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Student:

## Thermodynamics: Introduction

Heat, Temperature, and the Zeroth Law of Thermodynamics

**Objective:** To understand the concepts of heat and temperature, and to introduce the Zeroth Law of Thermodynamics.

### I. Understanding Heat

Heat as a form of energy transferred between bodies or systems due to a temperature difference.

### II. Exploring Temperature

Temperature is a measure of the average kinetic energy of particles in a substance. Temperature influences the physical state and behavior of matter.

### III. The Zeroth Law of Thermodynamics

Statement of the Zeroth Law: "If two systems are in thermal equilibrium with a third system, they are in thermal equilibrium with each other."

This law helps us establish the concept of temperature.

#### **In-Class Problem for Discussion:**

Consider two cups of water, one at  $40^{\circ}\text{C}$  and the other at  $20^{\circ}\text{C}$ . If these two cups are placed in a room that is maintained at a constant temperature of  $25^{\circ}\text{C}$ , what happens over time in terms of heat transfer and thermal equilibrium? Discuss using the concepts of heat, temperature, and the Zeroth Law of Thermodynamics.