DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 1

Topic :- UNITS AND MEASUREMENTS

1 **(c)**

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

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

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

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

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

2 **(a)**

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

Writing the dimensions on both sides

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

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

3 **(a)**

Given, $m = 3.513$ kg and $v = 5.00$ 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

$p = 17.6$ 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 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)**

$$n_1u_1 = n_2u_2$$

$$n_2 = \frac{n_1u_1}{u_2}$$

$$= \frac{170.474L}{M^3}$$

$$= \frac{170.474 \times 10^{-3}M^3}{M^3}$$

$$= 0.170474$$

9 **(c)**

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

10 **(d)**

By the principle of dimensions homogeneity

$$F = at^{-1}$$

$$[\mathrm{MLT^{-2}}] = a[\mathrm{T^{-1}}]$$

$$a = [\mathrm{MLT^{-1}}]$$

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

11 **(a)**

Let radius of gyration $[k] \propto [\mathrm{h}]^x[c]^y[G]^z$

By substituting the dimension of $[k] = [L]$

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

$[c] = [LT^{-1}]$

$[G] = [M^{-1}L^3T^{-2}]$
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 $E = \sigma(T^4) \Rightarrow \sigma - \frac{E}{T^4}$
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
$\therefore\ [\omega] = \left[\frac{1}{t}\right]$
$[\omega] = [M^0L^0T^{-1}]$

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 $(f) = [T^{-1}]$

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

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

$= [T^{-1}]$

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