

Organisms and their Environment

Mark Scheme 6

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Organisms and their Environment
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 6

Time Allowed: 53 minutes

Score: /44

Percentage: /100

1 (a)	1 antennae ; 2 elongated bodies ; 3 <u>segmented</u> body / many <u>segments</u> ; 4 many (≥ 10) legs ; 5 (one or two pairs of) legs on each segment ; 6 exoskeleton ; 7 <u>jointed</u> legs ;	max [3]	
(b)	1 length of antennae ; 2 number of sections on antennae ; 3 presence / absence, of tail pieces / AW ; 4 length of tail pieces ; 5 length of legs ; 6 number of leg joints ; 7 total number of legs ; 8 position of legs on body ; 9 number of legs per segment ; 10 size / shape of segments ; 11 number of body segments ; 12 length of body ; 13 head shape ; 14 presence / absence 'spots / markings' ;	max [3]	

1 (c) (i)	nucleus ;	[1]	Ignore chromosomes
(ii)	1 <i>idea that</i> animals are identified accurately ; R identify unqualified 2 barcoding is, cheap/easy/quick/efficient ; 3 barcoding is useful if distinguishing characteristics/dichotomous key are difficult ; 4 identify previously unknown species ; 5 helps to identify, threatened/endangered species ;	max [2]	
(iii)	1 ref to genes ; 2 codes for (specific) proteins ; 3 stores genetic information ; 4 can be copied to pass on information to new cells ;	max [2]	
(d) (i)	1 all arrows point from food to feeder ; 2 millipedes eat dead leaves <u>and</u> fungi ; 3 food chain : bacteria → nematodes → springtails → centipedes ; 4 centipedes eat millipedes, springtails and earthworms ;	[4]	
(ii)	1 ref to, respiration / decomposition ; 2 release <u>carbon dioxide</u> ; 3 carbon dioxide is taken in by, plants/photosynthesis ;	max [2]	
		[Total:17]	

Question		Marks	Additional Guidance
2 (a) (i)	<p>1 concentration of PCBs increases up the food chain/ ora;</p> <p>2 concentration is much higher in larger organisms/ ora;</p> <p>3 big(gest) increase between herring and porpoise;</p> <p>4 (only) herring/porpoise/ animals at top of food chain, have a range of concentrations;</p> <p>5 use of figures (arbitrary units) to make a comparison between two, trophic levels/organisms;</p>	max 3	<p>MP4 must be a qualitative statement, not just statement of figures</p> <p>MP5 – must be a comparison not just figures unqualified, e.g. use of 'but', 'and', 'only', etc. and accept $\times 1.8/2$, $\times 4$, $\times 30$, $\times 384$, $\times 1900$</p>
(ii)	<p>animals at higher trophic levels live longer;</p> <p>eat many of the animals below them in the food chain;</p> <p>PCBs cannot be, excreted/eliminated/removed/ broken down;</p> <p>so build up in the body (tissues);</p> <p><u>bioaccumulation/ biomagnification</u>;</p>	max 3	
(b) (i)	<p><u>mutation</u>/ change in DNA;</p> <p>any mutagen;</p> <p>gene(s) code for, AHR/protein;</p> <p>any sensible suggestions about change to protein molecule;</p> <p>fish susceptible to PCB poisoning died;</p> <p>fish with changed protein survived and reproduced;</p> <p>passing on mutant <u>allele</u>;</p> <p>reference to (natural) selection;</p>	max 5	<p>A ref to genetic variation R AHR/protein, mutates e.g. radiati</p> <p>e.g. different amino acid sequen</p>
(ii)	<p>fish with mutant allele not at an advantage/no selection for PCB resistance;</p> <p>PCB resistant fish may not compete well with others/ ora;</p> <p>so less successful at breeding/ ora;</p> <p>leave fewer offspring/ ora;</p> <p>idea that mutant allele is diluted as fish interbreed;</p>	max 2	<p>A 'the altered AHR protein is of less/no use'</p>

Question		Marks	Additional Guidance
2 (c)	<p>1 persistent / does not breakdown / accumulates;</p> <p>2 fill up / takes up space in, landfill sites / rubbish dumps;</p> <p>3 suffocate / choke, animals;</p> <p>4 kills animals that get trapped in it;</p> <p>5 release, toxins / poisons;</p> <p>6 AVP;</p>	<p>max 3</p>	<p>MP1 A 'can't get rid of them' / takes a long time to breakdown</p> <p>MP3 and MP4 do not allow kill unqualified</p> <p>MP5 maybe in context of leaching out, burning or eating</p> <p>I references to recycling</p> <p>I pollution unqualified</p> <ul style="list-style-type: none"> • (fill with water to become) breeding grounds for mosquitoes • blocks light for, photosynthesis • negative effect on tourism / visual pollutant • blocks drains • blocks flow of water in, rivers / streams • reduces soil, drainage / aeration • interferes with water treatment <p>allows spread of alien species in the oceans</p>
		[Total: 16]	

Question	answers	Mark	Additional Guidance
3 (a)	<p>there are different forms of one, feature / characteristic ;</p> <p>example of a feature shown by Soay sheep ;</p> <p>coat / fur, colours patterns of coat / AW with and without horns lengths of horns ear, length / width / size / shape face, length / width / size / shape body mass body shape / body size / AW</p>	[2]	<p>look for a general explanation of 'variation in their phenotype' and an example</p> <p>the example chosen does not have to be visible in Fig. 6.1</p>
(b) (i)	<p><i>in years with high populations of sheep</i></p> <p>1 more deaths in total ; A low survival rate</p> <p><i>for all sizes of lambs</i></p> <p>2 more lambs died than survived ;</p> <p>3 any comparative data quote using same body mass in high and low population years – units (kg) are not necessary A tolerance given in table for bars between gridlines</p>	[max 2]	<p><i>looking at sum total of the bars in each graph</i></p> <p><i>looking at bars for each body mass</i></p> <p>e.g. lambs 13-14 (kg), 106 died in hi population year against 12 that died in low population year</p> <p>see page 18 for table of data</p>

Question	answers	Mark	Additional Guidance
3 (ii)	<i>in high population – ora for low population</i> <i>one mark for competition and two marks for marking points 2-11</i>		ignore explanations about why the population is high in some years and low in others – not relevant
1	competition for, shelter / food / grass / resources ;	[1]	
2	as a result of competition there is shortage of food for each lamb ; <i>as a result of competition for food</i>		R competition for mates
3	lambs do not store enough fat ;		
4	ref insulation ;		
5	cannot survive the winter ;		
6	ewes / females, produce less milk ;		
7	ref to number of lambs per female ;		
8	ref to, more likely to die of disease / AW ; A disease more likely to spread		
9	more small lambs die ;		
10	(pregnant) ewes / females, are short of food	[max 2]	

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Question	answers	Mark	Additional Guidance
3 (c)	<p><i>note that this is not a question about artificial selection</i></p> <p>1 variation / AW, among the sheep in the population ;</p> <p>2 some are better, adapted / suited / AW, than others ; A 'best adapted'</p> <p>3 any example of an adaptive feature for survival in the extreme conditions ;</p> <p>4 any example of an appropriate selective agent ; ignore 'extreme conditions / weather'</p> <p>5 survive and, breed / have offspring ; A ora</p> <p>6 pass on their <u>alleles</u> ;</p> <p>8 <i>idea that</i> over time better adapted, features / traits, become more common ;</p>	[max 4]	<p><i>points need to be in correct sequence and in the context of selection</i></p> <p>R better animals survive unqualified by adaptation or some example</p> <p>'some sheep have thicker coats' = MP1 and MP3</p> <p>MP3 must be a feature related to survival in extreme conditions, not 'strength', 'fitness' 'healthiness' etc</p> <p>to survive the cold = MP4</p>

body mass / kg	low population years		high population years	
	died	surv	died	surv
3 – 4	0	0	6 (5 – 7)	0
5 – 6	0	2 (1 – 3)	15 (14 – 16)	0
7 – 8	0	7 (6 – 8)	20	(2 – 4)
9 – 10	5 (4 – 6)	16 (15 – 17)	56	(5 – 7)
11 – 12	12 (11 – 12)	48	(93 – 95)	25 (24 – 26)
13 – 14	12 (11 – 12)	57 (56 – 58)	106 (105 – 107)	30 (29 – 31)
15 - 16	12 (11 – 12)	52		34 (33 – 35)
17 – 18	6 (5 – 7)	22 (21 – 23)	16	(17 – 19)
19 – 20	2 (1 – 3)	12	(5 – 7)	2 (1 – 3)
21 - 22	0	0	2 (1 – 3)	0