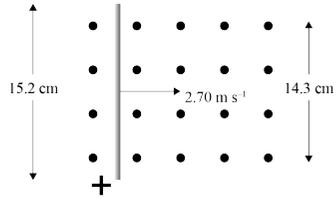
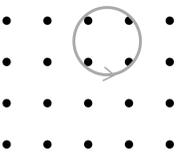


Q	Evidence	Achievement	Merit	Excellence
TWO (a)	$P = \frac{V^2}{R} \Rightarrow R = \frac{V^2}{P} = \frac{12^2}{55} = 2.62 \Omega$ OR $P = IV \Rightarrow 55 = 12I \Rightarrow I = 4.58 \text{ A}$ $R = \frac{V}{I} = \frac{12}{4.58} = 2.62 \Omega$	<ul style="list-style-type: none"> Need to see $\frac{12^2}{55}$ or $\frac{12}{4.58}$. Or equivalent		
(b)	$R_t = 1.22 + \left(\frac{1}{2.62} + \frac{1}{2.62} \right)^{-1} = 2.53 \Omega$ OR $R_t = 1.22 + \frac{2.62}{2} = 2.53 \Omega$	<ul style="list-style-type: none"> 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 $1.22 + 2.62 + 2.62$. 	<ul style="list-style-type: none"> 2.53 Ω. 	
(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.	<ul style="list-style-type: none"> Two statements-typically R increases and current decreases. Don't accept an unsupported comment that A is brighter. 	<ul style="list-style-type: none"> Achieved plus constant circuit voltage. 	Full argument must argue with voltage across lamps.
(d)	If lamp C blows, everything stops working. Neither of the headlamps will be connected to the rated 12 V. The headlamps will be different brightness or will be getting different voltages. The radio must be on to make lamp B go.	<ul style="list-style-type: none"> ONE reason. 	<ul style="list-style-type: none"> TWO reasons. 	<ul style="list-style-type: none"> THREE reasons.

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Clearly has the bottom of the wire marked positive. 	<ul style="list-style-type: none"> Bottom of wire marked positive or top marked negative. 		
(b)	$V = BvL = 1.2 \times 10^{-3} \times 2.7 \times 0.143 = 4.63 \times 10^{-4} \text{ V}$	<ul style="list-style-type: none"> Any power of 4.9 	<ul style="list-style-type: none"> Any other power of ten for 4.6. 	<ul style="list-style-type: none"> $4.63 \times 10^{-4} \text{ V} = 0.00046$
(c)(i)	$V = IR \Rightarrow I = \frac{12}{3.4} = 3.53 \text{ A}$ $F = BIL = 1.2 \times 10^{-3} \times 3.53 \times 0.143 = 6.06 \times 10^{-4} \text{ N}$	<ul style="list-style-type: none"> Left OR 3.53A Or any power of 6.43 	<ul style="list-style-type: none"> $6.06 \times 10^{-4} \text{ N}$ Any power where they make one correct conversion 	<ul style="list-style-type: none"> $6.06 \times 10^{-4} \text{ N}$ AND Left.
(ii)	Left (\leftarrow).			
(d)(i)		<ul style="list-style-type: none"> Shows Anti-clockwise direction around circle. OR ONE bullet point. <p>Accept for achieved only- The electron is a moving charge in a magnetic field that is why there is a force.</p>	<ul style="list-style-type: none"> Anti-clockwise direction. AND ONE bullet point. OR TWO bullet points. 	<ul style="list-style-type: none"> Anti-clockwise direction. AND Full argument.
(ii)	<ul style="list-style-type: none"> The moving electron produces a magnetic field. 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. The electron experiences a force towards the weaker side. 			

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
N0	N1	N2	A3	A4	M5	M6	E7	E8

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.
No relevant physics	1a	2a	3a	4a	2m + 1a	3m	1e + 2m	1e + 2m + 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