Physics I H Semester 1 rev 201412172345 `github.com/cg505/formulaPage`

$\Delta x \to \Delta\theta$ displacement, $v \to \omega$ vel., $a = \bar{a} \to \alpha$ constant accel., $\bar{x}$ avg. x

$v = v_o + at$ | $\bar{v} = \frac{v_0+v}{2}$ | $\Delta x = \bar{v}t$ | $\Delta x = v_0 t + \frac{1}{2}at^2$ | $v^2 = v_0^2 + 2a\Delta x$

Earth gravity $g = 9.80\,\mathrm{m/s^2}$

Newton $F = ma$

Friction $f = \mu N$

Static $f_s \le \mu_s N$

Weight $W = mg$

$a_c = \frac{v^2}{r}$

Momentum $\vec{p} = m\vec{v}$

Impulse $\vec{F}\Delta t = \Delta\vec{p} = m\vec{v}_f - m\vec{v}_i$

Universal gravitational constant $G = 6.67 \times 10^{-11}\,\mathrm{N\,m^2/k\,g^2}$

$v = \sqrt{\frac{GM}{r}}$

Period $T = \frac{2\pi r}{v}$

$T^2 = \frac{4\pi^2 r^3}{GM}$

T in yr, r in AU $T^2 = r^3$

$F = \frac{Gm_1 m_2}{r^2}$

Work $W = \vec{F}\cdot\vec{x} = |F||x|\cos\theta$

Springs $F = -kx$

Potential $\mathrm{PE}_{grav} = mgy$

Energy $\mathrm{PE}_{elastic} = \frac{1}{2}kx^2$

Kinetic E. $\mathrm{KE} = \frac{1}{2}mv^2$

Work and KE $W = \Delta\mathrm{KE} = \mathrm{KE}_f - \mathrm{KE}_i$

Conservation of E. $\mathrm{KE}_i + \mathrm{PE}_i = \mathrm{KE}_f + \mathrm{PE}_f$

Perfectly inelastic collision $m_1\vec{v}_{1_i} + m_2\vec{v}_{2_i} = (m_1+m_2)\vec{v}_f$

Inelastic collision (not perf.) $m_1\vec{v}_{1_i} + m_2\vec{v}_{2_i} = m_1\vec{v}_{1_f} + m_2\vec{v}_{2_f}$

Elastic collision $\vec{v}_{1_i} - \vec{v}_{2_i} = -(\vec{v}_{1_f} - \vec{v}_{2_f})$

Arc length $s = r\theta$

Tangential Velocity $v = r\omega$

Changes speed $a_{tan} = r\alpha$

$a_c = a_r = \frac{v^2}{r} = r\omega^2$

$a_c = a_r = \frac{v^2}{r} = r\omega^2$

Torque (in m N not J) $\tau = |\vec{r}\times\vec{F}| = |\vec{r}||\vec{F}|\sin\theta$

Rot. inertia $I = \Sigma mr^2$ See back

$F = ma$ $\tau = I\alpha$

Angular momentum $L = I\omega$

Angular impulse $\tau\Delta t = \Delta L = I\omega_f - I\omega_i$

Linear kinetic energy $\mathrm{KE}_{linear} = \mathrm{KE}_{trans} = \frac{1}{2}mv^2$

Rotational $\mathrm{KE}_{rot} = \frac{1}{2}I\omega^2$

Used below $\mu = \frac{m}{L}$

Springs $\omega = \sqrt{\frac{k}{m}}$

SHM (smh) $x = A\cos(\omega t)$ or $A\sin(\omega t)$

Period/freq $f = \frac{1}{T} = \frac{\omega}{2\pi}$

Pendulum $T = 2\pi\sqrt{\frac{L}{g}}$

Sound in air v in m/s, temp T in °C $v = 331 + 0.6T$

Wavelength $\lambda = \frac{v}{f}$

String $v = \sqrt{\frac{F_{tens}}{\mu}}$

Harmonics $f_n = \frac{nv}{2L}$

Open tube $f_n = \frac{nv}{2L}$

Closed tube $f_n = \frac{nv}{4L}$ n is odd

Intensity $I = \frac{P}{4\pi r^2}$

Loudness, dB $\beta = 10\log\left(\frac{I}{I_0}\right)$

Standard Intensity $I_0 = 10^{-12}\,\mathrm{W/m^2}$

Doppler Effect $f' = f\left(\frac{v \pm v_{obs}}{v \mp v_{src}}\right)$

Values of Rotational Inertia I

Thin hoop	mr^2
Solid cylinder	$\frac{1}{2}mr^2$
Hollow cylinder	$\frac{1}{2}m(r_1^2 + r_2^2)$
Sphere	$\frac{2}{5}mr^2$

A sphere is the fastest object

Equilibrium Probz

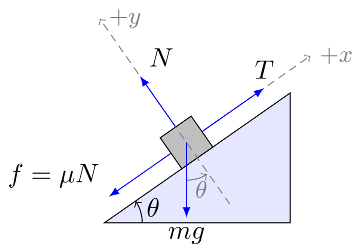
$$F_{up} = F_{down}$$

$$F_{left} = F_{right}$$

$$\tau_{CW} = \tau_{CCW}$$

Choose pivot point at unknown force

Free body diagrams!



$$N = mg\cos\theta$$

$$T - mg\sin\theta - f = ma$$

$$T - mg\sin\theta - \mu mg\cos\theta = ma$$