

Chapter 10: Energy and Energy Changes: Physical and Chemical Change

NGSS Standards Addressed:

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields

LHS Core Values:

~Students will be thoughtful communicators who read, write, listen and speak effectively in preparation for careers and/or post-secondary education

~Students will be creative and practical problem solvers

~Students will be responsible users of technology and media

~Students will demonstrate continuous effort towards proficiency in all requirements for graduation

Objectives:

The student will:

1. Give examples of different forms of energy.
2. List the important units in which energy is expressed and convert from one to another.
3. Define and use the concepts of thermal equilibrium, internal energy and molecular kinetic energy.
4. Describe how the change in internal energy of a system is related to the exchanges of heat (q) and work (w) between the system and its surroundings.
5. To understand how bond breaking and bond making affect a system's potential energy.
6. Distinguish between and identify energy changes as exothermic or endothermic
7. Define the first law of thermodynamics both verbally and by means of an equation. (The Law of Conservation of Energy)
8. Describe the term *state function* and describe its importance in thermochemistry.
9. Give examples of state functions.

10. To utilize algebraic sign conventions that describe whether heat and work are flowing in or out of a system.
11. Define enthalpy, and relate enthalpy change (ΔH) in a process occurring at a constant pressure of heat added to or lost by the system during the process.
12. State Hess's law and apply it to calculate the enthalpy change in a process that could be combined to yield the reaction of interest.
13. Define the terms *heat capacity* and *specific heat*.
14. Calculate any of the following quantities given the other three: heat, quantity of material, temperature change and specific heat.
15. Calculate the heat capacity of a calorimeter, given the temperature change and quantity of heat involved; also calculate the heat evolved or absorbed in a process from knowledge of the heat capacity of the system and its temperature change.
16. Explain and identify the concepts of energy spread, matter spread and entropy
17. Explain how the above concepts give rise to the second Law of Thermodynamics.