

# Mark Scheme (Results)

January 2013

International GCSE  
Physics (4PH0) Paper 2P

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

## Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.edexcel.com](http://www.edexcel.com) or [www.btec.co.uk](http://www.btec.co.uk) for our BTEC qualifications.

Alternatively, you can get in touch with us using the details on our contact us page at [www.edexcel.com/contactus](http://www.edexcel.com/contactus).

If you have any subject specific questions about this specification that require the help of a subject specialist, you can speak directly to the subject team at Pearson. Their contact details can be found on this link: [www.edexcel.com/teachingservices](http://www.edexcel.com/teachingservices).

You can also use our online Ask the Expert service at [www.edexcel.com/ask](http://www.edexcel.com/ask). You will need an Edexcel username and password to access this service.

Pearson: helping people progress, everywhere

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk)

January 2013

Publications Code UG034772

All the material in this publication is copyright

© Pearson Education Ltd 2013

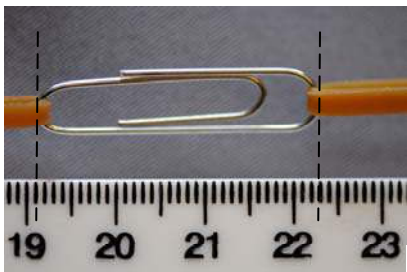
Question number		Answer			Accept	Reject	Marks										
1	(a)	<table border="1"><thead><tr><th>Type of radiation</th><th>Charge</th><th>Source</th></tr></thead><tbody><tr><td>Alpha particle</td><td>(+) 2</td><td>Unstable nucleus</td></tr><tr><td>Beta particle</td><td>- 1</td><td>Unstable nucleus</td></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 <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
			Total	5

Question number		Answer	Accept	Reject	Marks									
3	(a)	(i) 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									
		(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
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
				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 $3 \times 10^8$ (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
				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



Further copies of this publication are available from  
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467  
Fax 01623 450481  
Email [publication.orders@edexcel.com](mailto:publication.orders@edexcel.com)  
Order Code UG034772 January 2013

For more information on Edexcel qualifications, please visit our website  
[www.edexcel.com](http://www.edexcel.com)

Pearson Education Limited. Registered company number 872828  
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Ofqual  




Llywodraeth Cynulliad Cymru  
Welsh Assembly Government

