

Chapter 17 Notes
Thermochemistry

1. **Energy is exchanged or transformed in all chemical reactions and physical changes of matter. “Temperature “ and “Heat flow” can be described in terms of the motion of molecules(or atoms):**
 - a) **Temperature is a measure of the average kinetic energy of molecular motion in a sample.**
 - b) **Heat is energy transferred from a sample at higher temperature to one at lower temperature. Often, heat is described as flowing from the “system” to the “surroundings” or from the “surroundings” to the “system”**
 - c) **The “system” is defined by its boundaries, with the “universe” frequently considered the surroundings.**
2. **Chemical processes can either release(EXOTHERMIC) or absorb(ENDOTHERMIC) thermal energy.**
 - a) **Endothermic processes absorb heat, and their equations can be written with heat as a reactant**
 - b) **Exothermic processes release heat, and their equations can be written with heat as a product**

- c) The “net” heat released to or absorbed from the surroundings comes from the making and breaking of chemical bonds during a reaction.
- d) Breaking a bond always requires energy and making a bond almost always releases energy. The amount of energy per bond depends on the strength of the bond.

3. Heat flow is measured in two common units, the calorie and the joule:

- a) A calorie(cal) is defined as the quantity of heat needed to raise the temperature of 1 g of pure water 1 degree C. The word calorie is written with a small “c” except when referring to the energy in food. The dietary Calorie, written with a capital “C”, always refers to the energy of food. One Dietary Calorie is actually equal to 1000 calories, or one kilocalorie
- b) The joule is the SI unit of energy. One joule of heat raises the temperature of 1 g of pure water 0.2390 C.
- c) You can convert between calories and joules as follows:

$$1 \text{ J} = 0.2390 \text{ cal} \qquad 4.184 \text{ J} = 1 \text{ cal}$$