

**Module 3: Biodiversity and Evolution**  
**2.3.1 Biodiversity**  
**June 2009-January 2013**  
**Mark schemes**

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|--|
| (a) define the terms <i>species</i> , <i>habitat</i> and <i>biodiversity</i> ;   |
| (b) explain how biodiversity may be considered at different levels; habitat, species and genetic;                                  |
| (c) explain the importance of sampling in measuring the biodiversity of a habitat  |
| (d) describe how random samples can be taken when measuring biodiversity;  |
| (e) describe how to measure species richness, species evenness in a habitat;   |
| (f) use Simpson's Index of Diversity ( $D$ ) to calculate the biodiversity of a habitat, using the formula $D = 1 - (\sum(n/N)^2)$ |
| (g) outline the significance of both high and low values of Simpson's Index of Diversity ( $D$ );                                  |
| (h) discuss current estimates of global biodiversity   |

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

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

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

5	(b)	(ii)	31 / 32 / 33 ;;	2
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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 by 13000 and threatened rose by 1500."

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

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

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

Question	Answer	Marks	Guidance														
7	<table border="1"> <thead> <tr> <th data-bbox="282 1361 352 1809">definition</th> <th data-bbox="282 1061 352 1361">term</th> </tr> </thead> <tbody> <tr> <td data-bbox="357 1361 456 1809">sampling in which the observer does not decide when and where to take measurements</td> <td data-bbox="357 1061 456 1361">random ;</td> </tr> <tr> <td data-bbox="461 1361 552 1809">a representative group of organisms that are selected from a population</td> <td data-bbox="461 1061 552 1361">sample ;</td> </tr> <tr> <td data-bbox="557 1361 647 1809">the area in which an organism lives</td> <td data-bbox="557 1061 647 1361">habitat ;</td> </tr> <tr> <td data-bbox="652 1361 743 1809">a measure of the relative numbers of individuals in each species</td> <td data-bbox="652 1061 743 1361">species evenness ;</td> </tr> <tr> <td data-bbox="748 1361 839 1809">the frequency of occurrence of plants in a particular area</td> <td data-bbox="748 1061 839 1361">abundance ;</td> </tr> <tr> <td data-bbox="844 1361 935 1809">the number of species present in a particular area</td> <td data-bbox="844 1061 935 1361">species richness ;</td> </tr> </tbody> </table>	definition	term	sampling in which the observer does not decide when and where to take measurements	random ;	a representative group of organisms that are selected from a population	sample ;	the area in which an organism lives	habitat ;	a measure of the relative numbers of individuals in each species	species evenness ;	the frequency of occurrence of plants in a particular area	abundance ;	the number of species present in a particular area	species richness ;	6	<p><b>DO NOT AWARD</b> mark if two or more answers are given in any box except <b>IGNOREs</b> listed below</p> <p><b>IGNORE</b> systematic</p> <p><b>IGNORE</b> percentage cover</p> <p><b>IGNORE</b> biodiversity</p>
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<b>Total</b>		<b>6</b>															



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Question	Expected Answer	Mark	Additional Guidance																														
3 (a) (i)																																	
1	(all), sub-arctic / all 4 named sub-arctic, species / birds, show decrease ;		ACCEPT reference to numbers rather than breeding success throughout																														
2	(all / most), other / non sub-arctic / all 4 named non sub-arctic, species / birds, show, increase / no change ;		1 sub-arctic species = snow bunting + Lapland bunting + ptarmigan + dotterel																														
3	greater change / AW (in breeding success), in sub-arctic than in non sub-arctic species ;		2 non sub-arctic species = red grouse + wheatear + meadow pipit + ring ouzel																														
4	comparative figs (in 1970 AND 2000) ;	3	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) <b>4 DO NOT CREDIT</b> if figures are not from 1970 and 2000																														
	<table border="1"> <thead> <tr> <th data-bbox="422 481 454 1041">species</th> <th colspan="2" data-bbox="422 1041 454 1946">number of young raised per year</th> </tr> <tr> <td data-bbox="454 481 486 1041"></td> <th data-bbox="454 1041 486 1153">1970</th> <th data-bbox="454 1153 486 1946">2000</th> </tr> </thead> <tbody> <tr> <td data-bbox="486 481 518 1041">Snow bunting*</td> <td data-bbox="486 1041 518 1153">78</td> <td data-bbox="486 1153 518 1946">2 Down 76</td> </tr> <tr> <td data-bbox="518 481 550 1041">Lapland bunting*</td> <td data-bbox="518 1041 550 1153">7</td> <td data-bbox="518 1153 550 1946">0 Down 7</td> </tr> <tr> <td data-bbox="550 481 582 1041">Ptarmigan*</td> <td data-bbox="550 1041 582 1153">1280</td> <td data-bbox="550 1153 582 1946">876 Down 404</td> </tr> <tr> <td data-bbox="582 481 614 1041">Red grouse</td> <td data-bbox="582 1041 614 1153">890</td> <td data-bbox="582 1153 614 1946">962 Up 72</td> </tr> <tr> <td data-bbox="614 481 646 1041">Wheatear</td> <td data-bbox="614 1041 646 1153">209</td> <td data-bbox="614 1153 646 1946">231 Up 22</td> </tr> <tr> <td data-bbox="646 481 678 1041">Meadow pipit</td> <td data-bbox="646 1041 678 1153">23</td> <td data-bbox="646 1153 678 1946">82 Up 59</td> </tr> <tr> <td data-bbox="678 481 710 1041">Ring ouzel</td> <td data-bbox="678 1041 710 1153">23</td> <td data-bbox="678 1153 710 1946">26 Up 3</td> </tr> <tr> <td data-bbox="710 481 742 1041">Dotterel*</td> <td data-bbox="710 1041 742 1153">45</td> <td data-bbox="710 1153 742 1946">35 Down 10</td> </tr> </tbody> </table>	species	number of young raised per year			1970	2000	Snow bunting*	78	2 Down 76	Lapland bunting*	7	0 Down 7	Ptarmigan*	1280	876 Down 404	Red grouse	890	962 Up 72	Wheatear	209	231 Up 22	Meadow pipit	23	82 Up 59	Ring ouzel	23	26 Up 3	Dotterel*	45	35 Down 10		
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3	Question	Expected Answer	Mark	Additional Guidance
3	(a) (ii)	<p>1 climate change / global warming ;</p> <p>2 (environmental) change too rapid for adaptation ;</p> <p>3 change in, flora / plants / food supply / insects / prey / predators / human activity ;</p> <p>4 disease (that affects sub-arctic species more than others) ;</p> <p>5 sub-arctic species, less well-adapted than / have been outcompeted by, non sub-arctic species / AW ;</p>	2 max	<p>1 <b>IGNORE</b> greenhouse effect  <b>DO NOT CREDIT</b> 'it is too warm' or 'it is not cold enough' without reference since 1970</p> <p>3 <b>ACCEPT</b> camouflage no longer appropriate / reduction in size of habitats</p> <p>5 <b>ACCEPT</b> ora</p>
3	(b) (i)	the <u>number of species</u> present (in a habitat) ;	1	<b>DO NOT CREDIT</b> range / amount

Question	Expected Answer	Mark	Additional Guidance
3 (b)	<p>(ii)</p> <p>1 idea of: 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)	<p>1 (measures), abundance / numbers, of individuals in each species ;</p> <p>2 species evenness is more quantitative than species richness ; <b>ora</b></p> <p>3 high(er) species evenness indicates high(er) biodiversity ; <b>ora</b></p> <p>4 low species evenness indicates, dominance by / high abundance of, one / few, species ; <b>ora</b></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%"
<b>Total</b>		<b>12</b>	

Question	Expected Answer	Mark	Additional Guidance
6 (a)	<ol style="list-style-type: none"> <li>1 <u>biodiversity</u> (of heathland) ;</li> <li>2 rare / endangered, species / plants / animals / fungi / organisms / named organism ;</li> <li>3 rarity of (this) <u>habitat</u> ;</li> <li>4 example of current <u>legal</u> status ;</li> <li>5 (likely) <u>reduction in size</u> of, habitat / ecosystem / heathland ;</li> <li>6 effect of reduced size on <u>viability</u> (of whole ecosystem) ;</li> <li>7 effect on, movement / spread, of, species / named species / plants / animals ;</li> <li>8 a method of minimizing impact / AW / named example ;</li> </ol>	3 max	<ol style="list-style-type: none"> <li>4 e.g. National Park / SSSI / protected species / National Nature Reserves / NNR / other <i>legal</i> example</li> <li>5 <b>IGNORE</b> 'habitat destruction' alone. Must refer to extent or size of destruction.</li> <li>7 <b>CREDIT</b> effect on wildlife corridors Answers could refer to limiting species spread or introduction of species</li> <li>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)</li> </ol>
6 (b)	<ol style="list-style-type: none"> <li>(i) <ol style="list-style-type: none"> <li>1 <i>idea of</i> (collect in) different / wider, area ;</li> <li>2 (collect at) different, times of day / times of year / weather conditions ;</li> <li>3 use of named, collecting / identifying, technique ;</li> <li>4 method of ensuring that individuals <u>not counted again</u> ;</li> <li>5 mark-release-recapture / capture-recapture, technique ;</li> </ol> </li> </ol>	3 max	<ol style="list-style-type: none"> <li>1 <b>ALLOW</b> several transects e.g. another path</li> <li>3 e.g. (sweep) net / photographs / feeding stations <b>IGNORE</b> pooter (as could only catch larvae) / light trap / use of key / single transect</li> <li>4 This mark refers to an initial or the only sample – it is <b>not</b> linked to mp 5</li> <li>5 <b>CREDIT</b> count marked individuals in 2<sup>nd</sup> sample / population = <u>no. in 1<sup>st</sup> sample x no. in 2<sup>nd</sup> sample</u> / no. retrapped in 2<sup>nd</sup> sample</li> </ol>

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6 (b) (ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">species</th> <th style="width: 10%;">n</th> <th style="width: 10%;">n/N</th> <th style="width: 10%;">(n/N)<sup>2</sup></th> </tr> </thead> <tbody> <tr> <td>Grayling (<i>Hipparchia semele</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Large Heath (<i>Coenonympha tullia</i>)</td> <td></td> <td style="text-align: center;"><u>0.3548</u></td> <td></td> </tr> <tr> <td>Gatekeeper (<i>Pyronia tythonus</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Green Hairstreak (<i>Callophrys rubi</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Silver-studded Blue (<i>Plebeius argus</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Small Heath (<i>Coenonympha phamhyllus</i>)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">Sum (<math>\Sigma</math>)</td> <td style="text-align: center;">0.31633 OR 0.31217</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">1 - <math>\Sigma</math></td> <td style="text-align: center;">D = 0.68367 OR 0.68783</td> </tr> </tbody> </table>	species	n	n/N	(n/N) <sup>2</sup>	Grayling ( <i>Hipparchia semele</i> )				Large Heath ( <i>Coenonympha tullia</i> )		<u>0.3548</u>		Gatekeeper ( <i>Pyronia tythonus</i> )				Green Hairstreak ( <i>Callophrys rubi</i> )				Silver-studded Blue ( <i>Plebeius argus</i> )				Small Heath ( <i>Coenonympha phamhyllus</i> )						Sum ( $\Sigma$ )	0.31633 OR 0.31217			1 - $\Sigma$	D = 0.68367 OR 0.68783	3	<p>Original table on question paper had incorrect figure in (n/N)<sup>2</sup> column for Grayling row. Answers for mps 2 &amp; 3 take this into account.</p> <p><b>ACCEPT</b> ecf from incorrect answer for <math>\Sigma</math> (whether decimal places or rounding)</p> <p><b>IGNORE</b> refs to relative robustness of habitat</p>
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6 (b) (iii)	<p>1 many species present / high species richness / all species evenly represented / high species evenness / high biodiversity ;</p> <p>2 (so) should not be developed / development should be modified / development should be reconsidered / should be conserved / AW ;</p>	2	<p><b>1 ACCEPT</b> 'types of butterfly' as AW for species <b>IGNORE</b> 'individuals' or 'organisms'</p> <p><b>2 DO NOT CREDIT</b> ref to 'planning' alone (as given in question) <b>2 IGNORE</b> responses that imply uncertainty about the development. e.g. 'could' 'might' 'may'</p>																																				

Question	Expected Answer	Mark	Additional Guidance														
6 (c) (i)	<table border="1"> <thead> <tr> <th>species</th> <th>letter</th> </tr> </thead> <tbody> <tr> <td>Grayling (<i>Hipparchia semele</i>)</td> <td>A ;</td> </tr> <tr> <td>Large Heath (<i>Coenonympha tullia</i>)</td> <td>D ;</td> </tr> <tr> <td>Gatekeeper (<i>Pyronia tythonus</i>)</td> <td>F ;</td> </tr> <tr> <td>Green Hairstreak (<i>Callophrys rubi</i>)</td> <td>B ;</td> </tr> <tr> <td>Silver-studded Blue (<i>Plebeius argus</i>)</td> <td>C ;</td> </tr> <tr> <td>Small Heath (<i>Coenonympha phamylus</i>)</td> <td>E</td> </tr> </tbody> </table>	species	letter	Grayling ( <i>Hipparchia semele</i> )	A ;	Large Heath ( <i>Coenonympha tullia</i> )	D ;	Gatekeeper ( <i>Pyronia tythonus</i> )	F ;	Green Hairstreak ( <i>Callophrys rubi</i> )	B ;	Silver-studded Blue ( <i>Plebeius argus</i> )	C ;	Small Heath ( <i>Coenonympha phamylus</i> )	E	5	DO NOT CREDIT if more than one letter given against any individual species
species	letter																
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Large Heath ( <i>Coenonympha tullia</i> )	D ;																
Gatekeeper ( <i>Pyronia tythonus</i> )	F ;																
Green Hairstreak ( <i>Callophrys rubi</i> )	B ;																
Silver-studded Blue ( <i>Plebeius argus</i> )	C ;																
Small Heath ( <i>Coenonympha phamylus</i> )	E																
6 (c) (ii)	<p>1 (is) same <u>genus</u> ;</p> <p>2 have, features / characteristics / appearance / behaviour /            biochemistry / physiology / anatomy /            genes / genetic makeup / DNA,            that are, similar / in common ;</p> <p>3 (share a) common, ancestor / phylogeny ;</p>	2 max	<p>1 DO NOT CREDIT vague statements like 'could be in the same genus'            IGNORE <i>Coenonympha</i></p> <p>2 IGNORE 'similar' on its own            DO NOT CREDIT 'same'            IGNORE specific examples            (e.g. orange wings / large spot)</p> <p>3 ACCEPT closely related ;</p>														
Total		18															

Question	Expected Answers	Marks	Additional Guidance
7 (a)	<p><i>habitat</i></p> <p>1 the place where, an organism / organisms / a population / a community, lives ; <b>1 max</b></p> <p><i>biodiversity</i></p> <p>2 variety of life / the range of living organisms found / AW ;</p> <p>3 variety / range, of, habitats / ecosystems ;</p> <p>4 <u>number of different species</u> ;</p> <p>5 variety / genetic diversity, within species ; <b>2 max</b></p>	<b>3 max</b>	<p>1 <b>ACCEPT</b> animal or plant <b>ACCEPT</b> location / environment / area <b>DO NOT CREDIT</b> ecosystem</p> <p><i>max 2 for biodiversity</i></p> <p>2 <b>DO NOT CREDIT</b> ref to variation <b>ACCEPT</b> <u>species richness</u> / <u>species diversity</u></p> <p>4 must have ref to number / how many / etc.</p>
7 (b)	<p>not <u>random</u> / should have been <u>random</u> ;</p> <p>unrepresentative / skewed / biased, results ;</p> <p>creates an over-estimate of diversity ;</p> <p>may miss some (dominant) species / does not cover full range of species ;</p>	<b>2 max</b>	<p><b>DO NOT CREDIT</b> ref to 'fair test' unless qualified</p> <p>'misleading' is not quite good enough</p> <p><b>CREDIT</b> plant / animal instead of species</p>
7 (c) (i)	<p>remove units from the body of the table <b>and</b> put units in column heading / AW ;</p>	<b>1</b>	<p><b>ALLOW</b> 'measurement' or 'type of measurement' instead of 'unit'</p> <p><b>DO NOT CREDIT</b> 'units are not necessary in table'</p>



Question	Expected Answers	Marks	Additional Guidance
7 (c) (ii)	bell shaped ;  peak / highest point, for ling between peaks for bracken and cotton grass (on horizontal axis) ; peak / highest point, for ling lower than both bracken and cotton grass (on vertical axis) ;	3	<ul style="list-style-type: none"> <li>• must start at 0% cover and after 0m and finish at 0% cover and before 100m</li> <li>• line must cross the line for bracken</li> <li>• allow sharp angle for peak of bell</li> </ul>
7 (c) (iii)	1 absent at bottom of slope / present at top of slope ;  2 amount of bracken / percentage cover, increases with increasing distance ; 3 comparative figs. with units ;	2 max	<p>1 <b>DO NOT CREDIT</b> that bracken is present at top if answer also implies that some bracken is present at the bottom</p> <p><b>ALLOW</b> 'before 40 - 50m' as AW for 'bottom'</p> <p><b>ALLOW</b> 'after 40 - 50m' as AW for 'top'</p> <p><b>ALLOW</b> 'start' instead of 'bottom' and 'finish' or 'end' or 'higher up' instead of 'top'</p> <p>Needs to be stated – cannot be implied from mp 2</p> <p>3 two percentages at two stated distances (must be from table) e.g. 0% at 0m and 74% at 100m or percentage difference between two stated distances</p> <p><b>ALLOW</b> 'percentage cover' instead of % for units</p> <p><b>DO NOT CREDIT</b> 0% at the bottom and 74% at the top (as no distance has been quoted)</p>

Mark Scheme

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Question	Expected Answers	Marks	Additional Guidance
7 (d) (i)	record / identify / list / AW, all species / (all) other plants ; (count / estimate) numbers of <u>individuals</u> within each species / AW ;	2 max	IGNORE observe IGNORE animals for <i>this habitat</i> IGNORE 'species richness' and any other calculation ACCEPT the number of plants / species  if the formula is given, only credit this mark if 'n' is explained in terms of the number of individuals within the species
7 (d) (ii)	not stable / at risk / low ability to withstand change / AW ; more likely to lose species ;	1 max	IGNORE 'biodiversity is low' as this is given in the question IGNORE 'only a few species' or 'dominated by a few species' as these are descriptions of low biodiversity
<b>Total</b>		<b>14</b>	