

System of particles and rotation test

Very short answer type questions

Question 1 Define radius of gyration. Is radius of gyration of a body constant quantity?

Question 2 Does moment of inertia change with the change in axis of rotation?

Question 3 Where does the center of mass of two particle system lie, if one particle is more massive than the other?

Question 4 Give an example each for a body, where center of mass lies inside the body and outside the body?

Question 5 Do the internal forces affect the motion of a system under the effect of some external forces?

Short answer type questions

Question 6 A body A of mass M while falling vertically downwards under gravity breaks into two parts; a body B of mass $M/3$ and a body C of mass $2M/3$. How does the center of mass of bodies B and C taken together shift compared to that of body A?

Question 7 If $\vec{A} \times \vec{B} = \vec{C} \times \vec{B}$, show that \vec{C} need not be equal to \vec{A} . When will \vec{A} be equal to \vec{C} ?

Question 8 Why is a ladder more apt to slip, when you are high up on it than you just begin to climb?

Question 9 A planet moves around the sun under the effect of gravitational forces exerted by the sun. Why is the torque on the planet due to gravitational force zero?

Question 10 A particle moves in a circular path with decreasing speed. What happens to its angular momentum?

Question 11 The moment of inertia of a circular disc about a diameter is $\frac{1}{4}MR^2$ where M is the mass and R is the radius of the disc. Using this relation, find the moment of inertia about an axis passing through its center and perpendicular to its plane.

Question 12 Using expressions for power and kinetic energy of rotational motion, derive the relation $\tau = I\alpha$, where letters have their usual meaning.

Question 13 Will two spheres of equal mass, one solid and other hollow have equal moment of inertia? Explain.

Question 14 How does an ice-skater, a ballet dancer or an acrobat take advantage of the principle of conservation of angular momentum?

Question 15 State the two theorems of moment of inertia. Give an example of application of each case.