

Physics A

General Certificate of Secondary Education

Unit **A332/02**: Unit 2 – Modules P4, P5, P6 (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.

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

This would be worth zero marks.

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 one mark.

Put ticks (✓) in the two correct boxes.

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

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

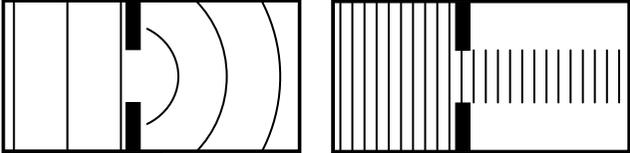
Question			Gd	Expected Answers	Marks	Additional Guidance
1	a	i	CD	increases PE as it goes up/decreases PE as it goes down (1) idea of PE converted to KE/KE converted to PE(1)	[2]	PE is converted to heat via the brakes as alternative to KE.
		ii	D	friction (1)	[1]	Allow air resistance / drag.
	b		D	800 kJ	[1]	Allow any clear and unambiguous response.
	c	i	C	800 (kJ)	[1]	Ecf from part b. So if they got part b wrong then the answer they chose from b is the correct answer here. Accept 800,000 if unit is changed to J.
		ii	CB	Idea of some kind of resistive force acting (doing work) (1) Some energy is lost (to heating) / not all PE goes to KE (1)	[2]	Examples of resistive forces, e.g. braking force / air resistance etc. Allow efficiency arguments e.g. 'not 100% efficient' for first mark
Total					[7]	

2	a		C	A (1)	[1]	Allow any clear and unambiguous response.
	b		C	D (1)	[1]	Allow any clear and unambiguous response.
	c		BC	<input type="checkbox"/>	[2]	
				<input type="checkbox"/>		
				The counter forces on the boat decrease ... <input checked="" type="checkbox"/> (1)		
				<input type="checkbox"/>		
				The weight decreases. <input checked="" type="checkbox"/> (1)		
				<input type="checkbox"/>		
	d		A*	Nigel (1)	[1]	
Total					[5]	

Question		Gd	Expected Answers	Marks	Additional Guidance					
3	a	A	greater than the same as	[1]	Both required for the mark.					
	b	AB	Time of impact increases / driver slows down over a greater period of time (1) (So) force of impact is reduced (because the change in momentum stays the same) (1)	[2]	driver / passenger / dummy If candidate explicitly states that <u>change</u> in momentum is different, the second marking point cannot be awarded.					
Total				[3]						
4	a	DD C	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>E</td> <td>C</td> <td>D</td> <td>A</td> <td>B</td> </tr> </table>	E	C	D	A	B	[3]	E somewhere before C C somewhere before D D somewhere before A A somewhere before B Four correct for 3 marks. Three correct for 2 marks. Two correct for 1 mark. No marks for one or none correct.
E	C	D	A	B						
	b	D	230V a.c. (1)	[1]	Allow any clear and unambiguous response					
	c	BAA*	$230/12 = \text{number of turns on primary} / 100$ (1) number of turns on primary = $230 \times 100 / 12$ (1) number of turns on primary = 1917 (1)	[3]	i.e. correct substitution into formula (note $230/12=19.17$) i.e. rearrangement (worth 2marks if they start at this point and skip first stage) Correct answer = 3 marks automatically. Allow 1900, 1910, 1920, 1916 Allow 916 / 917 for full marks ecf if 110 chosen in part b. For candidates who have mixed up primary and secondary coils, allow 2 marks for an answer of 5 coils.					
Total				[7]						

Question		Gd	Expected Answers	Marks	Additional Guidance
5	a	C	component A LDR / light dependent resistor	[1]	Both the correct letter and the name required for the mark.
	b	D	<p style="text-align: center;">The resistance decreases</p> <div style="display: flex; justify-content: center; gap: 10px;"> <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> </div>	[1]	
	c	i	B 0.2 (1)	[1]	
		ii	BB B (1) C (1)	[2]	
	d	BA*	<p style="text-align: center;">The current passing through A1 is equal to ...</p> <div style="display: flex; justify-content: center; gap: 10px;"> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div> <p style="text-align: center;">When the second buzzer is added ...</p> <div style="display: flex; justify-content: center; gap: 10px;"> <input checked="" type="checkbox"/> (1) </div>	[2]	
Total				[7]	

Question		Gd	Expected Answers	Marks	Additional Guidance																				
6	a	BA	transverse perpendicular parallel	[2]	All 3 for 2 marks. 1 or 2 correct for one mark.																				
	b	BB	Position B: wavelength and frequency Position C: speed	[2]	Any order. Allow energy in place of either wavelength or frequency. All 3 for 2 marks. 1 or 2 correct for one mark.																				
	c	B	300 000 km/s (1)	[1]	Allow any clear and unambiguous response.																				
	d	i	BA <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th colspan="3">speed of the red light</th> </tr> <tr> <th></th> <th>increases</th> <th>decreases</th> <th>stays the same</th> </tr> </thead> <tbody> <tr> <td>boundary 1</td> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>boundary 2</td> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>boundary 3</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> </tbody> </table>		speed of the red light				increases	decreases	stays the same	boundary 1		✓		boundary 2			✓	boundary 3	✓			[2]	2 marks for three correct. 1 mark for two correct.
	speed of the red light																								
	increases	decreases	stays the same																						
boundary 1		✓																							
boundary 2			✓																						
boundary 3	✓																								
		ii	AA* The wavelength of blue light is shorter ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> Blue light travels slower than red light ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	[2]																					
Total				[9]																					

Question	Gd	Expected Answers	Marks	Additional Guidance
7	CC CC	 <p data-bbox="383 485 815 515"><u>Diffraction / diffract / diffracted</u> (1)</p> <p data-bbox="383 555 1032 616">diffraction shown on at least one diagram / curved wavefronts on RHS of at least one diagram (1)</p> <p data-bbox="383 655 1066 716">wavelength not changing when waves travel through gaps (1)</p> <p data-bbox="383 756 1099 817">more diffraction on left diagram / relating the size of the wavelength to the size of the gap (1)</p> <p data-bbox="383 857 1099 917">diffraction only happens when the wavelength matches (about the same as) the size of the gap (1)</p>	4 max	<p data-bbox="1240 453 1794 483">Must use any of these words for this mark.</p> <p data-bbox="1240 655 1424 686">Judge by eye.</p> <p data-bbox="1240 756 1924 786">Right hand diagram must show little or no diffraction.</p>
		Total	[4]	

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