

Chapters 6, 12 and 17: The Basic Vocabulary of Thermodynamics

Thermodynamics describes the macroscopic properties of matter, and predicts how energy affects these properties. The laws of thermodynamics are empirical; they cannot be derived from more fundamental concepts. The power of thermodynamics (and its weakness!) is that it does not depend on any theory of the structure of matter (Chapters 7-10).

System: The region of space of interest, with physical or mathematical boundaries.

E.g. the reactants and products of a chemical reaction, or a sample of an ideal gas.

Surroundings: The rest of the universe (!); external to system.

State: (1) A system with measurable values of P , V , n , T , **and**

(2) A system at equilibrium-- no net observable change

$$P_{\text{sys}} = P_{\text{ext}} \equiv P \text{ and } T_{\text{sys}} = T_{\text{ext}} \equiv T$$

State Function: (1) A property used to define a state (P , V , n , T), **or**

(2) A property whose change in value depends only on initial and final states: *E.g.* ΔP , ΔV , Δn , ΔT , ΔH

State functions are **path independent**.

Non-State Function: A physical quantity (*e.g.* heat (q), work (w)) that characterizes the process of going from one state to another

Non-state functions are in general **path dependent (don't use Δ)**