

Section 6.1: Introduction to Thermochemistry

Thermochemistry refers to the study of heat flow or heat energy in a chemical reaction. In a study of Thermochemistry the chemical energy is transformed into Heat Energy during a chemical reaction.

Units of Energy

The System International unit (SI unit) of energy is $\text{kg}\cdot\text{m}^2\cdot\text{s}^{-2}$

This was given the name **joule (J)**.

Thus, the SI unit of energy is joule (J).

$$1 \text{ joule (J)} = 1 \text{ kg}\cdot\text{m}^2\cdot\text{s}^{-2}$$

$$1000 \text{ J} = 1 \text{ kJ}$$

In order to understand how this unit comes about, remember that the potential energy of an object of mass m at altitude h is mgh .

$$m \equiv \text{kg} \quad \text{Mass}$$

$$g \equiv \text{m}\cdot\text{s}^{-2} \quad \text{Acceleration}$$

$$h \equiv \text{m} \quad \text{Height}$$

The most common unit of energy in chemistry is the **calorie** (1 cal = 4.184 J). Remember the “food” calorie is denoted Calorie (Cal), with a capital C (1 Cal = 1000 cal)

Heat energy is the energy that flows into or out of a system because of a difference in temperature between the **system** and its **surroundings**. The system is a part of the universe on which we focus our attention. The **surrounding** is the rest of the universe with which the exchange of heat energy occurs.

For example: Consider a beaker of water in contact with a hot plate. The water in the beaker is the System. Here, the hot plate and the beaker holding the water is the surrounding.

For practical purposes only those materials in close contact with the system are called surroundings.

The direction of heat flow must be studied from the “system’s” view point. Heat is expressed by the symbol “ q ”. “ q ”, in common terms, is the quantity of heat. “ q ” is expressed in J or kJ.

When the heat flows from the surroundings into the system, the process is called endothermic. Look at the video of an endothermic process on the DVD. For an endothermic process, $q > 0$ or q is positive.

When heat flows from the system into the surroundings, the process is called exothermic. Look at the video of an exothermic process on the DVD. For an exothermic process, $q < 0$ or q is negative.

Remember: Exothermic reaction = Heat is given off during the reaction ($q < 0$).
Heat leaves reactants and products and spreads into surroundings.
Endothermic reaction = Heat is taken up or absorbed during the reaction ($q > 0$). Heat flows from the surroundings into the system.