DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 2

Topic :- UNITS AND MEASUREMENTS

1 **(d)**

Given equation , $y = a\sin(bt - cx)$

Comparing the given equation with general wave equation

$y = a\sin\left(\frac{2\pi t}{T} - \frac{2\pi x}{\lambda}\right)$,

We get $b = \frac{2\pi}{T}, c = \frac{2\pi}{\lambda}$

Dimension of $\frac{b}{c}$

$= \frac{2\pi/T}{2\pi/\lambda} = [LT^{-1}]$, and other three quantity is dimensionless

3 **(b)**

Units of a and PV^2 are same and equal to $dyne \times cm^4$

4 **(d)**

$f = \frac{1}{2\pi\sqrt{LC}}$

$\therefore \left(\frac{C}{L}\right)$ does not represent the dimensions of frequency

5 **(c)**

$P_1 = [ML^2T^{-1}]$

$D_2 = [(2M)(2L)^2(2T)^{-1}]$

$P_2 = 4[ML^2T^{-1}] = 4P_1$

6 **(a)**

Time period of a simple pendulum

$T = 2\pi\sqrt{\frac{L}{8}}$

$Or\ \ g = \frac{4\pi^2 L}{T^2} \qquad ....(i)$

Differentiating Eq. (i), we have

$$\frac{\Delta g}{g} = \frac{\Delta L}{L} + \frac{2\Delta T}{T} \qquad ....(ii)$$

Given, L=100 cm, T=2s,

$$\Delta T = \frac{0.1}{100} = 0.001s,$$

$$\Delta L = 1mm = 0.1\ cm$$

Substituting the in Eq. (ii), we have

$$\therefore \left|\frac{\Delta g}{g}\right|_{\max} = \frac{\Delta L}{L} + \frac{2\Delta T}{T}$$

$$= \frac{0.1}{100} + 2 \times \frac{0.001}{2}$$

Thus, maximum percentage eror

$$\left|\frac{\Delta g}{g}\right|_{\max} \times 100 = \left(\frac{0.1}{100} \times 100\right) + \left(\frac{2 \times 0.001}{2} \times 100\right)$$

$$= 0.1\% + 0.1\% = 0.2\%$$

7 **(d)**

Because temperature is a fundamental quantity

8 **(a)**

By submitting dimension of each quantity in R.H.S. of option (a) we get

$$\left[\frac{mg}{\eta r}\right] = \left[\frac{M \times LT^{-2}}{ML^{-1}T^{-1} \times L}\right] = [LT^{-1}]$$

This option gives the dimension of velocity

9 **(b)**

Percentage error in mass $= \frac{0.01}{23.42} \times 100 = 0.04$

Percentage error in volume $= \frac{0.1}{4.9} \times 100 = 2.04$

Adding up the percentage errors, we get nearly 2%.

10 **(d)**

Percentage error in A

$$= \left(2 \times 1 + 3 \times 3 + 1 \times 2 + \frac{1}{2} \times 2\right)\% = 14\%$$

11 **(d)**

According to Wien's law the product of wavelength corresponding to maximum intensity of radiation and temperature of body (in Kelvin) is constant *ie*, $\lambda_m T = b =$ constant, where b is Wien's constant and has value 2.89×10^{-3} m — K.

12 **(a)**

$$Y = \frac{\text{Stress}}{\text{Strain}} = \frac{\text{Force/Area}}{\text{Dimensionless}} \Rightarrow Y \equiv \text{Pressure}$$

13 **(c)**

Coefficient o friction $= \frac{\text{Applied force}}{\text{Normal reactiom}}$

$= \frac{[\text{MLT}^{-2}]}{[\text{MLT}^{-2}]} = \text{no dimensions}$

Unit $= \frac{\text{N}}{\text{N}} = \text{no unit}$

14 **(c)**

$[kx] =$ Dimension of $\omega t =$ (dimensionless)

Hence $K = \frac{1}{X} = \frac{1}{L} = [L^{-1}] \ \therefore [K] = [L^{-1}]$

15 **(a)**

Magnetic field $= \frac{\text{Force}}{\text{Charge} \times \text{velocity}}$

$$= \frac{[\text{MLT}^{-2}]}{[\text{AT}][\text{LT}^{-1}]} = [\text{MA}^{-1}\text{T}^{-2}]$$

17 **(c)**

Percentage error in measurement of a side

$= \frac{0.01}{1.23} \times 100$

Percentage error in measurement of area

$= 2 \times \frac{0.01}{1.23} \times 100$

18 **(a)**

Charge $=$ current $\times$ time

19 **(c)**

From the principle of dimensional homogenity $[v] = [at] \Rightarrow [a] = [LT^{-2}]$. Similarly $[b] = [L]$ and $[c] = [T]$

20 **(d)**

Given, $U = \frac{A\sqrt{x}}{x + B}$ ...(i)

Dimensions of $U =$ dimensions of potential energy

$= [\text{ML}^2\text{T}^{-2}]$

From Eq. (i),

Dimensions of $B =$ dimensions of $x = [\text{M}^0\text{LT}^0]$

$\therefore$ Dimensions of A

$$= \frac{\text{dimensions of } U \times \text{dimensions of } (x+B)}{\text{dimension of } \sqrt{x}}$$

$$= \frac{[ML^2T^{-2}][M^0LT^0]}{[M^0L^{1/2}T^0]}$$

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

Hence, dimensions of AB

$$= [ML^{5/2}T^{-2}][M^0LT^0]$$

$$= [ML^{7/2}T^{-2}]$$

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