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.

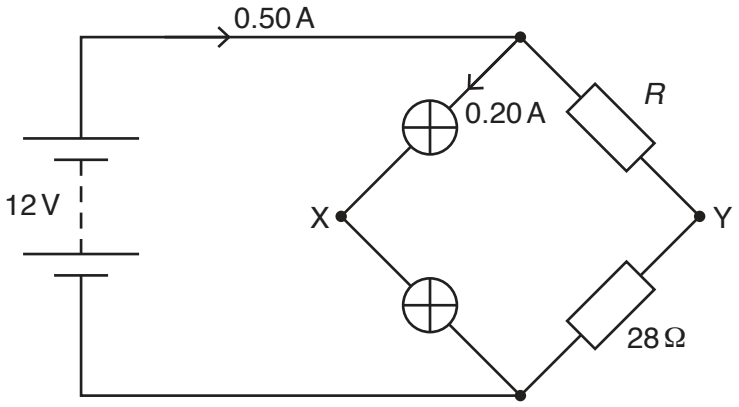

Fig. 6.1

The two lamps in the circuit have equal resistances. The two resistors have resistances R and 28 Ω. 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 = ... Ω [2]

(ii) resistance R.

R = ... Ω [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)**.

.....

.....

.....

.....

..... [2]

[Total: 11]