

Motion of System of Particles and Rigid Body – MCQs

1. The center of mass of a system of particles moves as if:

- A) Each particle were at rest
 - B) The total external force acts at the origin
 - C) The entire mass of the system is concentrated at that point
 - D) There are no external forces
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2. The position of center of mass of a uniform rod of length L is:

- A) At the midpoint
 - B) At the end
 - C) One-fourth from one end
 - D) Depends on orientation
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3. A particle of mass m is moving with velocity v . Its angular momentum about a point at a distance r from the line of motion is:

- A) mvr
 - B) mv/r
 - C) mv^2r
 - D) Zero
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4. Torque is a measure of:

- A) Linear momentum
 - B) Angular momentum
 - C) Rotational effect of force
 - D) Translational effect of force
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5. The SI unit of torque is:

- A) Nm
 - B) $\text{kg}\cdot\text{m}/\text{s}^2$
 - C) J
 - D) N/m
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6. A rigid body is:

- A) A deformable object
- B) An object which has fixed shape and size
- C) A point mass
- D) A massless particle

7. The moment of inertia of a body depends upon:

- A) Mass of the body only
 - B) Axis of rotation only
 - C) Distribution of mass and axis of rotation
 - D) Shape only
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8. The unit of moment of inertia is:

- A) $\text{kg}\cdot\text{m}/\text{s}^2$
 - B) $\text{kg}\cdot\text{m}^2$
 - C) Nm
 - D) m^2/s^2
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9. The radius of gyration is the distance from the axis of rotation to a point where:

- A) Total mass is assumed to be concentrated
 - B) Entire mass is at rest
 - C) Rotational energy becomes zero
 - D) Torque acts
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10. Which quantity is conserved in pure rolling motion without slipping?

- A) Linear momentum
 - B) Angular velocity
 - C) Mechanical energy
 - D) Rotational acceleration
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11. In pure rolling, the point of contact with the ground has:

- A) Maximum velocity
 - B) Zero velocity
 - C) Constant acceleration
 - D) Maximum acceleration
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12. Rotational kinetic energy is given by:

- A) $\frac{1}{2}mv^2$
 - B) $\frac{1}{2}I\omega^2$
 - C) $I\omega$
 - D) $\frac{1}{2}mr^2\omega^2$
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13. The angular momentum of a rotating body is:

- A) $I\omega^2$
 - B) $\frac{1}{2}I\omega^2$
 - C) $I\omega$
 - D) ω/I
-

14. A solid sphere rolls without slipping. The ratio of its rotational KE to total KE is:

- A) 1:2
 - B) 2:5
 - C) 5:7
 - D) 1:1
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15. The rotational analog of force is:

- A) Torque
 - B) Angular velocity
 - C) Moment of inertia
 - D) Angular momentum
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16. A flywheel with a larger moment of inertia:

- A) Is harder to stop
 - B) Is easier to rotate
 - C) Has lower angular momentum
 - D) Gains speed quickly
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17. The moment of inertia of a ring about its diameter is:

- A) MR^2
 - B) $\frac{1}{2}MR^2$
 - C) $\frac{1}{4}MR^2$
 - D) $\frac{1}{2}MR^2$
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18. Parallel axis theorem is used to calculate moment of inertia:

- A) About the center of mass
 - B) About a new axis parallel to the one through CM
 - C) Only for point objects
 - D) For equilibrium conditions
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19. In rotational motion, angular acceleration is defined as:

- A) Rate of change of torque
 - B) Rate of change of angular velocity
 - C) Rate of change of displacement
 - D) Rate of change of moment of inertia
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20. The torque acting on a particle is zero if:

- A) Force is perpendicular to position vector
 - B) Force and position vector are in the same direction
 - C) Force is constant
 - D) Velocity is zero
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Answer Key

- 1. C
- 2. A
- 3. A
- 4. C
- 5. A
- 6. B
- 7. C
- 8. B
- 9. A
- 10. C
- 11. B
- 12. B
- 13. C
- 14. B
- 15. A
- 16. A
- 17. C
- 18. B
- 19. B
- 20. B