

9th Class

➤ Gravity

❖ **Introduction:** Gravity is a fundamental force that exists between any two masses, any two bodies, any two particles. It is a force of attraction that pulls objects with mass towards each other.

❖ **Law of Gravitation:** The Law of Gravitation was formulated by Sir Isaac Newton. According to this law, every point mass attracts every other point mass in the universe with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers. Mathematically, it is expressed as:

$$F = G \cdot m_1 \cdot m_2 / r^2$$

Where:

- F is the gravitational force between the two masses,
- G is the gravitational constant,
- m_1 and m_2 are the masses of the two objects, and
- r is the distance between the centers of the two masses.

❖ **Gravitational Constant (G):** The gravitational constant (G) is a fundamental constant that appears in the equation of Newton's law of gravitation. Its value is approximately $6.674 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$

❖ **Weight and Mass:** The weight of an object is the force with which it is attracted towards the center of the Earth (or any other celestial body). It is given by $W = m \cdot g$, where m is the mass of the object and g is the acceleration due to gravity.

❖ **Free Fall:** When an object is falling under the influence of gravity alone (without any other forces acting on it), it is said to be in free fall. The acceleration due to gravity (g) is approximately 9.8 m/s^2 on the surface of the Earth.

❖ **Gravitational Potential Energy:**

The gravitational potential energy (U) of an object at a certain height is given by $U = m \cdot g \cdot h$, where m is the mass, g is the acceleration due to gravity, and h is the height.

❖ **Orbits and Satellites:** Objects in orbit, like satellites, are continuously falling towards the Earth due to gravity but have sufficient tangential velocity to keep missing the Earth. This combination of free fall and forward velocity results in a stable orbit.