

4

Thermodynamics

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4.1 Introduction

Thermodynamics is the study of conversion of work (or any form of energy) into heat and the other way round. It is an important branch of physics having many practical applications.

According to modern theory, heat is a form of energy. When a hot object is in contact with a cold object, the hot object gets cooler and the cold object becomes warmer, and both the objects reach the same temperature after some time due to exchange of heat.

Q.1. What is thermodynamics?

Ans: Thermodynamics is the branch of physics that deals with the concepts of heat and temperature and the inter-conversion of heat and other forms of energy.

4.2 Thermal Equilibrium

Q.2. Can you recall? (Textbook page no. 73)

When a piece of ice is placed in water at room temperature, the ice melts and water cools down. Why does their temperature change?

Ans:

- i. Water at room temperature is at higher temperature than the temperature of ice.
- ii. When ice is placed in the water, the heat energy is transferred from water at higher temperature to ice at lower temperature.
- iii. In this way, the temperature of ice increases and it melts whereas, the temperature of water decreases and it cools down.
- iv. This temperature change takes place due to exchange of heat.

Q.3. When do two systems are said to be in thermal equilibrium?

Ans:

- i. Two systems in thermal contact with each other are said to be in thermal equilibrium if they do not transfer heat between each other.
- ii. When two objects are at the same temperature, they are in thermal equilibrium.

Q.4. Can you tell? (Textbook page no. 76)

Why different objects kept on a table at room temperature do not exchange heat with the table?

Ans:

All the objects kept on table along with the table are at same temperature (room temperature) i.e., all the objects are in thermal equilibrium with the table. Hence, they do not exchange heat with the table.

4.3 Zeroth Law of Thermodynamics

Q.5. State zeroth law of thermodynamics.

Ans: If two systems are each in thermal equilibrium with a third system, they are also in thermal equilibrium with each other.

Q.6. Explain zeroth law of thermodynamics using a schematic representation.

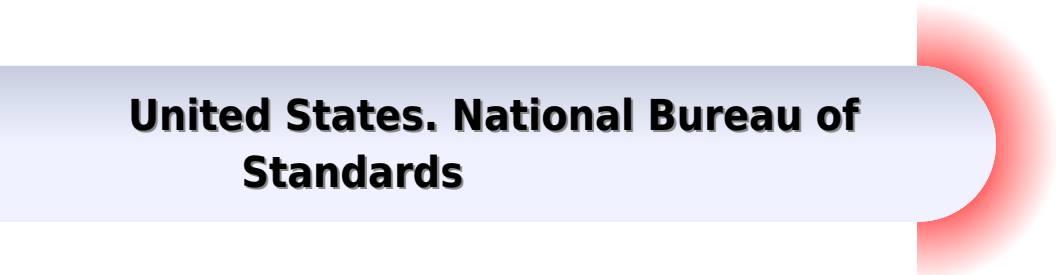
Ans: **Statement:** If two systems are each in thermal equilibrium with a third system, they are also in thermal equilibrium with each other.



Schematic representation of zeroth law of thermodynamics

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