

**General Chemistry II**  
**Topic: Chemical Thermodynamics**

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The student should be able to:

1. State and recognize instances of the First Law of Thermodynamics.
2. Define and relate to one another the following terms:  $\Delta E_{\text{system}}$ ,  $q$ , and  $w$ .
3. Define and relate to one another the following terms:  $\Delta H$ ,  $\Delta E$ ,  $P\Delta V$ ,  $\Delta nRT$ ,  $\Delta E + \Delta nRT$ , enthalpy change, exothermic reaction, and endothermic reaction.
4. Define Standard Heat of Formation.
5. Solve problems dealing with standard heats of reaction and standard heats of formation.
6. Define calorimetry and specific heat.
7. Solve heat lost = heat gained problems.
8. State Hess' Law of Constant Heat Summation, and relate it to the First Law of Thermodynamics.
9. Determine heats of reaction using Hess' Law.
10. Define and state the difference between bond dissociation energy and average bond energy.
11. Calculate bond energies from heats of reaction and vice versa.
12. Define entropy, and state the Second Law of Thermodynamics.
13. Relate changes in enthalpy and entropy to free energy changes, and explain the relationship between free energy change and the spontaneity of a chemical reaction.
14. Calculate standard free energy change values and standard entropy change values for specified chemical reactions given standard free energy change and standard entropy change values for reactants and products.
15. Relate the concept of free energy change for a chemical reaction to the concept of chemical equilibrium.