OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE **F212**

Molecules, Biodiversity, Food and Health

Mark Scheme for June 2010

Oxford Cambridge and RSA Examinations

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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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<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>
<table>
<tr><th>reagent</th><th>observation</th><th>molecule</th><th>present or absent</th></tr>
<tr><td>ethanol and water</td><td>white emulsion</td><td>lipid</td><td>present</td></tr>
<tr><td>Benedict's solution</td><td>brick-red precipitate</td><td><u>reducing</u> sugar / lactose / glucose / galactose / monosaccharides</td><td>present ;</td></tr>
<tr><td>biuret I and II</td><td>lilac colour</td><td>protein / named milk protein</td><td>present ;</td></tr>
<tr><td>iodine solution</td><td>yellow / brown</td><td>starch / amylose</td><td>absent ;</td></tr>
</table>
</td><td>3</td><td>One mark per correct row.
IGNORE 'yes', 'no' and ticks and crosses
DO NOT CREDIT if anything incorrect is written in any box in the molecule column.
e.g. 'starch or cellulose' = 0 mark

ACCEPT maltose
DO NOT CREDIT sucrose

ACCEPT casein / lactoglobulin / lactalbumin / polypeptide

IGNORE amylopectin</td></tr>
<tr><td>1</td><td>(a)</td><td>(ii)</td><td>milk is already, cloudy / an emulsion / white / AW ;</td><td>1</td><td>**ACCEPT** idea of difficulty in detecting change because of the appearance of milk</td></tr>
<tr><td>1</td><td>(a)</td><td>(iii)</td><td>(one) glycerol / glyceride ;
3 fatty acids ;

ester bond (between glycerol and fatty acid) ;</td><td>3</td><td>**ACCEPT** marking points from clearly labelled diagram but **DO NOT CREDIT** if contradicted in text.
IGNORE individual atoms on diagram and look for correct position of labels
MAX 2 if phosphate group included (as could be confused with phospholipid)

ACCEPT on diagram if 3 shown and at least one labelled
ACCEPT triglycerides are esters</td></tr>
</table>

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

Question	Expected Answer	Mark	Additional Guidance
1 (c) (ii)			
1	(death rate for) men greater (at any concentration) / AW ;		*1* **ACCEPT** ora
2	(death rates) rise with increasing cholesterol / AW ;		*2* **ACCEPT** 'positive correlation' (between death and cholesterol)
3	death rate for men, initially / AW, falls ;		*3* **ACCEPT** 4.8 or below as 'initially'.
4	steep(er) / AW, rise (in, males / both) at higher cholesterol levels ;		*4* Answers must refer to latter part of graph only (5.7 or above). **ACCEPT** difference (between sexes) greater at high concentration
5	comparative figures with unit for (blood) cholesterol to support any of the above points ;		*5* There are 3 ways of getting this mark: • values for both sexes at single concentration • two values for single sex at two concentrations • subtraction / calculation, that shows comparison **IGNORE** terms like 'about' See table for acceptable examples of x and y values – if intermediate cholesterol values are used, refer to the graph for the data
		3 max	

blood cholesterol (mmol dm^{-3})	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)			**Mark first two in list**
		1	coronary heart disease / CHD / cardio-vascular diseases / heart attack / cardiac arrest / myocardial infarction / MI / angina **;**		*1* **DO NOT CREDIT** heart disease alone or 'conary' **ACCEPT** hypertension / high blood pressure
		2	atherosclerosis / atheroma **;**		*2* **DO NOT CREDIT** arteriosclerosis
		3	stroke **;**		
		4	Type 2 diabetes **;**		
				2	
			Total	**16**	

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	**ACCEPT** '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)		3 max	**ACCEPT suitable examples for mps 1 to 4**
		1	morphology / anatomy / (observable / physical) features / appearance / AW ;		*1* **CREDIT** cell features e.g. nucleus / membrane-bound organelles / cell wall / prokaryotic-eukaryotic features / unicellular
		2	biochemistry / cytochrome C ;		*2* **CREDIT** component of cell wall
		3	genes / DNA / genetics / RNA ;		*3* **IGNORE** chromosomes
		4	behaviour / physiology / embryology ;		*4* **ACCEPT** 'how they feed' / nutrition / 'how they reproduce'
		5	idea of shared, evolutionary past / phylogeny ;		*5* **ACCEPT** 'how closely related' **IGNORE** refs to interbreeding / fertile offspring
2	(b)	(ii)	T S R W U Q ; ; ;	3	**Mark the order of letters** (ignoring the dotted lines) All 6 in correct order = 3 marks If any incorrect, then credit T S in order at beginning = 1 mark U Q in order at end = 1 mark R before W anywhere in the sequence = 1 mark

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

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

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(ii)			Idea of 'more' is needed for all marking points but it can be stated once and linked to more than one point. • e.g. 'more bacteria secreting enzymes' = mp 2 and 4 **ACCEPT** converse argument throughout **ACCEPT** 'fungi' / 'mould' in place of bacteria as question stem does not specify
		1	bacteria, reproduce / AW, more rapidly / faster **;**		***1*** **IGNORE** 'grow' **IGNORE** 'more easily' or 'effectively' **DO NOT CREDIT** if the candidate thinks there is no reproduction at 5°C
		2	(so) more bacteria present **;**		
		3	more, toxins / waste, produced / released / AW **;**		
		4	more enzymes, secreted / AW **;**		***4*** **DO NOT CREDIT** excreted
		5	enzyme, action faster / works better / more effective, at higher temperatures **;**		***5*** **IGNORE** optimum
		6	(substrate and enzymes have) more kinetic energy **;**		
		7	more, enzyme-substrate complexes / ESC / (successful) collisions between substrate and active site **;**	**3 max**	

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

Question			Expected Answer	Mark	Additional Guidance
3	(c)		**This is a QWC question** **Ignore sections and mark as continuous prose**		Assume candidate is talking about mycoprotein unless otherwise stated. **CREDIT** ora for beef throughout. **IGNORE** use of figures alone when awarding mps **1, 3, 6, 7, 9** – look for **descriptive statement**, e.g. • '12 g of protein' = no mark • 'only 12 g protein' = 1 mark (mp 9)
		1	low(er) / less, energy (than beef) **;**		
		2	useful for, slimming / weight control / AW **;**		***2*** **ACCEPT** preventing obesity **ACCEPT '**less energy to burn off *during exercise*' **DO NOT CREDIT** 'burn off' unqualified
		3	low(er) / less, (total) fat **;**		
		4	(very) low / (much) less, saturated fat **;**		
		5	lower, cholesterol **OR** lower risk of, (coronary) heart disease / CHD / cardio-vascular diseases / heart attack / cardiac arrest / myocardial infarction / MI / angina / atherosclerosis / atheroma **/** stroke / hypertension **;**		
		6	contains carbohydrate / AW **;**		***6*** **ACCEPT** 'more carbohydrate than beef' **IGNORE** 'carbs'
		7	low(er) / less, iron content **;**		
		8	(increased risk of) anaemia / fewer RBCs / less haemoglobin / reduced oxygen carrying capacity of blood **;**		***8*** **IGNORE** 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
		9	low(er) / less, protein **;**		
		10	(mycoprotein provides) more balanced diet **;**		
		11	need larger intake to meet requirements / AW **;**	**7 max**	
			QWC – award for 2 clear references to the table **;**	**1**	Award for 2 sets of comparative figures (stated or calculated) with units – 'content per 100g' not needed **IGNORE** vague terms like 'about' as long as figs are correct
			Total	**20**	

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

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

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

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

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

Question			Expected Answer	Mark	Additional Guidance
5	(b)	(iii)	*type of immunity* *artificial active* ☐ *artificial passive* ☐ *natural active* ☐ *natural passive* ✔ ;	1	**DO NOT CREDIT** if more than 1 box is ticked **DO NOT CREDIT** a cross **DO NOT CREDIT** a tick that has been crossed out and is a 'hybrid' tick
			Total	**17**	

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

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>6</td><td>(b)</td><td>(ii)</td><td>
<table>
<tr><th>species</th><th>n</th><th>n/N</th><th>$(n/N)^2$</th></tr>
<tr><td>Grayling (Hipparchia semele)</td><td></td><td></td><td></td></tr>
<tr><td>Large Heath (Coenonympha tullia)</td><td></td><td><u>0.3548</u></td><td></td></tr>
<tr><td>Gatekeeper (Pyronia tythonus)</td><td></td><td></td><td></td></tr>
<tr><td>Green Hairstreak (Callophrys rubi)</td><td></td><td></td><td></td></tr>
<tr><td>Silver-studded Blue (Plebeius argus)</td><td></td><td></td><td></td></tr>
<tr><td>Small Heath (Coenonympha phamhylus)</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>Sum (Σ)</td><td>0.31633 OR 0.31217</td></tr>
<tr><td></td><td></td><td>1 - Σ</td><td>D = 0.68367 OR 0.68783</td></tr>
</table>
;
;
;
</td><td>3</td><td>Original table on question paper had incorrect figure in $(n/N)^2$ column for Grayling row. Answers for mps 2 & 3 take this into account.

ACCEPT ecf from incorrect answer for Σ (whether decimal places or rounding)</td></tr>
<tr><td>6</td><td>(b)</td><td>(iii)</td><td></td><td>2</td><td>IGNORE refs to relative robustness of habitat</td></tr>
<tr><td></td><td></td><td>1</td><td>many species present / high species richness / all species evenly represented / high species evenness / high biodiversity ;</td><td></td><td>1 ACCEPT ‘types of butterfly’ as AW for species
IGNORE ‘individuals’ or ‘organisms’</td></tr>
<tr><td></td><td></td><td>2</td><td>(so) should not be developed / development should be modified / development should be reconsidered / should be conserved / AW ;</td><td></td><td>2 DO NOT CREDIT ref to ‘planning’ alone (as given in question)
2 IGNORE responses that imply uncertainty about the development. e.g. ‘could’ ‘might’ ‘may’</td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>6</td><td>(c)</td><td>(i)</td><td>
<table>
<tr><th>species</th><th>letter</th></tr>
<tr><td>Grayling (Hipparchia semele)</td><td>A ;</td></tr>
<tr><td>Large Heath (Coenonympha tullia)</td><td>D ;</td></tr>
<tr><td>Gatekeeper (Pyronia tythonus)</td><td>F ;</td></tr>
<tr><td>Green Hairstreak (Callophrys rubi)</td><td>B ;</td></tr>
<tr><td>Silver-studded Blue (Plebeius argus)</td><td>C ;</td></tr>
<tr><td>Small Heath (Coenonympha phamhylus)</td><td>E</td></tr>
</table>
</td><td>5</td><td>DO NOT CREDIT if more than one letter given against any individual species</td></tr>
<tr><td>6</td><td>(c)</td><td>(ii)
1

2

3</td><td>(is) same <u>genus</u> ;

have, features / characteristics / appearance / behaviour / biochemistry / physiology / anatomy / genes / genetic makeup / DNA, that are, similar / in common ;

(share a) common, ancestor / phylogeny ;</td><td>2 max</td><td>1 DO NOT CREDIT vague statements like ‘could be in the same genus’
IGNORE Coenonympha

2 IGNORE ‘similar’ on its own
DO NOT CREDIT ‘same’
IGNORE specific examples (e.g. orange wings / large spot)

3 ACCEPT closely related ;</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>18</td><td></td></tr>
</table>

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