DPP

DAILY PRACTICE PROBLEMS

CLASS : XIth
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 5

Topic :- UNITS AND MEASUREMENTS

1 **(c)**

100 W= 100 J s^{-1} = 10^9 erg s^{-1}

2 **(d)**

From the given relation, $D = -\frac{n(x_2 - x_1)}{n_2 - n_1}$

Here $[n] = \left[\frac{1}{\text{area} \times \text{time}}\right] = \frac{1}{[L^2T]} = [L^{-2}T^{-1}]$

$x_2 - x_1 = [L]$ and $n_2 - n_1 = \left[\frac{1}{\text{volume}}\right] = \left[\frac{1}{L^3}\right] = [L^{-3}]$

So, $[D] = \frac{[L^{-2}T^{-1}L]}{[L^{-3}]} = [L^2T^{-1}]$.

3 **(b)**

Use formula for time period in angular SHM.

4 **(a)**

Electric potential $V = \frac{W}{q} = \frac{\text{joule}}{\text{coulomb}} = \frac{\text{newton} \times \text{metre}}{\text{coulomb}}$

$$= \frac{(\text{kg} - \text{ms}^{-2}) \times \text{m}}{\text{coulomb}}$$

$$= \text{kg} - \text{ms}^{-2} \times \text{m} \times \text{coulomb}^{-1}$$

$$\therefore \quad = [ML^2T^{-2}Q^{-1}]$$

5 **(b)**

$R = \frac{V}{I} = \left[\frac{ML^2T^{-3}A^{-1}}{A}\right] = [ML^2T^{-3}A^{-2}]$

6 **(b)**

Heat ΔQ transferred through a rod of length L and area A in time Δt is

$$\Delta Q = KA\left(\frac{T_1 - T_2}{L}\right)\Delta t$$

$$\therefore \quad K = \frac{\Delta Q \times L}{A(T_1 - T_2)\Delta t} \quad \text{...(i)}$$

Substituting dimensions for corresponding quantities in Eq. (i), we have

$$[K] = \frac{[ML^2T^{-2}][L]}{[L^2][\theta][T]}$$

$$= [MLT^{-3}\theta^{-1}]$$

7 **(b)**

$$\frac{F-32}{9} = \frac{K-273}{5} \Rightarrow \frac{x-32}{9} = \frac{x-273}{5} \Rightarrow x = 574.25$$

8 **(c)**

1 fermi $= 10^{-15}\,metre$

9 **(d)**

[Planck constant] = $[ML^2T^{-1}]$ and

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

10 **(b)**

MeV-sec is not a unit of energy. While others are units of energy.

11 **(b)**

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r^2}$$

$$\Rightarrow \varepsilon_0 = \frac{|q_1||q_2|}{[F][r^2]} = \frac{[A^2T^2]}{[MLT^{-2}][L^2]} = [A^2T^4M^{-1}L^{-3}]$$

12 **(d)**

$R_1 = (6 \pm 0.3)\text{k}\Omega$, $R_2 = (10 \pm 0.2)\text{k}\Omega$

$$R_{parallel} = \frac{R_1R_2}{(R_1+R_2)}$$

Let $(R_1 + R_2) = x$

$$\Rightarrow \quad R_P = \frac{R_1R_2}{x}$$

Taking log of both sides

$$\ln R_P = \ln R_1 + \ln R_2 - \ln x$$

Differentiating,

$$\frac{\Delta R_P}{R_P} = \frac{\Delta R_1}{R_1} + \frac{\Delta R_2}{R_2} + \left(-\frac{\Delta x}{x}\right)$$

$$\Delta x_{\text{mean}} = \frac{0.3+0.2}{2} = 0.25\ \Omega$$

$$R_{\text{mean}} = \frac{6+10}{2} = 8\ \Omega$$

$$\therefore \quad x = \frac{6+10}{2} = 8\ \Omega$$

$$\Rightarrow \quad \frac{\Delta x}{x} = \frac{0.25}{8}$$

$$\therefore \text{Total error} = \frac{0.3}{6} + \frac{0.2}{10} + \frac{0.25}{8}$$

$$= 0.05 + 0.02 + 0.03125 = 0.10125$$

$$\therefore \quad \frac{\Delta R_P}{R_P} = 10.125\%$$

13 **(d)**

$F_m = Bqv$ or $[B] = \left[\frac{F_m}{qv}\right] = \left[\frac{F_m}{Itv}\right]$

$$= \frac{[\text{MLT}^{-2}]}{[\text{A}][\text{T}][\text{LT}^{-1}]} = [\text{ML}^0\text{T}^{-2}\text{A}^{-1}]$$

Alternate

$F = BIl \Rightarrow [B] = \left[\frac{F}{Il}\right] = [\text{ML}^0\text{T}^{-2}\text{A}^{-1}]$

14 **(d)**

R=8.3 J/K-mol

$n_1 u_1 = n_2 u_2$

$$\therefore \quad n_2 = \frac{n_1 u_1}{u_2}$$

$$= \frac{8.3 \text{J/K}-\text{mol}}{\text{atm L/K}-\text{mol}}$$

$$= \frac{8.3 \text{J/K}-\text{mol}}{(1.013 \times 10^5 \text{N/m}^2)(10^{-3}\text{m}^3)/\text{K}-\text{mol}}$$

$$= \frac{8.12}{10^2} = 0.0812$$

$\therefore$ 8.3 J/K-mol=0.0812 atm L/K-mol

15 **(d)**

$P = nu \therefore n \propto \frac{1}{u}$

16 **(b)**

From Coulomb's law

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

Or $\varepsilon_0 = \frac{q_1 q_2}{4\pi F r^2}$

$\therefore$ Units of ε_0 (permittivity)

$$= \frac{\mathrm{C}^2}{\mathrm{N - m}^2} = \mathrm{C^2N^{-1}m^{-2}}$$

17 **(d)**

Work done $W = \varepsilon \Delta q$

$\therefore \quad \varepsilon = \frac{W}{\Delta q} = \frac{[\mathrm{ML^2T^{-2}}]}{[\mathrm{AT}]}$

$\therefore \quad [\varepsilon] = [\mathrm{ML^2T^{-3}A^{-1}}]$

18 **(a)**

Maximum absolute error is $\Delta a + \Delta b$. Now work out the relative error ad finally the percentage error.

19 **(b)**

Potential energy $= mgh = g\left(\frac{\mathrm{cm}}{\mathrm{sec}^2}\right)\mathrm{cm} = g\left(\frac{\mathrm{cm}}{\mathrm{sec}}\right)^2$

20 **(c)**

Resistivity, $\rho = \frac{m}{ne^2\tau}$

$$\therefore [\rho] = \frac{[\mathrm{M}]}{[\mathrm{L^{-3}}][\mathrm{AT}][\mathrm{T^2}]}$$

$$= [\mathrm{ML^3A^{-2}T^{-3}}]$$

So, electrical conductivity

$$\sigma = \frac{1}{\rho}$$

$\Rightarrow \quad [\sigma] = \frac{1}{[\rho]} = [\mathrm{M^{-1}L^{-3}A^2T^3}]$

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