



# **A Level Physics A**

**H556/02** Exploring physics

## **Question Set 19**

1 A student wishes to determine the permittivity  $\epsilon$  of paper using a capacitor made in the laboratory.

The capacitor consists of two large parallel aluminium plates separated by a very thin sheet of paper.

The capacitor is initially charged to a potential difference  $V_0$  using a battery. The capacitor is then discharged through a fixed resistor of resistance  $1.0\text{ M}\Omega$ .

The potential difference  $V$  across the capacitor after a time  $t$  is recorded by a data-logger. The student uses the data to draw the  $\ln V$  against  $t$  graph shown in Fig. 22.

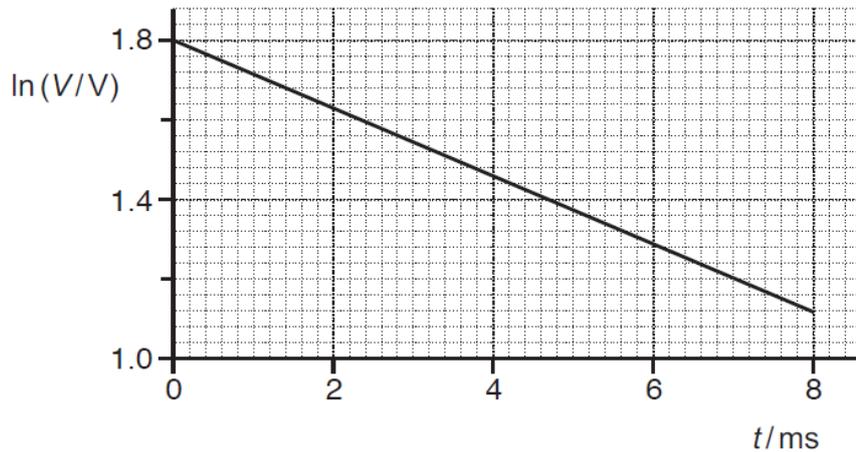


Fig. 22

(a) Show that the magnitude of the gradient of the line shown in Fig. 22 is equal to

$$\frac{1}{CR}$$

where  $C$  is the capacitance of the capacitor and  $R$  is the resistance of the resistor.

[2]

(b)\* Use Fig. 22 to determine the capacitance  $C$  of the capacitor. Describe how the student can then use this value of  $C$  to determine a value for  $\epsilon$ .

In your description, mention any additional measurements required on the capacitor.

[6]

**Total Marks for Question Set 19: 8**

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