

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

Time Allowed: 71 minutes

Score: /59

Percentage: /100

<p>1 (a)</p>	<p>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</p>	<p>[max 2]</p>	<p>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></p>
<p>(b) (i)</p>	<p>A – lag ; B – exponential / log ;</p>	<p>[2]</p>	<p><i>please look carefully at spelling of lag and log</i></p>

	Answer	Marks	Guidance for Examiners
1	(ii) <ol style="list-style-type: none"> 1 D – ‘birth’ = death ; 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]	<p>A rate of growth / reproduction for birth</p> <p>A limit / limits in context</p>
	(c) (i) jointed, legs / limbs / appendages ; exoskeleton ;	[max 1]	
	(ii) <i>either</i>		
	<ol style="list-style-type: none"> 1 <i>idea that</i> bottom of sea, predators / prey, unable to see ; 2 camouflage not needed (ref to, avoiding predators / 3 (therefore) no need to make pigment ; 4 less energy needed (to make pigment) ; 5 mutation / change in gene or DNA ; 6 so no pigment made (allow only if MP5 is given) ; 7 white crabs / albino crabs, survive and reproduce ; 8 pass on their, gene(s) / allele(s) (for no pigment) ; 9 ref to (natural) <u>selection</u> in context ; R if artificial 	<ol style="list-style-type: none"> 1 bottom of the sea is covered in white, sand / rock ; 2 dark coloured crabs, are conspicuous / easily seen, 3 by predators / more likely to be predated ; 4 no need to make pigment ; 5 less energy needed (to make pigment) ; 6 mutation / change in gene / DNA ; 7 so no pigment made (allow only if MP5 is given) ; 8 white crabs / albino crabs, survive and reproduce ; 9 pass on their, gene(s) / allele(s) (for no pigment) ; 10 ref to (natural) <u>selection</u> in context ; R if artificial 	[max 4]

Question	E answers	Mark	Additional Guidance
2 (a) (i)	<p>1 kills, / <u>destroys</u>, (all) bacteria / microorganisms ; A viruses <i>to prevent</i></p> <p>2 contamination / remove contaminants (of the milk / yoghurt) ;</p> <p>3 competition with the two bacteria added ;</p> <p>4 disease / might be pathogens / any suitable e.g. (TB / food poisoning) ;</p> <p>5 production of toxins ;</p> <p>6 alteration of the, flavour / taste ;</p> <p>7 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)	<p>1 best / optimum / ideal, temperature ;</p> <p>2 for bacterial, growth / division / reproduction ; A bacteria grow quickly</p> <p>3 ref to enzymes ; R if enzymes are denatured at 45 °C</p> <p>4 ref to, kinetic energy / collisions ;</p> <p>5 produce most lactic acid in the shortest time ; A 'lactic acid production takes too long at lower temperatures'</p> <p>6 ref to cost ;</p> <p>7 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>

Question	E answers	Mark	Additional Guidance
<p>2 (iii) 1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p>	<p>lag phase / numbers increase slowly / low rate of growth ; ignore 'numbers stay the same' (while) bacteria, make proteins / increase in size ; log phase / exponential phase / numbers increase quickly ; A rapid rate of growth / bacteria divide faster than die plenty of, food / nutrients / oxygen ; ignore raw materials stationary phase / numbers stay constant ; A 'birth' rate = death rate death phase / increase in death rate / decrease in numbers / bacteria be (because of) lack of, food/nutrients/oxygen or decrease in pH / accumu ref to <u>limiting</u> factors ; AVP ; e.g. <i>Lactobacillus bulgaricus</i> increases first</p>	<p>[max 5]</p>	<p>accept (cell) division / (binary) fission / reproduction for growth for MP1 and MP3</p> <p>MP4 A 'availability of food / AW'</p>
<p>(iv) 1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p>	<p>need different bacteria to, carry out different processes / produce</p> <p><i>idea that</i> each bacterium needs something produced by the other ;</p> <p><i>Streptococcus (thermophilus)</i> does not make lactic acid ; <i>Lactobacillus (bulgaricus)</i> needs formic acid produced by</p> <p>each stage requires a different (specific) enzyme ; A enzymes work on different substrates <i>idea that</i> each bacterium cannot make all the enzymes needed ; AVP ;</p>	<p>[max 2]</p>	<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)	<p>6/7 RIGHT = 4 5 RIGHT = 3 3/4 RIGHT = 2 1/2 RIGHT = 1 0 RIGHT = 0</p> <table border="1" data-bbox="658 429 1290 1137"> <tbody> <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> </tbody> </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)	<ol style="list-style-type: none"> 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 ; 2 then increased ; 3 use of figures – reference to day and density ;</p> <p><i>fungal spores</i></p> <p>4 numbers did not decrease immediately / decreased after day 7 ; 5 decreased, slowly ; 6 did not increase ; 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 ; 2 on contact / or immediately after ingesting it ; 3 some resistant / some tolerant / some not hit by spray / some not eaten pesticide / some survive ; 4 pesticide decays / removed / not effective for long ; 5 more grasshoppers migrate from neighbouring areas ; 6 more grasshoppers, hatching / AW ; 7 eggs not killed ;</p> <p><i>fungal spores</i></p> <p>8 did not kill on contact / did not kill immediately ; 9 spores need to, germinate / grow ; 10 takes several days (must be linked to MP9) ; 11 fungus (produces spores) that infect other grasshoppers ; 12 ref to transmission of fungus ; 13 any grasshoppers that migrate into area are infected (and killed) ;</p>	[max 4]	
		[Total: 20]	