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5 **(a)** For a cell, explain the terms

(i) *electromotive force* (e.m.f.),

.....

..... [1]

(ii) *internal resistance*.

.....

..... [1]

(b) The circuit of Fig. 5.1 shows two batteries A and B and a resistor R connected in series.

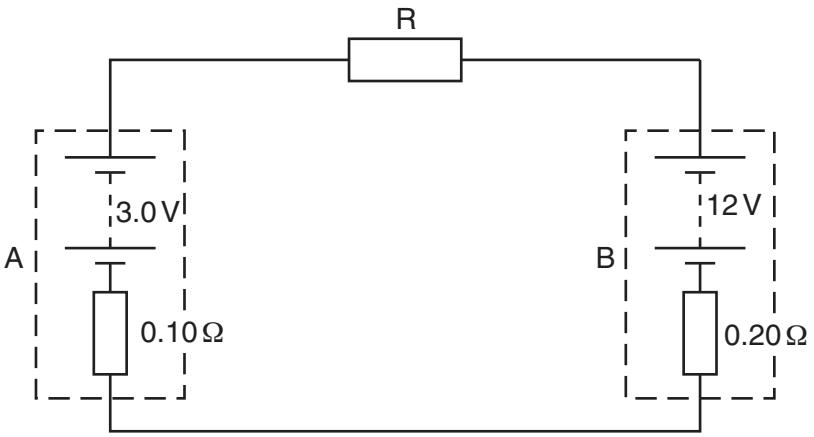

Fig. 5.1

Battery A has an e.m.f. of 3.0 V and an internal resistance of 0.10 Ω. Battery B has an e.m.f. of 12 V and an internal resistance of 0.20 Ω. Resistor R has a resistance of 3.3 Ω.

(i) Apply Kirchhoff's second law to calculate the current in the circuit.

current = ... A [2]

(ii) Calculate the power transformed by battery B.

power = ... W [2]

(iii) Calculate the total energy lost per second in resistor R and the internal resistances.

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energy lost per second = ... $J s^{-1}$ [2]

(c) The circuit of Fig. 5.1 may be used to store energy in battery A. Suggest how your answers in **(b)** support this statement.

.....

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..... [1]