

- 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.

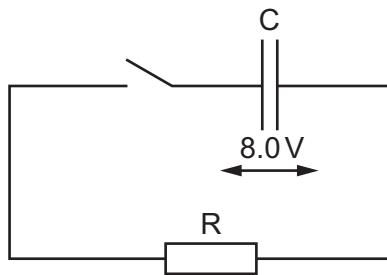


Fig. 6.1

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.

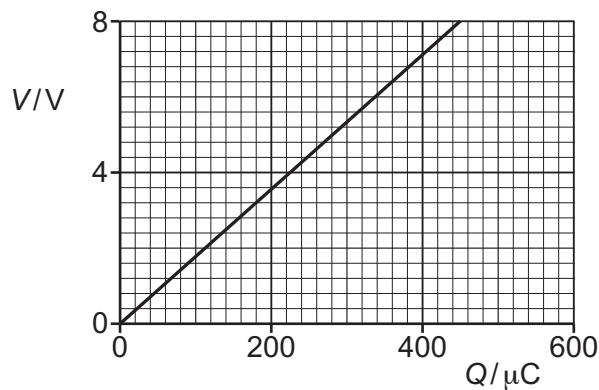


Fig. 6.2

- (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  $-\ln\left(\frac{V}{8.0V}\right)$ .

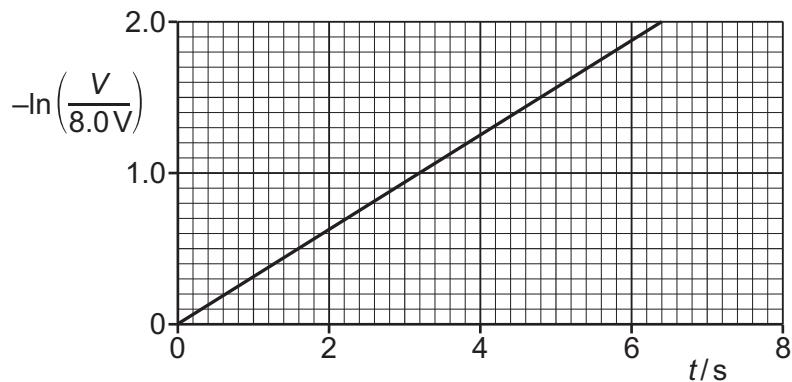


Fig. 6.3

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

[2]

- (ii) Determine the time constant  $\tau$  of the circuit in Fig. 6.1.

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

- (iii) Calculate the resistance of resistor R.

$$\text{resistance} = \dots \Omega \quad [2]$$

[Total: 8]