

Chapter-1

1. Introduction to Scientific Learning

Scientific Learning involves a **systematic investigation** to understand natural phenomena. It uses **observation, experimentation, and analysis** to discover **laws and principles** of science.

- Science is **evidence-based**.
- It requires **logical reasoning, precise measurement, and verification**.
- The **scientific method** includes:
 - Observation
 - Question
 - Hypothesis
 - Experiment
 - Analysis
 - Conclusion

2. Variables in Scientific Research

What is a Variable?

A **variable** is any quantity or factor that can **change** or be **manipulated** in an experiment.

3. Types of Variables

Variable Type	Definition	Example
Independent Variable	The variable you change to observe effects	Amount of sunlight in plant growth experiment
Dependent Variable	The variable you measure or observe	Plant height in response to sunlight
Controlled Variable	The variable kept constant	Type of plant, soil used
Extraneous Variable	Variables that could affect the outcome , but are not intended	Temperature, humidity

Memory Tip:

I = I change (Independent),

D = Data you collect (Dependent),

C = Constant (Controlled)

4. Units and Their Types

What is a Unit?

A **unit** is a standard quantity used to measure physical quantities.

Types of Units:

1. Fundamental (Base) Units

- Cannot be derived from other units
- Examples (SI Units):

- Length → **metre (m)**
- Mass → **kilogram (kg)**
- Time → **second (s)**
- Temperature → **kelvin (K)**
- Electric current → **ampere (A)**
- Amount of substance → **mole (mol)**
- Luminous intensity → **candela (cd)**

2. Derived Units

- Formed by combining fundamental units
- Examples:
 - Speed = m/s
 - Force = **newton (N)** = $\text{kg} \cdot \text{m/s}^2$
 - Work = **joule (J)** = $\text{N} \cdot \text{m}$

Memory Tip:

Remember "King Henry Died By Drinking Chocolate Milk" for metric units:
Kilo, Hecto, Deca, Base, Deci, Centi, Milli

5. Unitwise Analysis of Equations

What is Unitwise Analysis?

Unitwise analysis is the process of **checking the units** on both sides of an equation to ensure that they are **dimensionally consistent**.

If LHS unit = RHS unit → Equation is dimensionally correct

If not → The equation is incorrect or incomplete

6. Importance of Unitwise Analysis of Equations

- ☒ Helps verify **correctness of equations**
- ☒ Helps derive **new formulas**
- ☒ Helps convert **one unit system to another**
- ☒ Ensures **logical accuracy** in physical laws

Flowchart of Scientific Method

Observation → 2. Hypothesis → 3. Experiment → 4. Result → 5. Conclusion

Interesting Facts about the Chapter

- The word "**science**" comes from the Latin word "**scientia**" meaning "knowledge".
- **SI Units** were first defined in **1960** by the General Conference on Weights and Measures (CGPM).
- **Dimensional analysis** is often used by physicists to "**test**" or "**derive**" physical laws.

Quick Revision Summary

- Scientific study uses systematic steps to understand phenomena.
- Variables: Independent, Dependent, Controlled, Extraneous.
- Units: Fundamental (base) and Derived units.
- SI system is globally accepted.
- Unitwise analysis helps verify equations and derive new formulas.

Common Mistakes Students Make

1. Confusing independent and dependent variables
2. Writing incorrect units for physical quantities
3. Ignoring unit conversion in equations
4. Assuming dimensional correctness guarantees numerical correctness (it doesn't!)

