9ᵀʰ Class

➤ Work

❖ **Introduction:** Work in physics is defined as the product of force and displacement in the direction of the force. It is a measure of the energy transfer that occurs when an object is moved against an opposing force.

❖ **Definition of Work:** Mathematically, work (W) is given by the formula:

$W = F \cdot d \cdot \cos(\theta)$ Where:

- W is the work done,
- F is the applied force,
- d is the displacement, and
- θ is the angle between the force and displacement vectors.

❖ **Units of Work:** The unit of work is the joule (J), where $1\ J = 1\ N \cdot m$

❖ **Positive and Negative Work:**

- If the force and displacement are in the same direction, work is positive.
- If the force and displacement are in opposite directions, work is negative.

❖ **Work-Energy Theorem:** The work-energy theorem states that the work done on an object is equal to the change in its kinetic energy. Mathematically, it is expressed as: $W = \Delta KE$

Where:

- W is the work done,
- ΔKE is the change in kinetic energy.

❖ **Power:** Power (P) is the rate at which work is done or the rate at which energy is transferred. It is given by the formula: $P = w/t$ Where:

- P is power,

- W is work, and
- t is time.

❖ **Units of Power:** The unit of power is the watt (W), where $1\ W = 1\ J/s$

❖ **Practical Applications:** Understanding the concept of work is crucial in various practical applications, such as calculating the power of engines, understanding energy transfers, and designing efficient machines.

❖ **Conclusion:** The concept of work is fundamental in physics and has wide applications in understanding the mechanics of motion, energy transformation, and the functioning of various systems. It provides a foundational understanding of how forces influence the motion and energy of objects.