



# Mark Scheme (Results)

June 2014

Pearson Edexcel International GCSE  
Physics (4PH0/2PR)

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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 a             | A (Joule);   |   | 1          |
| b               | The cell converts <b>Chemical</b> energy into <b>Electrical</b> energy;;<br><br>The lamp converts this energy into <b>Light</b> and <b>Thermal</b> energy (BOTH needed); | either order for the second sentence  | 2<br><br>1 |
| c (i)           | 14(J);   |   | 1          |
| (ii)            | Efficiency = $\frac{\text{(useful) energy output}}{\text{(total) energy input}}$ ;   | allow<br>• x 100(%)   | 1          |
| (iii)           | Substitution;<br>Evaluation;<br>e.g.<br>(efficiency =) $\frac{36}{50}$<br><br>(=) 0.72   | do not allow<br>• inverted substitution<br>e.g. $50/36 = 1.39$<br><br>Allow<br>• 72%<br>• correct answer without working (bald answer) for both marks | 2          |

(Total for Question 1 = 8 marks)

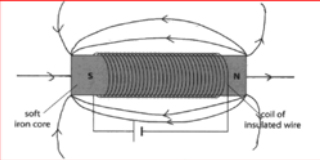
| Question number | Answer  | Notes   | Marks |
|-----------------|---|---|-------|
| 2 (a)           | B (hit the walls of the container harder)   |   | 1     |
| (b)             | (average) <b>KE</b> (of particles) <b>decreases</b> ( as the temperature falls);<br><br>AND one of <ul style="list-style-type: none"> <li>(because) they move slower;</li> <li>idea that at 0 K the particles have no kinetic energy;</li> <li>idea that at 0 K the particles are not moving;</li> </ul>    | ignore <ul style="list-style-type: none"> <li>' particles freeze'</li> <li>KE is lost</li> </ul> allow <ul style="list-style-type: none"> <li>'it' for average KE</li> <li>absolute zero for 0 K</li> </ul>   | 2     |
| 2 (c) (i)       | 300 K;  |   | 1     |
| (c) (ii)        | both temperatures seen in Kelvin;<br>Substitution;<br>(Rearrangement and) Evaluation;<br><br>e.g.<br>$\frac{210\,000}{300} = \frac{P_2}{354}$ this would get 2 marks if seen<br><br>$\frac{210\,000 \times 354}{300} = P_2$ this would get 2 marks if seen<br><br>$(P_2) = 250(\text{kPa})$ this is 3 marks | no mark for equation as it is given on page 2<br><b>allow</b> <ul style="list-style-type: none"> <li><math>\frac{210\,000}{300} = \frac{P_2}{81}</math> for 1 mark</li> <li>630 (kPa) for 2 marks</li> <li>bald answer 248 (kPa) for 3 marks</li> <li>answers which round to 250</li> </ul> Power of Ten error (POT) = -1 | 3     |

(Total for Question 2 = 7 marks)

| Question number | Answer   | Notes   | Marks      |      |     |      |     |      |     |      |     |      |     |  |   |
|-----------------|--|---|------------|------|-----|------|-----|------|-----|------|-----|------|-----|--|---|
| 3 (a)           | B;   |  | 1          |      |     |      |     |      |     |      |     |      |     |  |   |
| (b) (i)         | <p>MP1. Axes labelled with units;<br/> MP2. Correct scales (to occupy at least ¼ of the area of the graph and in sensible intervals);<br/> MP3. Plotting;<br/> MP4. Plotting;<br/> MP5. straight line of best fit which extends beyond given data points;</p> <div data-bbox="443 689 1189 1168"> <table border="1" data-bbox="945 954 1189 1168"> <thead> <tr> <th>Distance in m</th> <th>Time in ms</th> </tr> </thead> <tbody> <tr> <td>0.62</td> <td>1.8</td> </tr> <tr> <td>0.80</td> <td>2.4</td> </tr> <tr> <td>1.00</td> <td>3.0</td> </tr> <tr> <td>1.20</td> <td>3.8</td> </tr> <tr> <td>1.38</td> <td>4.2</td> </tr> </tbody> </table> </div> | Distance in m   | Time in ms | 0.62 | 1.8 | 0.80 | 2.4 | 1.00 | 3.0 | 1.20 | 3.8 | 1.38 | 4.2 | <ul style="list-style-type: none"> <li>ignore orientation of graph</li> <li>scale intervals on axes should be 2 or 5 or 10</li> <li>points should be less than 0.5 sq in diameter</li> <li>-1 each incorrect plot to max of -2</li> <li>tolerance = +/- ½ square</li> <li>if zero is not included, then line should go through all points except 3<sup>rd</sup> or 4<sup>th</sup></li> <li>if zero included, look for balance of points</li> </ul> | 5 |
| Distance in m   | Time in ms   |   |            |      |     |      |     |      |     |      |     |      |     |  |   |
| 0.62            | 1.8  |   |            |      |     |      |     |      |     |      |     |      |     |  |   |
| 0.80            | 2.4  |   |            |      |     |      |     |      |     |      |     |      |     |  |   |
| 1.00            | 3.0  |   |            |      |     |      |     |      |     |      |     |      |     |  |   |
| 1.20            | 3.8  |   |            |      |     |      |     |      |     |      |     |      |     |  |   |
| 1.38            | 4.2  |   |            |      |     |      |     |      |     |      |     |      |     |  |   |

|       |   |   |   |
|-------|---|---|---|
| (ii)  | <p>Attempt to find slope or gradient of line ;<br/> AND<br/> evaluation of value;<br/> matching unit;<br/> e.g.<br/> = <math>0.6/0.0018</math><br/> = 333<br/> m/s</p>  | <p><math>\Delta</math> seen<br/> or two lines from same axis<br/> seen<br/> or rise/run seen<br/> value in range of 310-350<br/> allow<br/> 0.333 km/s<br/> 0.333 m/ms</p>  | 3 |
| (iii) | <p>Any one specific variable from the experiment;<br/> e.g.<br/> hitting the block in the same place</p> <p>Use the same microphone/timer/wires</p> <p>Ensure there is no 'hammer bounce'</p>   | <p>These must be specific to<br/> the experiment<br/> Accept same</p> <ul style="list-style-type: none"> <li>• temperature</li> <li>• humidity</li> <li>• density</li> <li>• draughts</li> <li>• force</li> <li>• block</li> </ul> <p>ignore</p> <ul style="list-style-type: none"> <li>• 'keep everything the same'</li> <li>• use control variables</li> <li>• repeat experiment</li> </ul> | 1 |
| (iv)  | <p>Any 2 suggestions from</p> <p>MP1. repeat the time readings (for each distance);</p> <p>MP2. measure the distance to the sensor of the microphone;</p> <p>MP3. use wider range of distance readings (&lt;0.62 or &gt;1.38);</p> <p>MP4. use intermediate distances (between points);</p> | <p>ignore imprecise suggestions e.g.</p> <ul style="list-style-type: none"> <li>• 'be careful with timer'</li> <li>• 'change the distance'</li> </ul>   | 2 |

(Total for Question 3 = 12 marks)

| Question number | Answer   | Notes  | Marks |
|-----------------|--|--|-------|
| 4 (a) (i)       | <p>Any three from</p> <p>MP1. parallel field shown inside the core;</p> <p>MP2. one complete line from a pole and to the other pole;</p> <p>MP3. at least three lines at <b>each</b> pole with a minimum of two correctly curved lines;</p> <p>MP4. Arrow on any external field line from N or into S;</p>  | <p>Condone dotted lines</p> <p>Reject Crossing field lines for MP3 only conflicting arrows for MP4 only</p>  | 3     |
| (ii)            | <p>idea that strength of magnetic field is increased;</p>  | <p>allow concentrates the magnetic field ignore</p> <ul style="list-style-type: none"> <li>• 'channels the magnetic field'/eq</li> <li>• references to soft iron</li> <li>• references to easily magnetised /demagnetised</li> </ul> | 1     |



|     |   |  |   |
|-----|---|--|---|
| (b) | any two from: -<br>MP1 Steel is magnetically hard material/eq ;<br>MP2 Steel <b>becomes</b> (permanently) magnetised;<br>MP3 Steel <b>remains</b> magnetised (when current switched off) /paper clips <b>remain attracted</b> to steel; | NB do not credit repeat of stem ( <i>remain attached</i> is in the stem) | 2 |
|-----|---|--|---|

(Total for Question 4= 6 marks)

| Question number | Answer   | Notes   | Marks |
|-----------------|--|---|-------|
| 5 (a)           | i Step down (transformer);   |   | 1     |
|                 | ii $(V_p/V_s) = (N_p/N_s)$ ;<br><br>$\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$ $\frac{V_p}{V_s} = \frac{n_p}{n_s}$ | Allow <ul style="list-style-type: none"> <li>equation in words</li> <li>standard abbreviations :- s, p, in, out, 1, 2</li> <li>N, n or T for number of turns</li> <li>Rearrangements e.g.<br/> <math>(V_s/V_p) = (N_s/N_p)</math><br/> <math>V_s = (V_p) (N_s/N_p)</math><br/> <math>V_p = (V_s) (N_p/N_s)</math> </li> </ul> | 1     |
|                 | iii Substitution;<br>(rearrangement and) evaluation;<br>e.g.<br>$\frac{230}{25} = \frac{\text{primary turns}}{100}$<br>920 (Turns)   | Do not credit the equation in words or symbols<br><br><br><br><br><br><br>bald answer gains full marks  | 2     |

| Question number | Answer  | Notes   | Marks |
|-----------------|---|---|-------|
| (b)             | <p>Any 5 from</p> <p>MP1. it steps up or steps down the <b>voltage</b>;</p> <p>MP2. current in (primary) coil <b>produces</b> magnetic field;</p> <p>MP3. the current is changing /has frequency of 50 Hz;</p> <p>MP4. causing a (changing) magnetic field in the core;</p> <p>MP5. the core strengthens the magnetic field;</p> <p>MP6. field lines interact with (secondary) coil;</p> <p>MP7. which <b>induces</b> a voltage in the secondary coils;</p> <p>MP8. transformer won't work with (steady) d.c.</p> | <p>allow flux for magnetic field</p> <p>Allow increases or decreases voltage</p> <p>Allow concentrates for strengthens</p> <p>Allow flux changes in secondary coil</p> <p>Allow induces a current/eq</p> <p>NB do not credit repeat of stem</p> | 5     |

(Total for Question 5= 9 marks)

| Question number | Answer   | Notes  | Marks |
|-----------------|--|--|-------|
| 6 (a)           | electrons move;<br><br>from balloon to cloth;  | Allow<br>negative charges for electrons<br>Ignore all references to <ul style="list-style-type: none"> <li>• positive electrons</li> <li>• explanations in terms of movement of positive charge</li> </ul> | 2     |
| (b)             | Idea that movement is due to attraction;<br><br>between negative charges in the hair and (positive) balloon (however expressed);   | Allow unlike charges attract   | 2     |
| (c)             | The balloon is an insulator;   | Allow poor conductor   | 1     |
| (d)             | A sensible suggestion including movement of electrons;<br>e.g.<br>electrons move from air/water/hair onto balloon<br>charges move from the hair into the air<br>water is a conductor so electrons move (into air/from balloon) | Allow <ul style="list-style-type: none"> <li>• 'charge(s)' for electrons</li> <li>• the charge on the balloon is neutralised</li> </ul> Ignore all references to 'positive charge'                         | 1     |

(Total for Question 6= 6 marks)

| Question number | Answer  | Notes  | Marks |
|-----------------|---|--|-------|
| 7 (a)           | Any 2 from<br>air bags;<br>side impact beams/bars;<br>crumple zones /collapsible bumpers;<br>collapsible steering column /wheel;  | Allow<br>references to strong /<br>laminated / safety glass<br>ignore<br>unqualified bumpers | 2     |
| (b) (i)         | Any four from<br>MP1. same momentum change (with or without a seatbelt);<br>MP2. (but) time of impact increases;<br>MP3. (which) reduces rate of momentum change;<br>MP4. (therefore) reducing the (average) force;<br>MP5. the seat belt stretches (during collision);<br>MP6. (which) increases the area over which the force acts;<br>MP7. (hence) pressure on body reduces; | Ignore<br>• references to<br>momentum reducing<br>• word equation                            | 4     |
| (b) (ii)        | A sensible suggestion;<br>e.g.<br>there is a higher momentum (transfer in collision)<br>there is a larger force during impact<br>straps have a greater area over which force acts<br>larger area of straps reduces the pressure   |  | 1     |

|     |  |  |   |
|-----|--|--|---|
| (c) | Momentum (of car and dummy) reduces to <u>zero</u> ;<br>OR<br>All momentum is absorbed by the Earth; |  | 1 |
|-----|--|--|---|

(Total for Question 7= 8 marks)

| Question number | Answer  | Notes   | Marks |
|-----------------|---|---|-------|
| 8 (a)           | momentum = mass × velocity;   | Allow rearrangements and standard abbreviations<br>$p = m \times v$ | 1     |
| (b)             | Equation;<br>Substitution and rearrangement;<br>Evaluation;<br><br>e.g.<br>$m_1 \times v_1 = m_2 \times v_2$<br><br>$10\,000 \times 4.5 / 1500$<br><br>$30(\text{m/s})$ | bald answer = 3 marks<br>POT = -1                                   | 3     |

(Total for Question 8= 4 marks)