

# Mark Scheme (Results)

January 2013

International GCSE  
Physics (4PH0) Paper 2P

Edexcel Level 1/Level 2 Certificate  
Physics (KPH0) Paper 2P

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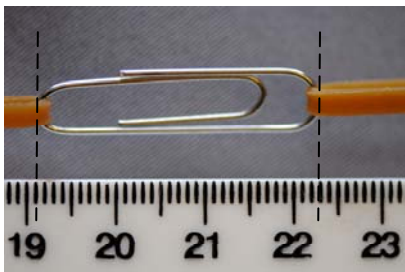
Question number		Answer			Accept	Reject	Marks												
1	(a)	<table border="1"> <thead> <tr> <th>Type of radiation</th> <th>Charge</th> <th>Source</th> </tr> </thead> <tbody> <tr> <td>Alpha particle</td> <td><b>(+)2</b></td> <td>Unstable nucleus</td> </tr> <tr> <td>Beta particle</td> <td>- 1</td> <td>Unstable nucleus</td> </tr> <tr> <td>Gamma ray</td> <td>0</td> <td><b>Unstable nucleus</b></td> </tr> </tbody> </table> <p>(As shown) 2 ; Unstable nucleus;</p>			Type of radiation	Charge	Source	Alpha particle	<b>(+)2</b>	Unstable nucleus	Beta particle	- 1	Unstable nucleus	Gamma ray	0	<b>Unstable nucleus</b>	++ Unstable nuclei	-2	2
Type of radiation	Charge	Source																	
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Question number		Answer	Accept	Reject	Marks
1	(b)	<p>Any three of:</p> <p>MP1 - Idea that alpha particles would not penetrate (enough); e.g. alpha particles absorbed / stopped by {aluminium / foil / a few cm air / paper / card}</p> <p>MP2 - Idea that gamma rays would be too penetrative; e.g. gamma rays {are not absorbed / are unaffected}</p> <p>MP3 - Idea that some beta particles will pass through the foil; e.g. not all of the beta particles are absorbed</p> <p>MP4 - Idea of a correlation between thickness and absorption; e.g. thinner aluminium absorbs fewer beta particles</p>	<p>Ignore references to danger or harm</p> <p>All ideas may be expressed in terms of penetration or absorption.</p> <p>No need to see the word "aluminium," provided the meaning is clear.</p> <p>Accept paper or card will stop alpha for MP1</p> <p>Accept comparisons of aluminium thickness for MP4</p>		3
	(c)	(i)			1
		${}_{39}^{90}\text{Y}$ <p>both 90 and 39 for mark</p>			
		(ii)			1
				<b>Total</b>	<b>7</b>

Question number		Answer	Accept	Reject	Marks
2	(a)	Any one of <u>Reduced</u> (running) costs; No atmospheric pollution / CO <sub>2</sub> ;  Renewable (resource);	No polluting emissions No greenhouse gases  Cleaner (only if qualified)	The wind is free No costs	1

Question number	Answer	Accept	Reject	Marks
2 (b)	<p>Up to two points about each of unreliability, environmental issues, site choice, maintenance difficulties, data use, or cost. 1 mark per point to a maximum 4 marks</p> <p>Unreliability - the wind does not always blow (at the right speed); the turbine does not always provide output OR a back-up generator is needed;</p> <p>Environmental effects - spoils the view OR is noisy; (construction) destroys habitats OR a hazard to flying birds;</p> <p>Site choice - a large site is needed; a windy site is needed;</p> <p>Maintenance difficulties - need to work in remote location (usually); need to work in a hazardous location e.g at height / sea;</p> <p>Data use - one turbine produces less power than a power station; need many/800 turbines to give same output as coal-fired;</p> <p>Cost - building a wind farm needs much money / time; other costs for research / land / maintenance;</p>	<p>Accept – appropriate reverse arguments in terms of the suitability of coal-fired power stations</p> <p>Ignore comments about efficiency or cost effectiveness</p>		4
			<b>Total</b>	<b>5</b>

Question number		Answer	Accept	Reject	Marks											
3	(a)	(i) 5.1			1											
		(ii) Suitable scale chosen (>50% of grid used); Axes labelled with quantities and units; Plotting to nearest half square (minus one for each plotting / error);; Line of best fit acceptable;  Sample graph:  <table border="1" data-bbox="1408 764 1615 979"> <tbody> <tr> <td>1</td> <td>0.6</td> </tr> <tr> <td>2</td> <td>2.0</td> </tr> <tr> <td>3</td> <td>2.4</td> </tr> <tr> <td>4</td> <td>3.4</td> </tr> <tr> <td>5</td> <td>4.7</td> </tr> <tr> <td>6</td> <td>(5.1)</td> </tr> </tbody> </table>	1	0.6	2	2.0	3	2.4	4	3.4	5	4.7	6	(5.1)	Ignore 6 bands point Line below points 2,5 and above points 1,3,4  Ecf from (a)(i) e.g. an appropriate curve  Orientation of axes unimportant	
1	0.6															
2	2.0															
3	2.4															
4	3.4															
5	4.7															
6	(5.1)															

Question number			Answer	Accept	Reject	Marks
3	(a)	(iii)	<p>Any two of</p> <p>It is a straight line;            Gradient / slope / correlation is <u>positive</u>;            Line does / doesn't pass through origin;            Idea of correlated variables, e.g. direct / indirect proportionality [depending on projection to the origin],            length increases with number of bands;</p>	<p>Ecf from (a)(i)/(ii)            Related statement e.g. curve, line forced through origin or mention of "anomaly"</p>		2
	(b)		<p><math>3.2 \pm 0.1</math> (cm) ; ;</p> <p>Sample working:</p> 	<p>Allow evidence of two readings from scale for one mark, e.g. subtraction (22.3 - 9.1) or appropriate drawing on the photograph</p>	<p>Direct measurement of photograph with a ruler</p>	2



Question Number		Answer	Accept	Reject	Marks
3	(c)	<p>Responses may refer to measuring the length of either object (the chain or the single paperclip from photographs A and B)</p> <p>Any two of:            Either object -                parallel with scale;                closer to scale;                use fiducial mark e.g. a set square;                take parallax into account;            Minimise effect of friction on stretched chain;            Remove paperclip from chain for measurement;</p>	<p>Ignore:            repetition,            measuring <u>paperclip</u> from zero</p> <p>Allow sensible equipment changes, e.g. more precise scale, using stiffer paperclips / links</p>		2
				<b>Total</b>	<b>12</b>

Question number		Answer	Accept	Reject	Marks
4		Any three of: the air is warmed / heated (by the hot rocks); air expands / molecules move apart; air becomes less dense; <u>hot</u> air rises; cooler air (from sides) displaces warm air; (at height) air cools / contracts / becomes more dense; cooled air falls; process is repeated;	Correct points in any order  Same ideas expressed in different words  Same ideas expressed in <u>labelled</u> additions to the diagram  "It" for air		3
				<b>Total</b>	<b>3</b>

Question number			Answer	Accept	Reject	Marks
5	(a)	(i)	Substitution; Calculation; e.g. $m \times g = 0.454 \times 10$ $= 4.54 \text{ (N)}$			2
		(ii)	Centre of gravity;	Centre of mass;		1
	(b)	(i)	force upwards;  from top of nail;	Near vertical by eye  In line with $F_2$		2
		(ii)	Any two from: increase $F_1$ OR increase force (from hand);  Increase $d_1$ OR increase distance of hand from pivot;  Keep $F_1$ perpendicular to hammer;	use two hands  use longer handle use longer hammer  Ignore: references to $d_2$ distance from nail to pivot idea of bigger [rather than longer] hammer		2
					<b>Total</b>	<b>7</b>

Question number			Answer	Accept	Reject	Marks
6	(a)	(i)	(Signal has) two values;  Only;	On or off, 0 or 1, two signal strengths  Binary		2
		(ii)	Any two of The idea of increased frequency (of wave or modulation);  The idea of regeneration (allowing more data to arrive); The idea of using increased bandwidth; The idea of using additional (signal) level; The idea of multiplexing (e.g. use more than one channel);	send more bits/sparks, send morse code more quickly, send other letters  The response should be about the signal, so ignore: idea of just sending a longer message using optical fibre(s)		2
	(b)	(i)	(wave) speed = frequency x wavelength	$v = f \times \lambda$ (accept rearrangements)		1
		(ii)	Substitution; Calculation; e.g.: $820\,000 \times 366$ $= 300\,120\,000$ or $300\,000\,000$ or $3 \times 10^8$ (m/s)	Bald answer;; Power of ten error (for 1 mark) e.g. $300\,000$ m/s Alternative <u>correct</u> units (for 2 marks) e.g. $300\,000$ km /s		2

Question number		Answer	Accept	Reject	Marks
6	(c)	183 (m);			1
	(d)	Any three of: MP1 Electrons move OR there is a current Or negative charge moves; MP2 (Discharge) to earth OR across cloud OR to named object – tree, house, lightning conductor; MP3 Air conducts; MP4 Phenomenon e.g. thunder clap / lightning;	Sparks generate radio waves; Lightning causes (radio) interference; Correct reference to electrostatic attraction / repulsion ;		3
				<b>Total</b>	<b>11</b>

Question number		Answer	Accept	Reject	Marks
7	(a)	B			1
	(b)	(i) Word equation or $V_p/I_p = V_s/I_s$ ;	$V_p/V_s = I_s/I_p$ or $V_s/V_p = I_p/I_s$ or $I_1V_1 = I_2V_2$		1
		(ii) Correct equation substituted OR rearranged; Answer; $V_p/V_s = I_s/I_p$ or $V_s/V_p = I_p/I_s$ e.g. $230 \times 0.25 = 12 \times I_s$ , so $I_s = (230 \times 0.25) \div 12$ $= 4.8$ (A)	Bald answer;;  4.79 (A) , 4.792 (A)		2
	(c)	Two of  MP1 Idea of energy / power lost; MP2 Idea of efficiency $\neq$ 100%; MP3 Idea of less available energy/power/voltage/current; MP4 Idea of resistance increasing (with temperature);			2
				<b>Total</b>	<b>6</b>

Question number		Answer	Accept	Reject	Marks
8	(a)	Area under the graph (from 0 s to 3 s) ;	6 x 3 or 18 (m); area shaded on graph		1
	(b)	(i) Momentum = mass x velocity;  (ii) Substitution in correct equation; Calculation; e.g. 6.4 x 6 = 38.4 kg m/s ;	$p = m \times v$ ; accept rearrangements  Ns;		1  3

Question number			Answer	Accept	Reject	Marks
8	(c)	(i)	4.8 (m/s) ;			1
		(ii)	Idea that momentum is conserved; Substitution; Calculation;  e.g. $p_1 = p_2 \quad / \quad m_1 \times v_1 = (m_1 + m_2) \times v_2$ $6.4 \times 6 = (6.4 + m_2) \times 4.8$  $m_2 = (38.4 \div 4.8) - 6.4 = 8 - 6.4$ $= 1.6 \text{ (kg)}$	Allow e.c.f. from incorrect momentum calculation in (b)(ii) and /or incorrect velocity reading  e.g.: Idea of conservation of momentum; $m_2 = [(b)(ii) \div (c)(i)] - 6.4$ ; correct evaluation of this;  e.g. 5 m/s $\rightarrow$ 1.28 kg  Allow for one mark - A calculation that only leads to total mass e.g. = 8 kg;		3
					<b>Total</b>	<b>9</b>



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