Lecture Supplement 25: Solution for 32.26

P32.26 (a) $I = \dfrac{\mathcal{E}}{R} = \dfrac{12.0\ \text{V}}{12.0\ \Omega} = \boxed{1.00\ \text{A}}$

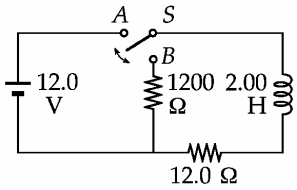

FIG. P32.26

(b) Initial current is 1.00 A: $\Delta V_{12} = (1.00\ \text{A})(12.00\ \Omega) = \boxed{12.0\ \text{V}}$

$\Delta V_{1\,200} = (1.00\ \text{A})(1\,200\ \Omega) = \boxed{1.20\ \text{kV}}$

$\Delta V_L = \boxed{1.21\ \text{kV}}$.

(c) $I = I_{\max} e^{-Rt/L}$: $\dfrac{dI}{dt} = -I_{\max}\dfrac{R}{L}e^{-Rt/L}$

and $-L\dfrac{dI}{dt} = \Delta V_L = I_{\max} R\, e^{-Rt/L}$.

Solving $12.0\ \text{V} = (1\,212\ \text{V})\, e^{-1\,212t/2.00}$

so $9.90\times10^{-3} = e^{-606t}$.

Thus, $\boxed{t = 7.62\ \text{ms}}$.