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

P26.7 (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) $\Delta V = \dfrac{Q}{C}$

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

P26.16 (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 $Q_{12} = C\Delta V = (12.0\ \mu\text{F})(9.00\ \text{V}) = \boxed{108\ \mu\text{C}}$

P26.17 (a) In series capacitors add as

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

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

(c) The charge on the equivalent capacitor is $Q_{eq}=C_{eq}\Delta V=(3.53\ \mu\text{F})(9.00\ \text{V})=31.8\ \mu\text{C}$.

Each of the series capacitors has this same charge on it.

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

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

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

P26.21 (a) $\frac{1}{C_s}=\frac{1}{15.0}+\frac{1}{3.00}$

$C_s=2.50\ \mu\text{F}$

$C_p=2.50+6.00=8.50\ \mu\text{F}$

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

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

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

$15.0-4.47=10.53\ \text{V}$

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

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

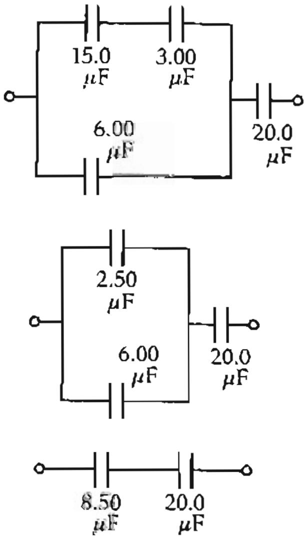

FIG. P26.21

P26.23 $C=\frac{Q}{\Delta V}$ so $6.00\times10^{-6}=\frac{Q}{20.0}$

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

$Q_1=120\ \mu\text{C}-Q_2$

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

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

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

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

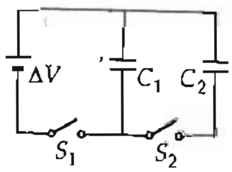

FIG. P26.23

P26.34 Use $U=\frac{1}{2}\frac{Q^2}{C}$ and $C=\frac{\epsilon_0 A}{d}$.

If $d_2=2d_1$, $C_2=\frac{1}{2}C_1$. Therefore, the $\boxed{\text{stored energy doubles}}$.