

Organisms and their Environment

Mark Scheme 4

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Organisms and their Environment
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 4

Time Allowed: 57 minutes

Score: /47

Percentage: /100

Question	E	Answers	Marks	Additional Guidance
			[Total: 11]	
1 (a)		line at 1 until end of May ; exponential increase from June to 100 000 at beginning of July ; A a straight line decrease at end of August to around 10 000 ; remains about 10 000 until beginning of November ;	[max 3]	if points are plotted, but no line or block graph used = max 1
(b)		eaten by, predator / fish ; not enough food ; too cold ; pollution ; AVP ;	[max 2]	A eutrophication
(c)	1	<i>accept ref. to <u>limiting factor</u>(s) once in the answer ;</i>		I refs. to numbers and descriptions rather than explanations for MP2 – 12 must be clear which period of the graph or phase is being described
	2	<i>lag phase (March April May)</i>		
	3	<i>slow reproduction rate / BR = DR ; no food / too cold / AW ;</i>		
	4	<i>exponential / log, phase (June)</i>		
	5	<i>reproduction rate increases / BR > DR ;</i>		
	6	<i>increase in temperature ; food available ;</i>		
	7	<i>steady / stationary / AW, phase (September October November)</i>		
	8	<i>reproduction rate slows / BR = DR ;</i>		
	9	<i>decline phase ;</i>		
	10	<i>(reached) carrying capacity / AW ;</i>		
	11	<i>DR > BR ;</i>		
	12	<i>predation ; less food / competition for food;</i>	[max 4]	

<p>2 (a)</p>	<p>carbon ; hydrogen ; oxygen ; nitrogen ; sulfur ;</p> <p>[4 max]</p>	<p>R CHONS</p>
<p>(b)</p>	<p>1 N / nitrogen, fixation ; 2 bacteria / <i>Rhizobium</i> ; R 'nodules are bacteria' 3 convert, nitrogen / N₂ / AW, into, ammonia / NH₃ / ammonium / NH₄⁺ / amino acid(s) ; 4 plants use (fixed) nitrogen to make, amino acids / proteins / AW ; [3 max]</p>	<p>N-fixing bacteria = 2 mar R to nitrite / nitrate A plants use NH₃ / NH₄⁺</p>
<p>(c)</p>	<p>1 (dead plants) eaten by, animals / detritivores / scavengers ; 2 e.g. earthworms / termites / AW ; 3 ref. their faeces / increase in surface area ; 4 decay / decomposition ; A decomposers 5 by, bacteria / fungi / saprophytes / saprotrophs ; 6 break down proteins to amino acids ; 7 deamination ; 8 ammonia / NH₃ / NH₄ ; } 9 ammonia to <u>nitrite</u> ; } 10 <u>nitrite</u> to nitrate ; A one mark for ammonia to nitrate 11 nitrification / nitrifying bacteria ; 12 <i>Nitrosomonas</i> / <i>Nitrobacter</i> in correct context of nitrification ; [6 max]</p>	<p>MP3 must be related to MP1 or 2 A even if linked to incorrect organism R if wrong type of bacteria (e.g. N-fixing) A if in context of MP1 or 2 but do not award twice protein → ammonia / AW = 1 mark if 6, 7, 8 not given R 'nitride' unless qualified by NO₂⁻ R nitrate unqualified by nitrite or ammonia</p>

<p>2 (d)</p>	<p>1 light intensity ; A limited sunlight / lack + of sunlight / sunshine 2 light duration ; A day length 3 water / moisture availability ; A drought / flood / humidity / soil water 4 carbon dioxide, availability / concentration / tension / level ; 5 temperature ; 6 competition / overcrowding / space / weeds ; 7 grazing / herbivores / predation / primary consumers ; 8 pests ; 9 parasites / disease ; 10 use of (inappropriate) herbicides / nearby use of herbicides ; A drift of herbicides / weed killers 11 pollution / sulphur dioxide / acid rain ; 12 soil pH / depth of soil / type of soil / poor soil / oxygen in the soil ; 13 wind speed ; 14 salt concentration of soil ;</p> <p style="text-align: right;">[3 max]</p>	<p>R heat / warmth</p> <p>R oxygen unqualified</p>
<p>(e)</p>	<p><i>accept ora with population starting to increase about day 40</i></p> <p>1 small population to start with ; 2 takes time for eggs to hatch ; 3 not enough food / soya bean plants not grown enough / AW ; 4 aphids, not sexually mature / cannot breed / finding mates ; 5 too cold / too wet / AW (another appropriate weather condition) ; 6 ref. to, predators / ladybirds ; 7 ref. to, parasites / disease ; 8 ref. to, pesticides / insecticides ; 9 no immigration ; 10 competition (between aphids, with another pest) ; 11 AVP ;</p> <p style="text-align: right;">[3 max]</p>	<p><i>do not expect knowledge of aphid biology</i> <i>! names of phases (lag, log)</i> <i>! 'adjusting to surroundings'</i> refs. to soya must refer to food for aphids A few soya plants / competition for food / soya grows slowly</p> <p>R unfavourable conditions unqualified</p> <p>(e.g. correct ref. biotic and abiotic factors)</p>
<p>[Total: 19]</p>		

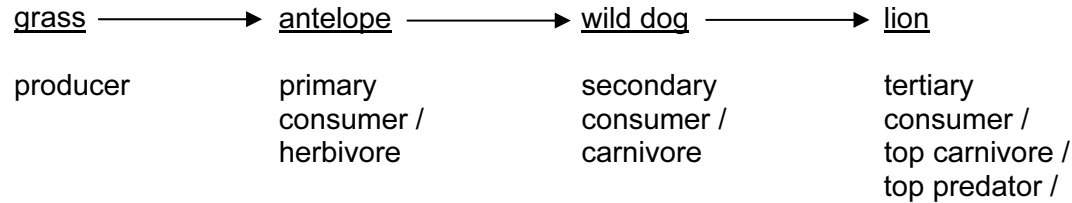
3 (a) (i) eats / consumes / feeds on, animals / meat / flesh ; [1]

(ii) fur / hair / whiskers / vibrissae ;
 external ear(s) / pinna(e) ;
 mammary glands / breasts / nipple / glands that produce milk / AW ;
R milk unqualified by external structure [max 1]

(b) (i) disease / parasite(s) / (named) pathogen(s) ;
 hunting (by farmers) ; **R** poaching
 shortage of, food / antelopes ; **A** idea of fewer
 shortage of water / drought ;
 predation (by lions) ; **A** more lions
 loss of habitat / AW e.g. territory ; **R** space unqualified
 change of climate / AW ;
 pollution ;
 AVP ; e.g. shortage of mates / small populations do not breed as much
R competition unqualified [max 2]

(ii) extinction / become endangered / become rare / inbreeding ; [1]

(c)



1 mark for minimum of two arrows in correct direction ;
 1 mark for all organisms named and all in correct order as a chain ;
ignore sun / decomposers / parasites
 2 marks for labelling the trophic levels –
either producer, primary, secondary + tertiary consumer
or 1st, 2nd, 3rd, 4th ;;
if one or two labels incorrect award 1 mark

[4]

- 3 (d) (i) maintenance / protection / preservation / 'caring for' / 'looking after' ,
of, habitat / ecosystem / community / species / (named) organisms / resources;

'making a habitat' = 1 mark

One of the following for a max 1 mark

for future generations / prevent extinction ;
encourage breeding (in wild or in captivity) ;
ref to, biodiversity / genetic resources / AW ;

[max 2]

- (ii) prevent destruction of, grassland / habitat ; **A** preserve
(nature) reserve / wild life park / AW ;

rangers / wardens ;

ensure good supply of, food / antelopes / prey / AW ;

legislation / AW ; e.g. refs to poaching / wild life trade

control of, predators / lions ;

A 'kill lions' / 'drive lions away' / 'provide food for lions'

education of local population ;

captive *breeding* / *breed* in a zoo / *breeding* programme ;

reintroduction to the wild ;

AVP ; e.g. further detail of any of the above points

[max 3]

- (e) *ignore refs to nitrogen fixation / denitrification*
marking points 7 + 8 must be in the correct context

1 (eaten / digested by) (named) scavenger(s) / hyaenas / vultures ;

2 excretion / urine / egestion / faeces / AW ;

3 dung beetles / detritivores / maggots ;

4 decay / decomposition / rotting, by, bacteria / fungi / named decomposer ;

5 protein → amino acids ;

6 deamination / amino acids → ammonia ; } **A** protein → ammonia

7 ammonia → nitrite ;

8 nitrite → nitrate ; } **A** ammonia → nitrate

9 nitrification / nitrifying bacteria ;

10 *Nitrosomonas* / *Nitrobacter* in correct context of nitrification ;

11 plants absorb, nitrate / ammonia ;

'decomposition by nitrifying bacteria' = 0

[max 5]

[Total: 19]