University Physics, 13/e

Young/Freedman

Chapter 30 Key Equations

$$\mathcal{E}_2 = -M\frac{di_1}{dt} \quad \text{and} \quad \mathcal{E}_1 = -M\frac{di_2}{dt} \quad \text{(mutually induced emfs)} \tag{30.4}$$

$$M = \frac{N_2\Phi_{B2}}{i_1} = \frac{N_1\Phi_{B1}}{i_2} \quad \text{(mutual inductance)} \tag{30.5}$$

$$L = \frac{N\Phi_B}{i} \quad \text{(self-inductance)} \tag{30.6}$$

$$\mathcal{E} = -L\frac{di}{dt} \quad \text{(self-induced emf)} \tag{30.7}$$

$$U = L\int_0^1 i\,di = \frac{1}{2}LI^2 \quad \text{(energy stored in an inductor)} \tag{30.9}$$

$$u = \frac{B^2}{2\mu_0} \quad \text{(magnetic energy density in vacuum)} \tag{30.10}$$

$$u = \frac{B^2}{2\mu} \quad \text{(magnetic energy density in a material)} \tag{30.11}$$

$$\tau = \frac{L}{R} \quad \text{(time constant for an } R\text{-}L \text{ circuit)} \tag{30.16}$$

$$\omega = \frac{1}{\sqrt{LC}} \quad \text{(angular frequency of oscillation in an } L\text{-}C \text{ circuit)} \tag{30.22}$$

$$\omega' = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} \quad \text{(underdamped } L\text{-}R\text{-}C \text{ series circuit)} \tag{30.29}$$