5 A battery of electromotive force (e.m.f.) 8.0 V and internal resistance 2.0 Ω is connected to a resistor X and a wire Y, as shown in Fig. 5.1.
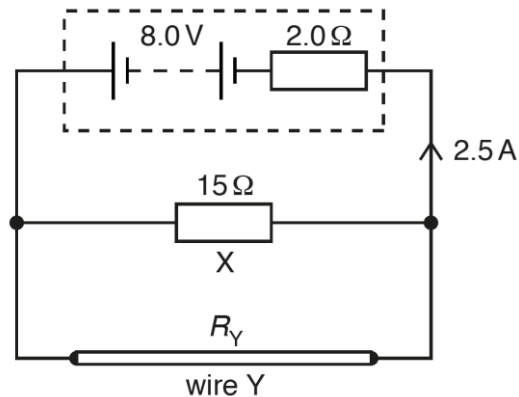

Fig. 5.1

The resistance of X is 15 Ω. The resistance of Y is R_Y. The current in the battery is 2.5 A.

(a) Calculate

(i) the thermal energy dissipated in the battery in a time of 5.0 minutes,

energy = ... J [2]

(ii) the terminal potential difference of the battery.

terminal potential difference = ... V [1]

(b) Determine the resistance R_Y.

$R_Y = $ .... Ω [3]

(c) Wire Y is replaced in the circuit by a new wire Z which has less resistance than wire Y. By considering the current in the battery, state and explain the effect of changing the wires on the total power produced by the battery.

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....[2]

[Total: 8]