

Important Question 2010 Class-XII (Physics)

- Q. 1.** A body covered a distance of l metres along a semicircular path . calculate the magnitude of displacement of the body and the ratio of distance to displacement .[$\pi/2$]
- Q. 2.** a ball dropped from the top of a tower of height h . it covers a distance $h/2$ in the last second of its motion . how long does the ball remain in air ? $g=10\text{m/s}^2$ [$(2 \pm \sqrt{2})$ s]
- Q. 3.** the maximum height attained by a projectile is increased by 10% by increasing its speed of projectile , without changing the angle of projection . what will the percentage increase in the horizontal range .[10%]
- Q. 4.** two trains are headed towards each other on the same track , each having a speed of 30 Km/h . a bird that can fly at 60 km/h flies off one train when they are 60 km apart and leads directly for the other train . on Reaching the other train . on reaching the other train , it flies back ti the first train and so on .
- (a) how many trips can the bird make from one train to the other before they meet ?
- (b) what is the total distance the bird travels ? [infinite, 60 km]
- Q. 5.** a body of mass m is projected with velocity v at an angle of 45° with the horizontal . find the change in its momentum at the end of flight . [$\sqrt{2} mv$]
- Q. 6.** a 100 m sprinter increases her speed from rest uniformly at the rate of 1.5 m/s^2 up to three quarters of the total run and covers the last quarter with uniform speed . how much time does she takes to cover the first half and second half of the run ?
- Q. 7.** (a) show that for a projectile the angle between the velocity and the x-axis as function of time is given by $\phi(t) = \tan^{-1}[(v_{oy} - gt)/v_{ox}]$, where the various symbols have their usual meanings .
- (c)show that projectile angle ϕ_o for a projectile launched from the origin is given by $\phi_o = \tan^{-1}[4hm/R]$
- Q. 8.** a jet airplane travelling at the speed of 500 km/h ejects its products of combustion at the speed of 1500 km/h relative to thhe jet plane . what is the speed of the later with respect to observer on the ground .[-1000 km/h]
- Q. 9.** a car moving along a straight highway with speed of 126 km/h is brought to stop within a distance of 200 m . what is the retardation of the car and how long does it take for the car to stop ? [11.43 s]
- Q. 10.** a ball is dropped from a height of 90 m on afloor . at each collision with the floor , the ball loses one tenth of its speed . plot the speed –time graph of its motion between $t=0$ to 12 s . [$g=10\text{m/s}^2$]
- Q. 11.** rain is falling vertically with a speed of 30 m/s . a woman rides a bicycle with a speed of 10 m/s in the north to south direction . what is the direction in which she should hold her umbrella ? [$\tan^{-1} 3/4$]
- Q. 12.** the ceiling of a long hall is 25 m high . what is the maximum horizontal distance that a ball thrown with a speed of 40 m/s can go without hitting the ceiling of the hall ? [150.5 m]
- Q. 13.** a man is 16 m behind a bus when it starts acceleration at 2 m/s^2 . what is the timetaken by him to board the bus ? [4 sec.]
- Q. 14.** a stone tied to the end of a string 80 cm long is whirled in a horizontal circle with a constant

speed . if the stone makes 14 revolutions in 25 seconds , what is the magnitude and direction of acceleration of the stone ? [9.90 m/s^2]

Q. 14. two particles A and B are connected by a rigid rod AB . the rod slides along perpendicular rails as shown . velocity of A to the left is 10 m/s . what is the velocity of B when angle $\alpha=30^\circ$ [17.32 m/s]

Q. 15. a cyclist is riding with a speed of 27 km/h . as he approaches a circular turn on the road of radius 80 m , he applies brakes and reduces his speed at the constant rate of 0.5 m/s^2 . what is the magnitude and direction of the net acceleration of the cyclist on the circular turn ? [0.86 m/s^2]

Q. 16. a balloon is ascending at 12 m/s . a packet is dropped from it when it is at a height of 65 m from the ground . what is the time taken by the packet to reach ground ? [5 sec]

Q. 17. a ball is dropped from a height. If it takes 0.200 s to cross the last 6.00 m before hitting the ground , find the height from which it was dropped . take $g=10 \text{ m/s}^2$. [48 m]

Q. 18. two trains A and B of length 400 m each moving on two parallel tracks with a uniform speed of 72 km/h in same direction , with A ahead of B . the driver of B decides to over take A and accelerates by 1 m/s^2 . if after 50 s , the guard of B decides to over take A and accelerates by 1 m/s^2 . if after 50 s , the guard of B just past the driver of A , what was the original distance between them . [1250 m]

Q. 19. person is standing on a truck moving with a constant velocity of 14.7 m/s on a horizontal road . the man throws a ball in such a way that it returns to the truck after the truck has moved 58.8 m . find the speed and the angle of projection (a) as seen from the truck (b) as seen from the road [19.6 m/s upward, 24.5 m/s at 53° horizontal]

Q. 20. on a rainy day , the rain was falling vertically with a speed of 30 m/s . if the wind starts flowing with a speed of 10 m/s in the direction from north to south , find the direction in which the boy should hold his umbrella in order to protect himself from the rain . [18° with the vertical]

Q. 21. a water tap leaks that water drops fall at regular intervals . tap is fixed 5 m above the ground . first drop reaches ground and at that very instant third drop leaves the tap . what is the height of the second drop at that instant ? [3.75 m]

Q. 22. a man standing on a road has to hold his umbrella at 30° with the vertical to keep the rain away . he throws the umbrella and starts running at 10 km/h . he finds that raindrops are hitting his head vertically . find the speed of raindrops with respect to (a) the road (b) the moving man [20 km/h , $10\sqrt{3} \text{ km/h}$]

Q. 23. a police van moving on a highway with a speed of 30 km/h fires a bullet at a thief's car speeding away in the same direction with a speed of 192 km/h . if the muzzle speed of the bullet is 150 m/s , with what speed does the bullet hit the thief's car ? [105 m/s]

Q. 24. a man can swim at a speed of 3 km/h in still water . he wants to cross a 500 m wide river flowing at 2 km/h . he keeps himself always at an angle of 120° with the river flow while swimming ? (a) find the time he takes to cross the river (b) at what point on the opposite bank will he arrive ? [$1/3\sqrt{3} \text{ h}$, $1/6\sqrt{3} \text{ km}$]

Q. 25. on a two- lane road , car A is travelling with a speed of 36 km/h . two cars B and C approach car A from opposite direction with speed of 54 km/h each . at a certain instant , when the distance AB equal to AC , both being 1 km , B decides to overtake A before C does . what minimum acceleration is required to avoid an accident . [1 m/s^2]

Q. 26. a particle starts from rest with a constant acceleration . at a time t second , the speed is found to

be 100 m/s and one second later the speed becomes 150 m/s . find (a) the acceleration and (b) the distance travelled during the $(t+1)$ th second [50 m/s² , 125 m]

Q. 27. a freely falling particle from a height h covers $h/2$ in last second of its motion . show that height $h = \frac{1}{2} g \left[\frac{1}{4} \left(\frac{h}{g} + 1 \right)^2 \right]$

Q. 28. a particle moves in the x-y plane with a constant acceleration of 1.5 m/s² in the direction making an angle of 37° with the x-axis . at $t=0$ the particle is at the origin and its velocity is 8 m/s along the x axis . find the velocity and the position of the particle at $t=4.0$ s [41.6 m , 7.2 m , 4 sec.]

Q. 29. an air craft is flying at a height 3400 m above the ground . if the angle subtended at ground observation point by the aircraft positions 10 sec apart is 30° , what is the speed of aircraft . [182.2 m/s]

Q. 30. in a harbour , wind is blowing at the speed of 72 km/h and the flag on the mast of a boat anchored in the harbour flutters along N-e direction . if the boat starts moving at a speed of 51 km/h to the north , what is the direction of flag on the mast of the boat ? [45°]

Q. 31. a machine gun is mounted on the top of a tower 100 m high . at what angle should the gun be inclined to cover a maximum range of firing on the ground below ? the muzzle speed of bullet is 150 m/s . take $g=10$ m/s² [43.8°]

Q. 32. a mass m is moved on a frictionless plane by a string moving with velocity v as shown in the figure . what is the horizontal velocity of the mass ? [$v/\sin \theta$]

Q. 33. two cars are moving with same velocity of 30 km/h maintaining a distance of 5 km between them . find the speed of third car moving in the opposite direction and meeting the two cars at an interval of 240 sec . [45 km/h]

Q. 34. a ball thrown vertically upwards with a speed of 19.6 m/s from the top of a tower returns to the earth in 6 seconds . find the height of tower . [58.8 m]

Q. 35. a juggler maintain four balls in motion , making each of them rise to a height of 20 m from his hand . what time interval should be maintain , for the proper distance between them ? [1 sec.]

Q. 36. a body falling from rest was observed to fall through 78.4 m in 2 seconds . find how long had it been falling before it was observed ? [3 sec.]

Q. 37. determine the horizontal force required to displace a mass of 0.03 kg suspended by a string until the string makes an angle 30° with the vertical . [0.01732 kgf]

Q. 38. a bird flies north at 20 m/s for 15 sec. it rests for 5 sec. and then flies south at 25 m/s for 10 sec. for the whole trip , find (a) the average speed (b) the average velocity (c) the average acceleration [18.34 m/s, 1.67 m/s, -1.5 m/s²]

Q. 39. a particle goes along a quadrant AB of a circle of radius 5 cm with a constant speed 2.5 m/s as shown . find the average velocity and average acceleration over the interval AB. [2.252 m/s , 1.126 cm/s²]

Q. 40. a ball is thrown up from the ground reaches a maximum height of 20 m . find its initial velocity , the time taken to reach the highest point , its velocity just before hitting the ground , its displacement between 0.5 sec and 2.5 sec., the time at which it is 15 m above the ground . [20 m/s , 2s, -20 m/s , 10m , 1s]

Q. 41. a balloon starting from the ground has been ascending vertically at a uniform velocity for 4 sec

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and a stone let fall from it reaches the ground in 6 sec . find the velocity of the balloon and its height when the stone was let fall .($g=10 \text{ m/s}^2$) [72 m , 42 m/s downward)

Q. 42. a car starts from rest and acceleration uniformly for 10 sec to a velocity of 8 m/s . it then run at a constant velocity and is finally brought to rest in 64 m with a constant retardation . the total distance covered by the car is 584 m . find the value of acceleration , retardation and total time taken .