

Prob. 1

$$\begin{aligned} \text{Cost} &= \left( 0.12 \frac{\text{USD}}{\text{kWh}} \right) \times \left( \text{Energy consumed by light in 2 weeks} \right) \\ &= 0.12 \frac{\text{USD}}{10^3 \text{ Wh}} \times 100.0 \text{ W} \times 14 \times 24 \text{ h} \\ &= 0.12 \times \frac{1}{10^3} \times 100.0 \times 14 \times 24 \text{ USD} = 4.03 \text{ USD} \end{aligned}$$

Prob. 2

$$U_A = \frac{Q_A^2}{2C_A}$$

$$U_B = \frac{Q_B^2}{2C_B}$$

$$\frac{U_A}{U_B} = \frac{Q_A^2}{Q_B^2}$$

$$C_A = C_B$$

$$\frac{8.0 \times 10^{-3} \text{ J}}{2.0 \times 10^{-3} \text{ J}} = \frac{Q_A^2}{(1.0 \mu\text{C})^2}$$

$$Q_A = 2.0 \mu\text{C}$$

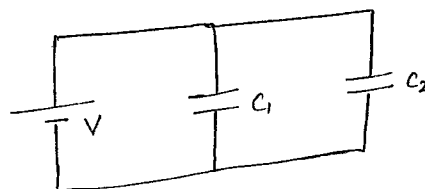
Prob. 3

$$(a) \quad C_{eq} = C_1 + C_2 = 30.0 \text{ nF}$$

$$(b) \quad V_1 = V_2 = V = 10.0 \text{ V} \Rightarrow \frac{V_1}{V_2} = 1.$$

$$(c) \quad \frac{Q_1}{Q_2} = \frac{V_1 C_1}{V_2 C_2} = \frac{C_1}{C_2} = 0.50$$

$$(d) \quad \frac{U_1}{U_2} = \frac{\frac{1}{2} C_1 V_1^2}{\frac{1}{2} C_2 V_2^2} = \frac{C_1}{C_2} = 0.50$$



Prob. 4

$$(a) \quad \frac{1}{R_{eq}} = \frac{1}{R} + \frac{1}{R} + \frac{1}{R} = \frac{3}{R}$$

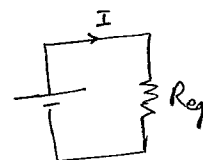
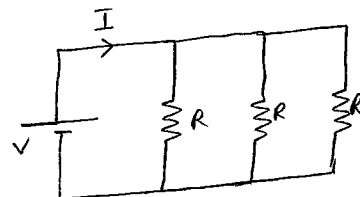
$$R_{eq} = \frac{R}{3} = \frac{300.0 \Omega}{3} = 100.0 \Omega$$

(b) All have the same voltage  $V = 10.0 \text{ V}$ .  
 $V_1 = V_2 = V_3 = 10.0 \text{ V}$

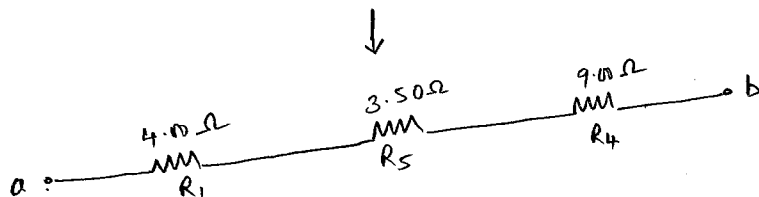
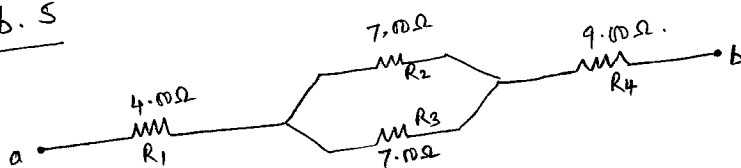
$$(c) \quad I_1 = \frac{V_1}{R_1} = \frac{10.0}{300.0} = 33.3 \text{ mA}$$

$$I_1 = I_2 = I_3 = 33.3 \text{ mA}$$

$$(d) \quad P_1 = P_2 = P_3 = I_1^2 R_1 = 0.333 \text{ W}$$



$$R_1 = R_2 = R_3 = 300.0 \Omega$$

Prob. 5

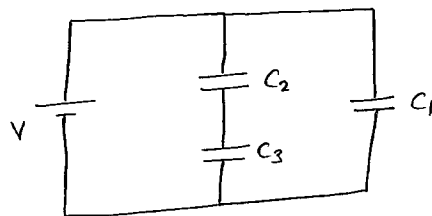
$$R_{eq} = (4.00 + 3.50 + 9.00) \Omega = 16.5 \Omega$$

$$\begin{aligned} \frac{1}{R_5} &= \frac{1}{R_2} + \frac{1}{R_3} \\ &= \frac{1}{7.00} + \frac{1}{7.00} = \frac{2}{7.00} \\ \Rightarrow R_5 &= \frac{7.00}{2} = 3.50 \Omega \end{aligned}$$

Prob. 6

$$V_1 = V = 10.0 \text{ V}$$

$$\begin{aligned} Q_1 &= C_1 V_1 \\ &= 10.0 \text{ nF} \times 10.0 \text{ V} \\ &= 100. \text{ nC} \\ &= 1.00 \times 10^{-7} \text{ C} \end{aligned}$$

Prob. 7

$$C = \frac{\epsilon_0 A}{d} = \frac{8.85 \times 10^{-12} \times 5.10 \times 10^{-4} \text{ m}^2}{4.4 \times 10^{-3} \text{ m}} = 1.026 \times 10^{-12} \text{ F} = 1.026 \text{ pF}$$

$$V = \frac{Q}{C} = \frac{400.0 \text{ pC}}{1.026 \text{ pF}} = 390 \text{ V}$$

Prob. 8

$$R = \frac{\rho l}{A} = \frac{\rho l}{(V/l)} = \frac{\rho l^2}{V}$$

$$\begin{aligned} V &= A l \\ A &= \frac{V}{l} \end{aligned}$$

$$R = \frac{\rho}{V} l^2$$

$$R' = \frac{\rho}{V} l'^2$$

$$\Rightarrow \frac{R'}{R} = \frac{l'^2}{l^2} = 10^2$$

$$\begin{aligned} R' &= 10^2 \times 100.0 \Omega \\ &= 1.00 \times 10^4 \Omega \end{aligned}$$