Q1.

An air-filled parallel-plate capacitor and a resistor are connected in series across the terminals of a battery.
The plates of the capacitor are then moved further apart.

This change results in

A a decrease in the potential difference across the capacitor plates ⬭

B a decrease in the charge held on the capacitor plates ⬭

C an increase in the energy stored on the capacitor ⬭

D an increase in the capacitance of the capacitor ⬭

(Total 1 mark)

Q2.

Which is equal to ε_0?

A the relative permittivity of a vacuum ⬭

B the charge stored on a capacitor consisting of two parallel plates of area 1 m^2 separated by 1 m when the potential difference between the plates is 1 V ⬭

C the work done when moving a 2 C charge from infinity to a distance of π m from the centre of a metal sphere that carries 2 C of charge ⬭

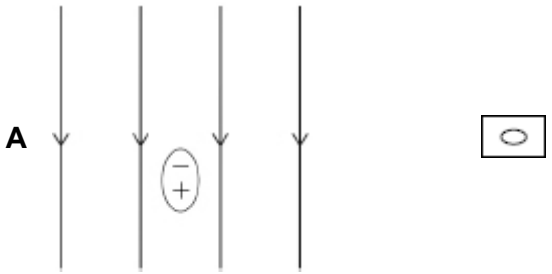
D the charge on a metal sphere which experiences a force of 1 N when its centre is placed 1 m from the centre of a metal sphere that carries 1 C of charge ⬭

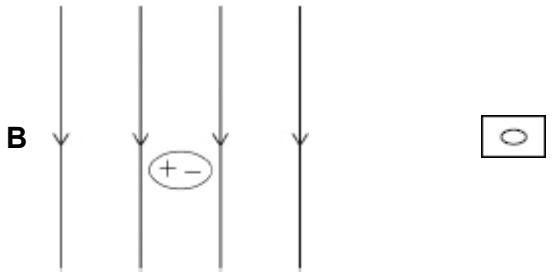
(Total 1 mark)

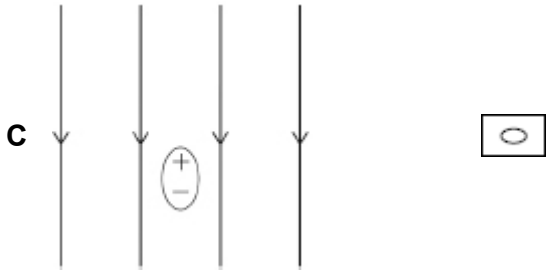
Q3.

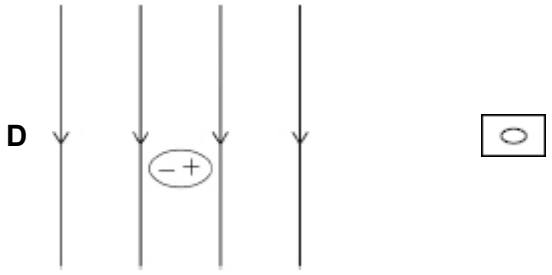
A polar molecule is in an external electric field.

Which diagram shows the orientation of the polar molecule?

A 

B 

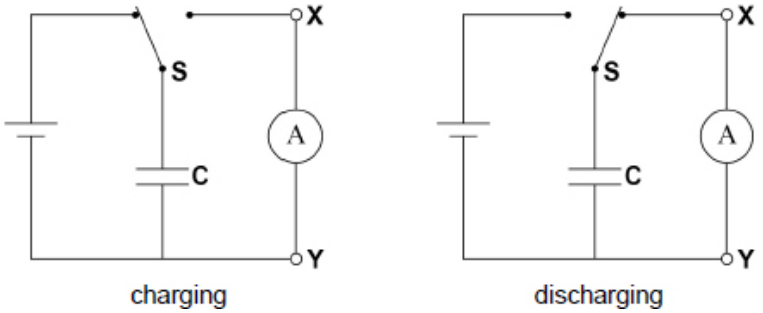
C 

D 

(Total 1 mark)

Q4.

A switch **S** allows capacitor **C** to be completely charged by a cell and then completely discharged through an ammeter.
The emf of the cell is $4.0\ \text{V}$ and it has negligible internal resistance.
The capacitance of **C** is $0.40\ \mu\text{F}$ and there are 8000 charge−discharge cycles every second.



What are the magnitude and direction of the average conventional current in the ammeter?

	Magnitude of current / A	Direction of current	
A	1.3×10^{-2}	**X** to **Y**	⬭
B	1.3×10^{-2}	**Y** to **X**	⬭
C	2.0×10^{-10}	**X** to **Y**	⬭
D	2.0×10^{-10}	**Y** to **X**	⬭

(Total 1 mark)

Q5.

A $30\ \mu\text{F}$ capacitor is charged by connecting it to a battery of emf $4.0\ \text{V}$.
The initial charge on the capacitor is Q_0.

The capacitor is then discharged through a $500\ \text{k}\Omega$ resistor.
The time constant for the circuit is T.

Which is correct?

A T is $15\ \text{ms}$. ⬭

B Q_0 is $12\ \mu\text{C}$. ⬭

C After a time T the pd across the capacitor is $1.5\ \text{V}$. ⬭

D After a time $2T$ the charge on the capacitor is Q_0e^2. ⬭

(Total 1 mark)

Q6.

Capacitor **X** of capacitance C has square plates of side length l and separation d and is made with a dielectric of relative permittivity ε.

Capacitor **Y** has square plates of side length $3l$ and separation $\frac{d}{3}$ and is made with a dielectric of relative permittivity $\frac{\varepsilon}{3}$.

What is the capacitance of **Y**?

A $\frac{C}{27}$ ○

B $\frac{C}{9}$ ○

C $9C$ ○

D $27C$ ○

(Total 1 mark)

Q7.

A parallel plate capacitor is connected across a battery and the energy stored in the capacitor is E.
Without disconnecting the battery, the separation of the plates is halved.

What is the energy now stored in the capacitor?

A $0.5E$ ○

B E ○

C $2E$ ○

D $4E$ ○

(Total 1 mark)

Q8.

A fully charged capacitor of capacitance $2.0\ \text{mF}$ discharges through a $15\ \text{k}\Omega$ resistor.

What fraction of the stored energy remains after 1.0 minute?

A $\frac{1}{4}$ ⬭

B $\frac{1}{e^2}$ ⬭

C $\frac{1}{16}$ ⬭

D $\frac{1}{e^4}$ ⬭

(Total 1 mark)