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

1. **Discuss the nature of energy by:**
   - comparing and contrasting kinetic and potential energy
   - identifying heat \( q \) and work \( w \) as the two forms of transient energy (energy transfer)
   - distinguishing between heat \( q \), internal energy \( U \) and temperature \( T \)

2. **Demonstrate an understanding of thermochemistry by:**
   - explaining the relationships among the following: system, surroundings, and universe; exothermic process and endothermic process; internal energy \( U \) and enthalpy \( H \); \( \Delta U \), \( \Delta H \), \( q_v \), and \( q_p \)
   - associating the sign of \( \Delta H \) with whether the process is exothermic or endothermic
   - calculating the quantity of heat involved in a reaction given the quantity of reactants and the enthalpy change for the reaction
   - calculating the amount of reactant needed to generate a given amount of heat
   - distinguishing between state functions and path functions and identifying examples of each
   - stating the first law of thermodynamics in words and performing calculations using the first law for a closed system \( (\Delta U = q + w) \)
   - explaining the sign conventions for heat and work

3. **Demonstrate an understanding of the concept of calorimetry by:**
   - describe the concept of specific heat capacity (symbolized \( C \))
   - performing calculations using the equation \( q = C \times m \times \Delta T \)
   - using constant pressure calorimetry data to calculate the standard reaction enthalpy \( (\Delta_r H^o = q_p) \) or to calculate the specific heat of a substance

4. **Name the six phase change processes and be able to:**
   - use Kinetic Molecular Theory to explain the relative energy changes associated with each phase change \( (\Delta_{vap} H, \Delta_{fus} H, \Delta_{sub} H) \)
   - use heat capacities and heats of fusion and vaporization to calculate the heat absorbed or evolved when a substance is heated or cooled and undergoes phase changes

5. **Calculate the standard enthalpy of reaction \( (\Delta_r H^o) \) using:**
   - standard enthalpies of formation \( (\Delta_f H^o) \) of reactants and products (direct method)
   - Hess's law (indirect method)

6. **NavApp: Explosives**
   - describe the characteristics of explosions and explosives, and describe the main causes of the destructive power of chemical explosives
   - distinguish between high and low explosives, and explain the uses of each
   - define the terms deflagrate, detonate, shock wave, and burning front
   - recognize that nitrogen and/or oxygen are found in most explosives as part of high-energy bonding arrangements such as nitro \(-\text{NO}_2\) , nitrate \(-\text{O-NO}_2\) or nitramine \(-\text{N-NO}_2\) groups, and peroxides \(-\text{O-O}\) or perchlorate \(-\text{O-ClO}_3\) groups
   - approximate the energy change for an explosion by calculating the enthalpy change for the explosion reaction
   - calculate the temperature change of gases formed in an explosion