Lab 1: Rutherford Scattering

1. Describe briefly JJ Thomson's model of the structure of the atom. Draw a labelled diagram.

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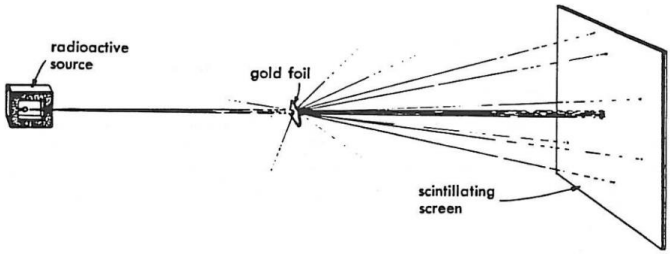
Ernest Rutherford investigated the deflection of alpha radiation as it passed through very thin gold leaf. He hypothesized that atoms had a small positive charge concentrated in the center. Together with his students Geiger and Marsden, at the University of Manchester, he conducted an experiment to test this hypothesis.



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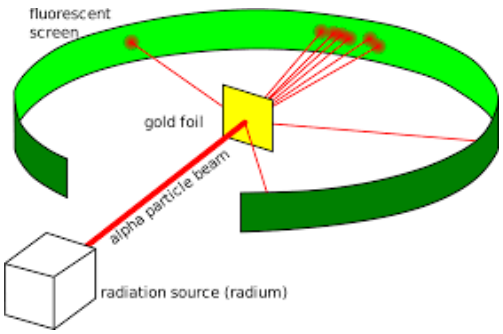
2. Describe the Alpha Scattering Experiment.



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Go to. https://phet.colorado.edu/sims/html/rutherford-scattering/latest/rutherford-scattering_en.html

When the new window pops up, select the "**Plum Pudding Atom**". Turn on the alpha particles (blue button). Click "Traces" box.

3. Which model of the atom does this represent?

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4. What type of path do the Alpha particles take? How does altering the energy of the alpha particle effect the direction of the paths?

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Select the "**Rutherford Atom**". Turn on the alpha particles. Click "Traces" box.

5. The gold leaf experiment is set up and the atoms are shown with electron shells. What type of paths do most of the Alpha particles take?

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6. **Compare** the paths of the alpha particles in this model and the Plum Pudding atom.

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7. How does altering the energy of the alpha particle effect the direction of the paths?

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8. Why do you think that our model of the atom changed after Rutherford's experiment?

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Select the nucleus box  . Turn on the alpha particles. Click "Traces" box.

Alpha particles have a +2e charge (2 x 1.6×10^{-19} C) and gold nuclei have a +79e charge.

9. Vary the energy of the alpha particles. Do any of the alpha particles collide with gold nuclei? What law appears to be describing the paths of the alpha particles?

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10. Describe the energy of an alpha particle as it approaches and is deflected by a gold nucleus.

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11. What would have happened if neutrons had been used in Rutherford's experiment? Explain your answer.

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12.
    a. What would have happened if aluminum had been used instead of gold in the alpha scattering experiment? Explain your answer.

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    b. Test your hypothesis by using the Atom box to change the metal (use the periodic table)

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13. How do you think Rutherford was able to estimate the size of the gold nucleus?

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14. What three properties of the nucleus can be deduced from the Rutherford scattering experiment? Explain your answer.

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References

https://spark.iop.org/collections/rutherfords-experiment