6 (a) Define resistance.

....

.... [1]

(b) A cylindrical metal wire of length 2.4 m and cross-sectional area $8.0 \times 10^{-6}\,\mathrm{m^2}$ has a resistance of $0.33\,\Omega$. There is a current in the wire of 4.7 A.

(i) Determine the resistivity of the metal from which the wire is made.

resistivity = ... Ω m [2]

(ii) Calculate the charge that passes through the wire in a time of 5.0 minutes.

charge = ... C [2]

(iii) The free electrons (charge carriers) in the wire have an average drift speed of $0.16\,\mathrm{mm\,s^{-1}}$.

Determine the number density of charge carriers in the metal.

number density = ... $\mathrm{m^{-3}}$ [2]

(c) The wire in **(b)** may be considered to be a fixed resistor. It is connected in series with a thermistor to a battery that has negligible internal resistance.

(i) Use circuit symbols to complete Fig. 6.1 to show the circuit diagram of this arrangement.
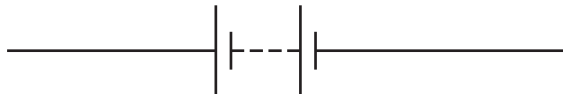
Fig. 6.1

[1]

(ii) Explain, without calculation, how the power dissipated in the wire changes as the temperature of the thermistor is increased.

....

....

....

.... [2]

[Total: 10]