Motion

1. **Motion :** If the position of an object is changing with respect to its surroundings, then it is said to be in motion. Otherwise, it is said to be at rest.
2. **Distance :** Distance is the length of the actual path travelled by an object in motion while going from one point to another.

- SI unit of distance is meter (m) and CGS unit is centimeter (cm)

3. **Displacement :** Displacement is the minimum distance between the starting and finishing point.
4. **Speed :** Speed is the distance covered per unit time. It is a scalar quantity.

$$Speed = \frac{Total\ distance\ travelled}{Time\ required}$$

- Speed has magnitude but not direction

5. **Velocity :** The distance travelled in a particular direction by an object in unit time is called its velocity or the displacement that occurs in unit time is called velocity. It is a vector quantity. Velocity has both magnitude and direction.

Velocity $= \frac{Displacement}{Time}$

6. The units of speed and velocity are the same. It is m/s in SI system and cm/s in the CGS system. If the motion is along a straight line (linear), then the values of speed and velocity are the same.
7. **Effect of speed and direction on velocity :**

- Velocity depends on speed as well as direction.
- Velocity changes by :
  i) Changing the speed and keeping direction the same.
  ii) Changing the direction and keeping speed the same.
  iii) Changing both speed as well as direction.

8. **Uniform Motion :** Uniform motion is the motion in which an object covers equal distance in equal intervals of time.
   e.g. Rotational motion of the blades of a fan at a constant speed.
9. **Non uniform Motion :** Non uniform motion is the motion in which an object covers unequal distance in an equal interval of time.
   e.g. The motion of a body falling under gravity.
10. **Acceleration :** The rate of change of velocity is called acceleration.

Acceleration $= \frac{Change\ in\ velocity}{Time}$

- S.I. unit of acceleration is m/s^2 and and CGS unit of acceleration is cm/s^2.
  If ' u ' is initial velocity, ' v ' is final velocity after time ' t ' and ' a ' is acceleration, then

$$a = \frac{v-u}{t}$$

11. If the velocity changes by equal amounts in equal time intervals, the object is said to be in uniform acceleration. Otherwise, the object is said to be in non-uniform acceleration.

AB'S PATHS KOLHAPUR

- When velocity increases then acceleration is positive. When velocity decreases then acceleration is negative. Negative acceleration is called retardation of deceleration.

12. An object can have positive or negative acceleration. If the velocity is uniform, acceleration is zero.
13. **Equations of motion :** For a body moving along a straight line with uniform acceleration a, the equations of motion relating u (initial velocity), v (velocity after time t), s (displacement in time t), a and t are
    i) $v = u +$ at (Velocity - time relation)
    ii) $s = ut + \frac{1}{2}at^2$ (displacement - time relation)
    iii) $v^2 = u^2 + 2$ as (displacement - velocity relation)
14. **Uniform circular motion :** When an object moves with constant speed along a circular path, the motion is called uniform circular motion. It is an accelerated motion.
15. If an object, moving along a circular path of radius ' r ', takes time 't' to come back to its starting position, its speed is $v = \frac{2\pi r}{t}$, ' r ' is the radius of the circle.
16. The direction of the motion of the object undergoing a circular motion at any instant is the direction of the tangent drawn to the circular path at the point where the object is present at that instant.
17. **Newton's First law of motion :** An object continues to remain at rest or in a state of uniform motion along a straight line unless an external unbalanced force acts on it. This law is called the law of inertia.
18. **Momentum :** Momentum = Mass of body × its velocity

$$P = mv$$

- S.I. unit of momentum is kgm/s and CGS unit is $g.cm/s$

19. **Newton's Second law of motion:** The rate of change of momentum is proportional to the applied force and the change of momentum occurs in the direction of the force. $F = \frac{m(v-u)}{t} = ma$
    Where, momentum = mass × velocity

$$P = mv$$

20. Newton's Third law of motion Every action force has an equal and opposite reaction force which acts simultaneously.
21. **Force :** Force = mass × acceleration

It is a vector quantity. Its SI unit is newton (N) and CGS unit is dyne.

$1\ N = 1\ kg.m/s^2$

$$1 \text{ dyne} = 1\ g.cm/s^2$$

22. **Law of conservation of momentum :** When no external force acts on two interacting objects, their total momentum remains constant. It does not change.

OR

When two objects collide, the total momentum before collision is equal to the total momentum after collision.

AB'S PATHS KOLHAPUR

23.

	Sr. No.	Dimension	Direction	S.I. Unit	CGS unit
1	Distance	Has dimension	No direction	Metre (m)	Centimetre (cm)
2	Displacement	Has dimension	Has direction	Metre (m)	Centimetre (cm)
3	Speed	Has dimension	No direction	Metre/ second (m/s)	cm/s
4	Velocity	Has dimension	Has direction	m/s	cm/s
5	Acceleration	Has dimension	Has direction	m/s^2	cm/s^2
6	Momentum	Has dimension	Has direction	$kg.m/s$	$g.cm/s$
7	Force	Has dimension	Has direction	Newton(N) $kg.m/s^2$	Dyne g.cm $/s^2$

24. The first scientist to measure speed as the distance/ time was **Galileo**. The speed of dry air is $343.2\ m/s$ while the speed of light is about $3 \times 10^8\ m/s$. The speed of revolution of the Earth around the Sun is about 29770 m/s.

25. **Average speed :** Average speed is the ratio of the total distance covered by a body to the total time taken to do so. If a body covers distances S_1 in time t_1 and then distance s_2 in time t_2, its average speed over time $\left(t_1 + t_2\right)$ is equal to $\frac{s_1+s_2}{t_1+t_2}$

26. **Accelerated motion :** Accelerated motion is the one in which a body's velocity goes on changing with time. Non-uniform motion is an accelerated motion.

Sr. No.	Acceleration	Velocity, ofbody	a=
1	Positive	Increases	$a = \frac{v-u}{t}, v > u$
2	Negative	Decreases	$a = \frac{v-u}{t}, v < u$
3	Zero	Uniform	$a = \frac{v-u}{t} = 0, v = u$

AB's PATIL'S KOLHAPUR

28. Uses of distance-time graph

i) To find the position of the body at any time in the given time interval.
ii) To find the speed of the body at any time in the given time interval.
iii) To find the average acceleration when speed at different times is found.

29. Examples of uniform circular motion
i) The motion of the Earth around the Sun.
ii) The motion of the Moon around the Earth.
iii) The motion of the electron around the nucleus of the hydrogen atom.
iv) The motion of the blades of a fan (when the speed is not changed)
v) The motion of a communication satellite (a geostationary used for communication) around the Earth.

30. Balanced force : Consider a rigid body acted upon by two forces, equal in magnitude, opposite in direction and having the same line of action. These forces are called balanced forces as their net effect on the body is zero.

31. Unbalanced forces : A single force acting on a body is an unbalanced force. It produces acceleration in the body. If two or more forces act on a body such that their resultant is not zero, the resultant is an unbalanced
force responsible for accelerating the body.

32. Inertia : The tendency of a body to resist a change in its state of rest or state of motion is called inertia.

33. Types of inertia:

i) Inertia of rest : The inherent property of a body by virtue of which it cannot change its position of rest is called the inertia of rest.
ii) Inertia of motion : The inherent property of the body by virtue of which it cannot change its state of motion is called inertia of motion.
iii) Inertia of direction : The inherent property of a body by virtue of which it cannot change its direction of motion is called the inertia of direction.

34. Interaction forces: When one body exerts a force on some other body, the other body, too, exerts a force and the first one at the same time. This mutual action
between the two bodies is known as interaction.

35. Forces of action and reaction : When a body exerts, a force on another body, the other body too, exerts a force on the first one at the same time. These two forces are equal in magnitude, opposite in direction and act simultaneously. Out of these one is called the action or force of action while the other one is called the reaction or force of reaction.

36. **Important**

- Action and reaction are terms that express force .
- These forces act in pairs. One force can not exist by itself.
- Action and reaction forces act simultaneously.

ABC PATHS KOLHAPUR

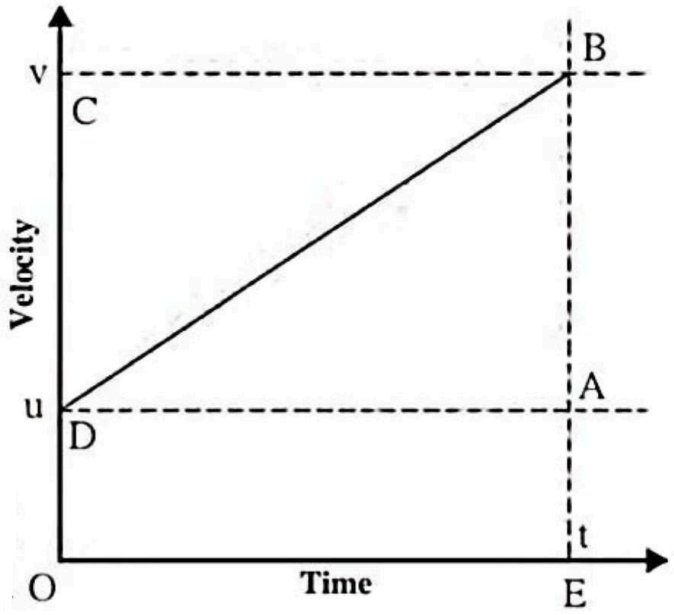
- Action and reaction forces act on different objects. They do not act on the same object and hence cannot cancel each other's effect.

37. Equation describing the relation between velocity and time

Figure shows the change in velocity with time of a uniformly accelerated object. The object starts from the point D in the graph with velocity u. Its velocity keeps increasing and after time t, it reaches the point B on the graph.
The initial velocity of the object $= u = OD$
The final velocity of the object $= v = OC$
Time $= t = OE$
Acceleration (a) $= \frac{Change\ in\ velocity}{Time}$
$= \frac{(\ Final\ velocity - Initial\ velocity\ )}{Time}$

$= \frac{(OC-OD)}{t}$

$\therefore CD =$ at ..... (i) $(OC - OD = CD)$
Draw a line parallel to the Y axis passing through B. This will cross the X axis in E . Draw a line parallel to X-axis passing through D. This will O cross the line BE at A .



Velocity - time graph

From the graph.... $BE = AB + AE$
$\therefore v = CD + OD$ .... $(AB = CD$ and $AE = OD)$
$\therefore v = at + u$ (from i)
$\therefore v = u + at$

This is the first equation of motion.

38. Equation describing the relation between displacement and time

Let us suppose that an object in uniform acceleration ' a ' and it has covered the distance ' s ' within time ' t '. From the graph in figure 1.9, the distance covered by the object during time ' t ' is given by

the area of the quadrilateral DOEB.
$\therefore s$ = area of quadrangle DOEB
= area (rectangle DOEA) + area of triangle (DAB)
$\therefore s = (AE \times OE) + \left(\frac{1}{2} \times [AB \times DA]\right)$

But, $AE = u, OE = t$ and $(OE = DA = t)$
AB = at $--$ $(AB = CD)$--- from (i)
$\therefore s = u \times t + \frac{1}{2} \times$ at $\times t$

$\therefore$ Newton's second equation of motion is $s = ut + \frac{1}{2}at^2$

39. Equation describing the relation between displacement and velocity

We have seen that from the graph in figure 1.9 we can determine the distance covered by the object in time t from the area of the quadrangle DOEB. DOEB is a trapezium. So we can use the formula for its area.
$\therefore s$ = area of trapezium DOEB
$\therefore s = \frac{1}{2} \times$ sum of lengths of parallel sides $\times$ distance between the parallel sides
$\therefore s = \frac{1}{2} \times (OD + BE) \times OE$ But, $OD = u, BE = v$ and $OE = t$
$\therefore s = \frac{1}{2} \times (u + v) \times t$

But, $a = \frac{(v-u)}{t}$
$\therefore t = \frac{(v-u)}{a}$

$\therefore s = \frac{1}{2} \times (u + v) \times \frac{(v-u)}{a}$

$\therefore s = \frac{(v+u)(v-u)}{2a}$

$\therefore 2$ as $= (v + u)(v - u) = v^2 - u^2$
$\therefore v^2 = u^2 + 2$ as
This is Newton's third equation of motion.

40. Law of conservation of momentum

Suppose an object A has mass m_1 and its initial velocity is u_1. An object B has mass m_2 and initial velocity u_2.
According to the formula for momentum, the initial momentum of A is m_1u_1 and that of B is m_2u_2.
Suppose these two objects collide. Let the force on A due to B be F_1. This force will cause acceleration in A and its velocity will become v_1.
$\therefore$ Momentum of A after collision $= m_1v_1$
According to Newton's third law of motion, A also exerts an equal force on B but in the opposite direction. This will cause a change in the momentum of B. If its velocity after collision is v_2,
The momentum of B after collision $= m_2v_2$. If F_2 is the force that acts on object B,
$F_2 = - F_1$

$\therefore m_2a_2 = - m_1a_1$ ..... $\because F = ma$

AB's PATHS KOLHAPUR

$\therefore m_2 \times \frac{(v_2 - u_2)}{t} = - m_1 \times \frac{(v_1 - u_1)}{t}$ ..... $\because a = \frac{(v-u)}{t}$

$\therefore m_2(v_2 - u_2) = - m_1(v_1 - u_1)$

$\therefore m_2 v_2 - m_2 u_2 = - m_1 v_1 + m_1 u_1$

$\therefore (m_2 v_2 + m_1 v_1) = (m_1 u_1 + m_2 u_2)$

The magnitude of total final momentum = the magnitude of total initial momentum.
Thus, if no external force is acting on two objects, then their total initial momentum is equal to their total final momentum. This statement is true for any number of objects.
'When no external force acts on two interacting objects, their total momentum remains constant. It does not change.'

This is a corollary to Newton's third law of motion. The momentum is unchanged after the collision. The momentum gets redistributed between the colliding objects. The momentum of one of the objects decreases while that of the other increases. Thus, we can also state this corollary as follows.
'When two objects collide, the total momentum before collision is equal to the total momentum after collision.'

In order to understand this principle, let us consider the example of a bullet fired from a gun. When a bullet of mass m_1 is fired from a gun of mass m_2, its velocity becomes v_1, and its momentum becomes $m_1 v_1$. Before firing the bullet, both the gun and the bullet are at rest and hence the total initial momentum is zero. According to the above law, the total final momentum also has to be zero. Thus, the forward moving bullet causes the gun to move backward after firing. This backward motion of the gun is called its recoil. The velocity of recoil, v_2, is such that,

$m_1 v_1 + m_2 v_2 = 0$ or $v_2 = - \frac{m_1}{m_2} \times v_1$

AB's PATHS KOLHAPUR

Practice Questions

1. If a body covers equal distances in equal intervals of time, however small these intervals may be, its motion may be called as
   (a) accelerated motion
   (b) uniform motion
   (c) non-uniform motion
   (d) none of the above

2. An acceleration of 3600 km/min^2 is the same as
   (a) 1 km/s^2
   .b) 100 m/s^2
   (c) 60 km/s^2
   (d) 600 m/s^2

3. The time of fall of a body to the ground from the top of the cliff 44.1 m high is
   (a) 10 sec
   (b) 3 sec
   (c) 9 sec
   (d) 6 sec

4. Uniform velocity of a fixed mass occurs when the resultant force acting on it is
   (a) constant
   (b) zero
   (c) decreases uniformly with time
   (d) increases uniformly with time.

5. A particle is projected from a point A vertically upwards with a speed of 50 m/s and another is dropped simultaneously from B which is 200 m vertically above A. The particles cross each other after ___ seconds.
   (a) 4
   (b) 5
   (c) 6
   (d) 8

6. A 120 m long train is moving towards west at a speed of 10 m/s. A small bird flying towards east with a speed of 5 m/s crosses the train. The time taken by the bird to cross the train would be ___ seconds.
   (a) 24
   (b) 16
   (c) 12
   (d) 8

7. A body under uniformly accelerated motion covers 20 m and 60 m in first two consecutive seconds of time from the beginning. The body' starts with an initial velocity
   (a) zero
   (b) 5 m/s
   (c) 10 m/s
   (d) 15 m/s

8. A trolley runs down a slope from rest with constant acceleration. In first second it travels 1.6 m . its acceleration is ___ m/s^2.
   (a) 0.8
   (b) 1.6
   (c) 3.2
   (d) 9.8

9. If a boy completes one round around a ground after every two minutes, then
   (a) his velocity is constant
   (b) his speed is constant
   (c) his momentum is constant
   (d) none of these

10. A 120 m long train is moving towards West at the speed of 10 m/s. A small bird flying towords east with the speed of 5 m/s crosses the train. The time taken by the bird to cross the train is

A.B.'s PATHS KOLHAPUR

(a) 24 s
(b) 16 s
(c) 12 s
(d) 8 s

11. If a bore is made along the diameter of the earth and a heavy sphere is dropped into into it then
(a) the sphere will reach to the centre and will stop
(b) the sphere will reach to the other extreme and then stop
(c) the sphere will perform oscillatory motion about the centre of the earth
(d) the sphere will reach to other extreme and will escape into the space

12. A bomb is dropped from a airplane flying horizontally when it is vertically above the building, the bomb will heat the building.
(a) true
(b) false
(c) not certain
(d) certain

13. A travels eastwards at 5 km/hr. B travels northwards at 12 km/hr. The relative velocity of each of them with respect to other is
a) 13 km/hr
b) 18 km/hr
(c) 7 km/hr
(d) 17 km/hr

14. A feather and block of iron fall at the same rate in
a) hydrogen
b) oxygen
(c) air
(d) vacuum

15. A stone dropped from a bridge reaches the bottom in 4 seconds. The height of the bridge is
(a) 2 m
(b) 64 feet
(c) 7840 m
(d) 7840 cm

16. A ball which falls on the ground bounces up again because of
(a) elasticity
(b) reaction force
c) gravitational force
(d) frictional force

17. Acceleration is given by
(a) force/mass
(b) mass / force
(c) force / velocity
(d) mass *X* force

18. Which of the following statements is wrong?
(a) Displacement is the rate of change of position
(b) Velocity is the rate of displacement
(c) Acceleration is the rate of change of velocity
(d) Force is the product of mass and acceleration

19. When the body falls vertically, its acceleration
(a) steadily decreases
(b) steadily increases
(c) remains constant
(d) changes

20. A body which is uniformly accelerated, changes its velocity from 36 km/hr in one direction to 18 km/hr in the opposite direction in 6 seconds. The total distance traveled by the body during this time interval is
(a) 30 m
(b) 25 m
(c) 9 m
(d) none of these

AR's PATHS KOLHAPUR

21. A body thrown vertically upwards reaches a maximum height of 100 m . How far will it move in the next 2 seconds?
    (a) 109.8 m
    (b) 119.6 m
    (c) 9.6 m
    (d) 19.6 m

22. The path along which a bullet fired from the moves is
    (a) a straight line
    (b) an arc of a circle
    (c) a parabola
    (d) a hyperbola

23. A simple pendulum is set into vibrations. The bob of the pendulum comes to rest after some time due to
    (a) air friction
    (b) inertia of bob
    (c) weight of bob
    (d) combination of all these

24. A man travels 4 km due east and then 3 km due north. The magnitude of his dis placement is
    (a) 7 km
    (b) 1 km
    (c) 5 km
    (d) none of these

25. A boat is rowed across the river at the rate of $4.5\ km/hr$. The river flows at the rate of $6\ km/hr$. The velocity of boat in m/s is
    (a) 2.9
    (b) 3.1
    (c) 2.1
    (d) 5

26. The displacement time graph of a particle is a straight line. Therefore,
    (a) its acceleration is constant
    (b) its velocity is constant
    (c) its displacement is constant
    (d) both velocity and acceleration are constant

27. The acceleration due to gravity is
    (a) equal at equator and poles
    (b) Maximum at the poies
    (c) Maximum of equator
    (d) Maximum at latitude 45

28. A stone is dropped from the roof of a house and it reaches the ground in 1 sec. How high is the house?
    (a) 9.8 m
    (b) 12 m
    (c) 19.6 m
    (d) 4.9 m

29. If two solid balls identical in size but one made of plastics and other of copper are set into motion then
    (A) Plastic balls have higher inertia of rest than that of copper balls.
    (B) Plastic balls have higher inertia of motion than that of copper balls.
    (C) Copper ball has higher inertia of motion than that of plastic ball.
    (D) Both balls have the same inertia of motion.

30. There is continuous change in the speed of a body due to the continuous application of ___
    (A) Inertia
    (B) Balanced force
    (C) Unifon *m* force
    (D) Unbalanced force

31. A straight 1 line in the distance - time graph shows that, ___ .....
    (A) The distance is increasing with time
    (B) The velocity is increasing with time
    (C) Velocity is decreasing with time.
    (D) The slope of the graph is constant.

AB's PATHS KOLHAPUR

32. Five cities A, B, CD and E are connected to each other as show 1 . If a person has to reach from A to E In the shortest time he should travel via.
(A) City B
(B) City C
(C) City D
(D) Any of the above

33. When wooden and metal block of same volume are thrown in soft mud from same height, it is observed that, ___
(A) Wooden blocks sink relatively deeper.
(B) Metal blocks sink relatively deeper.
(C) Both blocks sink upto same depth.
(D) Both blocks float on mud.

34. A ball at rest released vertically from a height ' h ' from ground exhibits maximum velocity. ___
(A) At height $h/2$
(B) At height $h/4$
(C) At height $h/7$
(D) Just before hitting the ground

35. To verify Newton's first law of motion, a balloon with the wooden disc is placed on a smooth glass sheet. A smooth glass sheet surface is used because ___
(A) A smooth glass sheet is an insulator.
(B) Smooth glass sheets offer very less friction.
(C) A smooth glass sheet is a reflector of light.
(D) Smooth glass sheet offers very less inertia.

36. The coin placed on the card sheet does not move along with the sheet, when the card sheet is flicked with a finger. This is due to ___
(A) Inertia of rest
(B) Inertia of motion
(C) Newton's third law of motion
(D) Newton's law of gravitation

37. The force necessary to cause an acceleration of 1 cm/s^2 in an object of mass 1 gm is called ___
(A) 1 Newton
(B) 1 Dyne
(C) 1 Kilo-Newton
(D) 1 Kilodyne

38. Newton's ..... law of motion is used in rocket launching.
(A) First
(B) Second
(C) Third
(D) Gravitational

39. If velocity of an object changes from 10 m/s to 24 m/s is 7 seconds, then acceleration is ___ m/s^2.
(A) 2
(B) 14
(C) 24
(D) 34

40. The inability of an object to change its state of rest or state of motion on its own is called as ___
(A) Momentum
(B) Displacement
(C) Inertia
(D) Force

41. How will be the velocity - time graph of a linear and uniformly accelerated motion ?
(A) A line parallel to X -axis
(B) A line parallel to Y -axis
(C) A Zig-Zag line
(D) None of these

42. In a collision of two objects A and B, A exerts a force of 3 N on B . What will be the force exerted by B on A ?

A B's PATHS KOLHAPUR

(A) More than 3 N
(B) 3 N
(C) 1.5 N
(D) 6 N

43. The minimum distance between the starting point of the motion and the finishing point of the motion is called as ___
(A) Distance
(B) Displacement
(C) Velocity
(D) Speed

44. A car starting from rest and undergoing linear motion, attains a speed of 125 m/s in 25 second. What is its acceleration ?
(A) 6 m/s^2
(B) 5 m/s^2
(C) 7 m/s^2
(D) None of these

45. A person starting from a vertex moves along the four sides of a rectangle of length 10 m and breadth 5 m and comes back to the original position. What is his displacement ?
(A) 30 m
(B) 15 m
(C) 0 m
(D) $5\sqrt{5}\ m$

46. A car covers a distance of 72 km in 2.5 hours. What is its speed ?
(A) 8 m/s.
(B) 28. 8 m/s.
(C') 16 m/s.
(D) 14. 4 m/s.

47. For an uniformly accelerated body, the displacement (s) in t seconds is given by s = ___
(A) $v^2 + 2as$
(B) $ut + \frac{1}{2}at^2$
(C) $v' + \frac{1}{2}at^2$
(D) $ut + at^2$

48. If velocity of a moving object is doubled, then its momentum ___
(A) Becomes double
(B) Becomes four times
(C) Becomes half
(D) Remains constant

49. During a collision ___ always remains constant.
(A) Velocity
(B) Speed
(C) Temperature
(D) Total momentum

50. If velocity of an object is constant, then acceleration is ___
(A) Positive
(B) Zero
(C) Negative
(D) Changing

51. When an object covers equal distance in equal intervals of time, the motion is called ___ motion.
(A) Uniform
(2) Linear
(C) Non - linear
(D) Non - uniform

ABS PATHS KOLHAPUR

52. Vector quantities can be described completely by magnitude and ___
(A) Unit
(B) Sign
(C) Direction
(D) Symbol

53. Which of the following quantities is a scalar quantity?
(A) Acceleration
(B) Momentum
(C) Speed
(D) Displacement

54. Sensitive change is ___ if the same force is applied to different objects over the same period.
(A) Different
(B) Same
(C) Unbalanced
(D) None of these

55. Which of the following equations represents velocity - time ?
(A) $v = u + at$
(B) $s = ut + \frac{1}{2}at^2$
(C) $v^2 = u^2 + 2as$
(D) None of these

56. When two objects collide, the total momentum before the collision is ___ the total momentum after the collision.
(A) Equal to
(B) Greater than
(C) Double
(D) Less than

57. On release of a bullet from the gun, the gun moves back slightly. This motion is called as ___
(A) Impact
(B) Unbalanced force
(C) Inertia
(D) Recoil

58. Find the odd one out.
(A) Motion of vehicles on a crowded street.
(B) A man going for a stroll on a beach
(C) Soldiers marching
(D) Motion of fishes in water

59. The mass of a canon is 500 kg and it recoils with a speed of $0.25\ m/s$. What is the momentum of the cannon?
(A) $20\ kg\ m/s$.
(B) $125\ kg\ m/s$
(C) $200\ kg\ m/s$.
(D) $12.5\ kg\ m/s$

60. A person swims 100 m in the first 40 s, 80 m in the next 40 s and 45 m in the last 20 s . What is the average speed of the person ?
(A) $2.25\ m/s$.
(B) $22.5\ m/s$
(C) $225\ m/s$.
(D) $0.225\ m/s$.

61. A body starts from rest and moves with uniform acceleration of $4\ m/s^2$. How much time will it take to cover a distance of 128 m ?
(A) 64 s
(B) 32 s
(C) 16 s
(D) 8 s

ABS PATHS KOLHAPUR

62. A Kangaroo can jump 2.5 m vertically. What must be the initial velocity of the Kangaroo?
(A) 49 m/s.
(B) 10 m/s.
(C) 7 m/s.
(D) 5 m/s.

63. The forces of action and reaction have the same
___ and opposite ___
(A) Unit, direction
(B) Direction, unit
(C) Momentum, inertia
(D) Inertia, momentum

64. Which of the following is based on the principle of moment of force?
(A) A moving fan
(B) Motion of a simple pendulum
(C) See-saw balanced by two children
(D) Swing

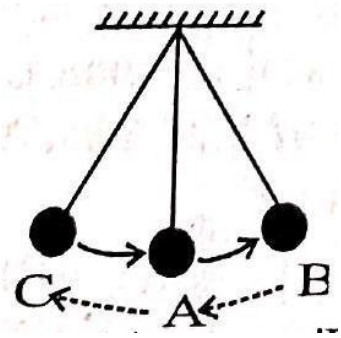
65. What is the type of motion that can be seen in a particle performing Simple Harmonic Motion (SHM) with a period of 2π seconds?
(A) Circular
(B) Elliptical
(C) Parabolic
(D) Translational

66. Why does a needle float on the surface of water when kept horizontally ?
(A) Due to adhesive force
(B) Due to cohesive force
(C) Due to fluidity
(D) Due to surface tension

67. The unit of which of the following quantities is volt ?
(A) Electric charge
(B) Electric current
(C) Electromotive force
(D) Specific resistance

68. A ball is thrown vertically upwards with a velocity of 19. 6 m/s, What is the maximum height to which it will reach?
(A) 10 m
(B) 9.8 m
(C) 19.6 m
(D) 39.2 m

69. In the figure shown, a pendulum oscillates via path A-O - B. At which point will it have maximum acceleration?
(A) At point ' A '
(B) At point ' B '
(C) At point ' O '



(D) Between ' A ' to ' O ' and between ' B ' to ' O '

ABS PATHS KOLHAPUR

70. 'In the cyclone, huge trees get uprooted. This phenomenon can be explained on the basis of which law?
(A) Newton's first law of motion
(B) Newton's second law of motion
(C) Newton's third law of motion
(D) Newton's law of gravitation

71. Which force makes the uranium nucleus unstable ?
(A) Weak forces
(B) Nuclear force
(C) Electromagnetic force
(D) Gravitational force

72. Which type of motion is shown by the wings of a bird when it flies in the air ?
(A) Rotational
(B) Vibrational
(C) Displacement
(D) Periodic

73. Which factors from the following affect the rate of change of momentum ?
(P) Mass of an object
(Q) Acceleration of an object
(R) Final velocity of an object
(S) The time required to change the velocity.
(A) P
(B) P, Q
(C) P, Q, R
(D) P, Q, R, S

74. According to which law from the following the 'bow and arrow' work ?
(A) Newton's first law of motion.
(B) Newton's second law of motion.
(C) Newton's third law of motion.
(D) Newton's law of gravitation.

75. A bullet is fired through a gun. Select the correct statement from the following about the total momentum of the system ?
(A) The total momentum of the system is zero.
(B) The total momentum of the system is greater than zero.
(C) The total momentum of the system is directly proportional to the mass of the gun.
(D) The total momentum of the system is inversely proportional to the mass of the bullet.

76. In which position from the following, the velocity of an object remains uniform?
(A) Changing the speed while keeping the direction as it is.
(B) Changing the direction while keeping the speed as it is.
(C) Changing the speed as well as direction.
(D) Keeping the speed and the direction constant.

77. Select the incorrect statement related to the speed and the velocity.
(A) The units of speed and velocity are sarne.
(B) The speed and velocity are related to displacement and distance respectively.
(C) If motion is linear, magnitude of speed and velocity is same.
(D) Speed is scalar and velocity is vector.

78. According to which law, huge trees uproot by cyclones ?
(A) Newton's first law of motion.
(B) Newton's second law of motion.
(C) Newton's third law of motion.
(D) Newton's law of gravitation.

79. Identify the odd physical quantity from below.
(A) Speed
(B) Velocity
(C) Acceleration
(D) Momentum

ABS STATES KOLHAPUR

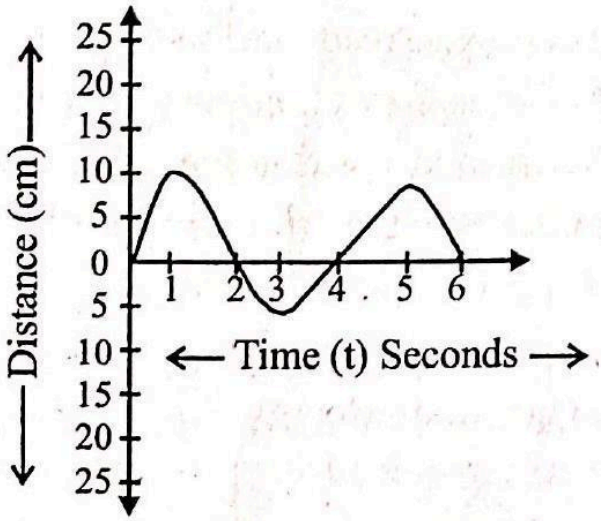
80. Select the proper unit of momentum in the MKS system.
(A) m/s^2
(B) $kg.cm/s$
(C) $kg \cdot m/s$
(D) $kg.cm/s^2$

81. Which of the following statements is incorrect related to the force of action and reaction?
(A) Force of action and reaction apply together in pairs.
(B) Action and reaction are just the terms explaining force.
(C) Force of action and reaction apply on the same body.
(D) Force of action and reaction are of equal magnitude.

82. A coconut falls down due to the wind from a coconut tree in 1 second. Determine the height of the coconut tree ?
(A) 9.5 m
(B) 98 m
(C) 49 m
(D) 4.9 m

83. Using which formula we get the velocity of the falling object from the height of 1 m ?
(A) $v = 2\,g$
(B) $v = \sqrt{2}g$
(C) $v^2 = 2\sqrt{g}$
(D) $v^2 = \sqrt{2}g$

84. Graph of time (on X-axis) and displacement (on Y-axis) of a body undergoing. S.H.M. is given. Find the amplitude and period of oscillation.



(A) 10 cm, 4 s
(B) 20 cm, 2 s
(C) 5 cm, 4 s
(D) 10 cm, 6 s

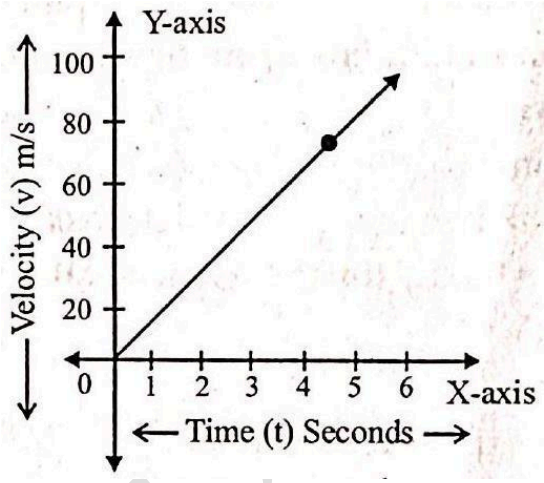
85. Which of the following physical quantities are vectors?
(A) P, R, S
(B) Q, R, T
(C) P, R, T
(D) P, R, S, T
(P) Energy
(Q) Displacement
(R) Momentum
(S) Power
(T) Acceleration

AB's P OLHAPUR

86. A bullet of 50 g is fired using a rifle of mass 10 kg . Rifle recoils with velocity 2. 5 m/s. Which of the following is the initial velocity of the bullet ?
(A) 50 m/s
(B) 350 m/s
(C) 500 m/s
(D) 1250 m/s

87. Two substances of equal mass and different velocities collide with each other. Determine the correct equation related to the conservation of momentum.
(A) $u_1 + v_1 = u_2 + v_2$
(B) $u_1 - v_1 = v_2 - u_2$
(C) $u_1 - v_1 = u_2 - v_2$
(D) $mv_1 - mu_1 = mv_1 + mv_2$

88. An object of mass 200 g is moving in a straight line. The figure shows its velocity-time graph. Find the force acting on the body.



(A) 3.1 N
(B) 16 N
(C) 3.2 N
(D) 0.16 N

89. Which of the following statements is incorrect related to the action and reaction forces?
(i) Both forces have the same magnitude.
(ii) Both forces act on the same body.
(iii) Both forces act on different bodies.
(iv) Both forces have different magnitudes.
(A) i, ii, iii
(B) i,iii
(C) ii, iv
(D) i, ii, iii, iv

90. An object is in linear motion. If its mass is reduced by 50% and its velocity is increased by 4 times of its original velocity, then which of the following is the correct relation between the original momentum P_1 and the final momentum P_2 of the object ?
(A) $P_1 > P_2$
(B) $2P_1 = P_2$
(C) $P_1 = 2P_2$
(D) $P_1 = 1/4P_2$

91. Find the incorrect statement from the following
(A) Acceleration is always positive.

AB'S MATHS HAPUR

(B) Earth moves around the Sun with uniform speed.
(C) When a body is at rest, there is a balanced force acting on it.
(D) Force is a reciprocal action between two objects.

92. Momentum = ___
(A) $\frac{Velocity}{Mass}$
(B) $\frac{Acceleration}{time}$
(C) Velocity × mass
(D) Speed × mass

93. Find the odd word out.
(A) Newton
(B) Joule
(C) kgm/s^2
(D) Dyne

94. Velocity of a vehicle changes from 15 m/s to 25 m/s In 5 seconds, what is the acceleration of the vehicle?
(A) 10 m/s^2
(B) 15 m/s^2
(C) 5 m/s^2
(D) 2 m/s^2

95. According to the first law of motion the relation of .... and time is given.
(A) Velocity
(B) Displacement
(C) Distance
(D) Acceleration

96. Newton's ___ The law of motion is called the law of inertia.
(A) First
(B) Second
(C) Third
(D) None of the above

97. Force = ___ (in the usual notation)
(A) mV
(B) m/a
(C) weight × acceleration
(D) mass × acceleration

98. Action and reaction __
(A) are equal in magnitude and have same direction
(B) cancel each other
(C) are equal in magnitude and opposite in direction
(D) are unequal in magnitude and have different direction

99. Find the odd one out.
(A) Speed
(B) distance
(C) mass
(D) velocity

100. Find an odd one out of the following.
(A) Force
(B) Momentum
(C) Acceleration
(D) Mass

101. Find an odd one out of the following and give reasons.
(A) Momentum
(B) Acceleration
(C). Force
(D) Time

AB'S EATHS KOLHAPUR

102. The mass of the wagon is 2000 kilograms. It is moving at a speed of 27 kilometers per hour. The wagon collides with another wagon of mass 3000 kg. Which was at rest. After the collision both the wagons started moving. Find the velocity of both the wagons after collision?
(A) $3\ m/s$
(B) $5\ m/s$
(C) $4.5\ m/s$
(D) $6.6\ m/s$

103. A shell of mass 5 kg is fired from a gun of mass 300 kg . The gun recoils with a velocity of 6 meters per second. Find the muzzle velocity of the shell?
(A) $90\ m/s$
(B) $270\ m/s$
(C) $180\ m/s$
(D) $360\ m/s$

104. An object of mass 16 kg is moving with an acceleration of $3\ m/s^2$. Calculate the applied force. If the same force is applied on an object of mass 24 kg . How much will be the acceleration?
(A) $24\ N, 2\ m/s^2$
(B) $48\ N, 4\ m/s^2$
(C) $48\ N, 2\ m/s^2$
(D) $24\ N, 4\ m/s^2$

105. During collision total ___ remains constant.
(A) displacement
(B) distance
(C) velocity
(D) Momentum

106. Which one of the following is the formulae for the magnitude of total final momentum = the magnitude of total initial momentum?
(A) $\left(m_2v_2 \times m_1v_1\right) = \left(m_1u_1 \times m_2u_2\right)$
(B) $\left(m_2v_2 + m_1v_1\right) = \left(m_1u_1 + m_2u_2\right)$
(C) $\left(m_2v_2 - m_1v_1\right) = \left(m_1u_1 - m_2u_2\right)$
(D) $\left(m_2v_2 \div m_1v_1\right) = \left(m_1u_1 \div m_2u_2\right)$

107. Which one of the following statements is false?
(A) Action and reaction forces act on different object
(B) Action and reaction forces act on one object
(C) Action and reaction forces act Simultaneously
(D) Action and reaction are called forces

108. The momentum is the product of ___ of an object.
(A) mass and velocity
(B) weight and velocity
(C) time and velocity
(D) displacement and velocity

109. Keep a 5 Rupee coin on the Cardboard kept on the glass filled with sand. Now strike the cardboard hard using your fingers. What will happen?
(A) The cardboard moves forward and the coin will be thrown off the ground.
(B) The cardboard will move forward and the coin will fly in the air.
(C) The cardboard will move forward and the coil will fall off the glass.
(D) All of the above

110. Which one of the following represents the formula of speed?
(A) distance × time
(B) $\frac{Distance}{Time}$
(C) $\frac{Time}{Distance}$
(D) All of the above

ABHYAS PATHS KOLHAPUR