

CHAPTER-6 | Systems of Particles and Rotational Motion

QUIZ
PART-02

1. Two bodies of masses m_1 and m_2 are connected. If no external force acts on the system, what happens to the velocity of the centre of mass?
- It decreases gradually
 - It increases gradually
 - It remains constant
 - It becomes zero

(C)

Explanation: When the net external force on a system is zero, the velocity of the centre of mass remains unchanged (law of conservation of momentum).

2. The vector product of two parallel vectors is:

- Equal to 1
- Equal to zero
- Equal to product of their magnitudes
- Equal to difference of their magnitudes

(B)

Explanation: The cross product is $AB\sin\theta$. For parallel vectors, $\theta = 0^\circ$, so $\sin 0^\circ = 0$.

3. The torque acting on a particle is mathematically expressed as:

- $\tau = F \cdot r$
- $\tau = r \times F$
- $\tau = F \times v$
- $\tau = m \cdot a$

(B)

Explanation: Torque is defined as the vector product of position vector and force.

4. If the net external force on a system of particles is nonzero, the acceleration of the centre of mass is determined by:

- Internal forces of particles
- External forces only
- Both internal and external forces
- Mass ratio of particles

(B)

Explanation: Internal forces cancel in pairs; only external forces influence the motion of the centre of mass.

5. Which law states that if a right-handed screw rotates in the direction of rotation of a body, then its advancement direction gives angular velocity?

- Fleming's Left-Hand Rule
- Right-Hand Law
- Right-Handed Screw Law
- Newton's Third Law

(C)

Explanation: The screw advances in the direction of angular velocity when rotated according to the body's sense of rotation.

6. The total linear momentum of a system of particles can be expressed as:

- Sum of masses of particles only
- Vector sum of momenta of individual particles
- Arithmetic mean of all velocities
- Always zero

(B)

Explanation: System momentum $p = m_1v_1 + m_2v_2 + \dots + m_nv_n = M V_{cm}$.

7. In a binary star system, two stars orbit around:

- Their individual centres
- The more massive star
- Their common centre of mass
- The Sun

(C)

Explanation: Each star moves in a trajectory around their common centre of mass.

8. Which property of cross product is not true?

- $A \times B = -(B \times A)$
- $A \times (B + C) = A \times B + A \times C$
- $A \times A = 0$
- $A \times B = B \times A$

(D)

Explanation: The cross product is anti-commutative, so option D is false.

9. If an asteroid breaks into two unequal pieces during motion, what happens to the path of the centre of mass?

- Shifts toward the heavier piece
- Shifts toward the lighter piece
- Follows the same trajectory as before breaking
- Comes to rest

(C)

Explanation: The external forces (like gravity) remain unchanged, so the centre of mass continues its original motion.

10. The vector product of unit vectors $\hat{i} \times \hat{j}$ is:

- $-\hat{k}$
- $\hat{k}$
- $\hat{i}$
- 0

(B)

Explanation: The cyclic relation of unit vectors gives $\hat{i} \times \hat{j} = \hat{k}$.