

Physics A

General Certificate of Secondary Education **A332/02**

Unit 2: Modules P4, P5, P6

Mark Scheme for June 2010

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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
 - words = 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. Annotations:

The following annotations are available on SCORIS.

 - ✓ = correct response
 - ✗ = incorrect response
 - bod = benefit of the doubt
 - nbod = benefit of the doubt **not** given
 - ECF = error carried forward
 - ^ = information omitted
 - I = ignore
 - R = reject
6. If a candidate alters his/her response, examiners should accept the alteration.
7. 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 0 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 checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be
worth one mark.

8. 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.

9. 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	electrons (1)	[1]	accept any clear and unambiguous response
		ii	positive (1)	[1]	accept any clear and unambiguous response
	b	i	<p>... stay still and do not move. <input type="checkbox"/></p> <p>... move together and touch. <input type="checkbox"/></p> <p>... move away from each other. <input checked="" type="checkbox"/> (1)</p> <p>... spin around together. <input type="checkbox"/></p>	[1]	
		ii	<p>like/same charges (1)</p> <p>repel (1)</p>	[2]	<p>allow 2 negative charges/they are both negative</p> <p>allow electrons in place of negative charges</p> <p>allow push away for repel</p> <p>2 positives repel = 1 mark</p>
	c		<p>... they have high melting points. <input type="checkbox"/></p> <p>... free electrons that can move. <input checked="" type="checkbox"/> (1)</p> <p>... they conduct heat very well. <input type="checkbox"/></p> <p>... they are shiny. <input type="checkbox"/></p>	[1]	
			Total	[6]	

Question		Expected Answers	Marks	Additional Guidance
2	a	magnets move (in relation to coil) (1) leading to a <u>changing</u> magnetic field (1) which causes voltage/potential difference/p.d. to be induced in the coil (1)	[3]	accept 'induces current' in place of voltage
	b	transformer (1)	[1]	ignore reference to step up/ step down
	c	i	[1]	allow 'alternating' on its own
		ii	[2]	
		... faster to generate. <input type="checkbox"/>		
		... easier to generate. <input checked="" type="checkbox"/> (1)		
		... used in more appliances. <input type="checkbox"/>		
		... less polluting. <input type="checkbox"/>		
		... more efficient to distribute. <input checked="" type="checkbox"/> (1)		
Total			[7]	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	unit conversion $450\text{g} = 0.45\text{kg}$ (1) 90 (1)	[2]	allow answer of 90 000 for 1 mark correct numerical answer gains both marks
		ii	90 (J) (1)	[1]	allow the same numerical answer as part (a) (i) above for 1 mark
	b		idea of equal and opposite force (1) force <u>on</u> the foot/football boot/lan <u>from</u> the ball (1)	[2]	
	c			[2]	award 1 mark if the line on the left starts from the top box (regardless of which box in the middle it is joined to) if more than one box selected in left column, the mark for that link will be zero award 1 mark if top box in the middle is linked to the bottom box on the right if more than one box selected in middle and/or right column, the mark for that link will be zero
			Total	[7]	

Question		Expected Answers	Marks	Additional Guidance
4	a	<p>any three from: burnt fuel / (hot) gases go down / downwards; there is an equal and opposite (thrust) on the rocket; weight/gravitational force/gravity acts down; upwards force/thrust greater than weight/gravity/downwards force;</p>	[3]	<p>owtte idea of interaction pair force pushing rocket up</p> <p>allow upthrust</p>
	b	700 000 (kJ) (1)	[1]	allow 700 000 000 J
	c	$\frac{13\,000\,000\,000}{1000} \quad (1)$ $13\,000\,000 / 1.3 \times 10^7 \quad (1)$	[2]	<p>full marks for correct answer with no/unclear working allow 1 mark for correctly rearranged word formula in place of first marking point answer does not need to be in standard form allow correct answers in kN etc provided they are clearly presented</p>
Total			[6]	

Question		Expected Answers	Marks	Additional Guidance							
5	a	matter <input type="checkbox"/> energy <input checked="" type="checkbox"/> (1) disturbances <input checked="" type="checkbox"/> (1) particles <input type="checkbox"/> charge <input type="checkbox"/>	[2]								
	b	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">description</td> <td style="text-align: center;">type of wave</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">... same direction ...</td> <td rowspan="2" style="border: 1px solid black; padding: 2px; text-align: center;">longitudinal waves</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">... right angles ...</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">needs a medium</td> <td rowspan="2" style="border: 1px solid black; padding: 2px; text-align: center;">transverse waves</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">... vacuum</td> </tr> </table>	description	type of wave	... same direction ...	longitudinal waves	... right angles ...	needs a medium	transverse waves	... vacuum	[2]
description	type of wave										
... same direction ...	longitudinal waves										
... right angles ...											
needs a medium	transverse waves										
... vacuum											
c	i	vertical line from central line to peak (top of wave) or trough (bottom of wave) (1)	[1]	allow approximately 1mm tolerance in drawing accept a correctly drawn line with the label 'A' missing							
	ii	C (1)	[1]	accept E for 1 mark							
d	i	stopwatch (1)	[1]	accept any clear and unambiguous response							
	ii	<u>number of waves</u> (1) time	[1]	accept any clear and unambiguous response							
Total			[8]								

Question			Expected Answers	Marks	Additional Guidance																				
6	a	i	300 000 km/s (1)	[1]	accept any clear and unambiguous response.																				
		ii	<table border="1"> <thead> <tr> <th>property of wave</th> <th>sound</th> <th>light</th> <th>both</th> </tr> </thead> <tbody> <tr> <td>can travel though a vacuum</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>needs a solid, liquid or gas to travel through</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>can show interference</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>can show diffraction</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>	property of wave	sound	light	both	can travel though a vacuum		✓		needs a solid, liquid or gas to travel through	✓			can show interference			✓	can show diffraction			✓	[3]	for rows 3 and 4 only, allow ticks in 'sound' and 'light' columns as equivalent to a single tick in the 'both' column four rows correct = 3 marks three rows correct = 2 marks two rows correct = 1 mark
property of wave	sound	light	both																						
can travel though a vacuum		✓																							
needs a solid, liquid or gas to travel through	✓																								
can show interference			✓																						
can show diffraction			✓																						
	b			[4]	mark left and right hand side separately for each side: four correct links = 2 marks two or three correct links= 1 mark more than one link from a box = incorrect link for that box																				
			Total	[8]																					

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