

Physics A

General Certificate of Secondary Education

Unit **A331/02**: Unit 1 – Modules P1, P2, P3 (Higher Tier)

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.

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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.

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

Question		Answer	Marks	Guidance										
2	(a)	fuel rod chain reaction control rod coolant	4											
	(b)	<table border="1"> <tbody> <tr> <td>energy is released from the electrons</td> <td></td> </tr> <tr> <td>two smaller nuclei of similar size are produced</td> <td>✓</td> </tr> <tr> <td>fission of uranium produces more energy than a chemical reaction of uranium with</td> <td>✓</td> </tr> <tr> <td>protons are given off</td> <td></td> </tr> <tr> <td>all the nuclei produced in the fission are non-radioactive</td> <td></td> </tr> </tbody> </table>	energy is released from the electrons		two smaller nuclei of similar size are produced	✓	fission of uranium produces more energy than a chemical reaction of uranium with	✓	protons are given off		all the nuclei produced in the fission are non-radioactive		2	
energy is released from the electrons														
two smaller nuclei of similar size are produced	✓													
fission of uranium produces more energy than a chemical reaction of uranium with	✓													
protons are given off														
all the nuclei produced in the fission are non-radioactive														

Question			Answer	Marks	Guidance
2	(c)	(i)	<p>type of waste</p> <p>method of disposal</p>	1	
		(ii)	<p><u>half-life</u> of intermediate is longer/long OR high level waste has a shorter/short <u>half life</u></p> <p>Idea that high level waste becomes intermediate waste</p>	2	assume 'it' means intermediate waste
	(d)		B and E	2	any order
			Total	11	

Question		Answer	Marks	Guidance								
3	(a)	<p>any three from: bias in sample/samples not matched/no control group e.g. all had cancer; small sample size; apparent <u>correlation</u>; idea that there is no mechanism for the microwaves causing cancer;</p>	3									
	(b)	<table border="1"> <tbody> <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> </tbody> </table>	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												
Total			4									

Question		Answer	Marks	Guidance	
4	(a)	the photons arriving at Venus have a higher energy	2		
		Earth's gravity is greater			
		more photons are arriving at Venus			✓
		Venus is covered in clouds all the time			
		the intensity of electromagnetic radiation decreases with increasing distance from the Sun			✓
	(b)	<p>identifies carbon dioxide as the important gas (1)</p> <p>Venus atmosphere has more / large amounts / 96% carbon dioxide (1)</p> <p>(greater) greenhouse effect / is a greenhouse gas (1)</p>	3	<p>accept CO₂ do not allow CO² etc. do not allow reference to oxygen or nitrogen (for first marking point), ora allow description of the greenhouse effect e.g traps heat do not allow absorbs sunlight ignore any reference to the distance from the Sun</p>	
	(c)	W/m ²	1		
Total			6		

Question			Answer	Marks	Guidance
5			respiration / respiring / excretion photosynthesis deforestation combustion / burning	4	ignore decomposing not breathing accept burning forests / clearing land / chopping down trees
			Total	4	

Question		Answer	Marks	Guidance	
6	(a)	They are large and orbit the Sun.	1		
		They are usually made of rocks and ice. They spend most of their time outside...			
		They are usually made of rock, and most of them are found between Mars and...			✓
		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...	✓	3	
		Fossils suggest the dinosaur numbers were decreasing for hundreds of thousands of...			
		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...	✓		
		There have been many other extinctions during the history of the world.			
Total			4		

Question		Answer	Marks	Guidance
7	(a)	<p>Big Bang</p> <p>formation of Solar System/Sun</p> <p>(age of) oldest rocks</p>	3	<p>accept making/creating/beginning for formation</p> <p>accept formation of universe do not accept just 'universe'</p> <p>do not accept just 'solar system' / 'sun'</p> <p>accept formation of the Earth</p>
	(b)	<p>straight line rising to the right</p> <p>line goes through origin</p>	2	accept a series of points indicating a straight line
		Total	5	

Question			Answer	Marks	Guidance										
8	(a)		7458	1											
	(b)	(i)	<table border="1"> <tr> <td>in the Solar System</td> <td></td> </tr> <tr> <td>outside the Solar System but closer than the nearest stars</td> <td></td> </tr> <tr> <td>outside the Solar System but inside the Milky Way</td> <td>✓</td> </tr> <tr> <td>outside the Milky Way, but not as far as nearby galaxies</td> <td></td> </tr> <tr> <td>as far as very distant galaxies</td> <td></td> </tr> </table>	in the Solar System		outside the Solar System but closer than the nearest stars		outside the Solar System but inside the Milky Way	✓	outside the Milky Way, but not as far as nearby galaxies		as far as very distant galaxies		1	
in the Solar System															
outside the Solar System but closer than the nearest stars															
outside the Solar System but inside the Milky Way	✓														
outside the Milky Way, but not as far as nearby galaxies															
as far as very distant galaxies															
		(ii)	<table border="1"> <tr> <td>measure how long it takes light to get to the Earth</td> <td></td> </tr> <tr> <td>use the Hubble relationship</td> <td></td> </tr> <tr> <td>use the brightness of the star</td> <td>✓</td> </tr> <tr> <td>use parallax</td> <td>✓</td> </tr> <tr> <td>measure how long it takes for a radar signal to return</td> <td></td> </tr> </table>	measure how long it takes light to get to the Earth		use the Hubble relationship		use the brightness of the star	✓	use parallax	✓	measure how long it takes for a radar signal to return		2	
measure how long it takes light to get to the Earth															
use the Hubble relationship															
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use parallax	✓														
measure how long it takes for a radar signal to return															
			Total	4											

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