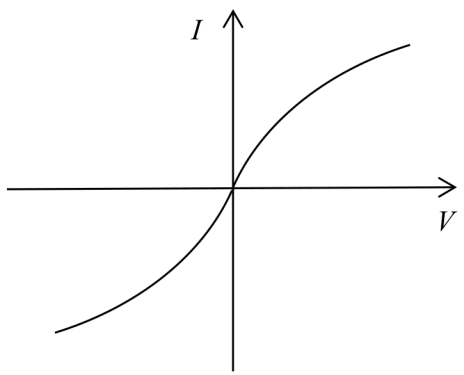
Question Number	Answer		Mark
13a	Correct shape of graph for positive quadrant Correct symmetry in negative quadrant  	(1) (1)	**2**
13bi	Use of $A = \pi r^2$ Use of $I = nqvA$ $v = 1.3 \times 10^{-2}$ m s^{-1} Example of calculation $A = \pi r^2 = \pi \times (0.023 \times 10^{-3}\text{ m})^2 = 1.66 \times 10^{-9}$ m^2 $v = \frac{I}{nAq} = \frac{0.44\text{ A}}{(1.26 \times 10^{29}\text{m}^{-3})\,(1.66 \times 10^{-9}\text{ m}^2)(1.60 \times 10^{-19}\text{C})} = 0.0131$ m s^{-1}	(1) (1) (1)	**3**
13bii	Use of $R = V/I$ Use of $R = \rho l/A$ $\rho = 9.1 \times 10^{-7}$ (Ωm), so approximately 2700°C (MP2 e.c.f. for A value from part b(i)) Example of calculation $R = \frac{140\text{ V}}{0.44\text{ A}} = 318\ \Omega$ $\rho = \frac{RA}{l} = \frac{(318\ \Omega)(1.66 \times 10^{-9}\text{m}^2)}{0.580\text{ m}} = 9.1 \times 10^{-7}\ \Omega$m, so this most closely matches the resistivity value at 2700°C.	(1) (1) (1)	**3**
	Total for question 13		**8**