Motion In a Plane

Q.No.1:
A projectile is given an initial velocity of $\left(\hat{i}+2\hat{j}\right)\text{m/s}$, where $\hat{i}$ is along the ground and $\hat{j}$ is along the vertical. If g = 10 m/s^2, the equation of its trajectory is:

JEE 2013

A. $y = x - 5x^2$
B. $y = 2x - 5x^2$
C. $4y = 2x - 5x^2$
D. $4y = 2x - 25x^2$

Q.No.2: A particle is moving with a uniform speed in a circular orbit of radius R in a central force inversely proportional to the nth power of R. If the period of rotation of the particle is T, then : **JEE 2018**

A. $T \propto R^{(n+1)/2}$
B. $T \propto R^{n/2}$
C. $T \propto R^{3/2}$ for any n.
D. $T \propto R^{\frac{n}{2}+1}$

Q.No.3: Two guns A and B can fire bullets at speeds 1 km/s and 2 km/s respectively. From a point on a horizontal ground, they are fired in all possible directions.The ratio of maximum areas covered by the bullets fired by the two guns, on the ground is: **JEE 2019**

A. 1 : 16
B. 1 : 2
C. 1 : 4
D. 1 : 8

Q.No.4: A body is projected at t = 0 with a velocity 10 ms^{-1} at an angle of 60° with the horizontal. The radius of curvature of its trajectory at t = 1 s is R. Neglecting air resistance and taking acceleration due to gravity g = 10 ms^{-2}, the value of R is: **JEE 2019**

A. 10.3 m

B. 2.8 m

C. 2.5 m

D. 5.1 m

Q.No.5: A particle moves from the point $\left(2.0\hat{i}+4.0\hat{j}\right)\ \mathrm{m},\ \text{at}\ t=0$, with an initial velocity $\left(5.0\hat{i}+4.0\hat{j}\right)\ \mathrm{ms}^{-1}$. It is acted upon by a constant force which produces a constant acceleration $\left(4.0\hat{i}+4.0\hat{j}\right)\ \mathrm{ms}^{-2}$.

What is the distance of the particle from the origin at time 2 s? **JEE 2019**

A. 15 m

B. $20\sqrt{2}\ \mathrm{m}$

C. 5 m

D. $10\sqrt{2}\ \mathrm{m}$

Q.No.6: A particle is moving along a circular path with a constant speed of 10 ms^{-1}. What is the magnitude of the change in velocity of the particle, when it moves through an angle of 60° around the centre of the circle? **JEE 2019**

A. $10\sqrt{3}\ \mathrm{m/s}$

B. zero

C. $10\sqrt{2}\ \mathrm{m/s}$

D. 10 m/s

Q.No.7: The trajectory of a projectile in a vertical plane is $y=\alpha x-\beta x^2$, where α and β are constants and x & y are respectively the horizontal and vertical distances of the projectile from the point of projection. The angle of projection θ and the maximum height attained H are respectively given by **JEE 2021**

A. $\tan^{-1}\alpha,\ \frac{4\alpha^2}{\beta}$

B. $\tan^{-1}\beta,\ \frac{\alpha^2}{2\beta}$

C. $\tan^{-1}\left(\frac{\beta}{\alpha}\right),\ \frac{\alpha^2}{\beta}$

D. $\tan^{-1}\alpha,\ \frac{\alpha^2}{4\beta}$

Q.No.8: A rubber ball is released from a height of 5 m above the floor. It bounces back repeatedly, always rising to $\frac{81}{100}$ of the height through which it falls. Find the average speed of the ball.
(Take g = 10 ms^{-2})

JEE 2021

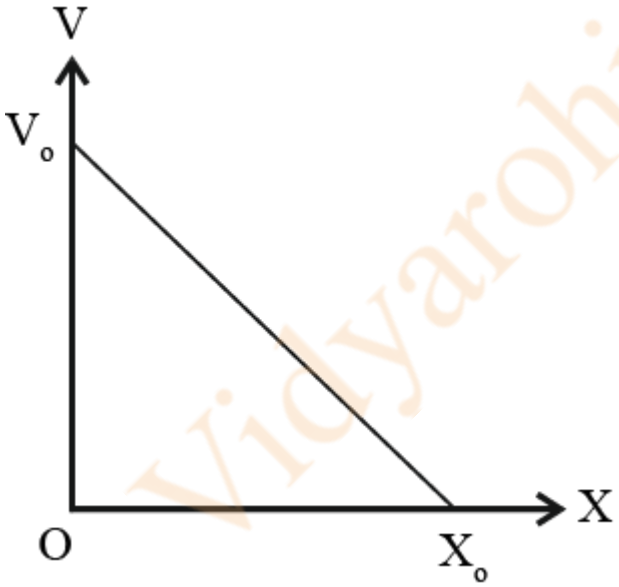
A. 3.50 ms^{-1}

B. 2.0 ms^{-1}

C. 2.50 ms^{-1}

D. 3.0 ms^{-1}

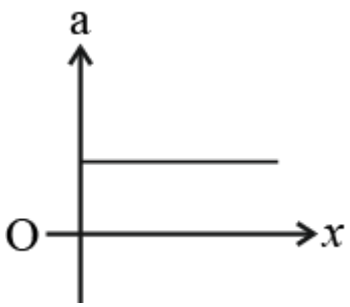
Q.No.9: The velocity-displacement graph of a particle is shown in the figure.



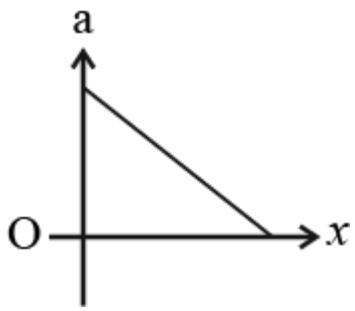
The acceleration-displacement graph of the same particle is represented by:

JEE 2021

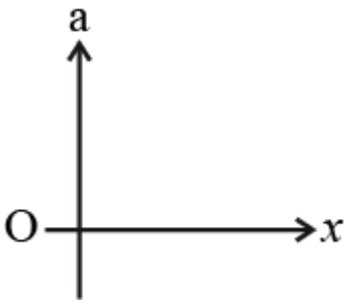
A.



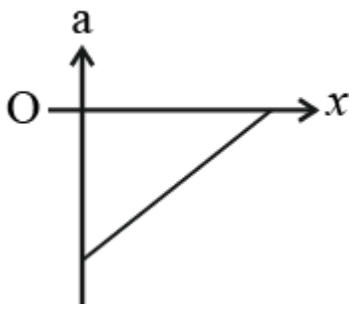
B.



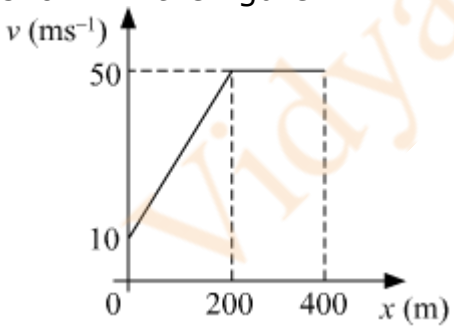
C.



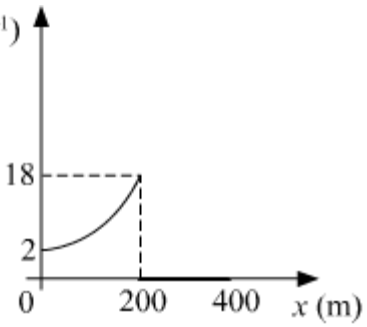
D.

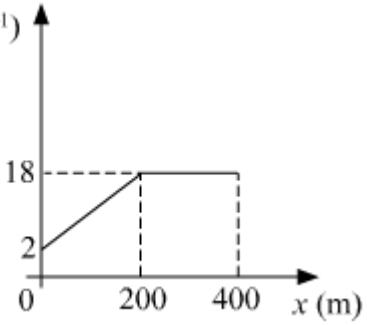


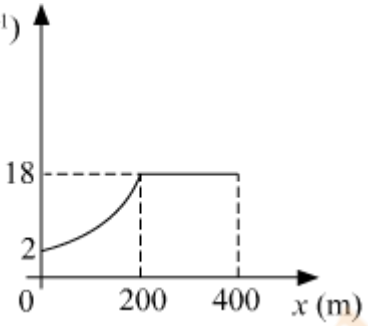
Q.No.10: The velocity-displacement graph describing the motion of a bicycle is shown in the figure.



The acceleration-displacement graph of the bicycle's motion is best described by : **JEE 2021**

A. 

B. 

C. 

D.