

## PHYSICS FORMULAE

### Kinematics

$$v_f = v_i + at \quad d = \left( \frac{v_i + v_f}{2} \right) t$$

$$d = v_i t + \frac{1}{2} at^2 \quad v_f^2 = v_i^2 + 2ad$$

### Dynamics

$$F_g = mg \quad F_{\text{net}} = ma$$

$$F_f = \mu F_N$$

### Equilibrium

$$\tau = rF$$

### Momentum

$$p = mv \quad J = F\Delta t$$

### Energy

$$E_k = \frac{1}{2} mv^2 \quad E_p = mgh$$

$$W = Fd \quad P = \frac{W}{\Delta t}$$

### Circular Motion

$$T = \frac{1}{f} \quad a_c = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$$

### Gravitation

$$F_g = G \frac{m_1 m_2}{r^2} \quad E_p = -G \frac{m_1 m_2}{r}$$

### Electrostatics

$$F_E = k \frac{q_1 q_2}{r^2} \quad E = \frac{F_E}{q} \quad E = k \frac{q}{r^2}$$

$$E_p = k \frac{q_1 q_2}{r} \quad V = \frac{E_p}{q} \quad V = k \frac{q}{r}$$

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

### Circuits

$$I = \frac{Q}{\Delta t} \quad R = \frac{\rho L}{A}$$

$$V = IR \quad P = IV$$

### Electromagnetism

$$B = \frac{\mu_0 I}{2\pi r} \quad B = \mu_0 n I$$

$$F_B = qvB \quad F_B = ILB$$

### Electromagnetic Induction

$$\varepsilon = Blv \quad \Phi_B = BA$$

$$\varepsilon = -N \frac{\Delta \Phi_B}{\Delta t} \quad \frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s}$$

### Special Relativity

$$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}} \quad L = L_0 \sqrt{1 - \frac{v^2}{c^2}}$$

$$p = \frac{mv}{\sqrt{1 - \frac{v^2}{c^2}}} \quad E = \frac{mc^2}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$u = \frac{u' + v}{1 + \frac{u'v}{c^2}}$$

**FUNDAMENTAL CONSTANTS AND PHYSICAL DATA**

Gravitational constant.....	$G = 6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$
Coulomb's law constant.....	$k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$
Vacuum permeability.....	$\mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m}/\text{A}$
Elementary charge.....	$e = 1.60 \times 10^{-19} \text{ C}$
Electron volt.....	1 eV = $1.60 \times 10^{-19} \text{ J}$
Unified atomic mass unit.....	1 u = $1.66 \times 10^{-27} \text{ kg}$
Proton mass.....	$m_p = 1.67 \times 10^{-27} \text{ kg}$
Neutron mass.....	$m_n = 1.67 \times 10^{-27} \text{ kg}$
Electron mass.....	$m_e = 9.11 \times 10^{-31} \text{ kg}$
Avogadro's number.....	$N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$
Speed of light.....	$c = 3.00 \times 10^8 \text{ m/s}$
<b>Earth</b>	
Radius.....	$R_E = 6.38 \times 10^6 \text{ m}$
Mass.....	$M_E = 5.98 \times 10^{24} \text{ kg}$
Acceleration due to gravity at the surface of Earth.....	$g = 9.8 \text{ m/s}^2$
Period of rotation.....	$= 8.62 \times 10^4 \text{ s}$
Astronomical Unit (approximate distance from the Sun to the Earth).....	1 AU = $1.50 \times 10^{11} \text{ m}$
Period of orbit around Sun.....	$= 3.16 \times 10^7 \text{ s}$
<b>Moon</b>	
Radius.....	$= 1.74 \times 10^6 \text{ m}$
Mass.....	$= 7.35 \times 10^{22} \text{ kg}$
Period of rotation.....	$= 2.36 \times 10^6 \text{ s}$
Radius of orbit around Earth.....	$= 3.84 \times 10^8 \text{ m}$
Period of orbit around Earth.....	$= 2.36 \times 10^6 \text{ s}$
<b>Sun</b>	
Radius.....	$R_S = 6.96 \times 10^8 \text{ m}$
Mass.....	$M_S = 1.99 \times 10^{30} \text{ kg}$

**MATHEMATICAL FORMULAE**

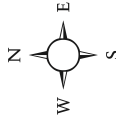
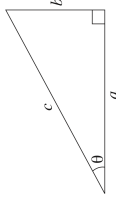
**Right Triangles**

$$a^2 + b^2 = c^2$$

$$\sin \theta = \frac{b}{c} \quad \cos \theta = \frac{a}{c}$$

$$\tan \theta = \frac{b}{a}$$

$$\text{area} = \frac{1}{2}ab$$

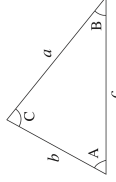


**All Triangles**

$$\text{area} = \frac{1}{2} \text{base} \times \text{height}$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

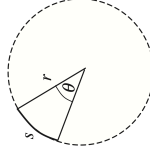


**Circles**

$$A = \pi r^2$$

$$C = 2\pi r$$

$$s = r\theta$$



**Quadratic Equation**

$$\text{If } ax^2 + bx + c = 0, \text{ then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Prefix	Symbol	Factor
tera	T	$10^{12}$
giga	G	$10^9$
mega	M	$10^6$
kilo	k	$10^3$
centi	c	$10^{-2}$
milli	m	$10^{-3}$
micro	$\mu$	$10^{-6}$
nano	n	$10^{-9}$
pico	p	$10^{-12}$