



Mark Scheme (Results)

Summer 2013

International GCSE  
Physics (4PH0) Paper 2PR

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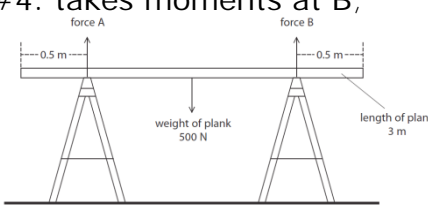
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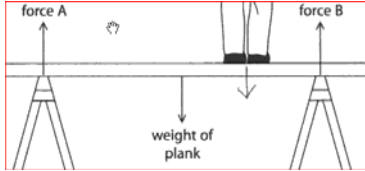
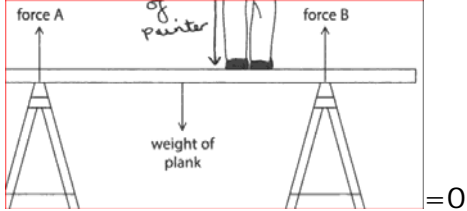
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Question number	Answer	Notes	Marks
1 (a) (b) (c) (d)	A activity		1
	A alpha particle		1
	B beta particle		1
	A alpha particle		1
		<b>Total</b>	<b>4</b>

Question number	Answer	Notes	Marks
2 (a)	B		1
(b) (i)	<p>#1. states principle of moments ;</p> <p>#2. moment= force X (perpendicular) distance from pivot:</p> <p>#3. calculates <b>one</b> moment about either A or B;</p> <p>#4. takes moments at B;</p>  <p>e.g.</p> <p>moments clockwise = moments anticlockwise</p> <ul style="list-style-type: none"> <li>moment = weight x distance</li> <li><math>500 \times 1</math></li> <li><math>1 \times 500 = Ax2</math></li> </ul>	<p>Ignore bald '500/2 =250'</p> <p>Accept for #2: in words or in recognisable symbols or in numbers from the diagram</p> <p>Accept qualitative alternative for last 2 marking points: '2 forces so divide weight in half' OWTTE = 1 mark if then qualified by distance consideration = 2 marks</p>	4
(ii)	Upward Force at point B 250(N);	allow arrow for clockwise or anticlockwise	1

Question number	Answer	Notes	Marks
(c) i	Arrow down from painter; (vertical, below feet)	 	1
ii	Both <b>forces</b> increase;  Force at B larger than force at A / $R_A$ ;	ignore: <ul style="list-style-type: none"> <li>• both moments increase</li> <li>• 'force B is larger'</li> </ul>	2
		<b>Total</b>	<b>9</b>

Question number	Answer	Notes	Marks
3 (a) i	Any ONE sensible suggestion from ensuring good contact; increasing friction; increasing pressure;	allow: <ul style="list-style-type: none"> <li>to prevent slipping sideways</li> <li>make it easier to control</li> </ul>	1
ii	Keep a fair test / controlled variable;	allow: it not an independent variable ignore: all mention of accuracy	1

Question number	Answer	Notes	Marks												
3 (b) (i)	(Type of) surface(s);	do not accept: <ul style="list-style-type: none"><li>a (single) named surface</li><li>type of block</li><li>material of block</li></ul>	1												
(ii)	4.5;		1												
(iii)	<p><b>Axes labelled</b>- quantity and unit;</p> <p><b>Linear scale</b> such that longest bar occupies at least half the grid;</p> <p><b>Plotting---</b>ignore order of bars 5 bars correctly plotted;; If only 3 bars correctly plotted allow 1 mark for plotting</p> <div><div>(Average) force in N</div><div>(Type of) Surface</div></div>	<p>allow force (N) force/N</p> <p>tolerance is +/- 0.5 small sq</p> <p>allow ecf from table</p> <p>ALL data plotted correctly as floating "x's" gets only one mark for plotting</p> <p>Reject both <b>plotting</b> marks if a <b>line</b> graph is drawn (only scale and axes marks are available in this case)</p> <div><table><tr><th>Type of surface</th><th>Average</th></tr><tr><td>chipboard</td><td>3.0</td></tr><tr><td>wood</td><td>2.5</td></tr><tr><td>coarse sandpaper</td><td>4.5</td></tr><tr><td>fine sandpaper</td><td>5.7</td></tr><tr><td>ice</td><td>0.5</td></tr></table></div>	Type of surface	Average	chipboard	3.0	wood	2.5	coarse sandpaper	4.5	fine sandpaper	5.7	ice	0.5	4
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chipboard	3.0														
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3 (c)	<p>Any two of the following five ideas:</p> <p>#1 different experimental set-up;  e.g. <ul style="list-style-type: none"> <li>different masses/weights</li> <li>different kind of wooden block</li> <li>different speed of pull</li> </ul> </p> <p>#2 variable friction;  e.g. <ul style="list-style-type: none"> <li>the surfaces were not uniformly smooth</li> <li>the wooden block did not move evenly across the surface</li> </ul> </p> <p>#3 errors in the force meter reading;  e.g. <ul style="list-style-type: none"> <li>errors recording the force on the N-meter</li> <li>faulty scale on N-meter</li> <li>zero errors / different ranges of N-meters used</li> <li>different angle of N-meter</li> </ul> </p> <p>#4 different contact;  e.g. <ul style="list-style-type: none"> <li>the weights on the block may not have been evenly placed on the block</li> <li>the block was not pressed down onto the surface evenly</li> </ul> </p> <p>#5 friction reduces as the experiment progresses;  e.g. <ul style="list-style-type: none"> <li>the wooden block becomes smoother as the experiment proceeds</li> <li>it moves over the surface more easily as the experiment progresses</li> <li>lubricant on block</li> </ul> </p>	<p>Ignore:</p> <ul style="list-style-type: none"> <li>unqualified 'broken N-meter'</li> <li>human error</li> <li>'strength of pull'</li> <li>anomalous results</li> <li>surface area of surface</li> </ul>	2



Question number	Answer	Notes	Marks
3 (d)	Any two from: Pressure less;  Area larger;  Use of formula $P = F/A$ ;	Load is the same/wood is thinner	2
(e)	Any TWO sensible suggestions;;  e.g. place a lubricant between the two surfaces  make the surfaces smoother  decrease weights /masses on block	allow: <ul style="list-style-type: none"> <li>named lubricants</li> <li>change the surfaces so that are not so rough</li> <li>reduce the area (of contact)</li> <li>decrease mass of block</li> </ul>	2
		<b>Total</b>	<b>14</b>

Question number	Answer	Notes	Marks
4 (a)	C Silver		1
(b)	<p>Must be in the correct context</p> <p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>negative charge moves or electrons move;</li> <li>(charge moves through wire) from plate B / to lifting sheet A;</li> <li>therefore produces unbalanced /net charge on A/B;</li> </ul>	<p><i>Do not award marks for repeat of stem</i></p> <p>Accept: lifting sheet for A, metal plate for B</p> <p>charge is not enough for first MP</p> <p>A has gained electrons /B has lost electrons for 2 marks</p> <p>Ignore references to 'poles' 'current'</p> <p>Reject ideas about positive charge moving</p>	2

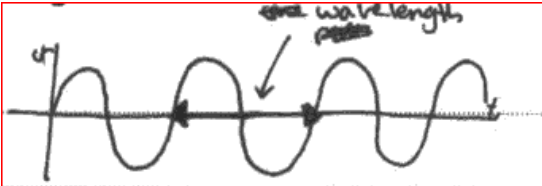
Question number	Answer	Notes	Marks
4 (c)	<p>Must be in the correct context Any two from</p> <ul style="list-style-type: none"> <li>(top of) dust becomes positive;</li> <li>negative <b>charge</b> on lifting sheet A <b>attracts</b> dust;</li> <li>force of attraction &gt; weight of dust;</li> </ul>	<p>Ignore unqualified 'opposite charges attract'</p> <p>allow an answer in terms of charge separation e.g. induced charge on dust ('top' positive 'bottom' negative)</p>	2
(d)	<p>Answers must be in the context of the stream of water and charged rod</p> <ul style="list-style-type: none"> <li>the water (molecules) have a charge;</li> <li>opposite charges attract / like charges repel;</li> </ul>	<p>do not credit repeat of stem</p> <p>allow (negatively) charged rod attracts (positively) charged water</p>	2
		<b>Total</b>	<b>7</b>

Question number	Answer	Notes	Marks
5 (a) (i)	idea that Energy source which cannot be <b>replaced</b> ;	allow: <ul style="list-style-type: none"> <li>• can't be used again</li> <li>• supply is limited in time</li> <li>• can't be replenished (for a long time)</li> <li>• can't be regenerated</li> </ul> ignore: <ul style="list-style-type: none"> <li>• can't be recycled</li> <li>• can't be stored</li> <li>• unqualified 'finite/limited/will run out'</li> <li>• not sustainable</li> <li>• can be used up</li> </ul>	1
(ii)	Any from for 1 mark;  Coal Oil or named fuel Gas	allow: crude oil fossil (fuel(s)) petrol diesel gasoline kerosene paraffin methane butane propane  ignore: burning fuel(s)	1

Question number	Answer	Notes	Marks
5 (b) (i)	<p>AT WIND FARM: any one from</p> <ul style="list-style-type: none"> <li>• Step-up transformer used at the wind farm;</li> <li>• voltage increased (for transmission);</li> </ul> <p>DURING TRANSMISSION: any one from</p> <ul style="list-style-type: none"> <li>• transmitted at (high voltage and) low current;</li> <li>• no/little energy is wasted during transmission;</li> </ul> <p>AT CITY END: any one from</p> <ul style="list-style-type: none"> <li>• Step down transformer at 'other end'/OWTTE;</li> <li>• voltage reduced to 230V/for safety/for homes;</li> </ul>	<p>allow: description of a transformer</p> <p>Allow small voltage loss in transmission</p>	3

Question number	Answer	Notes	Marks
5 (b) (ii)	<p>Answer to a maximum of SIX marks to include:  up to 4 <b>ideas</b> from advantages  and  up to 4 <b>ideas</b> from disadvantages  <b>Annotate with ticks /underlining</b></p> <p>advantages</p> <ol style="list-style-type: none"> <li>1. Renewable energy resource;</li> <li>2. No /little carbon emission or air pollution <i>OR</i> will not add to global warming <i>OR</i> little pollution;</li> <li>3. Source of energy is free <i>OR</i> low running costs;</li> <li>4. Brings employment/construction to some remote areas <i>OR</i> good for the local economy;</li> <li>5. Lots of energy available <i>OR</i> abundant source <i>OR</i> wind farm can generate large amounts of electricity;</li> <li>6. wind turbines can be more <b>efficient</b> than conventional power stations;</li> </ol> <p>disadvantages</p> <ol style="list-style-type: none"> <li>1. Unsightly/ugly <i>OR</i> can damage views/ blight landscapes / local people may find them an intrusion;</li> <li>2. Can be noisy/ causes noise pollution;</li> <li>3. Only work when the wind blows/ above certain wind speed <i>OR</i> no constant output of electricity <i>OR</i> not reliable;</li> <li>4. Each generator can only generate a small amount of electricity <i>OR</i> many are needed to supply the amount of electricity required for a city;</li> <li>5. Costly to construct /maintain;</li> <li>6. can only be placed in certain areas <i>OR</i> require large areas;</li> </ol>	<p>If a single word list, penalise by ONE mark</p> <p>accept suitable/sensible alternatives</p> <p>ignore:</p> <ul style="list-style-type: none"> <li>• environmentally friendly</li> <li>• cheaper than fossil fuels</li> <li>• kills birds /harming animals</li> <li>• unqualified 'expensive' /'high costs'</li> <li>• safer</li> <li>• carbon-neutral</li> <li>• unqualified 'more efficient' /'high efficiency'</li> </ul>	6
		<b>Total</b>	<b>11</b>

Question number	Answer	Notes	Marks
6 (a) (i)	Momentum = $mv$ ;	in words or in recognisable symbols	1
(ii)	Substitution into correct equation; Evaluation; consistent unit;  E.g. Momentum = $0.1 \times 3$  Solution 0.3  kg m/s	Allow: use of g ( $\rightarrow 300$ ) but unit <i>must</i> match  allow: <ul style="list-style-type: none"> <li>kg m s<sup>-1</sup></li> <li>N s</li> </ul>	3
(iii)	Momentum is conserved	ignore: <ul style="list-style-type: none"> <li>because it has the same mass and velocity</li> </ul> any discussion of energy	1
(b)	prediction: Two balls at the opposite end of the cradle move up/away; (balls D and E rise up)  any one sensible reason: <ul style="list-style-type: none"> <li><b>idea</b> that momentum is still conserved in this collision</li> <li>total momentum of the system is constant</li> <li>there is twice the momentum of one ball so the momentum is transferred to two balls;</li> </ul>	Allow: E moves off with $2v$  ignore <ul style="list-style-type: none"> <li>'the other balls remain still'</li> <li>inelastic (collisions)</li> <li>mention of energy</li> </ul>	2
		<b>Total</b>	<b>7</b>

Question number	Answer	Notes	Marks
7 (a)	<p>standard definition of wavelength;  e.g.</p> <ul style="list-style-type: none"> <li>distance between two points on a wave/ two peaks/ two troughs</li> <li>distance between each wavefront</li> <li>distance travelled by wave in one time period</li> </ul> 	<p>allow:  from clear diagram  crest for peak</p> <p>ignore:</p> <ul style="list-style-type: none"> <li>'the length of a wave'</li> <li>'distance taken for 1 cycle'</li> <li>distance between one wave and the next one</li> </ul>	1
7 (bi)	Speed of wave = frequency x wavelength;	<p>allow:  in any rearrangement  <math>v = f \cdot \lambda</math></p>	1
(bii)	<p>substitution into any form of the equation ;</p> <p>evaluation;</p> <p>e.g.  <math>3(\text{m/s}) = 1.5(\text{Hz}) \times \lambda</math></p> <p><math>(\lambda) = 2(\text{m});</math></p>	<p>accept for 1 mark  <math>\frac{3}{1.5}</math></p>	2



Question number	Answer	Notes	Marks
7 (ci)	<p>Diffraction;</p> <p>And one of</p> <ul style="list-style-type: none"> <li>• The incoming wave spreads out at the gap;</li> <li>• The energy carried by the wave spreads out ;</li> </ul>	<p>allow:</p> <ul style="list-style-type: none"> <li>• diffraction seen in (cii)</li> <li>• recognisable spelling for 'diffraction'</li> </ul> <p>ignore:</p> <ul style="list-style-type: none"> <li>• the wave gets bigger</li> <li>• wave is bent</li> <li>• (wavefront is) curved</li> </ul>	2
7 (cii)	<p>idea that (diffraction only apparent when) <math>\lambda</math> and size of gap comparable/RA;</p> <p>wavelength of light is very small / smaller than water waves /smaller than the gap;</p>	<p>Allow RA</p>	2
		<b>Total</b>	<b>9</b>



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