

Mark Scheme for June 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.

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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
<u>words</u>	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	credit alternative wording / or words to that effect
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. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- 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 the third and fourth boxes are required for the mark:

✗
✗

*This would be worth
1 mark.*

✓
✗

*This would be worth
0 marks.*

✗
✗
✓
✓

*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-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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 cities in England:

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

- e. For answers marked by levels of response:
- i. **Read through the whole answer from start to finish**
 - ii. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
 - iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question			Answer	Mark	Guidance										
1	(a)	(i)	10.5 (1) light years (1)	2	accept correct value given in other units of distance, with units e.g. 9.9×10^{16} m										
		(ii)	<table border="1"> <tr> <td>using parallax</td> <td>✓</td> </tr> <tr> <td>sending a spaceship</td> <td></td> </tr> <tr> <td>comparing its relative brightness</td> <td>✓</td> </tr> <tr> <td>using the orbit time of the planet</td> <td></td> </tr> <tr> <td>using a laser</td> <td></td> </tr> </table>	using parallax	✓	sending a spaceship		comparing its relative brightness	✓	using the orbit time of the planet		using a laser		2	one mark for each correct tick accept any unambiguous indication of choice
using parallax	✓														
sending a spaceship															
comparing its relative brightness	✓														
using the orbit time of the planet															
using a laser															
	(b)		A before B and B before D (1) E before A (1)	2	(C)EABD										
	(c)		central star labelled at least 3 large planets with separate orbits asteroids smaller than planets in solar orbits that don't cross planetary orbits OR asteroids smaller than planets contained between 2 planetary orbits comets in orbits that cross planetary orbits	4	maximum 1 mark for unlabelled diagram of 3 planets in approximately circular separate orbits around a central star allow diagrams with partial orbits if clear allow Sun do not allow point or artistic star symbols ignore extra planets allow asteroids in an outer orbit/ in an orbit between star and 1 st planet asteroids must be in orbits or a belt										

Question		Answer		Mark	Guidance
	(d)	It allows other astronomers to try and repeat the findings.	✓	2	
		The astronomers' friends will be able to see their results.			
		It increases the accuracy of the astronomers' study.			
		The findings can be evaluated by other astronomers.	✓		
		Only astronomers are allowed to write articles for the journal.			
	(e)	Distant galaxies are moving away from us.	✓	2	
		Galaxies contain a maximum of 100,000 stars.			
		The distances to galaxies are known very accurately.			
		The most distant galaxies move away from the Earth the slowest.			
		What we know about galaxies comes from the radiation from them.	✓		
		Total		14	

Question		Answer	Mark	Guidance										
2	(a)	B	1											
	(b)	<table border="1"> <tr> <td>There was a geometric fit between continents.</td> <td></td> </tr> <tr> <td>The movement of continents could not be detected.</td> <td>✓</td> </tr> <tr> <td>The same type of fossil could be found on different continents.</td> <td></td> </tr> <tr> <td>Mountains are only found in the middle of continents.</td> <td></td> </tr> <tr> <td>There were simpler explanations for the same evidence.</td> <td>✓</td> </tr> </table>	There was a geometric fit between continents.		The movement of continents could not be detected.	✓	The same type of fossil could be found on different continents.		Mountains are only found in the middle of continents.		There were simpler explanations for the same evidence.	✓	2	one mark for each correct tick accept any unambiguous indication of choice
There was a geometric fit between continents.														
The movement of continents could not be detected.	✓													
The same type of fossil could be found on different continents.														
Mountains are only found in the middle of continents.														
There were simpler explanations for the same evidence.	✓													
		Total	3											

Question		Answer	Mark	Guidance
3	(a)	beta	1	allow β
	(b)	microwave	1	
	(c)	ultraviolet	1	allow uv
		Total	3	

Question		Answer	Mark	Guidance
4		<p>radiation/light source/from is the Sun (1)</p> <p>radiation/light travels / transmits through air/space (1)</p> <p><u>reflects</u> from the Moon (1)</p> <p>eyes/retina are <u>light</u> detectors / <u>light absorbed</u> by eyes/retina (1)</p>	4	<p>if light travels from Earth to Moon then maximum 2 marks ignore anything about street lighting and the countryside</p> <p>do not allow air between Sun and Moon and Earth</p> <p>ignore 'Moon absorbs the light'</p> <p>not just 'light reaches our eyes'</p>
		Total	4	

Question		Answer	Mark	Guidance								
5	(a)	Carbon dioxide absorbs some radiation in the Earth's atmosphere.	✓	3 one mark for each correct tick accept any unambiguous indication of choice								
		The ozone layer is in the Earth's atmosphere.										
		The atmosphere reflects radiation from the Sun.										
		The Earth absorbs some radiation and then emits radiation.	✓									
		The Earth is warmer than it would otherwise be.	✓									
		The north and south poles are colder than the equator.										
		Ultraviolet radiation comes from the Moon.										
	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>increase</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>stay the same</td> <td></td> </tr> <tr> <td>decrease</td> <td></td> </tr> </table>	increase	✓	stay the same		decrease		1	accept any unambiguous indication of choice		
increase	✓											
stay the same												
decrease												
	(c) (i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>climate change</td> <td></td> </tr> <tr> <td>rising sea levels</td> <td></td> </tr> <tr> <td>skin cancer</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>icecaps melting</td> <td></td> </tr> </table>	climate change		rising sea levels		skin cancer	✓	icecaps melting		1	accept any unambiguous indication of choice
climate change												
rising sea levels												
skin cancer	✓											
icecaps melting												
	(ii)	correlation	1									
Total			6									

Question		Answer	Mark	Guidance
6	(a)	It is radioactive.		2 one mark for each correct tick accept any unambiguous indication of choice
		It is easily transmitted.	✓	
		It is can be used in power stations to make energy sources.		
		It can be seen clearly.		
		It can be used by many different devices.	✓	
	(b)	It is produced by motors.		1 accept any unambiguous indication of choice
		It was the second energy source discovered.		
		It is used to power secondary schools.		
		It is produced using another energy source.	✓	
Total			3	

Question		Answer	Mark	Guidance								
7	(a)	idea of not running out OR can be replaced within a lifetime/reasonably quickly	1	do not accept can be used again/re-used 0 marks 'sustainable' needs further explanation allow 'does not use finite resources'								
	(b)	8250 kJ and 750 kJ (1) 7500 kJ (1)	2	maximum of 1 mark if no units, unit must occur in at least one box								
	(c)	<table border="1"> <tbody> <tr> <td>It can keep being developed.</td> <td></td> </tr> <tr> <td>It can be used without damaging the environment for the future.</td> <td>✓</td> </tr> <tr> <td>It is made from materials that are sustainable.</td> <td></td> </tr> <tr> <td>It will work in the developing world.</td> <td></td> </tr> </tbody> </table>	It can keep being developed.		It can be used without damaging the environment for the future.	✓	It is made from materials that are sustainable.		It will work in the developing world.		1	accept any unambiguous indication of choice
It can keep being developed.												
It can be used without damaging the environment for the future.	✓											
It is made from materials that are sustainable.												
It will work in the developing world.												
Total			4									

Question		Answer	Mark	Guidance										
8	(a)	<table border="1"> <tr> <td>by burning the fuel</td> <td></td> </tr> <tr> <td>by re-using low level radioactive waste</td> <td></td> </tr> <tr> <td>by changes in the nucleus</td> <td>✓</td> </tr> <tr> <td>by using the electricity</td> <td></td> </tr> </table>	by burning the fuel		by re-using low level radioactive waste		by changes in the nucleus	✓	by using the electricity		1	accept any unambiguous indication of choice		
by burning the fuel														
by re-using low level radioactive waste														
by changes in the nucleus	✓													
by using the electricity														
	(b)	<table border="1"> <tr> <td>They produce ionising radiation.</td> <td>✓</td> </tr> <tr> <td>Their activity increases over time.</td> <td></td> </tr> <tr> <td>They produce carbon dioxide.</td> <td></td> </tr> <tr> <td>They contain electrons, protons and neutrons.</td> <td>✓</td> </tr> <tr> <td>They all have the same half-life.</td> <td></td> </tr> </table>	They produce ionising radiation.	✓	Their activity increases over time.		They produce carbon dioxide.		They contain electrons, protons and neutrons.	✓	They all have the same half-life.		2	one mark for each correct tick accept any unambiguous indication of choice
They produce ionising radiation.	✓													
Their activity increases over time.														
They produce carbon dioxide.														
They contain electrons, protons and neutrons.	✓													
They all have the same half-life.														
	(c)	<p>benefits outweigh the risk (1)</p> <p>examples of benefits e.g. more pay/better health care/interesting job/no other jobs/enjoyable/status (1)</p>	2	allow 2 benefits do not allow more than one economic benefit e.g. job security, better pay allow example e.g. radiotherapists want to help people, but not just wanting to help people										
		Total	5											

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