

Angular Momentum in Class Worksheet 2

Full Name, Period, AP/Honors:

0 Practice Questions

1. Two balls have masses of M and are traveling horizontally with speed v left and $2v$ right. They collide with a vertically oriented rod of mass $4M$ and length l . The masses stick near opposite ends of the rod. Find the final angular velocity and linear velocity of the system.
2. You are driving an constant velocity in a car and slam on the brakes. Does the Earth's angular momentum with respect to the sun change? Why or why not? The car is not part of Earth.
3. The Sun and Jupiter orbit the center of mass of the two objects. Jupiter's mass is about $\frac{1}{1000}$ of the mass of the Sun. Ignore all other planets. Take the center of mass to be the axis of rotation.
 - (a) Will the magnitude of the angular momentum be higher in the sun, in Jupiter, or equal?
 - (b) Will the magnitude of the linear momentum be higher in the sun, in Jupiter, or equal?
 - (c) Will most of the kinetic energy be stored in Jupiter, in the Sun, or evenly distributed?
4. Two balls are completely isolated from the rest of the universe. The objects are initially at rest in contact with each other, but not stuck together. After some time, the objects begin to rotate with equal angular velocities in opposite directions and translate with equal linear velocities in opposite directions. There are no other changes to the objects. Which conservation law, if any, would be violated?
5. You are standing on a friction-less plane. Explain how you would turn around and then move in a specific direction.
6. If a process has $\Delta\vec{p} = 0$, $\Delta\vec{L} = 0$ and $\Delta E = 0$ does this necessarily mean that the process will occur in the real world? Why or why not
7. Your friend designs a machine that uses energy acquired from a wind turbine mounted to a car to power the car. What is your comment on the design? (Note: this question is more open ended than most in this class. There is not necessarily a right answer.)