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| CHEMISTRY | CODE: SCS21 |
| 2014-2015 SCHOOL YEAR | INSTRUCTOR: Ms. Bui |
| CLASSROOM: 510 | LAB ROOM: 506 |

**LAB 04**

**RUTHERFORD’S EXPERIMENT**

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| Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Subject: Chemistry |

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| **PRE-LAB:**  Imagine you are a participant in a game show in which you are blindfolded. You are trying to determine the size and shape of an object located in the middle of the room. You can not move from your current position. ***Describe what actions you can take to find the size and shape of the object (use complete sentences)***  Now imagine if you were tasked with the responsibility to observe an object so small that no current devices will enable you to see the object. This was the challenge that Ernest Rutherford and his team had with studying the atoms. However, with a little ingenuity and a lot of great analysis, Ernest Rutherford and his team were able to invalidate the current atom model (the Plum Pudding Model) and establish the existence of the nucleus and the proton (positively charged subparticle).  **Gold Foil Experiment Summary:**  Alpha particles were shot at a gold foil in a dark room. A zinc sulfide screen was placed behind the foil and was used to record the flash of light each time the alpha particles hit it. This enabled the scientist to indirectly determine the path of the particle. |

**Lab Rubric**

Teacher’s Grade:

* Participation (20 points):
* On Task (20 points):  
  Understanding (20 points):
* Accuracy (20 points):

Lab Partner’s Grade:

* Lab Partners (20 points): (you may each give up to 20 points the grade you think this person deserve for contributing to the lab project. I will review and make a determination from there.
  + Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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  + Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Your Reflection (how did I perform)\_\_\_\_\_\_\_\_\_\_\_

**Materials:**

Phet Simulation Model

Marbles – 16

16 unlined white paper (16 x 5 = 70)

1 cardboard cover with a hidden object (8)

Pencils - 8

Rulers - 8

**Part 1: Simulation Observation and Analysis**

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| **Atomic Model** | **Question** | **Observations (written or drawn with labels)** |
| **Plum Pudding Model:**  According to the Plum Pudding Model: the atom is a large positively charged body with small free-floating negatively charged particles (electrons). In addition, the negative charge is equal to the positive charge and as a result, the charge is canceled. | 1. Describe the Atom. |  |
| 2. What happens when alpha particle (positively charge particles) are shoot at the atom. |  |
| 3. What do you conclude about the nature of the atom based on this model? |  |
| **Rutherford Model:**  Rutherford then hypothesized that if this was true, then the electron should flow straight through. | 1. Describe the atom |  |
| 2. What happens when alpha particle (positively charge particles) are shoot at the atom. |  |
| 3. Was Rutherford’s hypothesis correct? Why or why not? |  |

**Part II: In this part of the lab, you will be performing your own version of the experiment.**

**Procedure**

1. Pin the paper to the top of the cardboard (do not look under the board)

2. Roll the marble with a moderate amount of force under one side of the board. Draw the path of the marble on your white paper.

3. Continue steps 2 at all 4 sides of the cardboard. Roll at least 20 times from each side of the cardboard. Make sure to roll from different angles on each side.

4. Based on the data you collected, create your own hypothesis:

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5. Repeat as many targeted marble rolls to test your hypothesis.

**Post Lab**

1. Draw the general size and shape of the target to approximate scale in the box below. After you have done this, call your teacher over.

**Diagram 2: Actual Layers**

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?

**Post Lab Questions**: (all responses should be in complete sentences)

1. Compare your experiment to the Rutherford Experiment (look at the Gold Foil summary above in the pre-lab section). What do the marbles, unknown object and drawn paths represent?
2. Was your hypothesis correct? Why or why not? Explain in 2-5 sentences.
3. How did you use indirect observations to make the determination of the size and shape of your hidden object? Explain in 2-5 sentences.