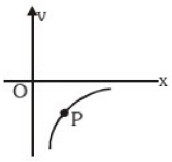
Motion in a Straight Line

1. **Assertion (A):** 

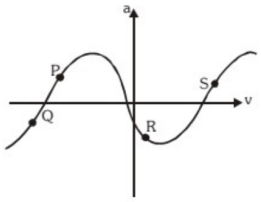
The acceleration(a) at P is negative

Reason (R): Acceleration $a = v\frac{dv}{dx}$; for above situation v is –ve; $\frac{dv}{dx}$ is –ve.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

2. **Assertion (A):** Path of a projected ball is parabolic in uniform gravitational field for oblique projection in absence of air resistance.
Reason (R): Gravitational force is always act perpendicular to velocity during the motion of a projectile.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

3. **Assertion (A):** In any interval, the magnitude of displacement is always less than or equal to the distance travelled.
Reason (R): For a particle travelling in a straight line with constant acceleration, the magnitude of the change in the velocity during any interval is always less than or equal to the change in the speed during that interval.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

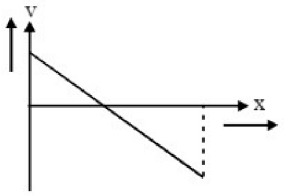
4. **Assertion (A):** At point P object is slowing down.


Reason (R): If acceleration is positive, object must speed up.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

5. **Assertion (A):** A particle with constant acceleration always moves along a straight line.
Reason (R): A particle with constant acceleration will not change direction of motion.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

6. **Assertion (A):** If initial velocity is negative and acceleration is positive then motion is retarded (initially).
Reason (R): If initial velocity is negative but acceleration is positive then displacement of a particle can never be positive.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

7. **Assertion (A):** A student performed an experiment by moving a certain block in a straight line. The velocity position graph cannot be as shown.



Reason (R): When a particle is at its maximum position in rectilinear motion its velocity must be zero.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** When a particle is observed from two different inertial reference frames the general shape of the trajectory of particle is same.

Reason (R): The position vector of a particle and its velocity are frame independent quantities.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** The speedometer of an automobile measures the average speed of the automobile.

Reason (R): Average velocity is equal to total distance divided by total time taken.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Two bodies of masses M and m (M > m) are allowed to fall from the same height if the air resistance force for each be the same then both the bodies will reach the earth simultaneously.

Reason (R): For same air resistance, acceleration of both the bodies will be same.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** The average speed of an object may be equal to arithmetic mean of individual speeds.

Reason (R): The average speed is equal to total distance travelled per total time taken.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Displacement of a body is vector sum of the area under velocity-time graph.

Reason (R): Displacement is a vector quantity.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. Figure shows sequence of large number of photographs of on object moving vertically under gravity. A motion picture of this photograph is run backward.

Assertion (A): A time reversal operation changes every $\vec{v}$ to $-\vec{v}$.

Reason (R): In time reversal sequence the gravitational acceleration will appear to be upward.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** If initial velocity is negative but acceleration is positive then displacement of a particle can never be positive.

Reason (R): If initial velocity is negative and acceleration is positive then motion must be retarded throughout.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** $\left|\frac{\Delta\vec{v}}{\Delta t}\right|$ and $\frac{\Delta|\vec{v}|}{\Delta t}$ are same if particle is moving in one dimension.

Reason (R): In one dimensional motion there is no component of acceleration perpendicular to velocity.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** If velocity of a particle moving in a straight line is zero at a point, its acceleration will be zero at that point.

Reason (R): Wherever $a = v\frac{dv}{dx}$ holds, $v = 0 \Rightarrow a = 0$.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** For a moving particle on a straight line magnitude of average velocity between any two points will be less than magnitude of instantaneous velocity at every point between them.

Reason (R): In x-t graph slope of chord joining two points gives average velocity between them.

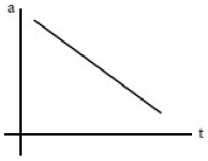
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. The acceleration time graph of a body moving in a straight line is shown here.



Assertion (A): Velocity of the body is necessarily decreasing over the time interval shown.

Reason (R): Acceleration of the body is constant over the time interval shown.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

20. **Assertion (A):** If $\vec{v}$ is the instantaneous velocity of a moving particle at time t then $\left|\int \vec{v}dt\right| \leq \int vdt$

Reason (R): Distance travelled by a particle is always less than or equal to displacement.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

21. **Assertion (A):** A reference frame attached to the earth is an inertial frame of reference.

Reason (R): In practical, Newton's laws can be applied in a frame of reference. Which is attached to the earth.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

22. **Assertion (A):** An observer confined to a windowless box cannot tell by any experiment whether he is stationary or in uniform motion with constant velocity w.r.t. the fixed stars.

Reason (R): The basic laws of Physics are identical in all reference systems that move with uniform velocity w.r.t. one another.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

23. **Assertion (A):** A body is thrown vertically upwards with an initial speed 25 m/s from a position 1. It falls back to position 1 after some time. During this time duration, total change of velocity of the body is zero.

Reason (R): Average acceleration of the body during this time is zero.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

24. **Assertion (A):** For uniformly accelerated motion along straight line, the position versus time graph is a straight line.

Reason (R): For uniformly accelerated motion the position in equal intervals of time changes by same amount.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

25. **Assertion (A):** In one dimensional motion, area under velocity-time graph gives change in position i.e., displacement.

Reason (R): In one dimensional motion, area under acceleration-time graph gives final velocity.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. **Assertion (A):** A body dropped from a height of 10 m from the ground will have the velocity 5 m/s at the height of 5 m.

Reason (R): At the height of 5 m from the ground, the acceleration due to gravity is 5 m/s^2.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A):** A particle moves in a straight line with constant acceleration. The average velocity of this particle can not be zero in any time interval.

Reason (R): For a particle moving in straight line, the average velocity in a time interval is always $\frac{u+v}{2}$, where u and v are initial and final velocities of the particle in given time interval.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

28. **Assertion (A):** At any instant, acceleration of a body can change its direction without any change in the direction of velocity.

Reason (R): At any instant, direction of acceleration is same as that of direction of change in velocity vector at that instant.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. **Assertion (A):** For motion from rest with constant acceleration distance time graph is a parabola, always with increasing slope.

Reason (R): Speed of the body starting from rest with constant acceleration always increases linearly with time.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

30. **Assertion (A):** If a body moves on a straight line, magnitude of its displacement and distance covered by it must be same.

Reason (R): Along a straight line, a body can move only in one direction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

31. **Assertion (A):** An object moving with a velocity of magnitude 10 m/s is subjected to a uniform acceleration 2 m/s^2 at right angle to the initial motion. Its velocity after 5s has a magnitude nearly 14 m/s.

Reason (R): The equation $\vec{v} = \vec{u} + \vec{a}t$ can be applied to obtain $\vec{v}$ if $\vec{a}$ is constant.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

32. **Assertion (A):** A coin is allowed to fall in a train moving with constant velocity. Its trajectory is a straight line as seen by observer attached to the train.

Reason (R): An observer on ground will see the path of coin as a parabola.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

33. **Assertion (A):** Two particles start moving with velocities $\vec{v}_1$ and $\vec{v}_2$ respectively in a plane. They can meet only if component of their velocities perpendicular to line joining them are equal.

Reason (R): Relative velocity of a body w.r.t. other body is calculated along the line joining two bodies.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

34. **Assertion (A):** Two balls are dropped one after the other from a tall tower. The distance between them increases linearly with time (elapsed after the second ball is dropped and before the first hits ground).

Reason (R): In given situation relative acceleration is zero, whereas relative velocity is non-zero.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	3	3	3	4	3	2	4	3	4	4	1	2	3	4	4	4	4	4	3
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34						
Ans.	4	1	4	4	3	4	4	1	1	4	1	2	3	1						