

- 6 (a) Define the *volt*.

.....
.....[1]

- (b) A battery of electromotive force (e.m.f.) 7.0 V and negligible internal resistance is connected in series with three components, as shown in Fig. 6.1.

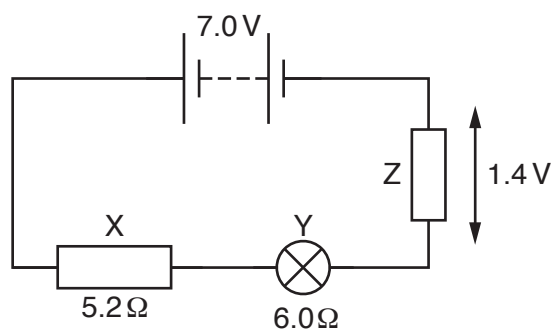


Fig. 6.1

Resistor X has a resistance of 5.2 Ω. The resistance of the filament wire of lamp Y is 6.0 Ω. The potential difference across resistor Z is 1.4 V.

- (i) Calculate the current in the circuit.

current = A [2]

- (ii) Determine the resistance of resistor Z.

resistance = Ω [1]

- (iii) Calculate the percentage efficiency with which the battery supplies power to the lamp.

efficiency = % [3]

- (iv) The filament wire of the lamp is made of metal of resistivity $3.7 \times 10^{-7} \Omega \text{ m}$ at its operating temperature in the circuit.

Determine, for the filament wire, the value of α where

$$\alpha = \frac{\text{cross-sectional area}}{\text{length}} .$$

$$\alpha = \dots\dots\dots \text{ m [2]}$$

[Total: 9]