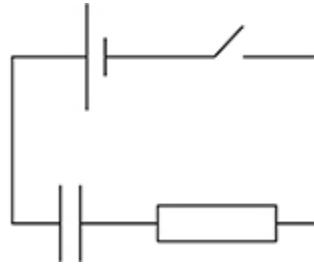
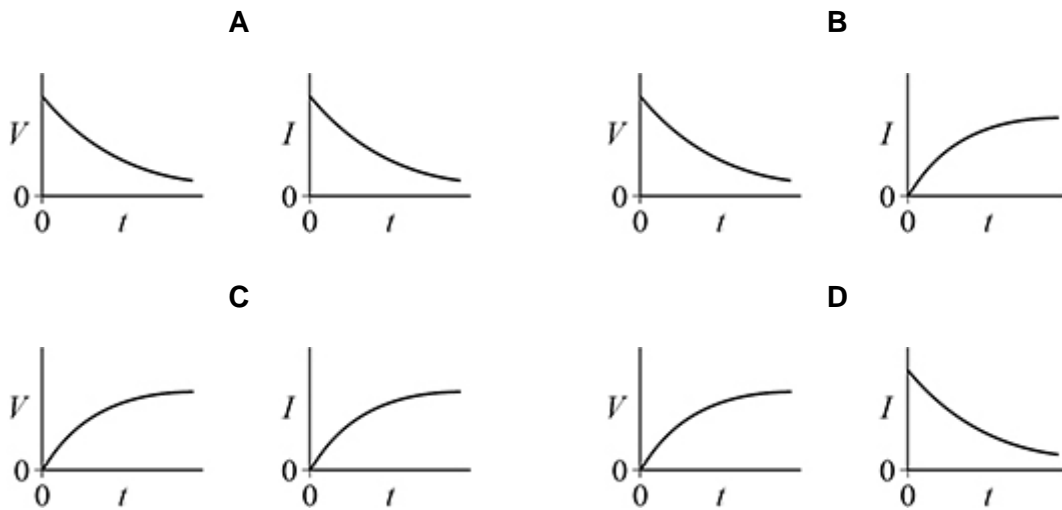


1. The capacitor in the circuit is initially uncharged.  
The switch is closed at time  $t = 0$



Which pair of graphs shows how the potential difference  $V$  across the capacitor and the current  $I$  in the circuit change with time  $t$ ?



- A
- B
- C
- D

(Total 1 mark)

2. When a parallel-plate capacitor is connected across a battery, the energy stored in the capacitor is  $W$ .

The battery remains connected as the distance between the capacitor plates is halved.

What is the energy now stored in the capacitor?

A  $0.5W$

B  $W$

C  $2W$

D  $4W$

(Total 1 mark)

3. An uncharged capacitor is connected to a power supply which supplies a constant current of  $10 \mu\text{A}$ .

After 100 ms, the potential difference across the capacitor is 5.0 kV.

What is the capacitance of the capacitor?

A  $2.0 \times 10^{-10} \text{ F}$

B  $4.0 \times 10^{-10} \text{ F}$

C  $2.5 \times 10^9 \text{ F}$

D  $5.0 \times 10^9 \text{ F}$

(Total 1 mark)

**4.** A parallel-plate capacitor is made using a sheet of dielectric material between, and in contact with, two plates.

The properties of four sheets of dielectric material are shown.

Which sheet will produce the maximum capacitance?

Sheet	Relative permittivity	Thickness / mm	
<b>A</b>	2	0.40	<input type="checkbox"/>
<b>B</b>	3	0.90	<input type="checkbox"/>
<b>C</b>	4	1.0	<input type="checkbox"/>
<b>D</b>	6	1.6	<input type="checkbox"/>

(Total 1 mark)

**5.** A parallel-plate capacitor is made by inserting a sheet of dielectric material between two plates. Both plates are in contact with the sheet.

Which relative permittivity and sheet thickness give the greatest capacitance?

	Relative permittivity	Thickness / mm	
<b>A</b>	2	0.40	<input type="checkbox"/>
<b>B</b>	3	0.90	<input type="checkbox"/>
<b>C</b>	4	1.0	<input type="checkbox"/>
<b>D</b>	6	1.6	<input type="checkbox"/>

(Total 1 mark)

6. A  $10 \mu\text{F}$  capacitor stores  $4.5 \text{ mJ}$  of energy. It then discharges through a  $25 \Omega$  resistor.

What is the maximum current during the discharge of the capacitor?

- A  $1.2 \text{ A}$
- B  $18 \text{ A}$
- C  $30 \text{ A}$
- D  $36 \text{ A}$

(Total 1 mark)

7. A  $1.0 \mu\text{F}$  capacitor is charged for  $20 \text{ s}$  using a constant current of  $10 \mu\text{A}$ .

What is the charge collected by the sphere each second?

- A  $5.0 \times 10^{-3} \text{ J}$
- B  $1.0 \times 10^{-2} \text{ J}$
- C  $2.0 \times 10^{-2} \text{ J}$
- D  $4.0 \times 10^{-2} \text{ J}$

(Total 1 mark)

8. A  $1.0 \mu\text{F}$  capacitor initially stores  $15 \mu\text{C}$  of charge. It then discharges through a  $25 \Omega$  resistor.

What is the maximum current during the discharge of the capacitor?

- A  $0.60 \text{ mA}$
- B  $1.2 \text{ mA}$
- C  $0.60 \text{ A}$
- D  $1.2 \text{ A}$

(Total 1 mark)

9. The initial potential difference across a capacitor is  $V_0$ . The capacitor discharges through a circuit of time constant  $T$ . The base of natural logarithms is  $e$ .

What is the potential difference across the capacitor after time  $T$ ?

A  $\frac{V_0}{e}$

B  $\frac{V_0}{e}$

C  $V_0e$

D  $V_0 \ln 2$

(Total 1 mark)

10. An air-filled parallel-plate capacitor is charged from a source of emf. The electric field has a strength  $E$  between the plates. The capacitor is disconnected from the source of emf and the separation between the isolated plates is doubled.

What is the final electric field between the plates?

A  $2E$

B  $E$

C  $\frac{E}{2}$

D  $\frac{E}{4}$

(Total 1 mark)

**11.** A parallel-plate capacitor has square plates of length  $l$  separated by distance  $d$  and is filled with a dielectric.

A second capacitor has square plates of length  $2l$  separated by distance  $2d$  and has air as its dielectric.

Both capacitors have the same capacitance.

What is the relative permittivity of the dielectric in the first capacitor?

A  $\frac{1}{2}$

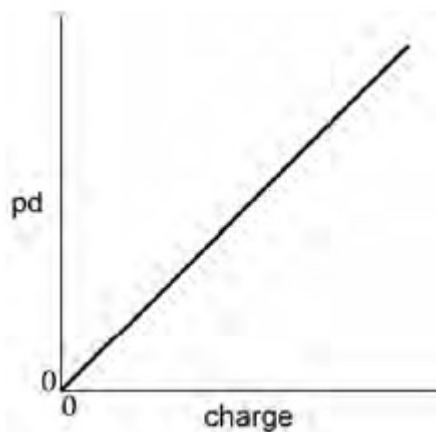
B 1

C 2

D 8

(Total 1 mark)

**12.** The graph shows the variation of potential difference (pd) with charge for a capacitor while it is charging.



Which statement can be deduced from the graph?

A The charging current is constant.

B The energy stored in the capacitor increases uniformly with time.

C The capacitance of the capacitor is constant.

D The power supply used to charge the capacitor had a constant terminal pd.

(Total 1 mark)

13.

A capacitor of capacitance  $120 \mu\text{F}$  is charged and then discharged through a  $20 \text{ k}\Omega$  resistor.

What fraction of the original charge remains on the capacitor  $4.8 \text{ s}$  after the discharge begins?

A  $0.14$

B  $0.37$

C  $0.63$

D  $0.86$

(Total 1 mark)

14.

A capacitor consists of two parallel square plates of side  $l$  separated by distance  $d$ .

The capacitance of the arrangement is  $C$ .

What is the capacitance of a capacitor with square plates of side  $2l$  separated by a distance  $\frac{d}{2}$ ?

A  $C$

B  $2C$

C  $4C$

D  $8C$

(Total 1 mark)

15.

A capacitor of capacitance  $C$  has a charge of  $Q$  stored on the plates. The potential difference between the plates is doubled.

What is the change in the energy stored by the capacitor?

A  $\frac{Q^2}{2C}$

B  $\frac{Q^2}{C}$

C  $\frac{3Q^2}{2C}$

D  $\frac{2Q^2}{C}$

(Total 1 mark)