OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



MARK SCHEME

B3.3 HOW ARE ORGANISMS IN AN ECOSYSTEM INTERDEPENDENT? (FOUNDATION)

SCORE	PERCENTAGE
/87	%

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Question			Answer/Indicative content	Marks	Guidance
1	a	i	Amino acids ✓	1	If more than one box is ticked, do not award the mark even if the correct box is also ticked
		ii	Add biuret solution ✓ Should turn from blue ✓ To purple if protein present ✓	3	ALLOW sodium / potassium hydroxide AND copper sulphate solutions
	b	i	There will be more collisions between enzymes and substrates so reactions will happen faster ✓	1	If more than one box is ticked, do not award the mark even if the correct box is also ticked
		ii	1. Goes pale ✓ 2. Hairs stand up ✓	2	MP1 ALLOW description of vasoconstriction
		iii	Homeostasis ✓	1	
			Total	8	
2	a	i	Berries / plantain ✓	1	
		ii	6 ✓	1	
		iii	Movement / flow of biomass (from one trophic level to another) ✓	1	IGNORE reference to flow of energy
	b		Pyramid with large bottom level, smaller middle and smallest top level ✓ Correctly labelled with berries at bottom, titmouse in middle and fox at the top ✓	2	
	c	i	Quadrat ✓	1	DO NOT ALLOW 'quadrant'
		ii	Pitfall trap ✓	1	

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Question			Answer/Indicative content	Marks	Guidance
	d		**Any four from** Butterfly population would decrease as another species eating them ✓ Dragonfly population would decrease as another species eating them ✓ Frogs would decrease as would have less to eat ✓ Ladybird population might increase as fewer being eaten as there are fewer dragonflies ✓ Berries might increase as fewer butterflies to eat them ✓ Greenflies and grasshoppers might increase as more berries to eat as fewer butterflies eating them ✓ Snake population might decrease as fewer frogs to eat ✓ This would mean fewer buzzards ✓ Titmouse increases as more berries ✓ Buzzards increase as more titmouse ✓ Snakes increase as more titmouse ✓ Plantain could increase as grasshoppers eats more berries ✓ Plantain might decrease as more grasshoppers ✓ Rabbits might increase if plantain increases ✓ Buzzards might increase if there are more rabbits ✓ Mouse could increase as the plantain increases ✓ Buzzards could increase if there are more mice ✓	4	**ALLOW** any other correct description linked to a correct explanation
			Total	**11**	
3	a		Never runs out; Idea qualified eg can't use it up like coal; External source of energy	1 1	**ignore** reusable **accept** always there **Examiner's Comments** Most candidates gained one mark for recognising the reasons why sunlight was regarded as a sustainable source of energy.

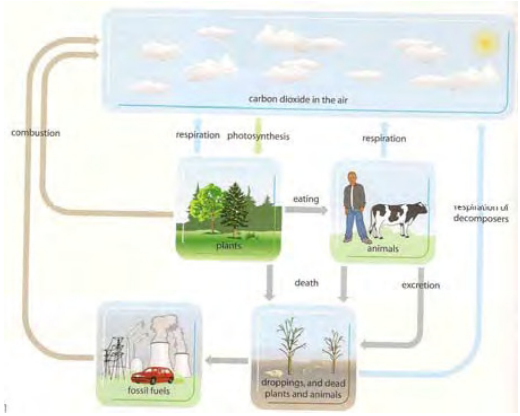
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Question			Answer/Indicative content	Marks	Guidance
	b		Goes **open** loop; Has an effect on food web / other organisms;	2	**Examiner's Comments** As in previous series candidates still have great difficulties with open / closed loop systems. Many candidates gained one mark for explaining one effect but failed to recognise that the system would become open loop once the changes had occurred.
	c		Farmers – more meat; Rest of world – less resources / O_2;	2	Examples could include native people, indigenous groups with a loss of habitat / homes / resources Scientists, medicines / cures from plants **Examiner's Comments** This question reflected the range of abilities within the candidates, marks gained were split with similar numbers gaining zero, one or two marks. Many incorrect responses reflected some candidates' inability to correctly read the question. Many responses referred to animals being affected, when the question specifically required a response about the effect on groups of people.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
4	a		amino acids; enzymes	2	**Examiner's Comments** This question showed that most candidates were unclear about which nitrogen containing chemicals plants make, with cellulose and starch being among the more popular choices.
	b		… used in respiration. ? … converted into starch for storage. ?	2	**Examiner's Comments** Few candidates failed to score one mark, but many went for the options that glucose is taken up from the soil or that it is lost from the underside of leaves instead of giving both correct options.
			Total	4	

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Question			Answer/Indicative content	Marks	Guidance
5			**Level 3 (5–6 marks)** Includes photosynthesis and two different pathways or processes for CO_2 to enter the atmosphere. Correct technical terms. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Includes ideas of processes that add and remove CO_2 from the atmosphere, possibly with labelled arrows on the diagram Less technical terms, ie more description. Incomplete with only some explanation. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Describes either photosynthesis or a pathway for CO_2 to enter the atmosphere. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to D** **General** diagram and / or explanation **Specific** diagram …  diagram shows correct links explanation of processes of …… combustion feeding respiration photosynthesis decomposition role of microorganisms **Use the L1, L2, L3 annotations in SCORIS; do not use ticks.** **Examiner's Comments** Was weakly answered on the whole. Candidates who were able to recall a significant amount of the carbon cycle were able to score well, but many gave poor answers which referred to either the water or nitrogen cycles, or indeed to recycling human waste. It was a little disappointing to find quite so many answers talking about trees “breathing in” carbon or carbon dioxide.
			Total	**6**	

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Question			Answer/Indicative content	Marks	Guidance
6	a	i	The tree will be in a better condition. ✓	1	**Examiner's Comments** Tended to be well answered, with just one tick in the top box.
		ii	…a competitor. ✓ …a predator. ✓	2 3	**Examiner's Comments** Was also well answered, with most candidates choosing at least one of the two correct boxes for competitor and predator. It was pleasing to see that virtually all gave the correct number of ticks, the most common error being to offer only one tick.
	b		*any three from:* heat;waste;uneaten parts;movement;migration; ignore references to sunlight accept references to "dead animals" or "animals die"		**Examiner's Comments** Was not well answered, and seemed to be another point where candidates missed the thrust of the question. There seemed to be a weak grasp of the idea of energy loss between trophic levels in the food web.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
7	a		**Level 3 (5–6 marks)** Answer includes why he is correct AND why he is wrong AND correct explanation of closed loop system. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Answer includes why he is correct AND why he is wrong OR why correct AND an explanation OR why wrong AND an explanation Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Answer includes why he is correct, OR why he is wrong OR gives an explanation(s). Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Answer includes some points from basic description. Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted up to grade C** **relevant scientific points concerning explanation of closed loop may include:** • no waste (from the system) / Waste recycled • output from one part forms input for another part **reasons he may be correct may include:** • Inside a dome • So nothing can enter or leave • Stated examples of waste & output process eg CO_2 from respiration • Stated examples of input & process eg CO_2 for photosynthesis **reasons he may be wrong may include:** • People enter and leave dome • Air will enter / leave when door is open • Other examples of how things could enter or leave eg Watering, fertiliser, replanting **Use the L1, L2, L3 annotations in Scoris;** **do not use ticks.** **Examiner's Comments** As in previous years closed loop systems appeared to cause problems for the majority of candidates at this level. Only 25% of candidates achieved more than a level 1 mark.
	b		**Any 2 from** Idea that this would be introducing something to the closed loop Idea that in closed loop predator / p	2	**Examiner's Comments** This problem was continued in this part and is clearly an area of the specification that is poorly understood by the majority of the candidates.
			Total	8	

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Question			Answer/Indicative content	Marks	Guidance
8	a		*Any two from* Humans look after young / good survival rate Cod abandon young / low survival rate Humans internal fertilisation, cod external	2	**Accept** (cod) do not look after eggs / young owtte **Examiner's Comments** Many candidates found it difficult to make suitable suggestions for the very large differences in the number of eggs produced by humans and fish.
	b		Food / energy recycled	1 1	**Accept** used for energy **Accept** CO_2 sink **Do not accept** reused
	c		*Any one from …*Water(Fish for) food **Total**	 4	
9		i			
			Algae give carbon dioxide to the coral ☐ Algae give chlorophyll to the coral ☐ Algae give glucose to the coral ✓ Algae give oxygen to the coral ✓ Coral gives carbon dioxide to the algae ✓ Coral gives chlorophyll to the algae ☐ Coral gives glucose to the algae ☐ Coral gives oxygen to the algae ☐	3	remove one mark for each additional incorrect answer **Examiner's Comments** In this question aspects of the role of symbiotic algae in coral were explored. In this part, the benefits to both organisms were required. Although most candidates scored, few gained all three marks available.
		ii	cellulose (1) starch (1)	2	**Examiner's Comments** Most candidates were able to give at least one substance which the algae can make from glucose produced in photosynthesis. Starch was better known than cellulose, and calcium was a common incorrect answer.
			Total	5	

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Question			Answer/Indicative content	Marks	Guidance
10	a		from top of diagram: B C A	2	two / three correct = 2 marks one correct = 1 mark Examiner's Comments Candidates did not appear to have a good working knowledge of the carbon cycle and as a result this question was often one that candidates struggled with. A range of answers were observed for this question, with many candidates correctly identifying all three processes.
	b		*any two from* animals are eating the plant / feeding (1) digestion (1) carbon used in body to build new chemicals carbon Examiner's Comments Candidates did not appear to have a good working knowledge of the carbon cycle and as a result this question was often one that candidates struggled with. A surprising number of candidates could not identify that the animals were eating the plants and those that did identify this often failed to develop the answer further.	2	do not allow the movement / transfer of
	c		*any two from* decay / decomposition / breakdown (1) of waste material or dead matter (1) by microorganisms Examiner's Comments Candidates did not appear to have a good working knowledge of the carbon cycle and as a result this question was often one that candidates struggled with. Candidates also found this question difficult. Very few candidates understood the role of microorganisms. Those that did, however, often went on to score two marks for this question.	2	do not allow the movement / transfer of
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
11		i	factor = carbon (dioxide) level (increases) (1) outcome = rate of photosynthesis increases (1)	2	read whole answer, as factor and outcome may be on same line but must be clear which is the factor and which is the outcome **Examiner's Comments** This question indicated that many candidates were unsure about what a 'factor' and an 'outcome' were. Many candidates confused the two or failed to say that photosynthesis rate increased.
		ii	(carbon dioxide levels are increasing) **because** combustion / burning fuels / waste from human system (so not closed loop)	1	**Examiner's Comments** This area of the specification caused a number of problems. Many candidates appeared to be unaware of 'closed loop systems' or failed to explain why carbon dioxide levels were rising.
		iii	plants release oxygen and animals release carbon dioxide. ( ) deforestation reduces the amount of photosynthesis. ( ) photosynthesis stops during winter months. (✓) animals cannot photosynthesise. ( ) the amount of carbon dioxide in the air is much larger than the amount used in photosynthesis. (✓)	2	three ticks = 1 mark max. four or more ticks = 0 marks **Examiner's Comments** Most candidates scored at least one of the two marks available here. However it was disappointing to see candidates fail to follow the instructions to place two ticks in the boxes.
			Total	**5**	

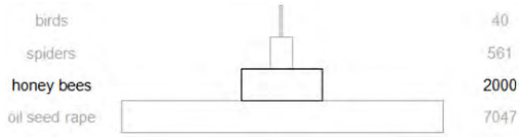
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Question			Answer/Indicative content	Marks	Guidance
12		i	Benedict's solution tests for presence of (reducing) sugar ✓ use biuret solution to test for protein ✓	2 (AO 2.2) (AO 1.2)	ALLOW marks anywhere on the answer lines ALLOW phonetic spellings of biuret ALLOW description of biuret chemicals ie sodium hydroxide and (dilute) copper (II) sulfate <u>Examiner's Comments</u> Candidates found this AO1/AO2 question challenging and most did not score any marks. It appeared that they had either not carried out practical work, or not recognised the importance of revising practical techniques. Candidates who recognised a different test was needed for protein often picked the wrong one. Many were looking for an improvement to the method that was used rather than realising that it was using the wrong test. Centres are advised that it is compulsory that candidates complete at least eight practical activities as set out in Chapter 8 of the specification.
		ii	Light blue to lilac/purple ✓	1 (AO 1.2)	<u>Examiner's Comments</u> A third of candidates were able to give the correct response with other incorrect responses given with a similar frequency. This question assessed objective AO1.
			Total	3	

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Question			Answer/Indicative content	Marks	Guidance
13		i	number of iguanas decrease ✓ due to a shortage of food ✓	2 (AO 2.1 × 2)	ALLOW they will starve DO NOT ALLOW (they will have) no food Examiner's Comments Three quarters of candidates scored at least one mark here and examination technique was the most common reason for lost marks. For example, rather than writing that if the algae decreased the iguana population would decrease because of less food, some candidates used absolutes such as "no food" and "the iguanas would become extinct". Other candidates misunderstood the food web and thought that the algae ate the iguanas, and a significant number of candidates wasted time writing about the effect on all of the other species and not the one that they were asked about. This question assessed objective AO2.
		ii	FIRST CHECK THE ANSWER ONANSWER LINE if answer = 1.5 (m) award 2 marks iguana drawing measures 10 cm 10 × 15 = 150 ✓ 150 cm ÷ 100 = 1.5 (m) ✓	2 (AO 2.2 × 2)	ALLOW working mark if measured incorrectly derived from length (cm) ÷ 100 Examiner's Comments This question was assessing mathematical skill M1c. Almost all candidates were able accurately measure the length of the iguana in cm. 10% of candidates were able to work out the length of the animal in cm but not convert this to m, and around half of candidates could complete the second part of the calculation and convert cm into m. Those who did not score any marks were unable to use the scale bar.

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Question			Answer/Indicative content	Marks	Guidance
		iii	(1.5 ÷ 100) x 80 = 1.2 (m) ✓	1 (AO 2.2)	ALLOW ECF from (c) (ii) Examiner's Comments As with 8 (c) (ii) this question assessed mathematical skill M1c and half of candidates were able to calculate the length after 20% reduction. A common error was to calculate 20% of the length of the iguana and not subtract this from the original length.
		iv	The marine iguanas that decreased in size the most on average lived for a greater length of time ✓ The marine iguanas that did not decrease in size survived for approximately 2 years less than the marine iguanas that decreased in size by up to 60 mm ✓	5 (AO 5 × 2.2)	Examiner's Comments Candidates scored well on this question with almost all obtaining at least one mark on this AO3 and mathematical skills question, and half scoring two marks.
			Total	7	
14		i	bar on correct level (second trophic level) AND longer than spiders bar AND ≤3cm long ✓ bar labelled 'honey bees' on left AND '2000' on right ✓	2 (AO 2.1 × 2) 2 (AO 2.2 × 2)	 Examiner's Comments Many candidates scored a mark for correctly labelling the left and right sides of the diagram. Far fewer candidates were able to draw a bar of appropriate length to complete the pyramid of biomass, and many did not attempt to draw a bar at all.
		ii	FIRST CHECK THE ANSWER ON ANSWER LINE (2000 ÷ 8000) x 100% ✓ = 25 (%) ✓ Total	If answer = 25 (%) award 2 marks 4	

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Question			Answer/Indicative content	Marks	Guidance
15			antimicrobial substances kill / protect plants from (death/damage caused by) pathogens/disease(s) ✓ **Plus any two from:** we depend on plants for food ✓ (photosynthesising) plants add oxygen to the air / remove carbon dioxide from the air / provide breathable air ✓ plants are an essential part of the carbon cycle ✓ all organisms (in an ecosystem) are <u>interdependent</u> ✓	3 (AO 1.1 × 3)	DO NOT ALLOW idea of plants being "immune" to diseases/pathogens <u>Examiner's Comments</u> Higher ability candidates were able to answer this synoptic question well, by linking understanding of plant defences against disease (B2.2.6) to ideas about the interdependence of organisms (B3.3.5) and why humans depend on plants (B3.1.1, B3.3.2 and B3.3.9).
			Total	3	

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