

CHEMISTRY STUDY MATERIALS FOR CLASS 9

(NCERT based Study Materials)

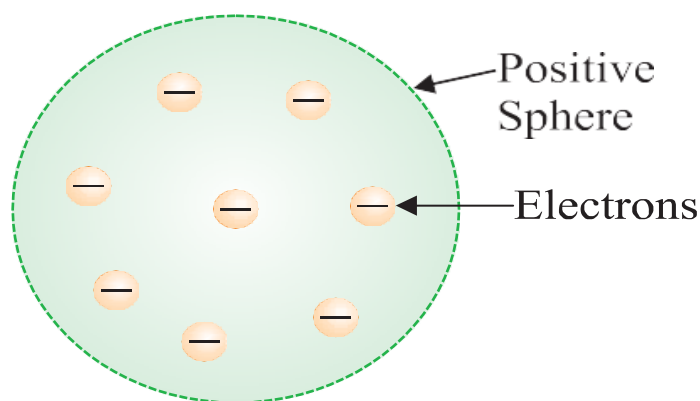
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Structure of Atom

Thomson's Atomic Model

- This model is often called the 'Water Melon Model'.
- In this model, Thomson predicted the presence of electrons inside positive sphere (made up of protons), just same as seeds of watermelon are embedded in red edible part of watermelon.



J. J. Thomson's Model of Atom

Conclusions of the Thomson model of the atom.

- An atom is a uniform sphere of positive charges (due to presence of protons) as well as negative charges (due to presence of electrons).
- Atom as a whole is electrically neutral because the negative and positive charges are equal in magnitude.
- An electron is a negatively charged component of an atom which exists outside the nucleus. Each electron carries one unit of negative charge and has a very small mass as compared with that of a neutron or proton.

Limitations of Thomson model of the atom.

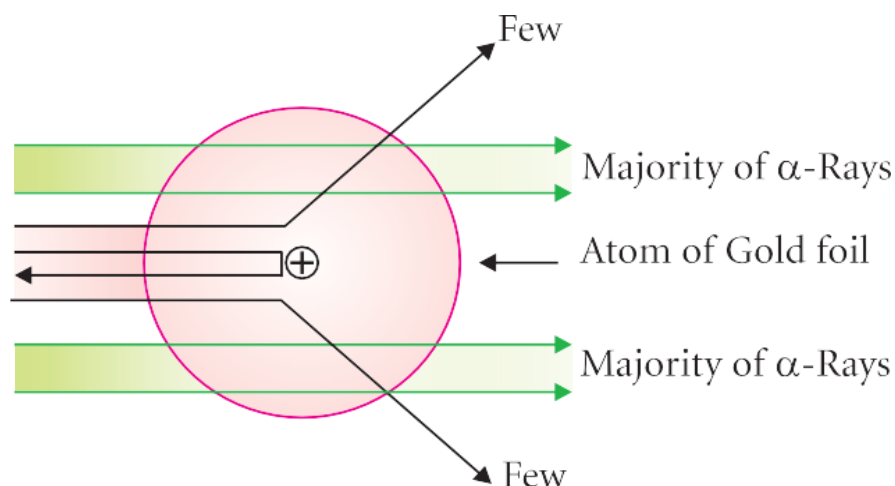
- Although this model explained neutrality of atom but couldn't able to explain other scientific experiments conducted on atom. Hence it was discarded.
- Model failed to explain how protons and electrons were arranged in atom so close to each other.

Rutherford's Atomic Model

- In his famous 'alpha -ray Scattering Experiment', Rutherford bombarded alpha-ray (Helium nucleus ${}^2\text{He}^4$) upon thin gold foil.

Observations of Rutherford model of atom:-Rutherford made following observations from this experiment :

- (i) Most of alpha-particles passed through gold foil undeflected.
- (ii) Some of the alpha-particles deflected by foil by small angles.
- (iii) One out of every 12000 particles appeared to rebound by 180° .



Rutherford α -ray Scattering Experiment

Conclusions of Rutherford model of atom:-From his observation, Rutherford draw following conclusions :

- (i) Atom consists of predominantly empty space as most of alpha-particles passed through gold foil undeflected.

- (ii) Atom contains centrally placed positively charged nucleus (carrying positively charged particles), because few alpha-particles suffered deflected and very few *i.e.*, one in 12000 bounced back.
- (iii) Since a minute fraction of α -particles suffered deflections and very few bounced back, this lead to conclusion that most of the space an atom is empty and the space occupied by nucleus is negligible compared to this empty space. Size of nucleus was about 10^{25} times that of size of atom.
- (iv) Whole of the atomic mass concentrated in the nucleus.

Rutherford nuclear model of atom:-On the basis of his experiment, Rutherford proposed model of atom having following features :

- (i) There is positively placed nucleus in an atom. Nearly all the mass resides in nucleus (Proton + Neutron).
- (ii) Electrons revolve round the nucleus in well defined orbits.
- (iii) Size of nucleus is very small compared to the size of atom.

Drawbacks of Rutherford's Model (Unstability of Atom)

- According to Rutherford, electrons revolve round the nucleus in well- defined orbits, but electrons being charged particles will lose their energy and finally will fall into the nucleus. This will make atom highly unstable.
- This was the major drawback of Rutherford which was unexplained by him.

