

1. A disk starts from rest and has a constant angular acceleration. If it takes a time t to make its 1st revolution, in time $2t$ (starting from rest) the disk will make
 (A) $\sqrt{2}$ revolutions (B) 2 revolutions (C) 4 revolutions (D) 8 revolutions

$\theta = \frac{1}{2} \alpha t^2 \rightarrow$ In time $2t$ it will make $2^2=4$ revolutions \rightarrow **Correct answer is B**

2. Consider a hollow sphere of radius R and mass M rolling without slipping. Which form of kinetic energy is larger, translational (K_T) or rotational (K_R)? (For a hollow sphere rotating around its axis, $I=2/3 MR^2$)

(A) K_R (B) K_T (C) They are equal (D) Depends on the linear speed

$K_R = \frac{1}{2} I \omega^2 = \frac{1}{2} (2/3 M R^2) (v^2/R^2) = 2/3 (\frac{1}{2} M v^2) = 2/3 K_T \rightarrow$ **Correct answer is B**

3. Two hollow balls, one of radius R and mass M , the other of radius $2R$ and mass $6M$, roll down an incline. They start together from rest at the top. Which one will reach the bottom first? (I is given in question 2)

(A) The small one (B) The bigger one (C) They arrive at the same time

Small one: $K_R = 2/3 (\frac{1}{2} M v^2) \rightarrow K=K_R+K_T = 5/6 M v^2$

But $K = U = Mgh \rightarrow v^2=6/5 gh$

Big one: $K_R = \frac{1}{2} (2/3 6M 4R^2) (v^2/(4R^2)) = 2Mv^2 \rightarrow K=K_R+K_T = 2Mv^2 + \frac{1}{2} (6M) v^2 = 5Mv^2$

But $K = U = 6Mgh \rightarrow v^2=6/5 gh$ (same velocity as small ball)

\rightarrow They arrive at the same time \rightarrow **Correct answer is C**

4. Two points are on a disk that rotates about an axis perpendicular to the plane of the disk at its center. Point B is 2 times as far from the axis as point A. If the linear speed of point B is V , the linear speed of point A is:
- (A) $4V$ (B) $2V$ (C) V (D) $V/2$ (E) $V/4$

$$V = \omega r \rightarrow \text{Correct answer is D}$$

5. A wheel of radius 0.5 m is spinning with constant angular velocity of 2 rad/sec. What is the centripetal acceleration of a point on the rim of the wheel?
- (A) 0.5 m/s^2 (B) 1.0 m/s^2 (C) 2.0 m/s^2 (D) 0.25 m/s^2 (E) 4.0 m/s^2

$$a = \omega^2 R = 4 * 0.5 \text{ m/s}^2 = 2.0 \text{ m/s}^2 \rightarrow \text{Correct answer is C}$$