Assignment: Physics (Class XI)

Chapter 4 – Motion in a Plane

1. Two vectors A and B have magnitudes 5 units and 12 units, respectively, and the angle between them is 90°. Find the magnitude and direction of their resultant.
2. A projectile is launched with a speed of 40 m/s at an angle of 30° to the horizontal. Calculate the time of flight, maximum height, and range.
3. A body is projected horizontally from a 78.4 m high tower with a speed of 10 m/s. Find the time taken to hit the ground and horizontal range.
4. A boat can move at 10 km/h in still water. The river flows at 4 km/h. Find the velocity of the boat if it moves perpendicular to the current.
5. A particle moves along a circular path of radius 2 m at a speed of 4 m/s. Find its centripetal acceleration and angular velocity.
6. Add two vectors of magnitude 8 N and 6 N inclined at 60° to each other. Find the magnitude and direction of the resultant.
7. A ball is projected at 60° with a speed of 25 m/s. Find the maximum height and range of the projectile.
8. A cyclist moves due east at 18 km/h and rain appears to fall vertically. What is the actual velocity of rain?
9. A projectile is thrown at an angle of 45° and lands at the same level after 5 seconds. Find the initial speed and range.
10. A car moves in a circular track of radius 100 m at 20 m/s. Find the centripetal force if the mass of the car is 1200 kg.
11. A river is 500 m wide and flows at 3 m/s. A boat takes the shortest path across in 100 seconds. Find the speed of the boat relative to water.
12. A particle is projected horizontally with a speed of 15 m/s from a height of 20 m. Find the time of flight and horizontal distance travelled.
13. Two forces of 5 N and 12 N act at a point at an angle of 90°. Find the resultant force using the vector method.
14. A body is moving in a horizontal circle of radius 2 m with constant speed. If it completes one revolution in 4 seconds, find the acceleration.
15. A man walks 4 km north, then 3 km west, then 2 km south. Find his resultant displacement from the starting point.
16. A stone is thrown with velocity 30 m/s at 30° above the horizontal. Find the time of flight and maximum height reached.
17. An airplane is flying at 300 km/h towards north. Wind is blowing from the west at 40 km/h. Find the resultant velocity and direction of the airplane.
18. A body moves along a circular path of radius 3 m with a constant speed of 6 m/s. Find its angular speed and acceleration.
19. A projectile launched with speed v at angle θ has a range R. Prove that for same speed, R is maximum when $\theta = 45°$.
20. A boy throws a ball with velocity 20 m/s at an angle of 37° to the horizontal. Calculate the time of flight, maximum height, and range.