

Question	Expected Answers	Marks	Additional Guidance
5 (a)	ecosystem ; producers / autotrophs ; primary ; trophic level(s) ; biotic / living ; minerals / elements ;	6	<p><b>DO NOT CREDIT</b> plants</p> <p><b>DO NOT CREDIT</b> tropic</p> <p><b>CREDIT</b> named, element / ion, e.g. nitrogen, nitrate</p> <p><b>ACCEPT</b> symbol e.g. N / NO<sub>3</sub><sup>-</sup></p> <p><b>ACCEPT</b> nutrient</p> <p><b>DO NOT CREDIT</b> energy / waste products</p>
5 (b) (i) 1 2 3 4 5 6 7 8	limiting / density-dependent, factors ; carrying capacity ; intraspecific competition ; for, food / nesting sites ; interspecific competition ; with, deer / tree shrew / giant squirrel ; <i>larger squirrel populations</i> attract more predators ; parasites / diseases, spread more easily ;	max 4	<p><b>3 ACCEPT</b> description            e.g. • “competition with other members of the same species”            • “competition with other (small) squirrels”</p> <p><b>4 ACCEPT</b> they run out of food</p> <p><b>5 ACCEPT</b> description            e.g. “competition with other species”</p> <p><b>7 DO NOT CREDIT</b> predation alone,            must be linked to larger squirrel population</p> <p><b>8 DO NOT CREDIT</b> disease alone,            must be linked to larger squirrel population</p>

Question	Expected Answers	Marks	Additional Guidance
5 (b) (ii)	species richness & evenness decrease ; ora (richness) 29 → 26 (species) ; (evenness) large numbers of, 2 / some, species, but, low numbers / none, of other species ;	max 2	<b>ACCEPT</b> they both, decrease / decline / fall or they were higher at start <b>ACCEPT</b> 6 → 4 or 2 fewer (from table) or 3 fewer (from text) <b>CREDIT</b> suitable named e.g.s from table
5 (c) (i)	rare initially / AW ; prey, numbers have reduced / have become extinct / have left the area ; idea of slower reproductive rate / AW ;	max 1	<b>ACCEPT</b> that there weren't very many at start <b>DO NOT CREDIT</b> 'lack of food' unless has indicated that food is an animal <b>ACCEPT</b> don't breed as fast / don't have as many offspring
5 (c) (ii)	1 aesthetic / amenity / recreational, value ; 2 (eco)tourism ; 3 to, preserve biodiversity / preserve genetic diversity / stop extinction ; 4 ref. interactions between species / need to preserve whole habitat ; 5 (rainforest species / preserve gene pool as) could be useful, in future / as potential, for, medicine / genetic engineering / AW ; 6 to support indigenous peoples / AW ; 7 to stop effect of deforestation on, atmosphere / climate / soil ; 8 AVP ;	max 3	<b>Mark the FIRST suggestion on each numbered line</b> 1 <b>ACCEPT</b> description, e.g. beautiful / so people will visit / so people will use it for leisure 2 <b>ACCEPT</b> description, e.g. raise money from visitors 3 <b>ACCEPT</b> description, e.g. keep more species 4 <b>ACCEPT</b> description, e.g. if habitat destroyed there will be a knock-on effect on many species 5 <b>ACCEPT</b> for drugs, pharmaceuticals, GM or GM e.g. (like crop improvement) 6 <b>ACCEPT</b> let native people continue to live in forest income for indigenous people 7 <b>ACCEPT</b> to stop, CO <sub>2</sub> % rising / global warming / erosion or forest acts as C, sink / store 8 e.g. • habitat for pollinators • habitat for predators of pests <b>DO NOT CREDIT</b> 'right to life'

Question	Expected Answers	Marks	Additional Guidance
5 (d)	<p><i>management practices</i>  coppicing / pollarding / description ;  selective felling / description ;  rotational felling / description ;  strip felling ;  replant after felling ;    (max 2)</p> <p><i>explanation of benefits re. sustainability</i>  preserves / prevents disruption to,  habitat / ecosystems / nesting sites ;  maintains / increases, species diversity / biodiversity ;  prevents, soil erosion / leaching ;  less disturbance by machinery ;  AVP ;    (max 2)</p>	max 4	<p>LOOK FOR key ideas expressed in different ways</p> <p><b>M1 CREDIT</b> coppicing with standards / rotational coppicing  <b>M2 ACCEPT</b> only some trees cut down  <b>M3 ACCEPT</b> cycle of felling different areas</p> <p><b>B5 CREDIT</b> specific benefits linked to a practice  e.g. • faster recovery due to seeding from untouched areas nearby (M3)  • pollarding so deer can't eat shoots (M1)</p>
	<b>Total</b>	<b>20</b>	

Question	Expected Answer	Mark	Additional Guidance
7 (a)	<p>1 pioneers arrive , <b>before</b> climax / <b>earlier</b> ; <b>ora</b></p> <p>2 pioneer communities subject to , <b>greater / more</b> , change / succession / replacement ; <b>ora</b></p> <p>3 pioneer community (usually) has , <b>less / lower</b> , biodiversity ; <b>ora</b></p> <p>4 <i>idea that</i> pioneer community is (often) <b>less</b> , stable / self-sustaining ; <b>ora</b></p> <p>5 pioneer community has <b>lower</b> biomass ; <b>ora</b></p> <p>6 AVP ;</p>	2 max	<p><b>Note: All mark points are comparative</b></p> <p>1 <b>CREDIT</b> pioneers arrive first / climax arrive last</p> <p>6 e.g. species in pioneer community better adapted to (named) abiotic factor(s) <u>and</u> those in climax community better adapted to (named) biotic factor(s)</p>

Question	Expected Answer	Mark	Additional Guidance
7 (b)	<p>1 decomposition is break down , dead matter / waste or decomposition is conversion of <u>organic</u> matter to inorganic ;</p> <p>2 denitrification is conversion of <u>nitrates</u> to nitrogen (gas) ;</p> <p>3 decomposition increases , mineral / <u>nitrate</u> , supply and denitrification reduces , mineral / <u>nitrate</u> , supply ;</p>		<p>1 <b>IGNORE</b> putrefication</p> <p>1 <b>CREDIT</b> for <b>inorganic</b>: carbon dioxide / CO<sub>2</sub> / water / H<sub>2</sub>O / ammonium compounds / ammonium ions / NH<sub>4</sub><sup>+</sup></p> <p><b>IGNORE</b> ammonia / NH<sub>3</sub></p> <p>2 <b>CREDIT</b> correct formulae (NO<sub>3</sub><sup>-</sup> and N<sub>2</sub>) <b>DO NOT CREDIT</b> nitrogen oxides</p> <p>3 <b>CREDIT</b> decomposition returns , mineral / <u>nitrate</u>, to soil and denitrification removes mineral / <u>nitrate</u>, to soil</p>
7 (c)	<p>1 conservation maintains , ecosystem / biodiversity / species / habitats or conservation involves , active / sustainable , management of , ecosystem / resource / habitat ;</p> <p>2 preservation leaves , ecosystems / habitats , undisturbed ;</p>	2 max	<p><b>IGNORE environment for MP1 and 2</b></p> <p><b>ACCEPT</b> named resource</p> <p><b>ACCEPT</b> unchanged/ not disrupted / no physical intervention</p> <p><b>IGNORE</b> ref to preservation in any context other than that of conservation/preservation</p>

Question	Expected Answer	Mark	Additional Guidance
7 (d)	<p>1 nitrogen fixation is the conversion of (atmospheric) nitrogen into, ammonia / ammonium compounds / ammonium ions ;</p> <p>2 nitrification is the conversion of, ammonia / ammonium compounds / ammonium ions, into nitrite / nitrate ;</p> <p>3 correct ref to microorganisms involvement in both processes ;</p>		<p>1 <b>CREDIT</b> <math>N_2</math> / <math>NH_3</math> / <math>NH_4^+</math></p> <p>2 <b>CREDIT</b> <math>NH_3</math> / <math>NH_4^+</math> <b>CREDIT</b> <math>NO_2^-</math> / <math>NO_3^-</math> <b>DO NOT CREDIT</b> nitrate to nitrite</p> <p>3 e.g. nitrogen fixation involves, <i>Rhizobium</i> / <i>Azotobacter</i> / <i>Nostoc</i> and nitrification involves, <i>Nitrosomonas</i> / <i>Nitrobacter</i></p>
	<b>Total</b>	<b>2 max</b> <b>8</b>	

Question	Answer	Marks	Guidance
2 (a) (i)	<p>1 peak in, 1988 / 1994 ;</p> <p>2 trend decrease after 1994 ;</p> <p>3 ref. decrease and then increase , 1988 to 1994 ;</p> <p>4 fluctuations (within pattern) ;</p> <p>5 overall increase from 1965 to 2002 ;</p>	3 max	<p><b>IGNORE</b> ref to population figures</p> <p><b>1 ACCEPT</b> increases until / highest number in, 1988/1994</p> <p><b>4 ACCEPT</b> 'goes up and down' / oscillates</p>
2 (a) (ii)	<p><i>accurate because</i></p> <p><i>idea that actual number of elk shot is recorded ;</i></p> <p><i>method not valid because</i></p> <p><i>idea that number of elk shot / hunting success ,</i>  <i>varies independently of population size ;</i></p>	2	<p><b>ACCEPT</b> elks shot are counted / reported</p> <p><b>CREDIT</b> suitable reason  e.g. numbers of licences issued / number of hunters  set quotas to hunt  illegal hunting  if weather suitable for hunting  only younger / older / diseased / larger, elk killed</p> <p><b>IGNORE</b> length of time spent hunting</p>

Question	Answer	Marks	Guidance
2	<p>(i) 1 <i>idea that population size is determined by limiting factor(s)</i> ;</p> <p>Before 1995, <i>population increases due to</i></p> <p>2 example of factor that is not limiting population ;</p> <p>Before 1995, <i>population levels off because</i></p> <p>3 reaches <u>carrying capacity</u> ;</p> <p>Before 1995, <i>population becomes limited by</i></p> <p>4 intraspecific competition for named resource;</p> <p>5 interspecific competition for named resource;</p> <p><i>Population can decline at any time/ dips, due to</i></p> <p>6 severe weather / natural disaster ;</p> <p>7 decrease before 1995 not due to wolves (as none present) ;</p> <p>8 decrease after 1995 (probably) due to wolves;</p> <p>9 <i>idea that effect of wolves on population may be debatable ;</i></p> <p>QWC ;</p>	<p>6 max</p>	<p><b>IGNORE</b> ref to abiotic / biotic factors throughout</p> <p>2 e.g. plenty of, enough, food Less / no predation Less / no overcrowding/ enough space less hunting</p> <p><b>2 IGNORE</b> water / nutrients/ availability of food</p> <p><b>4 CREDIT</b> description of intraspecific</p> <p><b>5 CREDIT</b> description of interspecific</p> <p><b>4 &amp; 5 CREDIT</b> any suitable limiting factor eg competition for, food / space / mates/ overcrowding</p> <p><b>6 CREDIT</b> ref to parasites/disease/ drought/floods/fires</p> <p>9 e.g. lack of data in 1996 and 1997 makes it difficult to form conclusions</p>
		1	<p><b>Award if</b> 1 mark awarded from mps 1 to 6 (limiting factors) <b>and</b> 1 mark awarded from mps 7 to 9 (effect of wolves)</p>



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2 (b) (ii)	<p><i>re-introduction of wolves is conservation because</i></p> <p>1 restoring the <u>ecosystem</u> (to its original form) or maintains <u>biodiversity</u> ;</p> <p>2 helps the (global) wolf population ;</p> <p>3 active / dynamic / sustainable, management / maintenance ;</p> <p>4 prevents over-population by the elk ;</p> <p>5 prevents over-grazing or damage to, habitat / ecosystem ;</p>	2 max	<p><b>ACCEPT</b> controls/ increases, <u>biodiversity</u>/ <b>ACCEPT</b> wolves do not become extinct / increase in number</p> <p>'Actively maintains biodiversity' = <b>MP1 and 3</b></p> <p><b>ACCEPT</b> wolves, limit / control, elk population or lack of wolves causes elk population to grow</p> <p><b>ACCEPT</b> if wolves absent, elk would damage habitat / other species may become extinct</p>
	<b>Total</b>	<b>14</b>	

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5 (a)	<p>1 <math>\frac{\text{herbivore / primary consumer, energy}}{\text{producer energy}} \times 100</math> ;</p> <p>Plus any 3 of the following:</p> <p>2 (a sample of) producers collected ;</p> <p>3 (a sample of) herbivores /primary consumers collected;</p> <p>4 (collected from) the same area ;</p> <p>5 (measure) biomass / dry mass (of individual or population) ;</p> <p>6 energy content calculated of producer and herbivore ;</p> <p>7 use of calorimeter / described;</p>	1	<p><b>CREDIT</b></p> <p><math>\frac{\text{trophic level 2 energy}}{\text{trophic level 1 energy}} \times 100</math> ;</p> <p><b>CREDIT</b> sample figures. e.g. if producer energy 20 000 kJ m<sup>-2</sup> and herbivore 2000 kJ m<sup>-2</sup> calculation is 2000 / 20000 x 100 = 10%</p> <p><b>CREDIT</b></p> <p><math>\frac{\text{Energy available after transfer}}{\text{Energy available before transfer}} \times 100</math></p> <p><b>IGNORE</b> ref to productivity</p> <p><b>CREDIT named examples for 2 and 3</b></p> <p><b>ACCEPT</b> 'organisms at each trophic level collected' for 1 mark</p> <p><b>5 ACCEPT</b> wet / fresh, mass <b>5 IGNORE</b> mass unqualified / pyramids of biomass</p> <p><b>6 ACCEPT</b> expressed as J/KJ/MJ, per gram <b>IGNORE</b> calories per gram</p> <p><b>7</b> e.g. burn sample, in oxygen / increase in measure temperature <b>ACCEPT</b> use of published tables for energy values of, fresh /wet, mass</p>
		4 max	

Question	Answer	Marks	Guidance														
5 (b)	<table border="1"> <thead> <tr> <th data-bbox="375 1182 427 1346">Goal</th> <th data-bbox="375 1346 427 1848">Letter</th> </tr> </thead> <tbody> <tr> <td data-bbox="427 1182 512 1346">improving soil that is low in nutrients for the growing of wheat</td> <td data-bbox="427 1346 512 1848">F ;</td> </tr> <tr> <td data-bbox="512 1182 596 1346">preventing the spoilage of fruits after picking</td> <td data-bbox="512 1346 596 1848">E ;</td> </tr> <tr> <td data-bbox="596 1182 692 1346">reducing the impact of a fungal disease on yields from cucumber plants</td> <td data-bbox="596 1346 692 1848">A / B ;</td> </tr> <tr> <td data-bbox="692 1182 777 1346">producing strawberry plants that grow quicker and fruit earlier</td> <td data-bbox="692 1346 777 1848">A / B ;</td> </tr> <tr> <td data-bbox="777 1182 861 1346">making sugar syrup from waste starch</td> <td data-bbox="777 1346 861 1848">D ;</td> </tr> <tr> <td data-bbox="861 1182 946 1346">producing large amounts of a fungus for food</td> <td data-bbox="861 1346 946 1848">C ;</td> </tr> </tbody> </table>	Goal	Letter	improving soil that is low in nutrients for the growing of wheat	F ;	preventing the spoilage of fruits after picking	E ;	reducing the impact of a fungal disease on yields from cucumber plants	A / B ;	producing strawberry plants that grow quicker and fruit earlier	A / B ;	making sugar syrup from waste starch	D ;	producing large amounts of a fungus for food	C ;	<b>6</b>	<p><b>Mark the first answer in each box.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p style="text-align: center;"><b>ACCEPT A / B</b></p> <p style="text-align: center;"><b>ACCEPT C</b></p>
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5 (c)	<p><b>Description</b></p> <p>Sparrows initially fly away from fruit bushes on which shiny CDs are hung, particularly when the CDs move in the wind.</p>	<p><b>Name</b></p> <p>escape reflex</p>		<p><b>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</b></p> <p><b>IGNORE</b> innate / instinctive / learnt (as stated in Q)</p> <p><b>DO NOT CREDIT</b> negative chemotaxis <b>ACCEPT</b> taxes</p> <p><b>CREDIT</b> insight (learning) / latent (learning) / intelligent learning / <u>observational learning</u></p>
	<p>After a few days the sparrows start visiting the fruit bushes again, and do not fly away even when the CDs move.</p>	<p>habituation</p>		
	<p>Carrot flies move towards chemicals released by carrot plants.</p>	<p>(positive chemo-) taxis</p>		
	<p>Raccoons learn to remove lids from containers of grain in a barn.</p>	<p>operant conditioning / trial and error (learning)</p>		
	<p>A line of young chicks follow their mother into a cornfield.</p>	<p>imprinting</p>		
	<b>Total</b>		<b>5</b>	
	<b>Total</b>		<b>15</b>	

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(b)	<p>respiration / decomposition / decay / ripening ;</p> <p><u>interspecific competition</u> ;</p> <p>(positive) <u>phototropism</u> ;</p> <p><u>succession</u> ;</p>	4	<p>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</p> <p>ACCEPT metabolism / metabolic reactions</p> <p>DO NOT CREDIT negative phototropism</p> <p>DO NOT CREDIT trophism (as ambiguous with trophic)</p>																		

Question	Answer	Marks	Guidance
(c)	<p><i>animals = primary consumers</i></p> <ol style="list-style-type: none"> <li>1 keep animals, warm / indoors ;</li> <li>2 reduce animal movement ;</li> <li>3 feed animals high, protein / energy, food ;</li> <li>4 vaccination / (routine) antibiotics, for animals ;</li> <li>5 selective breeding / genetic engineering, for improved animals ;</li> <li>6 slaughter just before, mature / full size ;</li> </ol>	3	<ol style="list-style-type: none"> <li>2 <b>ACCEPT</b> zero grazing idea</li> <li>3 <b>ACCEPT</b> growth-enhancing food additives</li> <li>4 <b>IGNORE</b> hormones</li> <li>5 <b>ACCEPT</b> description of improvement, e.g. disease resistant, faster-growing, higher yielding</li> </ol>
	<b>Total</b>	<b>15</b>	

Question	Answer	Marks	Guidance
2 (a)	<p>1 <u>geographical</u>, isolation / separation / barrier ;</p> <p>2 <i>idea of reproductive isolation ;</i></p> <p>3 different , <u>selection pressures</u> / adaptations (on different islands) ;</p> <p>4 small , populations / gene pools ;</p> <p>5 <i>idea of mp 4</i> resulting in founder effect ;</p> <p>6 <i>idea of mp 4</i> resulting in greater <u>genetic drift</u> ;</p>	2	<p>1 <b>IGNORE</b> allopatric speciation</p> <p>2 e.g. no / less , interbreeding between different , populations (early) / species (late)</p> <p>3 <b>IGNORE</b> different to mainland <b>ACCEPT</b> in different environments or conditions they evolve or adapt differently</p> <p>4 <b>DO NOT CREDIT</b> small species</p> <p>5 <b>ACCEPT</b> <i>idea of mp 4</i> resulting in greater impact of , mutation / input of alleles (migration) / loss of alleles (accidents etc.)</p>
2 (b)	<p>(i) 681 ; ;</p>	2	<p><b>Correct answer = 2 marks</b> even if no working shown</p> <p><i>Expected working</i>  <math>125\,000 - 16\,000 = 109\,000</math>  <math>(109\,000 \div 16\,000) \times 100 = 681\%</math></p> <p>If answer not rounded or rounded incorrectly  <b>ACCEPT</b> e.g. 682 <b>or</b> 681.3 <b>or</b> 681.25 for <b>1 mark</b></p> <p>If the final answer is incorrect <b>and</b> no mark was awarded for a figure close to correct value,  <b>ACCEPT</b> the figure 109 000 in the working  <b>or</b> 125 000 – 16 000 for <b>1 mark</b>.</p>

Question	Answer	Marks	Guidance
2 (b)	<p>1 <u>habitat / ecosystem</u> , disturbance / destruction ;</p> <p>2 (land used for) (named) building / roads ;</p> <p>3 (land used for) agriculture / farming ;</p> <p>4 deforestation ;</p> <p>5 effect of (tourist) , boats / divers, described ;</p> <p>6 more / increased , <u>pollution</u> ;</p> <p>7 sewage / eutrophication , in sea / water ;</p> <p>8 oil / fuel , spill in sea ;</p> <p>9 (humans) hunting / collecting / (over-) fishing ;</p> <p>10 competition from introduced species ;</p> <p>11 predation / overgrazing , by introduced species ;</p> <p>12 (new / named) , diseases / pathogens, introduced ;</p> <p><b>QWC</b> – linking <b>TWO</b> ecological pressures above to <b>TWO</b> examples of affected species ;</p>	6	<p>2 e.g. houses, schools, factories <b>ACCEPT</b> urbanisation and development for tourism</p> <p>4 <b>ACCEPT</b> description e.g. cutting down trees / logging</p> <p>9 <b>CREDIT</b> poaching / green sea turtles caught in fish nets</p> <p>10 <b>CREDIT</b> nest / egg , trampling by introduced species</p> <p>12 <b>CREDIT</b> West Nile virus / avian malaria / bird flu</p>
		1	<p>Two Galapagos animals or plants named in context.  e.g. ● (marine / land) iguana, (lava) lizard, (ground) finch (mp11 predation by cats)  ● rock purslane (mp11 overgrazing by goats)  ● (giant) tortoise (mp9 hunting, mp10 competition from goats)  ● whale / seal / named fish / sea cucumber (mp9 hunting)  ● <u>Scalesia</u> tree (mp4 deforestation, mp10 competition from red quinine tree)  ● (blue-footed) boobies (mp11 predation by rats)</p>



Question	Answer	Marks	Guidance
2 (c)	<p><i>economic</i> fewer jobs / smaller profits / business closure / reduced tourism / less income / less revenue ;</p> <p><i>ethical</i> question of , humane killing / animal suffering or people suffer through losing their , homes / friends / jobs ;</p>	2	<p><b>IGNORE</b> economic loss</p> <p><b>IGNORE</b> right to life arguments</p>
	<b>Total</b>	<b>13</b>	

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3	<p>1 E ;                    2 C ;</p> <p>3 B ;                    4 given</p> <p>5 F ;                    6 A ;</p> <p>7 G ;                    8 D ;</p>	7	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p>
	<b>Total</b>	<b>7</b>	

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8 (a)	<p><i>producer</i> (leaves / plants) fix carbon / photosynthesise / make food / autotroph(ic) / convert light energy to chemical energy / convert inorganic, C / CO<sub>2</sub>, to organic molecules ;</p> <p><i>consumer</i> (bird) eat / derives energy from / feeds on , other organisms</p> <p>or heterotroph(ic) ;</p> <p><i>trophic level</i> stage / position / place / level , in a food , chain / web ;</p>	3	<p><b>IGNORE</b> 'first level in a food chain' <b>DO NOT CREDIT</b> 'produces energy'</p> <p><b>IGNORE</b> 'consumes' <b>IGNORE</b> named levels / organisms e.g. eats producers <b>ACCEPT</b> animals, and / or, plants</p> <p><b>IGNORE</b> step, feeding level</p>
8 (b) (i)	<p>number of quadrats (per area) ; method of placing quadrats (randomly) ; time waiting , after solution added / for worms to rise ; <u>volume</u> of solution ; <u>concentration</u> of solution ; AVP ;</p>	2	<p><b>CREDIT</b> any two correct answers</p> <p><b>IGNORE</b> ref to quadrats being the same size (as given in Q)</p> <p><b>IGNORE</b> amount</p> <p>e.g. method of applying solution length of time spent counting time of day / light intensity soil moisture / rainfall / humidity method to ensure no double counting</p>

Question	Answer	Marks	Guidance
8 (b) (ii)	means different / mean less in soil with plants removed ;  (but) error bars overlap ;  (could have) mean trend reversed / equal numbers in some pairs of results ;  difference, not / less , valid ;	2	<b>DO NOT CREDIT</b> if difference in mean stated to be valid <b>IGNORE</b> average  <b>ACCEPT</b> cross (over)  e.g. in any pair of results you could find that the number of earthworms in the cleared soil could be higher than in the uncleared soil  <b>ACCEPT</b> introductory statement ' No it is not'.
8 (b) (iii)	number / abundance , of earthworms varies , from year to year / from 2004 to 2006 / over the two years / over time ;  number / abundance , of earthworms varies , before and after plant clearance / as vegetation changes / during succession ;	2	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>  <b>ACCEPT</b> change described e.g. more worms in 2006 than 2004  If neither mark point awarded <b>ACCEPT</b> numbers of earthworms constantly , changing / fluctuating for 1 mark
	<b>Total</b>	<b>9</b>	

Question	Answer	Mark	Guidance
5 (a) (i)	succession ;	1	FA IGNORE primary / secondary
(ii)	<u>mineral</u> content ; acidity / pH ; water depth;	2	FA
(b)	<i>similarity</i> chlorophyll breaks down / leaves change colour ; <i>differences</i> (bog) minerals stay in plant / (forest) minerals in soil ; <b>ora</b> decomposers / fungi / bacteria , not, present / active in bog ; <b>ora for forest</b>	1	FA for similarity  <b>Mark first two answers for differences</b>
(c)	decomposers / named decomposers, not, present / active ; waterlogging reduces, air / oxygen ; acidity / low pH , stops (decay) enzymes working ;	2 max	<b>ACCEPT</b> named mineral ions in words or correct symbols <b>ACCEPT</b> decomposers / fungi / bacteria, break down leaves in forest  <b>ACCEPT</b> (soil), bacteria / fungi / microbes can't survive or few can survive <b>CREDIT</b> waterlogging produces anaerobic conditions
(d)	bog / habitat / ecosystem, takes a long time to form / hard to replace ; loss of, biodiversity / rare species ;	2	<b>ACCEPT</b> peat bogs maintain biodiversity
	<b>Total</b>	<b>10</b>	

Question	Answer	Mark	Guidance
6	(a)	1	ACCEPT ora - smaller territory / smaller distance = higher predation DO NOT CREDIT descriptions wrong way round
	(ii)	2 max	IGNORE weasel population size ACCEPT keeps great tit numbers moderate
	(b)	2	IGNORE reliable, precise, accurate CREDIT 'as a valid control' = 2 marks IGNORE intraspecific competition
	(ii)	2 max	ACCEPT description e.g. barnacles / mussels, eat food of, limpets / chitons IGNORE food
	(iii)	2 max	IGNORE 'sponge population decreases' alone (as given in question) CREDIT nudibranchs <b>only</b> feed on sponges
		<b>Total</b>	<b>9</b>

Question		Answer	Marks	Guidance
3	(a)	(i) <u>ecology</u> ;	1	<b>First Answer</b>
		(ii) abiotic ;	1	<b>First Answer</b>
		(iii) <u>ecosystem</u> ;	1	<b>First Answer</b>
	(b)	(interspecific) <u>competition</u> ; species 1 <u>and</u> species 2 named ; description of interaction ;  <u>trophic</u> / predator-prey / predation / parasitism / grazing / herbivory ; species 1 <u>and</u> species 2 named ; description of interaction ;  mutualistic / mutualism ; species 1 <u>and</u> species 2 named ; description of interaction ;	6	<b>Mark the first suggestion on each numbered line only, max 3 for each, therefore max 6 overall.</b> <b>ACCEPT</b> English or scientific names for species (genus name alone acceptable and does not need capital letter) and accept phonetic spelling. <b>DO NOT ACCEPT</b> intraspecific  eg eat, same / named, food OR occupy same niche 'Red and grey squirrels compete for the same food' = 3 marks  <b>IGNORE</b> grass, worms,  <b>ACCEPT</b> symbiosis / symbiotic / commensalism <b>IGNORE</b> legumes and nitrogen-fixing bacteria if no species identified eg could include pollination, seed dispersal

Question	Answer	Marks	Guidance
(c) (i)	<p>auxin / IAA ;            (positive) <u>phototropism</u> ;            plants / shoots, bend towards light ;            etiolation / plants grow taller ;            climbing plants climb, up / over, other plants ;            (positive) <u>thigmotropism</u> / sense of touch ;            grow roots towards, water / minerals ;            allelopathy / description ;</p>	4 max	<p><b>IGNORE</b> other named hormones  <b>IGNORE</b> apical dominance  <b>DO NOT ACCEPT</b> phototropic / thigmotropic (but penalise once)  <b>IGNORE</b> move, grow</p> <p><b>IGNORE</b> nutrients</p>
(ii)	<p>less auxin / auxin production stopped ;  <u>apical dominance</u>, stopped / removed ;            side shoots grow / lateral buds develop / ora ;            plant becomes bushy ;</p>	3 max	<p><b>CREDIT</b> axillary buds  <b>IGNORE</b> side leaves</p>

Question	Answer	Marks	Guidance
(d)	<p>1 tape measure / rope, laid ;</p> <p>2 line / belt, <u>transect</u> ;</p> <p>3 continuous / interrupted / AW ;</p> <p>4 (use quadrat to) record percentage cover of plants ;</p> <p>5 (use quadrat with) ACFOR scale ;</p> <p>6 point quadrat use described ;</p> <p>7 use of key to identify species ;</p> <p>8 data recording sheets prepared in advance ;</p> <p>QWC – sequencing of steps in procedure ;</p>	5 max	<p>3 record all species touching line = continuous line quadrats end to end = continuous belt OR at selected intervals only = interrupted</p> <p>4 <b>ACCEPT</b> description = number of squares with species (&gt;half covered)</p> <p>5 <b>DO NOT ACCEPT</b> record abundance</p>
	<b>Total</b>	<b>1</b>	One point from <b>1 - 3</b> before a point from <b>4 to 8</b>
		<b>22</b>	



Question	Expected Answers	Marks	Additional Guidance
In ALL questions	<p><b>CREDIT AW FOR ALL</b> i.e. credit any alternatively worded statement that conveys the same sense as the mark point. If a particular word is essential and no other will do it is underlined.</p> <p><b>IGNORE</b> wrong or vague statements unless they <b>directly contradict</b> a mark point. e.g. in Q1(a)(i) mark point 1: Therefore penalise <i>‘plants eat sheep’</i> (<b>CON</b>) but ignore <i>‘sheep absorb plants by phagocytosis’</i> (wrong) or <i>‘sheep make use of plants’</i> (vague).</p> <p><b>ACCEPT</b> incorrect spellings if they are recognisable and sound the same when pronounced, <b>even for underlined terms</b>.</p>		
<b>1</b>	<p><b>Expected Answers</b></p> <p><b>1</b> (sheep / animals) ingest / consume / eat / feed on (grass / plants) ;</p> <p><b>2</b> digest / hydrolyse , (protein) to amino acids ;</p> <p><b>3</b> amino acids move <b>into</b> , blood / cells ;</p> <p><b>4</b> synthesis of <u>proteins</u> / <u>translation</u> ;</p>		<p><b>Additional Guidance</b></p> <p><b>2</b> <b>ACCEPT</b> break down <b>IGNORE</b> enzymes</p> <p><b>3</b> <b>ACCEPT</b> amino acids are absorbed into , blood / cells <b>CREDIT</b> AW description of movement e.g. diffusion / active transport but <b>DO NOT CREDIT</b> movement by osmosis</p>
<b>1</b>	<p><b>Expected Answers</b></p> <p><b>1</b> death / leaf loss ;</p> <p><b>2</b> decomposition / decay ;</p> <p><b>3</b> excretion / urination / described ;</p> <p><b>4</b> egestion / defaecation / described ;</p>	<b>3 max</b>	<p><b>3</b> <b>IGNORE</b> faeces in the context of mp3 but do not then credit mp4 as a description therefore <i>‘excretion of faeces’</i> scores mp3 only <b>IGNORE</b> waste matter <b>4</b> <b>IGNORE</b> waste matter</p>

Question	Expected Answers	Marks	Additional Guidance
1 (a) (iii)	<p>1 C is <i>Nitrosomonas</i> ;</p> <p>2 D is <i>Nitrobacter</i> ;</p> <p>3 C and D are <u>nitrifying</u> bacteria ; for mps 1, 2 and 3 internal max 2</p> <p>4 plants need nitrates to make , amino acids / protein(s) / enzymes / DNA / RNA / nucleic acids / chlorophyll / cytoplasm / new cells ;</p>	3	<p>Full marks can only be awarded if mp 4 awarded</p> <p>1 &amp; 2 <b>ACCEPT</b> “they are <i>Nitrosomonas</i> and <i>Nitrobacter</i>” = 2 marks (correct order) “they are <i>Nitrobacter</i> and <i>Nitrosomonas</i>” = 1 mark (wrong order)</p> <p>4 <b>IGNORE</b> plants need nitrates to grow (as given in Q)</p>
1 (a) (iv)	<p>1 E continues / plants use nitrate ;</p> <p>2 less / no , B / decay ;</p> <p>3 less / no , C / D / recycling of nitrogen / nitrification ;</p> <p>4 (cabbages) harvested / removed ;</p>	3 max	<p><b>IGNORE</b> references to other letters throughout</p> <p>2 <b>ACCEPT</b> cabbages do not rot down</p>

Question	Expected Answers	Marks	Additional Guidance
1 (a) (v)	<p>1 legume / any named leguminous plant ;</p> <p>2 <i>Rhizobium</i> / nitrogen-fixing bacteria (in root nodules) ;</p> <p>3 idea of converting nitrogen gas / N<sub>2</sub>, into , compounds / ammonium / ammonia / amino acids / protein (in plants) ;</p> <p>4 plants ploughed in / plants left to decay / ref B / ref C / ref D ;</p>	3 max	<p>1 CREDIT English or Latin name. Examples include but are not limited to: pea (<i>Pisum</i>) / bean (<i>Phaseolus</i> or <i>Vicia</i>) / vetch (<i>Vicia</i>) / soya (<i>Glycine</i>) / chickpea (<i>Cicer</i>) / peanut (<i>Arachis</i>) / alfalfa, lucerne or medick (<i>Medicago</i>) / clover or trefoil (<i>Trifolium</i>) / lupin (<i>Lupinus</i>) / <i>Leucaena</i> / <i>Cyamopsis</i> / <i>Sesbania</i> IGNORE names of non-leguminous plants, therefore 'plant legumes such as cucumbers' scores mp 1</p> <p>3 the nitrogen must be clearly gaseous IGNORE nitrite / nitrate (because not made in plant)</p>
1 (b)	<p>1 genetic resource / gene bank / have (different) alleles ;</p> <p>2 for, genetic engineering / genetic modification / artificial selection / selective breeding / described ;</p> <p>3 if conditions change / in the future ;</p> <p>4 example of useful trait ;</p> <p>5 to maintain , biodiversity / genetic diversity / (large) gene pool ;</p>	2 max	<p>IGNORE biotourism</p> <p>1 IGNORE source of genes</p> <p>3 IGNORE unless context is genetic more or better quality wool or meat</p> <p>4 e.g. disease resistance (<b>not immunity</b>) / hardiness / An animal need <b>not</b> be named but if it is it should be a farm animal e.g. sheep / cows / goats / pigs / poultry</p> <p>5 CREDIT ORA to prevent loss of genetic diversity IGNORE to prevent extinction / to increase biodiversity</p>

Question	Expected Answers	Marks	Additional Guidance
1 (c) (i)	mutation / described ; <u>selection</u> / <u>selection</u> pressure / <u>selective</u> advantage ;	2	1 <b>ACCEPT</b> new or different allele formed / DNA changed 2 <b>IGNORE</b> type of selection
1 (c) (ii)	1 small , population / gene pool ; 2 ref. inbreeding / genetic drift ; 3 unusual diet / cannot eat grass / poisoned by grass / must eat seaweed ; 4 may not be commercially viable / expensive to keep ;	2 max	1 <b>CREDIT</b> lack of genetic , variability / variety 2 <b>CREDIT</b> founder effect 3 Mark point must relate to diet
		<b>20</b>	

Question	Expected Answers	Marks	Additional Guidance
4 (a) (i)	57 / 57.3 ; ;	2	<b>Award 2 marks for a correct answer</b> <b>ACCEPT</b> 57.25 for 2 marks If answer is incorrect then allow 1 working mark for 655 – 280 or for seeing 375 anywhere in the working
4 (a) (ii)	<p><i>description (D)</i></p> <p><b>D1</b> number of, waders / birds, decrease (in area 2) ;  <b>D2</b> (numbers decrease) in , all / four , species ;  <b>D3</b> unlike / different to ,              area 1 / where hedgehogs absent ;  <b>D4</b> (area 1) two species increase /              only two species decrease ;  <b>D5</b> quote any two % change figures ;</p> <p><i>explanation (E)</i></p> <p><b>E1</b> hedgehogs are , secondary consumers / 'predators' ;  <b>E2</b> hedgehogs , stop birds breeding /              reduce offspring (one year) ;  <b>E3</b> <i>idea of fewer</i> , new adults / breeders (next year) ;  <b>E4</b> <i>idea of more deaths</i> than 'births' ;</p>	<p><b>D1</b> <b>CREDIT</b> 'it' as number <b>ACCEPT</b> 'amount'  <b>D2</b> <b>CREDIT</b> the four names if all said to decrease  <b>D4</b> <b>CREDIT</b> lapwing and redshank increase /              only dunlin and snipe decrease  <b>D5</b> Percentage change figures:              area 1   area 2              lapwing   +24   -31              redshank   +51   -41              dunlin       -31   -56              snipe       -10   -57              Look for ecf from 4(a)(i) if snipe in area 2 incorrect</p> <p><b>E1</b> <b>IGNORE</b> hedgehogs eat eggs as given in question  <b>E3</b> Look for idea of future / knock-on effect</p>	
		<b>6 max</b>	

Question	Expected Answers	Marks	Additional Guidance
4 (a) (iii)	<ol style="list-style-type: none"> <li>1 plenty of / enough , food / birds' eggs / space ;</li> <li>2 breed rapidly / breed successfully / young survive ;</li> <li>3 no / few , predators ;</li> <li>4 few die (young / before breeding) ;</li> <li>5 <i>idea that hedgehogs are introduced species ;</i></li> <li>6 <i>invasive / fill vacant niche / not reached carrying capacity ;</i></li> <li>7 these hedgehogs restricted to island ;</li> <li>8 cannot , emigrate / leave island (so numbers build up) ;</li> </ol>	4 max	<p>Mark the first suggestion on each numbered line. Award 1 mark for a factor and a further mark for a related explanation</p> <p>1 CREDIT little competition for food</p>
4 (b)	<p><i>idea that the following may be ethically wrong</i></p> <ol style="list-style-type: none"> <li>1 killing hedgehogs ;</li> <li>2 letting hedgehogs , kill / decrease number of , waders ;</li> <li>3 introducing hedgehogs to island (upset the ecosystem) ;</li> <li>4 catching / moving , hedgehogs might cause suffering ;</li> <li>5 doing nothing ;</li> </ol>	3 max	<p>CREDIT ORA <i>idea preventing these is ethically right</i> IGNORE 'right to life' and 'playing God'</p> <p>2 CREDIT ORA need to conserve waders</p> <p>4 '<i>the other methods are cruel</i>' = 1 mark (mp 4) <i>'moving hedgehogs elsewhere causes problem somewhere else'</i> = 1 mark (mp 4)</p> <p>5 CREDIT ORA idea of human responsibility</p>
		15	

Question	Expected Answers	Marks	Additional Guidance
7 (a)	<p>(i)</p> <p>1 sweep netting / sweep vegetation with a net ;            2 beating / beat trees and bushes ;            3 pooter / pooting / described ;</p>	1 max	<p>2 ACCEPT fogging            3 ACCEPT pitfall traps / described</p>
7 (a)	<p>(ii)</p> <p><i>idea of ladybirds not evenly distributed /</i>            some parts of hill different /            more representative ;            lets <u>reliability</u> be assessed / anomalies identified ;</p>	1 max	<p>ACCEPT description            e.g. could be more ladybirds one side than another</p> <p>ACCEPT increases reliability            IGNORE accuracy / precision / removes anomalies</p>
7 (b)	<p>(i)</p> <p>M1 (calculate) % / proportion / ratio ;            E1 as different total numbers at each site ;            or            M2 (draw) bar chart / kite diagram ;            E2 pictorial data easier to understand ;</p>		<p>M1 IGNORE <math>\chi^2</math></p> <p>M2 IGNORE histogram / line graph</p>

Question	Expected Answers	Marks	Additional Guidance
7 (b) (ii)	<p><i>yes (for first statement)</i></p> <ol style="list-style-type: none"> <li>1 first statement true / correlation exists ;</li> <li>2 number of black ladybirds increase , from 100m to 300m / until 300m ;</li> <li>3 400m number decrease <b>but</b> % black increases ;</li> </ol> <p><i>no (for second statement)</i></p> <ol style="list-style-type: none"> <li>4 correlation not proof of causation / no proof of causal link / second statement not (necessarily) true ;</li> <li>5 another (named) factor could be involved ;</li> </ol>	3 max	<p>If candidates argues 'yes' exclusively, can only be awarded mps 1-3</p> <p>If candidate answers 'no' exclusively, can only be awarded mps 4 &amp; 5</p> <p><i>Note percentage of black ladybirds increases as you go up the hill = 2 marks (mps 2 &amp; 3)</i></p> <p>5 <b>CREDIT</b> could be due to distance from town / more or less predation high up / camouflage / warning colours</p>
7 (c) (i)	<p>only expressed , when homozygous / in absence of dominant (allele) ; not expressed when heterozygous / expression masked by dominant (allele) ;</p>	1 max	<p><b>DO NOT CREDIT gene</b></p> <p><b>IGNORE letters / genotypes</b></p> <p><b>ACCEPT only seen in phenotype when it is present in 'double dose'</b></p>



Question	Expected Answers	Marks	Additional Guidance
7 (c)	<p>1 <math>q^2 = 296 / 346</math> or <math>0.85 / 0.855 / 0.86</math> ;</p> <p>2 <math>q = \sqrt{\text{previous answer}}</math> or <math>0.92 / 0.93</math> ;</p> <p>3 <math>p = 1 - \text{previous answer}</math> or <math>0.08 / 0.07</math> ;</p>		<p>1 <b>DO NOT CREDIT</b> calculation or figure unless it has been indicated as <math>q^2</math></p> <p>2 <b>ACCEPT</b> ecf</p> <p>3 <b>ACCEPT</b> ecf</p> <p><b>Note</b>  <b>If both p and q are correct = 3 marks</b>  <i>If p and q not given to 2 decimal places then penalise 1 mark and then apply ecf</i></p> <ul style="list-style-type: none"> <li>• If the 2 final answers add up to 1 give mp 3, then look for evidence of mps 1 or 2 in the working</li> <li>• If the 2 final answers do not add up to 1, look for evidence of mps 1, 2 &amp; 3 in the working</li> <li>• Award the working mark(s) if method correct, even if subsequent calculation incorrect (e.g. <math>1 - 0.54 = 0.56</math> could get mp 3 for '1 – previous answer' even though 0.56 is the incorrect answer for the calculation)</li> </ul> <p>e.g. <i>if black allele wrongly assumed to be recessive</i>  <math>q = 0.38</math> or <math>q = \sqrt{0.1445}</math> give mp 2 as ecf  <math>p = 0.62</math> or <math>p = 1 - 0.38</math> give mp 3 as ecf</p> <p>e.g. <i>if answer given as</i>  <math>q \approx 0.85</math> and <math>p \approx 0.15</math> give mp 3  They will not get mp 1 as they think that <math>296/346 = q</math> (rather than <math>q^2</math>) and so will not square root it so they won't get mp 2</p>
		3	
		11	

Question	Expected Answer	Mark	Additional Guidance																								
<p>3 (a)</p>	<p><i>climate - tropical versus temperate tropical has ...</i></p> <p>1 higher temperature / hotter ;                  2 more (sun)light / days longer ;                  3 photosynthesis faster ;                  4 <i>idea that</i>                  more storage of , organic molecules / biomass / energy                  or                  more formation of , organic molecules / biomass ;                  5 AVP ;</p> <p><i>vegetation - woodland or rainforest versus grassland(s) woodland or forest has ...</i></p> <p>6 <i>idea of</i> greater complexity / greater biodiversity / more niches ;                  7 competition for space less limiting ;                  8 AVP ;</p>	<p>4 max</p>	<p><b>CREDIT</b> reverse arguments for temperate</p> <table border="1" data-bbox="347 268 518 862"> <tr> <td></td> <td><i>tropical</i></td> <td><i>temperate</i></td> </tr> <tr> <td><i>temperature</i></td> <td>higher</td> <td>lower</td> </tr> <tr> <td><i>light intensity</i></td> <td>more</td> <td>less</td> </tr> <tr> <td><i>photosynthesis</i></td> <td>more</td> <td>less</td> </tr> <tr> <td><i>biomass made</i></td> <td>more</td> <td>less</td> </tr> </table> <p>eg</p> <ul style="list-style-type: none"> <li>• less seasonal change</li> <li>• faster , mineral cycling / decomposition</li> </ul> <p><b>CREDIT</b> reverse arguments for grassland</p> <table border="1" data-bbox="869 268 973 862"> <tr> <td></td> <td><i>wood</i></td> <td><i>grassland</i></td> </tr> <tr> <td><i>complexity</i></td> <td>more</td> <td>less</td> </tr> <tr> <td><i>competition</i></td> <td>less</td> <td>more</td> </tr> </table> <p>eg</p> <ul style="list-style-type: none"> <li>• greater , humidity / shelter</li> </ul>		<i>tropical</i>	<i>temperate</i>	<i>temperature</i>	higher	lower	<i>light intensity</i>	more	less	<i>photosynthesis</i>	more	less	<i>biomass made</i>	more	less		<i>wood</i>	<i>grassland</i>	<i>complexity</i>	more	less	<i>competition</i>	less	more
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<i>complexity</i>	more	less																									
<i>competition</i>	less	more																									
<p>3 (b)</p>	<p>(bomb) calorimeter ;                  detail of technique ;                  detail of , measurement / analysis ;</p>	<p>2 max</p>	<p>eg</p> <ul style="list-style-type: none"> <li>• known / dry , mass of (organic material) (material) burnt in oxygen</li> </ul> <p>eg</p> <ul style="list-style-type: none"> <li>• temperature rise of water measured</li> <li>• known volume of water</li> <li>• calculation described / converted to kJ</li> </ul>																								

Question	Expected Answer	Mark	Additional Guidance
3 (c) (i)	(perch) 22 ; (cow) 1 ;	2	
3 (c) (ii)	1 higher in bobcat / lower in cow ; <i>for bobcat</i> 2 more (energy) absorbed ; <b>ora</b> 3 less (energy / waste) egested ; <b>ora</b> 4 correct comparative figs. quoted from table ; 5 meat more digestible ; <b>ora</b> 6 mainly protein and fat ; 7 contains no <u>cellulose</u> ; <b>ora</b>	3 max	1 <b>DO NOT CREDIT</b> figs alone <b>IGNORE</b> refs to grasshopper and perch <b>ALLOW</b> ecf if cow calculated as > 6 in (i) 2 3 4 bobcat 83(%) <u>and</u> cow 40(%) (absorbed) <b>or</b> bobcat 17(%) <u>and</u> cow 60(%) (egested) 5 6 7
3 (c) (iii)	1 <u>grasshopper</u> ; 2 <i>idea of</i> high conversion to biomass figure ; 3 <i>idea of</i> herbivore / primary consumer / low(er) trophic level than perch ; 4 <i>idea of</i> more food available ; 5 <i>idea of</i> one stage of energy loss in food chain not two / more energy passes through food chain (to humans) ;	3 max	If perch is suggested, candidate can only access mp 2 = max 1 If bobcat or cow suggested, then = 0 1 2 <b>ACCEPT</b> ref to more energy accumulated in body <b>ACCEPT</b> mp2 in context of perch for max 1 3 4 5
	<b>Total</b>	<b>14</b>	

Question	Expected Answer	Mark	Additional Guidance
6 (a)			<b>Mark the first answer on each prompt line for all parts of (a).</b> If an additional answer is given that is incorrect or contradicts the correct answer, then = 0
6 (a)	(i) <u>tropism(s)</u> ;	1	<b>ACCEPT</b> phonetic spelling <b>IGNORE</b> named tropism eg phototropism
6 (a)	(ii) (plant) hormone / growth substance / growth regulator / pgr ;	1	
6 (a)	(iii) <u>deciduous</u> ;	1	
6 (a)	(iv) <u>conservation</u> ;	1	<b>DO NOT CREDIT</b> preservation
6 (a)	(v) decomposer(s) ;	1	<b>ACCEPT</b> saprotroph / saprophyte / saprobiont <b>IGNORE</b> fungi / bacteria <b>DO NOT CREDIT</b> detritivore
6 (a)	(vi) nitrogen fixation ;	1	<b>ACCEPT</b> nitrogen fixing <b>DO NOT CREDIT</b> nitrogen fixing bacteria
6 (b)	(i) stimulus identified ; organism named <b>and</b> normal response described ; response , stops / lessens , after repeated stimulation / over time ;	3	eg ● touch eg ● sea anemone withdrawing tentacles ‘learning to ignore’ is not quite enough
6 (b)	(ii) organism named <b>and</b> voluntary behaviour described ; reinforcer / reward / punishment , identified ; behaviour , increases (for reward) / decreases (for punishment) , in frequency ;	3	eg ● dog begging eg ● food reward / treat

<b>Mark Scheme</b> Page 9 of 10	<b>Unit Code</b> <b>2804</b>	<b>Session</b> June	<b>Year</b> 2004	<b>Version</b> Final
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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
6 (a)	starts with, uncolonised area / bare ground / bare rock / AW; reference to pioneer species; organisms modify environment / soil development; series of recognisable stages / seres / AW; progresses to, climax community / woodland;	2 max
(b)	<ol style="list-style-type: none"> <li>1 identify <u>species</u> present;</li> <li>2 use of <u>keys</u>;</li> <li>3 from, strand line / sea, to woodland; <b>A</b> other named habitat;</li> <li>4 use, tape / string, to mark out line;</li> <li>5 carry out (belt or line) <u>transect</u>;</li> <li>6 interrupted sampling / AW;</li> <li>7 use (frame / open) <u>quadrat</u>;</li> <li>8 ref to ideal size of quadrat / size changing in different parts of transect;</li> <li>9 placed randomly within (belt) transect;</li> <li>10 estimate percentage cover;</li> <li>11 use, ACFOR / abundance scale;</li> <li>12 use point quadrat; <b>A</b> pin quadrat</li> <li>13 mechanics of use;</li> <li>14 number touches on each species proportional to percentage cover;</li> <li>15 method for capturing animals;</li> <li>16 ref to capture mark recapture / estimating abundance of animal species;</li> <li>17 suitable graphical representation; e.g. kite diagram</li> <li>18 AVP; e.g. repeat for reliability ref to calculating species density / species frequency</li> </ol>	7 max
	<b>QWC – clear, well organised using specialist terms;</b>	1
		<b>[Total: 10]</b>