

Chapter 6 Thermochemistry: Energy Flow and Chemical Change

The first law of thermodynamics is the focus for the AP curriculum in this chapter and is consistently tested. It is important to know all of the following concepts for the exam. Except for nuclear reactions where mass and energy significantly interchange, chemical reactions obey the laws of conservation of matter and conservation of energy separately within the limits of measurement. This means atoms are conserved in chemical reactions and energy changes must sum up in an energy cycle. Thermal energy is the random movement of atoms and molecules (translation, vibration, and rotation) and chemical energy is stored within the structure of substances in chemical bonds. Chemical reactions rearrange atoms in molecules and therefore change the total amount of chemical energy stored in bonds. Energy is absorbed, released, or converted to other forms of energy in the process. The most usual conversion is to thermal energy, but sometimes electromagnetic radiation (light) or electrical energy are involved.

The amount of heat or thermal energy absorbed or released in a chemical reaction is designated by the symbol q . Temperature is not heat, but a measure of the thermal energy content of a substance. Heat is the transfer of thermal energy between two bodies or objects. Thermochemistry is the name given to the study of heat exchange in chemical reactions. Other concepts included are calorimetry, bomb calorimetry, Hess's Law, thermodynamic data, standard states, state functions, exothermic reactions, endothermic reactions, specific heat (c), and molar heat capacity (C), and the energy units calorie (cal) and joule (J).