

## CHAPTER 2.

Units and Measurements.

- Measurement of any physical quantity involves comparison with a certain basic, arbitrarily chosen, internationally accepted reference standard called unit.

→ The units for fundamental base quantities are called fundamental or base units. The units of all other physical quantities can be expressed as combinations of the base units.

Parallax Method

The difference of <sup>point</sup> the position of an ~~object~~ with respect to the surrounding viewed along two different line of sights is called parallax.

The distance between the two points of observation is called the basis.

- The angle ASB ( $\angle ASB$ ) represented by symbol  $\theta$  is called parallax angle or parallactic angle.

Estimation of Very Small distances.

~ Size of a molecule.

- We dissolve  $1 \text{ cm}^3$  of oleic acid in alcohol to make a solution of  $20 \text{ cm}^3$ . Then we take  $1 \text{ cm}^3$  of this solution and dilute it to  $20 \text{ cm}^3$ , using alcohol. So the concentration of the solution is

$$= \left( \frac{1}{20 \times 20} \right) \text{ cm}^3 \text{ of oleic acid / cm}^3.$$

Thus,

Volume of  $n$  drops of the solution

$$= nV \text{ cm}^3.$$

Amount of oleic acid in this solution

$$= nV \left( \frac{1}{20 \times 20} \right) \text{ cm}^3.$$

Oleic acid spreads very fast to form a film area of  $A \text{ cm}^2$  and forms a very thin layer of thickness  $t$ .

i.e.,

$$t = \frac{\text{Volume of the film}}{\text{Area of the film}}$$

$$\Rightarrow t = \frac{nV}{20 \times 20 A} \text{ cm.}$$

#### • Range of lengths.

$$1 \text{ fermi} = 1 \text{ f} = 10^{-15} \text{ m}$$

$$1 \text{ angstrom} = 1 \text{ \AA} = 10^{-10} \text{ m}$$

$$1 \text{ astronomical unit} = 1 \text{ AU (avg distance of the Sun from the Earth).}$$

$$= 1.496 \times 10^{11} \text{ m.}$$

$$1 \text{ light year} = 1 \text{ ly} = 9.46 \times 10^{15} \text{ m (distance that light covers with velocity } 3 \times 10^8 \text{ m/s in 1 yr).}$$

$$1 \text{ parsec} = 3.08 \times 10^{16} \text{ m} \left[ \begin{array}{l} \text{It is the distance at which} \\ \text{average radius of earth's} \\ \text{orbit subtends an angle 1 arc sec.} \end{array} \right].$$

#### • Measurement of mass.

$$1 \text{ unified atomic mass unit} = 1 \text{ u}$$

$$= \frac{1}{12} \text{ of mass of an atom of carbon-12}$$

$$\text{isotope } {}^{12}_6\text{C including mass of electrons}$$

$$= 1.66 \times 10^{-27} \text{ kg.}$$

