Pearson

Mark Scheme (Results)

Summer 2017

Pearson Edexcel International GCSE
in Physics (4PH0) Paper 2PR

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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	<table><tr><th rowspan="2">Name of power station</th><th colspan="4">Type of power station</th></tr><tr><th>fossil fuel</th><th>hydroelectric</th><th>nuclear</th><th>wind turbine</th></tr><tr><td>Dinorwig</td><td></td><td>✓</td><td></td><td></td></tr><tr><td>Drax</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>Fullabrook</td><td></td><td></td><td></td><td>✓</td></tr><tr><td>Torness</td><td></td><td></td><td>✓</td><td></td></tr></table> 1 mark for each correct row ;;;;	More than 1 tick (✓) in a row negates that row	4

Total for question = 4 marks

Question number	Answer	Notes	Marks
2 (a)	gravitational (potential energy);	allow GPE ignore gravity ignore thermal/heat potential energy	1
(b) (i)	friction; electrons; positive;	must be in this order	3
(ii)	all the hairs have the same (negative) charge; (same charges) repel;	condone positive charge allow 'like' for 'same'	2
(c)	any 3 of: MP1. metal /post conducts/eq; MP2. charge is **earthed**/charge flows to **ground**; MP3. discharging hair/ eq; MP4. hair falls down due to its weight;	allow electrons for charge allow metal provides low resistance path allow (all) charge leaves hair /girl hair/ girl becomes neutral condone 'pulled down by (effect of) gravity'	3

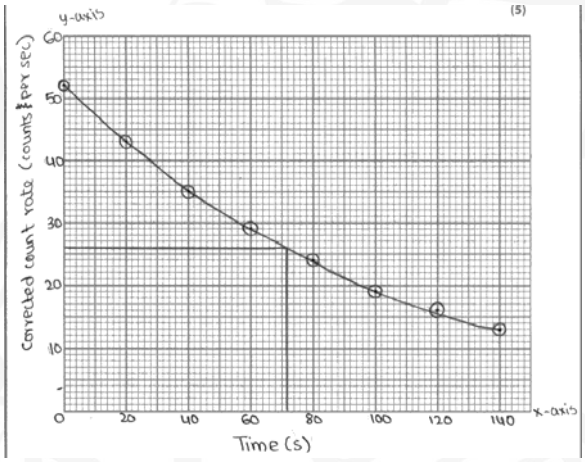
Total for question = 9 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>3 (a)</td><td>MP1. same number of <u>protons</u>
OR
same <u>atomic number</u>;

MP2. different number of <u>neutrons</u>
OR
different <u>mass number</u>;</td><td>ignore references to electrons / elements / nuclei / atoms</td><td>2</td></tr>
<tr><td>(b)</td><td>Any 2 of

MP1. Remove source / protactinium;
MP2. Measure background radiation and repeat;
MP3. Subtract background count/radiation from readings;</td><td>

allow ‘measure over a long period of time’
determine the difference in counts</td><td>2</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>(c) (i)</td><td>suitable scale chosen (>50% of grid used);
axes labelled with quantities and unit;
plotting correct to nearest half square (minus one for each plotting error);;
line (curve) of best fit acceptable;

 
</td><td>Allow counts/s, s^{-1}, Bq
i.e. two plotting errors = no marks for plotting
i.e. smooth curve within 1 small square of each point

<table><tr><th>time in seconds</th><th>count rate in counts per second</th></tr><tr><td>0</td><td>52</td></tr><tr><td>20</td><td>43</td></tr><tr><td>40</td><td>35</td></tr><tr><td>60</td><td>29</td></tr><tr><td>80</td><td>24</td></tr><tr><td>100</td><td>19</td></tr><tr><td>120</td><td>16</td></tr><tr><td>140</td><td>13</td></tr></table></td><td>5</td></tr>
<tr><td>(ii)</td><td>evidence of correct graph use;

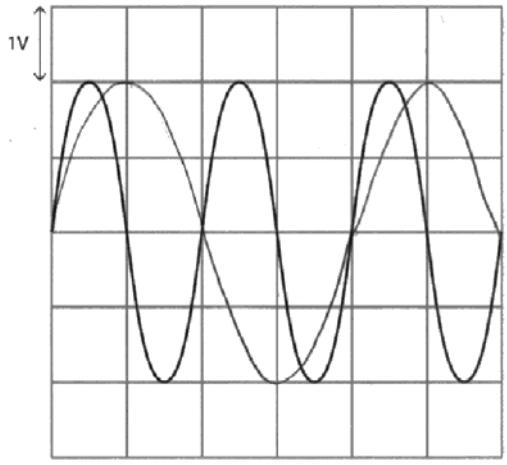
evidence of taking more than one measurement;

correct value in the range 66-73 (seconds);</td><td>e.g. construction lines at count rate of 26
e.g. additional construction lines at count rate of 13 or other pair of count rates such as 40:20</td><td>3</td></tr>
</table>

Total for question = 12 marks

Question number	Answer	Notes	Marks
4 (a) (i)	boiling;	allow evaporation	1
(ii)		ignore references to vibration allow molecules for particles	3
	MP1. idea that particles move apart;	allow spread out / take up more space may be shown on labelled diagram	
	MP2. idea that particles gain (kinetic) energy;	allow idea of moving fast**er** ignore 'move more'	
	MP3. idea that particles move (more) freely;	allow 'bonds break' / 'break away' / 'escape surface' / 'overcome attraction' ignore unqualified 'move more' / 'move randomly'	
(b) (i)		no mark for formula as seen on QP page 2 rearrangement and substitution in either order	3
	substitution; rearrangement;	$p_1 \times T_2 = p_2 \times T_1$ $p_1 = \frac{p_2 \times T_1}{T_2}$	
	evaluation; e.g. $\frac{100}{350} = \frac{p_2}{450}$ $(p_2 =) \frac{100 \times 450}{350}$ $(p_2 =)$ 130 (kPa)	allow 129, 128.6 etc correct answers without working gain 3 marks truncated answers e.g. 128 gains 2 marks only 230 gains 1 mark	
(ii)	straight line with same positive gradient throughout; line passes through the origin (if extended);	mark independently judge by eye	2

Total for question = 9 marks

Question number	Answer	Notes	Marks
5 (a)	A (20 Hz – 20,000 Hz); **The only correct answer is A** B is not correct because 25,00 Hz is too high for humans to hear C is not correct because humans can hear below 200Hz D is not correct because 25,00 Hz is too high for humans to hear and humans can hear below 200Hz		1
(b) (i)	calculation of time period; use of f=1/T; evaluation; e.g. (time period / T) = 0.010 (s) (f =) 1/0.010 (f =) 100 (Hz)	 allow ecf for incorrect T allow 0.01 seen anywhere 200 (Hz), 33(.3) (Hz) for 2 marks	3
(ii)	line drawn has similar amplitude to existing line; line drawn has a smaller frequency;  		2

Total for question = 6 marks

Question number	Answer	Notes	Marks
6 (a) (i)	any sensible suggestion; e.g. newtonmeter / balance / scale(s)	accept (electronic) scale condone newtonmetre ignore weighing machine	1
(ii)	weight = mass x gravitational field strength;	allow in standard symbols or in words e.g. W = m x g allow a 'mixture' e.g. weight = mass x g reject 'gravity' for g	1
(iii)	substitution OR rearrangement; evaluation; e.g. 50 = m x 10 (m =) 5 (kg)	allow use of g = 9.81 N/kg 5.1(kg) from g= 9.81 accept correct answer with no working for both marks	2
(b)	MP1. use of density = mass/volume; MP2. measure volume (of cannonball); MP3. further volume measurement detail; e.g. volume of cannonball= volume of water displaced OR measure diameter AND calculate volume of sphere	 allow 'find out' for measure allow radius for diameter $v=4/3\ \pi\ r^3$ for volume	3
(c)	any 3 of: MP1. Momentum = mass x velocity; MP2. momentum before (firing) is zero; MP3. momentum is conserved; MP4. idea that after firing cannon must have equal and opposite <u>momentum</u> to cannonball;	ignore references to Newton's laws p = m x v momentum before = momentum after $0 = m_1 \times v_1 - m_2 \times v_2$ (v taken in the direction of the arrows on the diagram)	3

Total for question = 10 marks

Question number	Answer	Notes	Marks
7 (a)	digital: only set values allowed; analogue: any value allowed / **continuously** variable;	allow in diagrams or words ignore references to quality, regeneration, range, information density allow idea of binary, on-off, OR 1-0 for digital signal	2
(b)	MP1. use of correct distance OR doubling time(at end of calculation); MP2. conversion from mm to m; MP3. substitution OR rearrangement; MP4. evaluation; e.g. (distance =) 4.2 (mm) (distance =) 0.0042 (m) $2.8 \times 10^{8} = \frac{0.0042}{\text{time}}$ (time =) 1.5×10^{-11} (seconds)	 seen anywhere 4.2×10^{-3} (m) $\text{time} = \frac{4.2 \times 10^{-3}}{2.8 \times 10^{8}}$ 1.5×10^{-11} (s) gets 4 marks 7.5×10^{-12} gets 3 allow POT error as unit conversion error for -1 e.g. 1.5×10^{-9} (s) gets 3 marks 7.5×10^{-11} gets 2	4

(c)	any 4 of: MP1. current (in coil /wire) is alternating / changing direction / varying; MP2. the coil / wire has a (changing) magnetic field; MP3. magnetic field of (permanent) magnet and of coil **interact**; MP4. producing a force (which changes direction) on the coil; MP5. causing loudspeaker cone to vibrate; MP6. vibrations transferred to air;	ignore references to RH rule or LH rule allow mention of a.c. ignore 'coil/ wire is electromagnet' condone 'fields overlapping' ignore 'cutting field' allow 'coil is attracted/repelled by permanent magnet' allow paper tube for loudspeaker cone	4

Total for question = 10 marks

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