

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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January 2013

Publications Code UG034772

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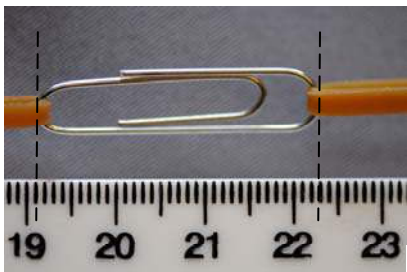
Question number		Answer			Accept	Reject	Marks										
1	(a)	<table border="1"><thead><tr><th>Type of radiation</th><th>Charge</th><th>Source</th></tr></thead><tbody><tr><td>Alpha particle</td><td>(+) 2</td><td>Unstable nucleus</td></tr><tr><td>Beta particle</td><td>- 1</td><td>Unstable nucleus</td></tr><tr><td>Gamma ray</td><td>0</td><td>Unstable nucleus</td></tr></tbody></table> <p>(As shown) 2 ; Unstable nucleus;</p>	Type of radiation	Charge	Source	Alpha particle	(+) 2	Unstable nucleus	Beta particle	- 1	Unstable nucleus	Gamma ray	0	Unstable nucleus	++ Unstable nuclei	-2	2
Type of radiation	Charge	Source															
Alpha particle	(+) 2	Unstable nucleus															
Beta particle	- 1	Unstable nucleus															
Gamma ray	0	Unstable nucleus															

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)	${}_{39}^{90}\text{Y}$ <p>both 90 and 39 for mark</p>			1
(ii)	B (the number of protons increases);			1
			Total	7

Question number		Answer	Accept	Reject	Marks
2	(a)	Any one of <u>Reduced</u> (running) costs; No atmospheric pollution / CO ₂ ; 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
			Total	5

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="1406 762 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>3.2 ± 0.1 (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
				Total	12

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
			Total	3

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
					Total	7

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 3×10^8 (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
				Total	11

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
				Total	6

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
					Total	9

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Order Code UG034772 January 2013

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