

- 4 A circuit used to measure the power transfer from a battery is shown in Fig. 4.1. The power is transferred to a variable resistor of resistance R .

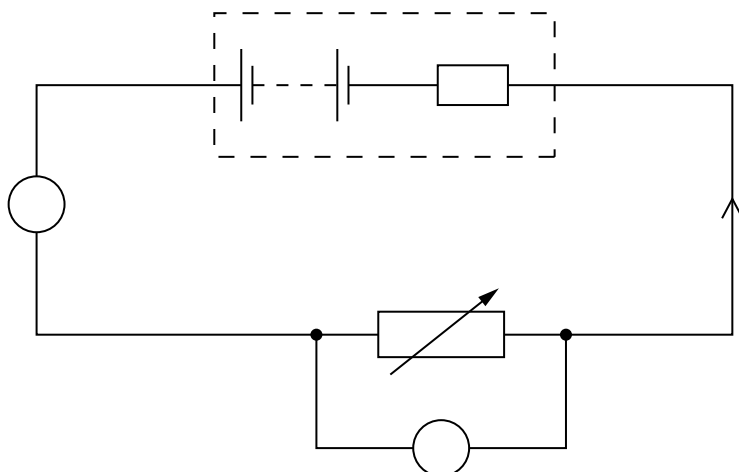


Fig. 4.1

The battery has an electromotive force (e.m.f.) E and an internal resistance r . There is a potential difference (p.d.) V across R . The current in the circuit is I .

- (a) By reference to the circuit shown in Fig. 4.1, distinguish between the definitions of e.m.f. and p.d.

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..... [3]

- (b) Using Kirchhoff's second law, determine an expression for the current I in the circuit.

[1]

(c) The variation with current I of the p.d. V across R is shown in Fig. 4.2.

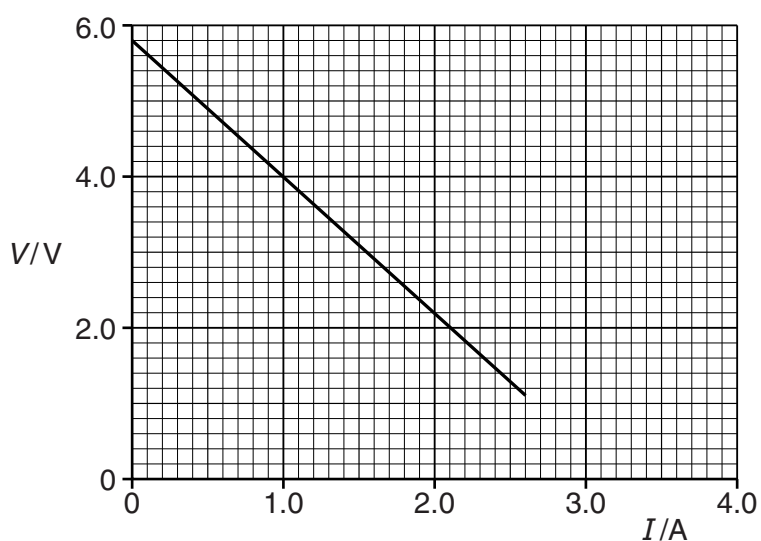


Fig. 4.2

Fig. 4.2 to determine

(i) the e.m.f. E ,

$E = \dots\dots\dots$ V [1]

(ii) the internal resistance r .

$r = \dots\dots\dots$ Ω [2]

(d) (i) Using data from Fig. 4.2, calculate the power transferred to R for a current of 1.6 A.

power = $\dots\dots\dots$ W [2]

(ii) your answers from (c)(i) and (d)(i) to calculate the efficiency of the battery for a current of 1.6 A.

efficiency = $\dots\dots\dots$ % [2]