DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutio

SUBJECT : PHYSICS
DPP NO. : 1

Topic :- UNITS AND MEASUREMENTS

1 **(c)**

From $h = ut + \frac{1}{2}gt^2$

$h = 0 + \frac{1}{2} \times 9.8 \times (2)^2 = 19.6\, m$

$\frac{\Delta h}{h} = \pm 2\frac{\Delta t}{t}$ $[\because a = g = \text{constant}]$

$= \pm 2\left(\frac{0.1}{2}\right) = \pm\frac{1}{10}$

$\therefore\ \Delta h = \pm\frac{h}{10} = \pm\frac{19.6}{10} = \pm 1.96\, m$

2 **(a)**

Given, $W = \frac{1}{2}kx^2$

Writing the dimensions on both sides

$[\mathrm{ML^2T^{-2}}] = k[\mathrm{M^0L^2T^0}]$

$\therefore$ Dimensions of $k = [\mathrm{MT^{-2}}] = [\mathrm{ML^0T^{-2}}]$

3 **(a)**

Given, $m = 3.513$ kg and $v = 5.00\ \mathrm{ms^{-1}}$

So, momentum, $p = mv = 17.565$

As the number of significant digits in m is 4 and v is 3, so, p must have 3 significant digits

$p = 17.6\ \mathrm{kgms^{-1}}$

4 **(d)**

Modulas of rigidity $= \frac{\text{Shear stress}}{\text{Shear strain}} = [ML^{-1}T^{-2}]$

5 **(c)**

The unit of physical quantity obtained by the line intergral of electric field is $\mathrm{JC^{-1}}$.

6 **(b)**

$F = \frac{Gm_1m_2}{d^2}$

$\Rightarrow\ G = \frac{Fd^2}{m_1m_2}$

$[G] = \frac{[\mathrm{MLT^{-2}}][\mathrm{L^2}]}{[\mathrm{M^2}]} = [\mathrm{M^{-1}L^3T^2}]$

Moment of inertia $I = mK^2 = [\mathrm{ML^2}]$

7 **(c)**

$\text{Stress} = \frac{\text{Force}}{\text{Area}} = \frac{N}{m^2}$

8 **(a)**

$n_1u_1 = n_2u_2$

$n_2 = \frac{n_1 u_1}{u_2}$
$= \frac{170.474L}{M^3}$
$= \frac{170.474 \times 10^{-3} M^3}{M^3}$
$= 0.170474$

9 **(c)**

Intensity (I)=$\frac{\text{Energy}}{\text{Area}\times\text{time}}$

10 **(d)**

By the principle of dimensions homogeneity

$$F = at^{-1}$$
$$[\text{MLT}^{-2}] = a[\text{T}^{-1}]$$
$$a = [\text{MLT}^{-1}]$$

Similarly for $b = [\text{MLT}^{-4}]$

11 **(a)**

Let radius of gyration $[k] \propto [h]^x [c]^y [G]^z$
By substituting the dimension of $[k] = [L]$
$[h] = [ML^2T^{-1}]$
$[c] = [LT^{-1}]$
$[G] = [M^{-1}L^3T^{-2}]$
And by comparing the power of both sides
We can get $x = 1/2, y = -3/2, z = 1/2$
Therefore dimension of radius of gyration is
$[h]^{1/2}[c]^{-3/2}[G]^{1/2}$

12 **(a)**

Here,
Mass of a body, $M = 5.00 \pm 0.05\ kg$
Volume of a body, $V = 1.00 \pm 0.05 m^3$
Density, $\rho = \frac{M}{V}$
Relative error in density is

$$\frac{\Delta\rho}{\rho} = \frac{\Delta M}{M} + \frac{\Delta V}{V}$$

Percentage error in density is

$$\frac{\Delta\rho}{\rho} \times 100 = \frac{\Delta M}{M} \times 100 + \frac{\Delta V}{V} \times 100$$
$$= \left(\frac{0.05}{5} \times 100\right) + \left(\frac{0.05}{1} \times 100\right) = 1\% + 5\% = 6\%$$

13 **(c)**

Stefan's law is $E = \sigma(T^4) \Rightarrow \sigma - \frac{E}{T^4}$

$$\text{where}, E = \frac{\text{Energy}}{\text{Area } \times \text{Time}} = \frac{\text{Watt}}{m^2}$$
$$\sigma = \frac{\text{Watt} - m^{-2}}{K^4} = Watt - m^{-2}K^{-4}$$

14 **(a)**

$y = a \sin(\omega t + kx)$.
Here, ωt should be dimensionless

$$\therefore \quad [\omega] = \left[\frac{1}{t}\right]$$
$$[\omega] = [\text{M}^0\text{L}^0\text{T}^{-1}]$$

15 **(c)**

Percentage error in $T = \frac{0.01}{1.26} \times 100 + \frac{0.01}{9.80} \times 100$

$+ \frac{0.01}{1.45} \times 100$

$= 0.8 + 0.1 + 0.7 = 1.6$

16 **(a)**

$$\frac{R}{L} = \frac{V/I}{V \times T/I} = \frac{1}{T} = \text{Frequency}$$

18 **(b)**

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} = \frac{\text{Energy}}{\text{Volume}} = ML^{-1}T^{-2}$$

19 **(b)**

The dimension of frequency $(f) = [\mathrm{T}^{-1}]$

The dimension of $\left(\frac{R}{L}\right) = \frac{[\mathrm{ML^2T^{-3}A^{-2}}]}{[\mathrm{ML^2T^2A^{-2}}]}$

$= \left[\frac{1}{T}\right]$

$= [\mathrm{T}^{-1}]$

20 **(a)**

Area of rectangle

$A = lb$

$= 10.5 \times 2.1$

$= 22.05\ cm^2$

Minimum possible measurement of scale =0.1 cm

So, area measured by scale = $22.0 cm^2$

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