

Circuits and electrostatics

- ✓ Ohm's law: $V = IR$
- ✓ Power: $P = IV = I^2 R = \frac{V^2}{R}$
- ✓ Series resistors: $R_{\text{total}} = R_1 + R_2 + \dots + R_n$
- ✓ Parallel resistors: $\frac{1}{R_{\text{total}}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$
- ✓ Resistance: $R = \frac{\rho L}{A}$
- ✓ Current: $I = \frac{Q}{t}$
- ✓ Coulomb's law: $F_E = \frac{kQ_1 Q_2}{r^2}$
- ✓ Electric field (point charge): $E = \frac{kQ}{r^2}$

Magnetism

- ✓ Magnetic force: $F_B = qvB \sin \theta$

Capacitors

- ✓ Capacitance: $C = \frac{Q}{V}$
- ✓ Capacitance (geometry): $C = \frac{\epsilon_0 A}{d}$
- ✓ Field between the plates: $E = \frac{V}{d}$
- ✓ Stored energy: $U = \frac{1}{2} QV$
- ✓ Series capacitors: $\frac{1}{C_{\text{total}}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots + \frac{1}{C_n}$
- ✓ Parallel capacitors: $C_{\text{total}} = C_1 + C_2 + \dots + C_n$

Waves and oscillations

- ✓ Frequency: $f = \frac{1}{T}$, where T is the period
- ✓ Wave speed: $v = \lambda f$
- ✓ Hooke's law: $F = -kx$
- ✓ Open pipe harmonics: $f_n = \frac{nv}{2L}$
- ✓ Closed pipe harmonics: $f_n = \frac{nv}{4L}$, n odd

Sound

- ✓ Speed of sound: $v = \sqrt{\frac{B}{\rho}}$
- ✓ Intensity: $I = \frac{P}{A}$
- ✓ Sound level: $\beta = 10 \log \frac{I}{I_0}$
- ✓ Doppler effect: $f_D = f_S \frac{v \pm v_D}{v \mp v_S}$, upper signs when moving toward each other

Light and optics

- ✓ Photon energy: $E = hf = \frac{hc}{\lambda}$
- ✓ Speed of light: $c = 3 \times 10^8$ m/s
- ✓ Index of refraction: $n = \frac{c}{v}$
- ✓ Lens equation: $\frac{1}{o} + \frac{1}{i} = \frac{1}{f}$
- ✓ Magnification: $m = -\frac{i}{o}$
- ✓ Lens power: $P = \frac{1}{f}$, in diopters with f in meters