MOTION

Motion involves a change of position of a body with time. Mechanics is the branch of Physics that studies how thing move and what makes them to move. Kinematics is the branch of mechanics describing how objects move without regarding the forces causing them to move, while dynamics is the branch of mechanics dealing with why objects move as they do.

Types of Motion

Random Motion: Random motion is the phenomenon that describes irregular movement or a movement at random. This is the kind of motion among gaseous particles as postulated by the atomic theory and kinetic theory of matter. An example of such motion is the *Brownian motion*.

Translational Motion: When rigid objects move from one point in space to another without rotating, the motion is said to be *translational*. Each part of an object undergoing pure translational motion follows the same

path. An example is a car travelling from Enugu to Lagos. Note that in translational motion, every point in the body remains relatively fixed to one another.

Rotational Motion: This implies the kind of motion wherein all the points of the moving body move in concentric circles and that the centre of these circles all li on a line called the axis of rotation. Examples are the earth rotating about its axis, the rotation of the blades of an electric fan, the wheels of a moving car, etc.

Oscillatory (or vibratory) Motion: When a body moves to and fro, reversing the direction of its motion and returning regularly to its original position, it is said to have a *vibratory* or *oscillatory motion*. Examples are the motion of a pendulum as it swings back and forth, a diving board, the vertical movement of a disturbed mass on spiral spring, etc.

Circular Motion: An object moving along a circular path is said to have a circular motion. Example: the earth moving round the sun.

Newton's Laws of Motion

Sir Isaac Newton (1642–1727) was the first to discover how forces relate to motion, that is how to cause and oppose motion. Below are the laws he proposed concerning motion:

Newton's First Law of Motion (Idea of Inertia): The first law states that every object continues in its state of rest or uniform motion in a straight line unless acted upon by an external force.

Newton's Second Law of Motion (The Law of rate of change of Momentum): The second law of motion states that the rate of change of momentum is proportional to the impressed force and takes place in the direction of that force. Mathematically,

$$F \propto \frac{change\ in\ momentum}{time\ taken}$$

Newton's Third Law of Motion (The Law of Action and Reaction): The third law of motion states that to every action there is an equal and opposite reaction.

Relative Motion

We may define motion as a change of position. It will however be impossible to determine the change of position without a point or frame of reference which we shall have assumed to be at rest. Thus every measurement must be made with respect to such points or frames of reference.

If you are sitting in a train travelling past a railway platform on which your friend is standing, there is said to be relative motion or separation between you and your friend.

If a student travelling in a school bus looks down on the floor of the bus, the bus will appear to him to be stationary. This is because the bus and the student are moving with the same speed and hence there is zero or no relative motion between them. But if the student looks out of the window, the trees outside the bus will appear to be moving in opposite direction as the bus. Trees do not move. The illusion of moving trees is due to the relative motion between the student in the moving bus and stationary trees.