Question	Answers	Extra information	Mark	AO / Specification reference
01.1	yes – spread of organism will be representative of population size		1	AO3 4.7.1.1
	no – only one organism could be found in each cell so total population could remain similar but more spread out		1	4.7.1.3
01.2	over time the grey population has increased <u>and</u> the red squirrel population has decreased		1	AO2 4.7.1.1
	red population has decreased at a steady rate		1	4.7.1.3
	grey population has increased at an ever-increasing rate		1	
01.3	any **four** from: • rate of reproduction of grey squirrels higher • and survival probability higher • so (even though life expectancy shorter) population will grow at a greater rate • *Parapox* virus may decrease population of red squirrels but grey squirrels are unaffected by the virus (as they are carriers)		4	AO2 4.7.1.1 4.7.1.3
01.4	number of offspring = $5 \times 6 \times 2 \times 4$		1	AO2 4.7.1.1
	number of offspring = 240		1	4.7.1.3
	number of offspring surviving = 240×0.15		1	
	number of offspring surviving = 36		1	

01.5	any **three** from: **Higher** because: • offspring are likely to reproduce as well as original population • red squirrels may migrate naturally to this area **Lower** because: • predation may reduce population • disease may reduce population number of offspring per litter likely to be less than 6		3	AO3 4.7.1.1 4.7.1.3
02.1	any **two** from: • streamlined – provides less resistance through the water • flippers/webbed feet – provides effective propulsion to move through water blubber – provides natural buoyancy / helps the seal float	one mark for the adaptation and one mark for the explanation	4	AO2 4.7.1.4
02.2	to prevent water entering them		1	AO3 4.7.1.4
02.3	more blubber / thicker fur – to provide more insulation (as water will be colder) white fur – to camouflage with ice	one mark for the adaptation and one mark for the explanation	2 2	AO3 4.7.1.4
03.1	animals and plants present in an ecosystem		1	AO1 4.7.1.1
03.2	temperature / light intensity / soil ph / water availability / oxygen availability / carbon dioxide availability / mineral availability	accept any other named abiotic factor	1	AO2 4.7.1.1 4.7.1.2
03.3	food availability / presence of predators / competition with other species / pathogens	accept any other named biotic factor	1	AO2 4.7.1.1 4.7.1.3

03.4	any **two** from: • light • space • water minerals / mineral ions		2	AO2 4.7.1.1
03.5	beech trees produce food by photosynthesis / provide shelter to increase probability of animals' survival		1	AO2 4.7.1.1
04.1	length – enables them to maximise access to light thorns – prevents them from being eaten		1 1	AO2 4.7.1.4
04.2	eaten by animals / birds dispersed through droppings		1 1	AO2 4.7.1.4
04.3	reduces competition for light / water / space / minerals / nutrients /water		1 1	AO2 4.7.1.4
05.1	bees depend on the cereal crop flowers for nectar / food source bees pollinate the cereal plants needed to produce new seeds / reproduce to produce more cereal plants to (continue to) feed the next generation of bees		1 1 1 1	AO2 4.7.1.1
05.2	species and environmental factors are in balance so population sizes remain (fairly) constant		1 1	AO1 4.7.1.1
05.3	• plant a hedgerow ○ provides another source of nectar for bees / shelter for animals that might eat mice which eat crops • grow different crops in the areas of the same field / neighbouring field which increases biodiversity / provides different food sources so supporting different populations	award 2 marks for appropriate suggestions award a further 2 marks for linked explanations	4	AO3 4.7.1.1

06.1	• extremophile		1	AO1 4.7.1.4
06.2	any **two** from: • very cold • high pressure • no light / very dark		2	AO3 4.7.1.4
06.3	mutualistic		1	AO1 4.7.1.4
06.4	light will attract other organisms which will provide a food source for the angler fish		1 1	AO3 4.7.1.4
07	any **six** from: • rolled up leaves reduce surface area in contact with air • so reduce rate of transpiration • (when dry, leaves roll up) so stomata open onto an enclosed moist space • water vapour accumulates in the space • through transpiration • this reduces the diffusion gradient between outside and inside of the leaf • preventing further water loss/ rate of transpiration slows • hairs prevent water vapour being blown away • so maintains humidity / small diffusion gradient / air has a high water potential waxy cuticle prevents water loss by evaporation		6	AO2 4.7.1.4
08.1	habitat		1	AO2 4.7.1.1
08.2	mass of grass present hunting		1 1	AO2 4.7.1.1

08.3	any **two** from: • mates – to produce new offspring / to pass on genes to the next generation • food – to survive territory / space – for shelter / access to food / find mates	award 1 mark for the factor, and one for the linked explanation accept any sensible answers	4		AO2 4.7.1.1
08.4	increased light intensity increases rate of photosynthesis plants grow larger more food available for deer so deer population is able to increase	accept converse	1 1 1		AO2 4.7.1.2 4.7.1.3
09	**Positives:** • (water clarity improved so) more light passes through water increasing the rate of photosynthesis / growth rate of plant material • providing a greater food supply to / supporting a larger population of organisms which feed on this material • more pollutants will be filtered from the water increasing the purity of the water • enabling species which are killed / strongly affected by pollution to re-establish / increase in population **Negatives:** • removal of small organisms / organic material (disrupts the existing food web) meaning some organisms will lose (much of) their food supply • reducing the population of these organisms • native populations which use the same food supply are out-competed for resources reducing their population	To award six marks, answers should include at least one advantage and at least one disadvantage, with the effect on native populations explained	6		AO3 4.7.1.1
10.1	camouflage / blend into their environment to hide from predators / prey	accept either option for each mark, and other sensible suggestions	1 1		AO2 4.7.1.4

10.2	for insulation to provide traction / to avoid slipping		1 1	AO3 4.7.1.4
10.3	1 : 5	accept sa = 6 x 30 x 30 or 5400 for 1 mark accept volume = 30 x 30 x 30 or 27 000 for 1 mark	3	AO2 4.1.3.1
10.4	body heat will be lost / transferred through external surfaces arctic foxes need to minimise heat loss so have a smaller surface area : volume ratio	 accept converse accept desert fox sa : v ratio = 1.5x greater than arctic fox for 1 mark	1 1 1	AO2 4.1.3.1 4.7.1.4
11.1	DNA / genetic material		1	AO1 4.6.4
11.2	(Carl) Linneaus		1	AO1 4.6.4
11.3	Order		1	AO1 4.6.4
11.4	*Panthera leo*		1	AO2 4.6.4
11.5	understand how living things are related / allow links to be made between species recognise biodiversity present in the world provide scientists with a common language to communicate (even if different languages spoken)		1 1 1	AO1 4.6.4