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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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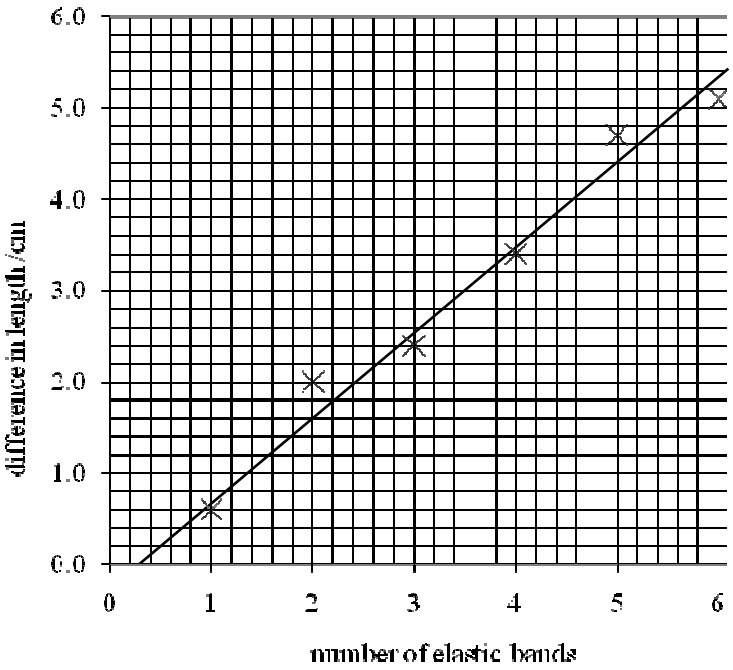
<table>
<tr><th colspan="3">Question number</th><th>Answer</th><th>Accept</th><th>Reject</th><th>Marks</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><td>Type of radiation</td><td>Charge</td><td>Source</td></tr>
<tr><td>Alpha particle</td><td>(+)2</td><td>Unstable nucleus</td></tr>
<tr><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>
</table>
(As shown)
2 ;
Unstable nucleus;
</td><td>++

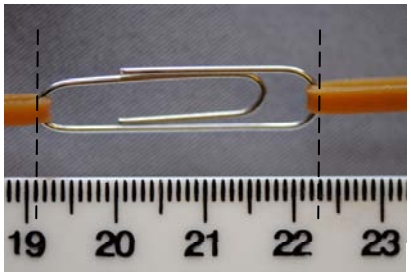
Unstable nuclei</td><td>-2</td><td>2</td></tr>
</table>

Question number			Answer	Accept	Reject	Marks
1	(b)		Any three of: MP1 - Idea that alpha particles would not penetrate (enough); e.g. alpha particles absorbed / stopped by {aluminium / foil / a few cm air / paper / card} MP2 - Idea that gamma rays would be too penetrative; e.g. gamma rays {are not absorbed / are unaffected} MP3 - Idea that some beta particles will pass through the foil; e.g. not all of the beta particles are absorbed MP4 - Idea of a correlation between thickness and absorption; e.g. thinner aluminium absorbs fewer beta particles	Ignore references to danger or harm All ideas may be expressed in terms of penetration or absorption. No need to see the word "aluminium," provided the meaning is clear. Accept paper or card will stop alpha for MP1 Accept comparisons of aluminium thickness for MP4		3
	(c)	(i)	$^{90}_{39}Y$ both 90 and 39 for mark			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)		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 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; Environmental effects - spoils the view OR is noisy; (construction) destroys habitats OR a hazard to flying birds; Site choice – a large site is needed; a windy site is needed; Maintenance difficulties – need to work in remote location (usually); need to work in a hazardous location e.g at height / sea; Data use – one turbine produces less power than a power station; need many/800 turbines to give same output as coal-fired; Cost – building a wind farm needs much money / time; other costs for research / land / maintenance;	Accept – appropriate reverse arguments in terms of the suitability of coal-fired power stations Ignore comments about efficiency or cost effectiveness		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:  	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)		5

Question number			Answer	Accept	Reject	Marks
3	(a)	(iii)	Any two of 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;	Ecf from (a)(i)/(ii) Related statement e.g. curve, line forced through origin or mention of "anomaly"		2
	(b)		3.2 ± 0.1 (cm) ; ; Sample working:  	Allow evidence of two readings from scale for one mark, e.g. subtraction (22.3 - 9.1) or appropriate drawing on the photograph	Direct measurement of photograph with a ruler	2

Question Number			Answer	Accept	Reject	Marks
3	(c)		Responses may refer to measuring the length of either object (the chain or the single paperclip from photographs A and B) 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;	Ignore: repetition, measuring <u>paperclip</u> from zero Allow sensible equipment changes, e.g. more precise scale, using stiffer paperclips / links		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; hot 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 labelled additions to the diagram "It" for air		3
					Total	**3**

Question number			Answer	Accept	Reject	Marks
5	(a)	(i)	Substitution; Calculation; e.g. m x g = 0.454 x 10 = 4.54 (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 x 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 $V_pI_p = V_sI_s$;	$V_p/V_s = I_s/I_p$ or $V_s/V_p = I_p/I_s$ or $I_1V_1 = I_2V_2$		1
		(ii)	Correct equation substituted OR rearranged; Answer; Vp/Vs = Is/Ip or Vs/Vp = Ip/Is e.g. 230 x 0.25 = 12 x I_s , so I_s = (230 x 0.25) ÷ 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 ≠ 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;	*p= m x v* ; accept rearrangements		1
		(ii)	Substitution in correct equation; Calculation; e.g. 6.4 x 6 = 38.4 kg m/s ;	Ns;		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. $p_1 = p_2$ / $m_1 \times v_1 = (m_1 + m_2) \times v_2$ $6.4 \times 6 = (6.4 + m_2) \times 4.8$ $m_2 = (38.4 \div 4.8) - 6.4 = 8 - 6.4$ $= 1.6$ (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 → 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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