

7 (a) Define the *ohm*.

.....  
..... [1]

- (b) A uniform wire has resistance  $3.2\ \Omega$ . The wire has length  $2.5\text{ m}$  and is made from metal of resistivity  $460\text{ n}\Omega\text{ m}$ .

Calculate the cross-sectional area of the wire.

cross-sectional area = .....  $\text{m}^2$  [3]

- (c) A cell of electromotive force (e.m.f.)  $E$  and internal resistance  $r$  is connected to a variable resistor of resistance  $R$ , as shown in Fig. 7.1.

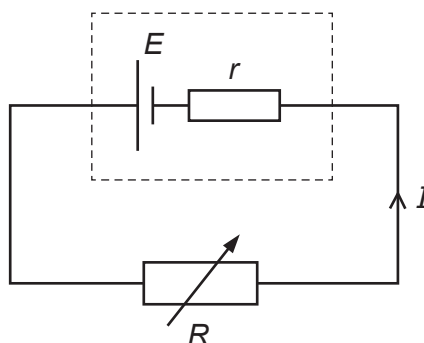


Fig. 7.1

The current in the circuit is  $I$ .

- (i) State, in terms of energy, why the potential difference across the variable resistor is less than the e.m.f. of the cell.

.....  
..... [1]

- (ii) State an expression for  $E$  in terms of  $I$ ,  $R$  and  $r$ .

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

- (iii) The resistance  $R$  of the variable resistor is changed so that it is equal to  $r$ .

Determine an expression, in terms of only  $E$  and  $r$ , for the power  $P$  dissipated in the variable resistor.

$$P = \dots\dots\dots [2]$$