## Assessment Schedule - 2022

Physics: Demonstrate understanding of electricity and electromagnetism (91173)
Evidence Statement

| Q | Evidence | Achievement | Merit | Excellence |
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| ONE <br> (a) | $E=\frac{V}{d}=\frac{15}{0.0022}=6800 \mathrm{~V} \mathrm{~m}^{-1}$ | Shows $\frac{15}{0.0022}$ |  |  |
| (b) | $\begin{aligned} & E q d=\frac{1}{2} m v^{2} \\ & 6818 \times 1.6 \times 10^{-19} \times 0.0022=\frac{1}{2} \times 9.11 \times 10^{-31} v^{2} \\ & v=\sqrt{5.27 \times 10^{12}}=2.30 \times 10^{6} \mathrm{~m} \mathrm{~s}^{-1} \end{aligned}$ | - $E_{\mathrm{p}}=E_{\mathrm{k}}$. | - 2.3 or 7.26 any power of ten. |  |
| (c)(i) <br> (ii) | - Increasing the distance between the plates decreases the (electric) field strength / or force. But $E_{p}$ is unchanged and the speed stays the same. OR The electric potential energy lost $=V q$, and is independent of the distance between the plates. So speed is the same. <br> - Increase the voltage. | - Increase voltage. OR $E(\mathrm{~F})$ decreases. | - Energy change the same so final speed the same. |  |
| (d)(i) <br> (ii) | As $E=\frac{V}{d}$, halving $V$ and doubling $d$ makes $E$ a quarter as big. | - $E$ smaller. <br> OR <br> E bigger and more field lines drawn | - $E$ smaller and fewer field lines - must be even and parallel. <br> OR $E=\frac{0.5 \mathrm{~V}}{2 d} \text { and } E \text { smaller. }$ | - $E$ is quarter. |


| Q | Evidence | Achievement | Merit | Excellence |
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| TWO <br> (a) | $\begin{aligned} & P=\frac{V^{2}}{R} \Rightarrow R=\frac{V^{2}}{P}=\frac{12^{2}}{55}=2.62 \Omega \\ & \text { OR } P=I V \Rightarrow 55=12 I \Rightarrow I=4.58 \mathrm{~A} \\ & R=\frac{V}{I}=\frac{12}{4.58}=2.62 \Omega \end{aligned}$ | - Need to see $\frac{12^{2}}{55}$ or $\frac{12}{4.58}$. Or equivalent |  |  |
| (b) | $R_{\mathrm{t}}=1.22+\left(\frac{1}{2.62}+\frac{1}{2.62}\right)^{-1}=2.53 \Omega$ <br> OR $R_{\mathrm{t}}=1.22+\frac{2.62}{2}=2.53 \Omega$ | - Forms $\left(\frac{1}{2.62}+\frac{1}{2.62}\right)^{-1}$ or $\frac{2.62}{2}$ or has 1.31 but not $\frac{1}{2.62}+\frac{1}{2.62}+\frac{1}{1.22}$. OR Adds 1.22 to any calculated resistance except all $1.22+2.62+2.62$. | - $2.53 \Omega$. |  |
| (c) | Adding the stereo would increase the overall resistance of the circuit. Because the circuit voltage is unchanged this would lower the circuit current. The voltage across lamp C would decrease, making the voltage across lamp A more. This would make lamp A brighter. | - Two statements-typically R increases and current decreases. <br> Don't accept an unsupported comment that A is brighter. | - Achieved plus constant circuit voltage. | Full argument must argue with voltage across lamps. |
| (d) | If lamp C blows, everything stops working. <br> Neither of the headlamps will be connected to the rated 12 V . <br> The headlamps will be different brightness or will be getting different voltages. <br> The radio must be on to make lamp B go. | - ONE reason. | - TWO reasons. | - THREE reasons. |


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| THREE <br> (a) | Clearly has the bottom of the wire marked positive. | - Bottom of wire marked positive or top marked negative. |  |  |
| (b) | $V=B v L=1.2 \times 10^{-3} \times 2.7 \times 0.143=4.63 \times 10^{-4} \mathrm{~V}$ | - Any power of 4.9 | - Any other power of ten for 4.6. | - $4.63 \times 10^{-4} \mathrm{~V}=0.00046$ |
| (c)(i) <br> (ii) | $\begin{aligned} & V=I R \Rightarrow I=\frac{12}{3.4}=3.53 \mathrm{~A} \\ & F=B I L=1.2 \times 10^{-3} \times 3.53 \times 0.143=6.06 \times 10^{-4} \mathrm{~N} \end{aligned}$ <br> Left $(\leftarrow)$. | - Left <br> OR <br> 3.53A <br> Or any power of 6.43 | - $6.06 \times 10^{-4} \mathrm{~N}$ <br> Any power where they make one correct conversion | $\begin{aligned} & \text { - } 6.06 \times 10^{-4} \mathrm{~N} \\ & \text { AND } \\ & \text { Left. } \end{aligned}$ |
| (d)(i) <br> (ii) | - The moving electron produces a magnetic field. <br> - This magnetic field adds / combines / interacts with the magnetic field that the electron is moving through, making a weaker field on one side, and a stronger field on the other side of the path of travel. <br> - The electron experiences a force towards the weaker side. | - Shows Anti-clockwise direction around circle. <br> OR <br> ONE bullet point. <br> Accept for achieved only- The electron is a moving charge in a magnetic field that is why there is a force. | - Anti-clockwise direction. <br> AND <br> ONE bullet point. <br> OR <br> TWO bullet points. | - Anti-clockwise direction. <br> AND <br> Full argument. |


| Not Achieved |  |  | Achievement |  | Achievement with Merit |  | Achievement with Excellence |  |
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| NØ | N1 | N2 | A3 | A4 | M5 | M6 | E7 | E8 |

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| No response; no relevant evidence. | Very little Achievement evidence. | Some evidence at Achievement level, but most is at Not Achieved level. | A majority of the evidence is at Achievement level. | Most evidence is at Achievement level. | Some evidence is at Merit level. | A majority of the evidence is at Merit level. | Evidence is provided for most tasks. The evidence at Excellence level may have minor errors, or the evidence is weak. | Evidence is provided for most tasks. The evidence at Excellence level is accurate. |
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| No relevant physics | 1a | 2a | 3 a | 4 a | $2 \mathrm{~m}+1 \mathrm{a}$ | 3 m | $1 \mathrm{e}+2 \mathrm{~m}$ | $1 \mathrm{e}+2 \mathrm{~m}+\mathrm{a}$ |

Other combinations are also possible.

## Cut Scores

| Not Achieved | Achievement | Achievement with Merit | Achievement with Excellence |
| :---: | :---: | :---: | :---: |
| $0-6$ | $8-13$ | $14-18$ | $19-24$ |

