A Capacitor with capacitance $C$ is connected to a battery with a voltage $V$. It has a plate charge $Q$ and a total energy $U$. Fill the gap with material which has dielectric constant $\kappa$. The corresponding new quantities are $Q'$ and $U'$.

![Capacitor Diagram]

Determine the ratio of charges $\frac{Q'}{Q}$.

A) $\frac{Q'}{Q} = \kappa$

B) $\frac{Q'}{Q} = 1$

C) $\frac{Q'}{Q} = \frac{1}{\kappa}$

$$V' = \frac{Q'}{C'} = V = \frac{Q}{C}, \quad \text{or}$$
$$\frac{Q'}{Q} = \frac{C'}{C} = \kappa.$$

Answer A.

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