Discussion 9 - Ciruits

Problem 1. The circuit shown in Figure 1 contains two batteries, each with an emf and an internal resistance, and two resistors.

a. Find the current in the circuit (magnitude and direction)

b. Find the terminal voltage V_{ab} of the 16.0 V battery.

c. Find the potential difference V_{ac} of the point a with respect to the point c.

Problem 2. Consider the circuit shown in Figure 2. The battery has emf $\mathcal{E}$ and negligible internal resistance. After the capacitors have attained their final charges, the charge on C_1 is Q_1.

a. What is the final charge on C_2?

b. What is the resistance R_1 in terms of R_2, C_1, Q_1, and $\mathcal{E}$?

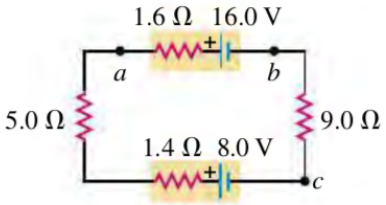

Figure 1: Problem 1

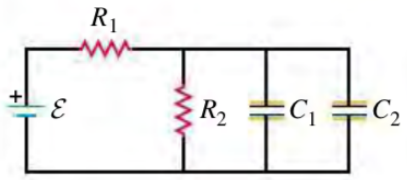

Figure 2: Problem 2

Problem 3. In the circuit shown in Figure 3 the batteries have negligible internal resistance and the meters are both idealized. With the switch S open, the voltmeter reads 15.0 V.

a. Find the emf $\mathcal{E}$ of the battery.

b. What will the ammeter read when the switch is closed?

Problem 4. In the circuit shown in Figure 4 both capacitors are initially charged to V_0.

a. How long after closing the switch S will the potential across each capacitor be reduced to $V = FV_0$ where $F < 1$?

b. What will be the current at that time?

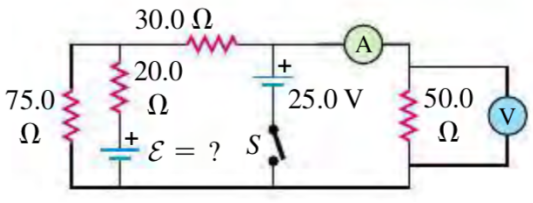

Figure 3: Problem 3

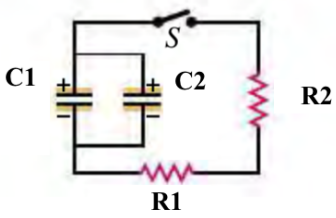

Figure 4: Problem 4