PHYSICS FORMULA SHEETS FOR CLASS 9TH

Motion

Speed and Velocity

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Average Speed

$$\text{Average Speed} = \frac{\text{Total Distance Covered}}{\text{Total Time Elapsed}}$$

Average Velocity

$$\text{Average Velocity} = \frac{\text{Total Displacement Covered}}{\text{Total Time Elapsed}}$$

Acceleration

$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{Time taken}} = \frac{v_{final} - v_{initial}}{t}$$

Three equations of Motion

$$v = u + at$$

$$S = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2aS$$

Where S is the displacement, u is the initial velocity and v is the final velocity, a is the acceleration and t is time

Displacement in nth second

$$S_n = u + (2n - 1)\frac{a}{2}$$

Force and Laws of Motion

Momentum(P)

$$p = mv$$

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

Newton's second law

$$F = \frac{m(v-u)}{t}$$

$$F = ma$$

Here F is the force applied, v and u are the initial and final velocities

Impulse

$$J = F\,\Delta t$$

$$J = m(v-u)$$

Law of Conservation of Momentum

The law of conservation of momentum, states that

If the net external force on a system of particles is zero, the linear momentum of the system remains constant

$$m_1v_1 + m_2v_2 = m_1u_1 + m_2u_2$$

Here subscripts 1 and 2 correspond to the two objects and v and u are the initial and final velocities of the respective objects

Centripetal Acceleration

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

Centripetal Force

$$F_{centrifugal} = -F_{centripetal}$$

$$F_{centrifugal} = -\frac{mv^2}{r}$$

Gravitation

Universal Law of Gravitation

$$F \propto \frac{M \times m}{r^2}$$

$$\Rightarrow F = G\frac{Mm}{r^2}$$

Here M and m are the two masses separated by distance r and G is the gravitational constant whose value is 6.7×10^{-11} Nm^2/kg^2

Acceleration due to gravity

$$F = mg$$

$$g = \frac{GM}{d^2}$$

Here d is the distance from the point of measurement to the centre of the planet

For earth g = 9.81 m/s^2

Kepler's third law

$$\Rightarrow \frac{r^3}{T^2} = constant$$

Here r is the distance between planet and the sun and T is the time taken to complete one revolution

For two planets in comparison

$$\frac{r_2^3}{T_2^3} = \frac{r_1^3}{T_1^2}$$

Thrust and Pressure

$$\text{Pressure} = \frac{\text{Force(N)}}{\text{Area}(m^2)}$$

Density

$$\rho = \frac{M}{V}$$

Where M is the mass and v is the volume of the object
Relative Density

$$\text{Relative Density} = \frac{\text{Density of a substance}}{\text{Density of water}}$$

'Buoyant Force

$$F_W = mg = \rho Vg$$

Where m is density times the volume of the body (ρV); g is the acceleration due to gravity

F_B = Apparent Weight – Actual Weight

Work, Energy and Power

Work Done (W) = Force (F) × Displacement (d)
Kinetic Energy

$$\text{Kinetic Energy} = \frac{1}{2}mv^2$$

m is the mass and v is the velocity
Kinetic energy and momentum

$$K = \frac{1}{2}m\left(\frac{P}{m}\right)^2 = \frac{P^2}{2m}$$

Here p is the momentum
Potential energy between two points A and B

$$U_B - U_A = mgh$$

Where h is the distance between two points
Power

$$\text{Power} = \frac{\text{Work}}{\text{Time}}$$

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

$$\text{Power} = \frac{\text{Energy Consumed}}{\text{Time taken}}$$

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

Sound

Frequency and Time Period

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

Where f is the frequency and T is the time period

Relation between wavelength(λ) , frequency(f), speed(v) and Time period(T)

$$\lambda = vT$$

$$v = \frac{\lambda}{T}$$

$$v = \lambda f$$