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.