OCR
RECOGNISING ACHIEVEMENT

GCSE

Science A

General Certificate of Secondary Education

Unit **A213/02:** Unit 3: Modules B3, C3, P3 (Higher Tier)

Mark Scheme for January 2012

Oxford Cambridge and RSA Examinations

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
ORA	or reverse argument

Available in scoris to annotate scripts

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response

	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Subject-specific Marking Instructions

a. If a candidate alters his/her response, examiners should accept the alteration.

b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

E.g.

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

This would be worth 1 mark.

c. The list principle:

If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.
Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

Question			Answer	Marks	Guidance
1	(a)		DBAC	1	
	(b)		**advantages**: renewable / sustainable / doesn't use resources (1) no fuel cost (1) no CO_2 produced / no harmful emissions / no greenhouse gases produced (1) land not needed (1); **disadvantages**: low power compared with fossil-fuel power stations (1) variable output (1) environmental/economic disturbance [to fishing] as it covers a lot of ocean surface (1) hazard to shipping (1) more expensive technology(1) **use of bar chart**: peak production is in winter, when energy needs are greatest (1)	3	**needs one mark in each category** **allow** never run out **allow** references to global warming **allow** carbon emissions **ignore** environmentally friendly **do not allow** does not pollute **allow** peak production in winter, when energy demand is lower if hot climate specified. (air conditioning, summer)
	(c)		1.8	1	± 0.05
	(d)		power output increases /goes up (1) constant /levels / plateaus out after about 5-6m / 700-760 kW (1)	2	**do not allow** 'at 7m' for 2nd mark
			Total	**7**	

Question			Answer	Marks	Guidance
2	(a)		Gamma radiation is ionising radiation. ✓ Gamma radiation is very penetrating. ✓ The activity is less under water. ☐ The radiation dissolves in the water. ☐	1	**both** answers needed for 1 mark tick in any other box = 0 marks
	(b)		**Ocean**: risk – containers could corrode / leak / break up into the oceans (1); **Space**: risk – accident on launch could contaminate huge areas (1); feasibility – would be very, very expensive (1)	2	**allow** any generic risk, e.g. leakage while transporting to disposal point
			Total	**3**	

Question			Answer	Marks	Guidance
3			evidence of repeated halving / $800 \div 2^4$ (1) = 50 (1)	2	50 with no working gets both marks.
			Total	**2**	

Question			Answer	Marks	Guidance
4	(a)		sources: **any three from:** space / sun / cosmic rays; rocks / granite; buildings; nuclear power stations; chernobyl; radon; food; drink; medical / hospitals / radiotherapy units;	1	three needed **do not allow** mobile phones **ignore** references to ground
	(b)		cannot get away from it / it is all around us / it is everywhere / it is in the air (1)	1	**must** be writing about **background radiation**
			Total	**2**	

Question			Answer	Marks	Guidance
5	(a)	(i)	3500 (1)	1	
		(ii)	molecules (1)	1	
	(b)		**any four from:** **similarities** variation in populations (1) both depend on reproduction / breeding / produce offspring (1) characteristics/genes / traits/ alleles passed on (1) **differences** in selective breeding man chooses which individuals will breed (1) in natural selection nature / environment determines which individuals will survive to breed (1) selective breeding shorter time scale than natural selection (1)	4	**allow** 'we' as humans **allow** survival of the fittest **allow** competition **do not allow** animals choosing who they breed with **do not allow** natural or naturally for nature
			Total	**6**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td>(i)</td><td>one (1)
four (1)</td><td>2</td><td>any other number chosen =0</td></tr>
<tr><td></td><td>(b)</td><td></td><td>personal background of scientists (1)

new data may be an anomaly (1)

old explanations have worked well for years (1)

scientists’ reputations may be established on old ideas (1)

not enough data / evidence (1)

data / evidence can be interpreted in different ways / the evidence could support more than one interpretation (1)</td><td>2</td><td>any two points

do not accept no data/evidence</td></tr>
<tr><td></td><td>(c)</td><td></td><td><table><tr><td>… account for the data already…</td><td>✓</td></tr><tr><td>… be easier to understand than…</td><td></td></tr><tr><td>… make use of modern…</td><td></td></tr><tr><td>… allow testable predictions…</td><td>✓</td></tr><tr><td>… test the predictions of earlier…</td><td></td></tr></table></td><td>2</td><td>one mark for each correct tick
if 3 ticks mark and deduct 1 mark
4 ticks = 0 marks</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
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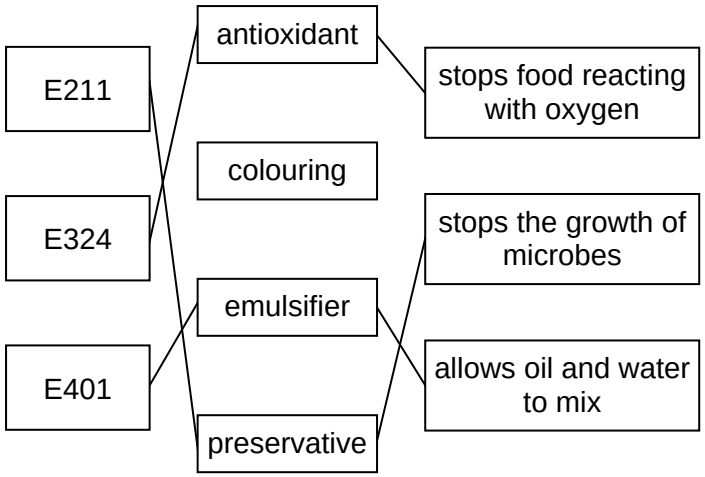
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>7</td><td></td><td></td><td>
<table>
<tr><th></th><th>NS</th><th>H</th><th>Both</th></tr>
<tr><td>… saliva</td><td>✓</td><td></td><td></td></tr>
<tr><td>… gastric juice</td><td></td><td></td><td>✓</td></tr>
</table>
(1)
(1)
</td><td>2</td><td>one mark for each correct row</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>2</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
8	(a)			3	1 mark for each correct line from E number to type to how it works. **ignore** any lines to or from colouring.
	(b)		Reduce the amount of additives in food. ☐ Make sure the food tastes good. ☐ Check the foods are correctly labelled. ☐ Determine the safe levels of chemicals in food. ✓	1	tick in any other box = 0 marks
	(c)	(i)	Andrew	1	
	(c)	(ii)	Carla	1	
			Total	**6**	

Question			Answer	Marks	Guidance
9	(a)		**Nitrogen to nitrates:** lightning (1) gives energy for nitrogen and oxygen in air to react (1) which dissolves in water (1) nitrogen used to make fertilisers (1) fertilisers spread on ground (1) (Nitrogen fixing) bacteria (1) in the roots of some plants (1) turn nitrogen to nitrates **Nitrates to nitrogen:** (Denitrifying) bacteria (1)	3	max of 2 marks for nitrogen to nitrates max of 1 marks for nitrates to nitrogen **allow** named plants such as clover, beans and alfalfa
	(b)		Bacteria break down the protein in wheat when it dies. ☐ Plants take soluble nitrates from the soil to build proteins. ✓ Decay splits protein molecules into amino acids. ☐ Protein in wheat is harvested and taken away. ✓ Manure damages the structure of the soil. ☐	2	1 mark for each correct tick if three ticks, mark and deduct 1 four ticks = 0

Question			Answer	Marks	Guidance
9	(c)		Nitrogen is replaced in the soil. ☐ The number of wildlife habitats decreases. ☐ Non-renewable resources are used. ☐ Only fertilisers from recycled waste are used ✓	1	tick in any other box = 0 marks
	(d)		natural chemicals in plants may be toxic; (1) (toxic moulds may grow) during storage; (1)	2	**ignore** any references to fertilisers, manure and pesticides
			Total	**8**	

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