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Questions:

5 Marks

1. (i) Explain the use of screw gauge and vernier caliper in measuring smaller distances.
   (ii) Write a note on triangulation method and radar method to measure larger distances
2. Explain in detail the various types of errors.
3. What do you mean by propagation of errors? Explain the propagation of errors in addition and multiplication.
4. How will you determine the distance of moon from earth using parallax method?
5. Explain the principle of homogeniety of dimensions. What are its uses? Give example

3 Marks

6. Briefly explain the types of physical quantities.
7. What are the limitations of dimensional analysis?
8. In a submarine equipped with sonar, the time delay between the generation of a pulse and its echo after reflection from an enemy submarine is observed to be 80 sec. If the speed of sound in water is 1460 ms^{-1}. What is the distance of enemy submarine?
9. Assuming that the frequency γ of a vibrating string may depend upon
   (i) applied force (F)
   (ii) length (I)
   (ill) mass per unit length (m), prove that $\gamma \alpha \frac{1}{l}\sqrt{\frac{F}{m}}$ using dimensional analysis.
10. What is Gross Error & How can it be minimised.
11. From a point on the ground, the top of a tree is seen to have an angle of elevation 60^{o} . The distance between the tree and a point is 50m. calculate the height of the tree?
12. Two resistances R_1 = (100 ± 3) Ω, R_2 = (150 ± 2)Ω, are connected in series. What is their equivalent resistance?
13. The voltage across a wire is (100 ± 5)V and the current passing through it is (10 ± 0.2) A. Find the resistance of the wire.
14. Obtain an expression for the time period T of a simple pendulum. The time period T depend upon
    (i) mass 'm' of the bob
    (ii) length 'l' of the pendulum and
    (iii) acceleration due to gravity g at the place where the pendulum is suspended. (Constant k = 2π) i.e
15. If the value of universal gravitational constant in SI is 6.6 x 10^{-11} Nm^2 kg^{-2}, then find its value in CGS System?

2 Marks

16. Write the rules for determining significant figures.
17. Define precision and accuracy. Explain with one example.
18. Write short notes on the following.
    (a) Unit
19. The radius of the circle is 3.12 m. Calculate the area of the circle with regard to significant figures.
20. Define the SI unit of electric current.
21. A RADAR signal is beamed towards a planet and its echo is received 7 minutes later. If the distance between the planet and the Earth is 6.3×10^{10} m. Calculate the speed of the signal?
22. Check the correctness of the equation $\frac{1}{2}mv^2 = mgh$ using dimensional analysis method.
23. Convert 76 cm of mercury pressure into Nm^{-2} using the method of dimensions.
24. Round - off the following numbers as indicated.
    (a) 17.234 to 3 digits
    (b) 3.996×10^5 to 3 digits
    (c) 3.6925×10^{-3} to 2 digits
    (d) 124783 to 5 digits
25. Write any two errors of systematic errors. Explain them.
26. Write short notes on the following.
    (b) Rounding - off
27. Write short notes on the following.
    Dimensionless quantities

Multiple Choice Questions

28. One of the combinations from the fundamental physical constants is $\frac{hc}{G}$, The unit of this expression is
    (a) Kg^2 (b) m^3 (c) S^{-1} (d) m
29. If the error in the measurement of radius is 2%, then the error in the determination of volume of the sphere will be
    (a) 8% (b) 2% (c) 4% (d) 6%
30. If the length and time period of an oscillating pendulum have errors of 1% and 3% respectively then the error in measurement of acceleration due to gravity is
    (a) 4% (b) 5% (c) 6% (d) 7%
31. The length of a body is measured as 3.51 m, if the accuracy is 0.01 mm, then the percentage error in the measurement is
    (a) 35.1% (b) 1% (c) 0.28% (d) 0.035%

32. Which of the following has the highest number of significant figures?
(a) 0.007 m^2 (b) 2.64×10^{24} kg (c) 0.0006032 m^2 (d) 6.3200 J

33. If $\pi = 3.14$, then the value of π^2 is
(a) 9.8596 (b) 9.860 (c) 9.86 (d) 9.9

34. Which of the following pairs of physical quantities have same dimension?
(a) force and power (b) torque and energy (c) torque and power (d) force and torque

35. The dimensional formula of Planck's constant h is
(a) $[ML^2T^{-1}]$ (b) $[ML^2T^3]$ (c) $[MLT^{-1}]$ (d) $[ML^3T^{-3}]$

36. The velocity of a particle v at an instant t is given by $v = at + br^2$. The dimensions of b is
(a) [L] (b) $[LT^{-1}]$ (c) $[LT^{-2}]$ (d) $[LT^{-3}]$

37. The dimensional formula for gravitational constant G is
(a) $[ML^3T^{-2}]$ (b) $[M^{-1}L^3T^{-2}]$ (c) $[M^{-1}L^{-3}T^{-2}]$ (d) $[ML^{-3}T^2]$

38. The density of a 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, then the value of density of material will be
(a) 0.04 (b) 0.4 (c) 40 (d) 400

39. If the force is proportional to square of velocity, then the dimension of proportionality constant is
(a) $[MLT^0]$ (b) $[MLT^{-1}]$ (c) $[MLT^{-2}T]$ (d) $[MLT^{-1}T^0]$

40. The dimension of $(\mu_0\epsilon_0)^{\frac{1}{2}}$ is
(a) length (b) time (c) velocity (d) force

41. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are taken as three fundamental constants. Which of the following combinations of these has the dimension of length?
(a) $\frac{\sqrt{hG}}{c^{\frac{3}{2}}}$ (b) $\frac{\sqrt{hG}}{c^{\frac{5}{2}}}$ (c) $\sqrt{\frac{hc}{G}}$ (d) $\sqrt{\frac{G}{hc^3}}$

42. Round of the following number 19.95 into three significant figures.
(a) 19.9 (b) 20.0 (c) 20.1 (d) 19.5

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