**Physics**

**Ballistic Pendulum**

**When a blowgun dart hits the pendulum, it will swing to some height. If you can measure this height, you can determine the velocity of the pendulum right after the collision using conservation of energy. (1/2mv2 = mgh) Knowing the velocity of the pendulum and dart right after the collision, and the mass of the pendulum and the dart, you can determine the velocity of the dart just before the collision. (mv = (m+m)v) This device is called a ballistic pendulum, and it was how the velocity of bullets was determined before there were high speed photodiodes and timers.**

1. You will need one lab partner, (Work in groups of 2), a blowgun, a dart, and a pendulum (A target suspended on a string that will swing up to some height when the dart sticks in it)
2. **Find the mass of the pendulum, and the dart**
3. Clean the blowgun, and from a distance of at least 6 feet, with the blowgun barrel horizontal, shoot the dart into the pendulum. Discard the trial if the dart does not fly straight and stick in the pendulum.
4. **Measure how high the pendulum swings when hit by the dart.** In the olden days, this was done by having the pendulum trace its swinging path upwards on a piece of glass coated with soot. This will work on a whiteboard with marker on it, or you could use a video? of the path. This will take cleverness on your part.
5. From the height the pendulum swings, **calculate the velocity of the pendulum right after the dart hit it**. (This is a conservation of energy calculation)
6. Using the velocity of the pendulum, and the mass of both the dart and the pendulum, **calculate the velocity of the dart before it struck the pendulum**. (This is a conservation of momentum calculation)
7. Repeat this another two times for a total of three calculations. Try each time to blow with the same intensity on the dart. Discard a data point if the dart does not seem to fly straight, or if it fails to stick.

Here's what you turn in:

1. A data table with the masses you measured, and all three heights the pendulum swung.
2. Your 3 calculations of the dart velocity. Show the energy calculation first, then the momentum.