EXERCISE-I

Distance and Displacement

1. A Body moves 6 *m* north. 8 *m* east and 10*m* vertically upwards, what is its resultant displacement from initial position

(A) $10\sqrt{2}m$ (B) $10m$

(C) $\frac{10}{\sqrt{2}}m$ (D) $10\times 2m$

2. A man goes 10*m* towards North, then 20*m* towards east then displacement is

(A) 22.5*m* (B) 25*m*

(C) 25.5*m* (D) 30*m*

3. A person moves 30 *m* north and then 20 *m* towards east and finally $30\sqrt{2}$ *m* in south-west direction. The displacement of the person from the origin will be

(A) 10 *m* along north (B) 10 *m* long south

(C) 10 *m* along west (D) Zero

4. An aeroplane flies 400 *m* north and 300 *m* south and then flies 1200 *m* upwards then net displacement is

(A) 1200 *m* (B) 1300 *m*

(C) 1400 *m* (D) 1500 *m*

5. An athlete completes one round of a circular track of radius *R* in 40 *sec*. What will be his displacement at the end of 2 min. 20 *sec*

(A) Zero (B) 2*R*

(C) $2\pi R$ (D) $7\pi R$

Uniform Motion

6. A particle is constrained to move on a straight line path. It returns to the starting point after 10 *sec*. The total distance covered by the particle during this time is 30 *m*. Which of the following statements about the motion of the particle is false

(A) Displacement of the particle is zero

(B) Average speed of the particle is 3 *m*/*s*

(C) Displacement of the particle is 30 *m*

(D) Both (A) and (B)

7. A particle moves along a semicircle of radius 10*m* in 5 seconds. The average velocity of the particle is

(A) $2\pi\ ms^{-1}$ (B) $4\pi\ ms^{-1}$

(C) $2\ ms^{-1}$ (D) $4\ ms^{-1}$

8. 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 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

(A) 5 *km*/*h* (B) $\frac{25}{4}$ *km*/*h*

(C) $\frac{30}{4}$ *km*/*h* (D) $\frac{45}{8}$ *km*/*h*

9. The ratio of the numerical values of the average velocity and average speed of a body is always

(A) Unity (B) Unity or less

(C) Unity or more (D) Less than unity

10. A person travels along a straight road for the first half time with a velocity v_1 and the next half time with a velocity v_2. The mean velocity v of the man is

(A) $\frac{2}{V}=\frac{1}{v_1}+\frac{1}{v_2}$ (B) $V=\frac{v_1+v_2}{2}$

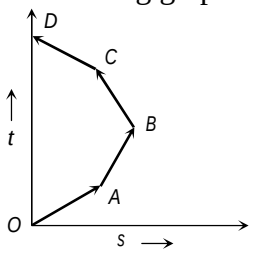
(C) $V=\sqrt{v_1v_2}$ (D) $V=\sqrt{\frac{v_1}{v_2}}$

11. If a car covers $2/5^{th}$ of the total distance with v_1 speed and $3/5^{th}$ distance with v_2 then average speed is

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

(C) $\frac{2v_1v_2}{v_1+v_2}$ (D) $\frac{5v_1v_2}{3v_1+2v_2}$

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



(A) The object moves with constantly increasing velocity from *O* to A and then it moves with constant velocity.

(B) Velocity of the object increases uniformly

(C) Average velocity is zero

(D) The graph shown is impossible

13. The numerical ratio of displacement to the distance covered is always

(A) Less than one

(B) Equal to one

(C) Equal to or less than one

(D) Equal to or greater than one

14. A 100 *m* long train is moving with a uniform velocity of 45 *km/hr*. The time taken by the train to cross a bridge of length 1 *km* is

(A) 58 *s* (B) 68 *s*

(C) 78 *s* (D) 88 *s*

15. A particle moves for 20 *seconds* with velocity 3 *m/s* and then 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

(A) 3 *m/s* (B) 4 *m/s*

(C) 5 *m/s* (D) Zero

Non-uniform Motion

16. The velocity of a body moving with a uniform acceleration of $2\ m./\sec^2$ is $10\ m/\sec$. Its velocity after an interval of 4 *sec* is

(A) $12\ m/\sec$ (B) $14\ m/\sec$

(C) $16\ m/\sec$ (D) $18\ m/\sec$

17. A particle starting from rest travels a distance x in first 2 *seconds* and a distance y in next two *seconds*, then

(A) $y = x$ (B) $y = 2x$

(C) $y = 3x$ (D) $y = 4x$

18. The initial velocity of a body moving along a straight line is $7\ m/s$. It has a uniform acceleration of $4\ m/s^2$. The distance covered by the body in the 5^{th} second of its motion is

(A) 25 *m* (B) 35 *m*

(C) 50 *m* (D) 85 *m*

19. The velocity of a body depends on time according to the equation $v = 20 + 0.1t^2$. The body is undergoing

(A) Uniform acceleration

(B) Uniform retardation

(C) Non-uniform acceleration

(D) Zero acceleration

20. Which of the following four statements is false

(A) A body can have zero velocity and still be accelerated

(B) A body can have a constant velocity and still have a varying speed

(C) A body can have a constant speed and still have a varying velocity

(D) The direction of the velocity of a body can change when its acceleration is constant

21. A particle moving with a uniform acceleration travels 24 *m* and 64 *m* in the first two consecutive intervals of 4 *sec* each. Its initial velocity is

(A) 1 *m/sec* (B) $10\ m/\sec$

(C) 5 *m/sec* (D) 2 *m/sec*

22. The position of a particle moving in the *xy*-plane at any time t is given by $x = (3t^2 - 6t)$ *metres*, $y = (t^2 - 2t)$ *metres*. Select the correct statement about the moving particle from the following

(A) The acceleration of the particle is zero at $t = 0$ second

(B) The velocity of the particle is zero at $t = 0$ second

(C) The velocity of the particle is zero at $t = 1$ second

(D) The velocity and acceleration of the particle are never zero

23. If body having initial velocity zero is moving with uniform acceleration $8\ m/\sec^2$ the distance travelled by it in fifth second will be

(A) 36 *metres* (B) 40 *metres*

(C) 100 *metres* (D) Zero

24. An alpha particle enters a hollow tube of 4 *m* length with an initial speed of 1 *km/s*. It is accelerated in the tube and comes out of it with a speed of 9 *km/s*. The time for which it remains inside the tube is

(A) $8\times10^{-3}\ s$ (B) $80\times10^{-3}\ s$

(C) $800\times10^{-3}\ s$ (D) $8\times10^{-4}\ s$

25. Two cars A and B are travelling in the same direction with velocities v_1 and $v_2\ (v_1 > v_2)$. When the car A is at a distance d ahead of the car B, the driver of the car A applied the brake producing a uniform retardation a There will be no collision when

(A) $d < \dfrac{(v_1 - v_2)^2}{2a}$ (B) $d < \dfrac{v_1^2 - v_2^2}{2a}$

(C) $d > \dfrac{(v_1 - v_2)^2}{2a}$ (D) $d > \dfrac{v_1^2 - v_2^2}{2a}$

26. The engine of a car produces acceleration $4\ m/s^2$ in the car. If this car pulls another car of same mass, what will be the acceleration produced

(A) $8\ m/s^2$ (B) $2\ m/s^2$

(C) $4\ m/s^2$ (D) $\dfrac{1}{2}\ m/s^2$

27. If a body starts from rest and travels 120 *cm* in the 6^{th} second, then what is the acceleration

(A) $0.20\ m/s^2$ (B) $0.027\ m/s^2$

(C) $0.218\ m/s^2$ (D) $0.03\ m/s^2$

28. If a car at rest accelerates uniformly to a speed of 144 *km/h* in 20 *s*. Then it covers a distance of

(A) 20 *m* (B) 400 *m*

(C) 1440 *m* (D) 2880 *m*

29. The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equal to

(A) $\dfrac{a}{b}$ (B) $7.5\ km/h$

(C) $\dfrac{a}{3b}$ (D) Zero

30. A truck and a car are moving with equal velocity. On applying the brakes both will stop after certain distance, then

(A) Truck will cover less distance before rest

(B) Car will cover less distance before rest

(C) Both will cover equal distance

(D) None

31. If a train travelling at 72 *kmph* is to be brought to rest in a distance of 200 metres, then its retardation should be

(A) $20\ ms^{-2}$ (B) $10\ ms^{-2}$

(C) $2\ ms^{-2}$ (D) $1\ ms^{-2}$

32. The displacement of a particle starting from rest (at $t = 0$) is given by $s = 6t^2 - t^3$. The time in seconds at which the particle will attain zero velocity again, is

(A) 2 (B) 4

(C) 6 (D) 8

33. What is the relation between displacement, time and acceleration in case of a body having uniform acceleration

(A) $S = ut + \dfrac{1}{2}\ ft^2$ (B) $S = (u + f)\ t$

(C) $S = v^2 - 2\ fs$ (D) None of these

34. Two cars A and B at rest at same point initially. If A starts with uniform velocity of 40 *m/sec* and B starts in the same direction with constant acceleration of $4\,m/s^2$, then B will catch A after how much time

(A) 10 *sec* (B) 20 *sec*

(C) 30 *sec* (D) 35 *sec*

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

(A) 36 *cm/sec* (B) 18 *cm/sec*

(C) 16 *cm/sec* (D) 32 *cm/sec*

36. 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

(A) Uniform, accelerated

(B) Uniform, decelerated

(C) Non-uniform, accelerated

(D) There is not enough data for generalization

37. Consider the acceleration, velocity and displacement of a tennis ball as it falls to the ground and bounces back. Directions of which of these changes in the process

(A) Velocity only

(B) Displacement and velocity

(C) Acceleration, velocity and displacement

(D) Displacement and acceleration

38. The displacement of a particle, moving in a straight line, is given by $s = 2t^2 + 2t + 4$ where s is in *metres* and t in seconds. The acceleration of the particle is

(A) 2 m/s^2 (B) 4 m/s^2

(C) 6 m/s^2 (D) 8 m/s^2

39. 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 $a_1 : a_2$ is equal to

(A) 5 : 9 (B) 5 : 7

(C) 9 : 5 (D) 9 : 7

40. The velocity of a bullet is reduced from 200*m*/*s* to 100*m*/*s* while travelling through a wooden block of thickness 10*cm*. The retardation, assuming it to be uniform, will be

(A) 10×10^4 m/s^2 (B) 12×10^4 m/s^2

(C) 13.5×10^4 m/s^2 (D) 15×10^4 m/s^2

41. A body of 5 *kg* is moving with a velocity of 20 *m*/*s*. If a force of 100*N* is applied on it for 10*s* in the same direction as its velocity, what will now be the velocity of the body

(A) 200 *m*/*s* (B) 220 *m*/*s*

(C) 240 *m*/*s* (D) 260 *m*/*s*

42. A particle starts from rest, accelerates at 2 m/s^2 for 10*s* and then goes for constant speed for 30*s* and then decelerates at 4 m/s^2 till it stops. What is the distance travelled by it

(A) 750 *m* (B) 800 *m*

(C) 700 *m* (D) 850 *m*

43. The engine of a motorcycle can produce a maximum acceleration 5 m/s^2. Its brakes can produce a maximum retardation 10 m/s^2. What is the minimum time in which it can cover a distance of 1.5 *km*

(A) 30 *sec* (B) 15 *sec*

(C) 10 *sec* (D) 5 *sec*

44. The path of a particle moving under the influence of a force fixed in magnitude and direction is

(A) Straight line (B) Circle

(C) Parabola (D) Ellipse

45. A car, moving with a speed of 50 *km/hr*, can be stopped by brakes after at least 6*m*. If the same car is moving at a speed of 100 *km/hr*, the minimum stopping distance is

(A) 6*m* (B) 12*m*

(C) 18*m* (D) 24*m*

Relative Motion

46. Two trains, each 50 *m* long are travelling in opposite direction with velocity 10 *m/s* and 15 *m/s*. The time of crossing is

(A) $2s$ (B) $4s$

(C) $2\sqrt{3}s$ (D) $t = \frac{v_1 - v_2}{a}$

47. A 120 *m* long train is moving in a direction with speed 20 *m/s*. A train *B* moving with 30 *m*/*s* in the opposite direction and 130 *m* long crosses the first train in a time

(A) $6s$ (B) $36\ s$

(C) $38\ s$ (D) None of these

48. A 210 meter long train is moving due North at a of 25*m/s*. A small bird is flying due South a little above the train with speed 5*m/s*. The time taken by the bird to cross the train is

(A) $6s$ (B) $7s$

(C) $9s$ (D) $10s$

49. A police jeep is chasing with, velocity of 45 *km*/*h* a thief in another jeep moving with velocity 153 *km*/*h*. Police fires a bullet with muzzle velocity of 180 *m*/*s*. The velocity it will strike the car of the thief is

(A) 150 *m*/*s* (B) 27 *m*/*s*

(C) 450 *m*/*s* (D) 250 *m*/*s*

50. A boat is sent across a river with a velocity of 8 *km/hr*. If the resultant velocity of boat is 10 *km/hr*, then velocity of the river is :

(A) 10 *km/hr* (B) 8 *km/hr*

(C) 6 *km/hr* (D) 4 *km/hr*

51. A train of 150 *meter* length is going towards north direction at a speed of $10 m/\sec$. A parrot flies at the speed of $5\ m/\sec$ towards south direction parallel to the railway track. The time taken by the parrot to cross the train is

(A) 12 *sec* (B) 8 *sec*

(C) 15 *sec* (D) 10 *sec*

52. A boat is moving with velocity of $3\hat{i} + 4\hat{j}$ in river and water is moving with a velocity of $-3\hat{i} - 4\hat{j}$ with respect to ground. Relative velocity of boat with respect to water is :

(A) $-6\hat{i} - 8\hat{j}$ (B) $6\hat{i} + 8\hat{j}$

(C) $8\hat{i}$ (D) $6\hat{i}$

53. The distance between two particles is decreasing at the rate of 6 *m/sec*. If these particles travel with same speeds and in the same direction, then the separation increase at the rate of 4 *m/sec*. The particles have speeds as

(A) 5 *m*/*sec* ; 1 *m*/*sec* (B) 4 *m*/*sec* ; 1 *m*/*sec*

(C) 4 *m*/*sec* ; 2 *m*/*sec* (D) 5 *m*/*sec* ; 2 *m*/*sec*

54. A boat moves with a speed of 5 *km/h* relative to water in a river flowing with a speed of 3 *km/h* and having a width of 1 *km.* The minimum time taken around a round trip is

(A) 5 min (B) 60 min

(C) 20 min (D) 30 min

55. For a body moving with relativistic speed, if the velocity is doubled, then

(A) Its linear momentum is doubled

(B) Its linear momentum will be less than double

(C) Its linear momentum will be more than double

(D) Its linear momentum remains unchanged

Motion Under Gravity

56. A body thrown with an initial speed of $96\ ft/\sec$ reaches the ground after $(g = 32\ ft/\sec^2)$

(A) 3 *sec* (B) 6 *sec*

(C) 12 *sec* (D) 8 *sec*

57. A stone is dropped from a certain height which can reach the ground in 5 *second*. If the stone is stopped after 3 *second* of its fall and then allowed to fall again, then the time taken by the stone to reach the ground for the remaining distance is

(A) 2 *sec* (B) 3 *sec*

(C) 4 *sec* (D) None of these

58. A man in a balloon rising vertically with an acceleration of $4.9\,m/\sec^2$ releases a ball 2 *sec* after the balloon is let go from the ground. The greatest height above the ground reached by the ball is $(g = 9.8\,m/\sec^2)$

(A) 14.7 *m* (B) 19.6 *m*

(C) 9.8 *m* (D) 24.5 *m*

59. A particle is dropped under gravity from rest from a height $h(g = 9.8\,m/\sec^2)$ and it travels a distance $9h/25$ in the last second, the height h is

(A) 100 *m* (B) 122.5 *m*

(C) 145 *m* (D) 167.5 *m*

60. A balloon is at a height of 81 *m* and is ascending upwards with a velocity of 12 *m*/*s*. A body of 2*kg* weight is dropped from it. If $g = 10\,m/s^2$, the body will reach the surface of the earth in

(A) 1.5 *s* (B) 4.025 *s*

(C) 5.4 *s* (D) 6.75 *s*

61. An aeroplane is moving with a velocity u. It drops a packet from a height h. The time t taken by the packet in reaching the ground will be

(A) $\sqrt{\left(\frac{2g}{h}\right)}$ (B) $\sqrt{\left(\frac{2u}{g}\right)}$

(C) $\sqrt{\left(\frac{h}{2g}\right)}$ (D) $\sqrt{\left(\frac{2h}{g}\right)}$

62. Water drops fall at regular intervals from a tap which is $5\ m$ 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

(A) 2.50 *m* (B) 3.75 *m*

(C) 4.00 *m* (D) 1.25 *m*

63. A ball is thrown vertically upwards from the top of a tower at 4.9 ms^{-1}. It strikes the pond near the base of the tower after 3 *seconds*. The height of the tower is

(A) 73.5 *m* (B) 44.1 *m*

(C) 29.4 *m* (D) None of these

64. An aeroplane is moving with horizontal velocity u at height h. The velocity of a packet dropped from it on the earth's surface will be (g is acceleration due to gravity)

(A) $\sqrt{u^2 + 2gh}$ (B) $\sqrt{2gh}$

(C) $2gh$ (D) $\sqrt{u^2 - 2gh}$

65. A rocket is fired upward from the earth's surface such that it creates an acceleration of 19.6 *m/sec*^{2}. If after 5 *sec* its engine is switched off, the maximum height of the rocket from earth's surface would be

(A) 245 *m* (B) 490 *m*

(C) 980 *m* (D) 735 *m*

66. A bullet is fired with a speed of 1000 $m/\sec$ in order to hit a target 100 *m* away. If $g = 10\ m/s^2$, the gun should be aimed

(A) Directly towards the target

(B) 5 *cm* above the target

(C) 10 *cm* above the target

(D) 15 *cm* above the target

67. A body starts to fall freely under gravity. The distances covered by it in first, second and third *second* are in ratio

(A) 1 : 3 : 5 (B) 1 : 2 : 3

(C) 1 : 4 : 9 (D) 1 : 5 : 6

68. P, Q and R are three balloons ascending with velocities $U, 4U$ and $8U$ respectively. If stones of the same mass be dropped from each, when they are at the same height, then

(A) They reach the ground at the same time

(B) Stone from P reaches the ground first

(C) Stone from R reaches the ground first

(D) Stone from Q reaches the ground first

69. A body is projected up with a speed 'u' and the time taken by it is T to reach the maximum height H. Pick out the correct statement

(A) It reaches $H/2$ in $T/2$ *sec*

(B) It acquires velocity $u/2$ in $T/2\sec$

(C) Its velocity is $u/2$ at $H/2$

(D) Same velocity at $2T$

70. A body falling for 2 seconds covers a distance S equal to that covered in next second. Taking $g = 10\,m/s^2, S =$

(A) 30 *m* (B) 10 *m*

(C) 60 *m* (D) 20 *m*

71. A body dropped from a height h with an initial speed zero, strikes the ground with a velocity $3\,km/h$. Another body of same mass is dropped from the same height h with an initial speed $-u' = 4km/h$. Find the final velocity of second body with which it strikes the ground

(A) 3 *km/h* (B) 4 *km/h*

(C) 5 *km/h* (D) 12 *km/h*

72. A ball of mass m_1 and another ball of mass m_2 are dropped from equal height. If time taken by the balls are t_1 and t_2 respectively, then

(A) $t_1 = \frac{t_2}{2}$ (B) $t_1 = t_2$

(C) $t_1 = 4t_2$ (D) $t_1 = \frac{t_2}{4}$

73. With what velocity a ball be projected vertically so that the distance covered by it in 5^{th} second is twice the distance it covers in its 6^{th} second $(g = 10\,m/s^2)$

(A) 58.8 *m/s* (B) 49 *m/s*

(C) 65 *m/s* (D) 19.6 *m/s*

74. A body sliding on a smooth inclined plane requires 4 seconds to reach the bottom starting from rest at the top. How much time does it take to cover one-fourth distance starting from rest at the top

(A) 1 *s* (B) 2 *s*

(C) 4 *s* (D) 16 *s*

75. A ball is dropped downwards. After 1 second another ball is dropped downwards from the same point. What is the distance between them after 3 seconds

(A) 25 *m* (B) 20 *m*

(C) 50 *m* (D) 9.8 *m*

76. A body, thrown upwards with some velocity, reaches the maximum height of 20*m*. Another body with double the mass thrown up, with double initial velocity will reach a maximum height of

(A) 200 *m* (B) 16 *m*

(C) 80 *m* (D) 40 *m*

77. A balloon starts rising from the ground with an acceleration of 1.25 m/s^2 after 8s, a stone is released from the balloon. The stone will $(g = 10\ m/s^2)$

(A) Reach the ground in 4 second

(B) Begin to move down after being released

(C) Have a displacement of 50 *m*

(D) Cover a distance of 40 *m* in reaching the ground

78. A body is thrown vertically upwards with a velocity u. Find the true statement from the following

(A) Both velocity and acceleration are zero at its highest point

(B) Velocity is maximum and acceleration is zero at the highest point

(C) Velocity is maximum and acceleration is g downwards at its highest point

(D) Velocity is zero at the highest point and maximum height reached is $u^2/2g$

79. A man throws a ball vertically upward and it rises through 20 *m* and returns to his hands. What was the initial velocity (u) of the ball and for how much time (T) it remained in the air $[g = 10m/s^2]$

(A) u = 10 *m/s*, T = 2*s* (B) u=10 *m/s*, T = 4*s*

(C) u = 20 *m/s*, T = 2*s* (D) u=20 *m/s*, T = 4*s*

80. A particle when thrown, moves such that it passes from same height at 2 and 10*s*, the height is

(A) g (B) $2g$

(C) $5g$ (D) $10g$

81. 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

(A) $m_1 : m_2 : m_3$ (B) $m_1 : 2m_2 : 3m_3$

(C) 1 : 1 : 1 (D) $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

82. From the top of a tower, a particle is thrown vertically downwards with a velocity of 10 *m/s*. The ratio of the distances, covered by it in the 3rd and 2nd seconds of the motion is (Take $g = 10 m/s^2$)

(A) 5 : 7 (B) 7 : 5

(C) 3 : 6 (D) 6 : 3

83. 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

(A) Velocity of *A* is more than *B* at the ground

(B) Velocity of *B* is more than *A* at the ground

(C) Both *A* & *B* strike the ground with same velocity

(D) None of these

84. A ball is dropped from top of a tower of 100*m* height. Simultaneously another ball was thrown upward from bottom of the tower with a speed of 50 *m/s* ($g = 10 m/s^2$). They will cross each other after

(A) 1*s* (B) 2*s*

(C) 3*s* (D) 4*s*

85. A cricket ball is thrown up with a speed of 19.6 ms^{-1}. The maximum height it can reach is

(A) 9.8 *m* (B) 19.6 *m*

(C) 29.4 *m* (D) 39.2 *m*