QUESTION BANK

EXERCISE - 1

Q.1 Define distance and displacement and give three differences between distance and displacement.
Q.2 Define the followings : (i) Uniform speed (ii) Average speed (iii) Acceleration
Q.3 Find graphically the fundamental equations of motion.
Q.4 Show that area under the speed time graph for a particle moving at a constant speed gives distance covered by the particle.
Q.5 What two pieces of information are necessary in order to define a vector quantity ?
Q.6 Distinguish between velocity and acceleration ?
Q.7 Acceleration is general defined as the time rate of change of velocity. When can it be defined as the time rate of change of speed?
Q.8 Consider these measurements : 10m, 10m/s and 10 m/s^2. Which is a measure of distance, which of speed, and which of acceleration ?
Q.9 Distinguish average speed from instantaneous speed.
Q.10 Distinguish between speed and velocity.
Q.11 If a car moves with a constant velocity, does it also move with a constant speed ? Explain.
Q.12 A car moving with initial velocity u accelerates uniformly with acceleration a and attains a velocity v after covering a distance s. Write the relation between v, u, a and s.
Q.13 What is meant by uniform circular motion ?
Q.14 Give two examples of uniform circular motion.
Q.15 Average velocity and instantaneous velocity are generally different quantities. Can they ever by equal for a specific type of motion ? Explain.
Q.16 If the average velocity is nonzero for sometime interval, does this mean that the instantaneous velocity is never zero during this interval ? Explain.
Q.17 Is it possible to have a situation in which the velocity and acceleration have opposite signs ? If so, sketch a velocity-time graph to prove your point.
Q.18 If the velocity of a particle is nonzero, can its acceleration ever be zero ? Explain.
Q.19 If the velocity of a particle is zero, can its acceleration ever by non zero ? Explain.
Q.20 If a car is traveling eastward, can its acceleration be westward ? Explain.
Q.21 Two cars are moving in the same direction in parallel lanes along a highway. At some instant, the velocity of car A exceeds the velocity of car B. Does this mean that the acceleration of A is greater than that of B ? Explain.
Q.22 A body moves with a velocity of 2 m/s for 5s, then its velocity uniformly increases to 10 m/s in the next 5s. Thereafter, its velocity begins to decrease at a uniform rate until it comes to rest after 10s.
(a) Plot a velocity-time graph for the motion of the body.
(b) Plot a distance-time graph for the motion of the body.
(c) Mark the portions to show when the motion of the body is uniform and when it is non-uniform.
(d) From the graph, find the total distance moved by the body after 2s and in the last 10s.

EXERCISE - 2

Q.1 A boy covers a distance of 2 km. at a speed of 5 km/hr. while going to the market from his home. He comes back home covering the same distance at a speed of 4 km/hr. Calculate the time taken in hours as well as in seconds.
Q.2 A ship is moving at a speed of 56 km/h. One second later it is moving at 58 km/h. What is its acceleration?
Q.3 A body starting from rest accelerates uniformly and travels a distance of 200m in 10 seconds. Calculate the value of its acceleration.

Q.4 All buses and cars these days are fitted with a speedometer, which shows the velocity of the vehicle. A device called odometer records the distance moved by the vehicle. If the reading on the odometer of a vehicle in the beginning of a trip and after 40 minutes were 1048 km. and 1096 km respectively, calculate its average velocity. Will the reading on the speedometer show this velocity when the vehicle is moving ? Support your answer with reason.

Q.5 A girl has designed a clap switch for a science exhibition that enabled her to switch on or off an alarm just with clapping of hands. While testing her device in a hall, she noticed that once the alarm has sounded it followed with another one due to each of the clap, that is, the sound reflected by the walls. She recorded the two soundings of alarm with her tape recorder and found out that time difference in between them is 0.1s. If the distance of the walls be 15m, calculate the speed of sound.

Q.6 A car is moving with a uniform velocity of 10 m/s. The driver of the car decided to overtake a bus moving ahead of the car. So the driver of the car accelerates at 1 m/s^2 for 10 seconds. Find the velocity of the car at the end of 10 seconds. Also find the distance travelled by the car while accelerating ?

Q.7 A rocket is uniformly accelerated from rest to a speed of 960 ms^{-1} in $1\frac{2}{3}$ minutes.Calculate the distance travelled.

Q.8 A motor car is uniformly decelerated from 90 kmh^{-1} to 18kmh^{-1} in a time of 10s. Calculate the acceleration.

Q.9 An airplane is flying in a horizontal circle of radius 1.5km with a speed of 450 km/h. What is the magnitude of the centripetal acceleration of the plane ?

Q.10 A 1.5 kg toy motorcycle is moving on the inside of a vertical circular track (r = 1.0m). It arrives at the top of the track with a speed of 5.0 m/s. What force does the track exert on the motorcycle ?

Q.11 A man wanted to pick up his wife at a bus station located 12km east from his home. It took him 15min. to drive to the bus station, a negligible time to pick up his wife, and 20 minutes to drive back home. Express your answers to the following questions in terms of the unit km/h.

(a) What was the average velocity (magnitude and direction) of the man's car during his trip to the station ?

(b) What was the average velocity of his car during the trip back home ?

(c) What was the average velocity of his car during the man's entire trip ?

Q.12 A ball, dropped from a window, falls vertically downward. The motion of the ball can be described relative to a coordinate system consisting of an origin O at ground level and a unit vector $\hat{i}$ pointing upward. At a time to, 1.5 s after its release, the position vector $\vec{r}$ of the ball is (9.0 m) $\hat{i}$, its velocity $\vec{v}$ is –(14.7 m/s) $\hat{i}$ and its acceleration $\vec{a}$ is –(9.8 m/s^2) $\hat{i}$. Answer the following questions to describe the motion of the ball at this time.

(a) What is the height of the ball above the ground? What is the magnitude of its velocity ? What is the magnitude of its acceleration ?

(b) What is the direction of the ball's position vector relative to O ? What is the direction of its velocity? What is the direction of its acceleration ?

(c) What is the position coordinate x of the ball? What is its velocity component v_x ? What is its acceleration component a_x ?

EXERCISE - 3

FILL IN THE BLANKS

Q.1 Distance traveled divided by elapsed time gives .....

Q.2 If a car starts at rest and accelerates uniformly, the distance it travels is proportional to the ..... of the time it travels.

Q.3 All objects in free fall at a given place have the same .....

Q.4 If a car is going northward and the driver jams on its brakes, the direction of its acceleration is .....

Q.5 When an object is going in a circular path at constant speed, the direction of its acceleration is .....

Q.6 The length of second's hand in a watch is 1 cm. The change in velocity of its tip in 15 second is .....

Q.7 A truck travelling due north at 20 m/s turns left and travels at the same speed, the change in velocity is .....

Q.8 A particle is moving eastward with a velocity of 5 m/s. In 10 second the velocity changes to 5 m/s northward. The average acceleration in this time is .....

Q.9 If a particle moves in a circle describing equal angles in equal interval of times, its velocity vector .....

Q.10 A particle moves with a velocity v in a circle of radius r, then its angular velocity is equal to ..... and acts along the .....

Q.11 The ratio of angular speeds of minute hand and hour hand of watch is .....

Q.12 A ball thrown vertically upwards return to its starting point in 4s. If $g = 10\ m/s^2$, its initial speed was .....

Q.13 A body falling freely from the rest has a velocity v after it has fallen through a distance h. The distance it has to fall down further for its velocity to become 2v is ..... times h.

Q.14 A body, dropped from a tower with zero velocity , reaches the ground in 4 sec. The height of the tower is about .....m

Q.15 The magnitude of average velocity ..... equal to the average speed.

TRUE AND FALSE STATEMENT

Q.16 Area under velocity-time graph shows displacement

Q.17 Magnitude of Displacement can be equal to or lesser than distance.

Q.18 If particle speed is constant, acceleration of the particle must be zero

Q.19 A particle moving with a uniform velocity must be along a straight line.

Q.20 A particle is known to be at rest at time t = 0. Its acceleration at t = 0 must be zero.

Q.21 The equation $s = ut + \frac{1}{2}at^2$ with the usual notation is vectorial in nature.

Q.22 A ball is thrown vertically upwards in vacuum. Then the time of ascent is equal to the time of descent.

Q.23 In a journey, numerical value of displacement ≤ distance.

Q.24 An object covers distances in direct proportional to the square of the time elapsed. Its acceleration is increasing.

Q.25 A particle in one dimensional motion with positive value of acceleration must be speeding up.

Q.26 In circular motion the centripetal and centrifugal forces acting in opposite directions balance each other and the net force on the revolving particle is zero.

Q.27 Magnitude of acceleration is constant in the rotating motion along a circular path.

Q.28 Forces responsible for uniform circular motion are called centrifugal force.

Q.29 Centrifugal force is the reaction of the centripetal force.

Q.30 If a body is moving on a curved path with constant speed, then its acceleration is perpendicular to the direction of motion.

EXERCISE - 4 (MCQ LEVEL 1)

ONLY ONE OPTION IS CORRECT

Q.1 If a body is moving at constant speed in a circular path, its–

(1) velocity is constant and its acceleration is zero

(2) velocity and acceleration are both changing direction only

(3) velocity and acceleration are both increasing

(4) velocity is constant and acceleration is changing direction

Q.2 A flowerpot dropped from a window and fell for 3.3 seconds to the ground. How high was the window–

(1) 16 meters (2) 32 meters (3) 50 meters (4) 100 meters

Q.3 A rock is thrown straight up and reaches a height of 12 meters before starting to fall. When it is at rest at the top of its path, its acceleration is –

(1) 0 (2) 1.2 meters per second squared

(3) 9.8 meters per second squared (4) 11 meters per second squared

Q.4 If a velocity of 3 meters per second is added to another of 5 meters per second, the sum is –
(1) 2 meters per second (2) 4 meters per second
(3) anything over 3 meters per second (4) between 2 meters per second and 8 meters per second.

Q.5 A graph is plotted showing the velocity of a car as a function of time. If the graph is a straight line, it means that
(1) the car started at rest (2) acceleration was constant
(3) acceleration was increasing (4) velocity was constant

Q.6 The acceleration of an object will be 9.8 meters per second squared if the object is falling freely –
(1) near the surface of the earth (2) anywhere
(3) traveling straight down (4) traveling upward

Q.7 If a car is traveling north on a straight road and its brakes are applied, it will–
(1) have no acceleration (2) accelerate to the south
(3) accelerate to the north (4) accelerate either east or west

Q.8 A bicycle averages 4.5 meters per second while traveling for 10 minutes. How far does it travel–
(1) 2700 m (2) 2800m (3) 2500m (4) 2400m

Q.9 You are on an ocean liner that is going eastward at 12.0 meters per second, and you run southward at 3.6meters per second. The magnitude and direction of your resulting velocity.
(1) 15.6 m/s, E/W (2) 18.4 m/s, W/E (3) 12.5 m/s, S/E (4) 13.5 m/s, S/E

Q.10 The acceleration of a car that speeds up from 12 meters per second to 30 meters per second in 15 seconds–
(1) 2.4 m/s^2 (2) 1.2 m/s^2 (3) 2 m/s^2 (4) 5.2 m/s^2

Q.11 If a car can accelerate at 3.2 meters per second squared, how long will it take to speed up from 15 meters per second to 22 meters per second –
(1) 2.2 s (2) 1.2 s (4) 5 s (4) 4s

Q.12 How far does a motorcycle travel if it starts at rest and is going 22 meters per second after 15 seconds –
(1) 160 m (2) 110m (3) 165m (4) 100m

Q.13 The acceleration of a car that gets to a speed of 18 meters per second from rest while traveling 240meters
(1) 1.2 m/s^2 (2) 0.68 m/s^2 (3) 12.8 m/s^2 (4) 4.2 m/s^2

Q.14 A ball is dropped from a window 24 meters high. How long will it take to reach the ground –
(1) 2.2 s (2) 1.2 s (3) 4.5 s (4) 0.2 s

Q.15 An arrow is fired straight up, leaving the bow at 15 meters per second. If air resistance is negligible, how high will the arrow rise–
(1) 10.5 m (2) 15.0 m (3) 11.5m (4) 8.5m

Q.16 A firefighter drops from a window into a net. If the window is 34 meters above the net, the speed with which firefighter hit the net –
(1) 18 m/s (2) 20 m/s (3) 12 m/s (4) 26 m/s

Q.17 A trained acrobat can safely land on the ground at speeds up to 15 meters per second. The greatest height from which the acrobat can fall –
(1) 11.5 m (2) 12.5 m (3) 8.5 m (5) 15 m

Q.18 A toy train is traveling around a circular track 2.0 meters in radius, and it makes a complete circuit every 4.5 seconds, its velocity is –
(1) 1.2 m/s (2) 2.8 m/s (3) 1.8 m/s (4) 3.2 m/s

Q.19 A thief snatches a purse and runs due west, going 6.0 meters per second. A policeman, 15 meters to the east, sees the event and gives chase. If the officer is a good sprinter, going at 8.5 meters per second, how far does he have to run to catch the thief –
(1) 12 m (2) 51m (3) 61m (4) 55 m

Q.20 In a test race, an automobile must complete a 100 kilometer run in 4 minutes. If the car goes at 36 meters per second for the first half of the track, its speed for the second half –
(1) 139 s (2) 122 s (3) 49 s (4) 109 s

Q.21 A bullet is fired from a rifle, emerging from the muzzle at 340 meters per second. It strikes a sandbag some distance away, having lost 10 percent of its velocity due to air resistance. If it penetrates the sandbag to a depth of 12.0 centimeters, how long did it take for the bullet to come to rest in the sandbag–

(1) 8×10^{-4} s (2) 2×10^{-4} s (3) 6×10^{-4} s (4) 4×10^{-4} s

Q.22 A car going at 24 meters per second passes a motorcycle at rest. As it passes, the motorcycle starts up, accelerating at 3.2 meters per second squared. If the motorcycle can keep up that acceleration, how long will it take for it to catch the car –

(1) 12 s (2) 14s (3) 20s (4) 18s

Q.23 A pitcher throws his fastball horizontally at 42.1 meters per second. How far does it drop before crossing the plate, 18.3 meters away–

(1) 0.8 m (2) 1.2 m (3) 2.2 m (4) 0.93 m

Q.24 The angular velocity of the second hand of a clock is –

(1) 0.105 rad/s (2) 1.105 rad/s (3) 2.102 rad/s (4) 3.120 rad/s

Q.25 A bus is moving eastward. It covers a distance of 200 kilometers in 4 hours, its velocity is

(1) 50 km/hr (2) 20 km/hr (3) 30 km/hr (4) 10 km/hr

Q.26 Mohan takes 20 minutes to cover a distance of 3.2 kilometers due north on a bicycle, his velocity in km/hour–

(1) 8.1 (2) 9.6 (3) 1.2 (4) 7.2

Q.27 The initial velocity of a cyclist was 4 m/s. His acceleration is 2 m/s^2, its velocity after 5 seconds is –

(1) 12 m/s (2) 10 m/s (3) 14 m/s (4) 8 m/s

Q.28 The initial velocity of a body is 15 m/s. If it is having an acceleration of 10 m/s^2, then the velocity of body after 10 seconds from start –

(1) 110 m/s (2) 105 m/s (3) 120 m/s (4) 115 m/s

Q.29 The breaks applied to a scooter produces a retardation of 6 m/s^2. If the scooter takes 2 seconds to stop after applying the breaks, the distance it covers during this time is –

(1) 12m (2) 10m (3) 8m (4) 6m

Q.30 The direction of the centripetal acceleration of an object in uniform circular motion is –

(1) in the direction of motion (2) opposite the direction of motion

(3) radially outward from the center of the circle (4) radially inward toward the center of the circle.

Q.31 A ball on a string is being whirled in a horizontal circle. If the speed is doubled what happens to the tension in the string ?

(1) It remains the same (2) It quadruples

(3) It doubles (4) It decreases by a factor of two

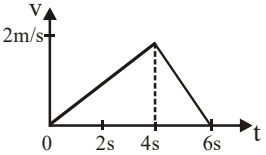
Q.32 A boy is swinging a bucket of water, mass m, in a vertical circle at constant speed. When the bucket is at the top of the circle, the boy "feels" no force. What force does the boy "feel" when the bucket is at the bottom of the circle ?

(1) 2mg (2) mg (3) zero (4) 3mg

EXERCISE - 5 (MCQ LEVEL 2)

ONE OR MORE THAN ONE CHOICE MAY BE CORRECT

Q.1 The velocity-time graph of a particle moving along a straight line is as shown in figure. Which of the following is/are INCORRECT for this motion?



(1) The motion is uniform.

(2) The acceleration is uniform.

(3) The particle changes its direction of motion.

(4) The displacement during the period 0-4s is equal to the area under the velocity-time graph for this period.

Q.2 A body thrown vertically up with a velocity u reaches the maximum height h after T second. Which of the following statements is/are INCORRECT?
(1) At a height h/2 from the ground its velocity becomes u/2. (2) At a time T its velocity becomes u.
(3) At a time 2T its velocity becomes – u. (4) At a time 2T its velocity becomes – 6u.

Q.3 Which of the following statements are true for a moving body –
(1) if its speed changes, its velocity must change and it must have some acceleration
(2) if its velocity changes, its speed must change and it must have some acceleration
(3) if its velocity changes, its speed mayor may not change, and it must have some acceleration
(4) if its speed changes but direction of motion does not change, its velocity may remain constant.

Q.4 The velocity of a particle is zero at t = 0.
(1) The acceleration at t = 0 must be zero
(2) The acceleration at t = 0 may be zero
(3) If the acceleration is zero from t = 0 to t = 10s, the speed is also zero in this interval.
(4) If the speed is zero from t = 0 to t = 10s the acceleration is also zero in this interval.

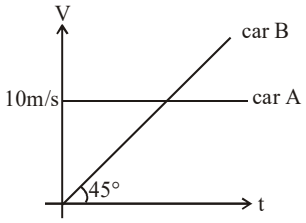
Q.5 A particle is projected vertically upwards in absence of air resistance with a velocity u from a point O. When it returns to the point of projection –
(1) its average velocity is zero (2) its displacement is zero
(3) its average speed is u/2 (4) its average speed is u

INTEGER TYPE QUESTIONS

Q.6 A train starts from a station P with a uniform acceleration a_1, for some distance and then goes with uniform retardation a_2 for some more distance to come to rest at the station Q. The distance between the stations P and Q is 4 km and the train takes 4 minutes to complete this journey, then $\frac{1}{a_1}+\frac{1}{a_2}=$

Q.7 A body moves with speed 10 m/s for 10 sec, then with a speed of 20 m/s for distance 300m. Find its average speed (in m/sec).

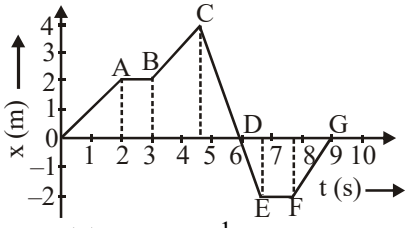
Q.8 Initially car A is 10.5 m ahead of car B. Both start moving at time t = 0 in the same direction along a straight line. The velocity time graph of two cars is shown in figure. Find the time (in sec) when the car B will catch the car A.



PASSAGE BASED QUESTIONS

Read the passage and answer Q. nos. 9 and 10

A dancer demonstrating dance steps along a straight line.
The position-time graph is shown :



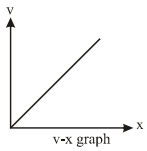
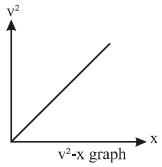
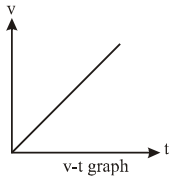
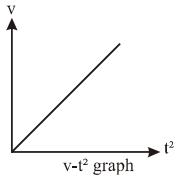
Q.9 The average speed for the dance step depicted by CD is
(1) 1 ms^{-1} (2) 1.33 ms^{-1} (3) 2.75 ms^{-1} (4) 0.89 ms^{-1}

Q.10 The average velocity of the dancer during time interval between t = 4.5s to t = 9s is
(1) 1 ms^{-1} (2) – 1.33 ms^{-1} (3) 2.75 ms^{-1} (4) – 0.89 ms^{-1}

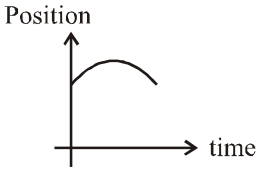
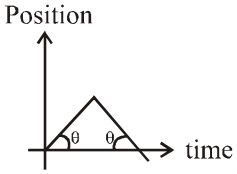
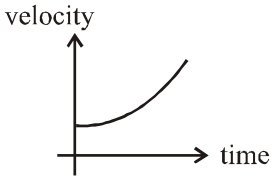
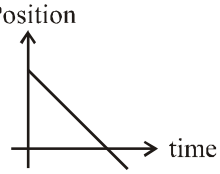
MATCH THE COLUMN TYPE QUESTIONS

Each question contains statements given in two columns which have to be matched.
Statements (A, B, C, D) in **column I** have to be matched with statements (p, q, r, s) in **column II**.

Q.11 Column I gives some graphs for a particle moving along x-axis in positive x-direction. The variables v, x and t represent speed of particle. x-coordinate of particle and time respectively. Column II gives certain resulting interpretation. Match the graphs in column I with the statements in column II.

Column I	Column II
(A) 	(p) Acceleration of particle is uniform
(B) 	(q) Acceleration of particle is nonuniform
(C) 	(r) Acceleration of particle is directly proportional to t
(D) 	(s) Acceleration of particle is directly proportional to x

Q.12 Match the situation given in column I with the possible curves in column II.

Column I		Column II
(A) Particle moving with constant speed	(p)	
(B) Particle moving with increasing acceleration	(q)	
(C) Particle moving with constant negative acceleration	(r)	
(D) Particle moving with zero acceleration	(s)	

ASSERTION & REASON TYPE

Each question contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason). Each question has 5 choices (1), (2), (3), (4) and (5) out of which ONLY ONE is correct.

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(3) Statement -1 is True, Statement-2 is False.
(4) Statement -1 is False, Statement-2 is True.
(5) Statement -1 is False, Statement-2 is False.

Q.13 **Statement 1 :** The displacement of a stone thrown up or down from a tower will be the same as they reach the ground.
Statement 2 : Distance travelled by the stone thrown up is more than the distance travelled by the stone thrown down.

Q.14 **Statement 1 :** The distance 'x' in which a car can be stopped depends on the initial velocity.
Statement 2 : Change in mass has no role to play.

Q.15 **Statement 1 :** All bodies dropped from a system will have a zero velocity.
Statement 2 : The nature of frame does not affect the initial velocity.

Q.16 **Statement 1 :** The motion of a body moving in a circular path with constant speed is an example of variable acceleration.
Statement 2 : Acceleration varies due to change in direction.

Q.17 **Statement 1 :** A body can have acceleration even if its velocity is zero at a given instant of time.
Statement 2 : A body is momentarily at rest when it reverses its direction of motion.

Q.18 **Statement 1 :** A body is momentarily at rest when it reverses the direction.
Statement 2 : A body cannot have acceleration if its velocity is zero at a given instant of time.

EXERCISE - 6 (PREVIOUS YEARS COMPETITION MCQ)

IIT JEE/AIEEE/AIPMT/OLYMPIADS QUESTIONS

Q.1 The displacement-time graph for two particles A and B are straight lines inclined at angles of 30° and 60° with the time axis. The ratio of velocities of $V_A : V_B$ is –

(1) 1 : 2 (2) $1:\sqrt{3}$ (3) $\sqrt{3}:1$ (4) 1 : 3

Q.2 A 150m long train is moving with a uniform velocity of 45 km/h. The time taken by the train to cross a bridge of length 850 meters is –

(1) 56 sec. (2) 68 sec. (3) 80 sec. (4) 92 sec.

Q.3 A man walks on a straight road from his home to market 2.5 km. away with a speed of 5 km/h. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 km/h. The average speed of the man over the interval of time 0 to 40 min. is equal to –

(1) 5 km/h (2) 25/4 km/h (3) 30/4 km/h (4) 45/8 km/h

Q.4 A body starts from rest. What is the ratio of the distance travelled by the body during the 4th and 3rd second

(1) 7/5 (2) 5/7 (3) 7/3 (4) 3/7

Q.5 The position of a particle moving along the x-axis at certain times is given below :

t (s)	0	1	2	3
x (m)	–2	0	6	16

Which of the following describes the motion correctly –

(1) Uniform, accelerated (2) Uniform, decelerated
(3) Non-uniform, accelerated (4) There is not enough data for generalization

Q.6 A body A starts from rest with an acceleration a_1. After 2 seconds, another body B starts from rest with an acceleration a_2. If they travel equal distances in the 5th second, after the start of A, then the ratio $a_1 : a_2$ =

(1) 5 : 9 (2) 5 : 7 (3) 9 : 5 (4) 9 : 7

Q.7 An object is projected upwards with a velocity of 100 m/s. It will strike the ground after (approximately)–
(1) 10 sec. (2) 20 sec. (3) 15 sec. (4) 5 sec.

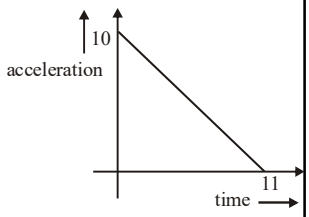
Q.8 A car moving with a speed of 50 km/hr., can be stopped by brakes after at least 6m. If the same car is moving at a speed of 100 km/hr, the minimum stopping distance is –
(1) 6m (2) 12m (3) 18m (4) 24m

Q.9 Two balls A and B of same masses are thrown from the top of the building. A, thrown upward with velocity V and B, thrown downward with velocity V, then –
(1) Velocity of A is more than B at the ground (2) Velocity of B is more than A at the ground
(3) Both A and B strike the ground with same velocity (4) None of these

Q.10 A ball is released from the top of a tower of height h meters. It takes T seconds to reach the ground. What is the position of the ball in T/3 seconds –
(1) h/9 meters from the ground (2) 7h/9 meters from the ground
(3) 8h/9 meters from the ground (4) 17h/18 meters from the ground

Q.11 A particle moving in a straight line covers half the distance with speed of 3 m/s. The other half of the distance is covered in two equal time intervals with speed of 4.5 m/s and 7.5 m/s respectively. The average speed of the particle during this motion is –
(1) 4.0 m/s (2) 5.0 m/s (3) 5.5 m/s (4) 4.8 m/s

Q.12 A particle starts from rest. Its acceleration (a) versus time (t) is as shown in the figure. The maximum speed of the particle will be
(1) 110 m/s (2) 55 m/s
(3) 550 m/s (4) 660 m/s



Q.13 A small block slides without friction down an inclined plane starting from rest. Let S_n be the distance travelled from time t = n – 1 to t = n. Then $\frac{S_n}{S_{n+1}}$ is –

(1) $\frac{2n-1}{2n}$ (2) $\frac{2n+1}{2n-1}$ (3) $\frac{2n-1}{2n+1}$ (4) $\frac{2n}{2n+1}$

Q.14 A stone falls freely under gravity. It covers distances h_1, h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is –

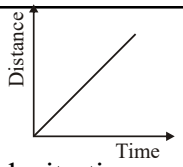
(1) $h_1 = h_2 = h_3$ (2) $h_1 = 2h_2 = 3h_3$ (3) $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$ (4) $h_2 = 3h_1$ and $h_3 = 3h_2$

EXERCISE - 7

PREVIOUS YEARS SA (SUMMATIVE ASSESSMENT) QUESTIONS

Q.1 Define uniform motion.
Q.2 Write an example of uniform motion.
Q.3 What does the odometer of an automobile measure ?
Q.4 Define distance and displacement.
Q.5 Differentiate between distance and displacement.
Q.6 Define average speed.
Q.7 Under what conditions is the magnitude of average velocity of an object equal to its average speed ?
Q.8 (i) List two differences in tabular form between speed and velocity.
(ii) When is a body said to have : (a) Uniform velocity, and (b) Variable velocity ?
(iii) How is the average velocity of a body calculated when its velocity changes at a non-uniform rate ?
Q.9 Giving one example each distinguish between uniform acceleration and non-uniform acceleration.

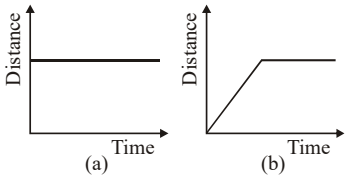
Q.10 State the type of motion represented by the given graph



Q.11 What does the slope of a velocity-time graph represent ?

Q.12 Name the quantity which is measured by the area occupied below the velocity-time graph.

Q.13 What kind of motion of a body is represented by the graphs?

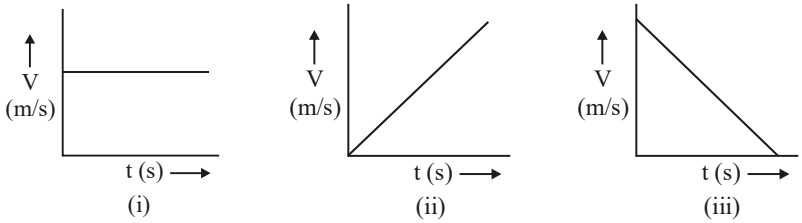


Q.14 (a) What is acceleration ? Write its unit.

(b) Draw velocity-time graph, when an object has :

(i) Uniformly accelerated velocity. (ii) Uniformly retarded velocity.

Q.15 What can you conclude about the motion of a body depicted by the velocity -time graphs (i), (ii) and (iii) given.

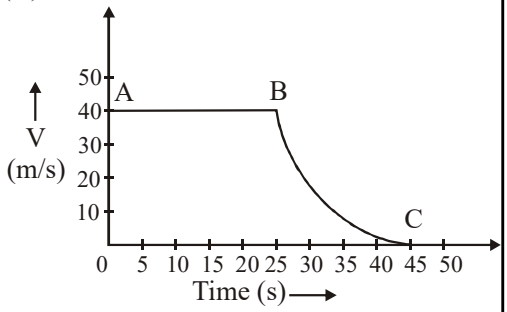


Q.16 The velocity-time graph of an object is shown in the figure.

(a) State the kind of motion that object has, from A to B and from B to C.

(b) Identify the part of graph where the object has zero acceleration. Give reason for your answer.

(c) Identify the part of graph where the object has negative acceleration. Given reason for your answer.



Q.17 (a) Draw the velocity time graph to show :

(i) The change in velocity of a freely falling body.

(ii) The change in velocity of a body thrown vertically upwards.

(b) Comment on the kind of motion of the body while :

(i) It comes down (ii) It goes up

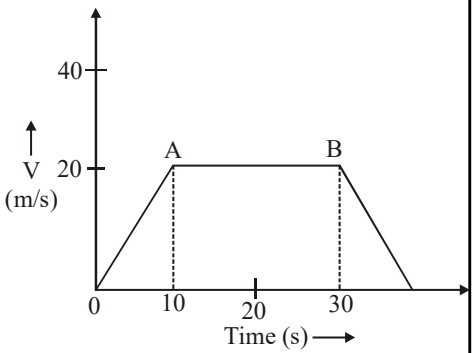
Q.18 The velocity-time graph of a body is given:

(i) State the kind of motion reported by OA, AB.

(ii) What is the velocity of the body after 10s and after 40s ?

(iii) Calculate negative acceleration of the body.

(iv) Calculate the distance covered by the body between 10th and 30th second.



Q.19 A train starting from rest attains a velocity of 72 km/h in five minutes. Assuming the acceleration is uniform, find:

(i) The acceleration. (ii) The distance travelled by the train for attaining this velocity.

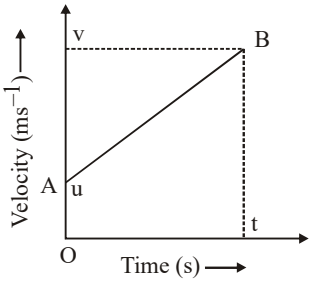
Q.20 A car travelling a speed of 10 m/s is brought to rest in 20 seconds by applying brakes. Calculate the acceleration and distance travelled during this time.

Q.21 A bus starting from rest moves with uniform acceleration of 0.1 ms^{-2} for two minutes, find :
(a) The speed acquired. (b) The distance travelled.

Q.22 Obtain the first equation of motion $v = u + at$, for velocity time relation by using velocity-time graph.

Q.23 Derive second equation of motion, $s = ut + \frac{1}{2} at^2$ graphically where the symbols have their usual meanings.

Q.24 Given below is the velocity-time graph of a car which starts with initial velocity u and uniform acceleration 'a'. It covers a distance 's' before finally attaining a velocity 'v'.
In time t establish a relationship between, u, v, a and s with the help of graph.



Q.25 How is uniform circular motion regarded as an accelerated motion ? Give an example of such a motion.

Q.26 (a) Define circular motion.
(b) An artificial satellite is moving in a circular orbit of radius 42,250km. Calculate speed, if it takes 24 hours to revolve once around the earth.

Q.27 (a) Define uniform circular motion. Explain with the help of diagram why is it called an accelerated motion ? Given an example of this kind of motion.
(b) Give an expression for the speed of an athlete if he takes time t to go around a circular track of radius r.
(c) A cyclists takes five round of a circular track of diameter 196m in 25 min.Calculate his speed.

Q.28 (a) Identify in the situations given below where the object is making a uniform circular motion :
(i) A car turning around a curve with uniform speed. Or A car going uphill.
(ii) Motion given to a discuss by an athlete before releasing it.
OR Motion of discuss when athlete releases it.
(b) A cyclist completes five rounds of a circular track of radius 21m in 12 minutes, calculate his speed.
(c) An artificial satellite moves around the earth with a velocity of constant magnitude still its motion is said to be an accelerated motion. Why ?

VALUE BASED QUESTIONS (Q.29-Q.30)

Q.29 A driver of a car travelling with a uniform velocity of 2 m/s notices a railway level crossing at a distance of 500m from him. A train approaching the level crossing with a uniform velocity of 90 km/h is at a distance of 1 km from the level crossing. Calculate at what rate he has to increase the velocity of the car so that he reaches the gates of level crossing exactly when the train enters the level crossing. Also find the final velocity of the car when it reaches the level crossing.

Q.30 The table given below shows the velocity of two cars A and B at different intervals of time :

Time (S)		0	5	10	15	20
Velocity in m/s	Car A	0	6	12	18	24
	Car B	0	4	9	15	22

(i) Identify the car which is moving with uniform acceleration. Give reason for your answer.
(ii) From the table given above calculate the distance covered by car A and B in 10s.

ANSWER KEY

EXERCISE - 2

(1) 3240 s **(2)** 7200 km/h^2 **(3)** 4 ms^{-2}. **(4)** 72 km/hr.
(5) 300 m/s **(6)** 20 m/s, 150m **(7)** 48000 m **(8)** –20/10 ms^{-2}
(9) – 2 ms^{-2} **(10)** 23N **(11)** (a) 48 km/hr east (b) 36 km/hr west (c) 0 km/hr
(12) (a) 9.0m, 14.7 m/s, 9.8 m/s^2, (b) Up (along $\hat{i}$), down (opposite to $\hat{i}$), down (opposite to $\hat{i}$),
(c) x = 9.0m, v_x = – 14.7 m/s, a_x = – 9.8 m/s^2

EXERCISE - 3

(1) average speed **(2)** square **(3)** accelration **(4)** south

(5) centripetal **(6)** $\left(\frac{2\pi}{30\sqrt{2}}\right)$ cm / sec **(7)** $20\sqrt{2}$ m/sec., south-west

(8) $1/\sqrt{2}$ m/s^2 north-west **(9)** changes in direction **(10)** v/r, axis of rotation **(11)** 12 : 1

(12) 20 m/s **(13)** 3 **(14)** 80 **(15)** may or may not be **(16)** True
(17) True **(18)** False **(19)** True **(20)** False **(21)** True
(22) True **(23)** True **(24)** False **(25)** False **(26)** False
(27) True **(28)** False **(29)** True **(30)** True

EXERCISE - 4

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

EXERCISE - 5

(1) (1, 2, 3) **(2)** (1, 2, 4) **(3)** (1, 3) **(4)** (2, 3, 4) **(5)** (1, 2, 3)
(6) 2 **(7)** 16 **(8)** 21 **(9)** (3) **(10)** (4)
(11) (A) → q, s (B) → p (C) → p (D) → q, r **(12)** (A) → q, s (B) → r (C) → p (D) → s
(13) (2) **(14)** (2) **(15)** (5) **(16)** (1) **(17)** (1) **(18)** (3)

EXERCISE - 6

Q	1	2	3	4	5	6	7	8	9	10	11
A	4	3	4	1	3	1	2	4	3	3	1
Q	12	13	14								
A	2	3	3								

EXERCISE - 7

(3) Distance **(10)** Uniform motion **(13)** (a) Object is at rest. (b) Non-uniform motion.
(15) (i) Constant velocity (ii) Uniform acceleration (iii) uniform retardation
(16) (a) Uniform from A to B and non-uniform from B to C (b) AB (c) BC
(18) (i) Accelerated, Constant velocity, Retardation (ii) 2m/s, 0 (iii) –2 m/s^2 (iv) 400m
(20) 100m **(21)** (a) 12 m/s(b) 720m **(26)** (b) 11055.42 km/h.
(27) (c) 2.05 m/s **(28)** (b) 0.9 m/s **(29)** 0.525 m/s^2, 23 m/s
(30) (i) Car A (ii) Car A : 60m, Car B : 42.5 m