

## CHAPTER OVERVIEW

### 5: Thermodynamic Potentials and Equilibrium

#### Extensive and Intensive Variables

All quantities in thermodynamics fall into two types: extensive and intensive. If we consider two independent systems, quantities which add up to give the corresponding quantities for the complete system are characterized as extensive quantities. The volume  $V$ , the internal energy  $U$ , the enthalpy, and as we will see later on, the entropy  $S$  are extensive quantities. If we divide a system into subsystems, those quantities which remain unaltered are called intensive variables. The pressure  $p$ , the temperature  $T$ , the surface tension are examples of intensive variables.

In any thermodynamic system, there is a natural pairing between extensive and intensive variables. For example, pressure and volume go together as in the formula  $dU = dQ - pdV$ . Temperature is paired with the entropy, surface tension with the area, etc.

[5.1: Thermodynamic Potentials](#)

[5.2: Thermodynamic Equilibrium](#)

[5.3: Phase Transitions](#)

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