

Organisms and their Environment

Mark Scheme 2

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Organisms and their Environment
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 2

CHEMISTRY ONLINE
— TUITION —

Time Allowed: 71 minutes

Score: /59

Percentage: /100

1 (a)	1 cell wall ; 2 plasmid ; 3 flagella ; 4 capsule ; 5 loop of DNA / circular chromosome / no chromosome(s) ; 6 no nucleus ; 7 no, organelles / named organelle ; 8 AVP ; e.g. smaller ribosomes	[max 2]	R size A fimbriae / pili ignore 'thread of DNA' unqualified <i>some of these structures are not in all bacteria, but are often shown in diagrams of bacteria</i>
(b) (i)	A – lag ; B – exponential / log ;	[2]	<i>please look carefully at spelling of lag and log</i>

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	Answer		Marks	Guidance for Examiners	
1	(ii)	1	D – ‘birth’ = death ;		<p>A rate of growth / reproduction for birth</p> <p>A limit / limits in context</p>
		2	E – death > ‘birth’ ;		
			<i>for either D or E</i>		
		3	less / no, food / nutrients ;		
		4	less / no, oxygen ;		
		5	accumulation of, wastes / toxins ;		
		6	limiting factor(s) <i>used in appropriate context</i> ;		
		7	carrying capacity / described ;	[max 3]	
(c)	(i)	jointed, legs / limbs / appendages ; exoskeleton ;		[max 1]	
	(ii)	<i>either</i>			
		1	<i>idea that</i> bottom of sea, predators / prey, unable to see ;	1	<p>bottom of the sea is covered in white, sand / rock ;</p> <p>dark coloured crabs, are conspicuous / easily seen, by predators / more likely to be predated ;</p> <p>no need to make pigment ;</p> <p>less energy needed (to make pigment) ;</p> <p>mutation / change in gene or DNA ;</p> <p>so no pigment made (allow only if MP5 is given) ;</p> <p>white crabs / albino crabs, survive and reproduce ;</p> <p>pass on their, gene(s) / allele(s) (for no pigment) ;</p> <p>ref to (natural) <u>selection</u> in context ; R if artificial</p>
		2	camouflage not needed (ref to, avoiding predators /	2	
		3	(therefore) no need to make pigment ;	3	
		4	less energy needed (to make pigment) ;	4	
		5	mutation / change in gene or DNA ;	5	
		6	so no pigment made (allow only if MP5 is given) ;	6	
		7	white crabs / albino crabs, survive and reproduce ;	7	
		8	pass on their, gene(s) / allele(s) (for no pigment) ;	8	
		9	ref to (natural) <u>selection</u> in context ; R if artificial	9	
					[max 4]

Question	E answers	Mark	Additional Guidance
2 (a) (i) 1 2 3 4 5 6 7	<p><u>kills</u>, / <u>destroys</u>, (all) bacteria / microorganisms ; A viruses <i>to prevent</i></p> <p>contamination / remove contaminants (of the milk / yoghurt) ;</p> <p>competition with the two bacteria added ;</p> <p>disease / might be pathogens / any suitable e.g. (TB / food poisoning) ;</p> <p>production of toxins ;</p> <p>alteration of the, flavour / taste ;</p> <p>AVP ;</p>		<p>ignore 'remove' / 'gets rid of' / 'eliminates'</p> <p>ignore 'harmful'</p> <p>ignore impurities / make milk pure</p> <p>kills harmful bacteria = 1 mark</p> <p>kills bacteria that cause disease = 2 marks</p> <p>kills bacteria that might contaminate the milk = 2 marks</p>
(ii) 1 2 3 4 5 6 7	<p>best / optimum / ideal, temperature ;</p> <p>for bacterial, growth / division / reproduction ;</p> <p>A bacteria grow quickly</p> <p>ref to enzymes ; R if enzymes are denatured at 45 °C</p> <p>ref to, kinetic energy / collisions ;</p> <p>produce most lactic acid in the shortest time ;</p> <p>A 'lactic acid production takes too long at lower temperatures'</p> <p>ref to cost ;</p> <p>bacteria killed / enzymes denatured, at higher temperatures /</p>	[max 2]	<p>R 'speeds up the reaction' unqualified</p> <p>A enzymes are not denatured / bacteria are not killed, at this temperature</p>

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Question	Answers	Mark	Additional Guidance
2 (iii)	<p>1 lag phase / numbers increase slowly / low rate of growth ; ignore 'numbers stay the same'</p> <p>2 (while) bacteria, make proteins / increase in size ;</p> <p>3 log phase / exponential phase / numbers increase quickly ; A rapid rate of growth / bacteria divide faster than die</p> <p>4 plenty of, food / nutrients / oxygen ; ignore raw materials</p> <p>5 stationary phase / numbers stay constant ; A 'birth' rate = death rate</p> <p>6 death phase / increase in death rate / decrease in numbers / bacteria be</p> <p>7 (because of) lack of, food/nutrients/oxygen or decrease in pH / accumu</p> <p>8 ref to <u>limiting</u> factors ;</p> <p>9 AVP ; e.g. <i>Lactobacillus bulgaricus</i> increases first</p>	[max 5]	<p>accept (cell) division / (binary) fission / reproduction for growth for MP1 and MP3</p> <p>MP4 A 'availability of food / AW'</p>
(iv)	<p>1 need different bacteria to, carry out different processes / produce</p> <p>2 <i>idea that</i> each bacterium needs something produced by the other ;</p> <p>3 <i>Streptococcus (thermophilus)</i> does not make lactic acid ;</p> <p>4 <i>Lactobacillus (bulgaricus)</i> needs formic acid produced by</p> <p>5 each stage requires a different (specific) enzyme ; A enzymes work on different substrates</p> <p>6 <i>idea that</i> each bacterium cannot make all the enzymes needed ;</p> <p>7 AVP ;</p>	[max 2]	<p>A both needed to make lactic acid A 'work differently'</p> <p>If MP4 awarded then also award MP2</p> <p>A <i>S. thermophilus</i> A <i>L. bulgaricus</i></p>

Question	E answers	Mark	Additional Guidance	
2 (b)	preservative / acidity regulator / pH regulator ; antioxidant ; colouring / food dye ; flavouring ; emulsifier ; sweetener ; thickener ; stabiliser ;	[max 3]	ignore names and/or (E) numbers of additives e.g. MSG, tartrazin sunset yellow, etc.	Reject fruit chocolate nutrients any named nutrient, e.g. food starch / corn starch (named) vitamin(s) (named) mineral(s) salt calcium supplement

3 (a)	pinna / external ear ; fur ; <u>mammary</u> glands / secretes milk ; sweat glands ; endothermic / homoeothermic / AW ; A – warm blooded different types of teeth ; 3 middle ear bones ;	[max 3]
(b)	MP1 redirects blood away from skin to (internal / vital) organs ; MP2 vasoconstriction ; MP3 fat under the skin ; MP4 fur / hair ; MP5 traps air ; MP6 fat / air, poor conductors of heat / insulators ; MP7 reduces heat loss ; MP8 by, conduction / convection ; MP9 generate heat, by metabolism / shivering ; A – endothermic MP10 small surface area to volume ratio / large size ;	[max 5]
(c)	group of organisms of one species ; live in the same place, at the same time / together ;	[2]
(d)	different species have different, genes / DNA ;	[1]
(e)	any two suitable suggestions, e.g. maintaining, genetic diversity ; important in food web ; possible medical application / useful genes ;	[max 2]
		[Total: 13]

Question	E	Answers	Marks	Additional Guidance																												
4 (a)		jointed / articulated, legs ; exoskeleton / described ;	[max 2]	R antennae / wings R many legs R segmentation body																												
(b)	6/7 RIGHT = 4 5 RIGHT = 3 3/4 RIGHT = 2 1/2 RIGHT = 1 0 RIGHT = 0	<table><tr><td>go to 2</td><td></td></tr><tr><td>go to 7</td><td></td></tr><tr><td><i>Schistocerca gregaria</i></td><td>A</td></tr><tr><td>go to 3</td><td></td></tr><tr><td>go to 4</td><td></td></tr><tr><td><i>Drosophila melanogaster</i></td><td>B</td></tr><tr><td>go to 5</td><td></td></tr><tr><td>go to 6</td><td></td></tr><tr><td><i>Ephestia cautella</i></td><td>G</td></tr><tr><td><i>Batrachedra amydraula</i></td><td>E</td></tr><tr><td><i>Rhynchophorus ferrugineus</i></td><td>F</td></tr><tr><td><i>Oryctes agamemnon</i></td><td>D</td></tr><tr><td><i>Microcerotermes diversus</i></td><td>C</td></tr><tr><td><i>Oligonychus afrasiaticus</i></td><td>H</td></tr></table>	go to 2		go to 7		<i>Schistocerca gregaria</i>	A	go to 3		go to 4		<i>Drosophila melanogaster</i>	B	go to 5		go to 6		<i>Ephestia cautella</i>	G	<i>Batrachedra amydraula</i>	E	<i>Rhynchophorus ferrugineus</i>	F	<i>Oryctes agamemnon</i>	D	<i>Microcerotermes diversus</i>	C	<i>Oligonychus afrasiaticus</i>	H	[4]	
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(c)	1 kills, harmless / other / non-pest, insects / animals / fish ; 2 ref to, predators / parasites, of pests ; 3 idea that pesticides are concentrated in food chains ; 4 any effect on animals higher up food chain ; e.g. extinction 5 any further detail, e.g. kills birds of prey / egg shell thinning ; 6 pollutes / poisons, streams / rivers / lakes / sea ; 7 AVP ;		[max 4]	MP5 A any consequence for food chain/web/ecosystem																												

(d)	as a control ;	[1]	A idea that it is used as a reference to see the effect of the pesticide
(e) (i)	<p><i>pesticide</i></p> <p>1 numbers decreased, immediately (after spraying) / on day 4 ;</p> <p>2 then increased ;</p> <p>3 use of figures – reference to day and density ;</p> <p><i>fungus spores</i></p> <p>4 numbers did not decrease immediately / decreased after day 7 ;</p> <p>5 decreased, slowly ;</p> <p>6 did not increase ;</p> <p>7 use of figures – reference to day and density ;</p> <p>8 any comparison to the control ;</p>	[max 5]	
(ii)	<p><i>pesticide</i></p> <p>1 kills nearly all grasshoppers / kills instantly ;</p> <p>2 on contact / or immediately after ingesting it ;</p> <p>3 some resistant / some tolerant / some not hit by spray / some not eaten pesticide / some survive ;</p> <p>4 pesticide decays / removed / not effective for long ;</p> <p>5 more grasshoppers migrate from neighbouring areas ;</p> <p>6 more grasshoppers, hatching / AW ;</p> <p>7 eggs not killed ;</p> <p><i>fungus spores</i></p> <p>8 did not kill on contact / did not kill immediately ;</p> <p>9 spores need to, germinate / grow ;</p> <p>10 takes several days (must be linked to MP9) ;</p> <p>11 fungus (produces spores) that infect other grasshoppers ;</p> <p>12 ref to transmission of fungus ;</p> <p>13 any grasshoppers that migrate into area are infected (and killed) ;</p>	[max 4]	
[Total: 20]			