

- 1 A circuit is set up to measure the resistance of an unknown resistor X as shown in Fig. 1.1.

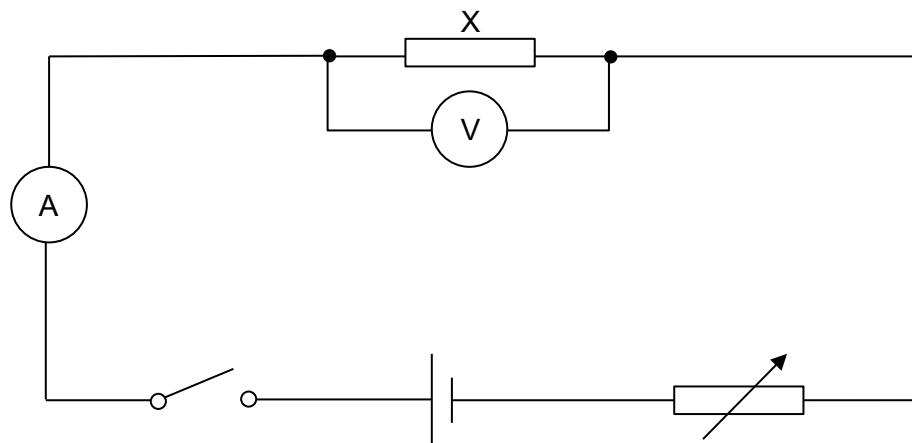


Fig. 1.1

- (a) When the switch is closed, the average drift velocity v of electrons moving through a wire is given by the equation,

$$v = \frac{\mu F}{e}$$

where e is the charge on an electron,
 F is a force acting on the electron, and
 μ is a constant.

Determine the SI base units of μ .

SI base units = [2]

- (b) An analogue voltmeter is used to take measurements of the potential difference across X.
For these measurements, state one example of

- (i) a systematic error,

..... [1]

- (ii) a random error.

..... [1]

- (c) The variable resistor is adjusted to give a new set of readings which, when repeated, give average values of potential difference V and current I of 3.00 ± 0.03 V and 4.9 ± 0.1 mA respectively.

- (i) Show that the resistance of X is 612Ω .

[1]

- (ii) Determine the actual uncertainty in the value of resistance of X showed in (i).

Hence state the value of resistance of X with its actual uncertainty to an appropriate number of significant figures.

resistance of X = \pm Ω [2]

- (d) When an experiment such as this is performed, it is common practice to adjust the variable resistor to obtain several sets of values of potential difference and current. These sets of values are then plotted on a graph from which the resistance of X may be deduced.
Discuss one advantage of this procedure compared with the determination of resistance of X from a single set of readings.

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..... [1]

