(a). \(C_2, C_3\) are series, they are parallel with \(C_1\),

\[ V_1 = \varepsilon = 2.00 \text{V}, \quad Q_1 = C_1 V_1 = 2.40 \mu\text{C}. \]

\[ Q_2 = Q_3 = Q_{23} = \varepsilon \frac{C_2 C_3}{C_2 + C_3} = 2 \times \frac{1.5 \times 0.5}{1.5 + 0.5} = 0.75 \mu\text{C}. \]

\[ V_2 = \frac{Q_2}{C_2} = 0.50 \text{V} \quad V_3 = \frac{Q_3}{C_3} = 1.50 \text{V} \]

(b). Insert the dielectric into \(C_3\), the capacitance of \(C_3\) increases, voltage will decrease, the charge on \(C_1\) will flow to \(C_3\), but the total charge on \(C_1\) and \(C_3\) will not change.

\[ Q_1 + Q_3 = 2.40 \mu\text{C} + 0.75 \mu\text{C} = 3.15 \mu\text{C} \]

\(C_2\) and \(C_3\) are series,

\[ Q_2 = Q_3 \quad \rightarrow \quad C_2 V_2 = kC_3 V_3 \quad \rightarrow \quad 1.5 V_2 = 2V_3 \quad V_3 = 0.75 V_2 \]

\[ V_1 = V_2 + V_3 = V_2 + 0.75V_2 = 1.75 V_2 \]

\[ Q_1 + Q_3 = C_1 V_1 + kC_3 V_3 = 3.15 \mu\text{C} \]

\[ 1.75 \times 1.2 V_2 + 2 \times 0.75 V_2 = 3.15 \]

\[ V_2 = 0.875 \text{V} \quad Q_2 = C_2 V_2 = 1.31 \mu\text{C} \]

\[ V_1 = 1.53 \text{V} \quad Q_1 = C_1 V_1 = 1.84 \mu\text{C} \]

\[ V_3 = 1.656 \text{V} \quad Q_3 = Q_2 = 1.31 \mu\text{C} \]