1. If the time period (T) of vibration of a liquid drop depends on surface tension (S), radius (r) of the drop and density (ρ) of liquid, then the expression of T is

(1) $T = k\sqrt{\frac{\rho r^3}{S}}$ (2) $T = k\sqrt{\frac{\rho^{1/2} r^3}{S}}$

(3) $T = k\sqrt{\frac{\rho r^3}{S^{1/2}}}$ (4) none of these

2. The electric field is given by $\vec{E} = \frac{A}{x^3}\hat{i} + By\hat{j} + Cz^2\hat{k}$. The SI units of A, B anc C are respectively.

(1) $\frac{N - m^3}{C}$, V/m^2, N/m^2-C

(2) $V\text{-}m^2$, V/m, N/m^2-C

(3) V/m^2, V/m, N-C/m^2

(4) V/m, N-m^3/C, N-C/m

3. What are the dimensions of A/B in the relation $F = A\sqrt{x} + Bx^2$, where F is the force, x is the distance and t is time?

(1) $L^{1/2}$ (2) $L^{3/2}$ (3) $L^{-3/2}$ (4) $L^{-1/2}$

4. The potential energy of a particle is given by the expression $U(x) = -\alpha x + \beta \sin\frac{x}{\gamma}$. A dimensionless combination of the constants α,β and γ is :-

(1) $\frac{\alpha}{\beta\gamma}$ (2) $\frac{\alpha^2}{\beta\alpha}$ (3) $\frac{\gamma}{\alpha\beta}$ (4) $\frac{\alpha\gamma}{\beta}$

5. The dimensions of $\frac{1}{\sqrt{\varepsilon_0\mu_0}}$ is that of :-

(1) velocity (2) time

(3) capacitance (4) distance

6. The dimensional formula for Planck's constant h and gravitational constant G respectively are :-

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

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

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

(4) $[MLT^{-3}]$, $[M^{-1}L^3T^{-3}]$

7. If energy (E), velocity (V) and time (T) are chosen as the fundamental quantities, the dimensional formula of surface tension will be :

(1) $[EV^{-1}T^{-2}]$ (2) $[EV^{-2}T^{-2}]$

(3) $[E^{-2}V^{-1}T^{-3}]$ (4) $[EV^{-2}T^{-1}]$

8. If dimension of critical velocity v_c, of liquid flowing through a tube is expressed as ($\eta^x \rho^y r^z$), where η, ρ and r the coefficient of viscosity of liquid, density of liquid and radius of the tube respectively, then the values of x, y and z are given by :

(1) 1, 1, 1 (2) 1, –1, –1

(3) –1, –1, 1 (4) –1, –1, –1

9. 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] :-

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

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

10. Which one of the following does not have the same dimensions

(1) work and energy

(2) angle and strain

(3) relative density and refractive index

(4) plank constant and energy

11. If unit of length and force incresed 4 times. The unit of energy.

(1) is increased by 4 times

(2) is increased by 16 times

(3) is increased by 8 times

(4) remains unchanged

12. The density of a material in CGS system is 8 g/cm^3. In a system of a unit in which unit of length is 5 cm and unit of mass is 20 g. The density of material is :-

(1) 8 (2) 20 (3) 50 (4) 80

13. In a new system the unit of mass is α kg, unit of length is β m and unit of times of γ s. The value of 1J in this new system is :-

(1) $\frac{\gamma^2}{\alpha\beta^2}$ (2) $\frac{\gamma\alpha}{\beta^2}$ (3) $\alpha\beta\gamma$ (4) $\alpha\gamma^2/\beta^2$

14. Which of the following has the highest number of significant figures ?

(1) 0.007 m^2 (2) 2.64×10^{24} kg

(3) 0.0006032 m^2 (4) 6.3200 J

15. 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, the value of density of material will be :-

(1) 0.04 (2) 0.4 (3) 40 (4) 400

16. The least count of a stop watch is $\frac{1}{5}$s . The time of 20 oscillations of a pendulum is measured to be 25s. What is the maximum percentage error in this measurement?

(1) 8% (2) 1% (3) 0.8% (4) 16%

17. The refractive index of water measured by the relation $\mu = \frac{\text{real depth}}{\text{apparent depth}}$ is found to have values of 1.34, 1.38, 1.32 and 1.36; the mean value of refractive index with percentage error :-

(1) $1.35 \pm 1.48\%$ (2) $1.35 \pm 0\%$

(3) $1.36 \pm 6\%$ (4) $1.36 \pm 0\%$

18. Choose the incorrect statement out of the following :-

(1) Every measurement made by any measuring instrument has some error.

(2) Every calculated physical quantity that is based on measured values has some error.

(3) A measurement can have more accuracy but less precision and vice versa.

(4) The percentage error is different from relative error.

19. A student measures the distance traversed in free fall of a body, initially at rest in a given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage errors in measurement of the distance and the time are e_1 and e_2 respectively, the percentage error in the estimation of g is :-

(1) $e_1 + 2e_2$ (2) $e_1 + e_2$

(3) $e_1 - 2e_2$ (4) $e_2 - e_1$

20. If a set of defective weights are used by a student to find the mass of an object using a physical balance, a large number of reading will reduce :-

(1) random error

(2) random as well as systematic error

(3) systematic error

(4) neither random nor systematic error

21. A quantity is represented by $X = M^a L^b T^c$. The percentage error in measurement of M, L and T are $\alpha\%$, $\beta\%$ and $\gamma\%$ respectively. The percentage error in X would be

(1) $(\alpha a + \beta b + \gamma c)$ %

(2) $(\alpha a - \beta b + \gamma c)$ %

(3) $(\alpha a - \beta b - \gamma c)$ %

(4) None of these

22. The period of oscillation of a simple pendulum in an experiment is recorded as 2.63s, 2.56s, 2.42s, 2.71s and 2.80s respectively. The average absolute error is

(1) 0.1s (2) 0.11s

(3) 0.01s (4) 1.0s

23. The length of a cylinder is measured with a metre rod having least count 0.1 cm. Its diameter is measured with vernier callipers having least count 0.01 cm. Given the length is 5.0 cm. and radius is 2.00 cm. The percentage error in the calculated value of volume will be –

(1) 2% (2) 1%

(3) 2.5% (4) 4%

24. A physical quantity ε is calculated by using the formula $\varepsilon = \frac{xy^2}{10z^{1/3}}$ where x, y and z are experimentally measured quantities. If the fractional percentage error in the measurements of x,y and z are 2%, 1% and 3% respectively, then the fractional percentage error in ε will be :-

(1) 0.5 % (2) 5 % (3) 6 % (4) 7 %

25. A wire has a mass (0.3 ± 0.003) g, radius (0.5 ± 0.005) mm and length (6 ± 0.06) cm. The maximum percentage error in the measurement of its density is–

(1) 1 (2) 2 (3) 3 (4) 4

26. The resistance of a metal is given by R = V/I, where V is potential difference and I is the current. In a circuit the potential difference across resitance is $V = (10 \pm 0.5)$V and current in resistance, $I = (2 \pm 0.2)$A. The value of resitance in Ω with percentage error is :-

(1) $5 \pm 10\%$ (2) $5 \pm 15\%$

(3) $5 \pm 20\%$ (4) $5 \pm 25\%$

27. The period of oscillation of a simple pendulum is given by $T = 2\pi\sqrt{\frac{\ell}{g}}$, where ℓ is about 100 cm and is known to have 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 :-
(1) 0.1% (2) 1% (3) 0.2% (4) 0.8%

28. In a vernier callipers, one main scale division is x cm and n divisions of the vernier scale coincide with (n –1) divisions of the main scale. The least count (in cm) of the callipers is :-

(1) $\left(\frac{n-1}{n}\right)x$ (2) $\frac{nx}{(n-1)}$ (3) $\frac{x}{n}$ (4) $\frac{x}{(n-1)}$

29. A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of – 0.004 cm, the correct diameter of the ball is :-

(1) 0.521 cm (2) 0.525 cm
(3) 0.053 cm (4) 0.529 cm

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**1**	**1**	**2**	**4**	**1**	**2**	**2**	**2**	**4**	**4**	**2**	**3**	**1**	**4**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	
Ans.	**3**	**1**	**4**	**1**	**1**	**1**	**2**	**3**	**2**	**4**	**2**	**3**	**3**	**4**	