

NAME:

# HONORS CHEMISTRY

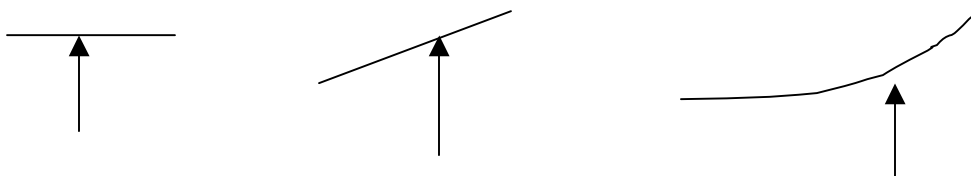
SECTION:

MINILAB: ATOMIC TARGET PRACTICE

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## Pre-Lab Questions

1. This activity is a simulation of Rutherford's scattering experiments. Read the entire procedure and compare the components used in this simulation (the marbles, the board, the unseen object, and the traced path of the marbles) to Rutherford's original experiments. What role is played by each component?
2. It is important to trace the apparent path of each marble roll, even when the marble rolls straight through without striking the unknown target. What general information about the target can be inferred based on where the marble rolls in one end and out the other?
3. The key skills in this activity, as in Rutherford's experiments, are the ability to make careful observations and to draw reasonable hypotheses. Assume that the marble strikes the following sides of a possible target. Sketch the path the marble might be expected to take in each case.



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## Materials

Black box  
2 marbles  
2 sheets of 8 ½ x 11 in paper

crayons  
tape

## Procedure

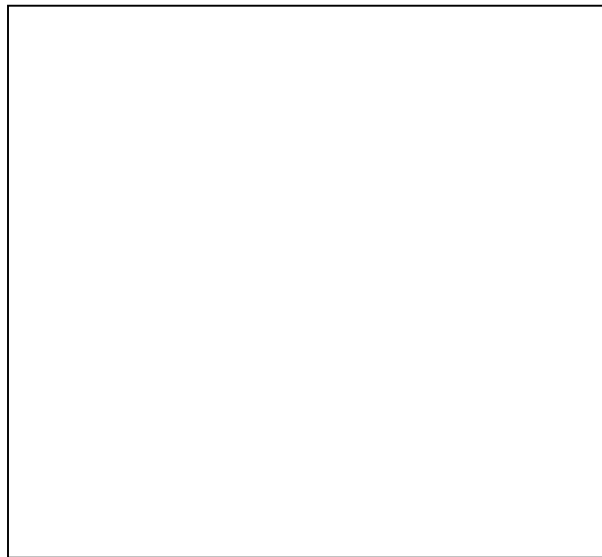
1. Tape two pieces of standard white size paper together to form an 11" square sheet.
2. Center the paper on top of a black box and tape it down to keep it in place. Record the code letter for the black box. Do not look underneath the black box!
3. Roll the marble with a moderate amount of force under one side of the black box. Observe where the marble comes out and trace the approximate path of the marble on the white paper. For example, if the marble rolls straight through, draw a straight line from one end of the sheet to the other. Note: Do not press too hard!
4. Working from all four sides of the black box, continue to roll the marble under the board, making observations and tracing the rebound path for each marble roll. Roll the marble at least 20 times from each side of the box. Vary the angles at which the marble is rolled into the box.
5. After sketching the apparent path of the marble from all sides and angles, the general size and shape of the unknown target should emerge "in the negative" from the area where there are no lines (where the marble does not penetrate).

6. Form a working hypothesis concerning the structure of the original target. Based on this hypothesis, repeat as many “targeted” marble rolls as necessary to either confirm or revise the structure.
7. Check your final results with your teacher. Do not look inside the “black box” until your teacher verifies your results.
8. If time permits, conduct a second investigation.

### Post Lab Questions

1. Draw the general size and shape of the target to approximate scale in the square below. What characteristics of the target were easiest to determine? What characteristics of the target’s shape were difficult to determine? Explain.

Shape \_\_\_\_\_



2. The speed of the marble rolls was an uncontrolled variable in this activity. How would the outcome of the scattering test have been different if the marble speed had been faster or slower?
3. Compare the overall size of the target with the size of the marble used to probe its structure. How would the outcome of the scattering test have been different if different size marbles had been used? Explain.
4. In what ways did this activity simulate Rutherford’s efforts to determine the structure of the atom? In what ways was it different? Be specific—consider the size, speed, and charge of both the particles and the target.