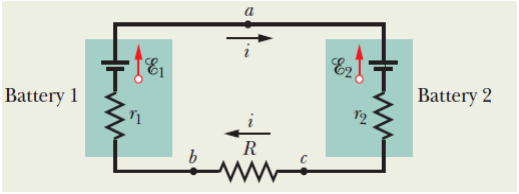
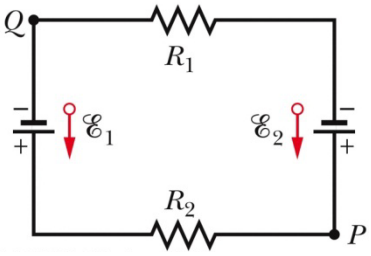
Chapter 21
Example Problems

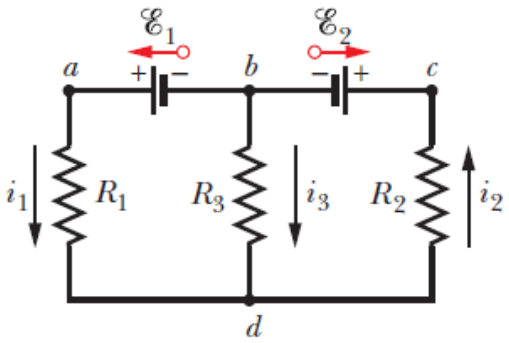
1. The emfs and resistances in the circuit have the following values: $r_1 = 2.3\ \Omega$, $r_2 = 1.8\ \Omega$, $R = 5.5\ \Omega$, $\mathcal{E}_1 = 4.4$ V, and $\mathcal{E}_2 = 2.1$ V
    a. What is the current in the circuit?
    b. What is the potential difference between the terminals of battery 1?



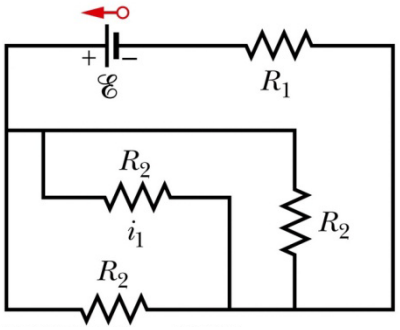
2. In the figure, the ideal batteries have emfs of $\mathcal{E}_1$ =150 V and $\mathcal{E}_2$ = 50 V and the resistances are R_1 = 3.0 Ω and R_2 = 2.0 Ω. If the potential at P is 100 V, what is it at Q?



3. What are the currents through each resistor if $\mathcal{E}_1$ = 4.0 V, $\mathcal{E}_2$ = 1.0 V, $R_1 = R_2$ = 10.0 Ω, and R_3 = 5.0 Ω, and the battery is ideal?



4. In the figure, the ideal battery has an emf of $\mathcal{E}$ = 12.0 V, R_1 = 6.00 Ω, and $R_2 = R_3 = R_4$ =18.0 Ω.
    a. What is the magnitude of the current through resistor R_2?
    b. How much energy is dissipated by all four resistors in 1.00 min?



5. A capacitor with initial charge q_0 is discharged through a resistor. What multiple of the time constant τ gives the time the capacitor takes to lose (a) the first one-third of its charge and (b) two-thirds of its charge?

6. In the figure, R_1 = 10.0 kΩ, R_2 = 15.0 kΩ, C = 0.400 μF, and the ideal battery has an emf of 20.0 V. First the switch is closed a long time so that the steady state is reached. Then the switch is opened at time t = 0. What is the current in resistor 2 at t = 4.00 ms?