Forces in Physics

Gravity Forces

$$F = mg$$

Weight of a mass m near an object of gravity g

$$g = \frac{(-)GM}{r}$$

The value of g at a distance r from the centre of a planet of mass M (the minus is the magnitude)

$$F = \frac{GMm}{r^2}$$

The force of G between mass m and mass M

Electrostatic Forces

$$E = \frac{V}{d}$$

The electric field strength between two charged parallel plates

$$F = \frac{qV}{d}$$

The force on a charge q between two charged parallel plates

$$E = \frac{kQ}{r^2}$$

The electric field near a point or spherical charge

$$F = \frac{KQq}{r^2}$$

The force on a charge q near a point or spherical charge

Magnetic Forces

$$F = BIl$$

The force on a current flowing at 90degrees to a magnetic flux density B

$$F = Bqv$$

The force on a charge q moving at velocity v at 90degrees to a magnetic flux density B

Others

$$F = kx$$

The force produced by a stretched spring or piece of material

$$F = -ks$$

The force on an oscillator that is moving with simple harmonic motion

Force and Motion Relationships

$$F = ma$$

Force, acceleration and mass

$$Ft = \Delta p$$

Impulse and momentum

$$E = FD$$

Forces and energy

Energy in physics

Gravitational PE

$$PE = mgh$$

The potential energy of a mass m lifted a height h above the earth

$$Vg = \frac{-GM}{r}$$

The value of gravitational potential energy at a distance r from the centre of mass M

$$PE = \frac{-GMm}{r}$$

The PE of mass m and mass M at a distance r apart

Electrostatic PE

$$E = qV$$

The PE lost when a charge q moves through potential difference V

$$E = \frac{1}{2}CV^2$$

The PE stored in a charged capacitor

$$V = \frac{kQ}{r}$$

The electrical potential V near a point or spherical charge

$$PE = \frac{kQq}{r}$$

The PE of a charge q near a point or spherical charge Q

Others

$$E = \frac{1}{2}kx^2$$

The energy stored in a stretched spring or piece of material

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

The kinetic energy of a moving mass m

$$E = \frac{1}{2}ka^2$$

The energy of a simple harmonic oscillator with amplitude A

$$E = hf$$

Photon energy

$$E = mC\Delta\theta$$

The energy needed to change the temerature of a material

$$E = kT$$

The average energy of a particle at temperature T

Time Speed and Distance

Time formulae

$$t = \frac{s}{v}$$

Time to go distance s at constant velocity v

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syntax errors or worse.

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\displaystyle t = \frac{2\pi \sqrt{\frac{m}{k}}
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Period of oscillation (mass on a spring)

$$t = 2\pi\sqrt{\frac{l}{g}}$$

Period of oscillation (Pendulum)

$$t = \frac{\ln 2}{\lambda}$$

Formula for radioactive half-life

$$t = 0.69RC$$

Time for charge in a capacitor to half

$$t = RC$$

Time for capacitor's charge to fall by 37%

$$t = \frac{1}{f}$$

The relationship between period and frequency

$$t = \frac{E}{P}$$

The relationship between power time and energy

Laws

Keplers 3rd Law: $t^2 = r^3$