

# **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
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	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.

<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

<b>Edinburgh</b>	
<b>Manchester</b>	
<b>Paris</b>	
<b>Southampton</b>	

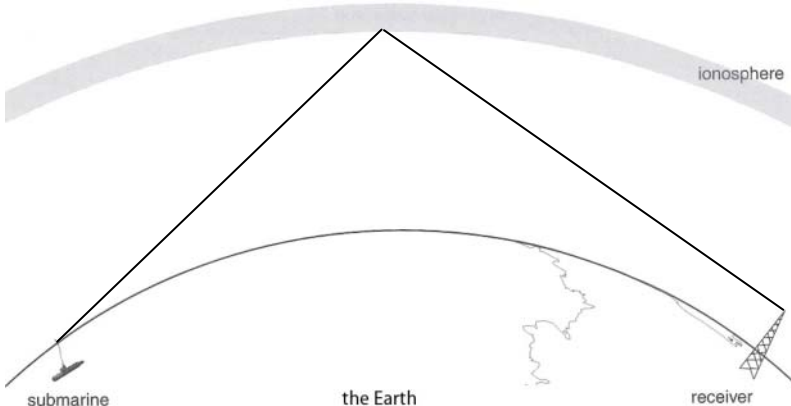
the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

<b>Edinburgh</b>			✓			✓	✓	✓	✓	
<b>Manchester</b>	✓	x	✓	✓	✓				✓	
<b>Paris</b>				✓	✓		✓	✓	✓	
<b>Southampton</b>	✓	x		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

Question			Answer	Marks	Guidance															
1	(a)	(i)	furnace anywhere before turbine (1) turbine anywhere before generator (1) generator anywhere before transformer (1)	3	furnace → turbine → generator → transformer															
		(ii)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>gas</td> <td></td> <td></td> </tr> <tr> <td>hydroelectric</td> <td>✓</td> <td>(1)</td> </tr> <tr> <td>nuclear</td> <td></td> <td></td> </tr> <tr> <td>solar</td> <td>✓</td> <td>(1)</td> </tr> <tr> <td>oil</td> <td></td> <td></td> </tr> </table>	gas			hydroelectric	✓	(1)	nuclear			solar	✓	(1)	oil			2	
gas																				
hydroelectric	✓	(1)																		
nuclear																				
solar	✓	(1)																		
oil																				
		(iii)	carbon dioxide (1)	1	<b>accept</b> CO <sub>2</sub> <b>do not accept</b> CO <sup>2</sup>															
	(b)		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><b>type of waste</b></td> <td></td> <td style="text-align: center;"><b>method of disposal</b></td> </tr> <tr> <td style="text-align: center;">high level</td> <td style="text-align: center;">/</td> <td style="text-align: center;">buried in landfill sites</td> </tr> <tr> <td style="text-align: center;">intermediate level</td> <td style="text-align: center;">/</td> <td style="text-align: center;">mixed with concrete and stored in large containers</td> </tr> <tr> <td style="text-align: center;">low level</td> <td style="text-align: center;">/</td> <td style="text-align: center;">stored carefully under water until it becomes less active</td> </tr> </table> <p style="text-align: right;">(2)</p>	<b>type of waste</b>		<b>method of disposal</b>	high level	/	buried in landfill sites	intermediate level	/	mixed with concrete and stored in large containers	low level	/	stored carefully under water until it becomes less active	2	2 or 3 correct lines = 2 marks 1 correct line = 1 mark			
<b>type of waste</b>		<b>method of disposal</b>																		
high level	/	buried in landfill sites																		
intermediate level	/	mixed with concrete and stored in large containers																		
low level	/	stored carefully under water until it becomes less active																		

Question			Answer	Marks	Guidance	
1	(c)	(i)	Cancer can <b>not</b> be treated using radioactive materials because they damage living cells.		1	
			Only doctors have anything to do with radioactive sources.			
			Radiation is used to contaminate food.			
			Radiation is used to sterilise surgical instruments.	✓		
			(1)			
		(ii)	half-life (1)	2		
			background (1)			
			<b>Total</b>	<b>11</b>		

Question			Answer	Marks	Guidance
2			<p><b>any four from:</b></p> <p>most penetrating;</p> <p>least ionising;</p> <p>can be detected outside the body;</p> <p>least absorbed (by the body) / passes through body/skin;</p> <p>does least damage / named damage e.g. cause cancer, kills cells (4)</p>	4	<p><b>allow</b> standard comparisons. e.g. alpha-paper, beta - aluminium, gamma - lead</p> <p><b>do not accept</b> no damage</p> <p><b>do not accept</b> strongest/weakest</p> <p><b>do not allow</b> the curing of cancer</p>
			<b>Total</b>	<b>4</b>	

Question			Answer	Marks	Guidance
3	(a)	(i)	emits (1) transmits (1) absorbs (1)	3	<b>allow</b> 'transmits' for the first response <b>only</b> if the mark has not been awarded for 'transmits' in the second marking point
		(ii)	reflects from ionosphere (1) <u>straight lines</u> from aerial to ionosphere to receiver (1)	2	<b>ignore</b> arrows 
	(b)	(i)	ultraviolet (1)	1	<b>accept</b> uv, u/v
		(ii)	protects them / exposure can cause cancer/cell damage (1)	1	'radiation causes mutation' <b>allow</b> UV health benefits e.g. vitamin D production
	(c)		heats atmosphere / global warming (1)	1	<b>allow</b> 'greenhouse effect'
<b>Total</b>				<b>8</b>	

Question			Answer	Marks	Guidance
4			<b>B and F</b> (2)	2	any order <b>allow</b> 'door screen'/'metal walls'
<b>Total</b>				<b>2</b>	



Question		Answer	Marks	Guidance								
5	(a)	<p><b>any three from:</b>                      bias in sample/samples not matched/no control group                      e.g. all had cancer;</p> <p>small sample size;</p> <p>apparent <u>correlation</u>;</p> <p>idea that there is no mechanism for the microwaves causing cancer (3)</p>	3									
	(b)	<table border="1"> <tr> <td>microwaves are absorbed by water</td> <td></td> </tr> <tr> <td>microwaves are not ionising radiation</td> <td>✓</td> </tr> <tr> <td>microwaves heat up cells</td> <td></td> </tr> <tr> <td>microwaves are electromagnetic radiation</td> <td></td> </tr> </table> <p>(1)</p>	microwaves are absorbed by water		microwaves are not ionising radiation	✓	microwaves heat up cells		microwaves are electromagnetic radiation		1	
microwaves are absorbed by water												
microwaves are not ionising radiation	✓											
microwaves heat up cells												
microwaves are electromagnetic radiation												
<b>Total</b>			<b>4</b>									

Question			Answer	Marks	Guidance										
6	(a)	(i)	<table border="1"> <tr> <td>from an exploding asteroid</td> <td></td> <td rowspan="4">(1)</td> </tr> <tr> <td>from a cloud of dust and gas</td> <td>✓</td> </tr> <tr> <td>from a collision between planets</td> <td></td> </tr> <tr> <td>from a collision between continents</td> <td></td> </tr> </table>	from an exploding asteroid		(1)	from a cloud of dust and gas	✓	from a collision between planets		from a collision between continents		1		
		from an exploding asteroid		(1)											
		from a cloud of dust and gas	✓												
from a collision between planets															
from a collision between continents															
(ii)	<table border="1"> <tr> <td>burning hydrogen</td> <td></td> <td rowspan="4">(1)</td> </tr> <tr> <td>fusion of hydrogen</td> <td>✓</td> </tr> <tr> <td>burning coal</td> <td></td> </tr> <tr> <td>solar energy</td> <td></td> </tr> </table>	burning hydrogen		(1)	fusion of hydrogen	✓	burning coal		solar energy		1				
burning hydrogen		(1)													
fusion of hydrogen	✓														
burning coal															
solar energy															
(iii)	<table border="1"> <tr> <td>comets</td> <td>✓</td> <td>(1)</td> </tr> <tr> <td>stars</td> <td></td> <td rowspan="4">(1)</td> </tr> <tr> <td>galaxies</td> <td></td> </tr> <tr> <td>moons</td> <td>✓</td> </tr> <tr> <td>universes</td> <td></td> </tr> </table>	comets	✓	(1)	stars		(1)	galaxies		moons	✓	universes		2	
comets	✓	(1)													
stars		(1)													
galaxies															
moons	✓														
universes															

Question			Answer	Marks	Guidance															
6	(a)	(iv)	4500 million (years old) (1)	1																
	(b)	(i)	10.5 years (1)	1																
		(ii)	<table border="1"> <tr> <td>radar</td> <td></td> <td></td> </tr> <tr> <td>parallax</td> <td>✓</td> <td>(1)</td> </tr> <tr> <td>relative brightness of its star</td> <td>✓</td> <td>(1)</td> </tr> <tr> <td>a laser measurer</td> <td></td> <td></td> </tr> <tr> <td>send a space probe</td> <td></td> <td></td> </tr> </table>	radar			parallax	✓	(1)	relative brightness of its star	✓	(1)	a laser measurer			send a space probe			2	
radar																				
parallax	✓	(1)																		
relative brightness of its star	✓	(1)																		
a laser measurer																				
send a space probe																				
		(iii)	none/0 (1)	1																
<b>Total</b>				<b>9</b>																

Question		Answer	Marks	Guidance
7	(a)	They are large and orbit the Sun.	(1)	
		They are usually made of rocks and ice, they spend most of their time outside the orbit of Neptune, but some visit the inner Solar System.		
		They are usually made of rock, most of them are found between Mars and Jupiter.		
		They can be large or small, but always orbit planets.		
	(b)	A layer of material found in asteroids is found all over the world in rocks formed about the time the dinosaurs disappeared.	3	
		Fossils suggest the dinosaur numbers were decreasing for hundreds of thousands of years.		
		There are the remains of a very large crater in the Gulf of Mexico.		
		Fossils of the same type of dinosaur are found on different continents.		
		A large amount of dust thrown into the atmosphere causes the whole world to have a winter that lasts for hundreds of years.		
		There have been many other extinctions during the history of the world.		
<b>Total</b>			<b>4</b>	

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