CH # 1:- Numerical Problems 1

1.1:- Calculate the number of seconds in a (a) Day (b) week (c) Month and state your answers using SI prefixes.

Solution:-

(a) Day

1 Day = 24 hours

1 hour = 60 min

1 min = 60 sec

= hour x min x sec

= 24 x 60 x 60

= 86,400 sec

= 86.4×10^3 sec

= 86.4 K sec $\therefore K = 10^3$ in prefixes.

Ans

(b) week:

1 week = 7 Days

So

= 7 x 24 x 60 x 60

= 7 x 86400 s

= 604,800 s

= 604.8×10^3 s

= 604.8 Ks

Ans

(c) Month

1 Month = 30 Days

So

$= 30 \times 24 \times 60 \times 60$

$= 30 \times 86400\ s$

$= 2,592,000\ s$

$= 2.592 \times 10^{6}\ s$

$= 2.592\ Ms$ $\therefore M = 10^{6}$ in prefixes.

Ans

1.2:- State the answers of problem 1.1 in scientific notation.

Solution:-

(a) Day = 86.4 Ks

$= 86.4\ Ks$

$= 86.4 \times 10^{3}\ s$

$= 8.64 \times 10^{1} \times 10^{3}\ s$

$= 8.64 \times 10^{4}\ s$

Ans

(b) week = 604.8 Ks

$= 604.8\ Ks$

$= 604.8 \times 10^{3}\ s$

$= 6.048 \times 10^{2} \times 10^{3}\ s$

$= 6.048 \times 10^{5}\ s$

Ans

(C) Month = $2.592\ Ms$

$= 2.592\ Ms$

$= 2.592 \times 10^{6}\ s$

Ans

1.3 Solve the following addition or subtraction. State your answers in scientific Notation.

(a) $4 \times 10^{-4}\ kg + 3 \times 10^{-5}\ kg$

Solution:-

$= 4 \times 10^{-4}\ kg + 3 \times 10^{-5}\ kg$

$= 4 \times 10^{-4} kg + 0.3 \times 10^{-4}\ kg$

$= (4 + 0.3) \times 10^{-4} kg$

$= 4.3 \times 10^{-4}\ kg$

Ans

(b) $5.4 \times 10^{-6} m - 3.2 \times 10^{-5} m$

Solution:-

$$= 5.4 \times 10^{-6}_{m} - 3.2 \times 10^{-5} m$$

$$= 0.54 \times 10^{-5}_{m} - 3.2 \times 10^{-5} m$$

$$= (0.54 - 3.2) \times 10^{-5} m$$

$$= -2.66 \times 10^{-5} m$$

Ans

1.4:- Solve the folloing multiplication ~~and~~ or divison. state your answeos in scientific notation.

(a) $(5 \times 10^{4} m) \times (3 \times 10^{-2} m)$

solution:-

$$= (5 \times 10^{4} m)(3 \times 10^{-2} m)$$

$$= (5 \times 3) \times 10^{4} \times 10^{-2} m^{2}$$

$$= 15 \times 10^{2} m^{2}$$

$$= 1.5 \times 10^{1} \times 10^{2} m^{2}$$

$$= 1.5 \times 10^{3} m^{2}$$

Ans

(b) $\frac{6 \times 10^8 \text{ kg}}{3 \times 10^4 \text{ m}^3}$

Solution:-

$$= \frac{6 \times 10^8 \text{ kg}}{3 \times 10^4 \text{ m}^3}$$

$$= \frac{2}{1} \times 10^{8-4} \text{ kgm}^{-3}$$

$$= 2 \times 10^4 \text{ kg m}^{-3}$$

Ans

1.5:- Calculate the following and state your answers in scientific notation.

$$\frac{(3 \times 10^2 \text{ kg}) \times (4.0 \text{ km})}{5 \times 10^2 \text{ s}^2}$$

Solution:-

$$= \frac{(3 \times 10^2 \text{ kg}) \times (4.0 \text{ km})}{5 \times 10^2 \text{ s}^2}$$

$$= \frac{(3 \times 4) \times 10^2 \times 10^3 \text{ kgm}}{5 \times 10^2 \text{ s}^2} \quad \therefore K = 10^3$$

$$= \frac{12}{5} \times 10^{2+3-2} \text{ kgms}^{-2}$$

$$= 2.4 \times 10^3 \text{ kgms}^{-2}$$

Ans

1.6:- state the number of significant digits in each measurement.

(a) 0.0045 m

Sol:-

$= 0.0045\ m$

$= 2\ (s.d)$

Ans

(b) 2.047m

Sol:-

$= 2.047\ m$

$= 4\ (s.d)$

Ans

(c) 3.40 m

Sol:-

$= 3.40\ m$

$= 3\ (s.d)$ Ans

(d) 3.420×10^4 m

Sol:-

$= 3.420 \times 10^4\ m$

$= 4\ (s.d)$ Ans

1.7:- Write in scientific notation.

(a) 0.0035 m

Solution:-

$= 0.0035\ m$

$= 3.5 \times 10^{-3}\ m$

Ans

(b) $20,6.4 \times 10^{2}\ m$

Solution:-

$= 206.4 \times 10^{2}\ m$

$= 2.064 \times 10^{2} \times 10^{2}\ m$

$= 2.064 \times 10^{4}\ m$

Ans

1.8:- Write using correct prefixes.

(a) $5.0 \times 10^{4}\ cm$

Solution:-

$= 5.0 \times 10^{4}\ cm$

$= 5.0 \times 10^{2} \times 10^{2}\ cm$

$= 5.0 \times 10^{2}\ m$ $\quad \therefore 10^{2}\ cm = m$

$= 0.5 \times 10^{3}\ m$

$= 0.5\ km$

Ans

(b) 580×10^{2} g

Solution:-

$= 580 \times 10^{2}$ g

$= 58.0 \times 10^{1} \times 10^{2}$ g

$= 58 \times 10^{3}$ g $\quad \therefore K = 10^{3}$

$= 58$ kg

Ans

(c) 45×10^{-4} s

solution:-

$= 45 \times 10^{-4}$ s

$= 4.5 \times 10^{1} \times 10^{-4}$ s

$= 4.5 \times^{1-4}$ s

$= 4.5 \times 10^{-3}$ s $\quad \therefore 10^{-3} = m$

$= 4.5$ ms

Ans

1.9:- Light year is a unit of distance used in Astronomy. It is the distance covered by light in one year. Taking the speed of light as 3.0×10^{8} ms^{-1}, Calculate the distance.

Solution:-

Given Data:-

$$\text{Speed} = 3.0 \times 10^{8}\ ms^{-1}$$

$$\text{Time} = 1\ \text{year} \qquad \therefore 1\ \text{year} = 365\ \text{days}$$

$$= 365 \times 24 \times 60 \times 60$$

$$= 31,536,000\ s$$

$$= 3.1536 \times 10^{7}\ s$$

To Find:-

$$\text{Distance} = ?$$

Solve:-

$$\text{Speed} = \frac{\text{Distance}}{\text{time}}$$

$$\text{Distance} = \text{speed} \times \text{time}$$

$$= 3.0 \times 10^{8}\ ms^{-1} \times 3.1536 \times 10^{7}\ s$$

$$= (3 \times 3.1536) \times 10^{8+7}\ m$$

$$\boxed{\text{Distance} = 9.46 \times 10^{15}\ m}$$

Ans

1.10:- Express the density of mercury given as $13.6\ g\,cm^{-3}$ in $Kg\,m^{-3}$.

Solution:-

$$= 13.6\ g\,cm^{-3}$$

$$= 13.6\ \frac{g}{cm^3}$$

$$= \frac{13.6 \times 10^{-3}\ Kg}{(10^{-2}\ m)^3}$$

$$= \frac{13.6 \times 10^{-3}\ Kg}{10^{-6}\ m^3}$$

$$= 13.6 \times 10^{-3} \times 10^{6}\ Kg\,m^{-3}$$

$$= 13.6 \times 10^{-3+6}\ Kg\,m^{-3}$$

$$= 13.6 \times 10^{3}\ Kg\,m^{-3}$$

$$= 1.36 \times 10^{1} \times 10^{3}\ Kg\,m^{-3}$$

$$\boxed{= 1.36 \times 10^{4}\ Kg\,m^{-3}}$$

Ans

$\therefore 1g = \frac{1}{1000}\ Kg$

$1g = \frac{1}{10^3} = 10^{-3}\ Kg$

$\therefore cm = 10^{-2}\ m$