



Mark Scheme (Results)

Summer 2016

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

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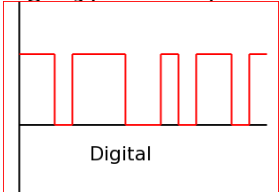

Publications Code 4PH0\_2PR\_1606\_MS

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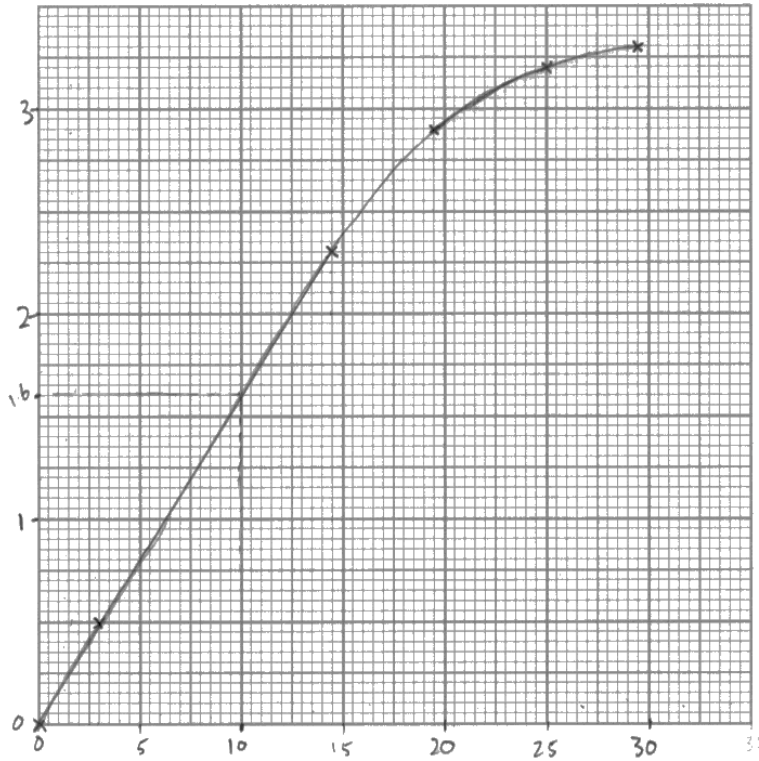
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## General Marking Guidance

- 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)           | <p>2 value line with top line &amp; lower line at constant heights;<br/>straight up/down lines;</p> <p>e.g. typical 'top hat' waveform</p>    | <p>ignore spacing of pulses<br/>judge by eye</p> <p>allow waveform with 3 distinct values at +X, zero and - X</p>  | 2     |
| (b)             | <p>any two described <b>advantages</b> from:-</p> <p>MP1. information density e.g. digital carry more information ( per second );</p> <p>MP2. quality e.g. maintain quality over longer distances;</p> <p>MP3. easier to reduce noise/less affected by noise;</p> <p>MP4. regeneration e.g. able to boost signal to original strength;</p> | <p>accept</p> <p>clearer</p> <p>easier to process</p> <p>total marks = 4</p>   | 2     |

| Question number | Answer   | Notes  | Marks |
|-----------------|--|--|-------|
| 2 (a)           | A  |  | 1     |
| (b) (i)         | suitable scales;<br><br>6 points plotted;;<br><br>curve of best fit; | <ul style="list-style-type: none"> <li>• Must use &gt; half width and half height of grid</li> <li>• to nearest ½ square, up to two marks available for this, -1 each error</li> <li>• reject dot to dot</li> <li>• allow a reasonably smooth curve, points should be evenly distributed about the line</li> </ul> | 4     |



| Voltage across X<br>in V | Current in X<br>in A |
|--------------------------|----------------------|
| 0                        | 0                    |
| 3.0                      | 0.5                  |
| 14.5                     | 2.3                  |
| 19.5                     | 2.9                  |
| 25.0                     | 3.2                  |
| 29.5                     | 3.3                  |

|       |   |   |   |
|-------|---|---|---|
| (ii)  | $V = I \times R$  | in words, or accepted symbols or rearranged   | 1 |
| (iii) | value of I from graph;<br>rearranged equation/sub into equation;<br>evaluation;<br>unit;<br>e.g.<br>$I = 1.6$ ( $\pm 1/2$ a small square)<br>$10 = 1.6 \times R$ OR $R = 10/1.6$<br>$R = 6.3$<br>$\Omega$ / ohms  | allow ECF from graph<br><br>answers without working can gain full marks<br><br>$R = 6.25$<br>allow answers which round to a number in the range 5.8 to 6.3  | 4 |
| (iv)  | any three <b>descriptions</b> from: -<br>MP1. as V increases I increases (at first);<br><br>MP2. constant gradient/constant R (at first);<br><br>MP3. I is proportional to V;<br><br>MP4. gradient changes at high voltage/eq;<br><br>MP5. $\Delta I$ smaller (than previously) for $V > 15V$ ; | allow<br>as I increases V increases<br><br>graph line linear (at first)<br><br>nonlinear above $\sim 15 V$<br>graph is less steep at high voltage<br><br>R increases for $V > 15V$ (to $\sim 8\Omega$ )<br><br>ignore<br>slows down<br>positive correlation | 3 |

|     |   |  |   |
|-----|---|--|---|
| (v) | any two <b>conclusions</b> from: -<br>MP1. resistance is constant at first;<br><br>MP2. <b>resistance</b> is not constant / <b>resistance</b> increases as V (or I) increases;<br><br>MP3. because X gets hot(ter);<br><br>MP4. X is a filament lamp; | allow<br>V and I are proportional at first, it obeys Ohms law at first<br><br>non-ohmic /does not obey Ohms law / V and I are not proportional<br><br>increasing temperature<br><br>total marks = 15 | 2 |
|-----|---|--|---|

| Question number | Answer   | Notes   | Marks |
|-----------------|--|---|-------|
| 3 (a) (i)       | any two from: -<br>MP1. travels at speed of $3 \times 10^8$ m/s;<br>MP2. travels in a vacuum;<br>MP3. transverse wave;<br>MP4. transfer energy / information;<br>MP5. can be reflected/refracted/diffracted; | travel at the same speed /speed of light                  | 2     |
| (ii)            | B gamma rays;  |   | 1     |
| (b) (i)         | step- up;  |   | 1     |
| (ii)            | $\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$ $\frac{V_p}{V_s} = \frac{n_p}{n_s}$   | allow equation in any rearrangement                       | 1     |
| (iii)           | substitution;<br>rearrangement;<br>evaluation;<br>e.g.<br>$\frac{230}{2000} = \frac{110}{n_s}$<br>$n_s = \frac{110 \times 2000}{230}$<br>$n_s = 960$   | sub and rearrangement in either order                     | 3     |
| (iv)            | to protect user from high voltage/eq;  | allow plastic is an insulator to prevent (electric) shock | 1     |
| Total 9 marks   |  |   |       |

| Question number | Answer   | Notes  | Marks |
|-----------------|--|--|-------|
| 4 (a) (i)       | uranium/plutonium;   | allow chemical symbols   | 1     |
| (ii)            | (particles) formed <b>after</b> fission/ <b>after</b> U breaks up;<br><br>plus any <b>one</b> from: -<br>neutron;<br>daughter nuclei;<br>named products;   | do not allow after decay<br><br>allow gamma (radiation)  | 2     |
| (iii)           | MP1 they are (still) radioactive/emit ionising radiation /eq;<br><br>MP2 they last for a very long time/have a long half-life/eq;  | allow harmful to people/environment  | 2     |
| (iv)            | it slows down neutrons/eq;   | ignore absorbs neutrons  | 1     |
| (v)             | any two ideas from: -<br>MP1 fewer neutrons would be absorbed;<br><br>MP2 fission rate would increase / / (reactor) become critical ;<br><br>MP3 too much energy produced (too fast);<br><br>MP4 meltdown of core/reactor; | more neutrons available<br><br>the reaction would go out of control<br>do not accept "turns into a bomb"<br><br>meltdown of 'it' | 2     |



|         |  |  |   |
|---------|--|--|---|
| (b) (i) | 773(K);  |  | 1 |
|         | <p>(ii) substitution;<br/>rearrangement;<br/>evaluation;<br/>e.g.</p> $\frac{8.4}{773} = \frac{P_2}{1170}$ $P_2 = \frac{8.4 \times 1170}{773}$ <p>13 (MPa)</p> | <p>no mark for the equation</p> <p>rearrangement and substitution in either order</p> <p>12.7</p> <p>allow ecf from (b)(i) for all 3 marks</p> <p>if calculation seen with °C for T<sub>1</sub> instead of K, then max mark = 2</p> <p>answer of 19.7 (MPa) with no working = 1 mark</p> <p>total marks = 12</p> | 3 |

| Question number | Answer  | Notes   | Marks             |
|-----------------|---|---|-------------------|
| 5 (a) (i)       | <p><math>p = m \times v</math></p> <p>(ii) statement of conservation of momentum;<br/>calculation of momentum before seen;<br/>use of correct mass for momentum after;<br/>evaluation of velocity;</p> <p>e.g.<br/> <math>m_1v_1 = m_2v_2</math><br/> <math>43.2 \times 4.10</math> OR <math>177(.12)</math> seen<br/> <math>(m_2=)</math> 45.7<br/> <math>(v=)</math> 3.88 (m/s)</p> | <p>accept answer in words, standard symbols or rearranged</p> <p>allow in words</p> <p>3.9, 3.876</p> | <p>1</p> <p>4</p> |
| (b)             | <p>MP1. boy and skateboard move backwards/in opposite direction to the ball;</p> <p>Either<br/> MP2. because of conservation of momentum/eq;<br/> MP3. because of Newton's 3<sup>rd</sup> law/eq;</p>   | <p>total marks = 7</p>  | 2                 |

| Question number | Answer   | Notes  | Marks |
|-----------------|--|--|-------|
| 6               | <p>five suitable comments:<br/>O/P = output power</p> <p><b>Wind</b></p> <ul style="list-style-type: none"> <li>• wind O/P is (far) too low (to meet demand)/the lowest;</li> <li>• (can't rely on) wind O/P is weather dependent;</li> </ul> <p><b>Gas</b></p> <ul style="list-style-type: none"> <li>• gas O/P (too) low /need many gas power stations (to meet demand);</li> <li>• gas (turbine) is the fastest to start up;</li> </ul> <p><b>Tidal</b></p> <ul style="list-style-type: none"> <li>• tidal gives the highest O/P;</li> <li>• tidal only occurs at fixed times (so is not useful);</li> </ul> <p><b>Nuclear</b></p> <ul style="list-style-type: none"> <li>• nuclear O/P is (relatively) high;</li> <li>• nuclear takes too long to start up;</li> </ul> <p><b>Coal</b></p> <ul style="list-style-type: none"> <li>• coal O/P is second highest;</li> <li>• coal second fastest to start up;</li> </ul> <p><b>Evaluation statement(s)</b></p> <ul style="list-style-type: none"> <li>• none of them is enough to meet the power demand;</li> <li>• nuclear/wind/tidal would be unsuitable;<br/>OR<br/>coal or gas could be suitable;<br/>OR<br/>a mixture of stations would be suitable;</li> </ul> <p><b>Costs</b><br/><b>allow 1 mark for relevant statement</b></p> | <p>ignore comments about</p> <ul style="list-style-type: none"> <li>• renewable</li> <li>• non-renewable</li> <li>• green-house effect</li> <li>• climate change</li> <li>• pollution</li> </ul> <p>can't be used for sudden need/RA</p> <p>e.g. coal is most expensive fuel<br/>gas is second most expensive fuel</p> <p>total marks =5</p> | 5     |

| Question number | Answer  | Notes  | Marks |
|-----------------|---|--|-------|
| 7 (a) (i)       | lever arm / bolt moves to the left;   |  | 1     |
| (ii)            | to return the metal bar (and lever) to the right/eq   | allow<br>pulls it back (again)   | 1     |
| (b) (i)         | $F_1d_1 = F_2d_2$ ;   | accept answer in words, standard symbols or rearranged clockwise (moments) = anticlockwise (moments) | 1     |
| (ii)            | substitution;<br>rearrangement;<br>evaluation;<br>e.g.<br>$110 \times 22 = 38 \times F_2$<br>$F_2 = \frac{110 \times 22}{38}$<br>63.7 (N)                 | rearrangement and substitution in either order<br><br>63.684 (N)<br>-1 for incorrect rounding        | 3     |
| (iii)           | any two from<br>MP1 (since distance to A greater) moment is greater;<br>MP2 distance to B is constant / still 110 cm;<br>MP3 (hence) force will increase; | allow correct re-calculation with $d_B$  | 2     |
| total marks = 8 |   |  |       |



