

# Organisms and their Environment

## Mark Scheme 3

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Organisms and their Environment
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 3

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**Time Allowed:** 60 minutes

**Score:** /50

**Percentage:** /100

Question	Answers	Marks	Additional Guidance
1 (a)	animals written in the correct boxes in the food web  (Ruppell's) vulture ; cheetah ; mice / mouse ;	[3]	
(b)	(primary) <u>producer</u> ; <u>primary</u> / <u>first consumer</u> ;	[2]	
(c) (i)	Sun / sunlight / light ;	[1]	
(ii)	(lost) to the atmosphere / (lost as) infra red (radiation) / heat / AW ;	[1]	R reflect R 'lost' only – needs qualifying
(d) 1 2 3 4 5 6 7 8 9 10	idea that <b>small</b> percentage of energy from sun is 'fixed' by photosynthesis ; most energy from sun not available / reference to wrong wavelength / AW ; energy is lost, between / within, trophic levels / along food chain ; ref. to 10% energy transfer / ORA ; ref. to material that is, inedible / not digestible ; energy lost, in respiration / heat / (named) metabolic process / decomposers ; ref. to (small) total percentage reaching fourth trophic level ; not enough energy in fourth trophic level to support another level ; except parasites ; ref. to another problem of animal that would prey on, top carnivores / scavengers ;	[max 3]	<b>NB: MP3</b> is for loss with no reference to magnitude, also award <b>MP4</b> if magnitude given e.g. '90% lost between trophic levels' is marks <b>MP5 A</b> ref to faeces examples for <b>MP10</b> animal would have to be very large, would need much energy to catch a cheetah, there would be very small populations

Question	E	Answers	Marks	Additional Guidance
1 (e)	1 2 3 4 5 6 7 8 9 10 11	feed is expensive / fish is sold at high price ; more energy efficient to feed humans on, crops / producers / animals used to make the fish food ; waste from salmon / excess feed, causes eutrophication ; diseases / parasites, spread easily in (high density of) salmon ; diseases spread to, wild fish / other organisms ; chemicals used to control disease also pollutants ; escapees breed with wild fish ; <i>idea of</i> genetic pollution of wild fish ; escapees compete with wild fish ; extinction of wild fish ; AVP ;	[max 3]	No credit for energy losses along the chain as already given in Question 1d           AVP e.g. chemicals / antibiotics / hormones in feed passed on e.g. less waste if humans could eat hi protein 'fish food' instead e.g. low quality stock compared with wi (less competition)
			<b>[Total : 13]</b>	

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Question	E	Answers	Marks	Additional Guidance
2	(a)	group of organisms / individuals, of same species ; can interbreed ; live in same area / habitat (at same time) ;	max 2	R 'people'
	(b)	<div> <div>1</div> <div>numbers of brown plant hoppers remain low, up to 40 days / day 40 ;</div> </div> <div> <div>2</div> <div>low numbers when spraying occurs (days 15 to 38) ;</div> </div> <div> <div>3</div> <div>rapid increase when spraying stopped / AW ;</div> </div> <div> <div>4</div> <div>then, crash / decrease ;</div> </div> <div> <div>5</div> <div>any population figure with unit ; e.g. to maximum of over 1000 per m<sup>2</sup></div> </div>	max 3	<i>ignore</i> ref. to resistance
	(c)	pesticide absorbed by the plants ; transported through the plant in the phloem ; ingested / AW, by insect when it, eats / sucks ; toxic / poisonous, to insect ;	max 2	A 'eats the plant'
	(d)	<div>1</div> no population explosion / AW ; <div>2</div> effective at reducing the numbers / AW ; <div>3</div> ref. to comparative figures from the graph ; <div>4</div> no pollution / damage to environment ; <div>5</div> no killing of harmless species ; <div>6</div> no concentration of pesticide in food chain ; <div>7</div> no pesticide left in foods / no harm to humans from the spray ; <div>8</div> no development of resistance to pesticide ; <div>9</div> less cost / economic benefits ; <div>10</div> AVP ; e.g. accept part of natural food chain	max 3	

Question		E	Answers	Marks	Additional Guidance
2	(e)	1	decreased rainfall ;	max 4	<b>A</b> species become, rare / endangered <b>A</b> increase or decrease if justified e.g. leading to global warming
		2	flooding ;		
		3	erosion / loss of (top)soil ;		
		4	desertification ;		
		5	silting of rivers ;		
		6	loss of (plant) nutrients / soil fertility ;		
		7	disruption to food chain ;		
		8	loss of habitat ;		
		9	extinction / loss of biodiversity ;		
		10	effect on carbon dioxide in the atmosphere ;		
		11	justification for effect ; <b>A</b> unproductive forest / productive crop		
		12	AVP ;		
					<b>[Total : 14]</b>

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Question	scheme		Guidance
3 (a) (i)	<p>high temperature denature enzymes ; kill bacteria ;</p> <p>to give optimum temperature (for, enzymes / bacteria) ;</p>	[max 2]	<p><b>R</b> 'kills enzymes' <b>R</b> 'denatures bacteria'</p>
(ii)	<p>respiration is anaerobic ; lactic acid, produced ; <b>A</b> lactate / formula</p>	[2]	<p>IGNORE carbon dioxide <i>treat MPs independently</i></p>
(iii)	<p><b>A</b> named example of a food additive ; colouring ; preservative / stabiliser / emulsifier / antioxidant ; flavouring / (artificial) sweetener ; thickening agent ;</p>	[max 1]	<p>IGNORE international numbers / E-numbers <b>R</b> any food nutrient(s) <b>A</b> 'conservants'</p>
(b)	<p><i>description</i></p> <p>1 sigmoid (growth curve) or lag phase + exponential/log + stationary 2 phase ; 2 little/no growth, rapid growth, no growth / 'leveling off' ; <i>explanation</i> <i>lag phase</i> 3 small number of bacteria ; 4 produce, proteins / enzymes / DNA ; <b>A</b> builds up energy/food stores <i>exponential phase</i> 5 binary fission / asexual reproduction ; 6 no limiting factors / no competition / plenty of food / plenty of resources ; <i>stationary phase</i> 7 death rate = 'birth' rate ; 8 resources / food, used up ;</p> <p>9 <u>p</u> not, favourable / optimum ;</p>	[max 5]	<p><i>marking points may be taken from labels and annotations on the graph</i></p> <p><b>R</b> 'adapting to the environment'</p> <p>5 population doubles every time bacteria divide 6 IGNORE ref. to temperature</p> <p>8 <b>A</b> factors now limiting / competition for food / oxygen used up / toxins built up</p>

Question	Expected Answers	Marks	Guidance
3 (c)	1 conditions not favourable ; 2 cannot compete with <i>S. thermophilus</i> ; <b>ora</b> 3 cannot increase until pH, falls / changes ; <b>ora</b> 4 cannot increase until <u>oxygen</u> concentration decreases ; <b>ora</b> 5 grows slower than <i>S. thermophilus</i> ; 6 takes longer to, adapt / feed ; 7 fewer <i>L. bulgaricus</i> to start with ; 8 idea that substance / condition, provided by <i>S. thermophilus</i> ;	[2]	<b>R</b> direct feeding of <i>L. bulgaricus</i> on <i>S thermophilus</i>  <b>8 A</b> <i>S. thermophilus</i> changed the environment to allow for growth of <i>L. bulgaricus</i>
		<b>[Total: 12]</b>	

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Question	E	Answers	Marks	Additional Guidance
4 (a)		1 – producer ; 2 – <u>secondary</u> / <u>2<sup>nd</sup> level</u> / <u>2<sup>nd</sup> order</u> , consumer ;	[2]	
(b)	1 2 3 4 5 6 7 8	<i>idea that</i> energy is lost, along the food chain / at each trophic level / between trophic levels ; <i>idea that</i> 90% lost between trophic levels / 10% passed on ; respiration / movement / heat loss / metabolism ; excretion ; food not eaten / food not digested / ref. to egestion / AW ; tuna / top carnivores, are in smaller numbers ; more energy available in, trophic level 2 / herbivorous fish, than in, level 4 / tuna or dolphins ; AVP ;	[max 3]	
(c)	1 2 3 4 5 6 7 8 9 10 11	<i>idea that</i> if not conserved they would become extinct ; ref. to, maintaining numbers of other species in food web / disruption of food web / maintaining balance in food web ; maintaining (bio)diversity ; so increase in number of, carnivorous fish / squid / trophic level 3 ; reduction in, herbivores / herbivorous fish / zooplankton / trophic level ; less food available for, consumers / AW ; would be less, tuna / food, for humans ; aesthetic reason (for conserving) / AW ; economic reason (for conserving) / AW ; AVP ; AVP ;	[max 4]	A 'extinguished'
(d)	1 2 3 4	persists / not broken down / does not decay ; eaten by animals ; fish / turtles / mammals, get entangled / trapped / suffocate ; AVP ;	[max 2]	