**4** **(a)** Distinguish between *potential difference* (p.d.) and *electromotive force* (e.m.f.) in terms of energy transformations.

.....

.....

.....

.....[2]

**(b)** Two cells A and B are connected in series with a resistor R of resistance 5.5 Ω, as shown in Fig. 4.1.

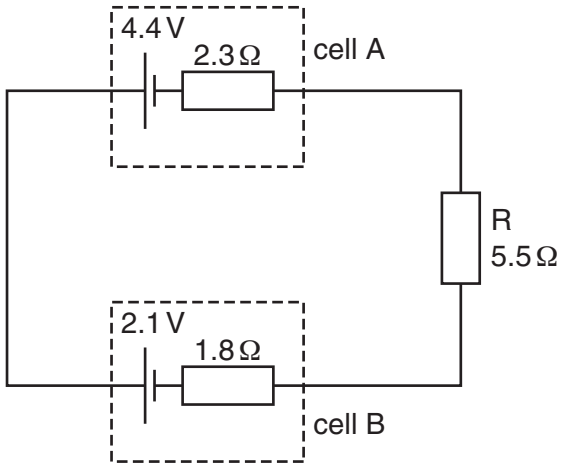


**Fig. 4.1**

Cell A has e.m.f. 4.4 V and internal resistance 2.3 Ω. Cell B has e.m.f. 2.1 V and internal resistance 1.8 Ω.

**(i)** State Kirchhoff's second law.

.....

.....[1]

**(ii)** Calculate the current in the circuit.

current = ..... A [2]

**(iii)** On Fig. 4.1, draw an arrow to show the direction of the current in the circuit. Label this arrow $I$. [1]

**(iv)** Calculate

**1.** the p.d. across resistor R,

p.d. = ..... V [1]

**2.** the terminal p.d. across cell A,

p.d. = ..... V [1]

**3.** the terminal p.d. across cell B.

p.d. = ..... V [2]