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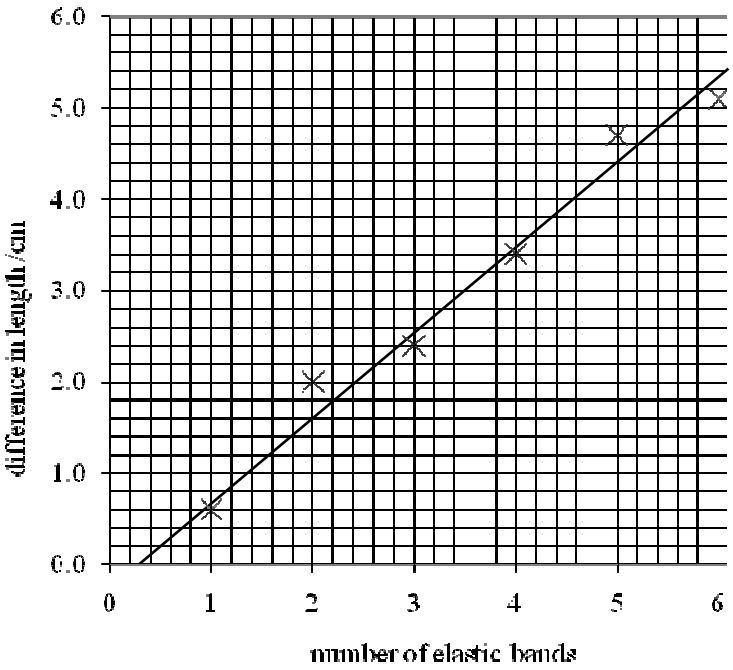
<table>
<tr><th colspan="3">Question number</th><th>Answer</th><th>Accept</th><th>Reject</th><th>Marks</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><td>Type of radiation</td><td>Charge</td><td>Source</td></tr>
<tr><td>Alpha particle</td><td>(+)2</td><td>Unstable nucleus</td></tr>
<tr>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

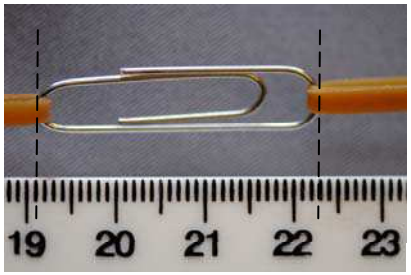
Unstable nuclei</td><td>-2</td><td>2</td></tr>
</table>

Question number			Answer	Accept	Reject	Marks
1	(b)		Any three of: MP1 - Idea t at alpha particles would not penetrate (e ough); e.g. alpha particles absorb d / stopped y {aluminium foil / a few c air / paper card} MP2 - Idea t at gamma ra s would be t o penetrative; e.g. gamma ays {are not absorbed / ar unaffected} MP3 - Idea t at some beta particles will pass through the oil; e.g. not all o the beta par icles are abs rbed MP4 - Idea o a correlation between thic ness and absorpti n; e.g. thinner luminium ab orbs fewer beta particles	Ig ıore re erences to da ger or harm All ideas may be ex ressed in ter s of pe etration or ab orption. No need to see t e word "aluminiu ," pr vided the me ning is lear. Ac ept paper or ard wil stop alpha f r MP1 Ac ept comparis ns of aluminium thick ess for MP4		3
	(c)	(i)	$^{90}_{39}Y$ both 90 and 9 for mark			1
		(ii)	B (the numb ɛr 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 $V_p I_p = V_s I_s$;	$V_p/V_s = I_s/I_p$ or $V_s/V_p = I_p/I_s$ or $I_1V_1 = I_2V_2$		1
		(ii)	Correct equation substituted OR rearranged; Answer; 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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