General Physics II Equation Sheet
Electricity, Magnetism, Circuits, Optics, SHM, Waves

Constants

$$k = 8.99 \times 10^9 \text{ N·m}^2/\text{C}^2$$
$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/(\text{N·m}^2)$$
$$\mu_0 = 4\pi \times 10^{-7} \text{ T·m/A}$$
$$c = 3.00 \times 10^8 \text{ m/s}$$

Circuits (High Use)

Ohm's Law:
$$V = IR$$

Power:
$$P = IV = I^2R = \frac{V^2}{R}$$

Series:
$$R_{\text{eq}} = R_1 + R_2 + \cdots$$

Parallel:
$$\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$$

Electric Fields and Potential

Coulomb's Law:
$$F = k\frac{|q_1 q_2|}{r^2}$$

Electric Field:
$$E = \frac{F}{q}, \quad E = k\frac{q}{r^2}$$

Electric Potential:
$$V = k\frac{q}{r}$$

Field from Potential (1D):
$$E = -\frac{\Delta V}{\Delta x}$$

Force from Field:
$$F = qE$$

Gauss' Law:
$$\Phi_E = \frac{Q_{\text{enc}}}{\epsilon_0}$$

Magnetism

Magnetic Force:
$$F = qvB\sin\theta$$

Force on Wire:
$$F = ILB\sin\theta$$

Circular Motion:
$$r = \frac{mv}{qB}$$

Magnetic Field (long wire):
$$B = \frac{\mu_0 I}{2\pi r}$$

Induction

Magnetic Flux:
$$\Phi_B = BA\cos\theta$$

Faraday's Law:
$$\mathcal{E} = -\frac{\Delta\Phi_B}{\Delta t}$$

Lenz's Law:

Induced current opposes change in flux

Optics

Mirror/Lens Equation:
$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

Magnification:
$$m = -\frac{d_i}{d_o}$$

Simple Harmonic Motion

Angular Frequency:
$$\omega = \sqrt{\frac{k}{m}}$$

Period:
$$T = \frac{2\pi}{\omega}$$

Max Speed:
$$v_{\max} = A\omega$$

Max Acceleration:
$$a_{\max} = A\omega^2$$

Energy:
$$E = \frac{1}{2}kA^2$$

Waves

Wave Speed:
$$v = f\lambda$$

Electromagnetic Waves:
$$c = f\lambda$$

Doppler Effect (Sound)

$$f' = f\frac{v \mp v_o}{v \pm v_s}$$

- top sign : approaching
- bottom sign : receding