
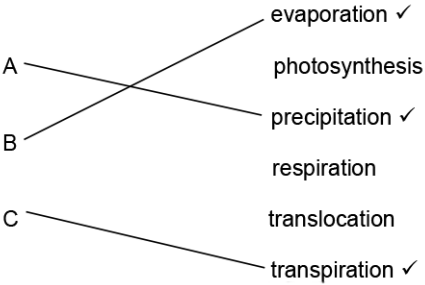





Mark scheme – Ecosystems (H)


Question		Answer/Indicative content	Marks	Guidance
1		D ✓	1 (AO2.2)	
		Total	1	
2		D ✓	1 (AO1.1)	
		Total	1	
3		D ✓	1 (AO2.1)	
		Total	1	
4		B	1 (AO 1.1)	<p><u>Examiner's Comments</u></p> <p>This AO1.1 question testing recall of mechanisms of energy losses in food chains, showed a clear area of misconception. In general, candidates chose either B or a significant number frequently put C and did not score.</p>  <p>Misconception</p> <p>Many candidates are unaware of the distinction between egestion and excretion.</p>
		Total	1	
5		B	1 (AO 1.2)	
		Total	1	
6	a		3 (AO3x1.1)	<p>Each correct line = 1 mark</p> <p>DO NOT ALLOW more than 1 line from each letter</p>
	b	prevents lake drying out / replenishes lake water / washes minerals into the lake ✓	1 (AO1.1)	<p>ALLOW idea of lack of water in lake causing harm to organisms that live in the water / will provide organisms with sufficient/enough water to live in</p> <p>ALLOW idea of providing organisms with dissolved oxygen</p> <p>IGNORE will provide organisms with more water</p> <p>IGNORE nutrients</p>

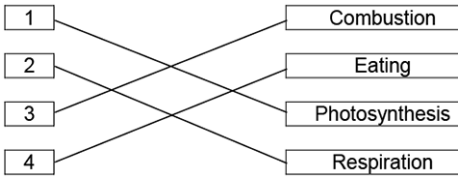
			Total	4								
7	a	<table border="1"> <tr> <td>bacteria in the compost kill disease causing fungi</td> <td></td> </tr> <tr> <td>the compost is sterile and so is aseptic</td> <td></td> </tr> <tr> <td>the compost provides carbon dioxide for photosynthesis</td> <td></td> </tr> <tr> <td>the compost provides minerals for the plants</td> <td>✓</td> </tr> </table>	bacteria in the compost kill disease causing fungi		the compost is sterile and so is aseptic		the compost provides carbon dioxide for photosynthesis		the compost provides minerals for the plants	✓	1 (AO1.1)	more than one box ticked = 0 marks
bacteria in the compost kill disease causing fungi												
the compost is sterile and so is aseptic												
the compost provides carbon dioxide for photosynthesis												
the compost provides minerals for the plants	✓											
	b	<p>normal bin has holes to allow in air / oxygen ✓</p> <p>(making normal compost) so aerobic respiration occurs ✓</p>	2 (AO2.1) (AO1.1)	<p>ALLOW converse arguments for bokashi bin</p> <p>ALLOW aerobic bacteria carry out respiration</p> <p>IGNORE bacteria work aerobically</p>								
	c	used the same pile of dead plant material for both composters / used same plant type / used equal mass in both composters ✓	1 (AO2.2)	<p>ALLOW used the same time interval for both composters</p> <p>ALLOW used the same water/moisture content for both composters</p> <p>ALLOW idea of same external conditions e.g. put both in same place / external temperature kept the same / kept in the same environment</p> <p>IGNORE references to fair testing</p>								
	d	i	<p>Axes – both correctly labelled, including units ✓</p> <p>Axes - even scales occupying more than half of the grid ✓</p> <p>Plotting - all points correctly plotted ✓</p> <p>Line - lines labelled or a key ✓</p> <p>Line - points with curve of best-fit lines ✓</p>	5 (AO5 x 2.2)	<p>Must have time on x-axis and temperature on y-axis</p> <p>ALLOW +/- half a square at least 8 points correctly plotted</p> <p>IGNORE extrapolated lines</p>							
		ii	<p>temperature increased as compost decomposed / bacteria released heat by respiration ✓</p> <p>temperature starts to drop as decomposition slows down/complete / bacterial respiration slows ✓</p>	2 (AO2 x 2.1)	<p>ALLOW rise in temperature due to energy released by respiration ✓</p> <p>ALLOW bacterial activity slows (if respiration already mentioned)</p> <p>ALLOW temperature starts to drop as enzymes in respiration denature at high temperatures</p>							
		iii	<p>idea that decomposition in bokashi (method) bin much slower ✓</p> <p>anaerobic respiration releases less heat/energy than aerobic respiration ✓</p>	2 (AO2 x 2.1)	Enter text here.							

	e	i	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 27 (%) award 3 marks</p> <p>400 / 1500 x 100 ✓ 26.6 (%) ✓ = 27 (%) ✓</p>	<p>3 (AO2.2) (AO2.2) (AO1.2)</p>	<p>If answer = 26.6 (%) award 2 marks</p> <p>ALLOW ECF for correct rounding</p>
		ii	<p>idea that the gas given off is carbon dioxide ✓</p> <p>less greenhouse gas produced / less likely to result in global warming / less contribution to greenhouse effect ✓</p>	<p>2 (AO2.2) (AO3.1b)</p>	<p>ALLOW for 2 marks less carbon dioxide produced which is a greenhouse gas</p> <p>ALLOW correct formula</p> <p>ALLOW explanations of the greenhouse effect IGNORE references to environmental damage/not environmentally friendly/pollution/not good for the environment</p>
			Total	18	
8	a		<p>(the salt) will draw water out of the plant cells by osmosis ✓</p>	<p>1 (AO 2.1)</p>	<p>ALLOW plant cells will lose water and become plasmolysed IGNORE flaccid / dries the plant out</p> <p>Examiner's Comments</p> <p>On this AO2.1 question, even higher ability candidates found it challenging. Quite a few understood that water would be lost but did not mention osmosis or refer to the cells being plasmolysed. Many responses considered cell turgidity and possible lysis. Some even thought salt water was beneficial for providing the cells with minerals.</p>
	b	i	<p>FIRST CHECK ANSWER ON THE ANSWER LINE If answer = 0.1 (%) award 3 marks</p> <p>= 2.5 ✓</p> <p>$\frac{2.5}{2500} \times 100$ ✓ = 0.1 (%) ✓</p>	<p>3 (AO 1.2) (AO 2.2) (AO 1.2)</p>	<p>ALLOW ECF on area of quadrats</p> <p>ALLOW ECF</p> <p>Examiner's Comments</p> <p>This AO1.2 and AO2.2 question was generally answered well. Some candidates incorrectly rounded their answer and others did not multiply the area of 1 quadrat by 10, therefore using 0.25 instead of 2.5 in their calculation. Very few candidates scored zero, as often candidates were able to get marks for error carried forward. This emphasises the importance of candidates showing their working out.</p> <p>Exemplar 2</p> <p>$10 \times 50 = 2500$ $0.5 \times 0.5 = 0.25$</p> <p>$\frac{0.25}{2500} \times 100 = 0.01$</p> <p>Percentage =0.1..... % [3]</p>

				 <p>AfL</p> <p>In this exemplar, it shows how ECF was applied to incorrect responses.</p> <p>ECF was applied to the percentage calculation method with incorrect value for the area of the quadrats, then ECF for the percentage calculation value.</p> <p>This highlights how important it is for candidates to show their working out as the candidate would not have scored any marks if all they had put was 0.01 on the answer line, as it would not have been possible to apply ECF.</p>
	ii	<p>Any three from:</p> <p>the second student samples less area / ORA ✓</p> <p>the second student did not sample at random / only sampled in the centre of the marsh / ORA ✓</p> <p>the centre may contain different plants compared to the edges ✓</p> <p>so, idea that the second student's results may be less representative / less accurate / ORA ✓</p>	3 (AO 3.1b)	<p>ASSUME SECOND SAMPLE IF NOT STATED</p> <p>ALLOW only 5 quadrats taken / less repeats / less sample size / less data collected</p> <p>ALLOW the second student will not have results from all over the marsh / ORA</p> <p><u>Examiner's Comments</u></p> <p>The majority of candidates gained some marks on this AO3.1b question, with a minority gaining maximum marks. Most candidates were able to recognise that second student's method was not random and not representative of the entire marsh. Fewer commented on the fact that 5 quadrats cover less area than 10. Very few candidates observed that the plants would probably be different in different areas of the marsh.</p>  <p>AfL</p> <p>Candidates should be prepared to evaluate by processing information, graphs and diagrams before attempting answers, as this will help them construct responses that will cover the marks available in the question.</p>
	iii	<p>make sure the tide is not coming in / make sure that the marsh is stable enough / wash hands after the experiment ✓</p>	1 (AO 3.3b)	<p>ALLOW be aware of tide timetables/high tides</p> <p>ALLOW be safe as the tide is unpredictable</p> <p>ALLOW avoid falling into deeper marsh/slipping in mud</p> <p>IGNORE references to clothing</p> <p><u>Examiner's Comments</u></p> <p>This AO3.3 question targeted practical skills and specifically improvement of experimental procedures. Many candidates misunderstood 'risk assessment' and suggested things that could go wrong with experiment; 'losing the quadrats', 'damaging or killing plants/animals', etc. rather than health and safety.</p>

					<p>ALLOW salt marsh plants are rare</p> <p>ALLOW plants can be lost / extinct</p> <p>ALLOW loss of habitat for the animals that live there</p> <p>Examiner's Comments</p> <p>This AO3.2b question required suitable conclusions to be drawn from the evidence in the question. Many candidates realised a marsh is a rare environment and that plants that grow there would be lost if the sand banks were built. As the question mentions increased biodiversity, lower ability candidates incorrectly considered other, more general reasons linked to the sand banks, with a frequent response being 'it would cause flooding' or that 'it would be expensive'.</p>
	c		<p>salt marshes are rare habitats ✓</p> <p>they contain plants that do not live anywhere else ✓</p>	2 (AO 3.2b)	
			Total	10	
9	a	i	<p>feeds on seeds it is a primary (consumer) ✓</p> <p>feeds on insects, then it is a secondary (consumer) ✓</p>	2 (AO 2.1)	<p>ALLOW eats seeds which are the producer/first trophic level</p> <p>ALLOW eats insects which are the primary consumer</p> <p>ALLOW it feeds on seeds and insects if no other marks scored.</p> <p>IGNORE references to herbivores/carnivores/predators</p> <p>Examiner's Comments</p> <p>This AO2.1 question was generally well answered by most candidates. Some candidates did not match the appropriate terminology to the seed and insect correctly and did not score.</p> <p></p> <p>Misconception</p> <p>A small number of candidates have the misconception that a secondary consumer refers to the number of steps away from the producer and wrote that the great tit was a secondary consumer of leaves.</p>
		ii	<p>predator because it eats/kills pine martens ✓</p> <p>competitor (with pine martens) because they eat flycatchers/same prey ✓</p>	2 (AO 2.1)	<p>ALLOW pine martens are foxes prey</p> <p>ALLOW foxes hunt pine martens</p> <p>ALLOW competitor because pine martens also eat flycatchers</p> <p>Examiner's Comments</p> <p>Generally, candidates coped well with this AO2.1 question. A small number of candidates did not link the animal to the term and simply said foxes eat pine martens and</p>

				flycatchers, but generally most understood the terms and used them correctly in the context of the food web.
		iii	insect(s) / Great tits	1 (AO 1.1) Examiner's Comments Almost all candidates scored on this AO1.1 question. On the rare occasion that an incorrect response was given it was for flycatcher.
	b	i	<p>correctly chosen axes, labelled with units ✓</p> <p>suitable scale for the number of bird boxes ✓</p> <p>bars correctly drawn ✓</p> <p>suitable key ✓</p>	<p>4 (AO 2.2)</p> <p>height (m) must be on x-axis</p> <p>DO NOT ALLOW scale that use less than half the grid</p> <p>ALLOW +/- half a square</p> <p>IGNORE ?touching adjacent bars</p> <p>Examiner's Comments</p> <p>This AO2.2 question testing graphing skills was generally well answered. The majority of candidates drew a good chart with suitable scales and a key. A small but significant number did not label the axes with units</p>  <p>AfL</p> <p>Candidates, particularly those of lower ability, need practice at drawing graphs and representing information in ways that have strict rules about using rulers, the size of graphs and bars. This will maximise their opportunity to get full marks on questions like this one.</p>
		ii	<p>Any three from:</p> <p>great tits (nest) higher (in the trees) / ORA ✓</p> <p>this protects them from weasels who live mainly on the ground / ORA ✓</p> <p>idea flycatchers (nest) at all heights ✓</p> <p>as pine martens can move up and down/climb the tree ✓</p>	<p>3 (AO 3.2b)</p> <p>ALLOW weasels can't reach them/great tits</p> <p>ALLOW fewer great tits lower down as weasels eat them = 2</p> <p>ALLOW flycatchers can get killed anywhere in tree by pine marten</p> <p>IGNORE pine martens eat flycatchers and live in the trees</p> <p>Examiner's Comments</p> <p>Most candidates were able to link the preference for height of box in great tits to protection from a ground-dwelling predator in this AO3.2b question analysing information and ideas to draw conclusions. Although many candidates could link the location of the great tits due to the weasel predator being on the ground, only a few candidates were able to explain the results for the flycatchers.</p>
			Total	12

1 0	a	 <p>✓✓</p>	2 (AO 1.1)	<p>ALLOW numbers matched to correct boxes All 4 lines correct = 2 marks 2 or 3 lines correct = 1 mark 1 or 0 lines correct = 0 mark</p> <p>Examiner's Comments</p> <p>Most candidates scored on this AO1.1. On the rare occasion where candidates made an error it was usually on photosynthesis or respiration.</p>
	b i	<p>(no) microorganisms (in the soil) ✓ no decay (takes place) ✓</p>	2 (AO 1.1) (AO 2.1)	<p>AW microbes, decomposers, saprophytes, detritivores, bacteria, fungi</p> <p>AW decomposition, rotting, break down ALLOW not enough nitrifying bacteria to replace nitrates / no nitrates released by nitrifying bacteria = 2 IGNORE no organisms to recycle the minerals</p> <p>Examiner's Comments</p> <p>Lower ability candidates didn't realise they needed to identify decomposer or a named type of decomposer and instead repeated the term living organisms from the question, thereby missing the AO1.1 aspect of the question. Higher ability candidates were able to name decomposers or types of decomposers. A significant number did not write about the AO2.1 aspect of the question about decomposition, using terms such as replenish or recycle minerals. Some candidates wrote about the minerals being used up but didn't go on to say why they would not be replaced.</p>
	ii	<p>plants release oxygen by photosynthesis ✓ organisms in the soil / microbes / animals release carbon dioxide by respiration ✓</p>	2 (AO 2.2)	<p>ALLOW correct word (or symbol) equations for photosynthesis linked to plants and respiration linked to organisms in the soil / microbes / animals</p> <p>AW microbes, decomposers, saprophytes</p> <p>IGNORE breathe out carbon dioxide IGNORE plants will respire and give out carbon dioxide ALLOW 1 mark for plants release oxygen/photosynthesis and microbes give out carbon dioxide/respire if no other marks are awarded.</p> <p>Examiner's Comments</p> <p>In this AO2.1 question, many candidates referred to plants only, indicating the importance of careful reading of the question that asked about organisms other than plants. Another frequent response from candidates that did not score was reference to 'breathing' out carbon dioxide and not specifically to respiration.</p>
Total		6		

1 1	a	i	<p>First check answer on answer line If answer = 0.9 %award 2 marks</p> $\frac{200}{22000} \times 100 \checkmark$ <p>= 0.9 ✓</p>	<p>2 (AO 2. × 2.2)</p>	<p>ALLOW 0.91 / 0.909</p> <p>Examiner's Comments</p> <p>Candidates found this AO2.2 question quite challenging, often over-complicating it. Many performed incorrect divisions, and a few candidates rounded up to 1, then were only able to gain the mark for showing their working out.</p>
		ii	<p>Any two from:</p> <p>egestion ✓</p> <p>excretion ✓</p> <p>respiration ✓</p> <p>decomposition ✓</p> <p>uneaten parts ✓</p>	<p>2 (AO 2. × 1.1)</p>	<p>ALLOW faeces</p> <p>ALLOW undigested food</p> <p>ALLOW named excretory product / urine</p> <p>ALLOW heat</p> <p>IGNORE movement</p> <p>Examiner's Comments</p> <p>This recall AO1.1 question was generally answered well. Movement on its own did not score but some candidates correctly linked this to respiration and so gained the mark for respiration.</p>
		b	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Detailed explanation including conclusions about how the mechanism affects photosynthesis and links this to less biomass available to humans in the food chain. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Explanation of how the mechanism affects photosynthesis or affects the biomass available to humans. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p>	<p>6 (AO 3. × 1.1) (AO 2. × 2.1) (AO 1. × 3.2b)</p>	<p>AO1.1 Demonstrate knowledge of photosynthesis and biomass.</p> <ul style="list-style-type: none"> • Photosynthesis requires light energy • Mechanism reduces photosynthesis • Trapped by the leaves and used to produce food molecules • Photosynthesis required for plant growth • Plant biomass is a food source for animals including humans <p>AO2.1 Apply knowledge and understanding of photosynthesis to the production of biomass</p> <ul style="list-style-type: none"> • More light energy converted to heat, then less energy for photosynthesis • Less photosynthesis then plants can make less food / plants can grow less • Less plant biomass leads to less available food <p>AO3.2b Draw conclusions linking photosynthesis to biomass in food chains</p>

Level 1 (1–2 marks)

Demonstrates some knowledge of how the mechanism affects photosynthesis or affects the biomass available to humans.

There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.

0 marks

No response or no response worthy of credit.

- In low light intensities, light availability is the limiting factor
- Less plant growth/crops therefore less food for cattle/less food for humans / in the food chain

Examiner's Comments

This Level of Response question assessed all three main assessment objectives. It was common to be limited to a low level mark due to repeating the stem of question regarding less biomass all through their response instead of linking the protection mechanism's impact to less light, less photosynthesis so less glucose/food made and consequently less food for cattle and humans. Candidates that did not appreciate that a reduction in light resulted in a reduction in photosynthesis, which also limited their answer to a low level.

There was little evidence of candidates planning their response. Taking time to consider how to answer a LoR, might encourage them to make notes and think through key areas. A common low level answer was to refer to the loss of energy due to the energy needed to switch on the mechanism. It was noted how many candidates did not link biomass to growth or production of food. However, those candidates that realised that the key to the answer was essentially linked to factors influencing photosynthesis, produced excellent responses.

Exemplar 5

High light intensity levels cause the plant to absorb less light, reducing the amount of photosynthesis that takes place. This means the plant will not grow as much/as quickly so there is less crops ^{that grow} available for humans to consume. As a result yield decreases so the mass of crops decreases. This means there is less food available for humans to consume. When the protection mechanism switches off slowly, there is a gradual increase in the amount of glucose the plant makes which slowly increases biomass available. However if it slowly increases the level of photosynthesis there is still less energy available for human consumption.

This answer has less lightless photosynthesis and less crop and links this to the impact on the food chain so all Level 3, 6 marks

This candidate has been credited Level 3 maximum 6 marks. They have structured their answer in a concise manner but included all the relevant marking points. The candidate describes the protection mechanism's impact in reducing light and photosynthesis. The candidate states that the decrease in mass of crops and food made means there is consequently less food for the humans to consume. They continue to give a reason why there will still be less energy available even when the plants resume photosynthesis due to the mechanism switching off slowly.

	c	i	mRNA carries the code for proteins ✓ more protein will be made ✓	2 (AO 2 × 2.1)	ALLOW protein will be made faster Examiner's Comments This question assessed AO2.1. Many candidates were able to link mRNA to either more or faster protein synthesis, but very few referred to the term 'code' to link mRNA and protein synthesis.
		ii	First check answer on answer line If answer = 40 award 2 marks $\frac{20 \times 200}{100}$ ✓ = 40 ✓	2 (AO 2 × 2.2)	Examiner's Comments Candidates found this AO2.2 mathematics skills question quite challenging. 240 was a common incorrect response. Candidates need to have more practice at similar questions using percentages to develop their mathematical skills in this area.
		iii	new method uses the plants own genes ✓ concern that plants with the insecticide/gene might be harmful to humans / might impact on food chains / might kill useful insects ✓	2 (AO 2.2) (AO3.2a)	ALLOW might have side-effects IGNORE ideas about cultural or religious or ethical objections or that it is playing God Examiner's Comments This question assesses both AO2 and AO3. Candidates were most likely to score a mark for the AO3 marking point, but it was rare for them to gain the AO2 mark. Many candidates described the effect of the gene on the plant, not consumers, or did not pick up on the possible problems of the insecticide itself. There were several responses written about the concern about genetic modification not being a natural process. This is an idea that mark schemes are unlikely to credit, preferring instead to focus on the effects of GM food on all consumers. Candidates also frequently missed out writing about the plants own genes and just focused on the AO3 marking point of the bacterial gene so missed the AO2 marking point. It was common for candidates to write about general dangers of bacteria and infections and not specifically the gene.
			Total	16	
1 2	a		< 3(mm) ✓ encourages more microbes from day 0 to 25 ✓	3 (AO 3.1a)	

		<p>therefore, more rapid decay/decomposition ✓</p> <p>OR</p> <p>3 – 5(mm) ✓</p> <p>encourages more microbes from day 26 to 50/overall ✓</p> <p>therefore, more rapid decay/decomposition ✓</p>	<p>(AO 3.2a)</p> <p>(AO 3.2b)</p>	<p>ALLOW > 5 given only 1 mark available for more rapid decay</p> <p>Examiner's Comments</p> <p>In this question assessing AO3, many candidates scored at least two marks. They had two opportunities from the data to gain the first marking point, but to gain the second marking point they needed to correctly match this to the day range, some did not do this. Far fewer candidates then went on to link this to the faster rate of decomposition.</p>
	b	<p>Any two from: (small pieces means) there will be a larger surface area of dead plants ✓</p> <p>therefore, decomposers will be able to reproduce faster / feed faster ✓</p> <p>therefore, decomposers will be able to respire faster ✓</p>	<p>2 (AO 2 × 2.2)</p>	<p>Examiner's Comments</p> <p>In this AO2 question, few candidates linked size to area and a number incorrectly thought large pieces had large surface area. Very few candidates were able to link the size to rates of respiration or reproduction.</p>
	c	<p>idea of recycling in nature ✓</p> <p>named example of a recycled substance e.g. carbon/nitrogen ✓</p> <p>example of reason why the recycling is important e.g. for photosynthesis / production of proteins in plants ✓</p>	<p>3 (AO 3 × 1.1)</p>	<p>ALLOW mineral being returned to the soil / environment</p> <p>IGNORE nutrients/minerals</p> <p>IGNORE water</p> <p>ALLOW carbon dioxide/nitrates/nitrogen compounds recycled</p> <p>Examiner's Comments</p> <p>Most candidates understood the concept of recycling nutrients and often correctly named examples. Only a few understood the importance of this, beyond the idea that the nutrients are needed. Occasionally did they say specifically why.</p> <p>Exemplar 3</p> <p><i>It is an important process because decomposed plants and animals contain a lot of carbon and decomposing carbon also releases oxygen and this is very important because living plants use carbon dioxide to photosynthesise and release oxygen which all living animals are dependent on.</i></p> <p>[3]</p> <p>This candidate has been credited maximum marks. They have identified a named element that is recycled and indicated that this is released by decomposition. The description of it being further used by living plants is sufficient to demonstrate an understanding of recycling.</p>

				<p>They complete their response by explaining why the plants take in the carbon dioxide by referencing its use in photosynthesis.</p> <p>Although this last marking point was seldom seen, where it was, this was usually associated with plants photosynthesising and only very occasionally with plants producing proteins.</p>
			Total	8
1 3	a	<p>badger number have increased ✓</p> <p>more competition for food / less slugs to eat ✓</p>	<p>2 (AO 3.1b)</p> <p>(AO 3.2b)</p>	<p>IGNORE reference to hedgehog numbers dropping</p> <p>ALLOW badgers eat more slugs so less for hedgehogs</p> <p>ALLOW less food to eat</p> <p>IGNORE badgers are predators of hedgehogs</p> <p>IGNORE they both eat slugs</p> <p>Examiner's Comments</p> <p>This question assessed the analysis of information and drawing conclusions in AO3. Most candidates achieved full marks. Where candidates did not get full marks, this was usually due to forgetting to identify the increase in badger population or stating categorically that there would be no food or no hedgehogs, which did not gain a mark. Candidates need to refer to graphs or tables when given this information, to avoid making this type of error.</p>
	b	<p>i</p> <p>in country/advantage/where badgers live, if it rolls up in a ball then will provide more protection / less attacks from badgers/predators ✓</p> <p>in cities/disadvantage/many roads, it will be run over by cars ✓</p>	<p>2 (AO 2 × 2.1)</p>	<p>ALLOW in country/advantage/where badgers live</p> <p>hedgehogs have defence against predators/badgers</p> <p>ALLOW hedgehogs have a reduced risk of being eaten</p> <p>Examiner's Comments</p> <p>This AO2.1 question was answered well overall. Candidates did not gain marks if they didn't correctly link their responses specifically to country or city areas. Just referring to roads was insufficient, however, candidates referring to many roads gained a mark as this distinguished the difference between city and country areas. The terms rural and urban were acceptable alternatives to country and city, in candidates' explanations. A common error was to say the rolling up was camouflage without explaining the answer.</p>
		<p>ii</p> <p>hedgehogs that run away are more likely to survive / less likely to get run over ✓</p> <p>to they will reproduce ✓</p> <p>pass on the allele/gene for running away ✓</p> <p>over time/many generations (running away will become more common) ✓</p>	<p>4 (AO 4 × 2.1)</p>	<p>ALLOW ORA for each marking point</p> <p>ALLOW reference to how change occurred e.g. mutation for running away</p> <p>ALLOW offspring produced / breed together</p> <p>ALLOW pass on advantageous gene</p> <p>IGNORE trait is pass on / genes are passed on</p> <p>Examiner's Comments</p> <p>This application of knowledge of natural selection question</p>

usually resulted in candidates gaining at least two marks. This was usually for identifying that the hedgehogs that could run away had a higher survival rate and could go on to breed. Higher ability candidates were able to link this to the advantageous gene and some could refer to the process occurring over time. Fewer candidates scored the last two marking points because they referred not to the advantageous gene, but in general to genes, mutation (not mutated gene) or to the trait or characteristic or behaviour of running away, and, for the last point, stating that because run away hedgehogs survived to breed, their numbers exceeded the numbers of roll up ones, simply because the roll up ones died.



Examination technique needs candidates to focus on applying their knowledge to a new scenario, and to answer the question asked, not to talk in generic terms.

Exemplar 1

Use ideas about natural selection.

A random genetic mutation occurred in the Dork which led to this new type of hedgehog. Because these hedgehogs run away when frightened, they are less likely to get flattened by cars or die. This means they survive to reproductive age and pass on the allele. However, hedgehogs that roll up may not survive so their numbers will decrease. The next generation of hedgehogs will have the best characteristics for survival.

pass on the allele was given as this answer is clearly referring to the advantage of running away/the genetic mutation which led to this type of hedgehog (running away hedgehog)

This candidate has been credited 3 marks. A mark is gained for identifying that a mutation has occurred to produce the running away hedgehog. They have gained a second mark for recognising they survive to reproductive age. Many candidates just referred to breeding or producing offspring which were deemed acceptable responses for that particular marking point. Also a third mark was gained for 'pass on the allele' has been given as they clearly understand that it is referring to the advantage of running away/genetic mutation for the advantageous gene. The candidate has not gained a mark for the new generation of hedgehogs as this does not reference the idea of the process repeating over several generations/overtime.

			Total	8
1 4			idea of less plants/percentage of plants/% cover in shade/closer to the tree ✓	4 (AO 1.2) ORA for all marking points ALLOW shows negative correlation

		<p>less light (in shade/closer to the tree) ✓</p> <p>less photosynthesis (in shade/closer to the tree) ✓</p> <p>less food/raw materials produced for growth (in shade/closer to the tree) ✓</p>	<p>(AO 2.1)</p> <p>IGNORE less sun IGNORE in shade no photosynthesis / no light</p> <p>(AO 3.1b)</p> <p>ALLOW less light for photosynthesis (closer to the tree) 2 marks ALLOW photosynthesis less effective (closer to the tree)</p> <p>Examiner's Comments</p> <p>This question assessed four different assessment objectives. Candidates had to identify the trend from the graph and apply their knowledge and understanding to give a reason for the trend. They also had to interpret reasons for the trend and draw conclusions about how the shade was affecting the plants. Most candidates identified the trend. Higher ability candidates linked this to less light closer to the tree so reduced rate of photosynthesis. However, only the highest ability candidates concluded that this would result in less glucose/food production. Most candidates just referred to reduced growth, which on its own did not score a mark.</p> <p>Exemplar 2</p> <p><i>The results show that the further away from the base of the tree (where the shade is strongest) more plants are growing. For example 2m away only 10% of the ground is covered by plants whereas 8m away a greater percentage of 64% of ground is covered. This means the higher the light intensity (away from shade), the higher rate of photosynthesis showing it is a limiting factor and helps more plants to grow. Whereas the shade limits the light intensity and limited growth.</i></p> <p>This candidate has been credited with 3 marks. A mark is gained for identifying the trend as a reverse argument. They have gained a second mark for recognising that this is due to a higher light intensity further from the tree. A third mark was gained for linking the increase light intensity to an increased rate of photosynthesis. The candidate has not gained the final conclusion mark as they have only referenced the plant growth and not the food/raw materials produced to enable the growth to occur.</p>
		Total	4
1 5		four / 4 ✓	<p>1 (AO1.2)</p> <p>Examiner's Comments</p> <p>This AO1.2 question required knowledge of scientific enquiry and procedures linked to interactions of organisms in a food web. Many candidates successfully identified four as the correct number. Lower ability candidates opted for the animals feeding on grass, thinking these were</p>

					secondary consumers and incorrectly gave three as a response.
			Total	1	