CLASS 11 PHYSICS EXTRA QUESTIONS

Class 11 Physics Chapter 6 System of Particles and Rotational Motion – Extra Questions with Answers

Extra practice questions for Class 11 Physics Chapter 6 (System of Particles and Rotational Motion), beyond the textbook. These Class 11 Physics Chapter 6 important questions are handy for last-minute exam practice.

Contents

Extra practice questions for Class 11 Physics Chapter 6 (System of Particles and Rotational Motion), beyond the textbook. These Class 11 Physics Chapter 6 important questions are handy for last-minute exam practice.

Very Short Answer Questions (1 mark)

Q1. Define torque.
Ans: Torque is the moment of force, $\tau = r \times F$, causing rotational effect.

Q2. What is the SI unit of moment of inertia?
Ans: kg m^2.

Q3. Write the formula for angular momentum.
Ans: $L = I\omega$ (or $L = r \times p$).

Q4. State the parallel axis theorem.
Ans: $I = I_{cm} + Md^2$, where d is the distance between the two parallel axes.

Q5. What is the moment of inertia of a thin rod about an axis through its centre, perpendicular to its length?
Ans: $I = (1/12)ML^2$.

Short Answer Questions (2–3 marks)

Q6. Two masses, 2 kg and 3 kg, are placed at x=0 and x=5 m. Find the position of the centre of mass.
Ans: $X_{cm} = (2(0)+3(5))/(2+3) = 15/5 = 3$ m.

Q7. A force of 10 N is applied at a perpendicular distance of 0.5 m from the axis of rotation. Find the torque produced.
Ans: $\tau = rF \sin 90° = 0.5(10)(1) = 5$ Nm.

Q8. A disc of mass 2 kg and radius 0.5 m rotates at 4 rad/s. Find its angular momentum ($I_{disc} = \frac{1}{2}MR^2$).
Ans: $I = \frac{1}{2}(2)(0.5^2) = 0.25$ kg m^2. $L = I\omega = 0.25(4) = 1$ kg m^2/s.

Higher-Order Thinking / Application Questions

Q9. A solid sphere of mass 2 kg and radius 0.1 m rolls without slipping with a linear speed of 4 m/s. Calculate its total kinetic energy, showing both translational and rotational contributions.
Ans: Translational $KE = \frac{1}{2}Mv^2 = \frac{1}{2}(2)(16) = 16$ J. For rolling without slipping, $\omega = v/R = 4/0.1 = 40$ rad/s. $I = (2/5)MR^2 = (2/5)(2)(0.01) = 0.008$ kg m^2. Rotational $KE = \frac{1}{2}I\omega^2 = \frac{1}{2}(0.008)(1600) = 6.4$ J. Total $KE = 16 + 6.4 = 22.4$ J.

Q10. An ice skater spinning with arms outstretched has moment of inertia 4 kg m^2 and angular speed 2 rad/s. When she pulls her arms in, her moment of inertia reduces to 1 kg m^2. Find her new angular speed and explain the physical principle behind this change.
Ans: By conservation of angular momentum (no external torque acts as she pulls her arms in): $I_1\omega_1 = I_2\omega_2$; $4(2) = 1(\omega_2)$; $\omega_2 = 8$ rad/s. Physically, when she pulls her arms inward, her mass redistributes closer to the rotation axis, reducing her moment of inertia. Since angular momentum $L = I\omega$ must stay constant in the absence of external torque, a decrease in I is compensated by a proportional increase in ω, causing her to

spin faster.

Class 11 Physics Chapter 6 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the Class 11 Physics Chapter 6 Solutions and Class 11 Physics Chapter 6 Revision Notes.

See also: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5 | Chapter 6

Practice more: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5

Quick revision: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5