Brain International School

Vikas Puri, New Delhi

ASSIGNMENT NO. 2

SUBJECT: PHYSICS **CLASS-XI** **MAY,2025**

CH: 1 *UNITS AND MEASUREMENTS*

CONVERSION OF ONE SYSTEM OF UNITS TO ANOTHER

1. Convert one Newton into dyne

   ANS: 10^5 dyne

2. Convert one Joule into erg.

   ANS: $10^7\ erg$

3. Find the value of 60 J per min on a system that has 100g, 100cm and 1 min as the base units.

   ANS: $2.16 \times 10^6\ New\ uints\ of\ power$

4. If the unit of force is 1 kN, unit of length 1 km and the unit of time is 100 s, what will be the unit of mass?

   ANS: 10^2 kg

5. If the units of force, energy and velocity are 20N,200J and 5 m/s, find the units of length, mass and time.

   ANS: 10 m, 8 kg,2 s

6. Find the value 100 J on a system which has 20 cm ,250 g and half minute as fundamental units of length, mass and time.

   ANS: $9 \times 10^6\ New\ uints\ of\ energy$

7. When 1 m, 1 kg, and 1 min are taken as the fundamental units, the magnitude of the force is 36 units. What will be the value of this force in CGS system?

   ANS:$10^3\ dyne$

8. If the unit of force is kN, the length is 1 km and time 100s, then what will be the unit of mass

   ANS: 10,000kg

9. In a system of units, the units of mass, length and time are 1 quintal,1 Km and 1 h, respectively. In this system 1 N force will be equal to

   (a) 1 New unit

   (b) 129.6 New unit

   (c) 10^3 New unit

   (d) 125.7 New unit

10. The density of a material in SI units is $128\ kgm^{-3}$.In certain units in which the unit of length is 25cm and the unit of mass is 50g.Fnd the numerical value of density of the material.

ANS: 40 New units.

11. The density of a material in CGS system of units is 4 g/cm^2. 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

ANS: 40 New units.

12. A calorie is a unit of heat or energy and it equals about 4.2 J where 1 J=1 kgm^2s^{-2}.Suppose we employ a system of units in which the units of mass equals α kg, the units of length equals β m, the unit of time is γ s. Show that a calorie has a magnitude 4.2 $\alpha^{-1}\beta^{-2}\gamma^2$ in terms of the new units.

13. A new unit of length is chosen such that the speed of light in vacuum is unity. What is the distance between the sun and the earth in terms of the new unit if light takes 8 min and 20 sec to cover this distance?

ANS: 500 New units of length.

DIMENSIONS

14. Find the dimensions of a/b in the equation: F= $a\sqrt{x} + bt^2$, where F is force, x is distance and t is time.

15. Find the dimensions of $a \times b$ in the relation: P = $\frac{b-x^2}{at}$, where P is power, x is distance and t is time.

16. The vander wall's equation for a gas is $(P + \frac{a}{V^2})(V - b) = RT$. Determine the dimensions of a and b. Hence write the SI units of a and b.

17. In the equation: $y = a\sin(\omega t - kx)$, t and x stand for time and distance respectively. Obtain the dimensional formula for ω and k.

18. Find the dimensions of $a \times b$ in the relation: E = $\frac{b-x^2}{at}$, where E is energy, x is distance and t is time.

19. Find the dimensions of a/b in the relation: P = $\frac{a-t^2}{bx}$, where P is pressure, x is distance and t is time.

DEDUCING RELATION AMONG THE PHYSICAL QUANTITES

20. Consider a simple pendulum, having a bob attached to a string, that oscillates under the action of the force of gravity. Suppose that the period of oscillation of the simple pendulum depends on (i) mass m of the bob (ii) length l of the pendulum and (iii) acceleration due to gravity g at the place. Derive the expression for its time period using method of dimensions.

21. The velocity 'v' of water waves depends on the wavelength 'λ', density of water 'ρ' and the acceleration due to gravity 'g'. Deduce by the method of dimensions the relationship between these quantities.

22. A body of mass m is moving in a circle of radius r with angular velocity ω. Find expression for centripetal force acting on it by the method of dimensions.

23. Obtain an expression for the centripetal force F acting on a particle of mass m moving with velocity V in a circle of radius r. Take dimensionless constant K=1.

CH 2 MOTION IN A STRAIGHT LINE

DISTANCE, DISPLACEMENT, AVERAGE VELOCITY AND AVERAGE SPEED

1. A vehicle travels 4 km with speed of 3 km/h and another 4 km with speed of 5 km/h, then its average speed is
   (a) 3.75 km/h
   (c) 3.50 km/h
   (b) 4.25 km/h
   (d) 4.00 km/h
2. A body travels from A to B at 40 ms^{-1} and from B to A at 60 ms^{-1} . Calculate the average speed and average velocity.

   ANS: $48ms^{-1}$, 0
3. On a 60 km track, a train travels the first 30 km with a uniform speed of 30 $km\ h^{-1}$. How fast must the train travel the next 30 km so as to average 40 $km\ h^{-1}$ for the entire trip?

   ANS: $60km\ h^{-1}$.
4. A car travels along a straight line for the first half time with speed 50 kmh^{-1} and the second half time with speed $60kmh^{-1}$. Find the average speed of the car.

   ANS: 55 kmh^{-1}
5. A car covers AB distance with first one-third at velocity v_1 m/s, second one-third at v_2 m/s and last one-third at v_3 m/s. If $v_3 = 3v_1$, $v_2 = 2v_1$ and $v_1 = 11$ m/s then find the average velocity of the car.

   ANS: $18ms^{-1}$
6. The position of an object moving along x-axis is given by $x = a + bt^2$, where a = 8.5 m, b = 2.5 ms^{-2} and t = 0 s and t =2 s? What is is the average velocity between t = 2 s and t = 4s?

   ANS: 15.0 ms^{-1}
7. The displacement (in metre) of a particle moving along x-axis is given by $x = 18t + 5t^2$. Calculate:
   (i) the instantaneous velocity at t = 2 s,
   (ii) average velocity between t = 2 s and t = 3 s,
   (iii) instantaneous acceleration.

   ANS: $38ms^{-1}, 43\ ms^{-1}$,$10\ ms^{-2}$
8. The displacement x of a particle varies with time t as $x = 4t^2 - 15\ t + 25$.
   Find the position, velocity and acceleration of the particle at t = 0. When will the velocity of the particle become zero?

   ANS: 1.875 s.
9. The velocity of a particle is given by the equation, $v = 2t^2 + 5cms^{-1}$. Find (i) the change in velocity of the particle during the time interval between t_1 = 2 s and t_2 = 4 s (ii) the average acceleration during the same interval and (iii) the instantaneous acceleration at t_2 = 4 s.

   ANS: $24cms^{-1}, 12cms^{-2}$,$16cms^{-2}$.
10. The distance x of a particle moving in one dimension, under the action of a constant force is related to time t by the equation, $t = \sqrt{x} + 3$, where x is in meters and t in seconds. Find the displacement of the particle when its velocity is zero.

    ANS: 0
11. The acceleration of a particle in ms^{-2} is given by $a = 3t^2 + 2t + 2$, where time t is in second. If the particle starts with a velocity v = 2 ms^{-1} at t = 0, then find the velocity at the ends of 2 s.

    ANS: $18ms^{-1}$.