MCAT DUMP SHEET

Physics: electricity, magnetism, waves, and optics

Achievable
https://achievable.me

Circuits and electrostatics

Ohm's law = $V = IR$

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

Series resistors = $R_{Total} = R_1 + R_2 + \ldots + R_n$

Parallel resistors = $\frac{1}{R_{Total}} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots + \frac{1}{R_n}$

Resistance = $\frac{R}{\rho L/A}$

Current = $I = \frac{Q}{t}$

Coulomb's law = $F_E = \frac{k(Q_1Q_2)}{r^2}$

Electric field (point charge) = $E = \frac{kQ}{r^2}$

Force by an electric field = $F = qE$

Magnetism

Magnetic force = $F_m = qvB \sin\theta$

Capacitors

Capacitance = $C = \frac{Q}{V}$

Capacitance (geometry) = $C = \frac{\varepsilon_0 A}{d}$

Capacitor electric field = $E = \frac{V}{d}$

Potential energy = $PE_C = \frac{1}{2} QV$

Series capacitors = $\frac{1}{C_{Total}} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots + \frac{1}{C_n}$

Parallel capacitors = $C_{Total} = C_1 + C_2 + \ldots + C_n$

Waves and oscillations

Frequency = $f = \frac{1}{T}$ where f is frequency and T is period

Velocity = $v = \lambda f$

Hooke's law = $F_s = -kx$

Harmonics for open pipes = $f_n = \frac{nv}{2L}$

Harmonics for closed pipes = $f_n = n_{odd} \times \frac{v}{4L}$

Sound

Velocity = $v = \sqrt{\frac{B}{\rho}}$

Intensity = $I = \frac{Power}{Area}$

Intensity in decibels = $\beta = 10 \log\left(\frac{I}{I_0}\right)$

Doppler effect = $f_D = \frac{(v \pm v_D)}{(v \pm v_S)} \times f_S$

Lights and optics

$E_{photon} = hf = \frac{hc}{\lambda}$

$c = 3 \times 10^8$ m/s

Index of refraction = $n = \frac{c}{v}$

Snell's law = $n_1 \sin\theta_1 = n_2 \sin\theta_2$

Lens equation = $\frac{1}{o} + \frac{1}{i} = \frac{1}{f}$

Magnification = $m = \frac{i}{o}$

Lens power = $P = \frac{1}{f}$