

Yakeen NEET 2.0 2026

MahaManthan ASSIGNMENT

Motion in a Plane

Assignment-01
By: M.R. Sir

1. A physical quantity is a vector quantity if it has direction and magnitude. **True/False**
2. A vector \vec{P} multiplied by a real number λ is also a vector, whose direction may be perpendicular to \vec{P} . **True/False**
3. $\vec{C} + \vec{A} + \vec{B} \neq \vec{B} + \vec{A} + \vec{C}$. **True/False**
4. Motion in a plane can be treated as superposition of two independent simultaneous one dimensional motions along two perpendicular directions. **True/False**
5. If a particle is moving in a plane and its speed is constant then distance traversed must be equal to displacement. **True/False**
6. Equations of motion are applicable for uniform circular motion. **True/False**
7. In non-uniform circular motion net acceleration of the body is towards center. **True/False**
8. A scalar quantity is one that has the same value for observers with different orientation of axes. **True/False**
9. If a vector is rotated its magnitude remains same. **True/False**
10. The shape of the trajectory of the projectile motion under gravity depends on the initial conditions of motion also. **True/False**
11. A particle executes a uniform circular motion and completes one revolution. Average velocity of the particle after completing of first quarter circle and first semicircle is same. **True/False**
12. In ground to ground projectile motion, maximum height attained by projectile may be equal for two different angles of projection. **True/False**
13. If two adjacent sides of a parallelogram are represented by \vec{A} and \vec{B} then $-\vec{C}$ will be along diagonal of parallelogram. Given that $\vec{A} + \vec{B} + \vec{C} = 0$. **True/False**
14. In projectile motion under gravity, radius of curvature remains same in journey. ($\theta \neq 90^\circ$ and 0°) **True/False**
15. The velocity vector of a particle at point is always along the tangent to the path of the particle at that point. **True/False**
16. The acceleration vector of a particle in uniform circular motion averaged over one cycle is a null vector. **True/False**
17. A particle is describing uniform circular motion such that its time period of revolution is T . Angle between average velocity in the interval $t = 0$ to $t = \frac{T}{4}$ and acceleration at $\frac{T}{4}$ is 45° . **True/False**
18. Vectors $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = 6\hat{i} + 8\hat{j}$ are parallel. **True/False**
19. Resultant of three non-coplanar vectors may be zero. **True/False**
20. A ball is dropped from the window of a train moving along horizontal rails. The path that ball travels to reach the ground is parabola. **True/False**
21. In the above part, the ball appears to move along circular path for the man in train who dropped the ball. **True/False**

22. In order to cross the river in shortest time a boat needs to move in the perpendicular direction to the flow of river. **True/False**
23. Similar to above, if the river has to be crossed through the shortest path, the boat must move at an angle $\theta < 90^\circ$ inclined downwards to the flow. **True/False**
24. A man has to hold the umbrella at an angle $\theta = \tan^{-1} \left(\frac{v_m}{v_r} \right)$ with vertical (where symbols have their usual meaning) while moving in rain falling vertically in an attempt to save himself from the rain. **True/False**
25. A person aiming to reach exactly opposite point on the bank of a stream is swimming with a speed of 0.5 m/s at an angle of 120° with the direction of flow of water. The speed of water in the stream is 0.25 m/s. **True/False**
26. In a projectile motion the velocity
- (1) is always perpendicular to the acceleration
 - (2) is never perpendicular to the acceleration
 - (3) is perpendicular to the acceleration for one instant only
 - (4) is perpendicular to the acceleration for two instants.
27. A river is flowing from west to east at a speed of 5 metres per minute. A man on the south bank of the river, capable of swimming at 10 metres per minute in still water, wants to swim across the river in the shortest time. He should swim in a direction
- (1) due north
 - (2) 30° east of north
 - (3) 30° north of west
 - (4) 60° east of north
28. Consider the motion of the tip of the minute hand of a clock. In one hour
- (1) the displacement is zero
 - (2) the distance covered is zero
 - (3) the average speed is zero
 - (4) the average velocity is zero
29. A police jeep is chasing a culprit going on a motorbike. The motorbike crosses a turning at a speed of 72 km/h. The jeep follows it at a speed of 90 km/h, crossing the turning ten seconds later than the bike. Assuming that they travel at constant speeds, how far from the turning will the jeep catch up with the bike?
30. When a particle moves in a circle with a uniform speed
- (1) its velocity and acceleration are both constant
 - (2) its velocity is constant but the acceleration changes
 - (3) its acceleration is constant but the velocity changes
 - (4) its velocity and acceleration both change.
31. Two cars having masses m_1 and m_2 move in circles of radii r_1 and r_2 respectively. If they complete the circle in equal time, the ratio of their angular speed ω_1 / ω_2 is:
- (1) m_1 / m_2
 - (2) r_1 / r_2
 - (3) $m_1 r_1 / m_2 r_2$
 - (4) 1
32. **Statement-I:** The projectile has only vertical component of velocity at the highest point of its trajectory.
Statement-II: At the highest point only one component of velocity is present.
- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
 - (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
 - (3) Statement-I is true, Statement-II is false.
 - (4) Statement-I is false, Statement-II is true.

33. **Statement-I:** The time of flight of a body becomes n times of original value, if its speed is made n times.

Statement-II: This due to the range of the projectile which becomes n times.

- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
- (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
- (3) Statement-I is true, Statement-II is false.
- (4) Statement-I is false, Statement-II is true.

34. **Statement-I:** In a plane projectile motion, the angle between instantaneous velocity vector and acceleration vector can be anything between 0 or π (excluding the limiting case).

Statement-II: In plane to plane projectile motion, acceleration vector is always pointing vertical downwards. (Neglect air friction).

- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
- (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
- (3) Statement-I is true, Statement-II is false.
- (4) Statement-I is false, Statement-II is true.

35. **Statement-I:** A body with constant acceleration always moves along a straight line.

Statement-II: A body with constant magnitude of acceleration may not speed up.

- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
- (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
- (3) Statement-I is true, Statement-II is false.
- (4) Statement-I is false, Statement-II is true.

36. **Statement-I:** In a non-uniform circular motion tangential acceleration arises due to change in magnitude of velocity.

Statement-II: In a non-uniform circular motion centripetal acceleration is produced due to change in direction of velocity.

- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
- (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
- (3) Statement-I is true, Statement-II is false.
- (4) Statement-I is false, Statement-II is true.

37. **Statement-I:** In a uniform circular motion angle between velocity vector and acceleration vector is always $\frac{\pi}{2}$.

Statement-II: For any type of motion, angle between acceleration and velocity is always $\frac{\pi}{2}$.

- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
- (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
- (3) Statement-I is true, Statement-II is false.
- (4) Statement-I is false, Statement-II is true.

38. **Statement-I:** Two particles start from the rest simultaneously and proceed with the same acceleration. The relative velocity of these particles will be zero throughout the motion.

Statement-II: At every moment the two particles will have the same velocity.

- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
- (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
- (3) Statement-I is true, Statement-II is false.
- (4) Statement-I is false, Statement-II is true.

39. Statement-I: A river is flowing from east to west at a speed of 5 m/min. A man on south bank of river, capable of swimming 10 m/min in still water, wants to swim across the river in shortest time. He should swim due north.

Statement-II: For the shortest time the man needs to swim perpendicular to the bank.

- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
- (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
- (3) Statement-I is true, Statement-II is false.
- (4) Statement-I is false, Statement-II is true.

40. Statement-I: Rain is falling vertically downwards with velocity 6 km/h. A man walks with a velocity of 8 km/h. Relative velocity of rain w.r.t. the man is 10 km/h.

Statement-II: Relative velocity is the ratio of two velocities.

- (1) Statement-I is true, Statement-II is true; Statement-II is a correct explanation for Statement-I
- (2) Statement-I is true, Statement-II is true; Statement-II is NOT a correct explanation for Statement-I
- (3) Statement-I is true, Statement-II is false.
- (4) Statement-I is false, Statement-II is true.

ANSWER KEY

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|-------------|-------------|
| 1. (False) | 21. (False) |
| 2. (False) | 22. (True) |
| 3. (False) | 23. (False) |
| 4. (True) | 24. (True) |
| 5. (False) | 25. (True) |
| 6. (False) | 26. (3) |
| 7. (False) | 27. (1) |
| 8. (True) | 28. (1, 4) |
| 9. (True) | 29. (1 km) |
| 10. (True) | 30. (4) |
| 11. (False) | 31. (4) |
| 12. (True) | 32. (4) |
| 13. (True) | 33. (3) |
| 14. (False) | 34. (2) |
| 15. (True) | 35. (4) |
| 16. (True) | 36. (2) |
| 17. (False) | 37. (3) |
| 18. (True) | 38. (1) |
| 19. (False) | 39. (1) |
| 20. (True) | 40. (3) |

