

1. OBJECTIVE QUESTIONS

1. A graph is plotted showing of a car as a function of time. If the graph is a straight line, it means that
- the car started at rest
 - acceleration was constant
 - acceleration was increasing
 - velocity was constant

Ans : (b) acceleration was constant

2. If the initial velocity of an object is equal to final velocity, the value of acceleration is
- positive
 - negative
 - zero
 - infinite

Ans : (c) zero

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3. A body thrown vertically upwards reaches a maximum height h . It then returns to ground. The distance and the displacement travelled by the body respectively are
- $2h$, zero
 - h , zero
 - zero, $2h$
 - zero, h

Ans : (a) $2h$, zero

$$\text{Distance} = h + h = 2h$$

$$\text{Displacement} = h - h = \text{zero}$$

4. If a car is traveling north on a straight road and its brakes are applied, it will
- have no acceleration
 - accelerate to the south
 - accelerate to the north
 - accelerate either east or west

Ans : (b) accelerate to the south

5. The displacement x of a particle moving along a

straight line at time t is given by

$$x = a_0 + a_1 t + a_2 t^2$$

What is the acceleration of the particle ?

- a_1
- a_2
- $2a_2$
- $3a_2$

Ans : (c) $2a_2$

$$v = \frac{dx}{dt} = a_1 + 2a_2 t$$

$$\therefore a = \frac{dv}{dt} = 2a_2$$

6. In a long distance race, the athletes were expected to take four rounds of the track such that the line of finish was same as the line of start. Suppose the length of the track was 200 m. The what is the displacement of the athletes when they touch the finish line?
- zero
 - 3 m
 - 5 m
 - 7 m

Ans : (a) zero

Displacement = 0 (zero), as athletes finish at the starting line.

7. When an object travels equal distances in equal intervals of time, howsoever small the interval may be, the motion of the object is said to be
- uniform
 - non-uniform
 - circular motion
 - oscillatory motion

Ans : (a) uniform

8. Which of the following is an example of non-uniform acceleration?
- The motion of a bicycle going down the slope of a road when the rider is not pedalling and wind resistance is negligible.
 - The motion of a ball rolling down an inclined plane.
 - The motion of a freely falling body.
 - The movement of a car in a crowded road.

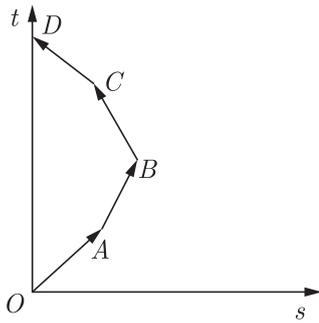
Ans : (d) The movement of a car in a crowded road.

9. A quantity has a value of -6.0 m/s. It may be the
- speed of a particle
 - velocity of a particle
 - position of a particle
 - displacement of a particle

Ans : (b) velocity of a particle

If a body travels equal distances in equal intervals of time, how so ever small these intervals may be, then the body is said to be moving with uniform speed. This motion is known as uniform motion.

10. Which of the following options is correct for the object having a straight line motion represented by the following graph?



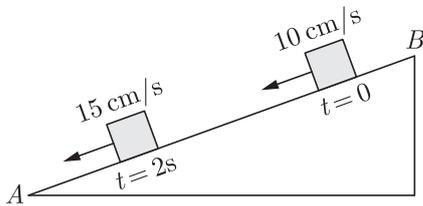
- (a) The object moves with constantly increasing velocity from O to A and then it moves with constant velocity.
- (b) Velocity of the object increases uniformly.
- (c) Average velocity is zero.
- (d) The graph shown is impossible.

Ans : (c) Average velocity is zero.

From given, it is clear that the net displacement is zero. So, average velocity will also be zero.

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11. An object is sliding down an inclined plane. The velocity changes at a constant rate from 10 cm/s to 15 cm/s in two seconds. What is its acceleration?

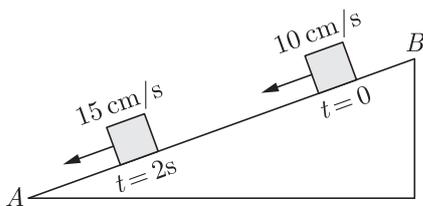


- (a) 10 cm/s^2
- (b) 2.9 cm/s^2
- (c) 2.5 cm/s^2
- (d) 40 cm/s^2

Ans : (c) 2.5 cm/s^2

The situation is shown in figure. Let us take BA as the positive direction. The velocity at $t=0$ is $u = +10 \text{ cm/s}$ and that at $t=2 \text{ s}$ is $v = +15 \text{ cm/s}$.

Thus,



The acceleration is positive, which means it is in the direction BA .

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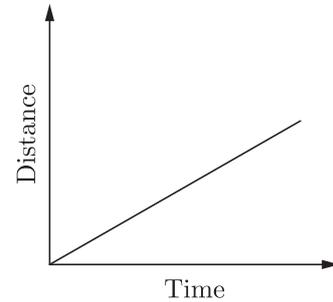
12. If a particle moves with a constant speed, the distance-

time graph is a

- (a) straight line
- (b) circle
- (c) stair-like
- (d) polygon

Ans : (a) straight line

13. The distance-time graph of an object moving in a fixed direction is shown in graph. The object

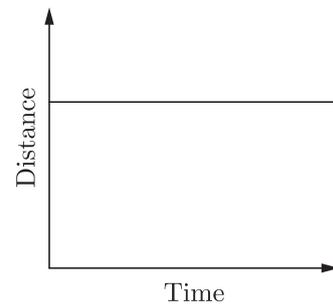


- (a) is at rest
- (b) moves with a constant velocity
- (c) moves with a variable velocity
- (d) moves with a constant acceleration

Ans : (b) moves with a constant velocity

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14. The distance-time graph of an object is shown in graph. The object



- (a) is at rest
- (b) moves with a constant speed
- (c) moves with a variable velocity
- (d) moves with a constant acceleration

Ans : (a) is at rest

15. If a body is moving at constant speed in a circular path, its

- (a) velocity is constant and its acceleration is zero
- (b) velocity and acceleration are both changing direction only
- (c) velocity and acceleration are both increasing
- (d) velocity is constant and acceleration is changing direction

Ans : (b) velocity and acceleration are both changing direction only

16. The area under speed-time graph represents a physical quantity whose unit is equal to the unit of

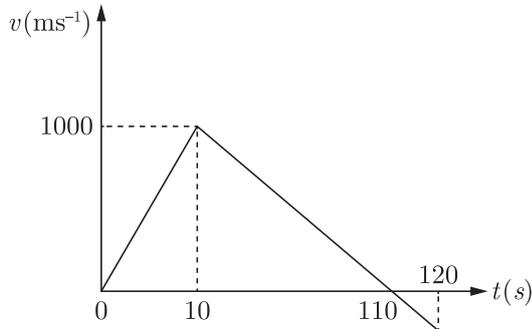
- (a) light year
- (b) area

- (c) volume (d) acceleration

Ans : (a) light year

The area under speed-time graph represents distance and the unit of distance is metre (m), which is same as the unit of light year ($1\text{ly} = 3.15 \times 10^7 \text{ m}$).

17. The graph shows the variation of velocity of a rocket with time. Then, the maximum height attained by the rocket is



- (a) 1.1 km (b) 5 km
(c) 55 km (d) none of these

Ans : (c) 55 km

$$\text{Maximum height} = \frac{1}{2} \times 110 \times 1000 = 55 \text{ km}$$

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18. If a car at rest accelerates uniformly to a speed of 144 km/h in 20 sec., it covers a distance of
(a) 20 cm (b) 400 m
(c) 1440 cm (d) 2980 cm

Ans : (b) 400 m

$$v = \left[\frac{144 \times 1000}{(60 \times 60)} \right] \text{ m/sec.}$$

$$v = u + at$$

or
$$\frac{(144 \times 1000)}{(60 \times 60)} = 0 + a \times 20$$

$$\therefore a = \frac{144 \times 1000}{60 \times 60 \times 20}$$

$$= 2 \text{ m/sec}^2$$

Now
$$s = ut + \frac{1}{2}at^2$$

$$= 0 + \frac{1}{2} \times 2 \times (20)^2 = 400 \text{ m}$$

19. If a body moves with uniform velocity, then the acceleration is equal to
(a) zero (b) constant
(c) finite (d) infinite

Ans : (a) zero

We know that

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

When a body moves with a uniform velocity then the value of change in the velocity is zero. Hence acceleration is also zero.

20. The displacement of a particle is given by

$$y = a + bt + ct^2 - dt^4$$

The initial velocity and acceleration are respectively

- (a) $b, -4d$ (b) $-b, 2c$
(c) $b, 2c$ (d) $2c, -4d$

Ans : (c) $b, 2c$

$$v = \frac{dy}{dt} = b + 2ct - 4dt^3$$

$$v_0 = b + 2c(0) - 4d(0)^3 = b$$

(\because for initial velocity, $t = 0$)

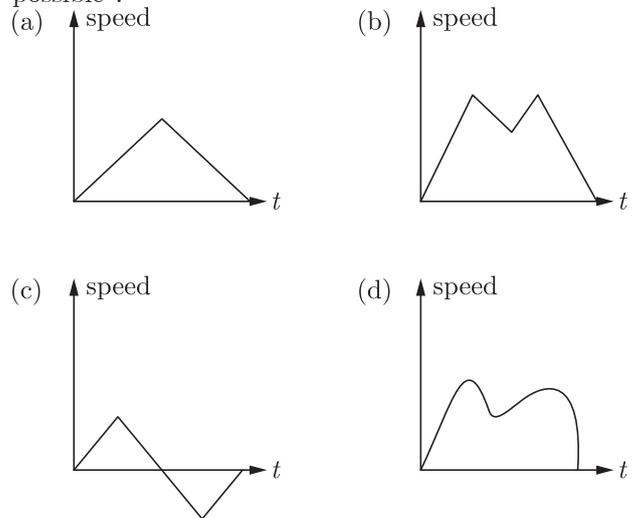
Now

$$a = \frac{dv}{dt} = 2c - 12dt^2$$

\therefore

$$a_0 = 2c - 12d(0)^2 = 2c, \text{ (at } t = 0)$$

21. Which of the following speed time graphs is not possible ?



Ans : (c)

This is because speed can never be negative.

22. If the motion is in straight line without change in direction then

- (a) distance \neq |displacement|
(b) distance $>$ |displacement|
(c) distance $<$ |displacement|
(d) distance = |displacement|

Ans : (d) distance = |displacement|

In the straight line motion distance is always equal to the displacement.

23. A passenger travels along the straight road for half the distance with velocity v_1 and the remaining half

distance with velocity v_2 . Then average velocity is given by

- (a) $v_1 v_2$ (b) $\frac{v_2^2}{v_1^2}$
 (c) $\frac{(v_1 + v_2)}{2}$ (d) $\frac{2v_1 v_2}{(v_1 + v_2)}$

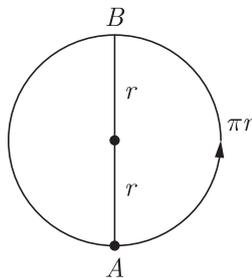
Ans : (d) $\frac{2v_1 v_2}{(v_1 + v_2)}$

$$\frac{\frac{x}{2} + \frac{x}{2}}{\frac{x}{2v_1} + \frac{x}{2v_2}} = \frac{1}{\left(\frac{v_2 + v_1}{2v_1 v_2}\right)} = \frac{2v_1 v_2}{v_1 + v_2}$$

24. A particle covers half of the circle of radius r . Then the displacement and distance of the particle are respectively

- (a) $2\pi r, 0$ (b) $2r, \pi r$
 (c) $\frac{\pi r}{2}, 2r$ (d) $\pi r, r$

Ans : (b) $2r, \pi r$



When a particle cover half of circle of radius r , then displacement is $AB = 2r$

distance = half of circumference of circle = πr

2. FILL IN THE BLANK

- The magnitude of average velocity equal to the average speed.
Ans : may or may not be
- Distance travelled divided by elapsed time gives
Ans : average speed
- A body, dropped from a tower with zero velocity, reaches the ground in 4 sec. The height of the tower is about m
Ans : 80
- A ball thrown vertically upwards return to its starting point in 4s. If $g = 10 \text{ m/s}^2$, its initial speed was
Ans : 20 m/s
- When negative acceleration acts on a moving body its velocity
Ans : decreases
- A stone is let to fall from a building of height 30m. The ratio of heights fallen by it after 2s and 3s is

.....

Ans : 4 : 9

7. If a car starts at rest and accelerates uniformly, the distance it travels is proportional to the of the time it travels.

Ans : square

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8. The speed-time graph of a moving object is a straight line parallel to the time-axis. It means the speed is

Ans : uniform

9. If a car is going northward and the driver jams on its brakes, the direction of its acceleration is

Ans : south

10. A body moving with a uniform speed along a circle has velocity.

Ans : variable

3. TRUE/FALSE

- A particle is known to be at rest at time $t = 0$. If its acceleration at $t = 0$ must be zero.
Ans : False
- Magnitude of acceleration is constant in the rotating motion along a circular path.
Ans : True
- The equation $s = ut + \frac{1}{2}at^2$ with the usual notation is vectorial in nature.
Ans : True
- Magnitude of displacement can be equal to or lesser than distance.
Ans : True
- In a journey, numerical value of displacement \leq distance.
Ans : True
- If particle speed is constant, acceleration of the particle must be zero.
Ans : False
- A particle moving with a uniform velocity must be along a straight line.
Ans : True
- A particle in one dimensional motion with positive value of acceleration must be speeding up.
Ans : False
- Area under velocity-time graph shows displacement.
Ans : True

4. MATCHING QUESTIONS

DIRECTION : In the section, each question has two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (a), (b), (c) and (d) out of which one is correct.

1. Match the Column

Column-I		Column-II	
(A)	Uniform speed	(p)	Unequal distance in equal time
(B)	Constant speed	(q)	Zero acceleration
(C)	Uniform acceleration	(r)	Unequal velocity in equal time change
(D)	Non-uniform acceleration	(s)	Equal distance in equal time
(E)	Non-uniform speed	(t)	Equal velocity change in equal time

Ans : (A) – (s), (B) – (q), (C) – (t), (D) – (r), (E) – (p)

2.

Column-I		Column-II	
(A)	Average velocity	(p)	$\frac{v-u}{T}$
(B)	Acceleration	(q)	$\frac{D}{T}$
(C)	Final velocity	(r)	$ut + \frac{1}{2}at^2$
(D)	Distance	(s)	$\frac{v+u}{t}$
(E)	Speed	(t)	$u + at$

Ans : (A) – (s), (B) – (p), (C) – (t), (D) – (r), (E) – (q)

3.

Column-I		Column-II	
(A)	Slope of displacement-time graph	(p)	Acceleration
(B)	Slope of velocity-time	(q)	Velocity
(C)	Area under velocity-time graph intercepted with time-axis	(r)	Change in velocity
(D)	Area under acceleration-time graph intercepted with time-axis	(s)	Displacement
		(t)	Speed

Ans : (A) – (q), (B) – (p), (C) – (s), (D) – (r)

5. ASSERTION AND REASON

DIRECTION : In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements, given below, mark the correct answer as:

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
 (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) Assertion is true but reason is false.
 (d) Both Assertion and Reason are false.

1. **Assertion :** An object may acquire acceleration even if it is moving at a constant speed.

Reason : With change in the direction of motion, an object can acquire acceleration.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

This is the equation of a parabola. A parabola results when one quantity is proportional to the square of the other. When an object is moving with a constant velocity (zero acceleration), the displacement versus time graph is a straight line and its slope is velocity.

When an object is moving at a constant speed but its direction of motion changes, its velocity changes and thus acceleration is produced. Motion of an object in a circular path is such an example. In a uniform circular motion, the direction of motion of the object changes continuously and hence the velocity changes continuously even though the speed is constant.

2. **Assertion :** Displacement of an object may be zero even if the distance covered by it is not zero.

Reason : Displacement is the shortest distance between the initial and final position.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

When the final position of an object coincides with its initial position, displacement is zero, but the distance travelled is not zero.

3. **Assertion :** The graph between two physical quantities P and Q is straight line, when P/Q is constant.

Reason : The straight line graph means that P is proportional to Q or P is equal to constant multiplied by Q .

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

According to statement of reason, as the graph is a straight line, $P \propto Q$, or, $P = \text{constant} \times Q$

$P/Q = \text{constant}$

Equation of a straight line is $y = mx + c$

4. **Assertion :** Velocity versus time graph of a particle in uniform motion along a straight path is a line parallel to the time axis.

Reason : In uniform motion the velocity of a particle increases as the square of the time elapsed.

Ans : (c) Assertion is true but reason is false.

When a particle is in uniform motion, the magnitude of its velocity at each instant such as $t = 0$, $t = 1s$,

$t = 2s$ etc. is always constant. Hence the velocity versus time graph for a particle in uniform motion along a linear path is a straight line parallel to the time axis.

5. **Assertion :** the speedometer of a car measures the instantaneous speed of the car.

Reason : Average speed is equal to the total distance covered by an object divided by the total time taken.

Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

The speedometer of a car measures the instantaneous speed of the car.

6. **Assertion :** An object may have acceleration even if it is moving with uniform velocity.

Reason : An object may be moving with uniform velocity but it may be changing its direction of motion.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

The uniform motion only means that the object is moving at a constant speed but its direction of motion may be changing at in the case of uniform circular motion. Hence, acceleration is produced in uniform motion due to changes in velocity.

7. **Assertion :** Motion with uniform velocity is always along a straight line path.

Reason : In uniform velocity a motion, speed is the magnitude of the velocity and is equal to the instantaneous velocity.

Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

The assertion is true and the reason is not the correct explanation of the assertion.

Uniform velocity means that speed and direction remain unchanged.

8. **Assertion :** If a particle is moving with constant velocity, then average velocity for any time interval is equal to instantaneous velocity.

Reason : If average velocity of a particle moving on a straight line is zero for a given time interval, then instantaneous velocity at some instant within this interval may be zero.

Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

Average velocity V_{av}

$$= \frac{\text{Total displacement}}{\text{Total elapsed time}} = \frac{Vt}{t} = V$$

= Instantaneous velocity

Hence, assertion is correct. If a particle is in a round trip on a straight line, then average velocity is zero but at the instant at which the particle reverses its direction of motion, velocity is zero. So, reason is correct. But reason is not the correct explanation of assertion.

9. **Assertion :** The displacement of an object can be either positive, negative or zero.

Reason : Displacement has both the magnitude and direction.

Ans : (b) Both assertion and reason are true but reason

is not the correct explanation of assertion.

Displacement may be positive, negative or zero. Displacement is a vector quantity.

10. **Assertion :** When the displacement of a body is directly proportional to the square of the time. Then the body is moving with uniform acceleration.

Reason : The slope of velocity-time graph with time axis gives acceleration.

Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

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