

# 9<sup>th</sup> Class

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## ➤ Rutherford's Alpha Scattering Experiment:

### 1. Background:

- The experiment was conducted by Sir Ernest Rutherford, Hans Geiger, and Ernest Marsden in 1909 at the University of Manchester.
- The prevailing model at the time was Thomson's Plum Pudding Model, which suggested that the positive charge in an atom was uniformly distributed.

### 2. Experimental Setup:

- Rutherford directed a stream of alpha particles (helium nuclei) at a thin gold foil.
- The gold foil was chosen because it could be made extremely thin, allowing most of the alpha particles to pass through.

### 3. Expectations:

- Based on the Plum Pudding Model, it was expected that the alpha particles would experience minimal deflection, as the positive charge was thought to be spread uniformly throughout the atom.

### 4. Surprising Results:

- Contrary to expectations, a small fraction of alpha particles underwent large-angle deflections or even bounced back.
- This unexpected result suggested that there was a small, dense, positively charged center in the atom responsible for deflecting the alpha particles.

### 5. Conclusions:

- Rutherford concluded that the majority of an atom is empty space, and the positive charge is concentrated in a tiny, dense nucleus at the center.
- Electrons orbit the nucleus at a distance.

### 6. Nuclear Model of the Atom:

- Rutherford's findings led to the development of the nuclear model of the atom.
- In this model, the nucleus contains protons (positively charged particles), and electrons orbit the nucleus at a distance.

### **7. Significance:**

- Rutherford's experiment revolutionized the understanding of atomic structure.
- It provided experimental evidence for the existence of a nucleus, which was not anticipated by the prevailing models of the time.

### **8. Limitations:**

- Rutherford's model couldn't explain the stability of electrons in orbit around the nucleus, as accelerated charged particles are expected to emit radiation and lose energy.

### **9. Subsequent Developments:**

- Rutherford's work paved the way for the development of the Bohr model, which explained the stability of electron orbits through quantization of energy levels.

### **Conclusion:**

Rutherford's Alpha Scattering Experiment played a crucial role in reshaping the atomic model, moving from Thomson's Plum Pudding Model to the nuclear model. It laid the foundation for further advancements in atomic theory and quantum mechanics.