**Your Mission: The time has finally arrived to use the metal loop-the-loop in the back of the class. Your mission will be to use your new understanding of energy (kinetic, potential, and the conservation of both) to find the correct height from which to release the ball so that it *just* makes it around the loop.**

* **Groups whose ball successfully completes the loop with their measurements will receive 2 extra credit points.**
* **The group with the lowest height (IE, the one where it just makes it around the loop) will receive 5 extra credit points.**

**In order to find your projected height, you must first calculate the velocity the ball will need to make it around the loop (remember circular motion?)**

**Measure the radius of the loop: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m**

**Find the mass of the ball: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_kg**

**Remember that, at the top of the loop, gravity and the normal force both contribute to the centripetal force**

Fg

FN

**At the minimum velocity needed to travel around the circle, *only* gravity acts on the object at the top of the loop (normal force = 0).**

**Fg= \_\_\_\_\_\_\_\_\_\_\_\_\_\_N**

**ag= \_\_\_\_\_\_\_\_\_\_\_\_\_\_m/s2**

**Knowing this, we can find the minimum velocity to complete the top of the loop, because we know that for circular motion, a=v2/R**

**v = \_\_\_\_\_\_\_\_\_\_\_\_\_\_m/s**

**Now – at the top of the loop, your ball will have some potential energy (mgh) and some kinetic energy (½mv2). Use energy conservation principles to find the total mechanical energy of the system, then find the initial height needed to create this energy.**

**Total mechanical energy = \_\_\_\_\_\_\_\_\_\_\_J**

**Height = \_\_\_\_\_\_\_\_\_m**

**This is the height where the ball will *just* make it around the loop in a perfect world, free of external forces.**

**What external forces might actually be working on the ball? In your group, come up with a way to try to figure out how much energy is lost to these external forces. You may use the motion sensors, the computers, and anything else you can find in the room (within reason). You may also do ONE trial on the loop, releasing the ball from a height of 1m.**

**Estimated amount of energy lost to external forces: \_\_\_\_\_\_\_\_\_\_\_\_J**

**Now find your new projected height by adding the energy lost to the total mechanical energy you found before, to find your final height.**

**Final Height = \_\_\_\_\_\_\_\_\_\_\_\_\_m**

**Once your group has your final height, you get *one shot* at releasing the ball. If it makes it – congratulations! If not, better luck next time.**

**Once your group has released your ball, your group should create a one page (12pt, double space) analysis detailing:**

* **The steps you took to arrive at your final height (be specific!)**
* **If it worked or not**
* **Why you believe it did/did not work**
* **Suggestions for the next time you do this procedure.**

**Each group needs to hand in ONE of these packets, plus your analysis with all group member’s names.**