DPP

DAILY PRACTICE PROBLEMS

CLASS : XITH | **Solutions** | **SUBJECT : PHYSICS**

DATE : | **DPP NO. : 7**

Topic :-.UNITS AND MEASUREMENTS

1 **(d)**

Express the result in two significant figures.

3 **(c)**

$$B = \frac{F}{IL} = \frac{[MLT^{-2}]}{[A][L]} = [MT^{-2}A^{-2}]$$

4 **(c)**

$30\ VSD = 29\ MSD$

$1\ VSD = \frac{29}{30}\ MSD$

Least count of vernier $= 1\ M.S.D.\ -\ 1\ V.S.D.$

$= 0.5° - \frac{29}{30} \times 0.5° = \frac{0.5°}{30}$

Reading of vernier $=$ M.S. reading $+$ V.S. reading $\times$ $L.C.$

$= 58.5° + 9 \times \frac{0.5°}{30} = 58.65$

5 **(a)**

From Coulomb's law, the force of attraction/repulsion between two point charges q and q separated by distance r is

$$F = \frac{1}{4_{\pi\varepsilon_0}} \frac{q^2}{r^2}$$

$$\Rightarrow \quad \varepsilon_0 = \frac{1}{4\pi} \cdot \frac{q^2}{Fr^2}$$

Where ε_0 is electric permittivity.

Dimensions of $\varepsilon_0 = \frac{[AT]^2}{[MLT^{-2}][L^2]}$

$$[\varepsilon_0] = [A^2M^{-1}L^{-3}T^{-4}]$$

6 **(a)**

Percentage error in radius is $\frac{0.1}{4.3} \times 100$. again, $V \propto R^3$

7 **(a)**

Required percentage error

$$= 2 \times \frac{0.01}{15.12} \times 0 + \frac{0.001}{10.15} \times 10 = 4 + 1 = 5$$

8 **(a)**

We know that the dimensional formula of energy is $[ML^2T^{-2}]$

$$n_2 = 1\left[\frac{1\text{kg}}{10\text{kg}}\right]^1\left[\frac{1\text{m}}{1\text{km}}\right]\left[\frac{1\text{s}}{1\text{ min}}\right]^2$$

$$= \frac{1}{10} \times \frac{1}{10^6} \times \frac{1}{(60)^{-2}} = \frac{3600}{10^7} = 3.6 \times 10^{-4}$$

9 **(d)**

$\lambda = m^p v^q h^r$

$[M^0LT^0] = [M^p][LT^{-1}]^q[ML^2T^{-2}]^r$

$[M^0LT^0] = [M^{p+r}L^{q+2r}T^{-q-r}]$

$\therefore \quad p + r = 0, q + 2r = 1, -q - r = 0$

After solving we get

$p = -1, q = -1, r = 1$

10 **(a)**

Least count LC

$$= \frac{Pitch}{Number\ of\ divisions\ on\ circular\ scale}$$

$$= \frac{0.5}{50} = 0.01\ mm$$

Now, diameter of ball

$$= (2 \times 0.5\ mm) + (25 - 5)(0.01) = 1.2mm$$

11 **(c)**

Volume of cylinder $V = \pi r^2 l$

Percentage error in volume

$$\frac{\Delta V}{V} \times 100 = \frac{2\Delta r}{r} \times 100 + \frac{\Delta l}{l} \times 100$$

$$= \left(2 \times \frac{0.01}{2.0} \times 100 + \frac{0.1}{5.0} \times 100\right) = (1 + 2)\% = 3\%$$

12 **(a)**

Let $h \propto G^x L^y E^z$

$$[ML^2T^{-1}] \propto [M^{-1}L^3T^{-2}]^x[ML^2T^{-1}]^y[ML^2T^{-2}]^z$$

$[ML^2T^{-1}] = k[M^{-1}L^3T^{-2}]^x[ML^2T^{-1}]^y[ML^2T^{-2}]^z$

Comparing the powers, we get

$$1 = -x + y + z \quad \text{...(i)}$$

$$2 = 3x + 2y + 2z \quad \text{...(ii)}$$

$$-1 = -2x - y - 2z \quad \text{...(iii)}$$

On solving Eqs. (i), (ii) and (iii), we get

$$x = 0$$

∴ Gravitational constant has no dimensions

13 **(d)**

We know that

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

In CGS units

$$d = 0.625 \text{ gcm}^{-3}$$

In SI units

$$d = \frac{0.625 \times 10^{-3} \text{ kg}}{10^{-6} \text{ m}^3} = 625 \text{ kgm}^{-3}$$

14 **(a)**

The velocity of a body at highest point of vertical circle is,

$$v = \sqrt{rg}$$

Or $v^2 = rg$

Or $\frac{v^2}{rg} = \text{constant}$

Hence, $\frac{v^2}{rg}$ is dimensionless.

15 **(b)**

Magnetic moment is the strength of magnet. Its SI unit is amp $\times$ m^2 or N - m/telsa or JT^{-1}.

17 **(a)**

Let $F \propto P^xV^yT^z$

By substituting the following dimensions:

$[P] = [ML^{-1}T^{-2}][V] = [LT^{-1}],[T] = [T]$

and comparing the dimension of both sides

$x = 1, y = 2, z = 2$, so $F = PV^2T^2$

19 **(a)**

Indestructibility, invariability and reproductibility are essential characteristics of a unit of measurement.

20 **(c)**

Energy = force × distance, so if both are increased by 4 times then energy will increase by 16 times

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