Answer on Question #45158, Physics, Electromagnetism

The energy of a capacitor is 4.0J after it has been charged by a 1.5 V battery. Calculate its energy when it is charged by a 4.5 V battery.

Solution

Let us find the capacitance. Energy of capacitor is

$$W = \frac{CU^2}{2}$$

where $U = 1.5\text{V}$ is voltage. Hence

$$C = \frac{2W}{U^2} = \frac{2 \cdot 4 \cdot 10^{-6}}{2.25} \approx 3.56 \cdot 10^{-6} F$$

So, energy, when charged from 4.5 V battery is

$$W = \frac{CU_2^2}{2} = \frac{3.56 \cdot 10^{-6} \cdot 4.5^2}{2} = 36 \cdot 10^{-6} J = 36 \mu J$$