Exercise 13 - Capacitance

Past Paper Homework Questions

1. The unit for capacitance can be written as

A $V C^{-1}$

B $C V^{-1}$

C $J s^{-1}$

D $C J^{-1}$

E $J C^{-1}$.

2. A 25·0 μF capacitor is charged until the potential difference across it is 500 V.
The charge stored in the capacitor is

A $5{\cdot}00 \times 10^{-8}$ C

B $2{\cdot}00 \times 10^{-5}$ C

C $1{\cdot}25 \times 10^{-2}$ C

D $1{\cdot}25 \times 10^{4}$ C

E $2{\cdot}00 \times 10^{7}$ C.

3. In an experiment to find the capacitance of a capacitor, a student makes the following measurements.

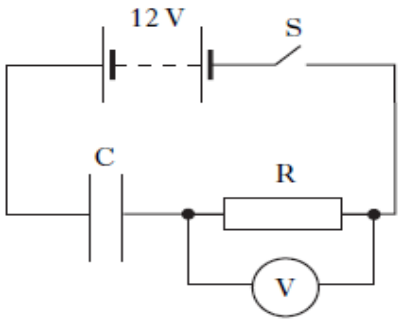
potential difference across capacitor = (10·0 ± 0·1) V

charge stored by capacitor = (500 ± 25) μC

Which row in the table gives the capacitance of the capacitor and the percentage uncertainty in the capacitance?

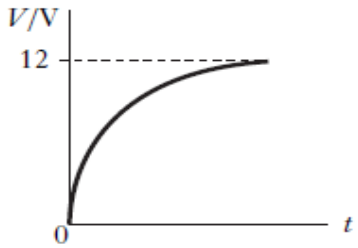
	Capacitance/μF	*Percentage uncertainty*
A	0·02	1
B	0·02	5
C	50	1
D	50	5
E	5000	6

4. A circuit is set up as shown.



The capacitor is initially uncharged. Switch S is now closed. Which graph shows how the potential difference, V, across R, varies with time, t?

A



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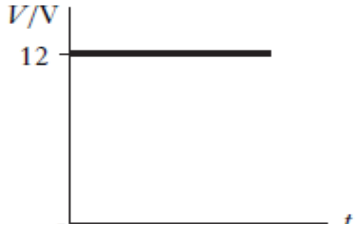
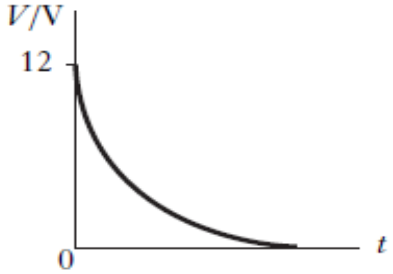


C



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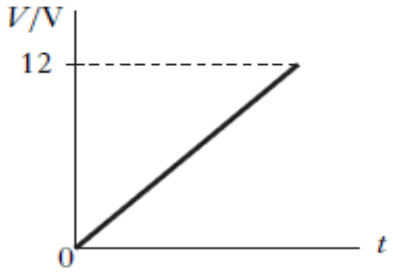
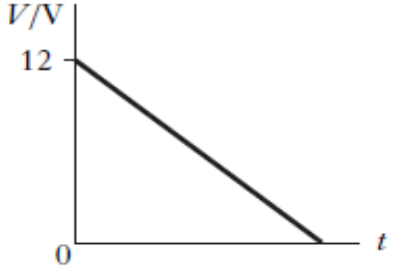


E



5. A student carries out an experiment to find the capacitance of a capacitor. The charge on the capacitor is measured for different values of p.d. across the capacitor. The results are shown.

charge on capacitor/μC	*p.d. across capacitor*/V
1·9	1·0
4·6	2·0
9·6	4·0

The best estimate of the capacitance is

A 1·9 μF

B 2·2 μF

C 2·3 μF

D 2·4 μF

E 2·6 μF.

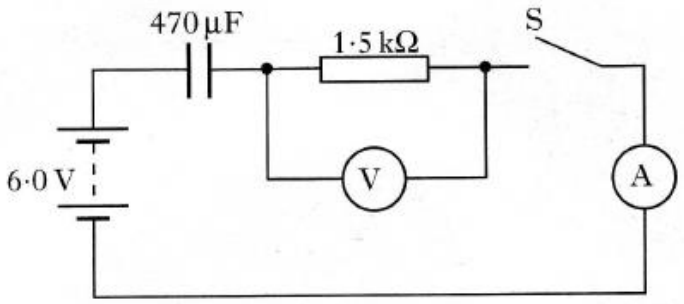
6. The capacitance of a capacitor is 1000 μF. The potential difference (p.d.) across the capacitor is 100 V. The charge stored by the capacitor is 0·10 C.

The charge on the capacitor is now reduced to half its original value.

Which row in the table shows the capacitance of the capacitor and the p.d. across the capacitor, for this new value of charge?

	Capacitance/μF	*p.d.*/V
A	1000	200
B	500	100
C	1000	100
D	500	50
E	1000	50

7. (*a*) The following diagram shows a circuit that is used to investigate the charging of a capacitor.



The capacitor is initially uncharged.

The capacitor has a capacitance of 470 μF and the resistor has a resistance of 1·5 kΩ.

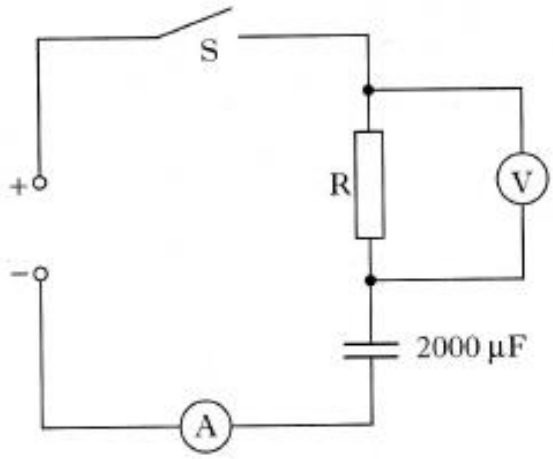
The battery has an e.m.f. of 6·0 V and negligible internal resistance.

(i) Switch S is now closed. What is the initial current in the circuit? 3

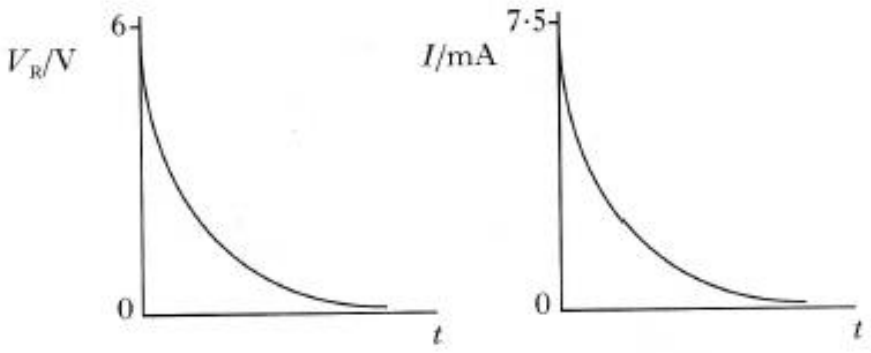
(ii) How much energy is stored in the capacitor when it is fully charged? 3

(iii) What change could be made to this circuit to ensure that the **same** capacitor stores **more** energy? 1

8. (*a*) The circuit below is used to investigate the charging of a 2000 μF capacitor. The d.c. supply has negligible internal resistance.



The graphs below show how the potential difference V_R across the **resistor** and the current I in the circuit vary with time from the instant switch S is closed.



(i) What is the potential difference across the capacitor when it is fully charged? 1

(ii) Calculate the energy stored in the capacitor when it is fully charged. 3

(iii) Calculate the resistance of R in the circuit above. 3

20 marks