

## CBSE Class 11 PHYSICS

### Revision Notes

### CHAPTER 12

### THERMODYNAMICS

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1. Thermal equilibrium
  2. Zeroth law of thermodynamics
  3. Heat, internal energy and work
  4. First law of thermodynamics, Isothermal and adiabatic processes
  5. Second law of thermodynamics, reversible and irreversible processes
  6. Heat engines and Refrigerators
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- **Thermodynamical system** : An assembly of extremely large number of gas molecules is called a thermodynamical system. The pressure P, volume V, temperature T and heat content Q are called Thermodynamical parameters.
- **Zeroth Law of Thermodynamics** : (Concept of temperature) According to this law, when thermodynamics systems A and B are separately in thermal equilibrium with a third thermodynamics system C, then the systems A and B are in thermal equilibrium with each other also.

**Internal Energy of a Gas is the sum** of kinetic energy and the potential energy of the molecules of the gas.

$K.E./molecule = \frac{1}{2}mc^2 = \frac{3}{2}kT$  where K is Boltzmann's constant. Internal energy of an ideal gas is wholly kinetic.

- **First Law of Thermodynamics** (principle of conservation of energy) According to this law  $dQ = dU + dW$  Where dQ is the small amount of heat energy exchange with a system, dU is small change in internal energy of the system and dW is the small external work done by or on the system.
- **Second Law of Thermodynamics**: It is impossible for self acting machine, unaided by

an external agency to convey heat from the body at lower temperature to another at higher temperature. This statement of the law was made by Clausius.

- According to Kelvin, it is impossible to derive a continuous supply of work by cooling a body to a temperature lower than that of the coldest of its surroundings.
- Heat Engines : A heat engine is a device which converts heat energy into mechanical energy. Efficiency of a heat engine is the ratio of work done (W) by the engine per cycle of the energy absorbed from the source  $Q_1$  per cycle.

$$\eta = \frac{W}{Q_1} = \frac{Q_1 - Q_2}{Q_1} = 1 - \frac{Q_2}{Q_1} \text{ where } Q_2 = \text{heat rejected to the sink}$$