Notes for Lectures on Thermodynamics
Postulates of Thermodynamics

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1. There exist particular states of simple systems, that are characterized, macroscopically by the internal energy, the volume V and the mole numbers $N_1, N_2, \cdots, N_k$ of the chemical components.

2. There exists a function, called the entropy S of the extensive parameters of any composite system, defined for all equilibrium states and having the following property: The values assumed by the extensive parameters in the absence of an internal constraint are those that maximize the entropy over the manifold of constrained equilibrium states.

3. The entropy of a composite system is additive over the constituent subsystems. The entropy is continuous and differentiable and is monotonically increasing function of energy.

4. The entropy of any system vanishes in the state for which

$$\left(\frac{\partial U}{\partial S}\right)_{V,N_1,\cdots,N_k} = 0$$

This condition means that the entropy vanishes at absolute zero temperature.
An understanding of postulates requires clear understanding of the following concepts

1. Internal energy

2. Entropy

3. Equilibrium states

4. Extensive parameters

5. Internal constraints

6. Additive property of entropy

7. Temperature as defined by $\left(\frac{\partial U}{\partial S}\right)_{V,N}$