

Physics A

General Certificate of Secondary Education

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

Mark Scheme for January 2011

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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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Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	= 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	= alternative wording
ORA	= or reverse argument

e.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)

"work done" = 0 marks

"work done lifting" = 1 mark

"change in potential energy" = 0 marks

"gravitational potential energy" = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. 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.

The example below illustrates how to apply this principle to an objective question.

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 zero marks.

Put ticks (✓) in the two correct boxes.

✗
✗

This would be worth one mark.

Put ticks (✓) in the two correct boxes.

✗
✗
✓
✓

This would be worth one mark.

7. 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.

8. 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			Expected Answers	Marks	Additional Guidance
1	a	i	1.8 (1)	[1]	Allow 1.76 or 1.77.
		ii	Nuclear power (1)	[1]	Must ecf from (a) (i) if this is larger than 2.6 then answer must be dental.
	b		Benefit outweighs risk (1) Example of benefit (1)	[2]	Allow two marks for two benefits. Allow one economic benefit.
Total				[4]	

2	a		ALARA – as low as reasonably achievable (1) Identifies a risk (1) e.g. (radiation can cause) cancer / contamination / (radiation / radioactive) leaks A correct implementation of the ALARA principle to this situation. (1) e.g. the amount of radiation reaching people can be reduced by adding lead shielding (which will reduce the risk to acceptable levels)	[3]	Ignore explosions. Allow toxic waste. The answer must illustrate how the suggestion leads to a reduction in risk; a method on its own is insufficient. Note the suggestion must be reasonable in the submarine context. So not using the nuclear reactor would not be reasonable.
	b	i	B (1)	[1]	
		ii	9 MBq (1)	[1]	
		iii	6 years (1)	[1]	
	c		C (1) E (1) F (1)	[3]	Any order.
Total				[6]	

3		<p>Source – sunlight / bulb / a light / named source emits light (1)</p> <p>Idea of light travelling / air is transparent / not absorbed by air / transmitted through air (1)</p> <p>Idea of paper reflects light / absorbed by ink / writing (1)</p> <p>Eye / retina is the detector. Eye / retina absorbs light / photons (1)</p>	[4]	<p>Maximum of 2 marks only can be scored for an incorrect sequence of events (correct sequence is 'source – paper – eye').</p> <p>Marks may be obtained from a suitably annotated diagram.</p> <p>Allow receptors as meaning detector.</p>
Total			[4]	

Question		Expected Answers	Marks	Additional Guidance
4	a	energy (1) number (1) intensity (1)	[3]	
	b	<input type="checkbox"/> 300 000 km/s <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	[1]	
Total			[4]	

Question		Expected Answers	Marks	Additional Guidance
5	a	<p style="text-align: right;"><input type="checkbox"/></p> <p>They absorb electromagnetic radiation ... <input checked="" type="checkbox"/> (1)</p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p>	[1]	
	b	<p>Carbon dioxide levels in the ... <input checked="" type="checkbox"/> (1)</p> <p style="text-align: right;"><input type="checkbox"/></p> <p>Since the industrial revolution, huge ... <input checked="" type="checkbox"/> (1)</p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p>Carbon dioxide is a greenhouse gas. <input checked="" type="checkbox"/> (1)</p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p>	[3]	
	c	<p>Risk / hazards / consequences / outcome / effect not known (and consequences potentially serious) (1)</p> <p>The effect of applying the principle (1) e.g. the method will not be carried out.</p>	[2]	<p>Accept consequences for global warming / climate change e.g. global warming continues / gets worse.</p>
Total			[6]	

Question		Expected Answers			Marks	Additional Guidance	
6			effect on cell	microwave	[3]	Four rows correct = 3 marks Three rows correct = 2 marks One or two rows correct = 1 mark	
			heats up the cells	✓			✓
			increases vibrations ...	✓			✓
			produces ions				
			provides energy for ...				✓
Total					[3]		
7	a			<input type="checkbox"/>	[1]		
			at the edge of tectonic plates	<input checked="" type="checkbox"/> (1)			<input type="checkbox"/>
	b			<input type="checkbox"/>	[1]		
			The Earth's mantle moves.	<input checked="" type="checkbox"/> (1)			<input type="checkbox"/>
	c		Example of suitable government action, e.g. building regulations/emergency plans (1)		[2]	Ignore governments building houses/shelters/schools etc. Ignore early warning systems / evacuation before the earthquake. Allow send in army / rescue teams / evacuation after the earthquake.	
			Explanation of how damage is reduced e.g. buildings less likely to collapse / people get medical help immediately so fewer die (1)				
Total					[4]		

Question		Expected Answers	Marks	Additional Guidance
8	a	Number of stars (in the galaxy) (1)	[1]	
	b	L p	[1]	Both needed.
	c	1 (1)	[1]	
	d	none (1)	[1]	Allow words to that effect.
Total			[4]	

9	a	There are difficulties in making ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[1]	
	b	<input type="checkbox"/> 12 x 300 000 x 60 x 60 x 24 x 365.25 <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[1]	
Total			[2]	

10	a	B (1)	[1]	
	b	10 cm/year (1)	[1]	
Total			[2]	

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