Unit dimensions and Measurement Assignment

1. The unit of Planck's constant is

(a) *Joule* (b) *Joule*/s (c) *Joule*/*m* (d) *Joule- s*

2. The unit of reactance is

(a) *Ohm* (b) *Volt* (c) *Mho* (d) *Newton*

3. The dimension of $\frac{R}{L}$ are

(a) T^2 (b) T (c) T^{-1} (d) T^{-2}

4. Dimensions of potential energy are

(a) MLT^{-1} (b) ML^2T^{-2} (c) $ML^{-1}T^{-2}$ (d) $ML^{-1}T^{-1}$

5. The dimensions of electric potential are

(a) $[ML^2T^{-2}Q^{-1}]$ (b) $[MLT^{-2}Q^{-1}]$ (c) $ML^2T^{-1}Q$ (d) $ML^2T^{-2}Q$

6. The physical quantities not having same dimensions are

(a) Speed and $(\mu_0\varepsilon_0)^{-1/2}$ (b) Torque and work

(c) Momentum and Planck's constant (d) Stress and Young's modulus

7. The dimensional formula for Boltzmann's constant is

(a) $[ML^2T^{-2}\theta^{-1}]$ (b) $[ML^2T^{-2}]$ (c) $[ML^0T^{-2}\theta^{-1}]$ (d) $[ML^{-2}T^{-1}\theta^{-1}]$

8. Which of the following quantities is dimensionless

(a) Gravitational constant (b) Planck's constant (c) Power of a convex lens (d) None of these

9. Which of the two have same dimensions

(a) Force and strain (b) Force and stress

(c) Angular velocity and frequency (d) Energy and strain

10. The dimensions of pressure is equal to

(a) Force per unit volume (b) Energy per unit volume (c) Force (d) Energy

11. Identify the pair whose dimensions are equal

(a) Torque and work (b) Stress and energy (c) Force and stress (d) Force and work

12. A physical quantity *x* depends on quantities *y* and *z* as follows: $x = Ay + B\tan Cz$, where A, B and *C* are constants. Which of the following do not have the same dimensions

(a) *x* and *B* (b) *C* and z^{-1} (c) *y* and B/A (d) *x* and *A*

13. $ML^3T^{-1}Q^{-2}$ is dimension of

(a) Resistivity (b) Conductivity (c) Resistance (d) None of these

14. Two quantities *A* and *B* have different dimensions. Which mathematical operation given below is physically meaningful **[CPMT 1997]**

(a) *A*/*B* (b) *A* + *B* (c) *A* – *B* (d) None of these

15. Let $[\varepsilon_0]$ denotes the dimensional formula of the permittivity of the vacuum and $[\mu_0]$ that of the permeability of the vacuum. If *M* = mass, *L*= length, *T*= time and *I*= electric current, then

(a) $[\varepsilon_0] = M^{-1}L^{-3}T^2I$ (b) $[\varepsilon_0] = M^{-1}L^{-3}T^4I^2$ (c) $[\mu_0] = MLT^{-2}I^{-2}$ (d) $[\mu_0] = ML^2T^{-1}I$

16. The dimension of quantity (L/RCV) is

(a) [*A*] (b) $[A]^2$ (c) $[A^{-1}]$ (d) None of these

17. The quantity $X = \frac{\varepsilon_0 LV}{t}$; here ε_0 is the permittivity of free space, L is length, *V* is potential difference and *t* is time. The dimensions of *X* are same as that of

(a) Resistance (b) Charge (c) Voltage (d) Current

18. The unit of permittivity of free space ε_0 is

(a) *Coulomb*/*Newton-metre* (b) *Newton-metre*^{2}/*Coulomb*^{2}

(c) *Coulomb*^{2}/(*Newton-metre*)^2 (d) *Coulomb*^{2}/*Newton-metre*^{2}

19. Dimensional formula of capacitance is

(a) $M^{-1}L^{-2}T^4A^2$ (b) $ML^2T^4A^{-2}$ (c) $MLT^{-4}A^2$ (d) $M^{-1}L^{-2}T^{-4}A^{-2}$

20. The dimensional formula for impulse is

(a) MLT^{-2} (b) MLT^{-1} (c) ML^2T^{-1} (d) M^2LT^{-1}

21. The dimensions of universal gravitational constant are

(a) $M^{-2}L^2T^{-2}$ (b) $M^{-1}L^3T^{-2}$ (c) $ML^{-1}T^{-2}$ (d) ML^2T^{-2}

22. How many wavelength of Kr^{86} are there in one *metre*

(a) 1553164.13 (b) 1650763.73 (c) 652189.63 (d) 2348123.73

23. Light year is a unit of

(a) Time (b) mass (c) Distance (d) Energy

24. *L*, *C* and *R* represent physical quantities inductance, capacitance and resistance respectively. The combination which has the dimensions of frequency is

(a) 1/*RC* and *R*/*L* (b) $1/\sqrt{RC}$ and $\sqrt{R/L}$ (c) $1/\sqrt{LC}$ (d) C/L

25. In the relation $P = \frac{\alpha}{\beta}e^{-\frac{\alpha z}{k\theta}}$, *P* is pressure, *z* is distance , *k* is Boltzmann constant and θ is temperature. The dimensional formula of β will be

(a) $[M^0L^2T^0]$ (b) $[M^1L^2T^1]$ (c) $[M^1L^0T^0]$ (d) $[M^0L^2T^1]$

26. If the acceleration due to gravity be taken as the unit of acceleration and the velocity generated in a falling body in one second as the unit of velocity then

(a) The new unit of length is g *metre* (b) The new unit of length is 1 *metre*

(c) The new unit of length is g^2 *metre* (d) The new unit of time is $\frac{1}{g}$ *second*

27. The famous Stefan's law of radiation states that the rate of emission of thermal radiation per unit by a black body is proportional to area and fourth power of its absolute temperature that is $Q = \sigma AT^4$ where $A =$ area, $T =$ temperature and σ is a universal constant. In the 'energy- length- time temperature' (E-L-T-K) system the dimension of σ is

(a) $E^2T^2L^{-2}K^{-2}$ (b) $E^{-1}T^{-2}L^{-2}K^{-1}$ (c) $ET^{-1}L^{-3}K^{-4}$ (d) $ET^{-1}L^{-2}K^{-4}$

28. The resistive force acting on a body moving with a velocity *V* through a fluid at rest is given by $F = C_DV^2A\rho$ where, C_D = coefficient of drag, *A* = area of cross-section perpendicular to the direction of motion. The dimensions of C_D are

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

29. The dimensions of (angular momentum)/(magnetic moment) are :

(a) $[M^3LT^{-2}A^2]$ (b) $[MA^{-1}T^{-1}]$ (c) $[ML^2A^{-2}T]$ (d) $[M^2L^{-3}AT^2]$

30. The frequency *n* of vibrations of uniform string of length *l* and stretched with a force *F* is given by $n = \frac{P}{2l}\sqrt{\frac{F}{m}}$ where *p* is the number of segments of the vibrating string and *m* is a constant of the string. What are the dimensions of *m*

(a) $ML^{-1}T^{-1}$ (b) $ML^{-3}T^0$ (c) $ML^{-2}T^0$ (d) $ML^{-1}T^0$

31. Choose the wrong statement(s)

(a) A dimensionally correct equation may be correct (b) A dimensionally correct equation may be incorrect

(c) A dimensionally incorrect equation may be incorrect (d) A dimensionally incorrect equation may be incorrect

32. A certain body of mass *M* moves under the action of a conservative force with potential energy *V* given by $V = \frac{Kr}{x^2 + a^2}$ where *x* is the displacement and *a* is the amplitude. The units of *K* are

(a) *Watt* (b) *Joule* (c) *Joule-metre* (d) None of these.

33. The Richardson equation is given by $I = AT^2e^{-B/kT}$. The dimensional formula for AB^2 is same as that for

(a) IT^2 (b) kT (c) IK^2 (d) IK^2/T

34. If the units of force, energy and velocity are 10 *N*, 100 *J* and 5 ms^{-1}, the units of length, mass and time will be

(a) 10*m*, 5*kg*, 1*s* (b) 10*m*, 4*kg*, 2*s* (c) 10*m*, 4*kg*, 0.5*s* (d) 20*m*, 5*kg*, 2*s*.

35. The period of oscillation of a simple pendulum is given by $T = 2\pi\sqrt{\frac{l}{g}}$ where *l* is about 100 *cm* and is known to 1*mm* accuracy. The period is about 2*s*. The time of 100 oscillations is measured by a stop watch of least count 0.1 s. The percentage error in *g* is

(a) 0.1% (b) 1% (c) 0.2% (d) 0.8%

36. The percentage errors in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum error in the estimation of the kinetic energy obtained by measuring mass and speed

(a) 11% (b) 8% (c) 5% (d) 1%

37. While measuring the acceleration due to gravity by a simple pendulum, a student makes a positive error of 1% in the length of the pendulum and a negative error of 3% in the value of time period. His percentage error in the measurement of g by the relation $g = 4\pi^2\left(l / T^2\right)$ will be

(a) 2% (b) 4% (c) 7% (d) 10%

38. The random error in the arithmetic mean of 100 observations is *x*; then random error in the arithmetic mean of 400 observations would be

(a) 4*x* (b) $\frac{1}{4}x$ (c) 2*x* (d) $\frac{1}{2}x$

39. What is the number of significant figures in 0.310×10^3

(a) 2 (b) 3 (c) 4 (d) 6

40. Error in the measurement of radius of a sphere is 1%. The error in the calculated value of its volume is

(a) 1% (b) 3% (c) 5% (d) 7%

41. The mean time period of second's pendulum is 2.00*s* and mean absolute error on the time period is 0.05*s*. To express maximum estimate of error, the time period should be written as

(a) (2.00 ± 0.01) *s* (b) $(2.00 + 0.025)$ *s* (c) (2.00 ± 0.05) *s* (d) (2.00 ± 0.10) *s*

42. A body travels uniformly a distance of (13.8 ± 0.2) m in a time (4.0 ± 0.3) s. The velocity of the body within error limits is

(a) (3.45 ± 0.2) ms^{-1} (b) (3.45 ± 0.3) ms^{-1} (c) (3.45 ± 0.4) ms^{-1} (d) (3.45 ± 0.5) ms^{-1}

43. The percentage error in the above problem is

(a) 7% (b) 5.95% (c) 8.95% (d) 9.85%

44. The unit of percentage error is

(a) Same as that of physical quantity

(b) Different from that of physical quantity

(c) Percentage error is unit less

(d) Errors have got their own units which are different from that of physical quantity measured

45. The decimal equivalent of 1/20 upto three significant figures is

(a) 0.0500 (b) 0.05000 (c) 0.0050 (d) 5.0×10^{-2}

46. If 97.52 is divided by 2.54, the correct result in terms of significant figures is

(a) 38.4 (b) 38.3937 (c) 38.394 (d) 38.39

47. Accuracy of measurement is determined by

(a) Absolute error (b) Percentage error (c) Both (d) None of these

48. The radius of a sphere is (5.3 ± 0.1) *cm*. The percentage error in its volume is

(a) $\frac{0.1}{5.3}\times100$ (b) $3\times\frac{0.1}{5.3}\times100$ (c) $\frac{0.1\times100}{3.53}$ (d) $3+\frac{0.1}{5.3}\times100$

49. A thin copper wire of length *l* metre increases in length by 2% when heated through 10ºC. What is the percentage increase in area when a square copper sheet of length *l* metre is heated through 10º*C*

(a) 4% (b) 8% (c) 16% (d) None of the above.

50. In the context of accuracy of measurement and significant figures in expressing results of experiment, which of the following is/are correct

(1) Out of the two measurements 50.14 *cm* and 0.00025 *ampere*, the first one has greater accuracy

(2) If one travels 478 *km* by rail and 397 *m*. by road, the total distance travelled is 478 *km*.

(a) Only (1) is correct (b) Only (2) is correct (c) Both are correct (d)None of them is correct.