW for nutrients **IGNORE** refs to energy **IGNORE** 'adequate / sufficient / enough' as this implies minimum **IGNORE** 'balanced' as this is part of the term they are defining **IGNORE** 'match consumption with use'

Question			Answer		Marks	Guidance
4	(b)	(i)			3	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** 'energy source'
			1	membranes **;**		**1 ACCEPT** 'phospholipid bilayer'
			2	absorption of fat soluble vitamins **;**		
			3	electrical insulation / insulation of , neurones / nerve cells / axons **;**		**3 ACCEPT** insulation in context of myelin / Schwann cells
			4	(thermal) insulation **;**		**4 IGNORE** refs to thermoregulation
			5	protection of organs **;**		**5 IGNORE** 'protect cells / padding'
			6	(source of) (steroid) hormones / named steroid hormone / named group of steroid hormones **;**		**6** e.g. testosterone, oestrogen, progesterone, aldosterone , glucocorticoids, androgens
			7	(source of) cholesterol / LDL / HDL **;**		
			8	waterproofing / skin suppleness / sebum **;**		**8 ACCEPT** ear wax
			9	source of vitamin D **;**		
			10	buoyancy **;**		

Question			Answer		Marks	Guidance
4	(b)	(ii)	1	(leads to) increased / AW , cholesterol / LDL **;**	3	**1 IGNORE** 'low density lipid' **1 IGNORE** cholesterol unqualified. Answers must imply that the level of cholesterol (in the body) is raised
			2	cholesterol / fat , deposited , <u>in</u> arterial walls / <u>under</u> endothelium **;**		**2 ACCEPT** 'LDL deposited in arterial wall' **2 ACCEPT** epithelium / lining , as AW for endothelium
			3	increase risk of / leads to , <u>ath</u>erosclerosis / <u>ath</u>eroma / plaque formation **;**		**3 ACCEPT** 'causes atherosclerosis'
			4	narrowing / blocking , of artery <u>lumen</u> **;**		**4 ACCEPT** 'sticking out into artery lumen'
			5	increased risk of / leads to , CHD / angina / stroke / hypertension / high blood pressure / heart attack / myocardial infarction / gallstones **;**		**5 DO NOT CREDIT** if candidates think the C stands for 'chronic' **5 ACCEPT** mis-spellings of 'coronary' which cannot be confused with chronic **5 ACCEPT** 'causes heart disease' **5 IGNORE** diabetes / arthritis as directly related to obesity

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4</td><td>(c)</td><td></td><td>
<table>
<tr><td></td><td>triglyceride</td><td>phospholipid</td><td></td></tr>
<tr><td>difference</td><td>3 fatty acids</td><td>2 fatty acids</td><td>;</td></tr>
<tr><td>difference</td><td>3 ester bonds</td><td>2 ester bonds</td><td>;</td></tr>
<tr><td>difference</td><td>absence of phosphate</td><td>presence of phosphate</td><td>;</td></tr>
</table>
<table>
<tr><td>similarity</td><td>(contain) glycerol</td><td>;</td></tr>
<tr><td>similarity</td><td>(contain) fatty acids</td><td>;</td></tr>
<tr><td>similarity</td><td>(contain) ester bonds</td><td>;</td></tr>
<tr><td>similarity</td><td>(contain elements) C,H and O</td><td>;</td></tr>
</table>
</td><td>4</td><td>Award one mark per correct row. CREDIT any correct (pair of) statement(s) in each row regardless of other information
2 max for differences
2 max for similarities

IGNORE molecule / group
IGNORE ‘hydrocarbon / hydrophobic / lipid , tail’ the first time it is seen but ECF if used as a synonym for ‘fatty acid’ in both difference and similarity

IGNORE molecule / group
DO NOT CREDIT if an incorrect element stated

ACCEPT ‘C, H and O atom’
DO NOT CREDIT molecule / group</td></tr>
<tr><td>4</td><td>(d)</td><td>(i)</td><td>emulsion (test) ;</td><td>1</td><td>ACCEPT ‘emulsification / white emulsion / Sudan III’
IGNORE refs to translucent grease mark test’</td></tr>
</table>

Question			Answer	Marks	Guidance
4	(d)	(ii)	*emulsion test* **1** add , ethanol / alcohol , (to sample) **;** **2** shake / stir / agitate / mix thoroughly / AW **;** **3** add (to) water **;** *If candidate is clearly describing Sudan III test* **5** mix sample with water **;** **6** add Sudan III (stain) **;** **7** shake / stir / agitate / mix thoroughly / AW **;** *If candidate is describing translucent grease mark test* ***AWARD*** *one mark only* **;**	3	*Max 2 if step 1,2 3 are in different sense order but* ***IGNORE*** *any ref to shaking after adding water, i.e. 1, 2, 3, 2.* **2 IGNORE** 'mix' unqualified **2** not dependent on correct chemical in mp **1** **3** not dependent on correct chemical in mp **1**
4	(d)	(iii)	(mixture) turns, cloudy / milky / white **;**	1	**DO NOT CREDIT** 'precipitate' **ACCEPT** 'red layer floating to top' if Sudan III test has been described in part (ii) **ACCEPT** 'translucent stain is permanent / AW'
			Total	**17**	

Question			Answer		Marks	Guidance
5	(a)			*idea that:*	2	**CREDIT** any valid point where seen
			1	not all , areas explored / species yet discovered **;**		**1 ACCEPT** 'not all species have been identified (yet)' **1 IGNORE** 'yet to be named' **1 IGNORE** refs to speciation **1, 2, 3 ACCEPT** 'organism' as AW for species as it is an '*idea that*' marking point
			2	microscopic / small / nocturnal / camouflaged , species difficult to see **;**		
			3	sampling might miss rare species **;**		
			4	organisms mistakenly identified as one species may actually be two (or more) species **;**		
			5	concept of species is difficult to define **;**		

Question			Answer		Marks	Guidance
5	(b)	(i)			3	Marking points 1-5 must be stated in words, not implied by figures
			1	both / assessed **and** threatened , show increase **;**		**1 IGNORE** both are similar shape unqualified **1 ACCEPT** general statement or referring to given time period **1 ACCEPT** assessed and threatened show positive correlation
			2	number of assessed (species) , always / AW , higher (than threatened species) **; ora**		
			3	*idea of*: widening gap between assessed (species) and threatened (species) / higher rate of increase for assessed species **;**		
			4	between 2000 and 2002 / in first two years , both / assessed **and** threatened , were level / AW **;**		**4 IGNORE** 'at the start' answers must mention years
			5	after 2004 , both / assessed **and** threatened , have, reduced rate of increase / slower increase / AW **;**		**5 IGNORE** 'between 2004 and 2005' answers must imply whole of subsequent time period
			6	figures to support any above statement **;**		**6** figures must support another point that has been credited **6** Answers must quote numbers for total assessed species **and** for threatened species along with two years **6 ACCEPT** calculated comparisons

Table of acceptable figures:

Year	total number of species	total species threatened	increase in total number of species since 2000	increase in number of species threatened since 2000	acceptable range for % of total
2000	16500	11500	-	-	65 - 75
2001	16500	11500	0	0	65 - 75
2002	16500	11500	0	0	65 - 75
2003	22000	12500	5500	1000	53 - 60
2004	38000	15500	21500	4000	39 - 43
2005	38500	15500	22000	4000	38 - 42
2006	40000	16500	23500	5000	40 - 43
2007	41500	16500	25000	5000	38 - 41
2008	45000	17000	28500	5500	36 - 39
2009	47500	17500	31000	6000	35 - 38
2010	57500	18500	41000	7000	31 - 33
	accept +/- 500	accept +/- 500	accept +/- 1000	accept +/- 1000	

Examples of acceptable figure quotes to support each point

mp1 "between 2000 and 2009 total assessed species increase by 31000 and threatened species increase from 11500 to 17500"

mp2 "in 2004 total assessed species was 38000 and threatened was 15500"

mp3 "in 2000 there were 5000 more assessed species than threatened, in 2006 the gap was 23500"

mp4 "between 2000 and 2002 assessed species were 16500 and threatened were 11500"

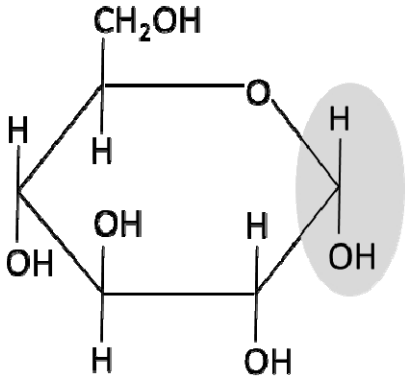
mp5 "in the 4 years before 2004, total species rose by 21500 and threatened by 4000. In the 4 subsequent years total assessed rose by13000 and threatened rose by 1500."

5	**(b)**	**(ii)**	31 / 32 / 33 **;;**	2	Correct answer = 2 marks If answer incorrect, **AWARD** 1 mark for 18,500 (± 500) ÷ 57,500 (± 500) **or** If answer not given to the nearest whole number **AWARD** 1 mark for any figure between 31.0 and 33.4

5	(b)	(iii)	1 a	*(total species assessed is increasing because)* , *idea of* more sampling / exploration (leads to more species identified)	2	**1 IGNORE** refs to speciation as time frame too short
				or		
			b	improved identification , techniques / described **;**		**1** eg DNA fingerprinting **1 IGNORE** study if used in the context of species that have already been identified
			2 a	*(threatened species is increasing because)* , loss of habitat		**IGNORE** idea of conservation not working
				or		
			b	climate change		
				or		
			c	increased human population		**IGNORE** refs to hunting
				or		
			d	*idea of* interspecific competition from introduced species		**IGNORE** 'competition from newly discovered species' as this implies that the candidate thinks the species was not present until it was discovered
				or		
			e	*idea that* some of the newly-identified species are likely to be threatened **;**		e.g 'as more species are discovered, the number of threatened species will go up'
			3 a	*(there is a widening gap between total and threatened species because)* , new species tend to be discovered in areas where humans don't live so they are not threatened		
				or		
			b	conservation techniques are working / AW **;**		

Question			Answer	Marks	Guidance
5	(c)		range / number , of habitats / ecosystems **;** genetic variation (within species) **;**	1	**CREDIT** only these answers

Question				Answer	Marks	Guidance
5	(d)				4	If correct points included under the wrong headings then award **max 1** for that convention **ACCEPT** suitable synonyms for trade throughout, e.g. 'buying and selling'
				CITES *2 max*		
			C1	regulate / monitor / prevent , trade in , selected / certain / endangered , species		**C1 ACCEPT** ref to products from endangered species, e.g. leopard skin **C1 ACCEPT** 'illegal' as AW for 'selected / AW'
			C2	ensure (international) trade does not endanger , wild populations / AW **;**		**C2 DO NOT AWARD** if 'all trade in wild plants' stated
			C3	prohibit (commercial) trade in wild plants **;**		
			C4	allow trade in , artificially propagated plants / AW **;**		
			C5	allow (some) trade in less endangered **,** wild species / organisms / animals and plants **;**		
				Rio Convention *2 max*		
			R1	sustainable use of **,** organisms / habitats / ecosystems **;**		**R1 ACCEPT** example e.g. replanting trees / fishing quotas / large mesh size
			R2	share genetic resources **;**		**R2 AWARD** in context of access to or benefits from genetic resources
			R3	share access to **,** scientific knowledge / technology **;**		
			R4	*idea of* promoting (named) *ex situ* conservation method(s) **;**		**R4** e.g. 'set up seed banks' / 'captive breeding programmes' **R4 IGNORE** 'zoos' unqualified **R4 IGNORE** 'in situ'
			R5	*idea of* raising profile of (biodiversity) with , governments / public bodies / general public **;**		**R5 ACCEPT** 'take biodiversity into account during planning processes' **R5 ACCEPT** 'informing people that it is their duty to consider biodiversity'
			R6	*idea of* international cooperation (on biodiversity issues) **;**		
				Total	**14**	

Question			Answer	Marks	Guidance
6	(a)		monosaccharide(s) **;**	1	**ACCEPT** phonetic spelling
6	(b)	(i)	*identical to diagram of β-glucose with* inversion of OH and H on any **one** carbon atom **;** correct inversion of OH and H on 1st C **;**	2	A correct diagram as shown below = 2 marks  **ACCEPT** displayed formula for CH_2OH etc If the candidate has drawn α-glucose upside down = 0 marks

Question			Answer		Marks	Guidance
6	(b)	(ii)		*Answers need a feature plus an explanation of how the feature helps the function*	2	
			1	soluble so can be (easily) , transported / carried (around organism) **;**		**1 ACCEPT** soluble so is able to , react / AW **1 ACCEPT** description of solubility in terms of chemical properties linked to transport or reactivity
			2	small (molecule) so can , be transported / diffuse , across (cell) membranes **;**		
			3	easily / quickly , respired / oxidised / broken down , to , release energy / produce ATP **;**		**3 DO NOT CREDIT** 'hydrolysed' **3 DO NOT CREDIT** 'easily broken down to provide energy for respiration' **3 DO NOT CREDIT** 'easily broken down to produce energy'
			4	molecules can , join / AW , to produce , (named) disaccharides / (named) polysaccharides **;**		**4 IGNORE** 'used to form glycogen' without idea of molecules , bonding / joining / condensation
6	(c)				3	**AWARD** making points from suitably labelled diagram
			1	part of nucleotide **;**		
			2	bonded / joined / attached , to (named) base **and** phosphate **;**		**2 IGNORE** 'made up of' **2 DO NOT CREDIT** answers which state incorrect bond **2 IGNORE** 'phosphate molecule'
			3	phosphate (joined) to C5 (and C3) / base (joined) to C1 **;**		
			4	(deoxyribose is part of) backbone (of DNA) **;**		
			5	*idea of* linking with (second) phosphate on adjacent nucleotide **;**		
			6	nucleotide is , monomer / repeating unit , of DNA / polynucleotide **;**		**6 ACCEPT** 'DNA formed from a chain of nucleotides'

Question			Answer		Marks	Guidance
6	(d)	(i)			3	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** *Candidates may **identify** the error or **correct** the error* **If nothing is written on the answer lines, ACCEPT** a clear indication on the boxed list of which statements are incorrect
			1	α-glucose / β-glucose **;**		**1 ACCEPT** b / B for 'β'
			2	some / no , 1–6 bonds **or** only 1 –4 bonds **;**		
			3	condensation / hydrolysis **;**		
			4	branches / straight chain **;**		
6	(d)	(ii)		glycogen / amylopectin **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** starch **DO NOT CREDIT** if spelling could be confused with another molecule, e.g. glucagon
				Total	**12**	

Question			Answer	Marks	Guidance
7	(a)		*idea that* (dairy) animals use plants for food **;** plants are the basis of all food chains **;** (some) yoghurts contain , (named) fruit / plant (flavouring) **;**	1	e.g. cows eat grass / cows are herbivores **IGNORE** refs to microorganisms

Question			Answer	Marks	Guidance
					IGNORE refs to obesity / weight loss **ACCEPT** ref to protein produced by bacteria
			advantages **A1** low in **,** saturated fat / cholesterol **; ora**		**A1 ACCEPT** 'no , cholesterol / saturated fat' **A1 ACCEPT** implication that fat is saturated , e.g. ,fat that leads to high blood cholesterol **A1 IGNORE** 'animal fat' unqualified
			A2 less likely to cause , heart disease / atherosclerosis / AW **;**		
			A3 no / fewer , animal welfare / moral / ethical / religious, issues **;**		**A3 ACCEPT** **'**suitable for , vegetarians / vegans' **A3 ACCEPT** refs to fewer animals being slaughtered
			A4 source of essential amino acids **;**		
			A5 high rate of (protein) production **;**		**A5 IGNORE** 'high yield' answers must imply rate
			A6 *idea of* fewer energy losses / more energy efficient **;**		**A6 IGNORE** 'efficient' unqualified **A6 ACCEPT** 'more efficient because lower down food chain'
			A7 *idea that* production can be changed more easily (according to demand) **;**		**A7** Answers could be in context of rate or content
			A8 *idea that* cheaper to produce (once established) **;**		**A8 IGNORE** 'uses fewer resources'
			A9 uses less , land area / space **;**		**A9 IGNORE** 'uses fewer resources'
			A10 (might be) grown on (plant) waste **;**		**A10** needs to be stated as an advantage
			A11 less risk of transfer of disease from animals **;**		**A11** e.g. CJD, salmonella from eggs
			A12 can be produced in any , climate / season **;**		

Question			Answer	Marks	Guidance
7	(b)		*disadvantages* **D1** different **,** taste / texture / palatability **;** **D2** lacks / less , iron **;** **D3** needs to be processed (to add **,** taste / texture) **;** **D4** *idea of* consumer resistance **;** **D5** growth conditions suit , pathogenic / harmful / spoilage , microorganisms / bacteria / microbes **;** **D6** need for **,** isolation / purification (of protein from material on which they grow) **;** **D7** may require removal of **,** toxins / (excess) RNA **;** **D8** loss of farming jobs **;** **D9** *idea of* higher set up costs **;**	7	**D4 ACCEPT** e.g. 'people don't want to eat something made from fungus' **D4** 'people prefer flavour of meat' = 2 marks (D1 and D4) **D5 ACCEPT** 'food might be contaminated with bacteria etc' **D5 IGNORE** mould / bad bacteria **D6 ACCEPT** 'purification of food from waste' **D9 IGNORE** 'expensive' unqualified **D9 ACCEPT** 'equipment costs a lot''
			QWC - balanced account	1	**Award** if **2 A** marks **and 2 D** marks have been awarded

Question			Answer	Marks	Guidance
7	(c)		<table><tr><th>*method*</th><th>*description*</th></tr><tr><td>*freezing*</td><td>**1** slows / reduces / AW , <u>enzyme</u> , activity / AW **2** removes available water / AW *max1*</td></tr><tr><td>*pickling*</td><td>(low pH) denatures **,** enzymes / proteins</td></tr><tr><td>*irradiation*</td><td>(microbial) DNA / genes / genetic material **,** destroyed / damaged / changed / mutated / disrupted</td></tr></table> **;** **;** **;**	3	*Award one mark per box* **1 ACCEPT** 'too cold for enzymes to work effectively' **1 DO NOT CREDIT** refs to enzymes becoming denatured **1 IGNORE** 'stops / disrupts (enzyme activity)' **2 ACCEPT '**ice crystals puncture cell membrane' **DO NOT CREDIT** high pH **ACCEPT** correct description of denaturation, e.g. 'shape of active site changed' **IGNORE** refs to osmosis **IGNORE** 'mutation' without ref to genetic material
			Total	**12**	

Question	Answer	Marks	Guidance
8		6	

Biological Term	Description
Natural Selection	The theory proposed by Darwin on the evolution of species
Speciation	The formation of a new species **;**
Continuous variation **;**	Differences between individuals that cover a range of values rather than discrete categories
Adaptation	a variation that increases the chances of survival **;**
Binomial **;**	A system of naming organisms that uses two scientific (Latin) names for species
ex situ **;**	The type of conservation of which seed banks are an example
Environmental Impact Assessment / EIA **;**	A study carried out by a local planning authority in order to judge the effect of a development on the biodiversity of an area.

IGNORE 'founding a new species'
IGNORE refs to classification / naming
ACCEPT descriptions of mechanism of speciation

ACCEPT 'something that helps survival'

DO NOT CREDIT 'EIA' if wrong words given
IGNORE 'environmental impact survey'

			Total	**6**	

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.
   e.g. 'parasite gains , nutrition / energy , from host ; **MP3 Q2 (a)**

   This means that to get the mark, the response needs to mention the idea of either nutrition or energy being obtained, and where it comes from in terms of the host.

   Note in this example that no word or term is underlined and so alternative wording (AW) that clearly conveys the same idea is acceptable. In some cases the Guidance column may indicate examples of wording or terms that are acceptable (ACCEPT) or that should be ignored (IGNORE). In the case of IGNORE read on to see if something creditworthy appears later in the response.

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

     e.g. (thermal) insulation; **MP4 Q4 (b)(i)**

     'insulation' as an answer on its own gains a mark as it does not contradict 'thermal'. Alternatives like keeping the body warm would not gain credit, but the response might say something equally creditworthy like 'insulating the body' and gain credit.

   - 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.

   e.g. *idea of* raising the profile of biodiversity with , governments / public bodies / general public ; **MP R6 Q5(d)**

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