23. The energy needed to charge the $100\,\mu$F capacitor to $300\,$V is

$$\frac{1}{2}C_2V^2 = \frac{1}{2}(100 \times 10^{-6}\,\text{F})(300\,\text{V})^2 = 4.50\ \text{J} .$$

The energy initially in the $900\,\mu$F capacitor is

$$\frac{1}{2}C_1V^2 = \frac{1}{2}(900 \times 10^{-6}\,\text{F})(100\,\text{V})^2 = 4.50\ \text{J} .$$

All the energy originally in the $900\,\mu$F capacitor must be transferred to the $100\,\mu$F capacitor. The plan is to store it temporarily in the inductor. We do this by leaving switch S_1 open and closing switch S_2. We wait until the $900\,\mu$F capacitor is completely discharged and the current in the circuit is at maximum (this occurs at $t = T_1/4$, one quarter of the relevant period). Since

$$T_1 = 2\pi\sqrt{LC_1} = 2\pi\sqrt{(10.0\,\text{H})(900 \times 10^{-6}\,\text{F})} = 0.596\ \text{s} ,$$

we wait until $t = (0.596\,\text{s})/4 = 0.149\,\text{s}$. Now, we close switch S_1 while simultaneously opening switch S_2. Next, we wait for one-fourth of the T_2 period to elapse and open switch S_1. The $100\,\mu$F capacitor then has maximum charge, and all the energy resides in it. Since

$$T_2 = 2\pi\sqrt{LC_2} = 2\pi\sqrt{(10.0\,\text{H})(100 \times 10^{-6}\,\text{F})} = 0.199\ \text{s} ,$$

we must keep S_1 closed for $(0.199\,\text{s})/4 = 0.0497\,\text{s}$. It is helpful to refer to Figure 23-1 to appreciate the emphasis on "quarter-periods" in this solution.