**Rutherford Scattering—Building the Model of the Atom**

Initial set-up: Go to<https://phet.colorado.edu/en/simulation/rutherford-scattering> and click on the simulation to launch. Then, click on “Rutherford Atom.”

Part A: Testing Gold and Other Elements

1. In Rutherford’s experiment, he used radioactive Uranium, in addition to magnetic deflection, to create a source of alpha particles.
2. You will now test the interaction listed in the data table below of various atoms with these alpha particles with varying levels of energy. You will observe the interactions of the alpha particles most clearly by checking the “trace” box to better see the path of the particles. As you are describing, make sure to use terms like repulsion, attraction and bending and to observe what the majority of the particles are doing.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Protons | Number of Neutrons | Identity of metal element | Alpha Particle Energy | Interactions of Particles |
| 79 | 118 | Gold | Min |  |
| 79 | 118 | Gold | Halfway |  |
| 79 | 118 | Gold | Max |  |
| 20 | 20 | Calcium | Min |  |
| 20 | 20 | Calcium | Halfway |  |
| 20 | 20 | Calcium | Max |  |

Part B: Analysis

1. Compare all of your trials:
   1. What did the majority of the alpha particles do?
   2. What charge must the alpha particle have based on it’s interactions with a positive nucleus? Explain how you can tell.
2. Compare the three levels of energy of the alpha particle for gold. Give your best explanation why there were different interactions between the alpha particle and the nucleus.
3. Did the paths for the Calcium atom with max, halfway and min alpha particles exhibit the same changes as the gold atom?
4. Compare the paths taken by all of the alpha particles for calcium vs. gold.
5. What were the differences?
6. How would Rutherford’s experiment have been different if he used Calcium? Explain.
7. Summarize: What did Rutherford prove about the atom from this experiment?