

# Experiment

## The Scattering Experiment

### Instructions

1. Read the document.
2. Carry out the experiment and collate the data.
3. Write your conclusion and evaluation using the prompt questions provided.

### Aim

To recreate Rutherford’s experiment to develop a deeper understanding of the Rutherford model of the atom.

### Theory

In 1911, Rutherford carried out an alpha particle scattering experiment, which prompted him to suggest a new model of the atom.

In this experiment his assistants, Geiger and Marsden, fired alpha particles at a very thin gold foil and monitored the trajectories of alpha particles as they passed through. It was expected that most alpha particles would pass through without deflection, due to the “plum pudding” model of the atom which was accepted at the time.

Rutherford made the following observations:

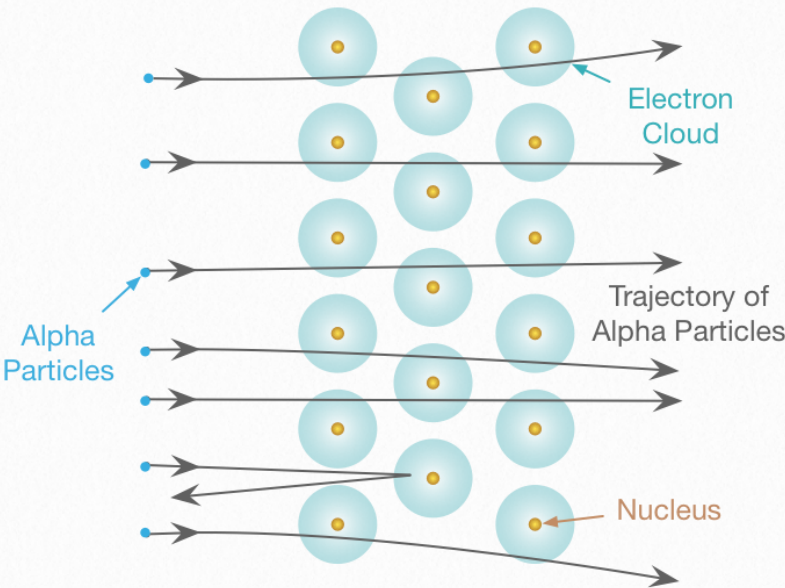
1. About 99% of the alpha particles pass straight through the foil, without deflection.
2. Some of the alpha particles are deflected through small angles
3. A very small number (1 in every 8000) of the alpha particles rebound off the gold foil and deflected by more than 90°.

Based on these observations, he made the following conclusions about the structure of the atom:

1. Most of the atom is made up of free space, if most particles pass through undeflected.
2. The nucleus of the atom is positive, if the positive alpha particles were deflected by repulsion.
3. Most of the mass of the atom is concentrated in the very small nucleus, if the force of collision is enough to cause a rebound of the alpha particle.

### Apparatus

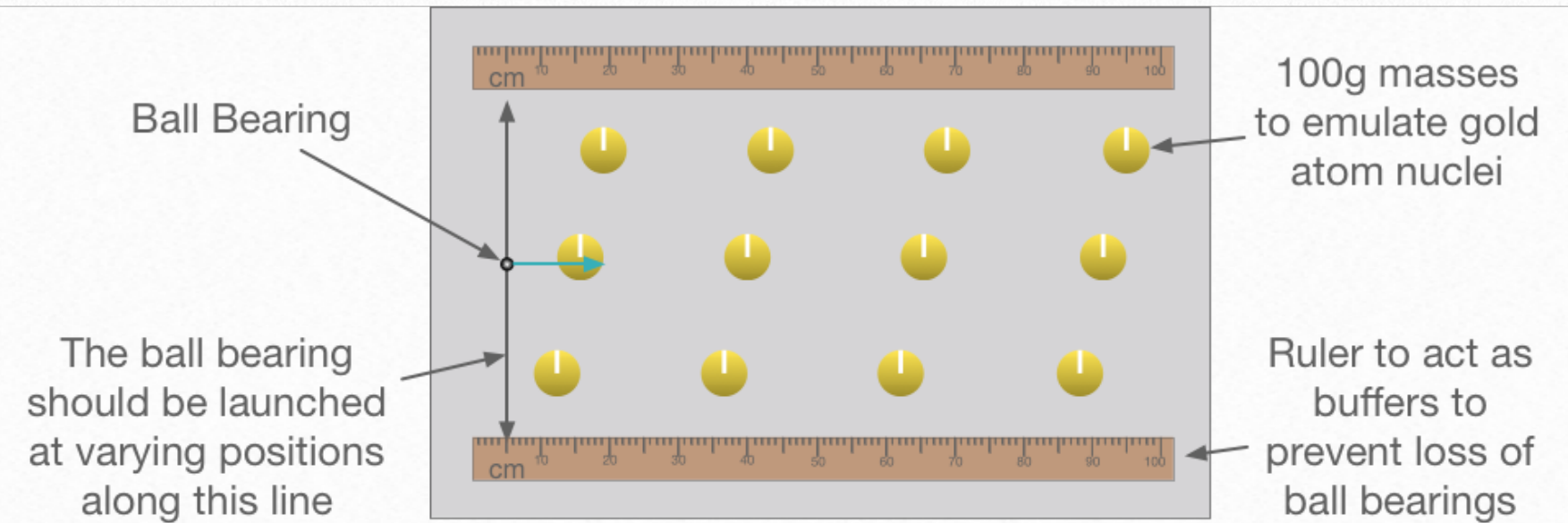
Required Resources	
12 x 100g Masses	Small Ball Bearing
2 x Meter Ruler	Small Ramp





# Experiment Continued

## Diagram



## Method

1. Set up the apparatus shown. This apparatus models the gold foil used in Rutherford’s scattering experiment. The 100g masses emulate the gold atom nuclei and it is only a few atoms thick.
2. The small ball bearing acts as the alpha particles being fired at the “gold foil”.
3. Roll the ball bearing towards the “gold foil”
4. Record, using a tally mark in the table below, the direction the ball bearing travelled.
5. Repeat this and launch the ball from different positions between the two meter rulers.
6. Take at least 100 readings to ensure a large enough sample size.

## Data

Direction of Ball Bearing	Number of Ball Bearings
Passes straight through, without deflection	
Experiences deflection, to the left	
Experiences deflection, to the right	
Experiences complete rebound	

## Graph

Plot a pie chart to represent the data

## Conclusion

1. What conclusion can be made from the data?
2. Do these results match the conclusions made by Earnest Rutherford?

## Evaluation

1. What could be changed about this scattering experiment to more closely emulate Rutherford’s experiment, using school laboratory equipment.