

Consider a typical capacitor, such as a parallel plate capacitor or a spherical capacitor. For each case, capacitance is defined by $C \equiv \frac{Q}{V}$. In the presence of a dielectric with a dielectric constant ($\kappa > 1$), while keeping Q fixed, the electric field between the gap will be reduced to $E' = \frac{E}{\kappa}$.

Prior to the insertion of a dielectric we have the electric potential V and the capacitance C and after inserting a dielectric we have V' and C' , respectively.

Choose the appropriate relationships.

A) $V' = \kappa V$ and $C' = \kappa C$

B) $V' = \kappa V$ and $C' = \frac{\kappa}{C}$

C) $V' = \frac{V}{\kappa}$ and $C' = \kappa C$

D) $V' = \frac{V}{\kappa}$ and $C' = \frac{C}{\kappa}$

E) $V' = V$ and $C' = C$

Since $V = E d$, we have

$$V' = E' d = \frac{E d}{\kappa} = \frac{V}{\kappa},$$

and since $C \equiv \frac{Q}{V}$, we have

$$C' = \frac{Q}{V'} = \frac{\kappa Q}{V} = \kappa C.$$

Answer **C**.

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