



- 5 (a) Copper has one conduction electron per atom.

The density of copper is  $8960 \text{ kg m}^{-3}$ .

The mass of 1.00 mole of copper is 63.5 g.

Show that the number density of charge carriers in copper is  $8.49 \times 10^{28} \text{ m}^{-3}$ .

[3]

- (b) A tungsten wire of diameter 0.36 mm has resistance  $30 \Omega$ . The power dissipated in the wire is 5.0 W.

The number density of charge carriers in tungsten is  $3.4 \times 10^{28} \text{ m}^{-3}$ .

Calculate the average drift velocity  $v$  of the conduction electrons in tungsten.

$$v = \dots \text{ ms}^{-1} [4]$$





- (c) The wire in (b) is now replaced with another tungsten wire of the same diameter but twice the length. The potential difference (p.d.) across the wire is unchanged. The temperature of both wires is the same.

State and explain the change to the drift velocity of the electrons in the second wire.

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[3]

[Total: 10]





**Question 6 begins over the page.**

