3. If P is the rate at which the battery delivers energy and Δt is the time, then $\Delta E = P\,\Delta t$ is the energy delivered in time Δt. If q is the charge that passes through the battery in time Δt and $\mathcal{E}$ is the emf of the battery, then $\Delta E = q\mathcal{E}$. Equating the two expressions for ΔE and solving for Δt, we obtain

$$\Delta t = \frac{q\mathcal{E}}{P} = \frac{(120\,\mathrm{A\cdot h})(12\,\mathrm{V})}{100\,\mathrm{W}} = 14.4\,\mathrm{h} = 14\,\mathrm{h}\ 24\,\mathrm{min}\ .$$