6 **(a)** Fig. 6.1 shows a potentiometer circuit for determining the resistance of resistor R. The uniform wire XY, of length 1.20 m, has a resistance of 20.0 Ω. The balance length XJ is 0.48 m. At the balance length, a voltmeter connected across the 1.0 Ω resistor reads 0.50 V. Determine the resistance of resistor R.

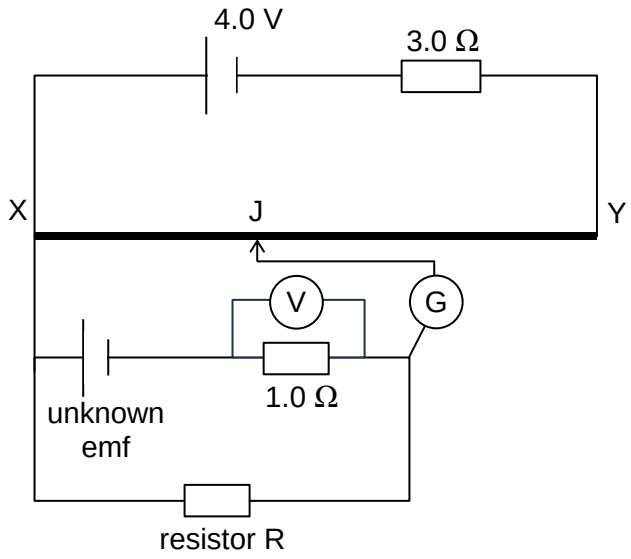

Fig. 6.1

resistance = ... Ω [3]

(b) A copper wire has a length of 3.0 m and a uniform cross-sectional area of 0.20 mm^2. It carries a current of 2.8 A when a potential difference of 0.72 V is applied across it.

(i) Given that the charge carrier in the copper wires are electrons, and that the number density of electrons is $8.49 \times 10^{28}\ m^{-3}$, determine its drift velocity.

velocity = ... $m\ s^{-1}$ [2]

(ii) Determine the resistivity of the copper wire.

resistivity = …… Ω m [2]

(iii) Explain, in microscopic terms, why the resistance of the copper wire increases as the current through it increases.

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…… [2]