PHYSICS

1. MOTION

1. Distance is defined as the actual path followed by a body. C. G. S. unit of distance is cm. S. I. unit of distance is m.

2. Displacement is the shortest distance between initial and final point in a definite direction. C.G.S. unit of displacement is cm. S. I. unit of displacement is m.

3. The rate of change of position of an object is called as speed.

   Speed = $\dfrac{Distance\ travelled}{Time\ taken}$.

   C.G.S. units of speed is cm/s and S. I. unit is m/s.

4. When a body covers equal distances in equal intervals of time (however small the time intervals may be), the body is said to be moving with a uniform speed.

5. When a body covers unequal distances in equal intervals of time, or equal distance in unequal intervals of time the then the body is said to be moving with a nonuniform speed.

6. Average speed = $\dfrac{Total\ distance\ covered}{Total\ time\ taken\ to\ cover\ the\ distance}$

7. Rate of change of displacement is known as velocity

   Velocity = $\dfrac{displacement}{time}$.

   C.G.S. unit of velocity is cm/s and S. I. unit of velocity is m/s

8. Average velocity = $\dfrac{Total\ displacement}{Total\ time\ taken}$.

9. Rate of change of velocity is known as acceleration.

   Acceleration = $\dfrac{Change\ in\ Velocity}{Time\ taken}$.

10. The velocity (v) – time (t) relation for a body moving with uniform acceleration (a) in a straight line is v = u + at. (u = initial velocity)

11. The displacement(s) – time(t) relation for a body moving with uniform acceleration (a) in a straight line is $s = ut + \dfrac{1}{2}at^2$. (u = initial velocity)

12. Third equation of motion : $v^2 - u^2 = 2as$ where, v=Final velocity; u=Initial velocity; a=Acceleration(uniform); s=displacement.

13. The uniform acceleration produced in a freely falling body due to the gravitational pull of the earth is known as acceleration due to gravity (g).

14. When a body is dropped freely its initial velocity is zero.

15. When a body is dropped freely the velocity continuously increases.

16. When a body is dropped freely the direction of motion and direction of g are same.

17. When a body is dropped freely from a tower of height h the time taken by the body to hit the ground is $t = \sqrt{\dfrac{2h}{g}}$

18. When a body is dropped freely from a tower of height h the velocity with which it hits the ground is $v = \sqrt{2gh}$

19. If a body is projected vertically upwards with a velocity 'u', the maximum height (h) reached by the body is $h = \dfrac{u^2}{2g}$.

20. The time taken by body to reach maximum height 'h' is called its time of ascent, $t_a = \dfrac{u}{g}$

21. Time taken by body to travel from the maximum height to the ground is called time descent (t_d) is given by $t_d = \dfrac{u}{g}$

22. In the absence of air resistance, time of ascent is equal to time of descent.

23. Slope of s-t graph gives velocity.

24. Slope of v-t graph gives acceleration.

25. Area covered under v-t graph gives displacement.

26. Area covered under a-t graph gives change in velocity.

27. The motion of an object moving along a circular path is called circular motion.

28. The motion of an object along a circular pathwith uniform speed is called uniform circular motion.

29. The acceleration of a body towards centre of the circular motion is known as centripetal acceleration.

2. LAWS OF MOTION

1. A push or pull is force.

2. Inertia of rest is the inability of the body to change its state of rest by itself.

3. Inertia of motion is the inability of the body to change its state of motion by itself.

4. Inertia of direction is the inability of the body to change its direction of motion by itself.

5. Mass is the measure of inertia.

6. A body continues to be in a state of rest or of uniform motion along a straight line, unless it is acted upon by unbalanced force to change its state. This is known as Newton's first law of motion.

7. Linear momentum = mass x velocity i.e., $\vec{p} = m\vec{v}$.

    Units of linear momentum: CGS unit : g-cm/s; SI unit : kg-m/s.

    Linear momentum is a vector quantity.

8. Newton's second law of motion states that the rate of change of momentum of a body is directly proportional to the appluied unbalanced force in the direction of force.

9. C.G.S. unit of force is g-cm/s^2 or dyne.

    S.I. unit of force is newton. $1N = 10^5$ dyne.

    The gravitational unit of force is kg-wt (kg-f) or g-wt (g-f).

10. Balanced forces do not change the state of rest or motion of an object.

11. Unbolanced forces can change either its speed or direction of motion of an object.

12. Newton's third law of motion states that for every action there is an equal and opposite reaction.

13. The sum of momenta of the two objects before collision is equal to the sum of mometa after collision provided there is no external unbalanced force acting on them.

    $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$

14. Recoil velocity is the backward velocity experienced by a shooter when one shoots a bullet. Due to the recoil velocity the shooter experiences a backward jerk. The recoil velocity is the result of conservation of linear momentum of the system.

    $v_R = -m_b v_b / m_G$

    mb = mass of bullet

    ub = velocity of bullet after shoot

    mb = mass of Gun

3. GRAVITATION

1. Earth attracts everything towards it by an unseen force of attraction . This force of attraction is known as gravitation or gravitational pull.

2. The force that causes acceleration and keeps the body moving along the circular path is acting towards the centre is called the centripetal force.

3. Centripetal force is also called as centre - seeking force

4. Every object in the universe attracts every other object with a force which is proportional to the product of their masses and inversely proportional to the square of the distance between them. This is called law of gravitation or universal law of gravitation

5. The gravitational force between two uniform objects is directed along the line joining their centres.

6. Let masses (M) and (m) of two objects are (distance d) apart. Let F be the attractional force between two masses,then $F = GMm/d^2$

7. G is called universal gravitational constant

8. The value of G is $6.67 \times 10^{-11} \, Nm^2/kg^2$.

9. G is a constant and is known as universal Gravitational constant

10. Importance of universal law of gravitation :

    (i) The force that binds us to the earth

    (ii) The motion of the moon around the earth

    (iii) The motion of planet around the sun

    (iv) The tides due to the moon and the sun

11. When an object falls from any height under the influence of gravitational force, it is known as free fall.

12. whenever an object falls towards the earth, an acceleration is involved.

    This acceleration is called the acceleration due to gravity.

13. The acceleration due to gravity is denoted by g

14. The unit of g is same as the unit of acceleration , m/s^2

15. Mathematical Expression for g is $g = GM/R^2$.

16. The value of acceleration due to gravity of the earth , $g = 9.8 \, m/s^2$

17. The mass of a body is the quantity of matter contained in it.

18. Mass is a scalar quantity which has only magnitude but no direction.

19. Mass of body always remains constant and does not change from place to place

20. S.I unit of mass is kilogram (kg). Mass of a body can never be zero.

21. The force with which an object is attracted towards the centre of the earth, is called the weight of the object . W= mg

22. As weight always acts vertically down wards, therefore weight has both magnitude and direction and thus it is vector quantity.

23. The weight of a body changes from place to place , depending upon 'g'.

24. The S.I unit of weight is Newton, weight of the object becomes zero If g is zero .

25. Weight of the object on the moon is 1/6 into its weight on the earth.

26. The force acting on an object perpendicular to the surface is called thrust.

27. Force exerted by any object per unit area is called pressure.

28. SI unit of pressure is N/m^2 and it is also denoted by pascal (Pa)

29. Gas and liquid both are considered as fluids. Fluids exert equal pressure in all directions .

30. The upward force exerted by fluids on object when they are immersed is called buoyant force and the phenomenon is called buoyancy.

31. The magnitude of buoyant force depend on the density of the fluid.

32. Archimedes principle stated that when a body is immersed fully or partially in a fluid , it experiences an upward force that is equal to the weight of the fluid displaced by it.

33. Application of Archimedes principle:

    (i)   used in designing ships of Submarines

    (ii)   Loctometers, which are used to determine the purity of milk

    (iii)   hydrometers used for determining the density of liquids.

34. The density of a substance is defined as mass per unit volume

35. SI unit of density is kg / m^3

36. The Relative density of a substance is the ratio of its density to that of water

37. Relative density has no unit

38. Relative density = Density of a substance/density of water.