DPP - Daily Practice Problems

Chapter-wise Sheets

Date : | **Start Time :** | **End Time :**

PHYSICS

CP01

SYLLABUS : Units and Measurements

Max. Marks : 74 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 20 Questions divided into 5 sections.
  Section I has **5** MCQs with ONLY 1 Correct Option, **3** marks for each correct answer and **–1** for each incorrect answer.
  Section II has **4** MCQs with ONE or MORE THAN ONE Correct options.
  For each question, marks will be awarded in one of the following categories:
  Full marks: **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
  Partial marks: **+1** For darkening a bubble corresponding to each correct option provided NO INCORRECT option is darkened.
  Zero marks: If none of the bubbles is darkened.
  Negative marks: **–2** In all other cases.
  Section III has **4** Single Digit Integer Answer Type Questions, **3** marks for each Correct Answer and 0 marks in all other cases.
  Section IV has Comprehension/Matching Cum-Comprehension Type Questions having **5** MCQs with ONLY ONE correct option, **3** marks for each Correct Answer and 0 marks in all other cases.
  Section V has **2** Matching Type Questions, **2** mark for the correct matching of each row and 0 marks in all other cases.
- You have to evaluate your Response Grids yourself with the help of Solutions.

Section I - Straight Objective Type

This section contains 5 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct.

1. A student measured the length of a rod and wrote it as 3.50 cm. Which instrument did he use to measure it?

(a) A meter scale.

(b) A vernier calliper where the 10 divisions in vernier scale matches with 9 division in main scale and main scale has 10 divisions in 1 cm.

(c) A screw gauge having 100 divisions in the circular scale and pitch as 1 mm.

(d) A screw gauge having 50 divisions in the circular scale and pitch as 1 mm.

RESPONSE GRID	1. ⓐⓑⓒⓓ

Space for Rough Work

2. If the constant of gravitational constant (G) and Planck's constant (h) and the velocity of light (c) be chosen as fundamental units then the dimensions of the radius of gyration is :

(a) $h^{1/2}\ c^{-3/2}G^{1/2}$ (b) $h^{1/2}c^{3/2}G^{1/2}$

(c) $h^{1/2}\ c^{-3/2}G^{-1/2}$ (d) $h^{-1/2}\ c^{-3/2}G^{1/2}$

3. Intensity observed in an interference pattern is $I = I_0 \sin^2\theta$. At $\theta = 30°$ intensity $I = 5 \pm 0.0020$ W/m^2. Find percentage error in angle if $I_0 = 20$ W/m^2.

(a) $\frac{4}{\pi}\sqrt{3}\times10^{-2}\%$ (b) $\frac{2}{\pi}\sqrt{3}\times10^{-2}\%$

(c) $\frac{1}{\pi}\sqrt{3}\times10^{-2}\%$ (d) $\frac{3}{\pi}\sqrt{3}\times10^{-2}\%$

4. Two masses M_A and M_B ($M_A < M_B$) are weighed using same weighing machine. Absolute error and relative error in two measurements are (Assume only systematic errors are involved)

(a) absolute error same for both, relative error greater for M_A and lesser for M_B

(b) absolute error same for both, relative error greater for M_B and lesser for M_A

(c) relative error same for both, absolute error greater for M_A and lesser for M_B

(d) relative error same for both, absolute error greater for M_B and lesser for M_A

5. Students I, II and III perform an experiment for measuring the acceleration due to gravity (g) using a simple pendulum. They use different lengths of the pendulum and /or record time for different number of oscillations. The observations are shown in the table.

Least count for length = 0.1 cm

Least count for time = 0.1 s

Student	Length of the pendulum (cm)	No. of oscillations (n)	Total time for (n) oscillations (s)	Time period (s)
I	64.0	8	128.0	16.0
II	64.0	4	64.0	16.0
III	20.0	4	36.0	9.0

If E_I, E_{II} and E_{III} are the percentage errors in g, i.e., $\left(\frac{\Delta g}{g}\times100\right)$ for students I, II and III, respectively, then

(a) $E_I = 0$ (b) E_I is minimum

(c) $E_I = E_{II}$ (d) E_{II} is maximum

Section II - Multiple Correct Answer Type

This section contains 4 multiple correct answer(s) type questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONE OR MORE** is/are correct.

6. The quantity/quantities that does/do not have mass in its/ their dimensions is/are

(a) specific heat

(b) latent heat

(c) electric potential difference

(d) electrical resistance

7. A student uses a simple pendulum of exactly 1m length to determine g, the acceleration due to gravity. He uses a stop watch with the least count of 1 sec for this and records 40 seconds for 20 oscillations. For this observation, which of the following statement(s) is (are) true?

(a) Error ΔT in measuring T, the time period, is 0.05 seconds

(b) Error ΔT in measuring T, the time period, is 1 second

(c) Percentage error in the determination of g is 5%

(d) Percentage error in the determination of g is 2.5%

8. If velocity of light in vacuum (3×10^8 m/s), acceleration due to gravity (9.81 m/s^2) and density of mercury (13600 kgm^{-3}) be adopted as the fundamental units, choose the correct option(s)

(a) unit of mass is 1.05×10^{52} kg

(b) unit of length is 9.17×10^{15} m

(c) unit of time is 3.06×10^{7} s

(d) unit of time is 3.06×10^{4} s

9. Which of the following are dimensionless quantities?

(a) $\frac{L}{CR^2}$ (b) $\frac{\varepsilon_0\mu_0E^2}{B^2}$ (c) $\frac{E^2}{B^2}$ (d) mLI^2

(Here symbols have their usual meanings)

Section III - Integer Type

This section contains 4 questions. The answer to each of the questions is a single digit integer ranging from 0 to 9.

10. If the time period t of a drop of liquid of density d, radius r, vibrating under surface tension s is given by the formula $t = \sqrt{d^a r^b s^c}$ and if a = 1, c = –1, then b is

11. To find the distance d over which a signal can be seen clearly in foggy conditions, a railways-engineer uses dimensions and assumes that the distance depends on the mass density ρ of the fog, intensity (power/area) S of the light from the signal and its frequency f. The engineer finds that d is proportional to $S^{1/n}$. The value of n is

RESPONSE GRID

2. ⓐⓑⓒⓓ 3. ⓐⓑⓒⓓ 4. ⓐⓑⓒⓓ 5. ⓐⓑⓒⓓ 6. ⓐⓑⓒⓓ

7. ⓐⓑⓒⓓ 8. ⓐⓑⓒⓓ 9. ⓐⓑⓒⓓ 10. ⓪①②③④⑤⑥⑦⑧⑨

11. ⓪①②③④⑤⑥⑦⑧⑨

Space for Rough Work

12. Density of a substance is $\rho = \frac{M}{V}$ where $M = (20 \pm 0.2)$ kg and $V = (10 \pm 0.1)\ m^3$. Calculate the percentage error in ρ.

13. In Searle's experiment, which is used to find Young's Modulus of elasticity, the diameter of experimental wire is $D = 0.05$ cm (measured by a scale of least count 0.001 cm) and length is $L = 110$ cm (measured by a scale of least count 0.1 cm). A weight of 50 N causes an extension of $X = 0.125$ cm (measured by a micrometer of least count 0.001cm). The maximum possible error in the values of Young's modulus is $x \times 10^{10}$ N/m^2. Find the value of x. Screw gauge and meter scale are free from error.

Section IV - Comprehension/Matching Cum-Comprehension Type

Directions (Qs. 14 and 15) : Based upon the given paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct.

PARAGRAPH

In an experiment to determine the charge to mass ratio e/m of the electron using a cylindrical diode, the following equation is derived: $\frac{e}{m} = \frac{8V}{r^2B^2}$, where V is the potential difference across the diode of radius r at the critical magnetic field B. The latter is supplied by passing a current I through a solenoid of diameter D and length L, and is given by

$$B = \frac{\mu_0 nI}{(1 + D^2/L^2)^{1/2}},$$

where n is the number of turns per unit length. The appropriate experimental quantities are determined as follows:

$n = 3920\ m^{-1}$; $D = 0.035 \pm 0.001$ m; $L = 0.120 \pm 0.001$ m;

$r = (3.4 \pm 0.1) \times 10^{-3}$ m; $I = 1.92 \pm 0.02$ A; $V = 20 \pm 1$ V.

14. Error in B is

(a) ± 0.9 T (b) ± 0.09 mT

(c) ± 0.9 mT (d) ± 0.09 T

15. Error in e/m is

(a) $\pm 0.01 \times 10^{11}$ c/kg (b) $\pm 1 \times 10^{11}$ c/kg

(c) $\pm 0.1 \times 10^{11}$ c/kg (d) $\pm 0.001 \times 10^{11}$ c/kg

Directions (Qs. 16-18) : This passage contains a table having 3 columns and 4 rows. Based on the table, there are three questions. Each question has four options (a), (b), (c) and (d) **ONLY ONE** of these four options is correct.

If dimensions are given, physical quantity may not be unique as two different physical quantities may have same dimensional formula. Column I and III shows physical quantities while column II gives dimensional formula with respect to M, L and T (fundamental physical quantities mass, length and time respectively).

	Column I		Column II		Column III
I.	Torque	(i)	$M^0L^0T^0$	(P)	Wave number
II.	Power of lens	(ii)	$M^0L^{-1}T^0$	(Q)	Moment of force
III.	Plane angle	(iii)	$M^0L^0T^{-1}$	(R)	π
IV.	Angular frequency	(iv)	$M^1L^2T^{-2}$	(s)	Angular velocity

16. Which of the following shows the correct matching in terms of dimensionally simillar quantity as x in e^x.

(a) (I) (i) (R) (b) (II) (iii) (S) (c) (III) (i) (R) (d) (IV) (iii) (S)

17. Which of the follwoing will remain unaffected if mass and length of the body changes?

(a) III (i) R (b) IV (iii) S (c) I (iv) Q (d) Both (a) and (b)

18. The dimensions of physical quantity 'X' in the equation

$$\frac{1}{\text{Angular frequency}} = \frac{\text{'X'}}{\text{Angular velocity}}$$ is same as:

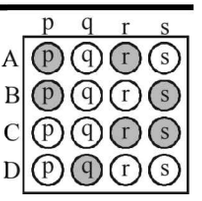
(a) II (i) R (b) IV (i) R (c) III (i) R (d) I (i) P

RESPONSE GRID					
12. ⓪①②③④⑤⑥⑦⑧⑨	13. ⓪①②③④⑤⑥⑦⑧⑨				
14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	

Space for Rough Work

Section V - Matrix-Match Type

This section contains 2 questions. It contains statements given in two columns, which have to be matched. Statements in column I are labelled as A, B, C and D whereas statements in column II are labelled as p, q, r and s. The answers to these questions have to be appropriately bubbled as illustrated in the following example. If the correct matches are A-p, A-r, B-p, B-s, C-r, C-s and D-q, then the correctly bubbled matrix will look like the following:



19. Some of the quantities in Column I have the same dimension as the quantities in Column II. Match the two columns.

Column I	**Column II**
(A) $\frac{ms\ell}{KA}$ m = mass s = specific heat capacity; ℓ = length; K = thermal conductivity; A = area	(p) $\frac{1}{\sqrt{\mu_0\varepsilon_0}}$ μ_0 = permeability of free space $\in_0$ = permittivity of free space
(B) E/B E = strength of electric field B = strength of magnetic field	(q) $\rho g h$ ρ = density of fluid g = acceleration due to gravity; h = height of column
(C) $\frac{1}{2}\varepsilon_0 E^2$ E = electric field ε_0 = permittivity of free space	(r) $\sqrt{\frac{GM}{r}}$ G = Newton's gravitational constant M = mass; r = radius
(D) $\frac{1}{2}\rho v^2$ ρ = density of fluid; v = speed of flow	(s) $\sqrt{LC}$ L = inductance; C = capacitance.

20. Column-I gives four physical quantities. Select the appropriate units for the choices given in Column-II. Some of the physical quantities may have more than one choice correct :

Column I	**Column II**
(A) Capacitance	(p) ohm-second
(B) Inductance	(q) coulomb^2–joule^{-1}
(C) Magnetic Induction	(r) coulomb (volt)$^{-1}$
(D) Magnetic flux density	(s) newton (amp-metre)$^{-1}$

RESPONSE GRID	
	19. A - ⓟⓠⓡⓢ; **B -** ⓟⓠⓡⓢ; **C -** ⓟⓠⓡⓢ; **D -** ⓟⓠⓡⓢ
	20. A - ⓟⓠⓡⓢ; **B -** ⓟⓠⓡⓢ; **C -** ⓟⓠⓡⓢ; **D -** ⓟⓠⓡⓢ

DAILY PRACTICE PROBLEM DPP CP01 - PHYSICS			
Total Questions	20	Total Marks	74
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	24	Qualifying Score	35

$$\text{Net Score} = \sum_{i=1}^{V}\left[\left(\text{correct}_i \times MM_i\right) - \left(In_i - NM_i\right)\right]$$

Space for Rough Work