P26.1  (a) \[ Q = CV = (4.00 \times 10^{-6} \text{ F})(12.0 \text{ V}) = 4.80 \times 10^{-5} \text{ C} = 48.0 \mu\text{C} \]
(b) \[ Q = CV = (4.00 \times 10^{-6} \text{ F})(1.50 \text{ V}) = 6.00 \times 10^{-6} \text{ C} = 6.00 \mu\text{C} \]

P26.2  (a) \[ C = \frac{Q}{\Delta V} = \frac{10.0 \times 10^{-6} \text{ C}}{10.0 \text{ V}} = 1.00 \times 10^{-6} \text{ F} = 100 \mu\text{F} \]
(b) \[ \Delta V = \frac{Q}{C} = \frac{100 \times 10^{-6} \text{ C}}{1.00 \times 10^{-6} \text{ F}} = 100 \text{ V} \]

P26.5  (a) \[ \Delta V = Ed \]
\[ E = \frac{20.0 \text{ V}}{1.80 \times 10^{-3} \text{ m}} = 11.1 \text{ kV/m} \]
(b) \[ \frac{E}{\varepsilon_0} \]
\[ \sigma = (1.11 \times 10^4 \text{ N/C})(8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2) = 98.3 \text{ nC/m}^2 \]
(c) \[ C = \frac{\varepsilon_0 A}{d} = \frac{(8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^1)(7.60 \text{ cm}^2)(1.00 \text{ m}/100 \text{ cm})^2}{1.80 \times 10^{-3} \text{ m}} = 3.74 \text{ pF} \]
(d) \[ \Delta V = \frac{Q}{C} \]
\[ Q = (20.0 \text{ V})(3.74 \times 10^{-12} \text{ F}) = 747 \text{ pC} \]

P26.19  (a) Capacitors in parallel add. Thus, the equivalent capacitor has a value of
\[ C_\text{eq} = C_1 + C_2 = 5.00 \mu\text{F} + 12.0 \mu\text{F} = 17.0 \mu\text{F} \]
(b) The potential difference across each branch is the same and equal to the voltage of the battery.
\[ \Delta V = 9.00 \text{ V} \]
(c) \[ Q_8 = C_\text{eqV} = (5.00 \mu\text{F})(9.00 \text{ V}) = 45.0 \mu\text{C} \]
and \[ Q_{12} = C_\text{eqV} = (12.0 \mu\text{F})(9.00 \text{ V}) = 108 \mu\text{C} \]
In series capacitors add as
\[ \frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{12.0 \ \mu F} \]
and
\[ C_{eq} = 3.53 \ \mu F. \]

(c) The charge on the equivalent capacitor is
\[ Q_{eq} = C_{eq} \Delta V = (3.53 \ \mu F)(9.00 \ V) = 31.8 \ \mu C. \]
Each of the series capacitors has the same charge on it.
So
\[ Q_1 = Q_2 = 31.8 \ \mu C. \]

(b) The potential difference across each is
\[ \Delta V_1 = \frac{Q_1}{C_1} = \frac{31.8 \ \mu C}{5.00 \ \mu F} = 6.35 \ V \]
and
\[ \Delta V_2 = \frac{Q_2}{C_2} = \frac{31.8 \ \mu C}{12.0 \ \mu F} = 2.65 \ V. \]

(a) \[ \frac{1}{C_{eq}} = \frac{1}{15.0} + \frac{1}{3.00} \]
\[ C_{eq} = 2.50 \ \mu F \]
\[ C_p = 2.50 + 6.00 = 8.50 \ \mu F \]
\[ C_{eq} = \left( \frac{1}{8.50 \ \mu F} + \frac{1}{20.0 \ \mu F} \right)^{-1} = 5.96 \ \mu F \]

(b) \[ Q = C \Delta V = (5.96 \ \mu F)(15.0 \ V) = 89.5 \ \mu C \] on 20.0 \ \mu F
\[ \Delta V = \frac{Q}{C} = \frac{89.5 \ \mu C}{20.0 \ \mu F} = 4.47 \ V \]
\[ 15.0 - 4.47 = 10.53 \ V \]
\[ Q = C \Delta V = (6.00 \ \mu F)(10.53 \ V) = 63.2 \ \mu C \] on 60.0 \ \mu F
\[ 89.5 - 63.2 = -26.3 \ \mu C \] on 15.0 \ \mu F and 3.00 \ \mu F

\[ C = \frac{Q}{\Delta V} \]
so
\[ Q = 6.00 \times 10^{-4} = \frac{Q}{20.0} \]
and
\[ Q_1 = 120 \ \mu C \]
\[ Q_2 = 120 \ \mu C - Q_2 \]
and
\[ \Delta V = \frac{Q}{C} : \]
\[ \frac{120 - Q_2}{C_1} = \frac{Q_2}{C_2} \]
or
\[ \frac{120 - Q_2}{6.00} = \frac{Q_2}{3.00} \]
\[ (3.00)(120 - Q_2) = (6.00)Q_2 \]
\[ Q_2 = 360 = 40.0 \ \mu C \]
\[ Q_1 = 120 \ \mu C - 40.0 \ \mu C = 80.0 \ \mu C \]
a) $C_1 = 34.8 \mu F$

$C_1 > C_{eq} \Rightarrow \text{The circuit should be series}$

\[ \frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} \Rightarrow \frac{1}{32} = \frac{1}{34.8} + \frac{1}{C_2} \]

\[ \Rightarrow C_2 = 397.7 \mu F \]

b) $C_1 = 29.8 \mu F$

$C_1 < C_{eq} \Rightarrow \text{The circuit should be parallel}$

\[ C_{eq} = C_1 + C_2 \]

\[ 32 = 29.8 + C_2 \]

\[ \Rightarrow C_2 = 2.2 \mu F \]