MCAT DUMP SHEET

Physics: mechanics and thermodynamics

Achievable
https://achievable.me

Work, Energy, and Power

Work = $W = Fd\cos\theta$

Kinetic energy = $KE = \frac{1}{2}mv^2$

Work-energy theorem = $W_{net} = \Delta KE$

Gravitational potential energy = $PE_{grav} = mgh$

Total mechanical energy = $E = KE + PE$

Power = $P = \frac{W}{t} = Fv$

Gravity

$F_{grav} = mg$

$F_{grav} = \frac{G(Mm)}{r^2}$

$g = \frac{G(M)}{r^2}$

g (Earth) $\approx 10\ m/s^2$

Torque

$\tau = rF\sin\theta$

Kinematics

Constant acceleration = $v = v_0 + at$

$d = v_0t + \frac{1}{2}at^2$

Projectile motion

Horizontal component

$x = v_{x0}t$

$v_x = v_{x0}$

$a_x = 0$

Vertical component

$y = v_{y0}t - \frac{1}{2}gt^2$

$v_y = v_{x0} - gt$

$a_y = -g$

Friction

$F_{static} \leq \mu_s F_N$

$F_{kinetic} = \mu_k F_N$

Inclined plane

θ = angle of incline

$F_{g\ parallel} = mg\sin\theta$

$F_{g\ perpendicular} = mg\cos\theta$

Circular motion

Centripetal acceleration = $v_0 + at$

Centripetal force = $F_c = ma_c = \frac{mv^2}{r}$

Thermodynamics

First law = $\Delta E = Q - W$

Work = $W = P\Delta V$

Heat capacity = $Q = C\Delta T$

Specific heat capacity = $Q = mc\Delta T$

Fluids

Density = $\rho = \frac{mass}{volume} = \frac{m}{v}$

Specific gravity = $SG = \frac{\rho}{\rho_{water}}$

Pascal's law = $P = \frac{F}{A}$

Gauge pressure = $P_{gauge} = P - P_{atm}$

Pascal's law = $\frac{F_1}{A_1} = \frac{F_2}{A_2}$

Continuity equation = $A_1v_1 = A_2v_2$

Flow rate = $Q = Av$

Buoyant force = $F_{buoyant} = F_{fluid} \times V_{submerged} \times g$