



Engineer
Meligy

2nd

Secondary

Physics

2026



— 1st Term —

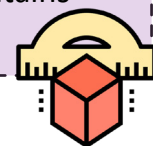


Introduction to Physics

The natural sciences focus on studying the phenomena that occur in the universe. They describe these phenomena, seek to explain them, and test them through experimentation with the ultimate goal of serving humanity. Accurate description of such phenomena is not possible without conducting precise measurements of various physical quantities.

Measurement

It is the process of comparing an unknown quantity with another known quantity of the same type, called the unit of measurement, to find out how many times the first quantity contains the second.



- Every measurement process has three main elements:

The physical quantity to be measured.

(Such as length, mass, or time).

1

The measuring tool.

(Like a ruler.)

2

The unit of measurement used.

(like meter or second).

3

- The quantities we deal with in science and in daily life such as **mass, time, length, volume**, and others are called **physical quantities**.

- Measuring them accurately is very important because we depend on them in many situations in our everyday life.

Classification of Physical Quantities



Physical quantities can be divided into two main types:

1. Fundamental Physical Quantities:



- These are quantities that **cannot be defined** in terms of other quantities.

- **Examples:** length, time, mass.



2. Derived Physical Quantities:



- These are quantities that **are defined in terms of fundamental quantities** (by combining or relating them through mathematical operations).

- **Examples:** volume, speed, acceleration.



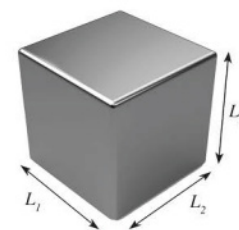
- For example:

The volume of a cuboid = length $\times$ width $\times$ height.

$$\text{Vol} = L_1 \times L_2 \times L_3$$

- Here, **volume** is a **derived** quantity because it is obtained from **multiplying** three fundamental quantities (**lengths**).

- There are several systems in the world for determining basic physical quantities and their units of measurement, including:



	Units of measurement		
Standard quantity	French system (Gaussian system) (C.G.S)	British system (F.P.S)	Metric system (M.K.S)
Length	Centimeter (cm)	Feet (ft)	Meter (m)
Mass	Gram (gm)	Pound (lbs)	Kilogram (Kg)
Time	Second (s)	Second (s)	Second (s)

Integration with Mathematics

- Physical quantities are connected to each other, and their relationships are always expressed using **mathematical equations**. These equations act as a short and clear way to describe physical phenomena.

- Each physical equation is not just a collection of symbols and numbers, it carries a **specific meaning** about the real world. This meaning is what we call the **physical meaning** of the equation.



Think With Mr. Meligy

1. Which of the following is a derived quantity?

- a) Length
- b) temperature
- c) area
- d) mass

2. Which of the following is a common measuring unit in all systems?

- a) meter
- b) gram
- c) second
- d) feet



International System of Units (SI)



International System of Units (SI)

Also known as the **modern metric system of measurement**, established in 1960 at the Eleventh General Conference on Weights and Measures, when four new units were added to the older metric system. It is now the standard system of units used worldwide in science, technology, and daily life.



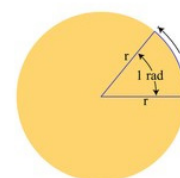
Series	Physical quantity	Unit in SI
1	Length (L)	Meter (m)
2	Mass (M)	Kilogram (Kg)
3	Time (t)	Second (s)
4	Electric current intensity (I)	Ampere (A)
5	Temperature (T)	Kelvin (K)
6	Quantity of substance (n)	Mole (mol.)
7	Luminous intensity (I_v)	Candela (cd)

In addition to the seven SI base units, **two more** units were added to measure angles:

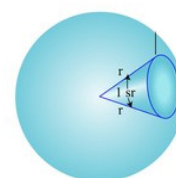
- **Radian (rad)**: used to measure a plane angle.
- **Steradian (sr)**: used to measure a solid angle.

Today, the International System of Units (SI) is used in almost all scientific, industrial, and technological fields worldwide, making it the **global language of measurement**.

Supplementary Units



Radian



Steradian

Measurement Tools



- In the past, people used **parts of their bodies** and **natural phenomena** as tools for measurement.
 - For example, they used the **arm**, the **palm of the hand**, and the **foot** to measure **length**.
 - They relied on the **rising and setting of the sun** and the phases of the moon to measure **time**.
 - As a result, different systems of measurement appeared and varied from one country to another.
- With the progress of civilization and the great industrial development, measurement tools have advanced tremendously. This development has enabled humans to describe natural phenomena **more accurately** and to **discover the truth** about things with **greater precision**.

Examples of Measuring Tools (Old and Modern)		
Quantity	Old Measuring Tools	Modern Measuring Tools
Length	 Metric Tape  Ruler	 Vernier Calliper  Micrometer
Mass	 Roman Balance  Double Pan Balance	 Pan Balance (after Callibration)  Digital Balance (after Callibration)
Time	 Hourglass  Pendulum Clock	 Stopwatch  Digital Clock



Think With Mr. Meligy

1. What are the two suitable tools for measuring the length and the diameter of a metal wire respectively?

- a) Micrometer, vernier caliper
- b) Meter tape, micrometer
- c) Ruler, meter tape
- d) Vernier caliper, ruler

2. The fundamental physical quantities from the following are:

- a) The length and the area
- b) The velocity and the acceleration
- c) The mass and the volume
- d) The time and the mass

3. The derived physical quantities from the following are:

- a) Velocity – distance – time
- b) Mass – density – volume
- c) Work – force – distance
- d) Force – volume – density

4. A common feature in the French (Gaussian) system, the British system, and the Metric system is that they all measure:

- a) Length in meters
- b) Mass in pounds
- c) Time in seconds
- d) Temperature in Celsius

5. The suitable tool for measuring the length of a room is:

a)



b)



c)

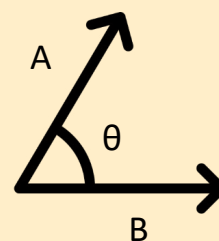


d)



6. From the opposite figure: The measuring unit of the confined angle (θ) between the two sides A, B in the International System of Units is:

- a) Candela
- b) Radian
- c) Steradian
- d) Meter





Think With Mr. Meligy

$$3x = 24$$

$$\frac{1}{2}x = 8$$

$$4x + 6 = -14$$

$$\frac{a}{-7} = -42$$

$$4x = -28$$

$$3y + 2 = 11$$

$$\frac{t}{-3} = 1$$

$$-r = 2$$

$$\frac{z}{3} + 8 = 12$$

- Laws of Powers:

- Fractional Powers:

- Proportions:

