PHYSICS

SPEED TEST

1

Chapter-wise

Physical World, Units & Measurements

Maximum Marks: 120 **Time: 1 Hour**

GENERAL INSTRUCTIONS

- This test contains 30 questions divided into two sections, Section-A consists of 20 Multiple Choice Questions and Section-B consists of 10 Numerical Value Answer Questions. For each Multiple Choice Question of Section-A only one option is correct. Darken the correct circle/ bubble in the Response Grid provided. And for each Numeric Value Answer Questions of Section-B fill the appropriate numeric value in the box provided in the response grid.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer of Section-A. Zero mark will be deducted for each incorrect answer of Section-B. Keep a timer in front of you and stop immediately at the end of 60 min.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

SECTION-A

1. The force is given in terms of time t and displacement x by the equation

$F = A \cos Bx + C \sin Dt$

The dimensional formula of $\frac{AD}{B}$ is :

(a) $[M^0 L T^{-1}]$ (b) $[M L^2 T^{-3}]$

(c) $[M^1 L^1 T^{-2}]$ (d) $[M^2 L^2 T^{-3}]$

2. N divisions on the main scale of a vernier calliper coincide with $(N+1)$ divisions of the vernier scale. If each division of main scale is 'a' units, then the least count of the instrument is

(a) a (b) $\frac{a}{N}$ (c) $\frac{N}{N+1} \times a$ (d) $\frac{a}{N+1}$

3. Young's modulus of a material has the same unit as

(a) pressur (b) strain

(c) compressibility (d) force

4. In the eqn. $\left(P + \frac{a}{V^2}\right)(V - b) = \text{constant}$, the unit of a is

(a) dyne cm^5 (b) dyne cm^4

(c) dyne/cm^3 (d) dyne cm^2

5. Of the following quantities, which one has dimensions different from the remaining three?

(a) Energy per unit volume

(b) Force per unit area

(c) Product of voltage and charge per unit volume

(d) Angular momentum

RESPONSE GRID 1. ⓐⓑⓒⓓ 2. ⓐⓑⓒⓓ 3. ⓐⓑⓒⓓ 4. ⓐⓑⓒⓓ 5. ⓐⓑⓒⓓ

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6. The percentage error in measuring M, L and T are 1%, 1.5% and 3% respectively. Then the percentage error in measuring the physical quantity with dimensions $ML^{-1}T^{-1}$ is

(a) 1% (b) 3.5% (c) 3% (d) 5.5%

7. The unit of permittivity of free space, ε_o is

(a) coulomb^2/(newton-metre)^2

(b) coulomb/newton-metre

(c) newton-meter^2/coulomb^2

(d) coulomb^2/newton-metre^2

8. If E, m, J and G represent energy, mass, angular momentum and gravitational constant respectively, then the dimensional formula of EJ^2/m^5G^2 is same as that of the

(a) angle (b) length (c) mass (d) time

9. The current voltage relation of a diode is given by $I = (e^{1000V/T} - 1)$mA, where the applied voltage V is in volts and the temperature T is in degree kelvin. If a student makes an error measuring ±0.01 V while measuring the current of 5 mA at 300 K, what will be the error in the value of current in mA?

(a) 0.2 mA (b) 0.02 mA (c) 0.5 mA (d) 0.05 mA

10. The distance of the Sun from earth is 1.5×10^{11} m and its angular diameter is (2000) s when observed from the earth. The diameter of the Sun will be :

(a) 2.45×10^{10} m (b) 1.45×10^{10} m

(c) 1.45×10^{9} m (d) 0.14×10^{9} m

11. The SI unit of a physical quantity is pascal-second. The dimensional formula of this quantity will be

(a) $[ML^{-1}T^{-1}]$ (b) $[ML^{-1}T^{-2}]$

(c) $[ML^{2}T^{-1}]$ (d) $[M^{-1}L^{3}T^{0}]$

12. Weber is the unit of

(a) magnetic susceptibility

(b) intensity of magnetisation

(c) magnetic flux

(d) magnetic permeability

13. Two full turns of the circular scale of a screw gauge cover a distance of 1mm on its main scale. The total number of divisions on the circular scale is 50. Further, it is found that the screw gauge has a zero error of –0.03 mm. While measuring the diameter of a thin wire, a student notes the main scale reading of 3 mm and the number of circular scale divisions in line with the main scale as 35. The diameter of the wire is

(a) 3.32 mm (b) 3.73 mm

(c) 3.67 mm (d) 3.38 mm

14. Velocity (v) and acceleration (a) in two systems of units 1 and 2 are related as $v_2 = \frac{n}{m^2}v_1$ and $a_2 = \frac{a_1}{mn}$ respectively. Here m and n are constants. The relations for distance and time in two systems respectively are:

(a) $\frac{n^3}{m^3}L_1 = L_2$ and $\frac{n^2}{m}T_1 = T_2$

(b) $L_1 = \frac{n^4}{m^2}L_2$ and $T_1 = \frac{n^2}{m}T_2$

(c) $L_1 = \frac{n^2}{m}L_2$ and $T_1 = \frac{n^4}{m^2} = T_2$

(d) $\frac{n^2}{m}L_1 = L_2$ and $\frac{n^4}{m^2}T_1 = T_2$

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RESPONSE GRID					
	6. ⓐⓑⓒⓓ	**7.** ⓐⓑⓒⓓ	**8.** ⓐⓑⓒⓓ	**9.** ⓐⓑⓒⓓ	**10.** ⓐⓑⓒⓓ
	11. ⓐⓑⓒⓓ	**12.** ⓐⓑⓒⓓ	**13.** ⓐⓑⓒⓓ	**14.** ⓐⓑⓒⓓ	

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15. Given below are two statements: One is labelled as Assertion (A) and other is labelled as Reason (R).
Assertion (A): Time period of oscillation of a liquid drop depends on surface tension (S), if density of the liquid is p and radius of the drop is r, then $T = K\sqrt{\frac{pr^3}{S^{3/2}}}$ is dimensionally correct, where K is dimensionless.
Reason (R): Using dimensional analysis we get R.H.S. having different dimension than that of time period.
In the light of above statements, choose the correct answer from the options given below.
(a) Both (A) and (R) are true and (R) is the correct explanation of (A)
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(c) (A) is true but (R) is false
(d) (A) is false but (R) is true

16. The respective number of significant figures for the numbers 23.023, 0.0003 and 2.1×10^{-3} are
(a) 5, 1, 2 (b) 5, 1, 5 (c) 5, 5, 2 (d) 4, 4, 2

17. Which of the following is not a dimensionless quantity ?
(a) Relative magnetic permeability (μ_r)
(b) Power factor
(c) Permeability of free space (μ_0)
(d) Quality factor

18. Match **List-I** with **List-II**.

List-I	List-II
(A) Torque	(i) MLT^{-1}
(B) Impulse	(ii) MT^{-2}
(C) Tension	(iii) ML^2T^{-2}
(D) Surface Tension	(iv) MLT^{-2}

Choose the **most appropriate** answer from the option given below :
(a) (A)–(iii), (B)–(i), (C)–(iv), (D)–(ii)
(b) (A)–(ii), (B)–(i), (C)–(iv), (D)–(iii)
(c) (A)–(i), (B)–(iii), (C)–(iv), (D)–(ii)
(d) (A)–(iii), (B)–(iv), (C)–(i), (D)–(ii)

19. Consider the efficiency of carnot's engine is given by $\eta = \frac{\alpha\beta}{\sin\theta}\log e\frac{\beta x}{kT}$, where α and β are constants. If T is temperature, k is Boltzmann constant, θ is angular displacement and x has the dimensions of length. Then, choose the incorrect option :
(a) Dimensions of β is same as that of force.
(b) Dimensions of $\alpha^{-1}x$ is same as that of energy.
(c) Dimensions of $\eta^{-1}\sin\theta$ is same as that of $\alpha\beta$.
(d) Dimensions of α is same as that of β.

20. A physical quantity of the dimensions of length that can be formed out of c, G and $\frac{e^2}{4\pi\varepsilon_0}$ is [c is velocity of light, G is universal constant of gravitation and e is charge]

(a) $c^2\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$ (b) $\frac{1}{c^2}\left[\frac{e^2}{G4\pi\varepsilon_0}\right]^{1/2}$

(c) $\frac{1}{c}G\frac{e^2}{4\pi\varepsilon_0}$ (d) $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

SECTION-B

21. The time period of a body under S.H.M. is represented by: $T = P^a D^b S^c$ where P is pressure, D is density and S is surface tension, then value of c is _____.

22. The density of material in CGS system of units is $4 g/cm^3$. In a system of units in which unit of length is 10 cm and unit of mass is 100 g, the value of density of material will be _____ unit.

RESPONSE GRID					
	15. ⓐⓑⓒⓓ	**16.** ⓐⓑⓒⓓ	**17.** ⓐⓑⓒⓓ	**18.** ⓐⓑⓒⓓ	**19.** ⓐⓑⓒⓓ
	20. ⓐⓑⓒⓓ	**21.**	**22.**		

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23. An object is moving through the liquid. The viscous damping force acting on it is proportional to the velocity. Then dimensions of constant of proportionality are $ML^0 T^{-x}$. Find the value of x.

24. The density of a solid metal sphere is determined by measuring its mass and its diameter. The maximum error in the density of the sphere is $\left(\frac{x}{100}\right)$ %. If the relative errors in measuring the mass and the diameter are 6.0% and 1.5% respectively, the value of x is _____.

25. The resistance $R = \frac{V}{I}$, where $V = (50 \pm 2)V$ and $I = (20 \pm 0.2)A$. The percentage error in R is 'x'%. The value of 'x' to the nearest integer is _____.

26. In an experiment to find acceleration due to gravity (g) using simple pendulum, time period of 0.5 s is measured from time of 100 oscillation with a watch of 1s resolution. If measured value of length is 10 cm known to 1 mm accuracy. The accuracy in the determination of g is found to be x%. The value of x is

27. The vernier constant of Vernier callipers is 0.1 mm and it has zero error of (– 0.05) cm. While measuring diameter of a sphere, the main scale reading is 1.7 cm and coinciding vernier division is 5. The corrected diameter will be _____ $\times 10^{-2}$ cm.

28. A student in the laboratory measures thickness of a wire using screw gauge. The readings are 1.22 mm, 1.23 mm, 1.19 mm and 1.20 mm. The percentage error is $\frac{x}{121}$% . The value of x is _____.

29. For $z = a^2 x^3 y^{1/2}$, where 'a' is a constant. If percentage error in measurement of 'x' and 'y' are 4% and 12%, respectively, then the percentage error for 'z' will be %.

30. The radius of a sphere is measured to be (7.50 + 0.85) cm. Suppose the percentage error in its volume is x. The value of x, to the nearest x, is _____.

RESPONSE GRID					
	23.	**24.**	**25.**	**26.**	**27.**
	28.	**29.**	**30.**		

PHYSICS CHAPTERWISE SPEED TEST-1			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	50	Qualifying Score	110
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

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