

Marwari college Darbhanga

Subject---physics (Hons)

Class--- B. Sc. Part 1

Paper—02 ; Group—A

Topic--- Thermal physics (Thermodynamic concept)

Lecture series—25

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Thermodynamics

Thermodynamics is the branch of physics that deals with the relationships between heat and other forms of energy. In particular, it describes how thermal energy is converted to and from other forms of energy and how it affects matter.

Thermal energy is the energy a substance or system has due to its temperature, i.e., the energy of moving or vibrating molecules,

Heat

Thermodynamics, then, is concerned with several properties of matter; foremost among these is heat. Heat is energy transferred between substances or systems due to a temperature difference between them.

As a form of energy, heat is conserved, i.e., it cannot be created or destroyed. It can, however, be transferred from one place to another. Heat can also be converted to and from other forms of energy. For example, a steam turbine can convert heat to kinetic energy to run a generator that converts kinetic energy to electrical energy. A light bulb can convert this electrical energy to electromagnetic radiation (light), which, when absorbed by a surface, is converted back into heat

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Temperature

The amount of heat transferred by a substance depends on the speed and number of atoms or molecules in motion.

The faster the atoms or molecules move, the higher the temperature, and the more atoms or molecules that are in motion, the greater the quantity of heat they transfer.

Temperature is "a measure of the average kinetic energy of the particles in a sample of matter, expressed in terms of units or degrees designated on a standard scale,"

The most commonly used temperature scale is Celsius, which is based on the freezing and boiling points of water, assigning respective values of 0 degrees C and 100 degrees C. The Fahrenheit scale is also based on the freezing and boiling points of water which have assigned values of 32 F and 212 F, respectively.

Thermodynamic system

A thermodynamic system is a body of matter and/or radiation, confined in space by walls, with defined permeabilities, which separate it from its surroundings. The surroundings may include other thermodynamic systems, or physical systems that are not thermodynamic systems. A wall of a thermodynamic system may be purely notional, when it is described as being 'permeable' to all matter, all radiation, and all forces.

a state of a physical system in which it is in mechanical, chemical, and thermal equilibrium and in which there is therefore no tendency for spontaneous change.

Thermal Equilibrium

The condition under which two substances in physical contact with each other exchange no heat energy. Two substances in thermal equilibrium are said to be at the same temperature.

Mechanical Equilibrium

A system is said to be in mechanical equilibrium when no mechanical work is done by one part of the system on any

other part of the system i.e. mechanical properties are uniform throughout the system.

Chemical equilibrium

A system is in chemical equilibrium if the composition of the system is the same everywhere .

Adiabatic Process

An adiabatic process occurs without transferring heat or mass between a thermodynamic system and its surroundings.