

OpenStax	Learning Outcomes	
5.1	Define terms associated with the energy of a reaction.	
5.1		Distinguish between energy and work.
5.1		Define kinetic energy, potential energy, and thermal energy.
5.1		State the law of conservation of energy.
5.1		Define heat and work.
5.1		Define energy, system and surrounding.
5.1		Distinguish among kinetic, thermal, potential, and chemical energies.
5.1		Convert between energy units.
5.2	Describe the basic principles of thermodynamics.	
5.3		Explain connections between change in internal energy and change in enthalpy.
5.3		Define state functions.
5.3		Recall the first law of thermodynamics.
5.3	Calculate the change in internal energy.	
5.3		Define internal energy.
5.3		Recall the sign convention of heat.
5.3		Recall the sign convention of work.
5.3		Explain how the sign of $\Delta U$ (internal energy) indicates the flow of energy.
		Calculate work.
5.3		State the equation for the relationship between pressure, volume, and work and identify all variables.
5.3		Determine PV work.
5.1	Distinguish between specific heat and heat capacity.	
5.1		Define specific heat and heat capacity.
5.2		State the equation relating heat, mass, specific heat, and temperature and identify all variables.
5.2		Use the equation relating heat, mass, specific heat, and temperature in calculations.
5.2		State the equation relating heat, heat capacity, and temperature and identify all variables.
5.2		Use the equation relating heat, heat capacity, and temperature and define all variables.
5.2	Use the principles of calorimetry to measure heat transfer between objects.	
5.2		Recall how thermal energy is transferred between the system and surrounding.
5.2		Complete calculations for the transfer of heat between two substances.
5.2		Define calorimetry.
5.2		Recognize the components of a constant pressure calorimeter.
5.2	Distinguish between properties of endothermic and exothermic processes.	
5.3		Define enthalpy.
5.1		Define endothermic and exothermic.
5.2		Sketch energy diagram for endothermic and exothermic processes.
5.2		Explain the sign convention used for endothermic and exothermic processes.
5.3	Use enthalpy in calculations.	
5.3		Use thermochemical equations to convert between quantity of a substance and heat.
5.3		Use measured values from a constant pressure calorimeter to calculate unknown values such as enthalpy change or heat capacity.
5.3		Describe the relationships between the chemical equation and $\Delta H$ of the reaction as the reaction is modified.
5.3		Explain the concept of Hess's Law.
5.3		Use Hess's Laws to determine the enthalpy change of a reaction.
5.3		Define standard state for gas, liquid, solid, or solution.
5.3		Define enthalpy of formation.
5.3		Express the reaction represented by a given enthalpy of formation.
5.3		Use values of enthalpy of formation to determine the enthalpy change for a given reaction.
5.3		Determine the enthalpy of formation for a substance given the enthalpy change of a reaction.