

Section
8-3

HOLT PHYSICS

Concept Review

Rotational Dynamics

1. A hollow ball and a solid ball have the same mass (15.0 kg) and radius (1.5 m). Both are rotating at 750 rpm.
 - a. What is the angular speed of each ball?
 hollow _____ solid _____
 - b. What is the moment of inertia for each ball? (Hint: Refer to **Table 8-1** on page 285 of your textbook.)
 hollow _____ solid _____
 - c. What is the angular momentum of each ball?
 hollow _____ solid _____
 - d. A small frictional torque of $0.10 \text{ N}\cdot\text{m}$ is exerted on both balls. Find the angular acceleration of each ball.
 hollow _____ solid _____
 - e. Based on your answer for part d, which ball will continue to spin for a longer time?

2. A 7.3 kg bowling ball is rolled down a lane with an initial translational speed of 3.6 m/s and zero rotational speed.
 - a. What is the initial energy of the ball? _____
 - b. The radius of the ball is 12.0 cm. What is the moment of inertia of the ball? _____
 - c. When the ball reaches the pins, it has rotational and translational kinetic energy. If the ball is rolling without slipping ($v = \omega r$), what is the translational speed of the ball? (Hint: Assume the energy from part a is conserved.) _____
 - d. Frictional force makes the ball roll instead of slide. Explain how this affects the energy of the ball and how friction affects the final speed of the ball.

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