5 A capacitor, a battery of electromotive force (e.m.f.) 12 V, a resistor R and a two-way switch are connected in the circuit shown in Fig. 5.1.

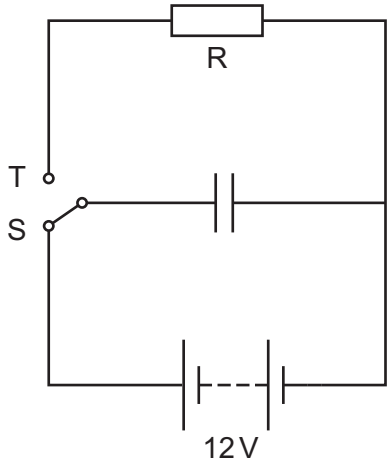

Fig. 5.1

The switch is initially in position S. When the capacitor is fully charged, the switch is moved to position T so that the capacitor discharges. At time t after the switch is moved the charge on the capacitor is Q.

The variation with t of $\ln(Q/\mu C)$ is shown in Fig. 5.2.

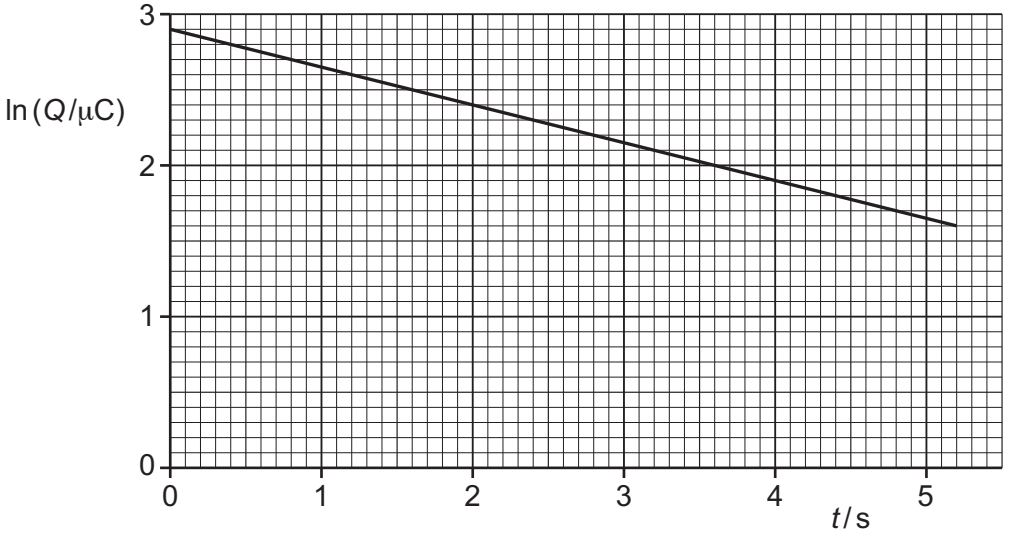

Fig. 5.2

(a) Show that the capacitance of the capacitor is 1.5 μF.

[3]

(b) Determine the resistance of R.

resistance = ... Ω [3]

(c) Calculate the energy stored in the capacitor at time $t = 0$.

energy = ... J [2]

(d) A second identical resistor is now connected in parallel with R.

The switch is initially in position S. When the capacitor is fully charged, the switch is moved to position T so that the capacitor discharges. At time t after the switch is moved the charge on the capacitor is Q.

On Fig. 5.2, sketch a line to show the variation of $\ln(Q/\mu C)$ with t between time $t = 0$ and time $t = 5.0\,s$. [2]

[Total: 10]