

1st Law of Thermodynamics

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Thermodynamics is the study of the relations between heat, work, temperature and energy. It describes how thermal energy is generated to and from other forms of energy and how it affects. For example, a electric stove burner converts electrical energy to heat and conducts that energy through the pot of water. This increases the kinetic energy of water molecules causing them to move faster. At certain temperature the atoms have gained enough energy to break free of the molecular bonds.

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

Heat:- Heat is energy transferred between substances or system due to temperature difference between them. ~~As~~ As a form of energy heat is conserved i.e. it can not be created nor destroyed.

Temperature:- The amount of heat transferred depends on the speed and no. of atoms or molecules in motion, so faster the atoms or molecules move, the higher the temperature.

Specific heat:- The amount of heat required to increase the temperature is called specific heat.

First Law of Thermodynamics:-

The first law of thermodynamics is a version of law of conservation of energy adopted for thermodynamic process distinguishing two kinds of transfer of energy as heat and thermodynamic work and relating them to a function of a body's state called internal energy.

The law of conservation of energy states that the total energy of an isolated system is constant. Energy can be transferred from one form to another but neither be created nor be destroyed.

For a thermodynamic process without transfer of matter, the first law of thermodynamics is the total change in the internal energy of a system is the sum of heat added to it and the work done on it.

$$\Delta U = Q - W$$

Where ΔU = Change in internal energy

Q = quantity of energy supplied to the system as heat.

W = Amount of thermodynamic work done done by the system on its surroundings

Internal energy (U) of a system to be the sum of kinetic energy of all the particles.

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- the potential energy of interactions between particles.

The kinetic and potential energy associated with random motion of molecules constitute the internal energy (U).

In the first law of thermodynamics while Q and W depend on path, $\Delta U = Q - W$ does not. The change of internal energy of a system during any thermodynamic process depends only on the initial and final stages not on path heading from one to another.

Questions for students:-

- i) What is thermodynamics?
- ii) What is 1st Law of thermodynamics?
- iii) What do you mean by thermal energy, heat, temperature and specific heat.

The End