KD EDUCATION ACADEMY [9582701166] STREET NO. 21 A-1 BLOCK BENGALI COLONY SANT NAGAR BURARI DELHI -110084

Time : 3 Hour | **STD 11 Science class 11 physics** | **Total Marks : 120**

kd 90+ questions ch-1 units and measurement

*** Choose The Right Answer From The Given Options.[1 Marks Each]** **[45]**

1. Find the value of 12.9g - 7.05g.
   (A) 5.84g (B) 5.8g
   (C) 5.86g (D) 5.9g
2. Which of the following are not a unit of time?
   (A) Second. (B) Parsec.
   (C) Year. (D) Light year.
3. A device which is used for measurement of length to an accuracy of about 10^{-4}m, is:
   (A) Screw gauge.
   (B) Spherometer.
   (C) Vernier callipers.
   (D) Either (a) or (b).
4. Pascal is the unit of:
   (A) Force. (B) Stress.
   (C) Work. (D) Energy.
5. Which of the following is not a physical quantity?
   (A) Time. (B) Impulse.
   (C) Mass. (D) Kilogram.
6. If R and L represent resistance and self-inductance respectively, which of the following combinations has the dimensions of frequency?
   (A) $\frac{R}{L}$ (B) $\frac{L}{R}$
   (C) $\sqrt{\frac{R}{L}}$ (D) $\sqrt{\frac{L}{R}}$
7. The dimensional formula for latent heat is:
   (A) $M^0L^2T^{-1}$ (B) ML^2T^{-1}
   (C) MLT^{-2} (D) ML^2T^{-2}
8. If P, Q, R are physical quantities, having different dimensions, which of the following combinations can never be a meaningful quantity?
   (A) $\frac{(P-Q)}{R}$ (B) $\frac{PQ}{R}$

(C) $\frac{(PR-Q^2)}{R}$ (D) $\frac{(R+Q)}{P}$

9. When 1m, 1kg and 1 min are taken as the fundamental units, the magnitude of the force is 36 units. What will be the value of this force in CGS system?
(A) 10^5 dyne (B) 10^3 dyne
(C) 10^8 dyne (D) 10^4 dyne

10. Which of the following time measuring devices is most precise?
(A) A wall clock.
(B) A stop watch.
(C) A digital watch.
(D) An atomic clock. Give reason for your answer.

11. Which of the following is a dimensional constant?
(A) Refractive index.
(B) Dielectric constant
(C) Relative density.
(D) Gravitational constant.

12. The pair(s) of physical quantities that have the same dimensions is (are):
(A) Volumetric strain and coefficient of friction.
(B) Disintegration constant of a radioactive substance and frequency of light wave.
(C) Heat capacity and gravitational potential.
(D) Planck's constant and torque.

13. Percentage errors in the measurement of mass and speed are 2% and 3%, respectively. The error in the estimation of kinetic energy obtained by measuring mass and speed will be:
(A) 8% (B) 2%
(C) 12% (D) 10%

14. The length and breadth of a metal sheet are 3.124m and 3.002m respectively. The area of this sheet up to four correct significant figures is:
(A) $9.37m^2$
(B) $9.378m^2$
(C) $9.3782m^2$
(D) $9.378248m^2$

15. The dimensions of entropy are:
(A) $[M^0L^{-1}T^0K]$
(B) $[M^0L^{-2}T^0k^2]$
(C) $[MLT^{-2}K]$
(D) $[ML^2T^{-2}k^{-1}]$

16. Which of the following has neither units nor dimensions?
(A) Angle.

(B) Energy.

(C) Relative density.

(D) Relative velocity.

17. The quantity having the same unit in all system of unit is:

(A) Mass.

(B) Time.

(C) Length.

(D) Temperature.

18. Obtain the dimensional equation for universal gas constant.

(A) $[\mathrm{ML^2T^{-2}}]\ \mathrm{mol}^{-1}\mathrm{K}^{-1}$

(B) $[\mathrm{M^2LT^{-1}mol}^{-2}\mathrm{K}^{-2}]$

(C) $[\mathrm{ML^2LT^{-1}\ mol^{-1}K^{-1}}]$

(D) $[\mathrm{ML^3LT^{-1}\ mol^{-1}K^{-2}}]$

19. In the formula $x = 3yz^2$, x and z have dimensions of capacitance and magnetic induction, respectively. The dimensions of y in MKS system are:

(A) $[\mathrm{M^{-2}L^{-2}T^4A^4}]$

(B) $[\mathrm{M^{-3}L^{-3}T^4A^5}]$

(C) $[\mathrm{M^{-3}L^{-2}T^8A^4}]$

(D) $[\mathrm{M^{-1}L^{-4}T^2A^4}]$

20. If the length of a rectangle l = 10.5cm, breadth b= 2.1cm and minimum possible measurement by scale = 0.1cm, then the area is:

(A) $22.0\mathrm{cm}^2$

(B) $21.1\mathrm{cm}^2$

(C) $22.05\mathrm{cm}^2$

(D) $22\mathrm{cm}^2$

21. The number of particles crossing per unit area perpendicular to X-axis in unit time is: $\mathrm{N} = -\mathrm{D}\frac{\mathrm{n_2}-\mathrm{n_1}}{\mathrm{x_2}-\mathrm{x_1}}$ Where n_1 and n_2 are number of particles per unit volume for the value of x_1 and x_2 respectively. The dimensions of diffusion constant D are:

(A) $\mathrm{M^0LT^2}$

(B) $\mathrm{M^0L^2T^{-4}}$

(C) $\mathrm{M^0LT^{-3}}$

(D) $\mathrm{M^0L^2T^{-1}}$

22. Which of the following statement is incorrect regarding mass?

(A) It is a basic property of matter.

(B) The SI unit of mass is candela.

(C) The mass of an atom is expressed in u.

(D) None of the above.

23. The mass and volume of a body are 4.237g and $2.5\mathrm{cm}^3$, respectively. The density of the material of the body in correct significant figures is:

(A) $1.6048\mathrm{gcm}^{-3}$.

(B) $1.69\mathrm{gcm}^{-3}$.

(C) $1.7\mathrm{gcm}^{-3}$.

(D) 1.695gcm^{-3}.

24. The number of significant figures in 3400 is:

(A) 3 (B) 4

(C) 2 (D) 1

25. If the value of force is 100N and value of acceleration is 0.001 ms^{-2}, what is the value of mass in this system of units?

(A) 10^3kg (B) 10^4kg

(C) 10^5kg (D) 10^6kg

26. Which of the following has same dimension as that of Planck constant?

(A) Work.

(B) Linear momentum.

(C) Angular momentum.

(D) Impulse.

27. In 4700m, significant digits are:

(A) 2 (B) 3

(C) 4 (D) 5

28. If momentum (P), area (A) and time (T) are taken to be fundamental quantities, then energy has the dimensional formula:

(A) $(\mathrm{P}^1\mathrm{A}^{-1}\mathrm{T}^1)$. (B) $(\mathrm{P}^2\mathrm{A}^1\mathrm{T}^1)$.

(C) $(\mathrm{P}^1\mathrm{A}^{\frac{-1}{2}}\mathrm{T}^1)$. (D) $(\mathrm{P}^1\mathrm{A}^{\frac{1}{2}}\mathrm{T}^{-1})$.

29. In the standard equation $\mathrm{S_{nth}} = \mathrm{u} + \frac{\mathrm{a}}{2}[2\mathrm{n} - 1],$ what dimensions do you view for S_{nth}?

(A) $M^\circ L^1 T^\circ$ (B) $M^\circ L^{-1} T^1$

(C) $M^\circ L^1 T^{-1}$ (D) $M^\circ L^\circ T^1$

30. In the gas equation $\left(\mathrm{p} + \frac{\mathrm{a}}{\mathrm{V}^2}\right)(\mathrm{V} - \mathrm{b}) = \mathrm{RT}$ the dimensions of a are:

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

(B) $[\mathrm{M}^{-1}\mathrm{L}^3\mathrm{T}^{-1}]$

(C) $[\mathrm{ML}^5\mathrm{T}^{-2}]$

(D) $[\mathrm{M}^{-1}\mathrm{L}^{-5}\mathrm{T}^2]$

31. Give force $= \frac{\alpha}{\text{Density} + \beta^3}$ What are the dimensions of α, β

(A) $[\mathrm{ML}^2\mathrm{T}^{-2}][\mathrm{ML}^{\frac{-1}{3}}]$

(B) $[\mathrm{M}^2\mathrm{L}^4\mathrm{T}^{-2}], [\mathrm{M}^{\frac{1}{3}}\mathrm{L}^{-1}]$

(C) $[\mathrm{M}^2\mathrm{L}^{-2}\mathrm{T}^{-2}][\mathrm{M}^{\frac{1}{3}}\mathrm{L}^{-1}]$

(D) $[\mathrm{M}^2\mathrm{L}^{-2}\mathrm{T}^{-2}][\mathrm{ML}^{-2}]$

32. A dimensionless quantity:

(A) May have a unit.

(B) Never has a unit.

(C) Always has a unit.

(D) Doesn't exist.

33. Which physical quantities have same dimension?

(A) Force and power.

(B) Torque and energy.

(C) Torque and power.

(D) Force and torque.

34. Number of degrees present in one radian is:

(A) 58° (B) 57.3°

(C) 56.3° (D) 56°

35. 'Parsec' is the unit of:

(A) Time.

(B) Distance.

(C) Frequency.

(D) Angular acceleration.

36. The surface area of a solid cylinder of radius 2.0cm and height A cm is equal to $1.5 \times 10^4 (mm)^2$. Here, A refers to:

(A) 0.9cm (B) 10cm

(C) 30cm (D) 15cm

37. The numbers 2.745 and 2.735 on rounding off to 3 significant figures will give:

(A) 2.75 and 2.74.

(B) 2.74 and 2.73.

(C) 2.75 and 2.73.

(D) 2.74 and 2.74.

38. SI unit of capacitance is:

(A) ohm-second.

(B) Wb.

(C) coulomb $(volt)^{-1}$

(D) $A\text{-}m^2$

39. Dimensions of gravitational constant are:

(A) $\mathrm{M}^{-1}\mathrm{L}^{3}\mathrm{T}^{-2}$ (B) $\mathrm{M}^{-2}\mathrm{L}^{3}\mathrm{T}^{-1}$

(C) $\mathrm{M}^{3}\mathrm{L}^{-1}\mathrm{T}^{-2}$ (D) $\mathrm{M}^{-1}\mathrm{L}^{2}\mathrm{T}^{-3}$

40. The number of significant figures in 0.06900 is:

(A) 5. (B) 4.

(C) 2 (D) 3.

41. On the basis of dimensions, decide which of the following relations for the displacement of a particle undergoing simple harmonic motion is not correct:

a. $y = \frac{a \sin 2\pi t}{T}$.
b. $y = a \sin vt$.
c. $y = \frac{a}{T} \sin\left(\frac{t}{a}\right)$.
d. $y = a\sqrt{2}\left(\sin \frac{2\pi t}{T} - \cos \frac{2\pi t}{T}\right)$.

42. The number of significant figures in 0.06900 is:
a. 5.
b. 4.
c. 2
d. 3.

43. A unitless quantity:
a. Never has a non-zero dimension.
b. Always has a non-zero dimension.
c. May have a non-zero dimension.
d. Does not exist.

44. The dimensions $ML^{-1}T^{-2}$ may correspond to:
a. Work done by a force.
b. Linear momentum.
c. Pressure.
d. Energy per unit volume.

45. The radius of a circle is stated as 2.12cm. Its area should be written as:
a. $14cm^2$.
b. $14.1cm^2$.
c. $14.11cm^2$.
d. $14.1124cm^2$.

*** Answer The Following Questions In One Sentence.[1 Marks Each] [2]**

46. The normal duration of I.Sc. Physics practical period in Indian colleges is 100 minutes. Express this period in microcenturies. 1 microcentury = $10^{-6} \times 100$ years. How many microcenturies did you sleep yesterday?

47. Express the power of a 100 watt bulb in CGS unit.

*** Given Section consists of questions of 2 marks each. [6]**

48. Name the device used for measuring the mass of atoms and molecules.

49. The distance of a galaxy is of the order of 10^{25}m. Calculate the order of magnitude of time taken by light to reach us from the galaxy.

50. Find the dimensions of Planck's constant h from the equation E = hv where E is the energy and v is the frequency.

*** Given Section consists of questions of 3 marks each. [42]**

51. A famous relation in physics relates 'moving mass' m to the 'rest mass' mo of a particle in terms of its speed v and the speed of light, c. (This relation first arose as a consequence of special relativity due to Albert Einstein). A boy

recalls the relation almost correctly but forgets where to put the constant c. He writes: $m = \frac{m_0}{(1-v^2)^{1/2}}$. Guess where to put the missing c.

52. The frequency 'f' of vibration of a stretched string depends upon:
    i. Its length
    ii. The mass per unit length 'm'
    iii. The Tension 'T' in the string.
    iv. Obtain dimensionally an expression for frequency 'f'.

53. If $x = at^2 + bt + c$, where x is displacement as a function of time. Write the dimensions of a b and c.

54. Write the dimensional formula for the following:
    i. Wein's constant.
    ii. Planck's constant.
    iii. Specific heat.
    iv. Latent heat.
    v. Rydberg's constant.

55. Compute the following with regards to significant figures.
    i. 4.6×0.128
    ii. $\frac{0.9995 \times 1.53}{1.592}$
    iii. $876 + 0.4382$

56. The volume of a liquid flowing out per second of a pipe of length l and radius r is written by a student as, $v = \frac{\pi}{8}\frac{Pr^4}{\eta l}$ where P is the pressure difference between the two ends of the pipe and η is coefficent of viscosity of the liquid having dimensional formula $ML^{-1}T^{-1}$. Check whether the equation is dimensionally correct.

57. A planet moves around the sun in a circular orbit. The time period of revolution T of the planet depends on
    i. Radius of the orbit (R).
    ii. Mass of the sun M.
    iii. Gravitational constant G.

    Show dimensionally that $T^2 \propto R^3$

58. Check by the method of dimensional analysis whether the following relations are correct. $v = \sqrt{\frac{P}{D}}$ where v = velocity of sound and P = pressure, D = density of medium $n = \frac{1}{2l}\sqrt{\frac{F}{m}}$, where n = frequency of vibration l = legnth of the string F = Stretching force m = mass per unit length of the string.

59. By using the method of dimension, check the accuracy of the following formula : $T = \frac{rh\rho g}{2\cos\theta}$ where T is the surface tension, h is the height of the liquid, ρ is the density of the liquid, g acceleration due to gravity θ angle of contact, and r is the radius of the tube.

60. E, m, l and G denote energy, mass, angular momentum and gravitational constant respectively. Determine the dimensions of $\frac{El^2}{m^5G^2}$

61. A physical quantity Q is given by $Q = \frac{A^2 B^{\frac{3}{2}}}{C^{+4} D^{\frac{1}{2}}}$ The percentage error in A, B, C, D are 1%, 2%, 4%, 2% respectively. Find the percentage error in Q.

62. If the unit of force is 100N, unit of length is 10m and unit of time is 100s, what is the unit of mass in this system of units?

63. What are the dimensions of:
    a. Volume of a cube of edge a.
    b. Volume of a sphere of radius a.
    c. The ratio of the volume of a cube of edge a to the volume of a sphere of radius a?

64. Let x and a stand for distance. Is $\int \frac{dx}{\sqrt{a^2 - x^2}} = \frac{1}{a} \sin^{-1} \frac{a}{x}$ dimensionally correct?

*** Given Section consists of questions of 5 marks each.** **[25]**

65. Name the physical quantity of the dimension given below:
    i. ML^0T^{-3}
    ii. $ML^{-1}T^{-1}$
    iii. $M^{-1}L^3T^{-2}$
    iv. ML^2T^{-3}
    v. ML^0T^{-2}
    vi. T^{-1}

66. An artificial satellite is revolving around a planet of mass M and radius R, in a circular orbit of radius r. From Kepler's Third law about the period of a satellite around a common central body, square of the period of revolution T is proportional to the cube of the radius of the orbit r. Show using dimensional analysis, that $T = \frac{k}{R}\sqrt{\frac{r^3}{g}}$, where k is a dimensionless constant and g is acceleration due to gravity.

67. A physical quantity X is related to four measurable quantities a, b, c and d as follows: $X = a^2 b^3 c^{\frac{5}{2}} d^{-2}$. The percentage error in the measurement of a, b, c and d are 1%, 2%, 3% and 4%, respectively. What is the percentage error in quantity X? If the value of X calculated on the basis of the above relation is 2.763, to what value should you round off the result.

68. Test if the following equations are dimensionally correct:
    a. $h = \frac{2S\cos\theta}{\rho r g}$
    b. $u = \sqrt{\frac{P}{\rho}}$
    c. $V = \frac{\pi P r^4 t}{8\eta l}$
    d. $v = \frac{1}{2\pi}\sqrt{\frac{mgl}{I}}$

    where h = height, S = surface tension, ρ = density, P = pressure, V = volume, η = coefficient of viscosity, v = frequency and I = moment of inertia.

69. The frequency of vibration of a string depends on the length L between the nodes, the tension F in the string and its mass per unit length m. Guess the expression for its frequency from dimensional analysis.

----- मंज़िल उन्हीं को मिलती है, जिनके सपनों में जान होती है!!पंख से कुछ नहीं होता, हौसलों से उड़ान होती है!
