

**Assessment Schedule – 2015****Physics: Demonstrate understanding of aspects of electricity and magnetism (90937)****Assessment Criteria**

| Achievement  | Merit  | Excellence  |
|--|--|---|
| <i>Demonstrate aspects of electricity and magnetism involves indicating awareness of concepts used in series and parallel circuit.</i> | <i>Demonstrate in-depth understanding of aspects of electricity and magnetism involves showing why concepts relate in series and parallel circuit.</i> | <i>Demonstrate comprehensive understanding of aspects of electricity and magnetism involves providing evidence that shows linking multiple concepts to solve a circuit problem in a parallel circuit.</i> |

**Evidence**

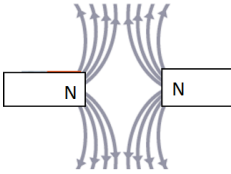
| Question                  | Achievement  | Merit  | Excellence   |
|---------------------------|--|--|--|
| ONE<br>(a)(i)<br><br>(ii) | 2.4 V<br>(No working is required)<br>OR<br>Bulbs in series have the same voltage across them.                                  | 2.4 V<br><br>Since the bulbs are <b>identical</b> , 12 volt is shared equally among 5 bulbs.   |  |
| (b)                       | Correctly calculated total resistance.<br>OR<br>Calculated the current using the wrongly calculated value of total resistance. | $R_{\text{total}} = 5 \times 2.5 = 12.5 \Omega$<br>$I = \frac{V}{R} = \frac{12}{12.5} = 0.96 \text{ A}$<br>OR<br>Calculates the current through each bulb. $I = \frac{2.4}{2.5} = 0.96 \text{ A}$  |  |
| (c)                       | Bulbs in this circuit are brighter due to higher V or I or lower R or fewer bulbs  | <ul style="list-style-type: none"> <li>Brightness (power) depends on voltage. Since the voltage across each bulb in this circuit is higher than the voltage across each bulb in the previous circuit as there are fewer bulbs to share the Voltage, they are brighter.</li> </ul> OR<br>Brightness (power) depends on current. Since the current in this circuit is higher than the current in the previous circuit as the total resistance is less, the bulbs are brighter in this circuit. | Power is greater in circuit 2, as both $V$ and $I$ are higher – correctly explained and linked to brightness<br>May be mathematical (gives $P = 2.3\text{W}$ circuit 1 and $14.4\text{W}$ circuit 2 and links power to brightness) |

|     |  |   |  |
|-----|--|---|--|
| (d) | <p>Correctly calculates the current through the headlight, or the correct current through the tail light.</p> <p>OR</p> <p>When the headlight is connected to 12 V power supply, the power used is 55 W, OR the bulb uses 55 J of energy per second when it is connected to 12 V supply OR 12V means 12 J of energy used for each coulomb of charge.</p> | <p>Correctly calculates the current through the headlight, or the correct current through the tail light.</p> <p>AND</p> <p>When the headlight is connected to 12 V power supply, the power used is 55 W, OR the bulb uses 55 J of energy per second when it is connected to 12 V supply OR 12V means 12 J of energy used for each coulomb of charge.</p> | <p>(i) <math>I = \frac{P}{V} = \frac{55}{12} = 4.58 \text{ A}</math></p> <p>Calculation of current through the tail light.</p> $I = \frac{V}{R} = \frac{12}{29} = 0.41 \text{ A}$ <p>Total = 4.58 + 0.41 = 4.99 = 5.0 A</p> <p>(ii) This means that when the headlight is connected to 12 V power supply the power used is 55 W (55 J s<sup>-1</sup> of energy is used by the bulb) OR 12V means 12 J of energy used for each coulomb of charge.</p> |
|-----|--|---|--|

| NØ                                 | N1                                | N2  | A3   | A4   | M5   | M6  | E7  | E8   |
|------------------------------------|-----------------------------------|---|--|--|--|---|---|--|
| No response; no relevant evidence. | Very little Achievement evidence. | Some evidence at the Achievement level; partial explanations. | Most evidence is at the Achievement level. | Nearly all the evidence is at the Achievement level. | Some evidence is at the Merit level with the remainder at the Achievement level. | Most evidence is at the Merit level with some at the Achievement level. | Evidence is provided for most tasks with evidence at the Excellence level weak or incomplete. | Evidence is provided for most tasks with evidence at the Excellence level accurate and full. |
| As above.                          | 1a                                | 2a  | 3a   | 4a   | 2m<br>e + a  | 3m<br>E+a   | e + 2a  | E + 2a<br>2e + a   |

| Question   | Achievement   | Merit   | Excellence   |
|------------|---|---|--|
| TWO<br>(a) | During brushing, friction causes the hair to become charged OR<br>During brushing, charges are added (removed), and the hair becomes charged.<br>OR<br>Strands of hair have the same charge so they repel each other. | During brushing, friction causes the hair to become charged OR<br>During brushing, charges are added (removed), and the hair becomes charged.<br>AND<br>Strands of hair have the same charge, so they repel each other.   | As M but Includes correct reference to dry air so hair retains its charge  |
| (b)        | Because the brush has the opposite charge to the hair, they attract each other.   | During brushing, charge transfer takes place and the brush and the hair are oppositely charged; hence they attract each other.  | If not in (a)<br>As M but Includes correct reference to dry air so hair/comb retains its charge or Plastic comb is insulator so has retained charge  |
| (c)        | Hair loses its charge (falls back).   | Stroking causes the excess charges on the hair to be transferred to Zoe's hand, and hair becomes uncharged.   |  |
| (d)        | A lightning conductor is a metal rod to allow charge / electrons to flow.   | (i) and (ii)<br>• A charge distribution in the air space is shown and matching reference to charging by induction.<br>OR<br>Positive charge induced on conductor attracting negative charges from the cloud with explanation.<br>OR<br>Neutral (even distribution of positive and negative) distribution shown and reference to air is an insulator.<br>OR<br>A partial explanation for (iii) is given (typically covers two points). | Typically covers at least THREE of the following ideas, one makes link to protecting the building.<br>• Lightning conductor made of metal. It is a good conductor. Allows easy transfer of electricity / low resistance. Easier / less resistance than the building.<br>• Lightning conductor is at a high point. Closer to the cloud so more likely to struck by lightning than the building.<br>• Lightning conductor is charged by induction so top is positive. Attracts negative charges from the cloud to the conductor diverting them from the building.<br>• Lightning conductor is connected to the ground. Lightning is conducted to the ground where the charge is dispersed. |

| NØ                                 | N1                                | N2  | A3   | A4   | M5   | M6  | E7  | E8   |
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| As above.                          | 1a                                | 2a  | 3a   | 4a   | 2m<br>e + a  | 3m  | e + 2a  | E + 2a,<br>2e + a  |

| Question     | Achievement   | Merit  | Excellence   |
|--------------|---|--|--|
| THREE<br>(a) | Magnetic field is the area where magnetic force is felt.  |  |  |
| (b)          | The top end of the compass is marked as N and the bottom end as S.<br>OR<br>Identifies Earth's magnetic north and south poles.<br>OR<br>Identifies that magnetic N is slightly different direction to geographic N  | (i) The top end of the compass is marked as N and the bottom end as S.<br>(ii) The north pole of the compass needle is attracted to the Earth's magnetic south, which is near geographic north. OR<br>compass point to the magnetic North pole nor the geographic (True) N so it is shown at an angle.   |  |
| (c)          | Either correct shape or direction.  | Both correct shape and direction.<br>  |  |
| (d)          | The material is (soft) iron.<br>OR<br>A brief explanation for (ii) is given.<br>E.g. The coil becomes magnetic when a current flows through it.<br>OR<br>Calculated (iii) using d as 25 cm.<br>OR incorrectly rearranges to give<br>$I = \frac{k}{Bd} = 0.05 \text{ A}$ | (i) (soft) iron.<br>It is used because it loses its magnetism as soon as the current stops flowing, or it can be magnetised temporarily.<br>OR<br>(ii) When the switch is closed, current flows through the coil and it becomes an electromagnet. The core attracts the flexible iron strip, breaking the contact.<br>OR<br>(iii) Correct working and answer.<br>$I = \frac{Bd}{K}$ $= \frac{1.6 \times 10^{-5} \times 0.25}{2 \times 10^{-7}}$ $= 20 \text{ A}$ | (i) (soft) iron.<br>It is used because it loses its magnetism as soon as the current stops flowing, or it can be magnetised temporarily.<br>(ii) When the switch is closed, current flows through the coil and it becomes an electromagnet. The core attracts the flexible iron strip, breaking the contact.<br>(iii) Correct working and answer.<br>$I = \frac{Bd}{K}$ $= \frac{1.6 \times 10^{-5} \times 0.25}{2 \times 10^{-7}}$ $= 20 \text{ A}$ |

| <b>NØ</b>                         | <b>N1</b>                         | <b>N2</b>  | <b>A3</b>                                  | <b>A4</b>  | <b>M5</b>  | <b>M6</b>   | <b>E7</b>   | <b>E8</b>  |
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| As above                          | 1a                                | 2a   | 3a<br>1a + 1m                              | 4a<br>2a + 1m  | 2m   | 3m  | e+a   | E + a,   |

### Cut Scores

| <b>Not Achieved</b> | <b>Achievement</b> | <b>Achievement with Merit</b> | <b>Achievement with Excellence</b> |
|---------------------|--------------------|-------------------------------|------------------------------------|
| 0 – 6               | 7 – 14             | 15 – 20                       | 21 – 24                            |