5 (a) State Kirchhoff's second law.

....

....[2]

(b) A battery of electromotive force (e.m.f.) 5.6 V and internal resistance r is connected to two external resistors, as shown in Fig. 5.1.
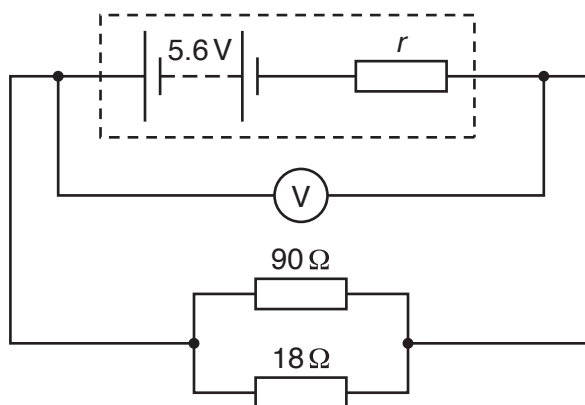

Fig. 5.1

The reading on the voltmeter is 4.8 V.

(i) Calculate:

1. the combined resistance of the two resistors connected in parallel

combined resistance = ... Ω [2]

2. the current in the battery.

current = ... A [2]

(ii) Show that the internal resistance r is 2.5 Ω.

[2]

(iii) Determine the ratio

$$\frac{\text{power dissipated by internal resistance } r}{\text{total power produced by battery}}.$$

ratio = ... [3]

(c) The battery in **(b)** is now connected to a battery of e.m.f. 7.2 V and internal resistance 3.5 Ω. The new circuit is shown in Fig. 5.2.
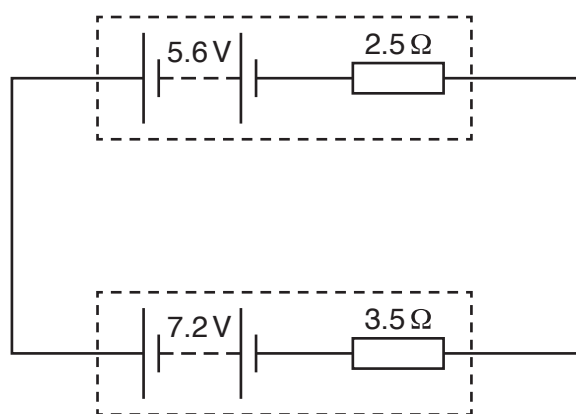

Fig. 5.2

Determine the current in the circuit.

current = ... A [2]

[Total: 13]