PHYSICS

1. Given that : $y = A \sin\left[\left(\dfrac{2\pi}{\lambda}\right)(ct - x)\right]$ where y and x are measured in metres. Which of the following statements is true ?
   (a) The unit of λ is same as that of x and A.
   (b) The unit of λ is same as that of x but not of A
   (c) The unit of c is same as that of $2\pi/\lambda$.

2. If the velocity of light (c), gravitational constant (G) and Planck's constant (h) are chosen as fundamental units, then which of the following represents the dimensions of the mass ?
   (a) $[c^{1/2}G^{1/2}h^{1/2}]$ (b) $[c^{1/2}G^{-1/2}h^{-1/2}]$
   (c) $[c^{1/2}G^{-1/2}h^{1/2}]$ (d) $[c^{-1/2}G^{1/2}h^{1/2}]$

3. Error in the measurement of radius of a sphere is 1%. The error in the calculate value of its volume is :
   (a) 1 %   (b) 3 %
   (c) 5 %   (d) 7 %

4. The length and breadth of a metal sheet are 3.124 m and 3.002 m respectively. The area of this sheet upto four correct significant figures is : (in m^2)
   (a) 9.37   (b) 9.378
   (c) 9.3782   (d) 9.378248

5. The ratio of the dimensions of Planck's constant and that of moment of inertia is the dimension of :
   (a) time   (b) frequency
   (c) agnular momentum (d) velocity

6. In a system of units, if force (F), acceleration (A) and time (T) are taken as fundamental units then the dimensional formula for energy is :
   (a) $[FA^2T]$ (b) $[FAT^2]$
   (c) $[F^2AT]$ (d) $[FAT]$

7. A physical quantity $P = \dfrac{\sqrt{abc^2}}{d^3 e^{1/3}}$ is determined by measuring a, b, c, d and e separately with the percentage error of 2 %, 3 %, 2%, 1% and 6% respectively. Minimum amount of error is contributed by measurement of :
   (a) b (b) a
   (c) d (d) e

8. A physical quantity $y = \dfrac{a^4 b^2}{(cd^4)^{1/3}}$ has four observables a, b, c and d are 2 %, 3 %, 4% and 5 % respectively. The error in y will be :

   (a) 6 %   (b) 11 %
   (c) 12 %   (d) 22 %

9. If E = energy, G = gravitational constant, I = impulse and M = mass, the dimension of GIM^2/E^2 are same as that of :
   (a) time   (b) mass
   (c) length   (d) force

10. The speed (v) of ripples on the surface of water depends on surface tension (σ), density (ρ) and wavelength (λ). The square of speed (v) is proportional to :
    (a) $\dfrac{\sigma}{\rho\lambda}$ (b) $\dfrac{\rho}{\sigma\lambda}$
    (c) $\dfrac{\lambda}{\sigma\rho}$ (d) $\rho\lambda\sigma$

11. Which two of the following five physical parameters have the same dimensions ?
    1. Energy density   2. Refractive index
    3. Dielectric constant   4. Young;s modulus
    5. Magnetic field
    (a) 1 and 4   (b) 1 and 5
    (c) 2 and 4   (d) 3 and 5

12. The length and breadth of a reactangle are (5.7 ± 0.1) cm and (3.4 ± 0.2) cm. The area of rectangle with error limits is approximately :
    (a) (19.4 ± 1) cm^2 (b) (19.4 ± 2) cm^2
    (c) (19.4 ± 2.5) cm^2 (d) (19.4 ± 1.5) cm^2

13. A quantity X is defined by the equation : $X = 3CB^2$, where C is capacitance in farad and B represents magnetic field in tesla. The dimensions of X are :
    (a) $[ML^{-2}]$ (b) $[ML^{-2}T^{-2}A]$
    (c) $[ML^{-2}T^{-2}A^2]$ (d) $[L^{-1} A^{-1}]$

14. If energy (E), velocity (v) and force (F) be taken as fundamental quantities, then what are the dimensions of mass ?
    (a) $[Ev^2]$ (b) $[Ev^{-2}]$
    (c) $[Fv^{-1}]$ (d) $[Fv^{-2}]$

15. From the dimensional consideration, which of the following equation is correct
    (a) $T = 2\pi\sqrt{\dfrac{R^3}{GM}}$ (b) $T = 2\pi\sqrt{\dfrac{GM}{R^3}}$

    (c) $T = 2\pi\sqrt{\dfrac{GM}{R^2}}$ (d) $T = 2\pi\sqrt{\dfrac{R^2}{GM}}$