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Class 11 (Physics)

Sheet 1A

(Units measurement percentage error & dimensional analysis)

1. Water pours out at the rate Q from a tap into a cylindrical vessel of radius r. Find the rate at which the height of water level rises when the height is h.
2. Using the method of integration show that the area of a triangle of base ' b 'and altitude' h' is ½.l.b.
3. Using the method of integration show that volume of a right circular cone is $V=1/3.\pi r^2h$.
4. You are given a rod of length L.The linear mass density is λ such that $\lambda=a+bx$, Here a and b are constants. Find the mass of the rod.
5. Let the instantaneous velocity of a rocket, just after launching,be given by $v=2t+3t^2$(where v is in m/s and t is in s).Find out the distance travelled by the rocket from t=2 s to t= 3 s.
6. Two particles 1 and 2 move with constant velocities v_1 and v_2 along two mutually perpendicular straight lines towards the intersection point O.At the moment t=0 the particles were located at the distances l_1 and l_2 from the point O. How soon will the distance between the particles become the smallest? What is it equal to?
7. The position x of a particle at a time t is given by $x=\frac{V}{a}(1-e^{-at})$,where V is a constant and a>0.Find the dimensions of V and a.
8. The length and breadth of a rectangle are (5.7 ± 0.1)cm and (3.4 ± 0.2)cm. Calculate the area of the rectangle with error limits.
9. The error in the measurement of the radius of a sphere is 0.5%.What is the permissible percentage error in the measurement of its (a) surface area and (b) volume?
10. The number of particles crossing a unit area perpendicular to the x-axis in a unit time is given by $n=-D(\frac{n2-n1}{x2-x1})$,when$n_1$and $n_2$are the number of particles per unit volume at $x=x_1$and$x=x_2$respectively ,and D is the diffusion constant. Find the dimensions of D.
11. If the velocity (V), acceleration (A),and force (F) are taken as fundamental qualities instead of mass (M), length(L), and time (T).What would be the dimensions of Young's modulus (Y)?

12. 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 KE obtained by measuring mass and speed?
13. The mass of liquid flowing per second per unit area of cross section of the tube is proportional to P^x and v^y ,where P is the pressure difference and v is the velocity ,then What is the relation between x and y.
14. Assuming that the mass m of the largest stone that can be moved by a flowing river depends upon the velocity v of the water ,its density ρ , and the acceleration due to gravity g. Then show that m is directly proportional to v^6.
15. A liquid drop of density ρ, radius r,and surface tension σ oscillates with time period T. Find a relation betweenT^2andρ,σ and r.
16. The heat generated in a circuit is given by $Q = I^2Rt$,where I is current, R is resistance, and t is time. If the percentage errors in measuring I, R and t are 2% , 1% , and 1% respectively, then what will be the maximum error in measuring heat?