Answer on Question #41660, Physics, Other

Question:

A capacitor of 10 uF and 20 uF are connected across batteries of 600 volts and 1000 volts respectively and then disconnected. They are then joined in parallel. What is the charge on each capacitor.

Answer:

Charge on capacitor equals:

$$Q = UC$$

where C is capacitance, U is voltage on capacitor.

If capacitor is connected across battery:

$$Q_1 = U_1 C_1$$

$$Q_2 = U_2 C_2$$

If they are joined in parallel:

$$U_1' = U_2'$$

The law of conservation of charge:

$$Q_1 + Q_2 = Q_1' + Q_2'$$

Or:

$$\begin{cases} \dfrac{Q_1'}{C_1} = \dfrac{Q_2'}{C_2} \\ Q_1' + Q_2' = U_1 C_1 + U_2 C_2 \end{cases}$$

Therefore:

$$Q_1' = \frac{U_1 C_1 + U_2 C_2}{1 + \dfrac{C_2}{C_1}} = 8.7 \cdot 10^{-6}\ C$$

$$Q_2' = \frac{U_1 C_1 + U_2 C_2}{1 + \dfrac{C_1}{C_2}} = 1.7 \cdot 10^{-5}\ C$$

Answer: $8.7 \cdot 10^{-6}$ and $1.7 \cdot 10^{-5}\ C$