ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

path to success

PRE-MEDICAL

PHYSICS

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Kinematics (Motion along a straight line and motion in a plane)

ENGLISH MEDIUM

EXERCISE-I (Conceptual Questions) — Build Up Your Understanding

DISTANCE & DISPLACEMENT, SPEED & VELOCITY, AVERAGE SPEED & AVERAGE VELOCITY

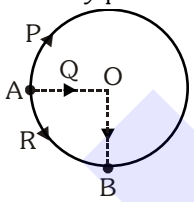
1. A man walks 30 m towards north, then 20 m towards east and in the last $30\sqrt{2}$ m towards south - west. The displacement from origin is :
(1) 10 m towards west
(2) 10 m towards east
(3) $60\sqrt{2}$ m towards north west
(4) $60\sqrt{2}$ m towards east north

KN0001

2. A body moves along the curved path of a quarter circle. Calculate the ratio of distance to displacement:
(1) 11 : 7 (2) 7 : 11
(3) 11 : $\sqrt{2}$ × 7 (4) 7 : $11\sqrt{2}$

KN0002

3. Three particles P, Q and R are situated at point A on the circular path of radius 10 m. All three particles move along different paths and reach point B as shown in figure. Then the ratio of distance traversed by particles P and Q is :



(1) $\frac{3}{4}$ (2) $\frac{1}{3}$ (3) $\frac{3\pi}{4}$ (4) $\frac{\pi}{3}$

KN0003

4. If displacement of a particle is zero, the distance covered :
(1) must be zero
(2) may or may not be zero
(3) cannot be zero
(4) depends upon the particle

KN0004

5. If the distance covered is zero, the displacement :
(1) must be zero
(2) may or may not be zero
(3) cannot be zero
(4) depends upon the particle

KN0005

6. The location of a particle is changed. What can we say about the displacement and distance covered by the particle :
(1) Both cannot be zero
(2) One of the two may be zero
(3) Both must be zero
(4) If one is positive, the other is negative and vice-versa

KN0006

7. An athlete completes one round of a circular track of radius R in 20 seconds. What will be his displacement at the end of 2 minutes 20 seconds?
(1) Zero (2) 2R (3) 2πR (4) 7πR

KN0007

8. A man walks for some time 't' with velocity (v) due east. Then he walks for same time 't' with velocity (v) due north. The average velocity of the man is :
(1) 2v (2) $\sqrt{2}$ v (3) v (4) $\frac{v}{\sqrt{2}}$

KN0008

9. A drunkard is walking along a straight road. He takes 5 steps forward and 3 steps backward, followed by 5 steps forward and 3 steps backward and so on. Each step is one meter long and takes one second. There is a pit on the road 11 meters away from the starting point. The drunkard will fall into the pit after :
(1) 29 s (2) 21 s (3) 37s (4) 31 s

KN0009

10. A car runs at constant speed on a circular track of radius 10 m taking 6.28s on each lap (i.e. round). The average speed and average velocity for each complete lap is :
(1) Velocity 10 m/s, speed 10 m/s
(2) Velocity zero, speed 10 m/s
(3) Velocity zero, speed zero
(4) Velocity 10 m/s speed zero

KN0010

11. A particle moving in a straight line covers half the distance with speed of 12 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) 8.0 m/s (2) 12.0 m/s
(3) 10.0 m/s (4) 9.8 m/s

KN0011

12. The magnitude of average velocity is equal to the average speed when a particle moves :
(1) on a curved path
(2) in the same direction
(3) with constant acceleration
(4) with constant retardation

KN0012

13. A body covers one-third of the distance with a velocity v_1 the second one-third of the distance with a velocity v_2, and the last one-third of the distance with a velocity v_3. The average velocity is :

(1) $\frac{v_1+v_2+v_3}{3}$ (2) $\frac{3v_1v_2v_3}{v_1v_2+v_2v_3+v_3v_1}$

(3) $\frac{v_1v_2+v_2v_3+v_3v_1}{3}$ (4) $\frac{v_1v_2v_3}{3}$

KN0013

14. A car travels a distance d on a straight road in two hours and then returns to the starting point in next three hours. Its average speed is :

(1) $\frac{d}{5}$ (2) $\frac{2d}{5}$

(3) $\frac{d}{2}+\frac{d}{3}$ (4) none of these

KN0014

15. A train covers the first half of the distance between two stations with a speed of 40 km/h and the other half with 60 km/h. Then its average speed is :
(1) 50 km/h (2) 48 km/h
(3) 52 km/h (4) 100 km/h

KN0015

16. A car moving on a straight road covers one third of a certain distance with 20 km/h and the rest with 60km/h. The average speed is :
(1) 40 km/h (2) 80 km/h
(3) $46\frac{2}{3}$ km/h (4) 36 km/h

KN0016

17. A particle moves in the east direction with 15 m/sec for 2 sec then northwards with 5 m/s for 8 sec. Average speed of the particle is :–
(1) 1 m/s (2) 5 m/s
(3) 7 m/s (4) 10 m/s

KN0017

18. The numerical ratio of displacement to the distance covered is always :–
(1) less than one
(2) equal to one
(3) equal to or less than one
(4) equal to or greater than one

KN0018

19. A particle moves in a straight line for 20 seconds with velocity 3m/s and then moves with velocity 4 m/s for another 20 seconds and finally moves with velocity 5 m/s for next 20 seconds. What is the average velocity of the particle ?
(1) 3 m/s (2) 4 m/s (3) 5 m/s (4) zero

KN0019

20. An object travels 10 km at a speed of 100 m/s and another 10 km at 50 m/s. The average speed over the whole distance is :–
(1) 75 m/s (2) 55 m/s
(3) 66.7 m/s (4) 33.3 m/s

KN0020

21. A point object traverses half the distance with velocity v_0. The remaining part of the distance is covered with velocity v_1 for the half time and with velocity v_2 for the rest half. The average velocity of the object for the whole journey is
(1) $2v_1(v_0+v_2)/(v_0+2v_1+2v_2)$
(2) $2v(v_0+v_1)/(v_0+v_1+v_2)$
(3) $2v_0(v_1+v_2)/(v_1+v_2+2v_0)$
(4) $2v_2(v_0+v_1)/(v_1+2v_2+v_0)$

KN0021

22. Select the incorrect statements from the following.
S1 :Average velocity is path length divided by time interval.
S2. In general, average speed is greater than the magnitude of the average velocity
S3. A particle moving in a given direction with a non-zero velocity can have zero speed.
S4. The magnitude of average velocity is the average speed.
(1) S2 and S3
(2) S1 and S4
(3) S1, S3 and S4
(4) All four statements

KN0022

ACCELERATION, AVERAGE ACCELERATION & APPLICATION OF CALCULUS

23. If x denotes displacement in time t and x = a cost, then acceleration is :
(1) a cos t (2) – a cos t
(3) a sin t (4) –a sin t

KN0023

24. The velocity-time relation of an electron starting from rest is given by u = kt, where k = 2 m/s^2. The distance traversed in 3 sec is :
(1) 9m (2) 16 m (3) 27 m (4) 36 m

KN0024

25. The position x of a particle varies with time (t) as $x = at^2 - bt^3$. The acceleration at time t of the particle will be equal to zero, where t is equal to :
(1) $\frac{2a}{3b}$ (2) $\frac{a}{b}$ (3) $\frac{a}{3b}$ (4) zero

KN0025

26. A particle moves along a straight line such that its displacement at any time t is given by $s = t^3 - 6t^2 + 3t + 4$ metres. The velocity when the acceleration is zero is :
(1) 3 m/s (2) –12 m/s
(3) 42 m/s (4) –9 m/s

KN0026

27. The displacement of a particle starting from rest (at t=0) is given by $s = 6t^2 - t^3$
The time when the particle will attain zero velocity again, is :
(1) 4s (2) 8s (3) 12s (4) 16s

KN0027

28. The velocity of a body depends on time according to the equation $v = 20 + 0.1t^2$. The body has :
(1) uniform acceleration
(2) uniform retardation
(3) non-uniform acceleration
(4) zero acceleration

KN0028

29. The displacement of a particle is given by $y = a + bt + ct^2 - dt^4$. The initial velocity and acceleration are respectively :
(1) b, – 4d (2) –b, 2c
(3) b, 2c (4) 2c, – 4d

KN0029

30. The initial velocity of a particle is u (at t = 0) and the acceleration is given by f = at. Which of the following relations is valid ?
(1) $v = u + at^2$ (2) $v = u + \frac{at^2}{2}$
(3) v = u + at (4) v = u

KN0030

31. A particle located at x = 0 at time t = 0, starts moving along the positive x–direction with a velocity 'v' which varies as $v = \alpha\sqrt{x}$, then velocity of particle varies with time as : (α is a constant)
(1) $v \propto t$ (2) $v \propto t^2$
(3) $v \propto \sqrt{t}$ (4) v = constant

KN0031

32. The relation $t = \sqrt{x} + 3$ describes the position of a particle where x is in meters and t is in seconds. The position, when velocity is zero, is :–
(1) 2 m (2) 4 m
(3) 5 m (4) zero

KN0032

33. The displacement of a particle is represented by the following equation : $s = 3t^3 + 7t^2 + 5t + 8$
where s is in metres and t in seconds. The acceleration of the particle at t = 1s is :–
(1) 14 m/s^2 (2) 18 m/s^2
(3) 32 m/s^2 (4) zero

KN0033

34. If for a particle position $x \propto t^2$ then :–
(1) velocity is constant
(2) acceleration is constant
(3) acceleration is variable
(4) None of these

KN0034

35. A body is moving according to the equation $x = at + bt^2 - ct^3$. Then its instantaneous speed is given by :–
(1) a + 2b + 3ct
(2) $a + 2bt - 3ct^2$
(3) 2b – 6ct
(4) None of these

KN0035

36. The motion of a particle is described by the equation $x = a + bt^2$ where a = 15 cm and b = 3 cm/sec^2. Its instantaneous velocity at time 3 sec will be :-

(1) 36 cm/sec (2) 18 cm/sec

(3) 16 cm/sec (4) 32 cm/sec

KN0036

37. Starting from rest ,the acceleration of a particle is a = 2(t –1). The velocity of the particle at t = 5 s is :-

(1) 15 m/s (2) 25 m/s

(3) 5 m/s (4) None of these

KN0037

38. Which of the following equations represents the motion of a body moving with constant finite acceleration? in these equations, y denotes the displacement in time t and p, q and r are arbitary constants :

(1) $y = (p + qt)^2 (r + pt)$

(2) $y = p + tqr$

(3) $y = (p + t) (q + t) (r + 1)$

(4) $y = (p + qt)r$

KN0038

39. Which of the following relations representing displacement x of a particle describes motion with constant acceleration ?

(1) $x = 6 - 7t^{-2}$ (2) $x = 3t^2 + 5t^3 + 7$

(3) $x = 9t^2 + 8$ (4) $x = 4t^{-2} + 3t^{-1}$

KN0039

40. Equation of a particle moving along the x axis is $x = u(t - 2) + a(t - 2)^2$

(1) the initial velocity of the particle is u

(2) the acceleration of the particle is a

(3) the acceleration of the particle is 2a

(4) at t = 2 particle is not at origin

KN0040

CONSTANT ACCELERATION MOTION, FREE FALL

41. The velocity of a particle moving with constant acceleration at an instant t_0 is 10 m/s. After 5 seconds of that instant the velocity of the particle is 20m/s. The velocity at 3 second before t_0 is :

(1) 8 m/s (2) 4 m/s

(3) 6 m/s (4) 7 m/s

KN0041

42. The velocity acquired by a body moving with uniform acceleration is 30 m/s in 2 seconds and 60 m/s in 4 seconds. The initial velocity is :

(1) zero (2) 2 m/s

(3) 4 m/s (4) 10 m/s

KN0042

43. If a body starts from rest, the time in which it covers a particular displacement with uniform acceleration is :

(1) inversely proportional to the square root of the displacement

(2) inversely proportional to the displacement

(3) directly proportional to the displacement

(4) directly proportional to the square root of the displacement

KN0043

44. A body at rest is imparted motion to move in a straight line. It is then obstructed by an opposite force, then:

(1) the body may necessarily change direction

(2) the body is sure to slow down

(3) the body will necessarily continue to move in the same direction at the same speed

(4) none of the above.

KN0044

45. If a car at rest accelerates uniformly to a speed of 144 km/h in 20 seconds, it covers a distance of :

(1) 20 m (2) 400 m

(3) 1440 m (4) 2980 m

KN0045

46. A body starts from rest and with a uniform acceleration of 10 ms^{-2} for 5 seconds. During the next 10 seconds it moves with uniform velocity. The total distance travelled by the body is :–

(1) 100 m (2) 125 m

(3) 500 m (4) 625 m

KN0046

47. Initially a body is at rest. If its acceleration is $5ms^{-2}$ then the distance travelled in the 18^{th} second is:–

(1) 86.6 m (2) 87.5 m

(3) 88 m (4) 89 m

KN0047

48. If a body starts from rest and travels 120m in the 8^{th} second, then acceleration is :

(1) 16 m/s^2 (2) 10 m/s^2

(3) 0.227 m/s^2 (4) 0.03 m/s^2

KN0048

49. If a train travelling at 72 km/h is to be brought to rest in a distance of 200 m, then its retardation should be :

(1) 20 m/s^2 (2) 2 m/s^2

(3) 10 m/s^2 (4) 1 m/s^2

KN0049

50. A car moving with a speed of 40 km/h can be stopped by applying brakes after at least 2m. If the same car is moving with a speed of 80 km/h., what is the minimum stopping distance ?

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

KN0050

51. A car moving with a velocity of 10 m/s can be stopped by the application of a constant force F in a distance of 20m. If the velocity of the car is 30 m/s. It can be stopped by this force in :

(1) $\frac{20}{3}$ m (2) 20 m

(3) 60 m (4) 180 m

KN0051

52. If a car at rest accelerates uniformly and attains a speed of 72 km/h in 10s, then it covers a distance of

(1) 50 m (2) 100 m

(3) 200 m (4) 400 m

KN0052

53. A stone is dropped into a well in which the level of water is h below the top of the well. If v is velocity of sound, the time T after which the splash is heard is given by.

(1) $T = \frac{2h}{v}$ (2) $T = \sqrt{\frac{2h}{g}} + \frac{h}{v}$

(3) $T = \sqrt{\frac{2h}{v}} + \frac{h}{g}$ (4) $T = \sqrt{\frac{h}{2g}} + \frac{2h}{v}$

KN0053

54. A stone thrown upwards with a speed 'u' from the top of the tower reaches the ground with a velocity '3u'. The height of the tower is :

(1) $\frac{3u^2}{g}$ (2) $\frac{4u^2}{g}$

(3) $\frac{6u^2}{g}$ (4) $\frac{9u^2}{g}$

KN0054

55. A stone falls from a balloon that is descending at a uniform rate of 12 ms^{-1}. The displacement of the stone from the point of release after 10 seconds is :

(g = 9.8 m/s^2)

(1) 490 m (2) 510 m

(3) 610 m (4) 725 m

KN0055

56. A rocket is fired vertically from the ground. It moves upwards with a constant acceleration of 10 m/s^2. After 30 seconds the fuel is finished. After what time from the instant of firing the rocket will it attain the maximum height ?

g = 10 m/s^2 :

(1) 30 s (2) 45 s

(3) 60s (4) 75 s

KN0056

57. A body is released from the top of a tower of height H metres . It takes t time to reach the ground. Where is the body $\frac{t}{2}$ time after the release :

(1) At $\frac{H}{2}$ metres from ground

(2) At $\frac{H}{4}$ metres from ground

(3) At $\frac{3H}{4}$ metres from the ground

(4) At $\frac{H}{6}$ metres from the ground

KN0057

58. A body dropped from the top of a tower covers a distance 7x in the last second of its journey, where x is the distance covered in first second. How much time does it take to reach the ground?

(1) 3s (2) 4s

(3) 5s (4) 6s

KN0058

59. A body falling from height 'h' takes t_1 time to reach the ground. The time taken to cover the first half of the height is :

(1) $t_2 = \frac{t_1}{\sqrt{2}}$ (2) $t_1 = \frac{t_2}{\sqrt{2}}$

(3) $t_2 = t_1$ (4) None of these

KN0059

60. Two balls are dropped from different heights at different instants. Second ball is dropped 2 seconds after the first ball. If both balls reach the ground simultaneously after 5 seconds of dropping the first ball, then the difference between the initial heights of the two balls will be: ($g=9.8m/s^2$)
(1) 58.8 m (2) 78.4 m
(3) 98.0 m (4) 117.6 m
KN0060

61. Drops of water fall from the roof of a building 18m high at regular intervals of time. When the first drop reaches the ground, at the same instant fourth drop begins to fall. What are the distances of the second and third drops from the roof ?
(1) 6 m and 2 m (2) 6 m and 3 m
(3) 8 m and 2 m (4) 4 m and 2 m
KN0061

62. If an iron ball and a wooden ball of same radii are released from a height h in vacuum then time taken by both of them to reach ground will be :
(1) unequal (2) exactly equal
(3) roughly equal (4) zero
KN0062

63. Water drops fall at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap at the instant the first drop touches the ground. How far above the ground is the second drop at that instant ?
(1) 1.25 m (2) 2.50 m
(3) 3.75 m (4) 4.00 m
KN0063

64. If a ball is thrown vertically upwards with 40 m/s. its velocity after two seconds will be :
(1) 10 m/s (2) 20 m/s
(3) 30 m/s (4) 40 m/s
KN0064

65. A stone is dropped from a certain height which can reach the ground in 5 seconds. It is stopped after 3 seconds of its fall and is again released. The total time taken by the stone to reach the ground will be :
(1) 6 s (2) 6.5 s (3) 7 s (4) 7.5 s
KN0065

66. With what speed should a body be thrown upwards so that the distances traversed in 5th second and 6th second are equal ?
(1) 58.4 m/s (2) 49 m/s
(3) $\sqrt{98}$ m/s (4) 98 m/s
KN0066

67. Which of the following four statements is false?
(1) A body can have zero velocity and still be accelerated
(2) A body can have a constant velocity and still have a varying speed
(3) A body can have a constant speed and still have a varying velocity
(4) The direction of the velocity of a body can change when its acceleration is constant.
KN0067

68. A body dropped from a tower reaches the ground in 4s. The height of the tower is about :
(1) 80 m (2) 20 m
(3) 160 m (4) 40 m
KN0068

69. A particle is dropped from a certain height. The time taken by it to fall through successive distances of 1 km each will be :
(1) all equal, being equal to $\sqrt{\frac{2}{g}}$ second.
(2) in the ratio of the square roots of the integers $1 : \sqrt{2} : \sqrt{3}$
(3) in the ratio of the difference in the square roots of the integers, i.e.,
$\sqrt{1},,(\sqrt{2}-\sqrt{1}),(\sqrt{3}-\sqrt{2}),(\sqrt{4}-\sqrt{3})$ .....
(4) in the ratio of the reciprocals of the square roots of the integers, ie., $\frac{1}{\sqrt{1}},\frac{1}{\sqrt{2}},\frac{1}{\sqrt{3}}$.....
KN0069

70. A ball is thrown upward with a velocity of 100 m/s. It will reach the ground after :–
(1) 10 s (2) 20 s
(3) 5 s (4) 40 s
KN0070

71. A particle is thrown vertically upward. Its velocity at half of the maximum height is 10m/s. The maximum height attained by it is ($g=10\ ms^{-2}$) :–
(1) 8m (2) 20m
(3) 10m (4) 16m
KN0071

72. Three different objects of masses m_1, m_2 and m_3 are allowed to fall from rest and from the same point 'O' along three different frictionless paths. The speeds of the three objects on reaching the ground, will be in the ratio of :–

(1) $m_1 : m_2 : m_3$ (2) $m_1 : 2m_2 : 3m_3$

(3) 1 : 1 : 1 (4) $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

KN0072

73. If a ball is thrown vertically upwards with speed u, the distance covered during the last 't' seconds of its ascent is :–

(1) ut (2) $\frac{1}{2}gt^2$

(3) $ut - \frac{1}{2}gt^2$ (4) (u + gt)t

KN0073

74. A stone falls freely such that the distance covered by it in the last second of its motion is equal to the distance covered by it in the first 5 seconds. It remained in air for :–

(1) 12 s (2) 13 s (3) 25 s (4) 26 s

KN0074

75. When a ball is thrown vertically up with velocity v_0, it reaches a maximum height 'h'. If one wishes to triple the maximum height then the ball should be thrown with velocity –

(1) $\sqrt{3}\,v_0$ (2) $3v_0$ (3) $9v_0$ (4) $3/2v_0$

KN0075

76. An object is dropped vertically down on earth. The change in its speed after falling through a distance d from its highest point is

(1) mgd (2) $\sqrt{2gd}$

(3) $2\sqrt{g/d}$ (4) $2\sqrt{\frac{mg}{d}}$

KN0076

77. The ratio of the distances traversed, in successive intervals of time by a body falling from rest, are

(1) 1 : 3 : 5 : 7 : 9 : .....

(2) 2 : 4 : 6 : 8 : 10 : .....

(3) 1 : 4 : 7 : 10 : 13 : .....

(4) None of these

KN0077

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

(1) $\frac{7}{5}$ (2) $\frac{5}{7}$

(3) $\frac{7}{3}$ (4) $\frac{3}{7}$

KN0078

79. A particle is thrown up vertically with a speed 'v_1', in air. It takes time t_1 in upward journey and t_2 ($> t_1$) in the downward journey and returns to the starting point with a speed v_2.Then:

(1) $v_1 = v_2$ (2) $v_1 < v_2$

(3) $v_1 > v_2$ (4) Data is insufficient

KN0079

80. A ball is thrown vertically upwards. Assuming the air resistance to be constant and considerable :–

(1) the time of ascent $\geq$ the time of descent

(2) the time of ascent < the time of descent

(3) the time of ascent > the time of descent

(4) the time of ascent = the time of descent

KN0080

81. A body is projected vertically up at t = 0 with a velocity of 98 m/s. Another body is projected from the same point with same velocity after 4 seconds. Both bodies will meet at t =

(1) 6 s (2) 8 s

(3) 10 s (4) 12 s

KN0081

82. A body released from a height falls freely towards earth. Another body is released from the same point exactly one second later. The separation between them two seconds after the release of the second body is :–

(1) 9.8 m (2) 49 m

(3) 24.5 m (4) 19.6 m

KN0082

GRAPHICAL ANALYSIS

83. Velocity-time curve for a body projected vertically upwards is a/an :–

(1) Parabola

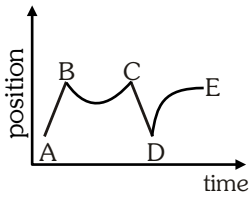
(2) Ellipse

(3) Hyperbola

(4) Straight line

KN0084

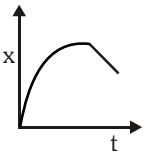
84. Fig. shows the position of a particle moving along x-axis as a function of time. The acceleration of the particle is zero in the region :

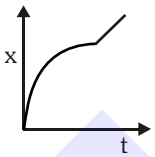


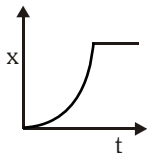
(a) AB (b) BC
(c) CD (d) DE
Select correct alternative
(1) a, b (2) a, c
(3) b, d (4) c, d

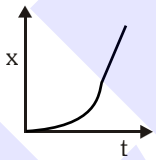
KN0085

85. A car starts from rest and accelerates uniformly by for 4 seconds and then moves with uniform velocity which of the x-t graph represent the motion of the car ?

(1) 

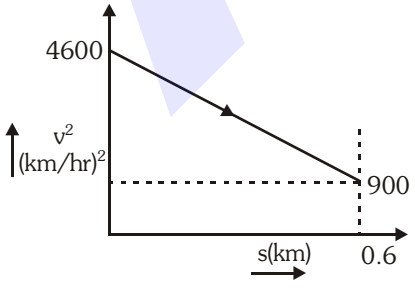
(2) 

(3) 

(4) 

KN0086

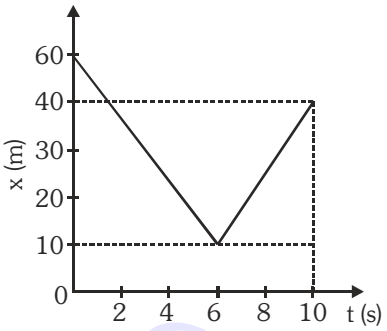
86. Graph between the square of the velocity (v) of a particle and the distance (s) moved is shown in figure. The acceleration of the particle in kilometers per hour square is :



(1) 2250 (2) 3084
(3) – 2250 (4) – 3084

KN0087

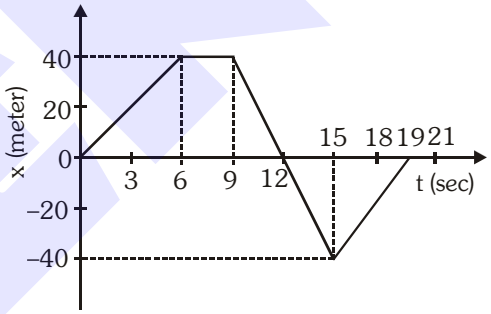
87. The fig. shows the position time graph of a particle moving on a straight line path. What is the magnitude of average velocity of the particle over 10 seconds ?



(1) 2 m/s (2) 4 m/s (3) 6 m/s (4) 8 m/s

KN0088

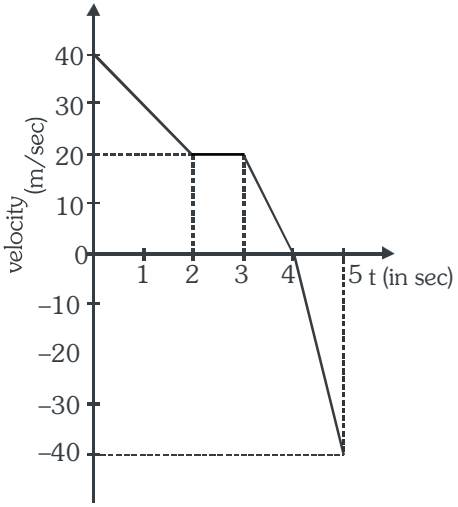
88. A person walks along an east-west street and a graph of his displacement from home is shown in figure. His average velocity for the whole time interval is



(1) 0 (2) 23 m/s
(3) 8.4 m/s (4) None of above

KN0089

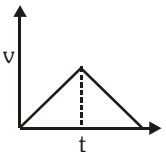
89. From the following velocity time graph of a body the distance travelled by the body and its displacement during 5 seconds in metres will be :

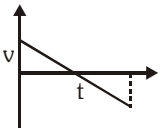


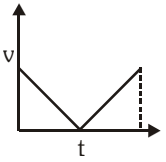
(1) 75, 75 (2) 110, 70
(3) 110, 110 (4) 110, 40

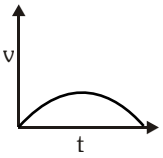
KN0090

90. A body is projected vertically upward from the surface of the earth, its velocity-time graph is :

(1) 

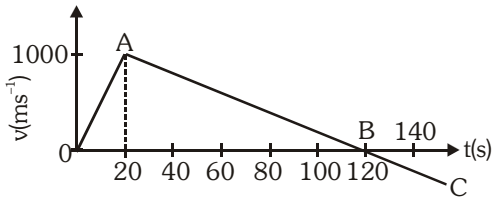
(2) 

(3) 

(4) 

KN0091

91. A rocket is launched upward from the earth is surface whose velocity time graphs shown in figure. Then maximum height attained by the rocket is :



(1) 1 km (2) 10 km
(3) 100 km (4) 60 km

KN0092

92. In above question, height covered by the rocket before retardation is :
(1) 1 km (2) 10 km
(3) 20 km (4) 60 km

KN0093

93. In above question mean velocity of rocket during the time it took to attain the maximum height :
(1) 100 m/s (2) 50 m/s
(3) 500 m/s (4) 25/3 m/s

KN0094

94. In above question the retardation of rocket is :
(1) 50 m/s^2 (2) 100 m/s^2
(3) 500 m/s^2 (4) 10 m/s^2

KN0095

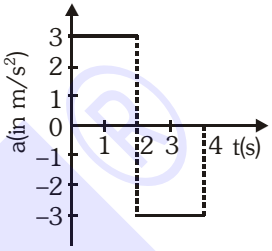
95. In above question the acceleration of rocket is :
(1) 50 m/s^2 (2) 100 m/s^2
(3) 10 m/s^2 (4) 1000 m/s^2

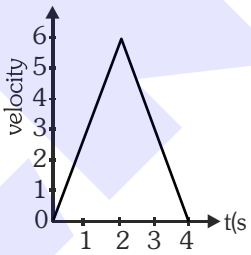
KN0096

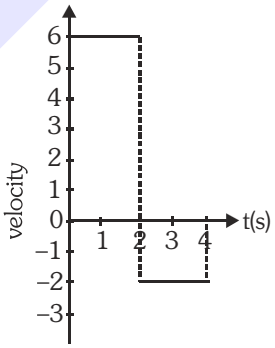
96. In above question the rocket goes up and comes down on the following parts respectively :
(1) OA and AB
(2) AB and BC
(3) OA and ABC
(4) OAB and BC

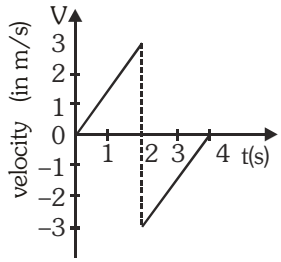
KN0097

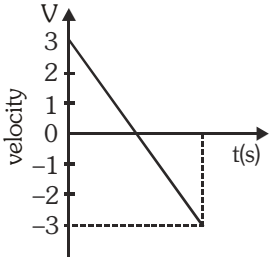
97. For the motion of a particle acceleration-time graph is shown in figure. The velocity time curve for the duration of 0 – 4 seconds is :



(1) 

(2) 

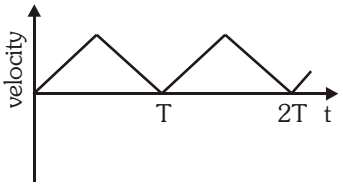
(3) 

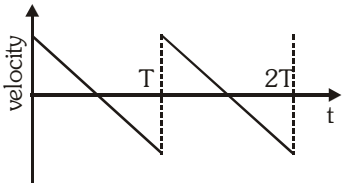
(4) 

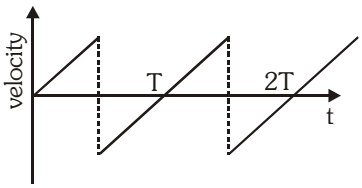
KN0098

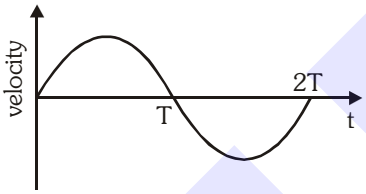
98. A ball is dropped from the certain height on the surface of glass. It collides elastically and comes back to its initial position. If this process is repeated then the velocity time graph is :

(Take downward direction as positive)

(1) 

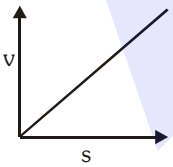
(2) 

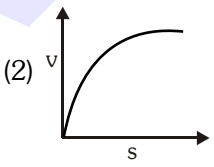
(3) 

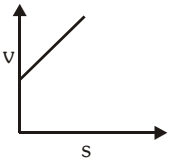
(4) 

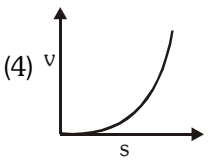
KN0099

99. A particle starts from rest and move with constant acceleration. Its velocity-displacement curve is :

(1) 

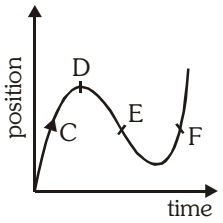
(2) 

(3) 

(4) 

KN0100

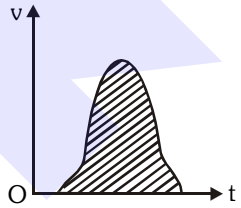
100. The position-time graph of a moving particle is shown. The instantaneous velocity of the particle is negative at the point :



(1) D (2) F (3) C (4) E

KN0101

101. Figure below shows the velocity-time graph of a one dimensional motion. Which of the following characteristics of the particle is represented by the shaded area?



(1) Speed

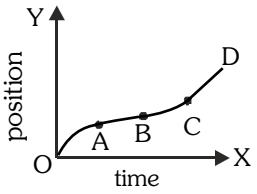
(2) Displacement

(3) Acceleration

(4) Momentum

KN0102

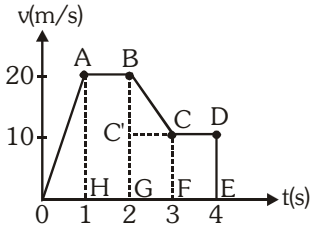
102. The graph between the position x and time t for a particle moving in a straigh line is shown in figure. During the interval OA, AB, BC and CD, the acceleration of the particle is :



	OA	AB	BC	CD
(1)	+	0	+	+
(2)	–	0	+	0
(3)	+	0	–	+
(4)	–	0	–	0

KN0103

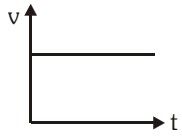
103. The variation of velocity of a particle moving along a straight line is illustrated in the figure. The distance transvered by the particle in 4 seconds is

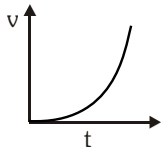


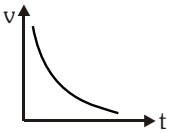
(1) 60 m (2) 25 m (3) 55 m (4) 30 m

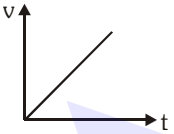
KN0104

104. Which of the following velocity-time graphs represent uniform motion ?

(1) 

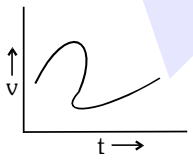
(2) 

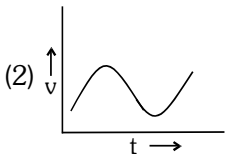
(3) 

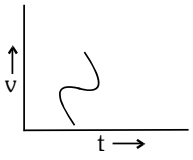
(4) 

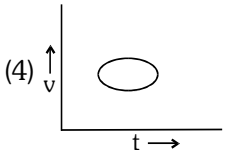
KN0105

105. Which of the following velocity–time graphs shows a realistic situation for a body in motion ?

(1) 

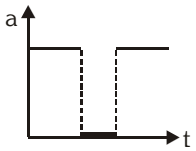
(2) 

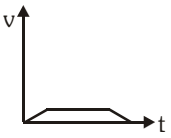
(3) 

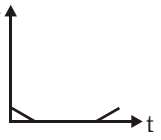
(4) 

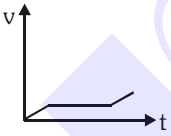
KN0106

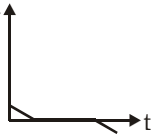
106. Acceleration-time graph of a body is shown. The corresponding velocity-time graph is :



(1) 

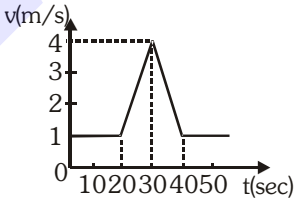
(2) 

(3) 

(4) 

KN0107

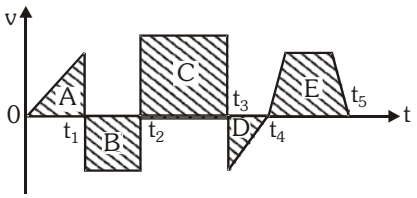
107. Velocity-time (v-t) graph for a moving object is shown in the figure. Total displacement of the object during the time interval when there is non-zero acceleration and retardation is :–



(1) 60 m (2) 50 m
(3) 30 m (4) 40 m

KN0108

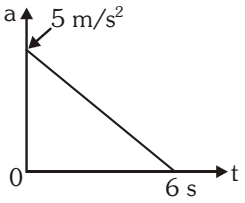
108. The velocity-time graph of an object is shown. The displacement during the interval 0 to t_4 is :-



(1) Area A + Area B + Area C + Area D + Area E
(2) Area A + Area C – Area B – Area D
(3) Area A + Area B + Area C + Area D
(4) Area A + Area C + Area E – Area B + Area D

KN0109

109. A particle starts from rest. Its acceleration at time t = 0 is 5 m/s^2 which varies with time as shown in the figure. The maximum speed of the particle will be :



(1) 7.5 m/s

(2) 15 m/s

(3) 30 m/s

(4) 37.5 m/s

KN0110

110. A car accelerates from rest at a constant rate of 2 m/s^2 for some time. Then, it retards at a constant rate of 4 m/s^2 and comes to rest. If it remains in motion for 3 seconds, then the maximum speed attained by the car is :

(1) 2 m/s (2) 3 m/s

(3) 4 m/s (4) 6 m/s

KN0111

GROUND TO GROUND PROJECTION

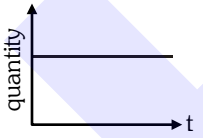
111. In the graph shown in fig. time is plotted along x-axis. Which quantity associated with a projectile motion is plotted along the y - axis ?

(1) kinetic energy

(2) momentum

(3) horizontal velocity

(4) none of the above



KN0112

112. In case of a projectile fired at an angle equally inclined to the horizontal and vertical with velocity u, the horizontal range is :

(1) $\frac{u^2}{g}$ (2) $\frac{u^2}{2g}$ (3) $\frac{2u^2}{g}$ (4) $\frac{u^2}{g^2}$

KN0113

113. A shell is fired vertically upwards with a velocity v_1 from the deck of a ship moving with a speed v_2. A person on the shore observes the motion of the shell as a parabola. Its horizontal range is given by :

(1) $\frac{2v_1^2v_2}{g}$ (2) $\frac{2v_1v_2^2}{g}$

(3) $\frac{2v_1v_2}{g}$ (4) $\frac{2v_1^2v_2^2}{g}$

KN0114

114. The range of a projectile when fired at 75° to the horizontal is 0.5 km. What will be its range when fired at 45° with the same speed ?

(1) 0.5 km (2) 1.0 km

(3) 1.5 km (4) 2.0 km

KN0115

115. A particle is projected with a velocity u making an angle θ with the horizontal. At any instant, its velocity v is at right angle to its initial velocity u; then v is:

(1) u cos θ (2) u tan θ

(3) u cot θ (4) u sec θ

KN0116

116. The speed of a projectile at its maximum height is $\frac{\sqrt{3}}{2}$ times of its inital speed 'u' of projection. Its range on the horizontal plane is :

(1) $\frac{\sqrt{3}u^2}{2g}$ (2) $\frac{u^2}{2g}$ (3) $\frac{3u^2}{2g}$ (4) $\frac{3u^2}{g}$

KN0117

117. A ball is thrown at an angle θ to the horizontal and the range is maximum. The value of tanθ is :

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

KN0118

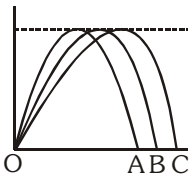
118. A student is able to throw a ball vertically to a maximum height of 40 m. The maximum distance to which he can throw the ball in the horizontal direction is :

(1) 40 $(2)^{1/2}$ m (2) 20$(2)^{1/2}$m

(3) 20 m (4) 80 m

KN0119

119. Three projectiles A, B and C are thrown from the same point in the same plane. Their trajectories are shown in the figure. Which of the following statement is true ?



(1) The time of flight is the same for all the three

(2) The launch speed is largest for particle C

(3) The horizontal velocity component is largest for particle C

(4) All of the above

KN0120

120. A projectile is thrown with an initial velocity of $\vec{v} = a\hat{i} + b\hat{j}$. If range of the projectile is double the maximum height attained by it then :
(1) a = 2 b (2) b = a
(3) b = 2a (4) b = 4a
KN0121

121. The equation of a projectile is $y = \sqrt{3}x - \frac{gx^2}{2}$. The angle of projection is :
(1) 30° (2) 60° (3) 45° (4) none
KN0122

122. The equation of a projectile is $y = 16x - \frac{x^2}{4}$. The horizontal range is :
(1) 16 m (2) 8 m (3) 64 m (4) 12.8m
KN0123

123. If a projectile is fired at an angle θ to the vertical with velocity u, then maximum height attained is given by :
(1) $\frac{u^2\cos\theta}{2g}$ (2) $\frac{u^2\sin^2\theta}{2g}$
(3) $\frac{u^2\sin^2\theta}{g}$ (4) $\frac{u^2\cos^2\theta}{2g}$
KN0124

124. If R is the maximum horizontal range of a particle, then the greatest height attained by it is:
(1) R (2) 2R (3) $\frac{R}{2}$ (4) $\frac{R}{4}$
KN0125

125. Two stones are projected with the same speed but making different angles with the horizontal. Their ranges are equal. If the angle of projection of one is $\frac{\pi}{3}$ and its maximum height is y_1, then the maximum height of the other will be :
(1) $3y_1$ (2) $2y_1$ (3) $\frac{y_1}{2}$ (4) $\frac{y_1}{3}$
KN0126

126. A projectile is thrown from a point in a horizontal plane such that its horizontal and vertical velocity components are 9.8 m/s and 19.6 m/s respectively. Its horizontal range is :
(1) 4.9 m (2) 9.8 m
(3) 19.6 m (4) 39.2 m
KN0127

127. A projectile is thrown into space so as to have the maximum possible horizontal range equal to 400m. Taking the point of projection as the origin, the coordinates of the point where the velocity of the projectile is minimum are:
(1) (400, 100) m
(2) (200, 100) m
(3) (400, 200) m
(4) (200, 200) m
KN0128

128. A particle is fired with velocity u making θ angle with the horizontal. What is the change in velocity when it is at the highest point ?
(1) u cos θ (2) u
(3) u sin θ (4) (u cosθ – u)
KN0129

129. In the above, the change in speed is :
(1) u cos θ (2) u
(3) u sin θ (4) (u cosθ – u)
KN0130

130. An arrow is shot into the air. Its range is 200 metres and its time of flight is 5 s. If the value of g is assumed to be 10 m/s², then the horizontal component of the velocity of arrow is :
(1) 25 m/s (2) 40 m/s
(3) 31.25 m/s (4) 12.5 m/s
KN0131

131. In the Q.130, the maximum height attained by the arrow is :
(1) 25 m (2) 40 m
(3) 31.25 m (4) 12.5 m
KN0132

132. In the Q.130, the vertical component of the velocity is :
(1) 25 m/s (2) 40 m/s
(3) 12.5 m/s (4) 31.25 m/s
KN0133

133. In the Q.130, the angle of projection with the horizontal is :
(1) $\tan^{-1}\left(\frac{4}{5}\right)$ (2) $\tan^{-1}\left(\frac{5}{4}\right)$
(3) $\tan^{-1}\left(\frac{5}{8}\right)$ (4) $\tan^{-1}\left(\frac{8}{5}\right)$
KN0134

134. A ball is thrown at different angles with the same speed u and from the same point; it has the same range in both the cases. If y_1 and y_2 be the heights attained in the two cases, then $y_1 + y_2 = \ldots$:

(1) $\frac{u^2}{g}$ (2) $\frac{2u^2}{g}$

(3) $\frac{u^2}{2g}$ (4) $\frac{u^2}{4g}$

KN0135

135. Two balls A and B are thrown with speeds u and u/2 respectively. Both the balls cover the same horizontal distance before returning to the plane of projection. If the angle of projection of ball B is 15° with the horizontal, then the angle of projection of A is :

(1) $\sin^{-1}\left(\frac{1}{8}\right)$ (2) $\frac{1}{2}\sin^{-1}\left(\frac{1}{8}\right)$

(3) $\frac{1}{3}\sin^{-1}\left(\frac{1}{8}\right)$ (4) $\frac{1}{4}\sin^{-1}\left(\frac{1}{8}\right)$

KN0136

136. At what angle to the horizontal should a ball be thrown so that its range R is related to the time of flight T as $R = 5T^2$? Take g = 10 ms^{-2} :

(1) 30° (2) 45°

(3) 60° (4) 90°

KN0137

137. A projectile is projected with initial velocity $(6\hat{i} + 8\hat{j})$ m/s. If g = 10 ms^{-2}, then horizontal range is :

(1) 4.8 metre (2) 9.6 metre

(3) 19.2 metre (4) 14.0 metre

KN0138

138. If the range of a gun which fires a shell with muzzle speed v, is R, then the angle of elevation of the gun is :

(1) $\cos^{-1}\left(\frac{v^2}{Rg}\right)$ (2) $\cos^{-1}\left(\frac{Rg}{v^2}\right)$

(3) $\frac{1}{2}\sin^{-1}\left(\frac{v^2}{Rg}\right)$ (4) $\frac{1}{2}\sin^{-1}\left(\frac{Rg}{v^2}\right)$

KN0139

139. The maximum range of a projectile fired with some initial velocity is found to be 1000 m. The maximum height (H) reached by this projectile is:

(1) 250 metre (2) 500 metre

(3) 1000 metre (4) 2000 metre

KN0140

140. The angle which the velocity vector of a projectile, will make with the horizontal after time t of its being thrown with a velocity v at an angle θ to the horizontal, is :

(1) θ (2) $\tan^{-1}\left(\frac{\theta}{t}\right)$

(3) $\tan^{-1}\left(\frac{v\cos\theta}{v\sin\theta - gt}\right)$ (4) $\tan^{-1}\left(\frac{v\sin\theta - gt}{v\cos\theta}\right)$

KN0141

141. A particle is projected at an angle of 45°, 8m away from the foot of a wall, just touches the top of the wall and falls on the ground on the opposite side at a distance 4m from it.The height of wall is :

(1) $\frac{2}{3}$m (2) $\frac{4}{3}$m (3) $\frac{8}{3}$m (4) $\frac{3}{4}$m

KN0142

142. The maximum horizontal range of a gun is 16 km. If g = 10 m/s^2, the muzzle velocity of the shell must be :–

(1) 1600 m/s (2) 400 m/s

(3) $200\sqrt{2}$ m/s (4) $160\sqrt{10}$ m/s

KN0143

143. A body is thrown with a velocity of 9.8 m/s making an angle of 30^0 with the horizontal. It will hit the ground after a time :–

(1) 3 s (2) 2 s (3) 1.5 s (4) 1 s

KN0144

144. Three particles A, B and C are projectied from the same point with the same initial speeds making angles 30°, 45° and 60° respectively with the horizontal. Which of the following statements are correct ?

(1) A, B and C have unequal ranges

(2) Ranges of A and C are equal and less than that of B

(3) Ranges of A and C are equal and greater than that of B

(4) A, B and C have equal ranges

KN0145

145. A ball whose kinetic energy is E, is thrown at an angle of 45° to the horizontal. Its kinetic energy at the highest point of its flight will be :–

(1) E (2) $\frac{E}{\sqrt{2}}$

(3) $\frac{E}{2}$ (4) zero

KN0146

146. A body is projected at such an angle that the horizontal range is three times the greatest height. The angle of projection is :–

(1) 25° (2) 33°

(3) 42° (4) 53°

KN0147

147. A projectile can have the same range R for two angles of projection. If t_1 and t_2 be the time of flight in the two cases, then :–

(1) $t_1t_2 \propto R^2$ (2) $t_1t_2 \propto R$

(3) $t_1t_2 \propto \frac{1}{R}$ (4) $t_1t_2 \propto \frac{1}{R^2}$

KN0148

148. A body is thrown with some velocity from the ground. Maximum height attained when it is thrown at 60° to the horizontal is 90 m. What is the height attained when it is thrown at 30° to the horizontal ?

(1) 90 m (2) 45 m

(3) 30 m (4) 15 m

KN0149

149. At the uppermost point of a projectile its velocity and acceleration are at an angle of :–

(1) 180° (2) 90°

(3) 60° (4) 45°

KN0150

150. A force $\vec{F} = 6t^2\hat{i} + 4t\hat{j}$ acts on a particle of mass 3 kg. What will be velocity of the particle at t = 3 second if at t = 0, the particle was at rest :-

(1) $18\hat{i} + 6\hat{j}$ (2) $18\hat{i} + 12\hat{j}$

(3) $12\hat{i} + 6\hat{j}$ (4) none

KN0151

151. A number of bullets are fired in all possible directions with the same initial velocity u. The maximum area of ground covered by bullets is :–

(1) $\pi\left(\frac{2u^2}{g}\right)^2$ (2) $3\pi\left(\frac{u}{g}\right)^2$

(3) $5\pi\left(\frac{u}{2g}\right)^2$ (4) $\pi\left(\frac{u^2}{g}\right)^2$

KN0152

152. For a given angle of projection if the initial velocity is doubled the range of the projectile becomes :-

(1) half (2) one-fourth

(3) two times (4) four times

KN0153

153. A ball is projected to attain the maximum range. If the height attained is H, the range is

(1) H (2) 2H (3) 4H (4) H/2

KN0154

154. Two projectiles are fired from the same point with the same speeds at angles of projection 60° and 30° respectively. Which one of the following is true ?

(1) Their horizontal ranges will be the same

(2) Their maximum heights will be the same

(3) Their landing velocities will be the same

(4) Their times of flight will be the same

KN0155

155. A ball is projected vertically upwards with a certain speed. Another ball of the same mass is projected at an angle 60^0 to the vertical with the same initial speed. The ratio of their potential energies at highest points of their journey, will be

(1) 1 : 1 (2) 2 : 1 (3) 3 : 2 (4) 4 : 1

KN0156

PROJECTION FROM A HEIGHT

156. A body is thrown horizontally with a velocity $\sqrt{2gh}$ from the top of a tower of height h. It strikes the ground level through the foot of the tower at a distance x from the tower. The value of x is :

(1) h (2) $\frac{h}{2}$ (3) 2 h (4) $\frac{3}{4}$ m

KN0157

157. When a particle is thrown horizontally, the resultant velocity of the projectile at any time t is given by :

(1) gt (2) $\frac{1}{2}gt^2$

(3) $\sqrt{u^2 + g^2t^2}$ (4) $\sqrt{u^2 - g^2t^2}$

KN0158

158. A ball is projected upwards from the top of a tower with a velocity of 50 m/s making an angle of 30^0 with the horizontal. The height of the tower is 70m. After how much time from the instant of throwing, will the ball reach the ground?

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

KN0159

159. An aeroplane moving horizontally with a speed of 180 km/h drops a food packet while flying at a height of 490 m. The horizontal range of the packet is :

(1) 180 m (2) 980 m (3) 500 m (4) 670 m

KN0160

160. A plane is flying horizontally at 98 m/s and releases an object which reaches the ground in 10 s. The angle made by it while hitting the ground is :

(1) 55° (2) 45° (3) 60° (4) 75°

KN0161

161. A stuntman plans to run along a roof top and then horizontally off it to land on the roof of next building. The roof of the next building is 4.9 metres below the first one and 6.2 metres away from it. What should be his minimum roof top speed in m/s, so that he can successfully make the jump ?

(1) 3.1 (2) 4.0 (3) 4.9 (4) 6.2

KN0162

162. From the top of a tower 19.6 m high, a ball is thrown horizontally. If the line joining the point of projection to the point where it hits the ground makes an angle of 45^0 with the horizontal, then the initial velocity of the ball is :

(1) 9.8 m/s (2) 4.9 m/s
(3) 14.7 m/s (4) 2.8 m/s

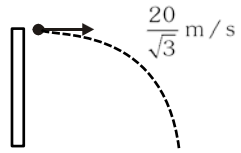
KN0163

163. A bomber is flying horizontally with a constant speed of 150 m/s at a height of 78.4 m. The pilot has to drop a bomb at the enemy target. At what horizontal distance from the target should he release the bomb?

(1) 0 m (2) 300 m
(3) 600 m (4) 1000 m

KN0164

164. A particle is projected horizontally with a speed of $\frac{20}{\sqrt{3}}$ m/s, from some height at t = 0. At what time will its velocity make 60° angle with the initial velocity



(1) 1 sec (2) 2 sec
(3) 1.5 sec (4) 2.5 sec

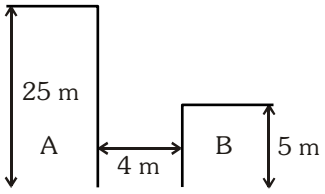
KN0165

165. In the above question what will be the displacement of the particle in x-direction when its velocity makes 60° angle with the initial velocity

(1) $\frac{20}{\sqrt{3}}$ m (2) $\frac{40}{\sqrt{3}}$ m
(3) $\frac{50}{\sqrt{3}}$ (4) $\frac{10}{\sqrt{3}}$

KN0166

166. A boy wants to jump from building A to building B. Height of building A is 25 m and that of building B is 5m. Distance between buildings is 4m. Assume that the boy jumps horizontally, then calculate minimum velocity with which he has to jump to land safely on building B.



(1) 6 m/s (2) 8 m/s (3) 4 m/s (4) 2 m/s

KN0167

RELATIVE MOTION IN ONE DIMENSION

167. A train moves in north direction with a speed of 54 km/h. A monkey is running on the roof of the train, against its motion with a velocity of 18 km/h with respect to train. The velocity of monkey as observed by a man standing on the ground is:

(1) 5 m/s due south (2) 25 m/s due south
(3) 10 m/s due south (4) 10 m/s due north

KN0168

168. A lift is moving downwards with acceleration a. A man in the lift drops a ball within the lift. The acceleration of the ball as observed by the man in the lift and a man standing stationary on the ground are respectively :

(1) g, g (2) g –a, g – a

(3) g – a, g (4) a, g

KN0169

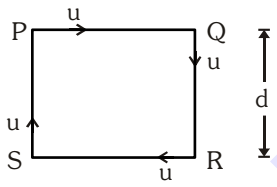
169. A boat takes 2 hours to go 8 km and come back in still water lake. The time taken for going 8 km upstream and coming back with water velocity of 4km/h is :

(1) 140 min (2) 150 min

(3) 160 min (4) 170 min

KN0170

170. Four persons P, Q, R and S of same mass travel with same speed u along a square of side 'd' such that each one always faces the person next to him. After what time will they meet each other ?

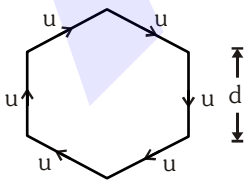


(1) $\frac{d}{u}$ (2) $\frac{2d}{3u}$

(3) $\frac{2d}{u}$ (4) $d\sqrt{3}u$

KN0171

171. Six persons of same mass travel with same speed u along a regular hexagon of side 'd' such that each one always faces the person next to him. After how what will they meet each other ?



(1) $\frac{d}{u}$ (2) $\frac{2d}{3u}$

(3) $\frac{2d}{u}$ (4) $d\sqrt{3}u$

KN0172

172. A person walks up a stalled escalator in 90 sec. He is carried in 60s, when standing on the same escalator which is now moving. The time he would take to walk up the moving escalator will be :–

(1) 27 s (2) 72 s

(3) 18 s (4) 36 s

KN0173

173. A jet air plane travelling with a speed of 500 km/h ejects its products of combustion with a speed of 1500 km/h relative to the jet plane. The speed of the latter with respect to an observer on the ground is :–

(1) 1500 km/h (2) 2000 km/h

(3) 1000 km/h (4) 500 km/h

KN0174

174. A train of 150 m length is running towards north at a speed of 10 m/s. A parrot flies at a speed of 5 m/s towards south parallel to the railway track. The time taken by the parrot to cross the train is equal to :–

(1) 12 s (2) 8 s

(3) 15 s (4) 10 s

KN0175

175. Two trains each 50m long, are travelling in opposite directions with respective velocities 10 m/s and 15 m/s. The time of crossing is :–

(1) 2 s (2) 4 s

(3) $2\sqrt{3}$ s (4) $4\sqrt{3}$ s

KN0176

176. Two cars are moving in the same direction with the same speed of 30 km/h. They are separated by 5 km. What is the speed of a car moving in the opposite direction if it meets the two cars at an interval of 4 minute ?

(1) 45 km/h (2) 60 km/h

(3) 105 km/h (4) None

KN0177

177. A stone is thrown upwards and it rises to a height of 200 m. The relative velocity of the stone with respect to the earth will be maximum at :–

(1) Height of 100 m (2) Height of 150 m

(3) Highest point (4) The ground

KN0178

178. A bus starts from rest moving with an acceleration of $2m/s^2$. A cyclist, 96 m behind the bus starts simultaneously towards the bus at 20 m/s. After what time will he be able to overtake the bus :–

(1) 8 s (2) 10 s (3) 12 s (4) 1 s

KN0179

179. A train is moving towards East with a speed 20 m/s. A person is running on the roof of the train with a speed 3 m/s against the motion of train. Velocity of the person as seen by an observer on ground will be :

(1) 23 m/s towards East

(2) 17 m/s towards East

(3) 23 m/s towards West

(4) 17 m/s towards West

KN0180

180. A motorcycle is moving with a velocity of 80 km/h ahead of a car moving with a velocity of 65 km/h in the same direction. What is the relative velocity of the motorcycle with respect to the car ?

(1) 15 km/h (2) 20 km/h

(3) 25 km/h (4) 145 km/h.

KN0181

181. A 100 m long train crosses a man travelling at 5 km/h, in opposite direction in 7.2 seconds, then the velocity of train is :–

(1) 40 km/h (2) 25 km/h

(3) 20 km/h (4) 45 km/h

KN0182

182. An elevator is accelerating upward at a rate of 6 ft/sec^2 when a bolt from its ceiling falls to the floor of the lift (Distance = 9.5 feet). The time (in seconds) taken by the falling bolt to hit the floor is (take g = 32 ft/sec^2)

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

KN0183

183. A 210 metres long train is moving due north with a speed of 25 m/s. A small bird is flying due south a little above the train with 5 m/s speed The time taken by the bird to cross the train is :-

(1) 6 s (2) 7 s (3) 9 s (4) 10 s

KN0184

184. Two balls are thrown simultaneously, (A) vertically upwards with a speed of 20 m/s from the ground and (B) vertically downwards from a height of 40 m with the same speed and along the same line of motion. At which point will the balls collide? (take g = 10 m/s^2)

(1) 15 m above from the ground

(2) 15 m below from the top of the tower

(3) 20 m above from the ground

(4) 20 m below from the top of the tower

KN0185

185. A body A is thrown up vertically from the ground with velocity v_0 and another body B is simultaneously dropped from a height H. They meet at a height $\frac{H}{2}$ if v_0 is equal to

(1) $\sqrt{2gH}$ (2) $\sqrt{gH}$

(3) $\frac{1}{2}\sqrt{gH}$ (4) $\sqrt{\frac{2g}{H}}$

KN0186

RELATIVE MOTION IN TWO DIMENSION

186. A boy is running on a levelled road with velocity (v) with a long hollow tube in his hand. Water is falling vertically downwards with velocity (u). At what angle to the vertical, should he incline the tube so that the water drops enters without touching its side :

(1) $\tan^{-1}\left(\frac{v}{u}\right)$ (2) $\sin^{-1}\left(\frac{v}{u}\right)$

(3) $\tan^{-1}\left(\frac{u}{v}\right)$ (4) $\cos^{-1}\left(\frac{v}{u}\right)$

KN0187

187. A river flows from east to west with a speed of 5 m/min. A man on south bank of river, capable of swimming at the rate of 10 m/min in still water, wants to swim across the river in shortest time; he should swim :

(1) due north

(2) due north-east

(3) due north-east with double the speed of river

(4) none of the above

KN0188

188. A boat is sailing with a velocity $(3\hat{i}+4\hat{j})$ with respect to ground and water in river is flowing with a velocity $(-3\hat{i}-4\hat{j})$. Relative velocity of the boat with respect to water is :

(1) $8\hat{j}$ (2) $5\sqrt{2}$

(3) $6\hat{i}+8\hat{j}$ (4) $-6\hat{i}-8\hat{j}$

KN0189

189. A river is flowing at the rate of 6 km/h. A swimmer swims across the river with a velocity of 9 km/h w.r.t. water. The resultant velocity of the man will be in (km/h):-

(1) $\sqrt{117}$ (2) $\sqrt{340}$

(3) $\sqrt{17}$ (4) $3\sqrt{40}$

KN0190

190. A man wishes to swim across a river 0.5 km wide. If he can swim at the rate of 2 km/h in still water and the river flows at the rate of 1 km/h. The angle made by the directon (w.r.t. the flow of the river) along which he should swim so as to reach a point exactly opposite his starting point, should be :

(1) 60° (2) 120° (3) 145° (4) 90°

KN0191

191. A boat-man can row a boat to make it move with a speed of 10 km/h in still water. River flows steadily at the rate of 5 km/h. and the width of the river is 2 km. If the boat man cross the river along the minimum distance of approach then time elapsed in rowing the boat will be :

(1) $\frac{2\sqrt{3}}{5}$h (2) $\frac{2}{5\sqrt{3}}$h

(3) $\frac{3\sqrt{2}}{5}$h (4) $\frac{5\sqrt{2}}{3}$h

KN0192

192. A bird is flying towards south with a velocity 40 km/h and a train is moving with a velocity 40 km/h towards east. What is the velocity of the bird w.r.t. an obserber in the train ?

(1) $40\sqrt{2}$ km/h. N-E

(2) $40\sqrt{2}$ km/h. S-E

(3) $40\sqrt{2}$ km/h. S-W

(4) $40\sqrt{2}$ km/h. N-W

KN0193

193. A bird is flying with a speed of 40 km/h in the north direction. A train is moving with a speed of 40 km/h in the west direction. A passenger sitting in the train will see the bird moving with velocity :

(1) 40 km/h in N-E direction

(2) $40\sqrt{2}$ km/h in N-E direction

(3) 40 km/h in N-W direction

(4) $40\sqrt{2}$ km/h in N-W direction

KN0194

194. A particle is moving with a velocity of 10 m/s towards east. After 10 s its velocity changes to 10 m/s towards north. Its average accelaration is :-

(1) zero

(2) $\sqrt{2}$ m/s^2 towards N-W

(3) $\frac{1}{\sqrt{2}}$m/s^2 towards N-E

(4) $\frac{1}{\sqrt{2}}$m/s^2 towards N-W

KN0195

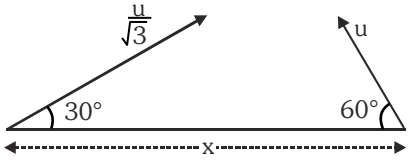
195. A man is walking on a road with a velocity of 3 km/h when suddenly, it starts raining velocity of rain is 10 km/h in vertically downward direction, relative velocity of the rain with respect to man is:

(1) $\sqrt{13}$ km / hr (2) $\sqrt{7}$ km / hr

(3) $\sqrt{109}$ km / hr (4) 13 km/h

KN0196

196. Two particles are separated by a horizontal distance x as shown in figure. They are projected as shown in figure with different initial speeds. The time after which the horizontal distance between them becomes zero is :



(1) $\frac{x}{u}$ (2) $\frac{u}{2x}$

(3) $\frac{2u}{x}$ (4) none of these

KN0197

197. Let $\vec{r}_1(t) = 3t\hat{i} + 4t^2\hat{j}$ and $\vec{r}_2(t) = 4t^2\hat{i} + 3t\hat{j}$ represent the positions of particles 1 and 2, respectively as functions of time t; $\vec{r}_1(t)$ and $\vec{r}_2(t)$ are in metres and t is in seconds. The relative speed of the two particles at the instant t =1 s, will be

(1) 1 m/s (2) $3\sqrt{2}$ m/s

(3) $5\sqrt{2}$ m/s (4) $7\sqrt{2}$ m/s

KN0198

198. A river 4.0 miles wide is flowing at the rate of 2 miles/hr. The minimum time taken by a boat to cross the river with a speed v = 4 miles/hr (in still water) is approximately

(1) 1 hr and 0 minute
(2) 2 hr and 7 minutes
(3) 1 hr and 12 minutes
(4) 2 hr and 25 minutes

KN0199

199. A river 2 km wide is flows at the rate of 2 km/h. A boatman who can row a boat at a speed of 4 km/h in still water, goes a distance of 2 km upstream and then comes back. The time taken by him to complete his journey is

(1) 60 min (2) 70 min

(3) 80 min (4) 90 min

KN0200

200. Two cars A and B start moving from the same point with same speed v = 5 km/minute. Car A moves towards North and car B is moving towards East. What is the relative velocity of B with respect to A ?

(1) $5\sqrt{2}$ km/min towards South-East

(2) $5\sqrt{2}$ km/min towards North-West

(3) $5\sqrt{2}$ km/min towards South-West

(4) $5\sqrt{2}$ km/min towards North-East

KN0201

EXERCISE-I (Conceptual Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	3	3	2	1	1	1	4	1	2	1	2	2	2	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	4	3	3	2	3	3	3	2	1	3	4	1	3	3	2
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	1	4	3	2	2	2	1	3	3	3	2	1	4	2	2
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	4	2	1	4	4	4	2	2	2	3	3	3	2	1	2
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	3	2	3	2	3	2	2	1	3	2	3	3	2	2	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	2	1	1	3	2	4	3	4	2	4	4	1	1	2	2
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	4	2	3	4	1	4	1	3	2	4	2	2	3	1	2
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	3	2	2	2	3	3	1	3	2	3	1	1	4	4	3
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Ans.	2	3	4	4	4	4	2	3	4	2	3	1	3	3	2
Que.	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	2	2	4	1	4	3	2	4	2	3	4	2	3	2	1
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Ans.	4	4	3	1	4	3	3	3	3	2	4	1	3	2	2
Que.	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans.	4	4	3	3	1	3	4	3	4	2	1	4	1	2	1
Que.	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Ans.	4	2	2	1	2	1	1	3	1	2	2	3	2	2	3
Que.	196	197	198	199	200										
Ans.	1	3	1	3	1										

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. A car runs at a constant speed on a circular track of radius 100 m, taking 62.8 seconds for every circular lap. The average velocity and average speed for each circular lap respectively is :-

(1) 0,0 (2) 0, 10 m/s

(3) 10 m/s, 10 m/s (4) 10 m/s, 0

KN0202

2. A particle moves along a straight line OX. At a time t (in seconds) the distance x (in metres) of the particle from O is given by $x = 40 + 12t - t^3$. How long would the particle travel before coming to rest ?

(1) 24 m (2) 40 m (3) 56 m (4) 16 m

KN0203

3. Two bodies, A (of mass 1 kg) and B (of mass 3 kg), are dropped from heights of 16 m and 25 m respectively. The ratio of the time taken by them to reach the ground is :-

(1) $\frac{5}{4}$ (2) $\frac{12}{5}$ (3) $\frac{5}{12}$ (4) $\frac{4}{5}$

KN0204

4. For angles of projection of a projectile $(45° - \theta)$ and $(45° + \theta)$, the horizontal ranges described by the projectile are in the ratio of :-

(1) 1 : 1 (2) 2 : 3 (3) 1 : 2 (4) 2 : 1

KN0205

AIPMT 2007

5. A car moves from X to Y with a uniform speed v_u and returns to X with a uniform speed v_d. The average speed for this round trip is :-

(1) $\frac{v_u + v_d}{2}$ (2) $\frac{2v_d v_u}{v_d + v_u}$

(3) $\sqrt{v_u v_d}$ (4) $\frac{v_d v_u}{v_d + v_u}$

KN0206

6. A particle moving along x-axis has acceleration f, at time t, given by $f = f_o\left(1 - \frac{t}{T}\right)$, where f_o and T are constants. The particle at t = 0 has zero velocity. At the instant when f = 0, the particle's velocity is :-

(1) $\frac{1}{2} f_o T$ (2) $f_o T$ (3) $\frac{1}{2} f_o T^2$ (4) $f_o T^2$

KN0207

7. The position x of a particle with respect to time t along x-axis is given by $x = 9t^2 - t^3$ where x is in metres and t in seconds. What will be the position of this particle when it achieves maximum speed along the + x direction ?

(1) 24 m (2) 32 m

(3) 54 m (4) 81 m

KN0208

8. The distance travelled by a particle starting from rest and moving with an acceleration $\frac{4}{3} m/s^2$, in the third second is :-

(1) $\frac{10}{3}$m (2) $\frac{19}{3}$m

(3) 6m (4) 4m

KN0209

AIPMT 2008

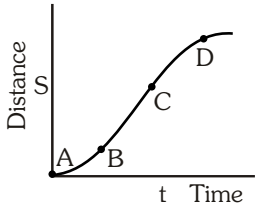
9. A particle moves in a straight line with a constant acceleration. It changes its velocity from 10 m/s to 20 m/s while passing through a distance of 135 m in t seconds. The value of t is :-

(1) 12 (2) 9

(3) 10 (4) 1.8

KN0210

10. A particle shows distance-time curve as given in this figure.The maximum instantaneous velocity of the particle is around the point :-



(1) D (2) A (3) B (4) C

KN0211

11. A particle of mass m is projected with velocity v making an angle of 45° with the horizontal. When the particle lands on the ground level, the magnitude of the change in its momentum will be:-

(1) $mv\sqrt{2}$ (2) zero

(3) 2 mv (4) $mv/\sqrt{2}$

KN0212

AIPMT 2009

12. A body starting from rest is moving under a constant acceleration up to 20 sec. If it moves S_1 distance in first 10 sec., and S_2 distance in next 10 sec. then S_2 will be equal to :

(1) S_1 (2) $2S_1$

(3) $3S_1$ (4) $4S_1$

KN0213

13. A bus is moving with a speed of 10 m/s on a straight road. A scooterist wishes to overtake the bus in 100 s. If the bus is at a distance of 1 km from the scooterist, with what speed should the scooterist chase the bus ?

(1) 10 m/s (2) 20 m/s

(3) 40 m/s (4) 25 m/s

KN0214

AIPMT (Pre) 2010

14. A particle moves a distance x in time t according to equation $x = (t + 5)^{-1}$. The acceleration of particle is proportional to :-

(1) $(\text{velocity})^{2/3}$ (2) $(\text{velocity})^{3/2}$

(3) $(\text{distance})^2$ (4) $(\text{distance})^{-2}$

KN0215

15. A ball is dropped from a high rise platform at t = 0 starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at t = 18s.What is the value of v ?

(take g = 10 m/s^2)

(1) 60 m/s (2) 75 m/s

(3) 55 m/s (4) 40m/s

KN0216

16. A particle has initial velocity $\left(3\hat{i}+4\hat{j}\right)$ and has acceleration $\left(0.4\hat{i}+0.3\hat{j}\right)$. Its speed after 10s is :-

(1) 10 units (2) 7 units

(3) $7\sqrt{2}$ units (4) 8.5 units

KN0217

AIPMT (Mains) 2010

17. The speed of a projectile at its maximum height is half of its initial speed. The angle of projection is :-

(1) 15° (2) 30° (3) 45° (4) 60°

KN0218

AIPMT (Pre) 2011

18. A boy standing at the top of a tower of 20 m height drops a stone. Assuming g = 10 m/s^2, the velocity with which it hits the ground is :-

(1) 10.0 m/s (2) 20.0 m/s

(3) 40.0 m/s (4) 5.0 m/s

KN0219

19. A body is moving with velocity 30 m/s towards east. After 10 seconds its velocity becomes 40 m/s towards north. The average acceleration of the body is :-

(1) 1 m/s^2 (2) 7 m/s^2

(3) $\sqrt{7}$ m / s^2 (4) 5 m/s^2

KN0220

20. A missile is fired for maximum range with an initial velocity of 20 m/s. If g = 10 m/s^2, the range of the missile is :-

(1) 40 m (2) 50 m

(3) 60 m (4) 20 m

KN0221

AIPMT (Mains) 2011

21. A particle covers half of its total distance with speed v_1 and the rest half distance with speed v_2. Its average speed during the complete journey is:-

(1) $\frac{v_1+v_2}{2}$ (2) $\frac{v_1v_2}{v_1+v_2}$

(3) $\frac{2v_1v_2}{v_1+v_2}$ (4) $\frac{v_1^2v_2^2}{v_1^2+v_2^2}$

KN0222

22. A projectile is fired at an angle of 45° with the horizontal. Elevation angle of the projectile at its highest point as seen from the point of projection, is :

(1) 45° (2) 60°

(3) $\tan^{-1}\frac{1}{2}$ (4) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

KN0223

AIPMT (Pre) 2012

23. The motion of a particle along a straight line is described by equation $x = 8 + 12t - t^3$ where x is in metres and t in seconds. The retardation of the particle when its velocity becomes zero is :-

(1) 6 m/s^2 (2) 12 m/s^2

(3) 24 m/s^2 (4) zero

KN0224

24. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is :-

(1) $\theta = \tan^{-1}(2)$ (2) $\theta = 45°$

(3) $\theta = \tan^{-1}\left(\frac{1}{4}\right)$ (4) $\theta = \tan^{-1}(4)$

KN0225

25. A particle has initial velocity $(2\hat{i}+3\hat{j})$ and acceleration $(0.3\hat{i}+0.2\hat{j})$. The magnitude of velocity after 10 seconds will be :

(1) 5 units (2) 9 units

(3) $9\sqrt{2}$ units (4) $5\sqrt{2}$ units

KN0226

AIPMT (Mains) 2012

26. A stone is dropped from a height h. It hits the ground with a certain momentum P. If the same stone is dropped from a height 100% more than the previous height, the momentum when it hits the ground will change by :-

(1) 200 % (2) 100 % (3) 68% (4) 41%

KN0227

NEET-UG 2013

27. 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 $h_3 = 3h_2$

KN0228

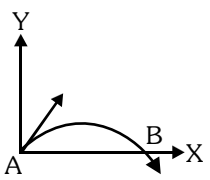
28. The velocity of a projectile at the initial point A is $(2\hat{i}+3\hat{j})$ m/s. Its velocity (in m/s) at point B is :-

(1) $2\hat{i}+3\hat{j}$

(2) $-2\hat{i}-3\hat{j}$

(3) $-2\hat{i}+3\hat{j}$

(4) $2\hat{i}-3\hat{j}$



KN0229

AIPMT 2014

29. A projectile is fired from the surface of the earth with a velocity of 5 m/s and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 m/s at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in m/s^2) is: (given g = 9.8 m/s^2)

(1) 3.5 (2) 5.9

(3) 16.3 (4) 110.8

KN0231

30. A particle is moving such that its position coordinates (x, y) are

(2m, 3m) at time t = 0

(6m, 7m) at time t = 2 s and

(13m, 14m) at time t = 5s.

Average velocity vector ($\vec{V}_{av}$) from t = 0 to t = 5 s is

(1) $\frac{1}{5}(13\hat{i}+14\hat{j})$ (2) $\frac{7}{3}(\hat{i}+\hat{j})$

(3) $2(\hat{i}+\hat{j})$ (4) $\frac{11}{5}(\hat{i}+\hat{j})$

KN0232

AIPMT 2015

31. A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to

$v(x) = \beta x^{-2n}$

where β and n are constants and x is the position of the particle. The acceleraion of the particle as a function of x, is given by :

(1) $-2n\beta^2x^{-4n-1}$ (2) $-2\beta^2x^{-2n+1}$

(3) $-2n\beta^2e^{-4n+1}$ (4) $-2n\beta^2x^{-2n-1}$

KN0233

32. A ship A is moving Westwards with a speed of 10 km/h and a ship B 100 km South of A, is moving Northwards with a speed of 10 km/h. The time after which the distance between them becomes shortest, is :-

(1) 5 h (2) $5\sqrt{2}$ h

(3) $10\sqrt{2}$ h (4) 0 h

KN0234

Re-AIPMT 2015

33. Two particles A and B, move with constant velocities $\vec{v}_1$ and $\vec{v}_2$. At the initial moment their position vectors are $\vec{r}_1$ and $\vec{r}_2$ respectively. The condition for particle A and B for their collision is:-

(1) $\vec{r}_1 - \vec{r}_2 = \vec{v}_1 - \vec{v}_2$ (2) $\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} = \frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|}$

(3) $\vec{r}_1 \cdot \vec{v}_1 = \vec{r}_2 \cdot \vec{v}_2$ (4) $\vec{r}_1 \times \vec{v}_1 = \vec{r}_2 \times \vec{v}_2$

KN0235

NEET-I 2016

34. If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is :-

(1) $\frac{3}{2}A + 4B$ (2) 3A+7B

(3) $\frac{3}{2}A + \frac{7}{3}B$ (4) $\frac{A}{2} + \frac{B}{3}$

KN0236

NEET-II 2016

35. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_p(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

(1) $\frac{a+f}{2(1+b)}$ (2) $\frac{f-a}{2(1+b)}$

(3) $\frac{a-f}{1+b}$ (4) $\frac{a+f}{2(b-1)}$

KN0237

NEET(UG) 2017

36. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be

(1) $\frac{t_1 t_2}{t_2 - t_1}$ (2) $\frac{t_1 t_2}{t_2 + t_1}$

(3) $t_1 - t_2$ (4) $\frac{t_1 + t_2}{2}$

KN0238

37. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at t = 2s is :-

(1) 5 m/s^2 (2) – 4 m/s^2

(3) – 8 m/s^2 (4) 0

KN0239

NEET(UG) 2019

38. The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east. If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t. north is given by :

(1) 30° west (2) 0°

(3) 60° west (4) 45° west

KN0299

39. When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60° with horizontal, it can travel a distance x_1 along the plane. But when the inclination is decreased to 30° and the same object the shot with the same velocity, it can travel x_2 distance. Then $x_1 : x_2$ will be

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

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

KN0300

NEET(UG) 2019 (Odisha)

40. A person standing on the floor of an elevator drops a coin. The coin reaches the floor in time t_1 if the elevator is at rest and in time t_2 if the elevator is moving uniformly. Then :-

(1) $t_1 < t_2$ or $t_1 > t_2$ depending upon whether the lift is going up or down

(2) $t_1 < t_2$

(3) $t_1 > t_2$

(4) $t_1 = t_2$

KN0301

41. Two bullets are fired horizontally and simultaneously towards each other from roof tops of two buildings 100 m apart and of same height of 200m with the same velocity of 25 m/s. When and where will the two bullets collide. ($g = 10$ m/s^2)

(1) after 2s at a height 180 m

(2) after 2s at a height of 20 m

(3) after 4s at a height of 120 m

(4) they will not collide

KN0302

42. A person travelling in a straight line moves with a constant velocity v_1 for certain distance 'x' and with a constant velocity v_2 for next equal distance. The average velocity v is given by the relation

(1) $\frac{1}{v}=\frac{1}{v_1}+\frac{1}{v_2}$ (2) $\frac{2}{v}=\frac{1}{v_1}+\frac{1}{v_2}$

(3) $\frac{v}{2}=\frac{v_1+v_2}{2}$ (4) $v=\sqrt{v_1v_2}$

KN0303

NEET(UG) 2020

43. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is :

($g = 10\ m/s^2$)

(1) 300 m (2) 360 m

(3) 340 m (4) 320 m

KN0304

NEET(UG) 2020 (Covid-19)

44. A person sitting in the ground floor of a building notices through the window, of height 1.5 m, a ball dropped from the roof of the building crosses the window in 0.1 s. What is the velocity of the ball when it is at the topmost point of the window ? ($g = 10\ m/s^2$)

(1) 15.5 m/s (2) 14.5 m/s

(3) 4.5 m/s (4) 20 m/s

KN0305

NEET(UG) 2021

45. A small block slides down on a smooth inclined plane, starting from rest at time t = 0. Let S_n be the distance travelled by the block in the interval t = n – 1 to t = n. Then, the ratio $\frac{S_n}{S_{n+1}}$ is :

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

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

KN0306

46. A car starts from rest and accelerates at $5\ m/s^2$. At t = 4 s, a ball is dropped out of a window by a person sitting in the car. What is the velocity and acceleration of the ball at t = 6 s ?

(Take $g = 10\ m/s^2$)

(1) 20 m/s, $5\ m/s^2$ (2) 20 m/s, 0

(3) $20\sqrt{2}\ m/s, 0$ (4) $20\sqrt{2}\ m/s, 10\ m/s^2$

KN0307

47. A particle moving in a circle of radius R with a uniform speed takes a time T to complete one revolution.

If this particle were projected with the same speed at an angle 'θ' to the horizontal, the maximum height attained by it equals 4R. The angle of projection, θ, is then given by :

(1) $\theta=\cos^{-1}\left(\frac{gT^2}{\pi^2R}\right)^{1/2}$ (2) $\theta=\cos^{-1}\left(\frac{\pi^2R}{gT^2}\right)^{1/2}$

(3) $\theta=\sin^{-1}\left(\frac{\pi^2R}{gT^2}\right)^{1/2}$ (4) $\theta=\sin^{-1}\left(\frac{2gT^2}{\pi^2R}\right)^{1/2}$

KN0308

NEET(UG) 2021 (Paper-2)

48. A particle starts from origin with zero initial velocity along x-axis. If velocity and displacement are related as $v = ax^{-2}$, where a is constant. The displacement of particle after time t is

(1) $(at)^{1/2}$ (2) $(3at)^{1/3}$

(3) $(2at)^{1/2}$ (4) $(2at)^{1/3}$

KN0309

49. If ball is thrown from some height at an angle with horizontal, for maximum horizontal range, the angle of projection should be

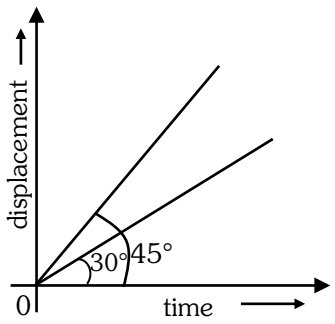
(1) Zero (2) 45°

(3) >45° (4)<45°

KN0310

NEET(UG) 2022

50. The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is :



(1) 1 : 1 (2) 1 : 2

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

KN0311

51. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second :

(1) 1 : 4 : 9 : 16 (2) 1 : 3 : 5 : 7

(3) 1 : 1 : 1 : 1 (4) 1 : 2 : 3 : 4

KN0312

52. A ball is projected with a velocity, 10 ms^{-1}, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be:

(1) $5\sqrt{3} ms^{-1}$ (2) 5 ms^{-1}

(3) 10 ms^{-1} (4) Zero

KN0313

NEET(UG) 2022 (OVERSEAS)

53. A stone is thrown vertically downward with an initial velocity of 40 m/s from the top of a building. If it reaches the ground with velocity 60 m/s, then the height of the building is:
(Take g = 10 m/s^2)

(1) 140 m (2) 80 m

(3) 100 m (4) 120 m

KN0314

54. Rain is falling vertically downward with a speed of 35 m/s. Wind starts blowing after some time with a speed of 12 m/s in East to West direction. The direction in which a boy standing at the place should hold his umbrella is:

(1) $\tan^{-1}\left(\frac{12}{37}\right)$ w.r.t. wind

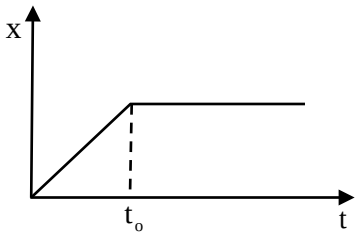
(2) $\tan^{-1}\left(\frac{12}{35}\right)$ w.r.t. rain

(3) $\tan^{-1}\left(\frac{12}{35}\right)$ w.r.t. wind

(4) $\tan^{-1}\left(\frac{12}{37}\right)$ w.r.t. rain

KN0315

55. The figure given below shows the displacement and time, (x-t) graph of particle moving along a straight line:



The correct statement, about the motion of the particle is:

(1) The particle is accelerated throughout its motion.

(2) The particle is accelerated continuously for time t_0 then moves with constant velocity.

(3) The particle is at rest.

(4) The particle moves at constant velocity up to a time t_0 and then stops.

KN0316

Re-NEET(UG) 2022

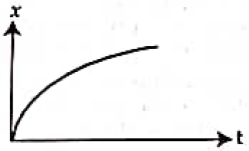
56. A cricket ball is thrown by a player at a speed of 20 m/s in a direction 30° above the horizontal. The maximum height attained by the ball during its motion is : (g = 10 m/s^2)

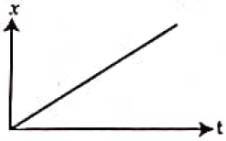
(1) 5 m (2) 10 m (3) 20 m (4) 25 m

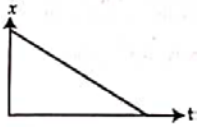
KN0317

57. The position-time (x – t) graph for positive acceleration is :

(1) 

(2) 

(3) 

(4) 

KN0318

EXERCISE-II (Previous Year Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**4**	**4**	**1**	**2**	**1**	**3**	**1**	**2**	**4**	**1**	**3**	**2**	**2**	**2**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**3**	**4**	**2**	**4**	**1**	**3**	**3**	**2**	**4**	**4**	**4**	**3**	**4**	**1**	**4**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	**1**	**1**	**2**	**3**	**2**	**2**	**2**	**1**	**3**	**4**	**1**	**2**	**1**	**2**	**2**
Que.	46	47	48	49	50	51	52	53	54	55	56	57			
Ans.	**4**	**4**	**2**	**4**	**3**	**2**	**1**	**3**	**2**	**4**	**1**	**1**			

EXERCISE-III (Analytical Questions) Master Your Understanding

1. Position of a particle moving along x–axis is given by $x = 2 + 8t - 4t^2$. The distance travelled by the particle from t = 0 to t = 2 is :
(1) 0 (2) 8 (3) 12 (4) 16
KN0240

2. A stone is dropped from a height h. Another stone is thrown up simultaneously from the ground which reaches a height 4h. The two stones will cross each other after time:-
(1) $\sqrt{\frac{h}{8g}}$ (2) $\sqrt{8gh}$ (3) $\sqrt{2gh}$ (4) $\sqrt{\frac{h}{2g}}$
KN0244

3. A body is projected upwards with a velocity u. It passes through a certain point above the ground after t_1 second. The time after which the body passes through the same point during the return journey is:
(1) $(\frac{u}{g} - t_1^2)$ (2) $2(\frac{u}{g} - t_1)$
(3) $3(\frac{u^2}{g} - t_1)$ (4) $3(\frac{u^2}{g^2} - t_1)$
KN0245

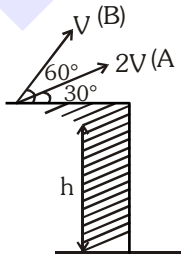
4. A stone is dropped from the top of a tower of height h. After 1 second another stone is dropped from the balcony 20 m below the top of the tower. Both reach the bottom simultaneously. What is the value of h ? take g = 10 m/s^2 :
(1) 3125 m (2) 312.5 m
(3) 31.25 m (4) 25.31 m
KN0246

5. A particle starts from rests and travels a distance S with uniform acceleration; then it travels a distance 2S with uniform speed; finally it travels a distance 3S with uniform retardation and comes to rest. If the complete motion of the particle is a straight line then the ratio of its average velocity to maximum velocity is :
(1) $\frac{6}{7}$ (2) $\frac{4}{5}$ (3) $\frac{3}{5}$ (4) $\frac{2}{5}$
KN0247

6. A body is thrown vertically upwards from the top A of a tower. It reaches the ground in t_1 seconds. If it is thrown vertically downwards from A with the same speed it reaches the ground in t_2, seconds. If it is allowed to fall freely from A, then the time it takes to reach the ground is given by :
(1) $t = \frac{t_1 + t_2}{2}$ (2) $t = \frac{t_1 - t_2}{2}$
(3) $t = \sqrt{t_1 t_2}$ (4) $t = \sqrt{\frac{t_1}{t_2}}$
KN0248

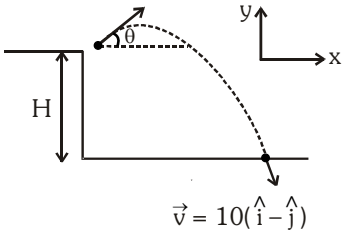
7. The ceiling of a hall is 40m high. For maximum horizontal distance, the angle at which the ball can be thrown with a speed of 56 m/s without hitting the ceiling of the hall is (take g = 9.8 m/s^2) :
(1) 25° (2) 30°
(3) 45° (4) 60°
KN0249

8. Two particles A & B are projected from a building. A is projected with speed 2V making an angle 30° with horizontal & B with speed V making an angle 60° with horizontal. Which particle will hit the ground earlier



(1) Particle A
(2) Particle B
(3) Particle A & B will hit at same time.
(4) None of these
KN0250

9. A ball was thrown from height H and the ball hit the floor with velocity $10(\hat{i} - \hat{j})$ after 1.5 sec of its projection. Find initial speed of ball.



(1) $10\sqrt{5}$ m/s (2) $5\sqrt{5}$ m/s
(3) 15 m/s (4) 30 m/s
KN0251

10. In the above question, the angle of projection θ is:

(1) $\theta = \tan^{-1}\left(\frac{3}{2}\right)$ (2) $\theta = \tan^{-1}\left(\frac{1}{2}\right)$

(3) $\theta = \tan^{-1}(2)$ (4) $\theta = \tan^{-1}(1)$

KN0252

11. In the above question 9 the height H is :

(1) 3.75 m (2) 2.25 m

(3) 1.50 m (4) 4.75 m

KN0253

12. A long horizontal belt is moving from left to right with a uniform speed of 2 m/s. There are two ink marks A and B on the belt 60 m apart. An insect runs on the belt to and fro between A and B such that its speed relative to the belt is constant and equals 4 m/s. When the insect is moving on the belt in the direction of motion of the belt, its speed as observed by a person standing on ground will be

(1) 6 m/s (2) 2 m/s

(3) 1.5 m/s (4) 4 m/s

KN0254

13. In above question 12 if A lies to the left of B, then :

(1) time taken by insect to travel from A to B and that taken to travel from B to A are equal

(2) time taken by insect to travel from A to B is less than that taken to tavel from B to A

(3) time taken by insect to travel from A to B is more than that taken to travel from B to A

(4) none of the above

KN0255

14. In above question 12 if A lies to the left of B, time taken by the insect to travel from B to A will be :

(1) 12 sec (2) 15 sec

(3) 18 sec (4) 21 sec

KN0256

15. In a straight line motion the distance travelled is proportional to the square root of the time taken. The acceleration of the particle is proportional to :-

(1) v (2) v^2

(3) v^3 (4) $\sqrt{v}$

KN0258

16. A particle travels 10m in first 5 seconds and 10 m in next 3 seconds. Assuming constant acceleration, what is the distance travelled in next 2 second ?

(1) 8.3 m (2) 9.3 m

(3) 10.3 m (4) None of these

KN0259

17. A balloon rises from the ground with an acceleration of 1.25 m/s^2. After 8s, a stone is released from the balloon. The stone will – (taking g = 10 m/s^2)

(1) have a displacement of 50 m

(2) cover a distance of 40 m in reaching the ground

(3) reach the ground in 4 s

(4) begin to move downwards after being released

KN0260

18. A man walks on a straight road from his home to a market 2.5 km away with a speed of 5 km/h. Finding the market closed, he instanly 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

KN0262

19. A man throws balls with the same speed vertically upwards one after the other at an interval of 2 seconds. What should be the speed of the throw so that more than two balls are in the sky at any time ? (Given g = 9.8 m/s^2)

(1) More than 19.6 m/s.

(2) At least 9.8 m/s.

(3) Any speed less than 19.6 m/s.

(4) Only with speed 19.6 m/s.

KN0263

EXERCISE-III (Analytical Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**1**	**2**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**3**
Que.	16	17	18	19											
Ans.	**1**	**3**	**4**	**1**											