Points to Remember

Inertia	The inherent property of a body to resist any change in its state (rest or motion), unless it is influenced by an external unbalanced force. ❋ ***Inertia of rest:*** Resistance to change the state of rest. ***Ex :*** *Leaves are detached when tree is shaken.* ❋ ***Inertia of motion****:* Resistance to change the state of motion. ***Ex :*** *Athlete run a distance before high jump or long jump.* ❋ ***Inertia of direction:*** Resistance to change the direction of motion. ***Ex :*** *We lean sideways when bus turns while driving.*
Newton's 1st Law (or) Law of Inertia	*The law states that every body continues to be in its state of rest or in the state of uniform motion along a straight line unless it is acted upon by some external force.*
Newton's 2nd Law (or) Law of Force	*The force acting on a body is directly proportional to the rate of change of linear momentum of the body. The change in momentum takes place in the direction of the force.* $\mathbf{F \propto \frac{\Delta p}{t}}$ **(or) F = ma**
Newton's 3rd Law	*For every action, there is an equal and opposite reaction. They always act on two different bodies.* $F_B = -F_A$. ***Application:*** Propulsion of rocket.
Law of Conservation of Linear Momentum	*There is no change in the linear momentum of a system of bodies as long as no net external force acts on them.*
Newton's universal law of gravitation	*The law states that the gravitational force between any two bodies in the universe is directly proportional to the product of their masses and inversely proportional to the square of the distance between the centers of these masses. The direction of the force acts along the line joining the masses.*

Important Formulae

★ Force : F = m × a

★ Linear Momentum : p = m × v

★ Torque : τ = F × d

★ Change in momentum :

$$\Delta p = P_f - P_i = mv - mu$$

★ Momentum of a couple : M = F × S

★ Impulse : J = F × t = Δp

★ Gravitational Force : F = $\frac{Gm_1m_2}{r^2}$

★ Acceleration due to gravity : g = $\frac{GM}{R^2}$

★ Weight : W = m × g

★ Kinetic Energy : $E_k = \frac{1}{2}mv^2 = \frac{p^2}{2m}$

Important Values to remember

★ ***Acceleration due to gravity***
on the surface of the Earth = 9.8 ms^{-2}
on the surface of the Moon = 1.625 ms^{-2}

★ Radius of Earth (R) = 6378km ≅ 6400km

★ Mass of Earth (M) = 5.972 × 10^{24}kg

★ Gravitational constant (G)= 6.674×10^{-11} $Nm^2 kg^{-2}$

★ 1N = 1 kg m s^{-1} = 10^5 dyne

★ 1 kg f = 9.8 N = 98 × 10^4 dyne

★ 1 g f = 9.8 × 10^{-3}N= 980 dyne

Important Principle

★ At equilibrium, the algebraic sum of the moments of all the individual forces about any point is equal to zero.