Physics Formulas for Chapters 2 - 8

Simple Kinematic Formulas

$\Delta x = v_{average} \times t$ Where Δx **is distance and t is time and v is velocity or speed.**

General Kinematic Formulas: The Big Three Formulas for uniformly accelerated motion

$v_f = v_i + at$ $\Delta x = v_i t + \frac{1}{2} a t^2$ $v_f^2 = v_i^2 + 2a\Delta x$ $g = 9.8\frac{m}{s^2}$ or you can use g=10 m/s²

a=acceleration and g is acceleration due to gravity. Δx can be substituted as Δy for vertical distances.

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$F_{net} = ma$ $Weight = mg$ $F_f = \mu N$

Objects in equilibrium: $\sum F_x = Zero$ **and** $\sum F_y = Zero$

Objects accelerating: $\sum F = ma$

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Work = F x d Where d = distance or Δx $Work = Fd * Cos\theta$

$W = Fd = \frac{1}{2}mv_f^{\ 2} - \frac{1}{2}mv_i^{\ 2}$ or $Fd = mgh_f - mgh_i$ $PE_g = mgh$ $KE = \frac{1}{2}mv^2$

Conservation of Mechanical Energy (ME) – no non-conservative forces like friction present

$ME_i = ME_f$ $PE_i + KE_i = PE_f + KE_f$ $mgh_i + \frac{1}{2}mv_i^2 = mgh_f + \frac{1}{2}mv_f^2$

Power: $P = \frac{Work}{t}$ P = F x v 1 Watt = 1 J/s

For Pre-AP: Chapter 10 and 11

$Q = mC\Delta T$ C = specific heat System energy and work: $U_f = U_i + Q_{in} + W_{in} - W_{out} - waste$

$eff = \frac{Work_{out}}{Work_{in}}$ If want percent, then multiply eff. times 100

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Ch. 6: Momentum is *p*

$p = mv$ impulse = Δ***p or*** Δmv and impulse = $F \times t$ **so** $F \times t = \Delta mv$

Conservation of Momentum – as long as no external force acts on system, total momentum is conserved. $p_i = p_f$

For two separate objects (#'s 1 and 2): $m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$

For two objects (#'s 1 and 2) that finally stick together: $m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$

Ch. 7-8: Circular motion and torque

$v = \frac{2\pi r}{T}$ $v = 2\pi rf$ T = period $f = frequency$ $T = \frac{1}{f}$ and $f = \frac{1}{T}$ $a_c = \frac{v^2}{r}$ $F_c = ma_c$

$F_G = G\frac{m_1 M_2}{r^2}$ $v = \sqrt{\frac{GM}{r}}$ G = Gravitational constant

τ (Tau) is torque $\tau = rF$ r is lever arm distance $G = 6.67 \times 10^{-11} \frac{N \bullet m^2}{kg^2}$

ω (omega) is rotational or angular speed (# of revolutions or rotations per unit of time)

I is moment of inertia (inertia of rotating mass) Angular momentum = $I\omega$

Conservation of Angular Momentum $I_1\omega_1 = I_2\omega_2$