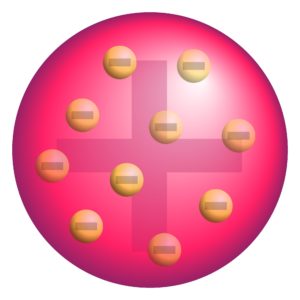
### ENGLISH ASSIGNMENT-2

## **Thomson’s Atomic Model**

In 1898, J. J. Thomson proposed the first of many atomic models to come. He proposed that an atom is shaped like a [sphere](https://www.toppr.com/guides/maths/surface-areas-and-volumes/sphere/) with a radius of approximately 10-10m, where the positive charge is uniformly distributed. The electrons are embedded in this sphere so as to give the most stable electrostatic arrangement.



Thomsons’ atomic model

Doesn’t the figure above remind you of a cut watermelon with seeds inside? Or, you can also think of it as a pudding with the electrons being the plum or the raisins in the pudding. Therefore, this model is also referred to as the **watermelon model**, **the** **plum pudding model**or **the raisin pudding model**.

An important aspect of this model is that it assumes that the mass of the atom is uniformly distributed over the atom. Thomson’s atomic model was successful in explaining the overall neutrality of the atom. However, its propositions were not consistent with the results of later experiments. In 1906, J. J. Thomson was awarded the Nobel Prize in physics for his theories and experiments on electricity conduction by gases.

**Contributions:**

**🡺**He did groundbreaking work in conduction of electricity in gases

🡺Sir J J Thomson discovered the electron

🡺His cathode ray experiments aided the invention of the first televisions

🡺He discovered the first evidence of different isotopes in a stable element

🡺His treatise on the motion of vortex rings is a seminal text on the subject

🡺He was the first to explain Thomson scattering

🡺Thomson proposed the plum pudding model of the atom

🡺His lectures foreshadowed Einstein’s quantum theory of light

🡺J J Thomson made vital contributions to mass spectrometry

🡺He vastly influenced the work of other Nobel prize winning physicists

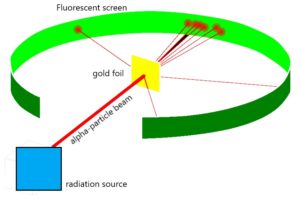
## **Rutherford’s Atomic Model**

The second of the atomic models was the contribution of Ernest Rutherford. To come up with their model, Rutherford and his students – Hans Geiger and Ernest Marsden performed an experiment where they bombarded very thin gold foil with α-particles. Let’s understand this experiment.

## α-Particle Scattering Experiment

### Experiment

In this experiment, high [energy](https://www.toppr.com/guides/physics/work-and-energy/energy-and-types-of-energy/) α-particles from a radioactive source were directed at a thin foil (about 100nm thickness) of gold. A circular, fluorescent zinc sulfide screen was present around the thin gold foil. A tiny flash of [light](https://www.toppr.com/guides/science/light-shadows-and-reflections/light-and-shadows/) was produced at a point on the screen whenever α-particles struck it.

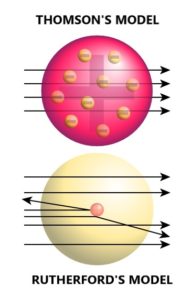


Rutherford’s alpha-particle scattering experiment

### Results

Based on Thomson’s model, the mass of every atom in the gold foil should be evenly spread over the entire atom. Therefore, when α-particles hit the foil, it is expected that they would slow down and change directions only by small angles as they pass through the foil. However, the results from Rutherford’s experiment were unexpected –

* Most of the α-particles passed undeflected through the foil.
* A small number of α-particles were deflected by small [angles](https://www.toppr.com/guides/maths/understanding-elementary-shapes/types-of-angles/).
* Very few α-particles (about 1 in 20,000) bounced back.



Thomson’s model versus Rutherford’s model

### Conclusions of the α-scattering experiment

Based on the above results, Rutherford made the following conclusions about the structure of the atom:

* Since most of the α-particles passed through the foil undeflected, most of the space in the atom is empty.
* The deflection of a few positively charged α-particles must be due to the enormous repulsive [force](https://www.toppr.com/guides/physics/force-and-pressure/force-and-its-effects/). This suggests that the positive charge is not uniformly spread throughout the atom as Thomson had proposed. The positive charge has to be concentrated in a very small volume to deflect the positively charged α-particles.
* Rutherford’s calculations show that the volume of the nucleus is very small compared to the total volume of the atom and the radius of an atom is about 10-10m, while that of the nucleus is 10-15m.

**Contributions:**

## 🡺**He discovered the principle of half-life and applied it to radiometric dating**

## **🡺Rutherford discovered that atoms were not indestructible**

## **🡺He formulated the Rutherford model of the atom in 1911**

## **🡺Ernest Rutherford discovered the atomic nucleus**

## **🡺He discovered the proton in 1917**

## **🡺He theorized the existence of the neutron**

## **🡺He is known as the father of nuclear physics**

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