

Energy in Rotation (Inspired by Preethi Pratap):

Goal: Students will measure the energy of a rotating object. They will see that this energy can be transferred into another form. This is connected to the radiation emitted when a molecule moves from one rotation state to another.

This is a quantitative lab exercise. Students conduct the experiment, record data, make calculations, and interpret their results. This

Materials: String
 Massive bob
 Meter stick
 Stopwatch (optional)

Procedure: Students attach the string to the bob. They measure out a radius and then twirl the bob around their heads. The goal of the experiment is to measure the total rotational energy of the bob. This is done by having the student release the string and measure the distance to where the mass lands.

Note that this lab can be dangerous. I suggest students wear safety glasses and practice safely releasing the spinning bobs before doing the lab.

Students then complete the lab sheet (see worksheet #1). This activity ends with energy transformation calculations. Less advanced students will benefit from the demonstration of a sample calculation. Students seem to find determining the time spent in the air especially difficult. They need to use the equation $d = \frac{1}{2}gt^2$ along with equations: $d = vt$, $KE = \frac{1}{2}mv^2$, and $GPE = mgh$.

As a separate activity, the teacher could have the students measure the period of the bob with a stopwatch. This would provide another way to calculate the rotational energy of the bob. Students could then compare the two different calculated values for rotational

energy and see whether or not they agree. (See worksheet #2) The only additional formula need for this worksheet is $v = 2\pi R/T$.