DPP

DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 6

Topic :- UNITS AND MEASUREMENTS

1 **(b)**

Bulk modulus $K = \frac{\text{normal stress}}{\text{volumetric strain}}$

$$= \frac{F/A}{-\Delta V/V}$$

$$= -\frac{FV}{A\,\Delta V}$$

Now, $\frac{F}{A} = p$

$\therefore$ $K = \frac{pV}{\Delta V}$

As volumetric strain is dimensionless.

$\therefore$ Dimensions of K = dimensions of normal stress

$\Rightarrow$ $[K] = [\mathrm{ML^{-1}T^{-2}}]$

2 **(a)**

$R = \frac{V}{I} \Rightarrow \pm\frac{\Delta R}{R} = \pm\frac{\Delta V}{V} \pm \frac{\Delta I}{I}$
$= 3 + 3 = 6\%$

4 **(d)**

$n(x\mathrm{m})^2 = 1\mathrm{m}^2$ or $n = \frac{1}{x^2}$

5 **(d)**

Given, $v = at + bt^2$

Applying the law of homogeneity $[v] = [bt^2]$

Or $[\mathrm{LT^{-1}}] = [b\mathrm{T}^2]$

Or $[b] = [LT^{-3}]$

6 **(a)**

$$V = \frac{W}{Q} = [ML^2T^{-2}Q^{-1}]$$

7 **(c)**

Volume of sphere $(V) = \frac{4}{3}\pi r^3$

% error in volume $= 3 \times \frac{\Delta r}{r} \times 100 = \left(3 \times \frac{0.1}{5.3}\right) \times 100$

8 **(d)**

Given, $v = at + \frac{b}{t+c}$

Since, LHS is equal to velocity, so at and $\frac{b}{t+c}$ must have the dimensions of velocity.

$\therefore \quad at = v$

Or $a = \frac{v}{t} = \frac{[LT^{-1}]}{[T]} = [LT^{-2}]$

Now, $c =$ time $\quad (\because$ like quantities are added$)$

$\therefore \quad c = t = [T]$

Now,

$$\frac{b}{t+c} = v$$

$\therefore \quad b = v \times \text{time} = [LT^{-1}][T] = [L]$

10 **(a)**

Dimensions of $E = [ML^2T^{-2}]$

Dimensions of $G = [M^{-1}L^3T^{-2}]$

Dimensions of $I = [MLT^{-1}]$

And dimension of $M = [M]$

$$\therefore \text{Dimensions of} \frac{GIM^2}{E^2} = \frac{[M^{-1}L^3T^{-2}][MLT^{-1}][M^2]}{[ML^2T^{-2}]^2}$$

$$= [T]$$

$$= \text{Dimensions of time}$$

11 **(a)**

Percentage error inside $=\frac{1}{2}\left[\frac{0.2}{100}\times 100\right]=0.1$

Absolute error inside $=\frac{0.1}{100}\times 10=0.01$

12 **(d)**

The second is the duration of 9192631770 period of the radiation corresponding to the transition between the two hyperfine levels of the ground state of cesium-133 atom. Therefore, 1 ns is 10^{-9} s of Cs-clock of 9192631770 oscillations.

14 **(a)**

Weight in air = $(5.00 \pm 0.05)N$

Weight in water =$(4.00 \pm 0.05)N$

Loss of weight in water =$(1.00 \pm 0.1)N$

Now relative density=$\frac{\text{weight in air}}{\text{weight loss in water}}$

$i.e.\ R.D=\frac{5.00 \pm 0.05}{1.00 \pm 0.1}$

Now relative density with max permissible error

$$=\frac{5.00}{1.00} \pm\left(\frac{0.05}{5.00}+\frac{0.1}{1.00}\right) \times 100=5.0 \pm(1+10)\%$$

$=5.0 \pm 11\%$

15 **(c)**

Angular momentum = $[ML^2T^{-1}]$, Frequency = $[T^{-1}]$

17 **(a)**

By the principle of dimensional homogenity

$[P]=\left[\frac{a}{V^2}\right] \Rightarrow [a]=[P] \times [V^2]=[ML^{-1}T^{-2}][L^6]$

$=[ML^5T^{-2}]$

18 **(a)**

$[E]=[ML^2T^{-2}]$

$[M]=[M]$

$[L]=[ML^2T^{-1}]$

$[G]=[M^{-1}L^3T^{-2}]$

$$\left[\frac{EL^2}{M^5G^2}\right]=\frac{[ML^2T^{-2}][ML^2T^{-1}]^2}{[M]^5[M^{-1}L^3T^{-2}]^2}$$

$$=\frac{[ML^2T^{-2}][M^2L^4T^{-2}]}{[M^5][M^{-2}L^6T^{-4}]}=\frac{[M^3L^6T^{-4}]}{[M^3L^6T^{-4}]}$$

$=[m^0L^0T^0]=$ Angle

19 **(c)**

$[MT^{-3}]=\frac{[ML^2T^{-2}]}{[L^2][T]}=$ energy /area $\times$ time=dimensions of solar constant.

20 **(b)**

We know that kinetic energy $=\frac{1}{2}mv^2$

Required percentage error is $2\%+2\times3\%$ *ie*, 8%

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	A	A	D	D	A	C	D	D	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	D	A	A	C	C	A	A	C	B