SC151 - CHAPTER 9 LEARNING OBJECTIVES

To satisfy the minimum requirements for this course, you should be able to:

Discuss the nature of energy by:
• giving examples of different forms of energy and examples of energy converting from one form to another.
• explaining the differences between energy (E) and work (w), between thermal energy and temperature (T), and between thermal energy and heat (q).
• converting between units of Joules, calories, and Calories.

Demonstrate an understanding of thermochemistry by:
• explaining the relationships among the following: system, surroundings, and universe; exothermic process and endothermic process; internal energy (E) and enthalpy (H); \( \Delta E \), \( \Delta H \), q_v, and q_p.
• sketching an energy diagram such as those shown in Figures 9.2 and 9.3 of the text, given the energy changes in the processes involved.
• associating the sign of \( \Delta H \) with whether the process is exothermic or endothermic.
• using a thermochemical equation to calculate the quantity of heat involved in a reaction given the quantity of reactants and the enthalpy change for the reaction on a mole basis, or to calculate the amount of reactant needed to generate a given amount of heat.

Demonstrate an understanding of thermodynamics by:
• explaining why energy (E), pressure (P), volume (V), temperature (T), and enthalpy (H) are state functions and why heat (q) and work (w) are not state functions.
• calculate the amount of work done when a gas changes volume at constant pressure using the equation \( w = -P\Delta V = -RT(\Delta n) \).
• stating the first law of thermodynamics in words and perform calculations using the mathematical equivalent of the first law \( \Delta E = q + w \).
• explaining the sign conventions for heat and work.

Demonstrate an understanding of the concept of calorimetry by:
• explaining the difference between heat capacity, specific heat and molar heat capacity, and converting among these quantities.
• performing calorimetric calculations to determine heat capacities, temperature changes, or the amount of heat absorbed or released by thermal transfer or a chemical reaction.
• using constant pressure or constant volume calorimetry data to calculate the enthalpy change of reaction \( \Delta H_{rxn} \) or the change of internal energy \( \Delta E_{rxn} \) of reaction.

Understand the definition of a standard state, and calculate the standard enthalpy of reaction \( \Delta H^0_{rxn} \) using:
• standard enthalpies of formation \( \Delta H^0_f \) of reactants and products.
• Hess's law.