

Mark Scheme for January 2012

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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

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

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

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 should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

Question		Answer	Marks	Guidance
1	(a)	DBAC	1	
	(b)	<p>advantages: renewable / sustainable / doesn't use resources (1)</p> <p>no fuel cost (1)</p> <p>no CO₂ produced / no harmful emissions / no greenhouse gases produced (1)</p> <p>land not needed (1);</p> <p>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)</p> <p>use of bar chart: peak production is in winter, when energy needs are greatest (1)</p>	3	<p>needs one mark in each category allow never run out</p> <p>allow references to global warming allow carbon emissions ignore environmentally friendly do not allow does not pollute</p> <p>allow peak production in winter, when energy demand is lower if hot climate specified. (air conditioning, summer)</p>
	(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 2 nd mark
Total			7	

Question		Answer	Marks	Guidance
2	(a)	<p>Gamma radiation is ionising radiation. <input checked="" type="checkbox"/></p> <p>Gamma radiation is very penetrating. <input checked="" type="checkbox"/></p> <p>The activity is less under water. <input type="checkbox"/></p> <p>The radiation dissolves in the water. <input type="checkbox"/></p>	1	both answers needed for 1 mark tick in any other box = 0 marks
	(b)	<p>Ocean: risk – containers could corrode / leak / break up into the oceans (1);</p> <p>Space: risk – accident on launch could contaminate huge areas (1); feasibility – would be very, very expensive (1)</p>	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)		<p>any four from:</p> <p>similarities variation in populations (1)</p> <p>both depend on reproduction / breeding / produce offspring (1)</p> <p>characteristics/genes / traits/ alleles passed on (1)</p> <p>differences in selective breeding man chooses which individuals will breed (1)</p> <p>in natural selection nature / environment determines which individuals will survive to breed (1)</p> <p>selective breeding shorter time scale than natural selection (1)</p>	4	<p>allow 'we' as humans</p> <p>allow survival of the fittest allow competition do not allow animals choosing who they breed with do not allow natural or naturally for nature</p>
			Total	6	

Question			Answer	Marks	Guidance										
6	(a)	(i)	one (1) four (1)	2	any other number chosen =0										
	(b)		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)	2	any two points do not accept no data/evidence										
	(c)		<table border="1"> <tbody> <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> </tbody> </table>	... account for the data already...	✓	... be easier to understand than...		... make use of modern...		... allow testable predictions...	✓	... test the predictions of earlier...		2	one mark for each correct tick if 3 ticks mark and deduct 1 mark 4 ticks = 0 marks
... account for the data already...	✓														
... be easier to understand than...															
... make use of modern...															
... allow testable predictions...	✓														
... test the predictions of earlier...															
			Total	6											

Question			Answer				Marks	Guidance	
7				NS	H	Both	2	one mark for each correct row	
			... saliva	✓					(1)
			... gastric juice			✓			(1)
			Total				2		

Question		Answer	Marks	Guidance															
8	(a)	<table border="0"> <tr> <td>E number</td> <td>type</td> <td>how it works</td> </tr> <tr> <td>E211</td> <td>antioxidant</td> <td>stops food reacting with oxygen</td> </tr> <tr> <td>E324</td> <td>colouring</td> <td>stops the growth of microbes</td> </tr> <tr> <td>E401</td> <td>emulsifier</td> <td>allows oil and water to mix</td> </tr> <tr> <td></td> <td>preservative</td> <td></td> </tr> </table>	E number	type	how it works	E211	antioxidant	stops food reacting with oxygen	E324	colouring	stops the growth of microbes	E401	emulsifier	allows oil and water to mix		preservative		3	1 mark for each correct line from E number to type to how it works. ignore any lines to or from colouring.
E number	type	how it works																	
E211	antioxidant	stops food reacting with oxygen																	
E324	colouring	stops the growth of microbes																	
E401	emulsifier	allows oil and water to mix																	
	preservative																		
	(b)	<p>Reduce the amount of additives in food. <input type="checkbox"/></p> <p>Make sure the food tastes good. <input type="checkbox"/></p> <p>Check the foods are correctly labelled. <input type="checkbox"/></p> <p>Determine the safe levels of chemicals in food. <input checked="" type="checkbox"/></p>	1	tick in any other box = 0 marks															
	(c) (i)	Andrew	1																
	(c) (ii)	Carla	1																
Total			6																

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

Question		Answer	Marks	Guidance
9	(c)	<p>Nitrogen is replaced in the soil. <input type="checkbox"/></p> <p>The number of wildlife habitats decreases. <input type="checkbox"/></p> <p>Non-renewable resources are used. <input type="checkbox"/></p> <p>Only fertilisers from recycled waste are used <input checked="" type="checkbox"/></p>	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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