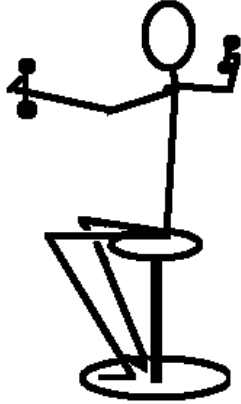


Angular momentum stool: *predict, observe, explain*

Predict: A student sits on a stool that is free to rotate around a vertical axis. The student is given two 1.0 kg weights to hold in each hand. The student stretches out his arms, and is given a counter-clockwise rotation rate of 2.0 revolutions every three seconds. He then brings his arms and the masses as close as possible to his body.



- (a) Indicate the direction of his angular momentum on the diagram above.
- (b) Assume the student and the stool combined have a mass of 100 kg (including his arms), roughly in the shape of a cylinder of radius 15 cm, and that his arms have a mass of 3.0 kg each; make a very rough approximation that his arms are point masses at the position of his elbow). How far are his elbows from his backbone, i.e. his axis of rotation? How far are the weights from his axis of rotation? What is the total moment of inertia of the student, stool, and weights with his arms and the weights outstretched?
- (c) What is his angular momentum with his arms and the weights outstretched?
- (d) What is the total moment of inertia of the student, stool, and weights with his arms and the weights tucked in at 15 cm from his backbone?
- (e) If angular momentum is conserved, how many revolutions per second should he make with his arms and the weights tucked in?

Angular momentum stool: *predict, observe, explain*

Observe: what do you observe?

Explain: If your predictions were not the same as your observations, do you understand why?