

8 A cylinder is made of modelling clay. The modelling clay is an electrical conductor.

Fig. 8.1 shows the cylinder.

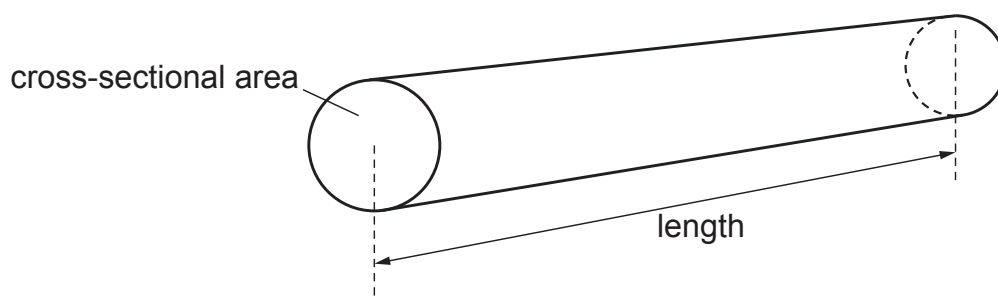


Fig. 8.1

The cylinder is connected into a circuit.

Fig. 8.2 shows that the circuit also includes a battery of electromotive force (e.m.f.) 9.0V and a resistor P.

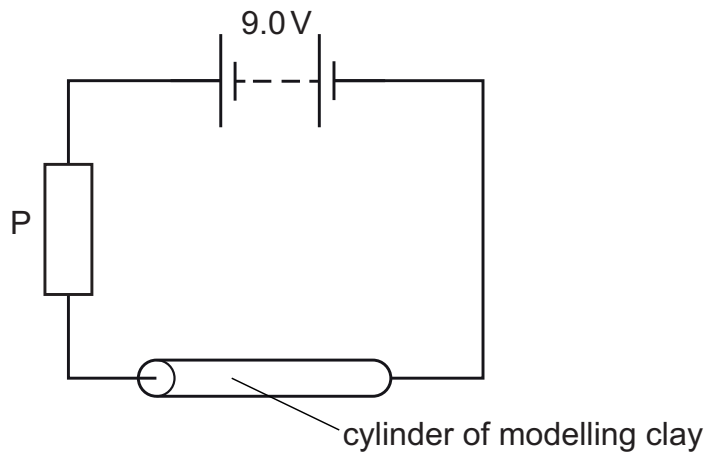


Fig. 8.2

The resistance of P is 4.0Ω . The current in P is 1.5A.

(a) Calculate:

(i) the magnitude X of the charge that flows through P in 600 s

$X = \dots\dots\dots$ [2]

(ii) the resistance of the cylinder of modelling clay.

resistance = $\dots\dots\dots$ [3]

(b) The cylinder is removed from the circuit and replaced with a new cylinder made of the same modelling clay.

The new cylinder is twice the length and has half the cross-sectional area of the first cylinder.

Calculate the time that it now takes for a charge of magnitude X to flow through resistor P.

time = $\dots\dots\dots$ [4]