4 A variable resistor R is connected between the terminals of a battery of e.m.f. E and internal resistance r, as shown in Fig. 4.1.

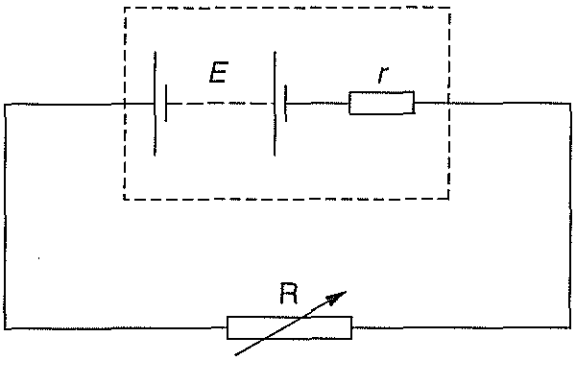

Fig. 4.1

The resistance of resistor R is varied.
The potential difference across R is V and the power dissipated in R is P.
The variation with V of P is shown in Fig. 4.2.

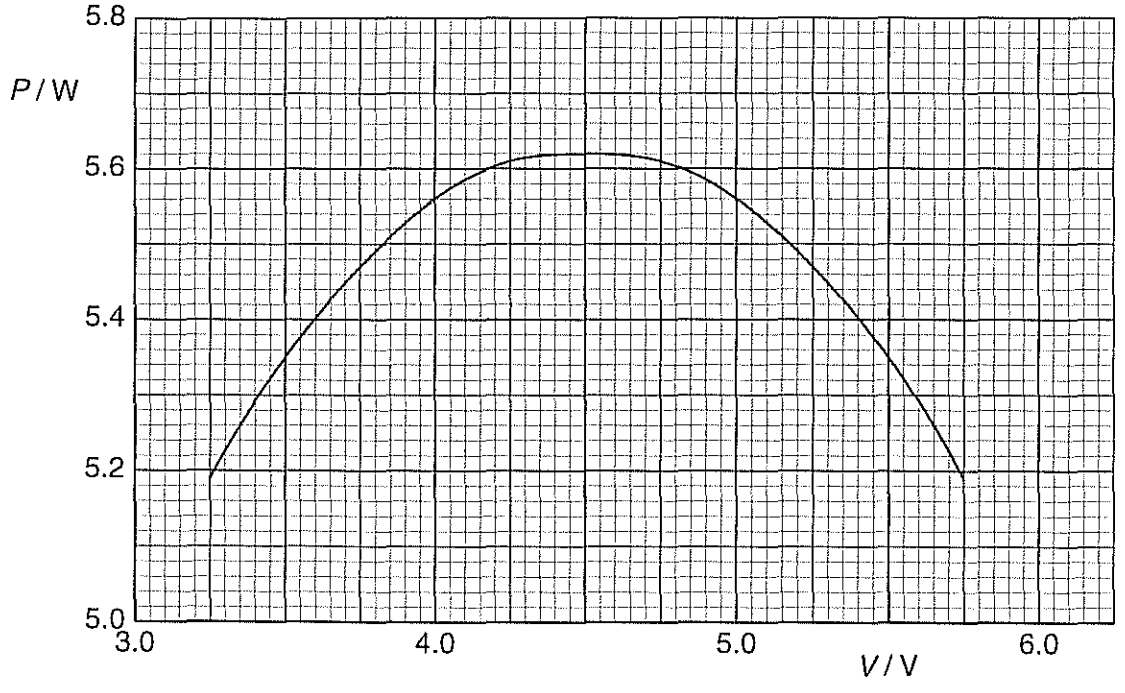

Fig. 4.2

(a) For the maximum value of P, use Fig. 4.2 to

(i) calculate the current in the circuit,

current = ... A [2]

[Turn over

(ii) show that the resistance of R is 3.6 Ω.

[1]

(b) When R has resistance 2.03 Ω, the current in the circuit is 1.60 A.
Use these data and your answers to **(a)** to determine the internal resistance *r* of the battery.

r = ... Ω [3]