Name _____ Period _____
Partner _____ Date _____

# Counting Atoms

**Pre-Lab Questions**

1. The average mass of one paper clip is 0.39 g. What is the expected mass of 100 paper clips?

2. A paper clip manufacturer finds it more efficient to package paper clips in 100-gram lots. How many paper clips would be contained in a 100-g package?

3. In designing a label for this package of paper clips, how many paper clips would you recommend the label advertise?

**Part A. Average Mass of Rice and Beans**

1. Get three weighing dishes. Count ten grains of rice into one and 20 grains into another.
2. Put the third weighing dish onto a balance and zero it out.
3. Add the ten grains of rice into the dish on the balance and record the mass. Remove them.
4. Add the 20 grains of rice into the dish on the balance and record the mass. Remove them.
5. Calculate the average mass of one rice grain in each of the two samples.
6. Add the two average masses together and divide it by two to get the "Average of the Averages".
7. Repeat using navy beans instead of rice.

**Data Table A.** ***Average Mass of Rice and Beans***
**Always discard any broken pieces of rice or beans**

| Mass | Rice | Navy beans |
|---|---|---|
| Mass of 10 pieces of… | | |
| Average mass of one "particle" | | |
| Mass of 20 pieces of… | | |
| Average mass of one "particle" | | |
| Average the two Averages above | | |

*Part B. Counting by Weighing*

1. Label two weighing dishes "A" and "B".
2. Use the average mass of a single grain of rice to calculate the predicted mass of 100 rice grains.
3. Measure out two separate samples, each with this predicted mass of rice grains, into two weighing boats.
4. *Note:* It may not be possible to obtain the exact predicted mass. Get as close as possible—whether above or below the predicted value. If you "tare" the balance with the weighing dish on it you have an easier time weighing the sample.
5. Count the actual number of rice grains in each of the two samples.
6. Repeat using navy beans instead of rice.

**Data Table B. *Counting by Weighing***

| | Mass | Rice | Navy beans |
|---|---|---|---|
| First Try | Predicted mass of 100 particles | | |
| | Actual Mass of Sample 1 | | |
| | Count the Number of particles | | |
| Second Try | Actual Mass of Sample 2 | | |
| | Count the Number of particles | | |

**Post-Lab Questions**

1. In Part A, does the average mass depend on the number of particles in the sample?

2. What are the advantages and disadvantages of weighing rather then counting 100 particles?

3. Give a possible explanation for any difference in the accuracy of the method for rice and beans.