REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

(a) Calculate the equivalent capacitance between a and b. All capacitors are 7.00 μF.

\[ C_e = C + \frac{1}{\frac{1}{C} + \frac{1}{3C}} = C + \frac{3C}{4C} = \frac{7}{11} \mu F \]

\[ C_e = 10.8 \mu F \]

(b) Find the effective resistance between a and b if all resistors are 9.00 Ω.

\[ R_e = \frac{R_1 + R_2}{13} \]

\[ R = 14.5 \Omega \]

(c) Determine the power being dissipated in the 150 Ω resistor. \( V = 125 \text{V} \).

\[ R = \frac{\frac{21R}{13}}{R_1} \]

\[ V = I_2 \left( R_0 + R_2 + R_0 + R_2 \right) \]

\[ P = I_2^2 R_1 = \frac{V^2}{R_1} \]

\[ P = 125 \text{V}^2 \]

\[ P = 22.2 \text{W} \]

(d) A given metal has a resistivity of \( 4.7 \times 10^{-8} \text{ohm} \cdot \text{m} \). If a wire is to have a resistance of 2.00 Ω per mile, calculate its cross-sectional area.

\[ R = \frac{\rho L}{A} \Rightarrow A = \frac{\rho L}{R} \]

\[ A = \frac{4.7 \times 10^{-8} \text{ohm} \cdot \text{m} \cdot 1 \text{mile}}{2 \times 10^3 \text{m} \cdot \text{mile}} = 3.78 \times 10^{-6} \text{m}^2 \]

(e) The 150 pF capacitor is charged to 100 volts. The battery is removed and then the switch is closed. Calculate the charge on the 100 pF capacitor.

\[ Q_1 = Q_1' + Q_2' \]

\[ Q_1 = \frac{C_1}{C_2} \]

\[ Q_1' = \frac{C_1}{C_2} \]

\[ Q_2' = c_2 \]

\[ Q_2' = \frac{C_2}{C_1 + C_2} \]

\[ V = \frac{150 \text{pF} \cdot 100 \text{pF}}{250 \text{pF}} = \frac{150 \text{V}}{6 \text{m}} = 6 \text{m} \]