

6 • Energy and Chemical Reactions

STUDY LIST

Driving Forces

I can...

- state that product-favored (spontaneous) reactions tend toward maximum entropy, ΔS , and minimum enthalpy, ΔH .
- state the sign of ΔH based on observation of warming or cooling of the surroundings.
- correctly apply the terms exothermic and endothermic to situations where the surroundings are warming or cooling.
- draw a PE curve (uphill or downhill) based on information about warming or cooling of the surroundings.

Measuring Heat

- state the units of heat capacity, specific heat, and molar heat capacity as well as the significance of each.
- convert between the heat units of calories and Joules. ($4.184 \text{ J} = 1 \text{ calorie}$)
- use calorimetry ($q = mC\Delta T$) to calculate heat changes during temperature changes.
- calculate the heat transferred when two objects, at different temperatures, come into contact.

Energy = Heat and Work

- state the difference between work and heat energy.
- state the difference between system and surroundings.
- recognize the system and the surroundings in a chemical or physical system.
- calculate the change in internal energy based on changes in heat absorbed by the system and work done by the system.
- state that ΔH is a more general (and useful) measure of energy than ΔE and that $\Delta H = q$ when a reaction occurs at constant pressure.

Chemical Work = Expanding Gases

- relate physical work ($w = F \cdot d$) and chemical work ($w = P \cdot \Delta V$).
- calculate **PV work** done by an expanding gas.
- state that no work is done in a **constant volume** situation such as a bomb calorimeter.

Calculating ΔH -- Hess's Law

- state the definition of a state function.
- list examples of properties that are and are not state functions.
- write the equation for the **heat of formation** of a substance.
- state that the heat of formation of an **element** under standard conditions has a value of zero.
- use **Hess's Law** to calculate the energy of a chemical or physical change.

Calculating Heat During Phase Changes – Heats of Fusion and Vaporization

- use heats of vaporization or heats of fusion to calculate heat changes during phase changes.
- write an equation showing the heat of fusion or heat of vaporization.