

Q3: A child is standing with folded hands at the centre of a platform rotating about its central axis. The kinetic energy of the system is K. The child now stretches his arms so that the moment of inertia of the system doubles. The kinetic energy of the system now is

1. 2K
2. K/2
3. K/4
4. 4K

Solution:

According to the conservation of angular momentum

$$I\omega_0 = I_1\omega_1$$

So we have $I_1 = 2I$

$$\omega_1 = \omega_0 / 2$$

$$\text{Initial kinetic energy} = I\omega_0^2/2 = K$$

$$\text{Final Kinetic energy} = I_1\omega_1^2/2 = 2I(\omega_0/2)^2/2 = K/2$$

Answer: (2) K/2