

# Units and Measurements - Class 11 Physics (CBSE NCERT)

## 1. Introduction

Measurement is the foundation of all experimental science and technology. This chapter covers the need for measurement, fundamental and derived units, systems of units, and the importance of dimensional analysis.

## 2. Physical Quantities and Units

Physical quantities are classified into fundamental and derived quantities. Fundamental units include meter (m), kilogram (kg), second (s), etc. The SI system is the internationally accepted system of units.

## 3. Measurement of Length, Mass, and Time

Different methods are used for measurement:

- Length: Vernier Calipers, Screw Gauge
- Mass: Beam Balance, Electronic Balance
- Time: Atomic Clocks, Mechanical Clocks

## 4. Significant Figures & Errors in Measurement

Significant figures denote the precision of a measurement. Errors in measurement can be classified as systematic and random errors. Least count error, absolute error, and relative error are also important concepts.

## 5. Dimensional Analysis and Its Applications

Dimensional analysis helps in:

- Checking the correctness of an equation
- Deriving relationships between physical quantities
- Converting units from one system to another

## 6. Important Derivations

Some important derivations covered in this chapter:

- Derivation of dimensional formula for various physical quantities
- Checking the correctness of equations using dimensional analysis

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## 7. Solved Examples & Numerical Problems

Example 1: Convert 5 km into meters.

Solution:  $1 \text{ km} = 1000 \text{ m}$

So,  $5 \text{ km} = 5 \times 1000 = 5000 \text{ m}$

Example 2: Calculate the absolute error if three measurements are 2.1 cm, 2.3 cm, and 2.2 cm.

Solution: Mean value =  $(2.1 + 2.3 + 2.2) / 3 = 2.2 \text{ cm}$

Absolute errors:  $|2.1 - 2.2|$ ,  $|2.3 - 2.2|$ ,  $|2.2 - 2.2|$

Absolute error = 0.1 cm

## 8. Summary & Key Formulas

- SI units: m, kg, s, A, K, mol, cd
- Dimensional analysis principle
- Error calculation methods
- Significant figures rules