Capacitors

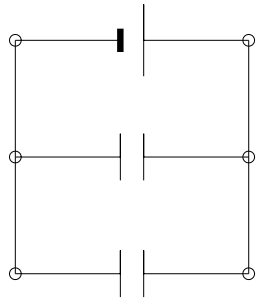
1. When the electric field in a certain dielectric exceeds $10^6\,V/m$ it experiences *dielectric breakdown* (gets destroyed). What is the breakdown voltage of a $10 \times 10\,cm^2$, $1\,\mu F$ capacitor if $\kappa = 3.7$?

2. In the circuit below $V = 12\,volt$, $C_1 = C_2 = 1\,nF$.

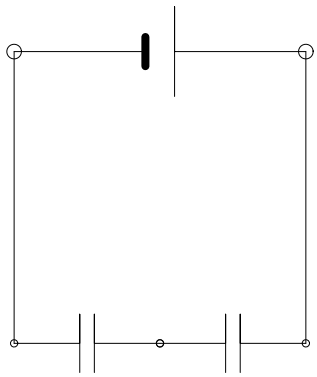
   (a) Find C_{eq} , V_1 , V_2 , q_1 , q_2 and charge taken from the battery

   (b) find the total energy stored in the circuit (use C_{eq})

   (c) Find C_{eq} , V_1 , V_2 , q_1 , q_2, if the space between the plates of C_2 (lower) is filled with $\kappa = 2$.



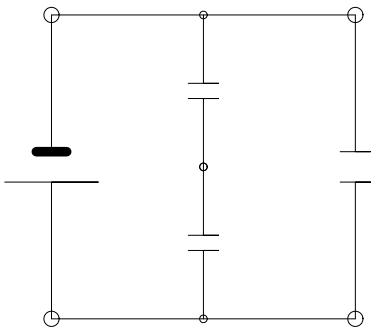
3. In the circuit below $V = 12\,volt$, $C_1 = C_2 = 1\,nF$.



   (a) Find C_{eq} , V_1 , V_2 , q_1 , q_2 and charge taken from the battery

   (b) the same, if the space between the plates of C_2 (right) is filled with $\kappa = 2$.

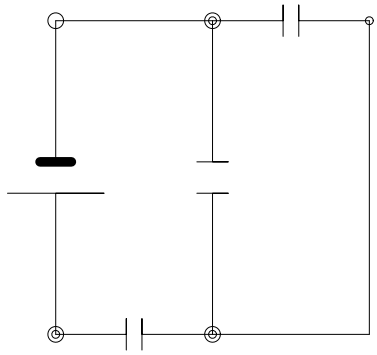
4. In the circuit below $V = 10\,volt$, $C_1 = C_2 = C_3 = 1\,\mu F$.



   (a) Find C_{eq} and charge taken from the battery

   (b) Find V_1 , V_2 , V_3 , q_1 , q_2 , q_3

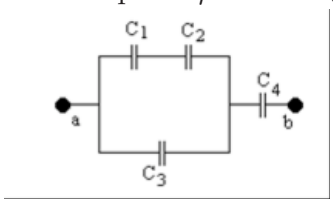
5. In the circuit below $V = 10\,volt$, $C_1 = C_2 = C_3 = 1\,\mu F$.



   (a) Find C_{eq} and charge taken from the battery

   (b) Find V_1 , V_2 , V_3 , q_1 , q_2 , q_3

6. All C's equal $1\,\mu F$ and $V_{ab} = 1\,V$. Find C_{eq} , all voltages and charges



7. A parallel plate capacitor with $C = 20\,\mu F$ is charged fully by a 12 volt battery, which is then disconnected. The space between the plates is now filled with pure water (dielectric constant $\kappa = 80$). What is the final potential difference across the plates?