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# Mark Scheme (Results)

Summer 2017

Pearson Edexcel International GCSE  
in Physics (4PH0) Paper 1PR

Pearson Edexcel International GCSE  
in Science (Double Award) (4SC0) Paper 1PR

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## General Marking Guidance

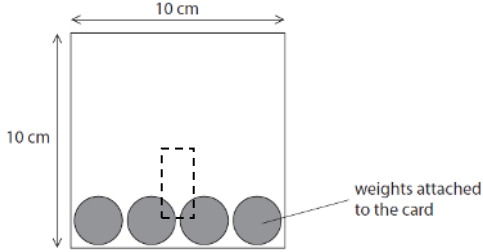
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

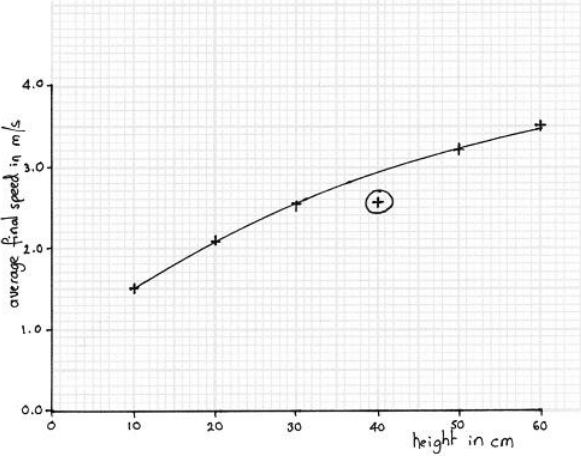
Question number	Answer	Notes	Marks
1 (a) (i)	<p>C – Holmes;</p> <p><b>The only correct answer is C</b></p> <p>A is not correct because it's a planet</p> <p>B is not correct because it's a galaxy</p> <p>D is not correct because it's a moon</p>		1
(ii)	<p>B – Hoag's Object;</p> <p><b>The only correct answer is B</b></p> <p>A is not correct because it's a planet</p> <p>C is not correct because it's a comet</p> <p>D is not correct because it's a moon</p>		1
(b)	<p>B – Milky Way;</p> <p><b>The only correct answer is B</b></p> <p>A is not correct because it's a different galaxy</p> <p>C is not correct because it's a different galaxy</p> <p>D is not correct because it's a different galaxy</p>		1

Total for question 1 = 3 marks

Question number	Answer	Notes	Marks
2 (a)	clear recognition that stationary is the horizontal sections;  3.5 (minutes);	seen on graph or in working e.g. use of 1.5 or 2 allow 3½	2
(b)	A; idea of line having smallest gradient;	allow 'line is shallowest' / 'least steep' etc. allow calculated speeds	2
(c) (i)	(average) speed = distance (moved) / time (taken);	allow in standard symbols or in words e.g. $s = d/t$ OR $v = s/t$	1
(ii)	substitution; evaluation; matching unit;  e.g. (speed =) 200 / 60 (speed =) 3.3  m/s	must match units used in calculation  allow 3, 3.33, 3.333 etc. condone 3.34  200 <b>metres per minute</b> receives 3 marks 12 <b>km/h</b> (condone kph) receives 3 marks 200 m/s receives 2 marks  allow any suitable unit of speed for 1 mark if no other mark scored	3
(d)	any 2 of:  speed of car; mass / weight of car; road / weather conditions;  road slope / angle; condition / type / age of tyres; condition / age of brakes; wind speed / direction;	ignore references to reaction time, thinking distance, stopping distance etc.  road surface, rain, ice, snow etc. ignore fog, mist etc.	2

Total for question 2 = 10 marks


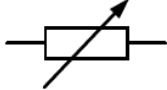




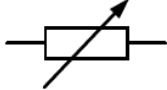





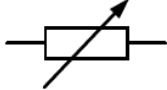



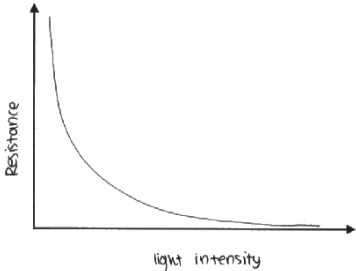
Question number	Answer	Notes	Marks
3 (a)	<p>X drawn at the horizontal centre AND <u>below</u> the vertical centre (by eye);</p> <p>i.e.</p>  <p>The diagram shows a square card with a width of 10 cm and a height of 10 cm. Four grey circular weights are attached to the bottom edge. A dashed rectangle is drawn below the horizontal center of the card, indicating the required position for the X.</p>	<p>allow any clear symbol in place of the X</p> <p>X must be in the area marked by the dashed lines</p>	1
(b)	<p>A – the final speed of the card;</p> <p><b>The only correct answer is A</b></p> <p>B is not correct because it's the independent variable</p> <p>C is not correct because it's a control variable</p> <p>D is not correct because it's a control variable</p>		1
(c) (i)	<p>correct value; given to 2 decimal places;</p> <p>e.g. 3.3966... 3.40</p>	<p>allow any value given to 2 d.p.</p> <p>3.39 gains 1 mark only</p>	2

(ii)	<p>suitable linear scale chosen (&gt;50% of grid used);  axes labelled with quantities and unit;  plotting correct to nearest half square (minus one for each plotting error);;</p> 	<p>ignore orientation</p> <p>ignore final point  i.e. two plotting errors = no marks for plotting</p> <table border="1" data-bbox="1062 479 1366 943"> <thead> <tr> <th>height in cm</th> <th>average final speed in m/s</th> </tr> </thead> <tbody> <tr> <td>10.0</td> <td>1.39</td> </tr> <tr> <td>20.0</td> <td>1.97</td> </tr> <tr> <td>30.0</td> <td>2.43</td> </tr> <tr> <td>40.0</td> <td>2.45</td> </tr> <tr> <td>50.0</td> <td>3.09</td> </tr> <tr> <td>60.0</td> <td>3.40</td> </tr> </tbody> </table>	height in cm	average final speed in m/s	10.0	1.39	20.0	1.97	30.0	2.43	40.0	2.45	50.0	3.09	60.0	3.40	4
height in cm	average final speed in m/s																
10.0	1.39																
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60.0	3.40																
(iii)	(40.0,2.45) identified clearly;		1														
(iv)	<p>line (curve) of best fit acceptable, ignoring anomalous point;</p>	<p>i.e. smooth curve within 1 small square of each point  ignore parts of curve outside plotted points if extrapolated</p>	1														
(v)	<p>idea that (average final) speed increases with height;</p> <p>idea that relationship is non-linear;</p>	<p>allow RA  ignore 'positive correlation'  ignore references to line being curved  allow  <b>not</b> proportional  allow idea of gradient changing</p>	2														

(d)	<p>any two of:</p> <p>MP1. move scale closer to card / use a ruler and place it nearer the light gate;</p> <p>MP2. measure height at eye level / parallax;</p> <p>MP3. drop using a clamp / eq;</p> <p>MP4. make sure scale is vertical / perpendicular to ground / use a set square;</p> <p>MP5. idea of accounting for zero error;</p>	<p>ignore references to precision, human error, repeats allow 'ruler' for scale</p> <p>allow idea of consistent release mechanism</p> <p>allow put light gate at zero</p>	2
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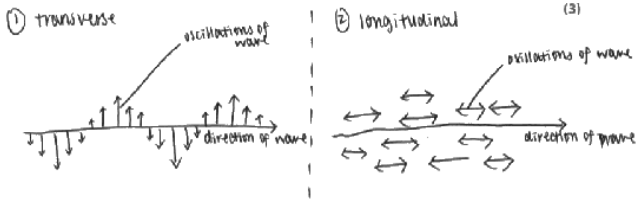
Total for question 3 = 14 marks



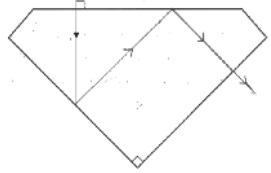
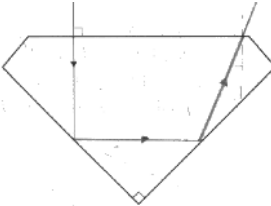
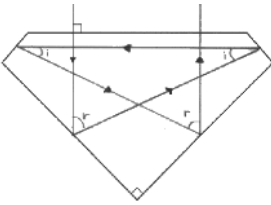
Question number	Answer	Notes	Marks												
4 (a)	1 mark for each correct line; ; ; ; ;  <table border="1" data-bbox="448 338 1034 1003"> <thead> <tr> <th data-bbox="448 338 676 434">Name of component</th> <th data-bbox="676 338 1034 434">Circuit symbol</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 434 676 553">fixed resistor</td> <td data-bbox="676 434 1034 553"></td> </tr> <tr> <td data-bbox="448 553 676 665">variable resistor</td> <td data-bbox="676 553 1034 665"></td> </tr> <tr> <td data-bbox="448 665 676 777">cell</td> <td data-bbox="676 665 1034 777"></td> </tr> <tr> <td data-bbox="448 777 676 889">lamp</td> <td data-bbox="676 777 1034 889"></td> </tr> <tr> <td data-bbox="448 889 676 1003">fuse / circuit breaker</td> <td data-bbox="676 889 1034 1003"></td> </tr> </tbody> </table>	Name of component	Circuit symbol	fixed resistor		variable resistor		cell		lamp		fuse / circuit breaker		symbols do not need to have connecting wires shown at each side  arrow can be any direction but must be diagonal only  ignore 'battery'  allow filament lamp symbol 	4
Name of component	Circuit symbol														
fixed resistor															
variable resistor															
cell															
lamp															
fuse / circuit breaker															
(b) (i)	voltage = current x resistance;	allow in standard symbols or in words e.g. $V = I \times R$	1												
(b) (ii)	substitution OR rearrangement; evaluation;  e.g. $R = V/I = 8.0/0.50$ $R = 16$ (ohms)	either seen	2												
(c)	axes labelled with resistance and {light intensity / light / intensity / brightness};  resistance decreasing as light intensity increases; curve of decreasing gradient; e.g. 	ignore units and orientation allow 'dark' and 'light' labels DOP  DOP	3												

Total for question 4 = 10 marks

Question number	Answer	Notes	Marks
5 (a)	D;  <b>The only correct answer is D</b>  A is not correct because it's the wavelength  B is not correct because it's half the wavelength  C is not correct because it's twice the amplitude		1
(b)	evidence of frequency being number of waves per unit time; evaluation; matching unit;  e.g. (f =) 18/12 (f =) 1.5 Hz	explicit or implied by working  must match units used in calculation  allow hertz, s <sup>-1</sup> , (waves) per second  allow any suitable unit of frequency for 1 mark if no other mark scored	3
(c)	any 1 of: named part of the EM spectrum; light; (waves on a) rope / string; (waves on a) slinky <b>if appropriately described</b> ; 	allow 'EM waves'  allow (secondary) seismic wave	1

<p>(d)</p>	<p>vibrations / oscillations / disturbance;  (are) parallel or perpendicular to direction  of energy transfer / wave  (travel/movement);  correct identification of <u>both</u> types;  e.g.</p>  <p>① transverse      oscillations of wave  direction of wave</p> <p>② longitudinal      (3)  oscillations of wave  direction of wave</p> <p>gets 3 marks</p>	<p>allow suitably  labelled diagrams</p>	<p>3</p>
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Total for question 5 = 8 marks

Question number	Answer	Notes	Marks
6 (a)	MP1. any internal reflection at <b>first surface</b> ; MP2. approximately correct angle of reflection at <b>first surface</b> ; MP3. ray reflects from second surface and emerges parallel to incident ray (by eye);	ignore arrows  gets MP1 only  gets MP1 and MP2  gets MP1 and MP3	3
(b) (i)	$\sin(c) = 1/n;$	allow in standard symbols or in words	1
(b) (ii)	substitution; rearrangement; evaluation;  e.g. $\sin(24^\circ) = 1/n$ $(n =) 1/\sin(24^\circ)$ $(n =) 2.5$	can be in either order   $(n =) 2.459, 2.46$ condone 2.45	3
(c)	any sensible use; e.g. <ul style="list-style-type: none"> <li>• optical fibres in {communication / sending information / decorative lamps}</li> <li>• endoscopes</li> <li>• safety reflector</li> <li>• prism in {binoculars / telescope / camera / periscope / rangefinder}</li> </ul>	allow 'broadband' for communication  allow described use of endoscope e.g. bicycle/car reflector, cat's eye	1

Total for question 6 = 8 marks



Question number	Answer	Notes	Marks
8 (a)	faster; expands; decreases; convection;	must be in this order	4
(b) (i)	gravitational (potential) energy = mass x g x height;	allow in standard symbols or in words e.g. GPE = m x g x h reject 'gravity' for g	1
(ii)	substitution;  evaluation;  e.g. (GPE =) 50 x 10 x 80 (GPE =) 40 000 (joules)	allow use of g=9.8 / 9.81   allow 40 kJ, 39 200, 39 240 (J)	2
(iii)	same answer as (b)(ii);	allow 40 000 (J)	1

Total for question 8 = 8 marks

Question number	Answer	Notes	Marks
9 (a)	<p>downward arrow labelled weight;</p> <p>upward arrow of equal length to downward arrow (by eye);</p>	<p>ignore starting position of arrows</p> <p>horizontal arrows allow <u>force</u> of gravity</p> <p>ignore label on upward force</p>	2
(b) (i)	pressure difference = height x density x g	<p>allow in standard symbols or in words e.g.</p> <p><math>p = h \times \rho \times g</math></p> <p>condone d for density</p>	1
(ii)	<p>substitution;</p> <p>answer seen in pascals / conversion to kPa;</p> <p>e.g.</p> <p>(P =) <math>48 \times 1030 \times 10</math></p> <p>(P =) 490 000 (Pa)</p>	<p>allow use of <math>g=9.8</math></p> <p>allow <math>\div 1000</math> seen anywhere</p> <p>1 mark max for RA</p> <p>allow 494 400, 500 000 (Pa)</p>	2
(c) (i)	600 (kPa);	<p>allow 594.4, 594, 590 (kPa)</p> <p>ecf from (b)(ii)</p>	1
(ii)	<p>substitution into <math>p_1V_1 = p_2V_2</math>;</p> <p>rearrangement;</p> <p>evaluation;</p> <p>e.g.</p> <p><math>100 \times 24 = 600 \times V_2</math></p> <p><math>V_2 = 100 \times 24 / 600</math></p> <p>(<math>V_2 =</math>) 4.0 (<math>m^3</math>)</p>	<p>ecf from (c)(i)</p> <p>-1 for POT error</p> <p>allow 2 marks max for use of 500 (kPa) as final pressure, giving <math>4.8 m^3</math></p> <p>allow answers in range 4.0 - 4.1(<math>m^3</math>)</p>	3

Total for question 9 = 9 marks

Question number	Answer	Notes	Marks
10 (a)	any suitable method, e.g.  place plotting compass near magnet;  note direction of compass; move compass to different position (and repeat);  OR  place magnet <b>under</b> paper / plastic; use of iron filings;  tap paper gently (to reveal shape);	allow suitably clear diagrams reject for one mark 'charges'  allow using multiple compasses  allow steel dust, iron powder for iron filings	3
(b)	MP1. field line connecting one pole to the other;  MP2. at least two complete field lines, but none touching / crossing;  MP3. field line are more concentrated near the poles;	ignore direction of field lines throughout allow small gap where field line joins magnet  ignore field lines inside the magnet  ignore field lines that start outside the pole region  judge by eye	3
(c) (i)	C – out of the page;  <b>The only correct answer is C</b>  A is not correct because it's the wrong direction  B is not correct because it's the wrong direction  D is not correct because it's the wrong direction		1



(ii)	(change that would reverse) direction of (magnetic) field; (change that would reverse) direction of current;	e.g. swap the magnets round e.g. reverse the voltage	2
(iii)	force decreases; (because) magnetic field becomes non-uniform / weaker;	DOP allow 'field lines get further apart'	2

Total for question 10 = 11 marks

Question number	Answer	Notes	Marks
11 (a)	<p>MP1. ammeter connected in <u>series</u> with filament lamp;</p> <p>MP2. voltmeter connected in <u>parallel</u> with filament lamp;</p> <p>MP3. suitable <b>method</b> of varying the voltage (e.g. by using variable resistor or using <b>variable</b> power supply);</p>	<p>marks are for how components are connected so ignore circuit symbols throughout</p> <p>allow voltmeter connected in parallel with lamp and ammeter</p>	3
(b)	<p>any 4 of:</p> <p>MP1. read ammeter / voltmeter <b>OR</b> record current / voltage;</p> <p>MP2. current is measured for more than one voltage;</p> <p>MP3. repeat readings and calculate average (mean);</p> <p>MP4. plot graph;</p> <p>MP5. suitable experimental precaution, e.g. check meters for zero error / switch off current between readings;</p>		4

Total for question 11 = 7 marks

Question number	Answer	Notes	Marks
12 (a) (i)	smoke (particles) in air (in smoke cell) OR pollen (grains) on water OR dust (particles) in air;		1
(ii)	MP1. large (observed) particles move randomly; MP2. (because) tiny / small particles are hitting them; MP3. tiny / small particles are not visible (by eye);	allow named large particle e.g. smoke, pollen, dust allow named tiny particle e.g. air, water allow invisible	3
(b)	MP1. (particles) collide with <b>walls</b> (of container); MP2. idea that force is produced (by bombarding molecules); MP3. pressure is force on an area;	bombard, hit, impact upon allow Newton's Laws / momentum argument allow $p = F / A$	3
(c) (i)	pressure = force / area;	allow in standard symbols or in words e.g. $p = F / A$	1
(ii)	substitution; rearrangement; evaluation;  e.g. $193,000 = F / 0.013$ $(F =) 193,000 \times 0.013$ $(F =) 2500 \text{ (N)}$	-1 for POT error  allow 2510, 2509  2.509 (N) gets 2 marks 2.509 kN gets 3 marks	3
(iii)	area decreases;  with any 2 of: <ul style="list-style-type: none"> <li>particles move faster / have more KE;</li> <li>particles hit (tyre) wall more frequently / with more force / harder;</li> <li>pressure increases (and force of vehicle weight stays the same);</li> </ul>	allow molecules for particles throughout  reject if incorrect reference to volume increasing	3

Total for question 12 = 14 marks

Question number	Answer	Notes	Marks
13 (a)	<p>B – 143;</p> <p><b>The only correct answer is B</b></p> <p>A is not correct because it's the number of protons</p> <p>C is not correct because it's the number of nucleons</p> <p>D is not correct because it's the number of nucleons + protons</p>		1
(b) (i)	<p>1 mark for each correct label;;</p> <p>e.g.</p> <p>largest circle labelled as <u>parent</u> (nucleus)</p> <p>either second largest circle labelled as <u>daughter</u> (nucleus)</p>		2
(ii)	<p>MP1. more neutrons released (in fission);</p> <p>MP2. neutrons can be absorbed by other (uranium) <b>nuclei</b>;</p> <p>MP3. causing further fissions / splitting;</p>	<p>allow 2 / 3 neutrons released</p> <p>allow 'collides', 'hits', 'enters' for 'absorbed'</p> <p>allow 'process repeats'</p>	3
(c)	<p>absorb <u>neutrons</u>;</p> <p>to vary / control {<b>rate</b> of reaction / energy output};</p>	<p>allow slow down / speed up reaction</p> <p>allow 'prevent overheating'</p> <p>ignore 'stop reaction'</p>	2

(d)	(i)	slow down <u>neutrons</u> ;	allow reduce (kinetic) energy of <u>neutrons</u>	1
	(ii)	any 2 of: graphite (ends) did not absorb neutrons; more (uranium nuclei underwent) fission;  increased {rate of reaction / amount of energy produced / rate of fission};	allow more 'neutrons absorbed by (uranium) nuclei' allow 'caused a large chain reaction'	2

Total for question 13 = 11 marks

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