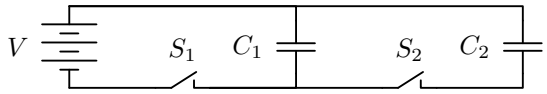
Recitation 4

Chapter 20

Problem 40. Two capacitors, $C_1 = 5.00\ \mu\text{F}$ and $C_2 = 12.0\ \mu\text{F}$, are connected in series, and the resulting combination is connected to a $\Delta V = 9.00$ V battery. Find (a) the equivalent capacitance of the combination, (b) the potential difference across each capacitor, and (c) the charge on each capacitor.

Problem 43. Consider the circuit shown in Figure P20.43, where $C_1 = 6.00\ \mu\text{F}$, $C_2 = 3.00\ \mu\text{F}$, and $\Delta V = 20.0$ V. Capacitor C_1 is first charged with Q_1 by the closing of switch S_1. Switch S_1 is then opened, and the charged capacitor is connected to the uncharged capacitor by the closing of S_2. Calculate Q_1 and the final charge on each capacitor (Q_1' and Q_2').



Problem 47. (a) A $C = 3.00\ \mu\text{F}$ capacitor is connected to a $\Delta V_a = 12.0$ V battery. How much energy U_a is stored in the capacitor? (b) If the capacitor had been connected to a $\Delta V_b = 6.00$ V battery, how much energy would have been stored?

Problem 51. Show that the force between two plates of a parallel-plate capacitor each have an attractive force given by

$$F = \frac{Q^2}{2\epsilon_0 A} \tag{1}$$

Problem 54. (a) How much charge Q_c can be placed on a capacitor with air between the plates before it breaks down if the area of each plate is $A = 5.00\ \text{cm}^2$? (b) Find the maximum charge assuming polystyrene is used between the plates instead of air.

Problem 73. A parallel-plate capacitor is constructed using a dielectric material whose dielectric constant is $\kappa = 3.00$ and whose dielectric strength is $E_c = 2.00 \cdot 10^8$ V/m. The desired capacitance is $C = 0.250\ \mu\text{F}$, and the capacitor must withstand a maximum potential difference of $V_c = 4000$ V. Find the minimum area A of the capacitor plates.