

Conservations of Momentum and Energy

Unit III Assignment

I large,
 ω small



(a)

I small,
 ω large



(b)

Covered concept:
angular momentum conservation
from movie “Ice Princess”

$$L = I\omega = \text{constant}$$

I : moment of inertia
 ω : rotational velocity

(Conservation of angular momentum, n.d.)

Observed: Casey spins slower when her arms are extended and faster when her arms are drawn in.

Explanation: $I \approx mr^2$

m: mass of her arm

r: distance from the rotation axis

I is proportional to the square of r . I is greater as the length of arm increases. The spinning speed ω decreases as the length of arm increases and vice versa. That is, this phenomena can be explained by the angular momentum conservation; **$L = I\omega = \text{const.}$**

Assume: the shape of Casey is a solid cylinder with 50 kg $\rightarrow$

$I = \frac{1}{2} mr^2 = 1 \text{ [kg m}^2\text{]}$ when $r = 0.2 \text{ meter}$.

$\omega = 1 \text{ revolution/second} = 1 \times 2\pi \text{ radian/second}$

$$L = I\omega = 2\pi \text{ kg m}^2/\text{s}$$

References