

**Physics A**

General Certificate of Secondary Education

Unit **A332/02**: Unit 2 – Modules P4, P5, P6 (Higher Tier)

**Mark Scheme for January 2013**

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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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






## Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	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
	no benefit of doubt
	reject
	correct response

	indicate level awarded for a question marked by level of response
	information omitted
	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	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

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		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

- 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	Marks	Guidance
1	(a)	arc shaped waves <b>and</b> spreading out after narrow gap, to be wider than the gap (1)	1	<b>ignore</b> wavelength
	(b)	diffraction (1)	1	
<b>Total</b>			<b>2</b>	
Question		Answer	Marks	Guidance
2	(a)	an analogue signal can take all values/is continuously changing (1) a digital signal is a series of off and on/0 and 1's/two values (1)	2	these points may be shown on the diagrams however if diagrams and writing contradict then lose mark(s) the candidate must have indicated the type of signal on at least one diagram to gain marks from the diagrams allow 1 mark for correct diagrams unlabelled allow 1 mark if labels reversed <b>ignore</b> references to quality of signal, noise, decoding etc.  <b>allow</b> on diagram of digital signal small indications of noise <b>ignore</b> small errors in drawings eg backward sloping curves
	(b)	intensity/quality (1) quality (1) digital and analogue (1)	3	needs both digital and analogue and in correct order for this mark.
<b>Total</b>			<b>5</b>	
Question		Answer	Marks	Guidance
3	(a)	<b>any three from:</b>  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.	3	owtte idea of interaction pair force pushing rocket up  <b>allow</b> upthrust
	(b)	800 000 (kJ) (1)	1	Allow 800 000 000 J
<b>Total</b>			<b>4</b>	



Question		Answer	Marks	Guidance
4		(loss of) PE = (gain in) KE or weight x height = $\frac{1}{2} mv^2$ (1)  $300 \times 15 = \frac{1}{2} \times 30 v^2$ or $v^2 = 300 \times 15 \times 2 \div 30$ (1)  $v = 17.32$ (m/s) (1)	3	PE = $300 \times 15$ or 4500 and everything else wrong then 1 mark  correct numerical answer gains full marks providing the answer does not come from incorrect Physics
<b>Total</b>			<b>3</b>	

Question		Answer	Marks	Guidance																
5	(a)	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 15%;">force on plane</div> <div style="border: 1px solid black; padding: 5px; width: 15%; text-align: center;">object interaction pair is acting on</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 15%;">A</div> <div style="border: 1px solid black; padding: 5px; width: 15%;">exhaust particles...</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 15%;">B</div> <div style="border: 1px solid black; padding: 5px; width: 15%;">the Earth</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 15%;">C</div> <div style="border: 1px solid black; padding: 5px; width: 15%;">molecules of air</div> </div> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 15%;">D</div> <div style="border: 1px solid black; padding: 5px; width: 15%;">molecules of air</div> </div>	4	look at the links as they leave the left-hand boxes all four links correct (4) three links correct (3) two links correct (2) one link correct (1)  if a candidate draws more than four lines and makes no attempt to cross them out then each wrong line cancels out one correct line																
	(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 15%;">take off and climb</th> <th style="width: 15%;">level flight</th> <th style="width: 15%;">decent and landing</th> </tr> </thead> <tbody> <tr> <td>Total energy is conserved.</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Some work done</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>The plane gains kinetic and gains gravitational</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> </tbody> </table>		take off and climb	level flight	decent and landing	Total energy is conserved.	✓	✓	✓	Some work done	✓	✓	✓	The plane gains kinetic and gains gravitational	✓			3	1 mark per correct row mark each <b>row</b> independently as set of 3 tick boxes
	take off and climb	level flight	decent and landing																	
Total energy is conserved.	✓	✓	✓																	
Some work done	✓	✓	✓																	
The plane gains kinetic and gains gravitational	✓																			
<b>Total</b>			<b>7</b>																	

Question		Answer	Marks	Guidance							
6	(a)	<p>The sound wave is a longitudinal wave.</p> <p>The wave speed is greater in the flame than in the air.</p> <p>The energy of the sound wave is related to the amplitude.</p>	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;">D</td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="text-align: center;">(1)</td> </tr> </table>	A	(1)	D	(1)	B	(1)	3	
A	(1)										
D	(1)										
B	(1)										
	(b)		4	<p>mark each side independently</p> <p>left hand side: one mark per correct link</p> <p>right hand side: one mark per correct link</p> <p>any additional lines from a box will cancel the mark for the correct line</p> <p><b>allow 1 additional mark</b> for link shown by dashed line on the right, provided no more than <b>2 marks in total</b> for the right side</p>							
<b>Total</b>			<b>7</b>								

Question		Answer	Marks	Guidance	
7	(a)	<p>All the energy transferred to the kettle heats the water.</p> <p>The energy transferred increases the voltage across the kettle.</p> <p>The power of the kettle is the rate at which energy is transferred to the kettle.</p> <p>When the electric charge flows through the kettle, energy is transferred to the kettle.</p>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px; text-align: center;">✓</div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px; text-align: center;">✓</div> </div>	2	one mark for each box correctly ticked then lose one mark for each additional tick
	(b)	<p><math>3000 \times 3 \div 60 = 150 \text{ kWh}</math></p> <p><math>3 \times 3 \div 60 = 0.15 \text{ kWh}</math></p> <p><math>3000 \times 3 \times 60 = 540\,000 \text{ J}</math></p> <p><math>3000 \times 3 = 9000 \text{ J}</math></p> <p><math>3 \times 3 = 9 \text{ J}</math></p>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px; text-align: center;">✓</div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px; text-align: center;">✓</div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 30px;"></div> </div>	2	one mark for each box correctly ticked then lose one mark for each additional tick
	(c)	<p>kilowatt hours/kWh (1)</p> <p>idea that the joule is a very small amount of energy/using kWh makes the numbers more manageable (1)</p>	2	<b>accept</b> idea that it is a 'more convenient unit to use' for second marking point	
<b>Total</b>			<b>6</b>		

Question		Answer	Marks	Guidance
8	(a)	electrons negative current	2	3 correct = 2 marks 2 correct = 1 mark 0/1 correct = 0 marks
	(b)	charges cannot move freely in rubber metals are good insulators the wire contains charges plane and ground have same charge	2	all correct = 2 marks 3 correct = 1 mark 0/1/2 correct = 0 marks
		<b>Total</b>	<b>4</b>	
Question		Answer	Marks	Guidance
9	(a)	12	1	accept '3 x 4'
	(b)	5Ω (1)	1	any clear indication of correct answer is allowed
	(c)	Add the voltage across each of the resistors together. Multiply the current by the total resistance.	2	
		<b>Total</b>	<b>4</b>	

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