Physical Quantities and Measurement

- The ancient people use hand-span, foot-span, finger width, palm length, the distance of a step, etc. as units of measurements. These are known as non-standard methods of measurement.

Bigger Units:

- For length, the bigger units use are:

  (i) Astronomical unit (A.U.): It is the mean distance between Earth and Sun. 1 A.U. = 1.496×10^{11} m
  (ii) Light year (ly): It is the distance travelled by light in vacuum, in one year. 1 ly =9.46×10^{12} km
  (iii)Parsec: 1 Parsec = 3.26 ly

- For mass, the bigger units use are:

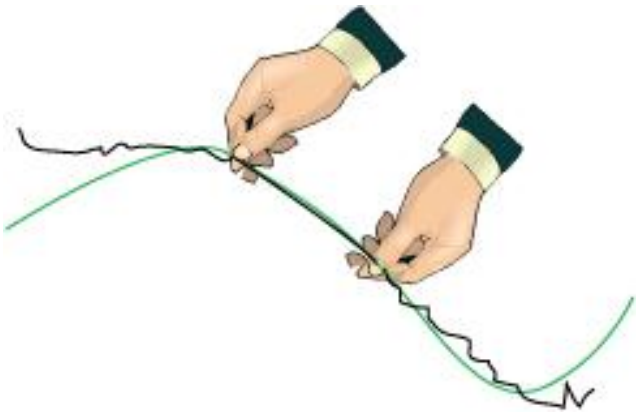
  (i) quintal: 1 quintal = 100 kg
  (ii) metric tonne: 1 metric tonne = 1000 kg = 10 quintal

- For time:

  (i) lunar month: 1 lunar month =29.5 days
  (ii) Leap year
  (iii) Decade
  (iv) Century
  (v) Millennium

- Now we use **International system of units (SI)** is used as standard units all over the world.
- **Metre (m)** is the SI unit of length.
  - 1m = 100 cm = 1000 mm and $1\text{m} = \frac{1}{1000}\text{km}$
- In our daily life we use various types of measuring devices such as metre scale, measuring tape, metre rod etc.

- The use of a measuring instrument depends on the nature of object and the type of surface of object.
- The length of a **curved line** can be measured with the help of a thread by placing the thread along the curve line, then measuring the length of thread with the help of metre scale.



1. There is a standard for the measurement for everything.

2. Weights issued by the department of weights and measures are of 50 g, 100 g, 200 g, 500 g, 1 kg, 2 kg…….

3. Balance and weights are checked regularly by the department of weights and measures to avoid cheating.

4. Some relations:

(i) 1000 milligrams (mg) = 1 gram (g)

(ii) 1000 grams (g) = 1 kilogram (kg)

(iii) 100 kilograms (kg) = 1 quintal

(iv) 1000 kilograms (kg) = 10 quintals = 1 tonne

Measurement of Mass:

Mass is the matter contained in a body .

SI unit of mass is kilogram (kg).

Beam balance and physical balance is used to measure the mass of body.

Parameters	Mass	Weight
Definition	Quantity of matter present in the body	Force with which body is attracted towards the earth
Value	Constant everywhere	Varies from place to place
Quantity	Scalar quantity	Vector quantity
Measurement	Measured with physical or beam balance	Measured with a spring balance
Unit	gram or kilogram	newton (N)

1. Clocks are used for the measurement of time. The units of measuring time are seconds, minutes and hours.

(i) 1 hour = 60 minutes.

(ii) 1 minute = 60 seconds

2. Age of the person is measured in years, months and days.

(i) 1 year = 12 months

(ii) 1 month = 30 days

(iii) 1 day = 24 hours

Measurement of Temperature:

- It is the degree of hotness or coldness of a body.
- SI unit of temperature is Kelvin (K)
- Thermometer is the device used to measure temperature.

Types of thermometer:

- Laboratory thermometer: It has a capillary filled with mercury. It has graduations from –10°C to –110°C. The mercury rises in the stem when it comes in contact with a hot body.

- Clinical thermometer: It is used to measure the temperature of the human body. It has graduations from 35°C to 42°C or 95°F to 108°F.
- Maximum and Minimum thermometer: It indicates the highest and the lowest temperature recorded during the day.

The amount of flat surface or region occupied by a closed figure is known as the area of the closed figure.

Steps to measure area of closed figure using graph paper

- **Step 1:** Firstly, we place the closed figure on a squared paper or a graph paper where every square measures 1 cm × 1 cm.
- **Step 2:** Then we make an outline of the figure.
- **Step 3:** Now we look at the squares enclosed by the figure. Some of them are completely enclosed, some half, some less than half and some more than half. Note down the number of squares of each category.
- **Step 4:** Calculate the area of the closed figure by considering the following points.

  (a) Take the area of 1 full square as 1 square unit.

  (b) Ignore portions of the area that are less than half a square.

  (c) If some portion enclosed by the figure is more than half a square, then

  count its area as one square unit.

  (d) If exactly half of the square is counted, take its area as $\frac{1}{2}$ square unit.

Formulae for measuring area of regular bodies

- Area of square = $(\text{side})^2$
- Area of rectangle = length × breadth
- Area of circle = $\pi \times (\text{radius})2$
- Surface area of cylinder = $2\pi \times (\text{radius}) \times \text{length}$
- Surface area of sphere = $4\pi \times (\text{radius})2$
- Area of triangle = $12 \times \text{base} \times \text{height}$