# 9Th Class

## ➢ Energy

### ❖ Introduction:

Energy is the ability to do work. It exists in various forms and is crucial for all physical processes. The concept of energy helps us understand and analyze different phenomena in the universe.

### ❖ Types of Energy:

1. **Kinetic Energy (KE):**
   - Kinetic energy is the energy possessed by an object due to its motion.
   - The formula for kinetic energy is $KE = 1/2mv^2$, where $m$ is the mass of the object and $v$ is its velocity.
2. **Potential Energy (PE):**
   - Potential energy is the energy stored in an object due to its position or state.
   - Gravitational potential energy ($PE_{gravity}$) is given by $PE_{gravity} = mgh$, where
   - $m$ is the mass, $g$ is the acceleration due to gravity, and $h$ is the height.
   - Elastic potential energy ($PE_{elastic}$) is the energy stored in a stretched or compressed elastic material, such as a spring.
3. **Mechanical Energy:**
   - Mechanical energy is the sum of kinetic energy and potential energy in a system.
   - In the absence of non-conservative forces like friction, the total mechanical energy of a system remains constant (law of conservation of mechanical energy).
4. **Thermal Energy:**
   - Thermal energy is the internal energy of a system due to the random motion of its particles.
   - Heat is the transfer of thermal energy between objects with different temperatures.

- **Conservation of Energy:** The law of conservation of energy states that the total energy of an isolated system remains constant. Energy can change from one form to another, but the total amount of energy in the system does not change.

- **Power:** Power is the rate at which work is done or the rate at which energy is transferred or transformed. Mathematically, power ($P$) is given by $P = \mathrm{w/t}$, where $W$ is the work done and $t$ is the time taken.
- **Transformation of Energy:** Energy can be transformed from one form to another. For example, potential energy can be converted into kinetic energy, and vice versa.
- **Renewable and Non-renewable Energy:** Energy sources are classified as renewable (e.g., solar, wind) or non-renewable (e.g., fossil fuels). Understanding and utilizing renewable energy sources are important for sustainable development.