Systems of Particles and Rotational Motion

Physics · Answer Key · 20 Questions

1. What is the ideal representation of a particle in physics?

A) A point mass with no size
B) A body with finite size
C) A system of interconnected particles
D) A rotating object

2. What is a key concept when considering the motion of a system of particles as a whole?

A) The center of mass
B) The total mass
C) The average velocity
D) The moment of inertia

3. An ideal rigid body is defined as a body with a perfectly definite and ____ shape.

A) unchanging
B) flexible
C) deformable
D) elastic

4. In pure translational motion, what is true for all particles of a rigid body at any instant?

A) They have the same velocity
B) They have different velocities
C) They are stationary
D) They have the same acceleration

5. What is the primary type of motion possible for a rigid body fixed along a straight line?

A) Rotation
B) Translation
C) Oscillation
D) Vibration

6. In rotation about a fixed axis, every particle of the body moves in a ____.

A) circle
B) straight line
C) spiral
D) ellipse

7. For particles on the axis of rotation, what is their linear velocity?

A) Zero
B) Maximum
C) Equal to angular velocity
D) Variable

8. The center of mass of a system of particles is defined by the equation X = (m1*x1 + m2*x2) / (m1 + m2). What does this represent?

A) The mass-weighted mean of positions
B) The average position
C) The geometric center
D) The point of maximum density

9. If two particles have the same mass, where does their center of mass lie?

A) Exactly midway between them
B) Closer to the more massive particle
C) At one of the particles
D) Outside the line connecting them

10. The motion of the center of mass of a system of particles is governed by which forces?

A) External forces only
B) Internal forces only
C) Both internal and external forces
D) Gravitational forces only

11. What is the rotational analogue of force in linear motion?

A) Torque
B) Moment of inertia
C) Angular momentum
D) Angular velocity

12. The angular momentum of a particle is defined as the vector product of its position vector and its ____.

A) linear momentum
B) linear velocity
C) mass
D) acceleration

13. What is the condition for mechanical equilibrium of a rigid body?

A) Total force is zero and total torque is zero
B) Total force is zero
C) Total torque is zero
D) Total linear momentum is constant

14. A couple is a pair of forces of equal magnitude but acting in ____ directions with different lines of action.

A) opposite
B) same
C) parallel
D) perpendicular

15. What is the definition of the centre of gravity (CG) of a body?

A) The point where the total gravitational torque is zero
B) The point where the mass is concentrated
C) The geometric center of the body
D) The point of maximum density

16. The moment of inertia (I) of a rotating body is analogous to ____ in linear motion.

A) mass
B) force
C) velocity
D) acceleration

17. The kinetic energy of a rotating body is given by K = ____.

A) 1/2 * I * ?^2
B) 1/2 * m * v^2
C) I * ?
D) m * v

18. Which of the following kinematic equations for rotational motion with uniform angular acceleration corresponds to v = v0 + at in linear motion?

A) ? = ?0 + ?t
B) ? = ?0 + ?0t + 1/2 * ?t^2
C) ?^2 = ?0^2 + 2?(? - ?0)
D) ? = d?/dt

19. Newton's second law for rotational motion about a fixed axis is given by:

A) ? = I?
B) F = ma
C) p = mv
D) L = I?

20. If the total external torque on a system of particles is zero, what happens to its total angular momentum?

A) It is conserved (remains constant)
B) It becomes zero
C) It increases linearly with time
D) It decreases linearly with time