PH2610 Classical and Statistical Thermodynamics
Course Content

Section 1 Introduction to Classical Thermodynamics

1.1 Introduction – Macroscopic and microscopic descriptions

1.2 Systems and Variables

1.3 Thermodynamic Equilibrium

- 1.3.1 Equilibrim
- 1.3.2 Thermodynamic state
- 1.3.3 Functions of state
- 1.3.4 Reversible processes
- 1.3.5 Cyclic processes
- 1.3.6 Temperature, thermal equilibrium and the zeroth law of thermodynamics
- 1.3.7 Temperature scales

1.4 The First Law of Thermodynamics

1.5 Work

- 1.5.1 Expression for work
- 1.5.2 An example: work done on a gas
- 1.5.3 Other examples of expressions for work

Section 2 Introduction to Statistical Mechanics

2.1 Introducing entropy

- 2.1.1 Boltzmann's formula

2.2 The spin 1/2 paramagnet as a model system

- 2.2.1 Quantum states of a spin 1/2 paramagnet
- 2.2.2 The notion of a microstate
- 2.2.3 Counting the microstates
- 2.2.4 Distribution of particles among states
- 2.2.5 The average distribution and the most probable distribution

2.3 Entropy and the second law of thermodynamics

- 2.3.1 Order and entropy
- 2.3.2 The second law of thermodynamics
- 2.3.3 Thermal interaction between systems and temperature

2.4 More on the S=1/2 paramagnet

- 2.4.1 Energy distribution of the S=1/2 paramagnet
- 2.4.2 Magnetisation of $S = 1/2$ magnet — Curie's law
- 2.4.3 Entropy of $S = 1/2$ magnet

2.5 The Boltzmann distribution

- 2.5.1 Thermal interaction with the rest of the world − using a Gibbs ensemble
- 2.5.2 Most likely distribution
- 2.5.3 What are α and β?
- 2.5.4 Link between the partition function and thermodynamic variables
- 2.5.5 Finding Thermodynamic Variables