Unit 5: Thermochemistry

Specific Heat

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- ***specific heat****:* willingness of an object to change temperature, with the symbol C_p (the p means "under constant pressure")
- ***specific heat****:* the amount of energy required to change the temperature of one gram of a substance by 1°C

Specific Heat Units

- **1 calorie** = energy required to heat 1 gram of ***water*** by 1°C
- **1 Calorie** (food labels) = 1 kilocalorie
- 1 calorie = 4.184 joules
- 1 kcal = 4.184 kJ

Specific Heat

Duluth, next to Lake Superior, stays cool in the summer and relatively warm in the winter. Why?

Substance	Specific Heat (J/g°C)
copper	0.3845
granite	0.7953
lead	0.1276
ice	2.06
water	4.184

Calculating Heat (Energy Transfer)

$$\Delta H = C_p \bullet m \bullet \Delta T$$

- C_p: specific heat (units: J/g°C)
- m: mass (units: g)
- ΔT: change in temperature (units: °C)

Note: ΔH is sometimes called "q"

Heats of Reaction

- There are different types of changes in heat (some listed below):
  - ΔH_{rxn} = heat of reaction (heat absorbed or released during a reaction
  - ΔH_f^0 = heat of formation (heat absorbed or released during synthesis of one mole at 298K and 1 atm of pressure)
  - ΔH_{sol} = heat of solution (heat absorbed or released when a substance dissolves)
  - ΔH_{comb} = heat of combustion (heat absorbed or released when a substance combusts)
  - ΔH_{vap} = heat of vaporization (energy needed to boil one mole
  - ΔH_{fus} = heat of fusion (energy needed to melt one mole)

Calculating Heat Example #1

$$\Delta H = C_p \bullet m \bullet \Delta T$$

3.05 kg of aluminum is heated from 22.1°C to 67.5°C. Calculate the heat absorbed in both J and kJ by the metal. The specific heat of aluminum is 0.900 J/g°C.

Calculating Heat Example #2

A 205-g block of Nelsonium at temperature of 90°C is dropped into 402 g of water at 27°C. The final temperature of the mixture is 31°C? What is the specific heat of Nelsonium?