

- 6 A battery of electromotive force (e.m.f.) 12 V and negligible internal resistance is connected to a network of two lamps and two resistors, as shown in Fig. 6.1.

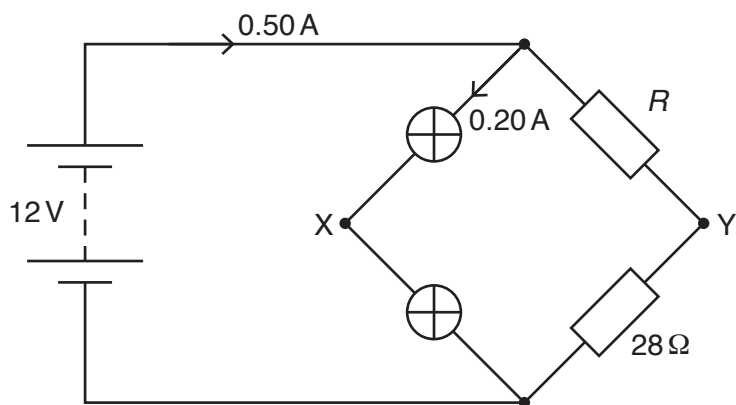


Fig. 6.1

The two lamps in the circuit have equal resistances. The two resistors have resistances  $R$  and  $28\ \Omega$ . The lamps are connected at junction X and the resistors are connected at junction Y. The current in the battery is 0.50 A and the current in the lamps is 0.20 A.

(a) Calculate:

- (i) the resistance of each lamp

resistance = .....  $\Omega$  [2]

- (ii) resistance  $R$ .

$R =$  .....  $\Omega$  [2]

(b) Determine the potential difference  $V_{XY}$  between points X and Y.

$V_{XY} =$  ..... V [3]

(c) Calculate the ratio

$$\frac{\text{total power dissipated by the lamps}}{\text{total power produced by the battery}}.$$

ratio = ..... [2]

(d) The resistor of resistance  $R$  is now replaced by another resistor of lower resistance.

State and explain the effect, if any, of this change on the ratio in (c).

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..... [2]

[Total: 11]