5 **(a)** a cell, explain the terms
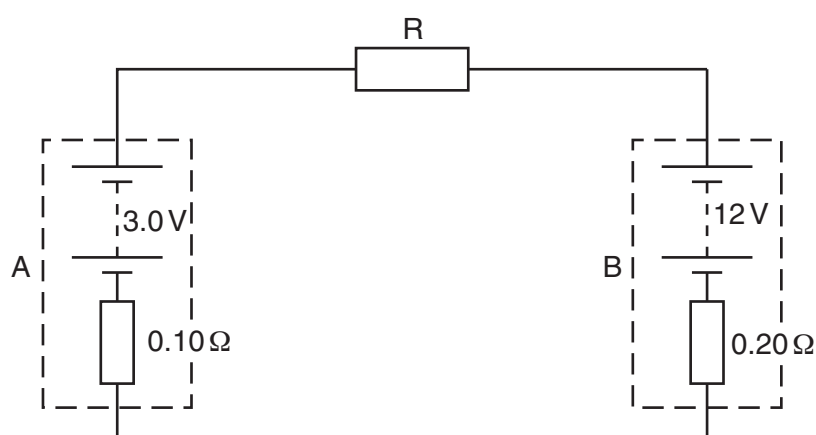
  (i) *electromotive force* (e.m.f.),

  ....

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

(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.

energy lost per second = ... Js^{-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.

....

....

.... [1]