Names: _____ _____ Date: _____

Cloud Chamber

1. **Construct** your cloud chamber, and take a few minutes to just **observe** particle tracks. Play around with lighting angle. Do you see evidence for different particles? Collisions (zig-zag tracks)? Decays (track-splitting)?

> *Troubleshooting:* #1 thing that goes wrong is that the dry ice is not in contact with the base of the chamber, so it is not getting cold enough to condense a good cloud layer. If you do not see a thin layer of cloud droplets, try flipping it and adding a sponge beneath to push the ice layer back up into contact with the pie plate. Other common issues are not getting an airtight seal with the plasticine, or not using enough isopropanol.

2. **Measurements:** Have one person be the timer and the other the particle counter. Record the number of "events" observed in a 20 second time interval. Repeat at least 5 times (the more data the better).

3. **Calculations:** Determine the average (mean) and the uncertainty (standard deviation) of the number of particles per 20 second interval. (*Note:* $x_1, x_2 ... x_N$ are the individual measurements, and N is the total number of measurements).

Mean: $\bar{x} = \dfrac{x_1 + x_2 + x_3 + ... + x_N}{N}$

Standard Deviation: $\sigma_x = \sqrt{\dfrac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + (x_3 - \bar{x})^2 + ... + (x_N - \bar{x})^2}{N}}$

Final Answer - The number of particle tracks observed in 20 seconds is ($\bar{x} \pm \sigma_x$):

_____ $\pm$ _____

4. **Estimate** the volume of your cloud layer:

5. **Calculate** the number of charged particles zipping through the Innovation Lab every second. Find the uncertainty on this value (to find this uncertainty, apply the same multiplication/division to the uncertainty from part 3 as you do to the mean).

Final Answer - The number of charged particles in the Innovation Lab each second is:

_____ ± _____

6. **Report** this result by writing it on the board.

Bonus: **Plot** your data from part 2 by sketching a histogram (bar graph).