MOTION IN ONE & TWO DIMENSION

1. At the time $t = 0$ the velocity of an object is u and at time t its acceleration $f = at$. Then the velocity at time t will be
A) u B) at
C) $u + at^2$ D) $u + \frac{1}{2} at^2$

2. A balloon is at a height of 81 m is ascending upward with a velocity of 12 ms^{-1}. A body of 2 kg weight is dropped from it. If $g = 10\ ms^{-2}$, the body will reach the surface of earth in
A) 1.5 sec B) 4.0 sec
C) 5.4 sec D) 6.7 sec

3. A lift is descending with an acceleration a. A person standing in it drops a book. The acceleration of book relative to floor of lift will be (take acceleration due to gravity g)
A) g B) a
C) $g - a$ D) $g + a$

4. If the displacement of a particle varies with time as $\sqrt{x} = t + 7$, then velocity of particle is
A) inversely proportional to x B) proportional to x
C) proportional to $\sqrt{x}$ D) inversely proportional to $\sqrt{x}$

5. A person travels along the straight road for half the distance with velocity V_1 and the remaining half distance with velocity V_2. Then the average velocity is given by
A) $V_1 V_2$ B) $\frac{V_2}{V_1}$
C) $\frac{V_1 + V_2}{2}$ D) $\frac{2V_1V_2}{V_1 + V_2}$

6. Two bodies of different masses m_1 and m_2 are dropped from different heights h_1 and h_2. The ratio of times taken by the two to drop through these distances is
A) $h_1 : h_2$ B) $h_2 : h_1$
C) $\sqrt{h_1} : \sqrt{h_2}$ D) $h_1^2 : h_2^2$

7. A man in a balloon rising vertically with an acceleration of 4.9 m s^{-2}, releases a ball 2 seconds after the balloon is let go from the ground. The greatest height above the ground reached by the ball is
A) 14.7 m B) 19.6 m
C) 9.8 m D) 24.5 m

8. The distance covered by a freely falling particle starting from rest in the first, second, third,.....,n^{th} second of its motion
A) form arithmetic progression
B) form geometric progression
C) does not form any well defined series
D) depend on the height from which it falls

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

A) $\frac{2h}{v}$ B) $\sqrt{\frac{2h}{g}} + \frac{h}{v}$

C) $\sqrt{\frac{2h}{v}} + \frac{h}{g}$ D) $\sqrt{\frac{h}{2g}} + \frac{h}{v}$

10. A bus is beginning to move with an acceleration of 1 ms^{-2}. A boy who is 48 m behind the bus starts running at 10 ms^{-1}. After what time will be the boy be able to catch the bus?

A) 6 sec B) 8 sec

C) 10 sec D) never

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

A) 1 second B) 2 second

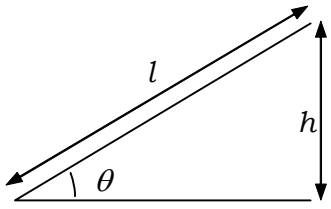
C) 3 second D) 16 second

12. The two ends of a train moving with a constant acceleration pass a certain point with velocities u and v. Velocity with which the middle point of train passes the same point is

A) $\frac{u+v}{2}$ B) $\frac{u^2+v^2}{2}$

C) $\sqrt{\frac{u^2+v^2}{2}}$ D) $\sqrt{u^2+v^2}$

13. A smooth inclined plane is inclined at an angle θ with the horizontal. A body starts from rest and slides down the inclined surface, then the time taken by the body to reach the bottom is



A) $\sqrt{2h/g}$ B) $\sqrt{2l/g}$

C) $\frac{1}{\sin\theta}\sqrt{2h/g}$ D) $\sin\theta\sqrt{2h/g}$

14. A body starts from rest with uniform acceleration a, its velocity after n seconds is v. The displacement of body in last 2 seconds is

A) $\frac{2v(n-1)}{n}$ B) $\frac{v(n-1)}{n}$

C) $\frac{v(n+1)}{n}$ D) $\frac{2v(2n+1)}{n}$

15. Three persons are initially at the three corners of an equilateral triangle of side a. Each person now moves with uniform speed v in such a way that first moves directly

towards second, second directly towards third and third directly towards first. The three persons will meet after a time equal to

A) $\frac{a}{v}$ sec

B) $\frac{2a}{3v}$ sec

C) $\frac{2a}{\sqrt{3}v}$ sec

D) $\frac{a}{\sqrt{3}v}$ sec

16. Two bodies are thrown vertically upwards with their initial velocities in the ratio 2 : 3 then the ratio of maximum heights attained by them

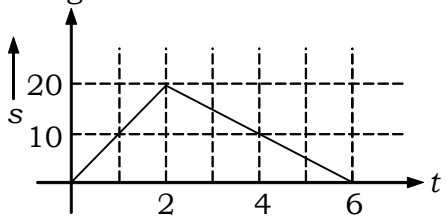
A) $\sqrt{2}:\sqrt{3}$

B) 2 : 3

C) 4 : 9

D) 8 : 27

17. The displacement time graph of body is shown in figure. The ratio of the magnitude of the constant speeds during the first two seconds and the next four second is



A) 1 : 2

B) 1 : 4

C) 2 : 1

D) 4 : 1

18. A tower has height h. A ball is projected vertically upwards from the top of the tower with a velocity u. The ball strikes the ground after time

A) $\frac{u}{g}+\sqrt{\frac{2h}{g}}$

B) $\frac{u}{g}-\sqrt{\frac{2h}{g}}$

C) $\frac{u}{g}\left[1+\sqrt{1+\frac{2gh}{u^2}}\right]$

D) $\frac{u}{g}\left[1+\sqrt{1-\frac{2gh}{u^2}}\right]$

19. Mark the correct statement

A) the slope of distance-time gives the average speed

B) the slope of distance-time graph gives the instantaneous speed

C) the average speed of a moving object may be zero

D) the average speed is a scalar but the instantaneous speed is a vector

20. A particle moving with a uniform acceleration travels 24 m and 64 m in first two successive intervals each of 4 seconds. The initial velocity of particle is

A) 1 m s^{-1}

B) 10 m s^{-1}

C) 5 m s^{-1}

D) 2 m s^{-1}

21. A wooden block of mass 10 g is dropped from the top of a cliff 100 m high. Simultaneously a bullet of 10 g is fired from the foot of the cliff upwards with a velocity of 100 ms^{-1}. The bullet and the wooden block will meet, each other, after a time

A) 10 s

B) 0.5 s

C) 1 s

D) 7 s

22. A plane, flying horizontally at a height of h meter with a velocity of u ms^{-1} passes directly over an aircraft gun. In order to hit the plane, at what angle with the

horizontal the gun should be fixed at that instant (given the muzzle velocity of the shell is v ms^{-1})

A) $\theta = \cos^{-1}\left(u/v\right)$ B) $\theta = \sin^{-1}\left(u/v\right)$

C) $\theta = \tan^{-1}\left(u/v\right)$ D) nothing can be said

23. A bullet is fired from the surface of earth with the velocity of u ms^{-1}, at an angle θ with the x–axis. Simultaneously another similar bullet is fired from a certain planet with a velocity u' ms^{-1} at the same angle with the x–axis. The trajectories in the two cases are identical. If g and g' are the accelerations due to gravity on earths surface and planet surface then which is true

A) $u/u' = g/g'$ B) $u/u' = g^2/g'^2$

C) $u^2/u'^2 = g'/g$ D) $u^2/u'^2 = g/g'$

24. A bus moves over a straight level road with an acceleration a. A boy in the bus drops a ball outside. The acceleration of the ball with respect to the bus and the earth are respectively

A) a and g B) $(a + g)$ and $(g - a)$

C) $\sqrt{a^2 + g^2}$ and g D) $\sqrt{a^2 + g^2}$ and a

25. A body is projected at an angle of 30° with a momentum p. At highest point the magnitude of the momentum will be

A) p B) $p/2$

C) $\frac{p\sqrt{3}}{2}$ D) zero

26. A large number of bullets are fired in all directions with the same speed v. What is the maximum area on the ground on which these bullets will spread

A) $\pi\frac{v^2}{g}$ B) $\pi\frac{v^4}{g^2}$

C) $\pi^2\frac{v^4}{g^2}$ D) $\pi^2\frac{v^2}{g^2}$

27. A boy throws a ball with a velocity u at an angle θ with the horizontal. At the same instant he starts running with uniform velocity to catch the ball before it hits the ground. To achieve this he should run with a velocity of

A) $u\cos\theta$ B) $u\sin\theta$

C) $u\tan\theta$ D) $\sqrt{u^2\tan\theta}$

28. A particle moves in x–y plane according to law $x = a\sin\omega t$ and $y = b\cos\omega t$ where a and b are constants. Then the particle follows

A) a parabolic path
B) a circular path
C) a straight line path equally inclined to x and y axes
D) an elliptical path

29. A projectile is projected at angle 35° with the horizontal. Its range is R_1. Another projectile is projected with same initial speed at 35° with the vertical and its range is R_2. Then what is the relation between R_1 and R_2

A) $R_1 = R_2$ B) $R_1 = 2\ R_2$

C) $R_1 = \cot 35^\circ\ R_2$ D) $R_1 = \cot 70^\circ\ R_2$

30. For hitting a target one must aim

A) directly at the target

B) higher than target

C) lower than target

D) higher or lower than target depending on velocity of projection

31. A boy can swim in still water at 1 ms^{-1}. He swims across a river flowing at 0.6 ms^{-1} which is 336 m wide. If he travels the shortest possible distance, then time he takes to cross the river is

A) 7 min B) 9.3 min

C) 5.6 min D) 4.8 min

32. A ball is thrown vertically upwards with a velocity V_1 from the deck of a ship traveling at a speed V_2. A person on the shore observes the motion of the ball as a parabola whose horizontal range is

A) zero B) $\frac{V_1^2}{g}$

C) $\frac{2V_1^2V_2}{g}$ D) $\frac{2V_1V_2}{g}$

33. A body moves on a quarter circle of radius r. What are the values of displacement and distance traveled by it

A) displacement = r, distance = πr B) displacement = $r\sqrt{2}$, distance = $\frac{\pi r}{2}$

C) displacement = $\frac{\pi r}{2}$, distance = $2\sqrt{2}\,r$ D) displacement = zero , distance = $\frac{\pi r}{2}$

34. Drops of water fall from the roof of a building 9 m high at regular intervals of time, the first drop reaching the ground at the instant fourth drop starts to fall. What are the distances of the second and third drops from the roof

A) 6 m and 2 m B) 6 m and 3 m

C) 4 m and 1 m D) 4 m and 2 m

35. 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

A) 29 sec B) 21 sec

C) 37 sec D) 31 sec

36. A person throws balls into air after every second. The next ball is thrown when the velocity of the first ball is zero. How high do the ball rise above his hand

A) 2 m B) 5 m

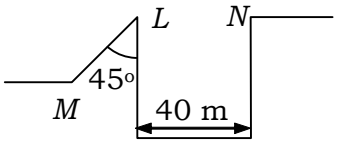
C) 8 m D) 10 m

37. A man projects a coin vertically upwards from the gate of a uniformly moving train. The path of coin for the man will be
A) parabolic
B) inclined straight line
C) vertical straight line
D) horizontal straight line

38. At the top of the trajectory of a projectile, the acceleration is
A) the maximum
B) the minimum
C) zero
D) g

39. A projectile can have the same range R for two angles of projection. If t_1 and t_2 be the times of flight in two cases then
A) $t_1 t_2 \propto R^2$
B) $t_1 t_2 \propto R$
C) $t_1 t_2 \propto 1/R$
D) $t_1 t_2 \propto 1/R^2$

40. A body is projected up a smooth inclined plane with a velocity V from point M as shown in figure. The angle of inclination is 45^o and the top of the plane is connected to a well of diameter 40 m. What is the value of V, for the body to just clear the well? (Length of the inclined plane is $20\sqrt{2}$ m)



A) 40 ms^{-1}
B) $40\sqrt{2}$ ms^{-1}
C) 20 ms^{-1}
D) $20\sqrt{2}$ ms^{-1}

41. If a body is moving in a circle of radius r meters with a constant speed v ms^{-1}. The angular velocity is
A) r/v
B) vr
C) v^2/r
D) v/r

42. A motor cyclist going round in a circular track at a constant speed has
A) constant linear velocity
B) constant acceleration
C) acceleration of constant magnitude with its direction changing
D) constant force

43. A wheel is at rest. Its angular velocity increases uniformly and becomes 80 radian per second, after 5 seconds. The total angular displacement is
A) 800 rad
B) 400 rad
C) 200 rad
D) 100 rad

44. The length of a second's hand in a watch is 1 cm. The change in velocity of its tip in 15 seconds is
A) zero
B) $\frac{\pi\sqrt{2}}{30}$ cm/sec
C) $\frac{\pi}{30\sqrt{2}}$ cm/sec
D) $\frac{\pi}{30}$ cm/sec

45. The velocity at the maximum height of a projectile is half of its initial velocity of projection u. Its range on horizontal plane is

A) $\frac{3u^2}{g}$ B) $\frac{3u^2}{2g}$

C) $\frac{u^2}{3g}$ D) $\frac{\sqrt{3}u^2}{2g}$

46. A body is projected at an angle of 30^o with the horizontal with velocity of projection u. Its velocity at half the maximum height is

A) $u/\sqrt{2}$ B) $u/2$

C) $\frac{\sqrt{7}}{2\sqrt{2}}u$ D) $\frac{\sqrt{13}}{4}u$

47. Ball A is rolled in a straight line with a speed of 5 ms^{-1} towards a bigger ball B lying 20 m away. After collision with ball B, ball A retraces the path and reaches its starting point with a speed of 4 ms^{-1}. What is the average velocity of ball A during the time interval 0 to 6 sec

A) zero B) 2 ms^{-1}

C) 4 ms^{-1} D) 5 ms^{-1}

48. A train is moving southwards at a speed of 30 ms^{-1}. A monkey is running northwards on the roof of the train with a speed of 5 ms^{-1}. What is the velocity of the monkey as observed by a person standing on the ground

A) 35 ms^{-1} in the southward direction B) 35 ms^{-1} in the northward direction

C) 25 ms^{-1} in the southward direction D) 25 ms^{-1} in the northward direction

49. Two persons P and Q are standing 54 m apart on a long moving belt. Person P rolls a round stone towards person Q with a speed of 9 ms^{-1} with respect to the belt. If the belt is moving with a speed of 4 ms^{-1} in the direction from Q to P, what is the speed of the stone with respect to an observer on a stationary platform

A) 4 ms^{-1} B) 5 ms^{-1}

C) 9 ms^{-1} D) 13 ms^{-1}

50. A balloon is rising vertically upwards at a velocity of 10 ms^{-1}. When it is at a height of 45 m from the ground, a parachutist bails out from it. After 3 s he opens his parachute and decelerates at a constant rate of 5 ms^{-2}. What was the height of the parachutist above the ground when he opened his parachute?
(Take g = 10 ms^{-2})

A) 15 m B) 30 m

C) 45 m D) 60 m

Answer to Motion in one & two dimensions

01. D)	**02.** C)	**03.** C)	**04.** C)	**05.** D)	**06.** C)	**07.** A)	**08.** A)	**09.** B)	**10.** B)
11. B)	**12.** C)	**13.** C)	**14.** A)	**15.** B)	**16.** C)	**17.** C)	**18.** C)	**19.** B)	**20.** A)
21. C)	**22.** A)	**23.** D)	**24.** C)	**25.** C)	**26.** B)	**27.** A)	**28.** D)	**29.** A)	**30.** B)
31. A)	**32.** D)	**33.** B)	**34.** C)	**35.** A)	**36.** B)	**37.** C)	**38.** D)	**39.** B)	**40.** D)
41. D)	**42.** C)	**43.** C)	**44.** B)	**45.** D)	**46.** C)	**47.** B)	**48.** C)	**49.** B)	**50.** B)