IB Physics

Measuring the Initial

Velocity of an Air Rocket

**You can measure the initial velocity of an air rocket by firing it straight up into the air and timing how long it takes to reach the earth again. This lab will be evaluated only for CE.**

**Materials:**

1. Get a launch platform, a bicycle pump, a nose cone, a rocket body, and four different sizes of thrust washers. (Super, High, Medium, and Low) Locate yourself at least 20 m from the nearest group, or hard surface.

**Design**  - (You don't need to write out a procedure)

2. Your goal is to measure the initial velocity of the air rocket as it leaves the launch pad from the time it is in the air. This is tricky because the launch is always unpredictable – so the timer’s reaction time introduces a systematic error. Clever students estimate this error and add it to the average of time. You need to decide how many trials of each washer to do, how to time, and how to correct for the timer’s reaction time. There is also random trial to trial error. (Not every launch is the same.)

**Data Collection and Processing (not evaluated for IB)**

3. •Create a nice data table for your raw data. Include in your table **labels**, **units** and **uncertainty**. You will have to calculate the uncertainty for each washer from the trials. The uncertainty for multiple trials of a washer is ± where the range is Max-Min

4. •Calculate one initial launch velocity from the **average** of your trials for each washer. It would be appropriate to add the timer’s reaction time to the average. (Remember – at **½ the total time** in the air the final velocity is 0, so you know v, a and t) •Show a formula for how you did this.

5. •Also **calculate the uncertainty of this velocity** from the uncertainty of time. (use the relation  - that the fractional uncertainty of the time is the same as that of the velocity) •Show how you did this for one instance.

6. •Create an appropriate graph to present your calculated **velocities**. (Computer generated, or by hand on graph paper…)

**Conclusion and Evaluation**

7. •Evaluate the procedure. Summarize the findings citing your velocities to make your point, noticing any trends or curious results, evaluate the procedure you used to gather data and identify maybe three sources of error, and then suggest ways to mitigate those sources of error.