

Question			Expected Answers	Mark	Additional Guidance
1	(a)		spread over wider area / more widespread / bigger range / AW ;	1	ACCEPT geographical description, e.g. 'they now live in the South / Wales <u>also</u> ' but answer must imply that they still live in previously occupied areas IGNORE <i>idea of higher numbers</i> IGNORE bigger / more without further qualification
1	(b)	(i)	impossible / difficult , to count every individual ; sample provides an <u>estimate</u> ; sample <u>representative</u> (of whole area) ;	2 max	ACCEPT <i>idea that</i> counting every individual is too time consuming
1	(b)	(ii)	to compare (the two areas) ; (presence or absence of) roe deer is independent variable ; <i>idea of</i> controlling variables other than roe deer ;	1 max	ACCEPT one area acts as a control ACCEPT to see the effect of the roe deer
1	(b)	(iii)	1 (species) richness is number of <u>species</u> (in a habitat) ; 2 (species) evenness is , abundance / number of <u>individuals</u> of , each / every / all , species (in a habitat) ; 3 <i>idea that</i> both (richness and evenness) are needed to reveal dominance ; 4 <i>idea that</i> high biodiversity associated with high species richness and high species evenness ;	3 max	IGNORE amount ACCEPT 'how many' as AW for 'number' ACCEPT evenness is relative , numbers / abundance , of (each) species IGNORE number of individuals of , a / the / one , species

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1	(b)	(iv)	<p>plants are , the basis / AW , of (all) food chains ;</p> <p>shrubs / plants , are food for , insects / animals , that birds eat ;</p> <p><i>idea that</i> shrubs might provide , nesting sites / cover / protection / habitat ;</p>	1 max	<p>IGNORE birds eat , shrubs / seeds / fruit</p> <p>IGNORE 'fewer insects' without reason for fewer insects</p> <p>AWARD in the context of birds, or animals that birds eat</p> <p>IGNORE home</p>
	(b)	(v)	<p>(habitat) dominated by, one / few / AW, species ;</p> <p>ecosystem / habitat , is , unstable / less likely to cope with change ;</p>	2	<p>ACCEPT high number of one species</p> <p>IGNORE area / environment</p> <p>ACCEPT in the context of an example of environmental change</p> <p>ACCEPT a change in one species with have a large effect on the , ecosystem / habitat / food chain</p>
1	(c)	(i)	<p><i>idea of</i> danger to , humans / local wildlife / domestic animals / deer ;</p> <p>environment may no longer be suitable for lynx / AW ;</p>	1	<p>ACCEPT <i>idea of</i> danger to existing food chains</p> <p>IGNORE could become a pest</p> <p>IGNORE dangerous without further qualification</p> <p>IGNORE competition</p>

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1	(c)	(ii)	<p>1 (phylogeny is) the evolutionary , relationship between / history of , organisms / species ;</p> <p>2 phylogeny is the <u>basis</u> of classification ;</p> <p>3 example of molecular evidence used to classify ;</p> <p>4 species / organisms , within the same group have shared , phylogeny / evolutionary history / common ancestor ; ora</p> <p>5 <i>idea that</i> phylogeny of <i>L. lynx</i> and <i>L. pardinus</i> are sufficiently , different to have been placed in separate <u>species</u> / similar to have been placed in same <u>genus</u> ;</p>	4 max	<p>1 ACCEPT reasonable description of evolutionary , history / relationship, e.g. changes in ancestral organisms</p> <p>2 Must be a clear statement</p> <p>3 ACCEPT base sequence / amino acid sequence / DNA / cytochrome C / haemoglobin / ATPase (used to classify)</p>
1	(c)	(iii)	<p>modern / new / better , technology (to distinguish between closely related species) ;</p> <p>more , molecular / biochemical / DNA / genetic , evidence ;</p>	1	ACCEPT named example, e.g. DNA sequencing

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1	(c)	(iv)	<p>1 <i>idea of impact on food chain(s) ;</i></p> <p>2 <i>idea of right to exist / duty of humans to care for other species / ethical reason / preserving species for future generations ;</i></p> <p>3 <i>idea of aesthetic reason ;</i></p> <p>4 <i>economic reason / tourism / might provide useful resource ;</i></p>	3max	<p>1 ACCEPT controlling deer population</p> <p>1 ACCEPT top carnivore / top predator / keystone species / it might compete with existing species</p> <p>1 IGNORE other species might die</p> <p>2 IGNORE 'playing God'</p> <p>2 IGNORE refs to poaching / hunting</p> <p>3 ACCEPT beautiful creatures / nice to look at / AW</p>
			Total	[19]	

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

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

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

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

Question			Answer				Marks	Guidance
3	(a)	(i)	species	number of individuals (n)	n/N	(n/N) ²	3	Award 3 marks for the correct answer (0.6366) If answer is incorrect: IGNORE numbers in first 4 rows 'N = 100' = 1 mark $\Sigma(n/N)^2$ ALLOW ecf for correct calculation from candidate's incorrect N value $1-(\Sigma(n/N)^2)$ ALLOW ecf for correct calculation from candidate's $\Sigma(n/N)^2$ value Answer must be given to 4 dp for ecf
			Dog's mercury	40	0.4	0.1600		
			Wild strawberry	13	0.13	0.		
			Common avens	43	0.4	0.1849		
			Wood sorrel	4	0.04	0.0016		
				N = 100		$\Sigma(n/N)^2 = 0.3634$ $1-(\Sigma(n/N)^2) = 0.6366$		
3	(a)	(ii)	<i>species richness</i> <u>number of species</u> (in an area / habitat) ; <i>species evenness</i> number of / how many, <u>individuals</u> there are of, <u>each / every, species</u> (in an area / habitat) ;				2	IGNORE organisms / abundance / quantity / variety DO NOT CREDIT amount ACCEPT 'organisms' as AW for individuals CREDIT relative abundance of (each) species / population size of each species IGNORE relative abundance of, a / one, species DO NOT CREDIT amount

Question			Answer	Marks	Guidance
3	(a)	(iii)	(habitat) dominated by, one / few / AW, species ; change in one species , likely to affect whole habitat / AW ; community / ecosystem / habitat / area , is unstable / not able to withstand change / <u>easily</u> damaged ;	2	ACCEPT high number of one species IGNORE environment / biodiversity as AW for community IGNORE the community / AW will be damaged
3	(b)		<p>1 <i>idea of</i> random sampling ;</p> <p>2 standardisation of technique ;</p> <p>3 use of, key/identification chart ;</p> <p>4 survey at different , times of year / season ;</p> <p>5 include , trees / species larger than quadrat ;</p>	2	IGNORE prompt lines and mark as prose 1 ACCEPT description of randomisation method 2 ACCEPT description of standardisation method 2 ACCEPT count the same way each time 4 IGNORE 'repeat' unqualified 4 IGNORE different times of day / different times
			Total	9	

Question			Answer	Marks	Guidance
4	(a)	(i)	<p>range / variety / number , of species (in an area) ;</p> <p>range / variety of, habitats / ecosystems ;</p> <p>variety of , alleles / genes ;</p>	2	<p>IGNORE amount throughout</p> <p>ACCEPT a combination of species richness and species evenness</p> <p>ACCEPT abundance</p> <p>IGNORE organisms</p> <p>ACCEPT number of habitats</p>
4	(a)	(ii)	<p>1 part of (local) food , chain / web ;</p> <p>2 tourism ;</p> <p>3 native species / <i>idea of</i> heritage of the area ;</p> <p>4 to protect a neighbouring red squirrel population ;</p> <p>5 <i>idea that</i> Northumberland red squirrel population is nationally significant ;</p>	2	<p>IGNORE prompt lines and any reference to biodiversity</p> <p>CREDIT a correct response anywhere in the answer</p> <p>IGNORE unspecified refs to ethical, aesthetic or economic</p> <p>1 ACCEPT keystone species</p> <p>3 ACCEPT native to UK</p> <p>5 e.g. Northumberland has significant proportion of total population so loss of this population might jeopardise all British squirrels</p> <p>IGNORE refs to genetic resource as no suggestion that this population is distinct from red squirrels elsewhere.</p>

Question			Answer	Marks	Guidance
4	(a)	(iii)	<p><i>idea that:</i> it is wrong to interfere with nature ;</p> <p>it is wrong to kill animals ;</p> <p>grey has (as much) right to live <u>there</u> (as red) ; <i>idea that</i> might be useful in the future / enjoyed by future generations ; grey will be part of food chain ;</p>	1	<p>ACCEPT qualified refs to , moral / ethical / religious , reasons IGNORE it's wrong to play God</p> <p>ACCEPT it is cruel</p>
4	(b)		<p><i>idea that:</i></p> <p>1 harder to see ; ora</p> <p>2 (harder to see because) more timid / frightened of people / spend less time on ground / smaller ; ora</p> <p>3 species may be wrongly identified ;</p> <p>4 grey squirrels more likely to visit gardens / parks / public areas ; ora</p> <p>5 people are more inclined to report grey sightings ; ora</p> <p>6 AVP : ora</p>	2	<p>IGNORE prompt lines and mark as prose CREDIT correct response where seen</p> <p>1 ACCEPT 'they remain hidden'. IGNORE 'they may be hiding'</p> <p>2 IGNORE 'they may be hiding'</p> <p>6 ACCEPT grey squirrels might be less camouflaged (so easier to see)</p> <p>6 ACCEPT red squirrels might be (more) nocturnal / AW 6 IGNORE squirrel species hard to distinguish / same individual counted more than once</p>

Question		Answer	Marks	Guidance
4	(c)	<p>1 size (of development) ;</p> <p>2 <i>idea of environmental sensitivity / which species present / which habitats present , in the area ;</i></p> <p>3 potential damage (to area / organisms) ;</p> <p>4 <i>idea of potential strategies to minimise impact ;</i></p>	3	<p>IGNORE prompt lines and mark as prose IGNORE refs to benefits of development Answers should be given in terms of assessing aspects of the development.</p> <p>1 ACCEPT 'how big will it be?'</p> <p>2 ACCEPT e.g. 'what lives there?' / 'whether a rare species live there' 'whether red squirrels live there' / 'the biodiversity of the area' / is it an SSSI? / species richness</p> <p>3 ACCEPT e.g. 'how much damage will it do?' / effect on ecosystem / how much it would be destroyed / how many organisms will it kill?</p> <p>4 ACCEPT e.g. 'what can be done about it?' / possible change to reduce impact 4 Must be a general statement 4 IGNORE stated example without the general idea</p>
		Total	10	