meta-calculator

Top Physics Formulas:

Here you will find the most common physics equations and formulas used in high school and fundamental university courses. These include, but are not limited to, mechanics, kinematics, energy, uniform circular motion, and waves formulas.

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Top Physics Formulas:

For more physics formulas visit Wikipedia.

Basic Mechanics Equations

Velocity

$\overline{v} = \frac{\Delta x}{\Delta t} \quad v = \frac{dx}{dt}$

Where x is the displacement and t the time. The first equation gives the *average* velocity while the second equation is the instantaneous velocity

Acceleration

$\overline{a} = \frac{\Delta v}{\Delta t} \quad a = \frac{dv}{dt}$

Where v is the velocity and t the time. The first equation gives the *average acceleration* while the second equation is the instantaneous acceleration

Force

$F = ma$

Where m is the mass of the object and a is the acceleration

Weight

$w = mg$

Where m is the mass and g is the gravitational acceleration. On earth, it is $9.8\ m/s^2$.

Kinematics Equations (Equations of Motion)

1. $v = v_0 + at$
2. $\Delta x = \frac{v+v_0}{2}t$
3. $\Delta x = v_0 t + \frac{1}{2}at^2$
4. $v^2 = v_0^2 + 2a\Delta x$

- To be used under constant acceleration

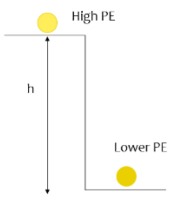
Δx	Displacement
t	Time
v_0	Initial Velocity
v	Final Velocity
a	Acceleration

Energy

Gravitational Potential Energy

$$PE_g = mgh \ [Joules]$$

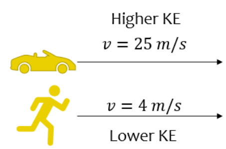
Where m is the mass of the object, g is the gravitational constant $9.8\ m/s^2$, and h is the height of the object



Kinetic Energy

$$KE = \frac{1}{2} mv^2 [Joules]$$

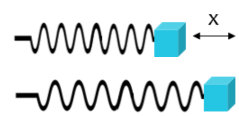
Where m is the mass of the object, v is the velocity of the object



Elastic Potential Energy

$$PE_s = \frac{1}{2} kx^2 \ [Joules]$$

Where k is the spring constant and x is the displacement



For more energy equations see here.

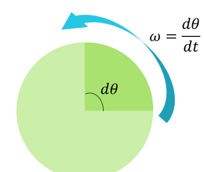
Uniform Circular Motion

Angular Velocity & Acceleration

$$\overline{\omega} = \frac{\Delta\theta}{\Delta t} \quad \omega = \frac{d\theta}{dt}$$

$$\overline{\alpha} = \frac{\Delta\omega}{\Delta t} \quad \alpha = \frac{d\omega}{dt}$$

Where theta is the angular displacement. The first equation gives the average angular velocity, while the second is the instantaneous angular velocity. The third equation gives the average angular acceleration, while the fourth is the instantaneous angular acceleration



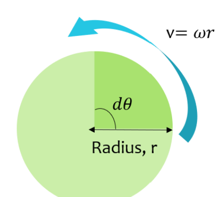
Linear Velocity & Acceleration

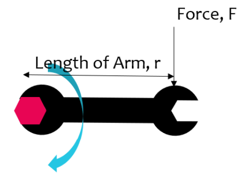
$$v = \omega r$$

$$a = \alpha \times r - \omega^2 r$$

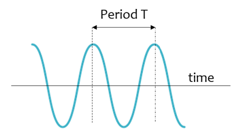
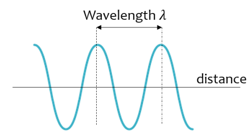
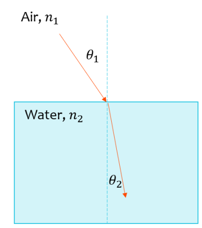
The angular velocity ω can be converted into a linear velocity v with this equation where r is the radius

The angular acceleration α can be converted into a linear acceleration a with this equation where r is the radius



Torque $\tau = r \times F$	Where F is the force acting in the direction of rotation, and r is the arm length	

Waves & Light

Frequency of EM Wave $f = \frac{1}{T}$	Where T is the period of the wave	
Velocity of EM Wave $v = \lambda f$	Where λ is the wavelength and f is the frequency	
Snell's Law $n_1\theta = n_2\theta$	Where n_1 and n_2 are the indices of refraction for the given mediums and θ_1 is the angle of incidence and θ_2 is the angle of refraction	

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Use the Graphing Calculator
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