

My Thermal & Statistical Physics Notes
for Jomo Kenyatta University of Agriculture and Technology

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Introduction

Thermal and Statistical Physics is the best of the best of the Sciences and I aim to cover a lot in my Notes.

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Chapter 1

Heat and Temperature

1.1 What is Heat?

We could think of heat as:

- The transfer of thermal energy from a region of high thermal energy to a region of low thermal energy, provided that the two regions are in contact, is known as **heat**.
- The transfer of thermal energy between molecules within a system

The SI unit for Heat is the joule J

Just a heads up...

A body can only lose or gain heat but not possess heat as heat is a measure of thermal energy and not a property of matter.

1.2 What is Temperature?

We can define temperature as:

- (*layman*) the hotness or coldness of a body.
- (*more technical*) a measure of the mean kinetic energy of a body in a thermal energy system.

The SI unit for Temperature is the kelvin K.

Just a heads up...

There are many ways in which Temperature is represented. These are:

- **Celsius** °C: Used in Commonwealth Countries and it is also known as the Centigrade scale. It is based on the percent division for the range defined by the melting and boiling point of water.
- **Fahrenheit** °F: Used in the US and Caribbean countries. It was defined by German scientist, Daniel Gabriel Fahrenheit. In this scale, water freezes at 32 °F (0 °C) and boils at 212 °F (100 °C). The scale allows for temperatures below zero and the coldest possible temperature capped at -459.67 °F.
- **Rankine** °R: Not widely used. Defined by Scottish scientist William John Rankine. It is to Fahrenheit as Celsius as it is to Kelvin. In this scale, water freezes at 491.67 °R and boils at 671.67 °R.

You can switch between these Celsius and Fahrenheit by the following equation:

$$C = \frac{9}{5} (F - 32) \quad (1.1)$$

Chapter 2

Laws of Thermodynamics

2.1 The Zeroth Law

Thermodynamics is the branch of Physics that describes the co-relation of properties of macroscopic systems of matter and energy - in layman's terms, "*Interaction of Thermal energy with Matter*".

It is described by 3 fundamental Laws, the first of which is the **Zeroth Law**.

The Zeroth Law

No heat is transferred between bodies in Thermal equilibrium and thus they are of the same Temperature. [?]

If 2 systems A & B, are in thermal equilibrium with a third system C, then they all are in equilibrium with each other.

A

$\cap B \equiv C$ (2.1)

Appendices

Bibliography

- [1] David Halliday, Robert Resnick, and Jearl Walker. *Fundamentals of physics*. John Wiley & Sons, 2013.