

- 6 A capacitor C is charged so that the potential difference (p.d.) V across its terminals is 8.0 V. The capacitor is connected into the circuit of Fig. 6.1.

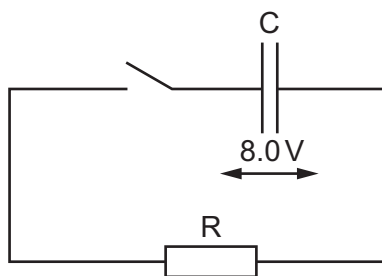


Fig. 6.1

The switch is initially open. The switch is closed at time $t = 0$.

- (a) Fig. 6.2 shows the variation of V with the charge Q on the plates of capacitor C as the capacitor discharges.

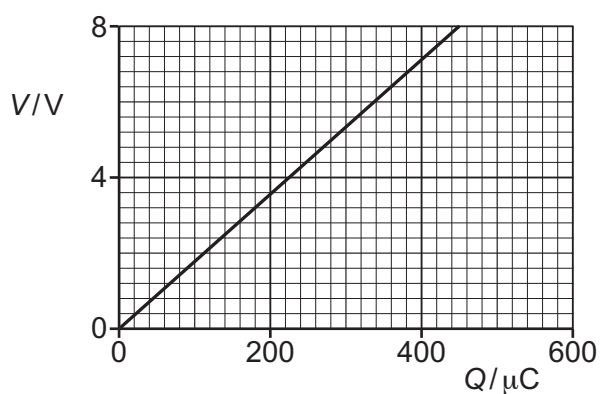


Fig. 6.2

- (i) Show that the energy stored in capacitor C at time $t = 0$ is 1.8 mJ.

[2]

- (ii) Determine the capacitance of capacitor C. Give a unit with your answer.

capacitance = unit [2]

- (b) Fig. 6.3 shows the variation with t of $-\ln\left(\frac{V}{8.0\text{V}}\right)$.

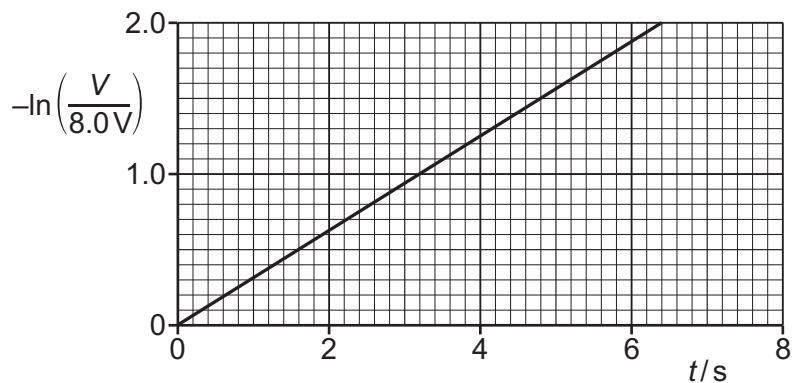


Fig. 6.3

- (i) Show that, when t is equal to one time constant, the value of $-\ln\left(\frac{V}{8.0\text{V}}\right)$ is equal to 1.0.

[2]

- (ii) Determine the time constant τ of the circuit in Fig. 6.1.

$\tau = \dots\dots\dots \text{s}$ [1]

- (iii) Calculate the resistance of resistor R.

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