**5** **(a)** State Ohm's law.

.....

.....

..... [2]

**(b)** The variation of current $I$ with potential difference $V$ for a filament lamp is shown in Fig. 5.1.

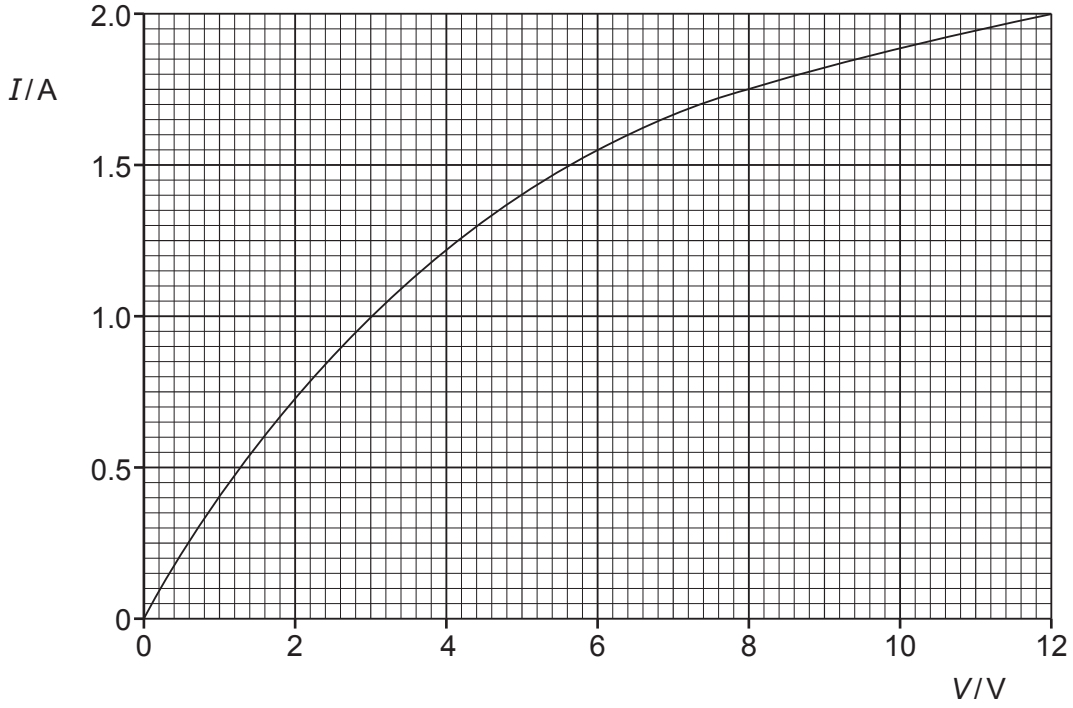


**Fig. 5.1**

The resistance of the filament lamp increases with potential difference.

**(i)** State how Fig. 5.1 shows this.

.....

..... [1]

**(ii)** Explain why the resistance varies in this way.

.....

..... [1]

**(c)** Fig. 5.2 shows a circuit with a battery of electromotive force (e.m.f.) 12.0 V connected to a linear potentiometer AB and two identical filament lamps P and Q.

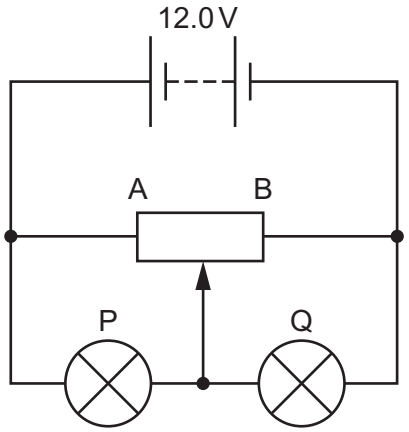


**Fig. 5.2**

The battery has negligible internal resistance and the lamps each have the same $I$–$V$ characteristic shown in Fig. 5.1.

When the slider of the potentiometer is at its midpoint, as shown in Fig. 5.2, the current $I$ in the battery is 1.78 A.

Determine:

**(i)** the current in lamp P

current = ..... A [1]

**(ii)** the total power dissipated in lamps P and Q

total power = ..... W [2]

**(iii)** the resistance of the potentiometer between its ends A and B.

resistance = ..... Ω [2]

**(d)** The slider of the potentiometer in **(c)** is moved to end A.

State and explain the effect on the brightness of lamps P and Q.

lamp P: .....

.....

lamp Q: .....

.....

[2]

[Total: 11]