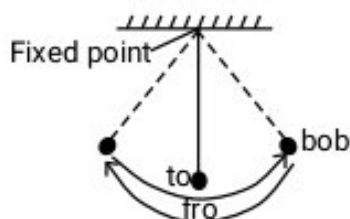# CHAPTER FOUR

MOTION

What is Motion?
Answer:
Motion is defined as the change in the position of a body with time with respect to a reference point.

Examples of motion are:
1. The movement of the earth round the sun.
2. The rotation of the earth about its axis.
3. An aeroplane flying in the sky.
4. A boy walking or running.

Types of Motion
1. **Random Motion**: Random motion is the movement of a body in a zigzag or disorderly manner. Examples are the motion of dust particles in air, the motion of smoke particles, the motion of butterfly, etc.

2. **Translational Motion**: This is a motion performed by a body in a straight line from point 'P' to another point 'Q'. If you walk from one end of the classroom to the other, you have performed Translational motion.

3. **Rotational Motion**: This is a motion a body performs in a circular path about an axis. The rotation of the blades of a fan, the rotation of a wheel about an axis, the rotation of the earth about its axis, the motion of a moving vehicle wheel, are all examples of rotational motion.

4. **Oscillatory Motion**: This is the motion of a body in a to and fro manner about a fixed point. When a body moves to and fro about a fixed point, we say the body is oscillatory. One complete oscillation (to and fro) is a circle. Examples of oscillatory motion include the motion of kebala need wheel of a wristwatch, the motion of a simple pendulum, the motion of a loaded test tube inside water, etc.

Note: It is possible for a body to perform two types of motion at the same time, for example, a rolling football performs both rotational and Translational motion at the same time.

5. **Relative Motion**: Relative motion is the motion of a body with respect to another. Put in another way, it is the motion of a body with respect to a reference point. All motion are relative.

What is the cause of Motion?
Answer:
Force: Force is the cause of motion and it can either be push or pull. Force is a vector

CHAPTER TWO

FUNDAMENTAL AND DERIVED QUANTITIES AND UNITS

What are fundamental quantities? Give examples.
Answer:
Fundamental quantities are physical quantities whose dimensions and units are not derived from other physical quantities.

Basically, there are three fundamental quantities in Mechanics. They are:
1. Mass denoted as 'M'. Its unit is kilogram.
2. Length denoted as 'L'. Its S.I. unit is metre.
3. Time with dimension T. its unit is second.

Fundamental Quantities	Fundamental Units
Electric Current	Ampere
Temperature	Kelvin
Amount of Substance	Mole
Luminous Intensity	Candela

What are Derived Quantities? Give examples.
Answer:
Derived quantities are those obtained by some simple combination of the fundamental quantities or unit.

Units formed by the combination of fundamental units are called derived units.

Derived Quantities	Derived Units
Velocity	Metre per second (m/s)
Acceleration	Metre per second per second (m/s^2)
Momentum	Kilogram metre per second (kgm/s)
Force	Kilogram metre per second per second (kgm/s^2) or Newton
Power	Newton metre per second (Nm/s) or Watt

DERIVATION OF UNITS OF QUANTITIES BY METHOD OF DIMENSION
Once the dimension of physical quantity is derived, the units can be written down, e.g.

What is the unit of velocity?
Answer:

$$\text{Velocity} = \frac{\text{Displacement}}{\text{Time}} = \frac{L}{T} = LT^{-1}$$

Therefore, its unit is ms^{-1}

What is the unit of pressure?
Answer:

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} = \frac{\text{Mass} \times \text{Acceleration}}{\text{Area}} = \frac{MLT^{-2}}{L^2} = ML^{-1}T^{-2}$$

The unit is therefore kgm^{-1}s^{-2} but frequently it is given as Nm^{-2}.