

## Boltzmann Distribution and Helmholtz Free Energy

---

<b>BOLTZMANN FACTOR</b>	<b>58</b>
Partition Function	61
Example: Energy and Heat Capacity of a Two State System	62
Definition: Reversible Process	64
<b>PRESSURE</b>	<b>64</b>
Thermodynamic Identity	67
<b>HELMHOLTZ FREE ENERGY</b>	<b>68</b>
Example: Minimum Property of the Free Energy of a Paramagnetic System	69
Differential Relations	70
Maxwell Relation	71
Calculation of $F$ from $Z$	71
<b>IDEAL GAS: A FIRST LOOK</b>	<b>72</b>
One Atom in a Box	72
Example: $N$ Atoms in a Box	74
Energy	76
Example: Equipartition of Energy	77
Example: Entropy of Mixing	78
<b>SUMMARY</b>	<b>80</b>
<b>PROBLEMS</b>	<b>81</b>
1. Free Energy of a Two State System	81
2. Magnetic Susceptibility	81
3. Free Energy of a Harmonic Oscillator	82
4. Energy Fluctuations	83
5. Overhauser Effect	84
6. Rotation of Diatomic Molecules	84
7. Zipper Problem	85
8. Quantum Concentration	85