P26.1 (a) $Q = C\Delta V = (4.00 \times 10^{-6}\text{ F})(12.0\text{ V}) = 4.80 \times 10^{-5}\text{ C} = \boxed{48.0\ \mu\text{C}}$

(b) $Q = C\Delta V = (4.00 \times 10^{-6}\text{ F})(1.50\text{ V}) = 6.00 \times 10^{-6}\text{ C} = \boxed{6.00\ \mu\text{C}}$

P26.2 (a) $C = \dfrac{Q}{\Delta V} = \dfrac{10.0 \times 10^{-6}\text{ C}}{10.0\text{ V}} = 1.00 \times 10^{-6}\text{ F} = \boxed{1.00\ \mu\text{F}}$

(b) $\Delta V = \dfrac{Q}{C} = \dfrac{100 \times 10^{-6}\text{ C}}{1.00 \times 10^{-6}\text{ F}} = \boxed{100\text{ V}}$

P26.5 (a) $\Delta V = Ed$

$$E = \frac{20.0\text{ V}}{1.80 \times 10^{-3}\text{ m}} = \boxed{11.1\text{ kV/m}}$$

(b) $E = \dfrac{\sigma}{\epsilon_0}$

$$\sigma = (1.11 \times 10^4\text{ N/C})(8.85 \times 10^{-12}\text{ C}^2/\text{N}\cdot\text{m}^2) = \boxed{98.3\text{ nC/m}^2}$$

(c) $C = \dfrac{\epsilon_0 A}{d} = \dfrac{(8.85 \times 10^{-12}\text{ C}^2/\text{N}\cdot\text{m}^2)(7.60\text{ cm}^2)(1.00\text{ m}/100\text{ cm})^2}{1.80 \times 10^{-3}\text{ m}} = \boxed{3.74\text{ pF}}$

(d) $\Delta V = \dfrac{Q}{C}$

$$Q = (20.0\text{ V})(3.74 \times 10^{-12}\text{ F}) = \boxed{74.7\text{ pC}}$$

P26.12 (a) Capacitors in parallel add. Thus, the equivalent capacitor has a value of

$$C_{eq} = C_1 + C_2 = 5.00\ \mu\text{F} + 12.0\ \mu\text{F} = \boxed{17.0\ \mu\text{F}}.$$

(b) The potential difference across each branch is the same and equal to the voltage of the battery.

$$\Delta V = \boxed{9.00\text{ V}}$$

(c) $Q_5 = C\Delta V = (5.00\ \mu\text{F})(9.00\text{ V}) = \boxed{45.0\ \mu\text{C}}$

and $Q_{12} = C\Delta V = (12.0\ \mu\text{F})(9.00\text{ V}) = \boxed{108\ \mu\text{C}}$

P26.13 (a) In series capacitors add as

$$\frac{1}{C_{eq}}=\frac{1}{C_1}+\frac{1}{C_2}=\frac{1}{5.00\ \mu F}+\frac{1}{12.0\ \mu F}$$

and $C_{eq}=\boxed{3.53\ \mu F}$.

(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 this same charge on it.

So $Q_1=Q_2=\boxed{31.8\ \mu C}$.

(b) The potential difference across each is $\Delta V_1=\frac{Q_1}{C_1}=\frac{31.8\ \mu C}{5.00\ \mu F}=\boxed{6.35\ V}$

and $\Delta V_2=\frac{Q_2}{C_2}=\frac{31.8\ \mu C}{12.0\ \mu F}=\boxed{2.65\ V}$.

P26.17 (a) $\frac{1}{C_s}=\frac{1}{15.0}+\frac{1}{3.00}$

$C_s=2.50\ \mu F$

$C_p=2.50+6.00=8.50\ \mu F$

$$C_{eq}=\left(\frac{1}{8.50\ \mu F}+\frac{1}{20.0\ \mu F}\right)^{-1}=\boxed{5.96\ \mu F}$$

(b) $Q=C\Delta V=(5.96\ \mu F)(15.0\ V)=\boxed{89.5\ \mu C}$ on $20.0\ \mu F$

$\Delta V=\frac{Q}{C}=\frac{89.5\ \mu C}{20.0\ \mu F}=4.47\ V$

$15.0-4.47=10.53\ V$

$Q=C\Delta V=(6.00\ \mu F)(10.53\ V)=\boxed{63.2\ \mu C}$ on $6.00\ \mu F$

$89.5-63.2=\boxed{26.3\ \mu C}$ on $15.0\ \mu F$ and $3.00\ \mu F$

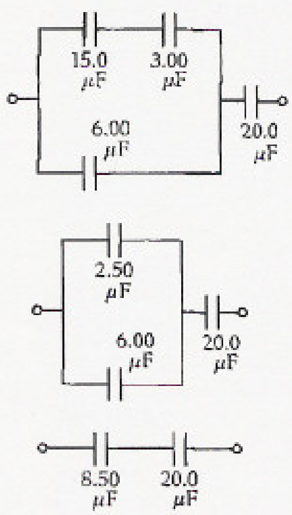


FIG. P26.21

P26.19 $C=\frac{Q}{\Delta V}$ so $6.00\times10^{-6}=\frac{Q}{20.0}$

and $Q=\boxed{120\ \mu C}$

$Q_1=120\ \mu C-Q_2$

and $\Delta V=\frac{Q}{C}$: $\frac{120-Q_2}{C_1}=\frac{Q_2}{C_2}$

or $\frac{120-Q_2}{6.00}=\frac{Q_2}{3.00}$

$(3.00)(120-Q_2)=(6.00)Q_2$

$Q_2=\frac{360}{9.00}=\boxed{40.0\ \mu C}$ $Q_1=120\ \mu C-40.0\ \mu C=\boxed{80.0\ \mu C}$

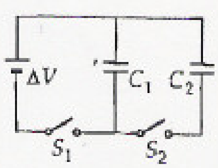
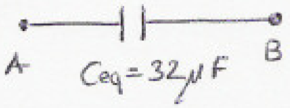


FIG. P26.23

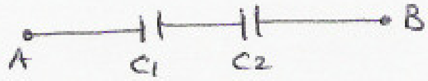
P26.18



$C_{eq} = 32\mu F$

a) $C_1 = 34.8\ \mu F$

$C_1 > C_{eq}$ => The circuit should be series

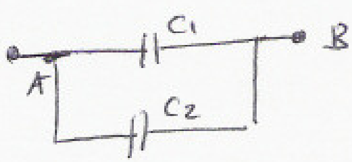


$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$ => $\frac{1}{32} = \frac{1}{34{,}8} + \frac{1}{C_2}$

=> $\boxed{C_2 = 397{,}7\mu F}$

b) $C_1 = 29.8\mu F$

$C_1 < C_{eq}$ => The circuit should be parallel



$C_{eq} = C_1 + C_2$

$32 = 29{,}8 + C_2$

=> $\boxed{C_2 = 2{,}2\mu F}$