



Sharp Test Series — Sample Paper

Chapter Test

QUESTION PAPER CODE
SMPLTHY-2026-000112

Total Questions 14	Subjects Physics	Maximum Marks 30	Time 1 Hour 30 Minutes
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Instructions

1. All questions are compulsory unless the section heading says otherwise.
2. Figures to the right indicate full marks.
3. Draw neat, labelled diagrams wherever necessary.
4. In numerical questions, write the formula, the working and the answer with units.
5. Write all your answers in the separate answer booklet.

SECTION A — Multiple Choice Questions

[5]

Attempt **all** questions. Each question carries 1 mark.

- Q.1** The theorem of perpendicular axes, $I_z = I_x + I_y$, is applicable only to [1]
(A) any three-dimensional rigid body
(B) spherical bodies
(C) plane laminar bodies
(D) bodies of uniform density
- Q.2** A body tied to a string is whirled in a vertical circle of radius r . The minimum speed it must have at the topmost point is [1]
(A) $\sqrt{g r}$ (B) $\sqrt{2 g r}$
(C) $\sqrt{5 g r}$ (D) $\sqrt{3 g r}$
- Q.3** If M is the mass of a body and K its radius of gyration about a given axis, the moment of inertia of the body about that axis is [1]
(A) $M K$ (B) $M^2 K$
(C) $M K^2$ (D) M/K^2
- Q.4** The kinetic energy of a body of moment of inertia I rotating with angular velocity ω is [1]
(A) $I \omega$ (B) $(1/2) I \omega$
(C) $I \omega^2$ (D) $(1/2) I \omega^2$
- Q.5** A stone is whirled in a vertical circle of radius 1.6 m. The minimum speed it must have at the highest point is ($g = 10 \text{ m/s}^2$) [1]
(A) 4 m/s (B) 8 m/s
(C) 16 m/s (D) 2 m/s

SECTION B — Short Answer Questions

[8]

Attempt **all** questions. Each question carries 2 marks.

- Q.6** Explain, using the principle of conservation of angular momentum, why a ballet dancer spins faster when she folds her arms close to her body. [2]
- Q.7** Distinguish between centripetal force and centrifugal force on any two points. [2]

- Q.8** The blades of a ceiling fan make 300 revolutions per minute. Calculate the angular speed of the fan and its period of revolution. [2]
- Q.9** Write the moments of inertia of a solid sphere and of a thin hollow sphere, each of mass M and radius R , about a diameter. State with reason which of the two is greater. [2]

SECTION C — Short Answer Questions

[9]

Attempt **all** questions. Each question carries 3 marks.

- Q.10** Derive the expression for the kinetic energy of a body rotating with a uniform angular velocity about a fixed axis. [3]
- Q.11** A uniform rod of mass 3 kg and length 1.2 m rotates about an axis perpendicular to its length. Calculate its moment of inertia when the axis passes through (a) its centre and (b) one of its ends. Also find its radius of gyration in case (b). [3]
- Q.12** A small body tied to the end of a string of length 0.9 m is revolved in a vertical circle. Calculate (a) the minimum speed it must have at the highest point to complete the circle, and (b) its speed at the lowest point in that case. ($g = 9.8 \text{ m s}^{-2}$) [3]

SECTION D — Long Answer Questions

[8]

Attempt **all** questions. Each question carries 4 marks.

- Q.13** A body of mass 0.2 kg tied to a string of length 1.0 m is revolved in a vertical circle. At the highest point its speed is 1.5 times the minimum speed needed there. Calculate (a) its speed at the highest point, (b) the tension in the string at the highest point, (c) its speed at the lowest point and (d) the tension at the lowest point. ($g = 9.8 \text{ m s}^{-2}$) [4]
- Q.14** State the theorem of parallel axes and the theorem of perpendicular axes for moment of inertia, and prove any one of them. [4]