DYNAMICS

Newton's Laws of Motion

First law: If a body is at rest it remains at rest or if it is in motion it moves with a uniform velocity until it is acted on by resultant force or torque.

Second law: The rate of change of momentum of a body is proportional to the resultant force and occurs in the direction of force; $F = ma$

Third law: If a body A exerts a force on a body B, then body B exerts an equal but opposite force on body A, forming an action-reaction pair.

Mass and Weight

Mass	Weight
• Measured in kilograms • Scalar quantity • Constant throughout the universe	• Measured in Newtons • Vector quantity • Not constant • W = mg

Mass : is a measure of the amount of matter in a body, & is the property of a body which resists change in motion.

Weight: is the force of gravitational attraction (exerted by the Earth) on a body.

Momentum

Linear momentum: Product of mass and velocity, $p = mv$.

Force: Rate of change of momentum, i.e: $F = \dfrac{mv - mu}{t}$.

Principle of conservation of linear momentum: When bodies in a system interact, total momentum remains constant provided no external force acts on the system.

$$m_A u_A + m_B u_B = m_A v_A + m_B v_B$$

Elastic Collisions

- Total **momentum** conserved

- Total **kinetic energy** is conserved

- Velocity of approach = Velocity of seperation

$$u_A - u_B = v_B - v_A$$

Inelastic Collisions

- Total **momentum** conserved

- Total **energy** is conserved but E_k may be converted into other forms of energy e.g heat

- Velocity of approach $>$ Velocity of seperation

$$u_A - u_B > v_B - v_A$$