

CHEMISTRY STUDY MATERIALS FOR CLASS 9

(NCERT based Study Materials)

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Structure of Atom

Discovery of Electrons – Cathode Rays (By J. J. Thomson)

Thomson explained presence of electrons by cathode rays experiment.

1. J J Thomson Experiments:

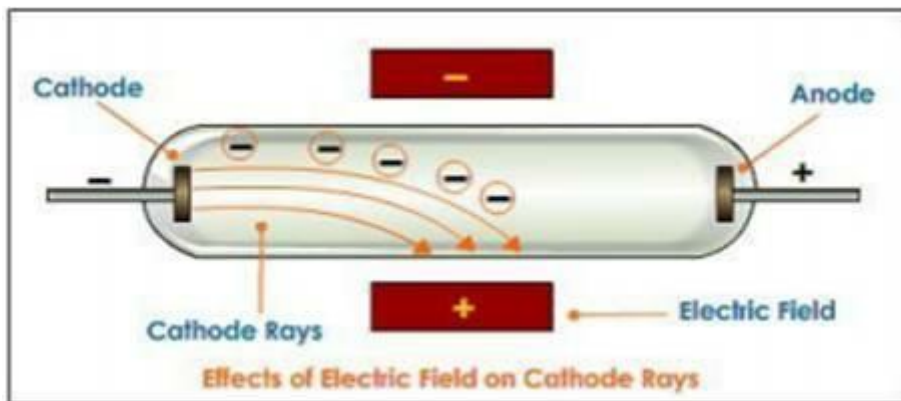
SCIENTIST	PROPOSED ATOMIC MODEL
<p data-bbox="204 840 730 920">Joseph John Thomson British Physicist and Nobel laureate</p> 	<p data-bbox="896 891 1264 920">PLUM –PUDDING MODEL</p> 

Discovered electrons in 1897.

- Showed us that the atom can be split into even smaller parts.

J.J.Thomson used cathode ray tubes to demonstrate that the cathode ray responds to both magnetic and electric fields.

Since the ray was attracted to a positive electric plate placed over the cathode ray tube (beam deflected toward the positive plate) he determined that the ray must be composed of negatively charged particles. He called these negative particles "electrons."



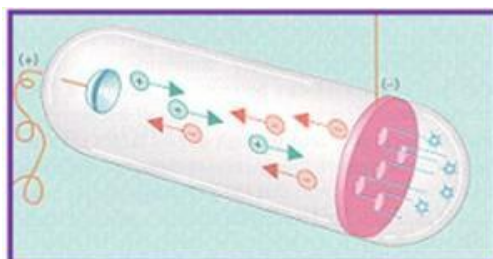
Facts about Electrons

- Charge on electron = $- 1.6 \times 10^{-19} \text{ C}$ (C = Coloumb)
(As calculated by Robert E. Millikan)
- Mass of electron = $9.1 \times 10^{-31} \text{ kg}$

Discovery of Protons – Anode Rays/Canal Rays (By E. Goldstein)

E. Goldstein by his famous anode rays/canal rays experiment was able to detect presence of positively charged particles called protons in the atom.

Eugene Goldstein in 1886 discovered the presence of new radiations in a gas discharge and called them canal rays. These rays were positively charged radiations which ultimately led to the discovery of another sub-atomic particle.



- Used a Cathode Ray Tube to study "canal rays" which had electrical and magnetic properties opposite of an electron
- Canal Rays: The positively charged radiation produced in the discharge tube at low pressure and high voltage are called canal rays.

Protons:- The canal rays have positively charged sub-atomic, particles known as protons (p).

Facts about Protons

- Charge on proton = $+ 1.6 \times 10^{-19} \text{ C}$
- Mass of proton = $1.673 \times 10^{-27} \text{ kg}$
i.e., Mass of proton / 1840 = Mass of electron

Discovery of Neutrons (By J. Chadwick)

- J. Chadwick bombarded lighter elements (like lithium, boron etc.) with alpha-particles and observed emission of new particles having zero charge but having mass equal to that of proton.
- These particles were called 'Neutron' *i.e.,* neutral particle of the atom.
- Neutrons are absent in Protium isotope of hydrogen atom. (${}_1\text{H}^1$)
- Since, mass of electrons are negligible as compared to that of proton and neutrons hence, sum of masses of protons and neutrons in an atom will compose its atomic mass.

Atomic Models

- From the knowledge of existence of subatomic particles viz., electron, proton and neutron in an atom, various atomic models were proposed by different scientists.
- Following are some of the atomic models :
 - (a) Thomson's Model of Atom
 - (b) Rutherford's Model of Atom
 - (c) Bohr's Model of Atom
- The most trusted and scientifically established model of atom which is adopted these days is 'Quantum Mechanical Model of Atom'. It will be dealt in higher classes.
