52. (a) We do not employ energy conservation since, in reaching equilibrium, some energy is dissipated either as heat or radio waves. Charge is conserved; therefore, if $Q = C_1 V_{\text{bat}} = 40\ \mu\text{C}$, and q_1 and q_2 are the charges on C_1 and C_2 after the switch is thrown to the right and equilibrium is reached, then

$$Q = q_1 + q_2 \quad .$$

Reducing the right portion of the circuit (the C_3, C_4 parallel pair which are in series with C_2) we have an equivalent capacitance of $C' = 8.0\ \mu\text{F}$ which has charge $q' = q_2$ and potential difference equal to that of C_1. Thus,

$$\begin{aligned} V_1 &= V' \\ \frac{q_1}{C_1} &= \frac{q_2}{C'} \end{aligned}$$

which yields $4q_1 = q_2$. Therefore,

$$Q = q_1 + 4q_1$$

leads to $q_1 = 8.0\ \mu\text{C}$ and consequently to $q_2 = 32\,\mu\text{C}$.

(b) From Eq. 26-1, we have $V_2 = (32\,\mu\text{C})(16\,\mu\text{F}) = 2.0$ V.