

Question		Answer	Marks	Guidance
1	(a)	<p>1 <math>\frac{\text{herbivore / primary consumer, energy}}{\text{producer energy}} \times 100</math> ;</p> <p><b>Plus any 3 of the following:</b></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 <b>and</b> herbivore ;</p> <p>7 use of calorimeter / described;</p>	<p>4 max</p>	<p>1 <b>CREDIT</b>  <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>  <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 <b>1 mark</b></p> <p>5 <b>ACCEPT</b> wet / fresh, mass  5 <b>IGNORE</b> mass unqualified / pyramids of biomass</p> <p>6 <b>ACCEPT</b> expressed as J/KJ/MJ, per gram  <b>IGNORE</b> calories per gram</p> <p>7 e.g. burn sample, in oxygen / in measure temperature increase  <b>ACCEPT</b> use of published tables for energy values of, fresh /wet, mass</p>

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1	(c)				<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><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</u> learning</p>
		<b>Description</b>	<b>Name</b>		
		Sparrows initially fly away from fruit bushes on which shiny CDs are hung, particularly when the CDs move in the wind.	escape reflex	;	
		After a few days the sparrows start visiting the fruit bushes again, and do not fly away even when the CDs move.	habituation	;	
		Carrot flies move towards chemicals released by carrot plants.	(positive chemo-) taxis	;	
		Raccoons learn to remove lids from containers of grain in a barn.	operant conditioning / trial and error (learning)	;	
A line of young chicks follow their mother into a cornfield.	imprinting	;			
			<b>Total</b>	<b>5</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><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> <p><b>ACCEPT</b> metabolism / metabolic reactions</p> <p><b>DO NOT CREDIT</b> negative phototropism  <b>DO NOT CREDIT</b> trophism (as ambiguous with trophic)</p>																			

Question		Answer	Marks	Guidance
	(c)	<p><i>animals = primary consumers</i></p> <p>1 keep animals, warm / indoors ;</p> <p>2 reduce animal movement ;</p> <p>3 feed animals high, protein / energy, food ;</p> <p>4 vaccination / (routine) antibiotics, for animals ;</p> <p>5 selective breeding / genetic engineering, for improved animals ;</p> <p>6 slaughter just before, mature / full size ;</p>	3	<p>2 <b>ACCEPT</b> zero grazing idea</p> <p>3 <b>ACCEPT</b> growth-enhancing food additives</p> <p>4 <b>IGNORE</b> hormones</p> <p>5 <b>ACCEPT</b> description of improvement, e.g. disease resistant, faster-growing, higher yielding</p>
		<b>Total</b>	<b>15</b>	

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

Question		Answer	Mark	Guid
4	(a) (	succession ;	1	<b>FA</b> <b>IGNORE</b> primary / secondary
	(ii)	<u>mineral</u> content ; acidity / pH ; water depth;	2	<b>FA</b>
	(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    2	<b>FA for similarity</b>  <b>Mark first two answers for differences</b>  <b>ACCEPT</b> named mineral ions in words or correct symbols <b>ACCEPT</b> decomposers / fungi / bacteria, break down leaves in forest
	(c)	decomposers / named decomposers, not, present / active ;  waterlogging reduces, air / oxygen ;  acidity / low pH , stops (decay) enzymes working ;	2 max	<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>	