

Physics 101: Conceptual Physics Formula Sheet

Constants

$$g \approx 10 \text{ m/s}^2 \text{ (acceleration near Earth's surface)}$$

$$G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2 \text{ (Gravitational constant)}$$

$$k = 9 \times 10^9 \text{ Nm}^2/\text{C}^2 \text{ (electrostatic constant)}$$

Mechanics

$$\sum \mathbf{F} \equiv \mathbf{F}_{\text{net}} = 0 \text{ (Newton's 1st Law)}$$

$$\sum \mathbf{F} \equiv \mathbf{F}_{\text{net}} = m\mathbf{a} \text{ (Newton's 2nd Law)}$$

$$\mathbf{F}_{1,2} = -\mathbf{F}_{2,1} \text{ (Newton's 3rd Law)}$$

$$F_g = GMm/r^2 \text{ (Universal law of gravitation)}$$

$$F_g = mg \text{ (gravitational force near Earth's surface)}$$

$$\mathbf{p} = m\mathbf{v} \text{ (momentum)}$$

$$F\Delta t = \Delta(mv) \text{ (impulse)}$$

$$W = Fd \text{ (Work)}$$

$$E_{\text{tot}} = U + K \text{ (total energy)}$$

$$K = \frac{1}{2}mv^2 \text{ (kinetic energy)}$$

$$U = mgh \text{ (grav. potential energy)}$$

$$\tau = F_{\perp}d \text{ (torque), } \perp \text{ means that force and distance have to be perpendicular}$$

$$L = I\omega \text{ (angular momentum)}$$

$$F_{\text{net}} = mv^2/r \text{ (centripetal force)}$$

Electricity & Magnetism

$$F_e = kQq/r^2 = qE_e \text{ (Coulomb's Law)}$$

$$E_e = kQ/r^2 \text{ (Electric Field)}$$

$$V = IR \text{ (Ohm's Law)}$$

$$P = IV = I^2R = V^2/R \text{ (Electric Power)}$$

$$R_{\text{eq}} = R_1 + R_2 + \dots \text{ (Series Circuit)}$$

$$\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots \text{ (Parallel Circuit)}$$

$$R_{\text{eq}} = \frac{R_1 R_2}{R_1 + R_2} \text{ (special case for 2 parallel resistors)}$$

$$F_B = qv_{\perp}B \text{ (Magnetic Force) } \perp \text{ means that velocity and magnetic field have to be perpendicular}$$

Kinematics (Linear Motion)

$$\bar{v} = \frac{v_0 + v}{2} = \frac{d}{t} \text{ (average speed)}$$

$$v = v_0 + at \text{ (speed)}$$

$$a = \frac{v - v_0}{t} \text{ (acceleration)}$$

$$d = v_0 t + \frac{1}{2}at^2 \text{ (distance)}$$

Kinematics (Projectile Motion)

$$x = x_0 + v_{0,x}t + \frac{1}{2}a_x t^2$$

$$v_x = v_{0,x} + a_x t$$

$$y = y_0 + v_{0,y}t + \frac{1}{2}a_y t^2$$

$$v_y = v_{0,y} + a_y t$$