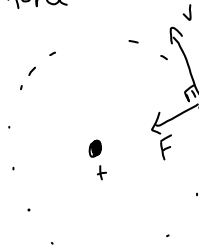


What are the electrons doing in the nuclear model?

- In the Thomson model, the electrostatic forces of repulsion between the positive matter spread throughout the atom is balanced by the attraction to the negative electrons embedded in it.
- In the Rutherford model, all the positive matter is concentrated in a tiny nucleus \rightarrow the electrons are separated from it
- The electrons cannot be stationary or they would fall into the nucleus due to electrostatic attraction.
- Rutherford proposed that the electrons must orbit the nucleus and that the electrostatic force provides the centripetal force.



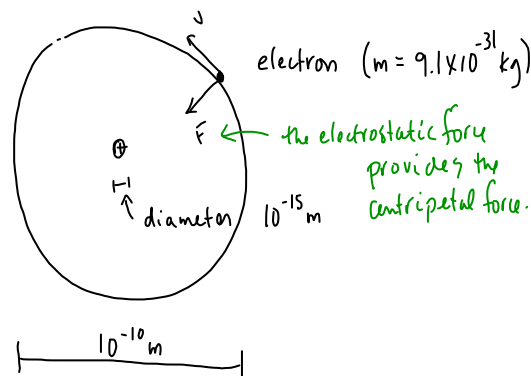
The Rutherford model of the atom (Nuclear model)

In 1911 Rutherford proposed his model as a result of the Geiger Marsden experiment.

- small positive nucleus (diameter $\sim 10^{-14}$ m)
- the nucleus contains most of the mass
- surrounded by negative electrons orbiting the nucleus which are held in orbit by the electrostatic Coulomb force of attraction between the electrons + nucleus.
- diameter of atom $\sim 10^{-10}$ m
- atom is mostly empty space.

For hydrogen:

$$m(\text{proton}) = 1.7 \times 10^{-27} \text{ kg}$$



Limitations of the simple (Rutherford) model of the nuclear atom.

1. The electrons are accelerating



accelerating charges radiate energy



electrons would radiate energy and spiral into the nucleus



unstable atom

2. The forces between positive components of nucleus are very large due to them being close together



In Thomson model, everything was held together by electrons balancing thing out.



In the Rutherford model, what balances this out since electrons are far away from nucleus.