

6.S: Putting the Second Law to Work (Summary)

Learning Objectives

After mastering the material presented in this chapter, one will be able to:

1. Define the free energy functions A and G , and relate changes in these functions to the spontaneity of a given process and constant volume and pressure respectively.
2. Use the definitions of entropy and reversible work of expansion to write an equation that combines the first and second laws of thermodynamics.
3. Utilize the combined first and second law relationship to derive Maxwell Relations stemming from the definitions of U , H , A , and G .
4. Utilize the Maxwell Relations to derive expressions that govern changes in thermodynamic variable as systems move along specified pathways (such as constant temperature, pressure, volume, or adiabatic pathways.)
5. Derive and utilize an expression describing the volume dependence of A .
6. Derive and utilize an expression describing the pressure dependence of G .
7. Derive and utilize expressions that describe the temperature, dependence of A and G .
8. Derive an expression for, and evaluate the difference between C_p and C_V for any substance, in terms of T , V , α , and κ_T .

Vocabulary and Concepts

- free energy
- Gibbs Free Energy
- Gibbs function
- Gibbs-Helmholtz equation
- Helmholtz function
- maximum work
- Maxwell Relation
- standard free energy of formation (ΔG_f°)

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