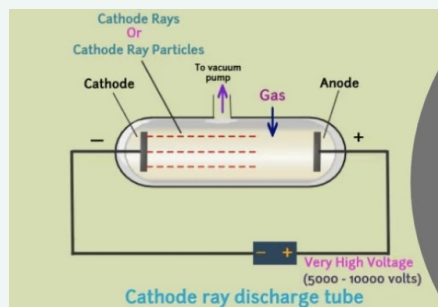


DISCOVERY OF SUB ATOMIC PARTICLES



DISCOVERY OF ELECTRON

Michael Faraday in 1850s used Cathode Ray discharge tube to study electrical discharge

Between electrodes voltage applied -10000V

Pressure reduced- 10^{-4} atm/(0.01mm)

Phosphorescent Material like zinc sulphide used on glass wall behind anode to observe the emitted rays from cathode

when a perforated anode is used glow between electrode disappears but current continues to flow a faint greenish glow is observed on the glass wall due to the rays emitted by cathode which pass through the holes of anode.

these rays are called Cathode rays due to their origin.

Characteristics of Cathode Rays

they travel in a straight line

they consist of material particles as they show mechanical effects

they consist of electrons

they show heating effect

they produce x rays

they cause ionization of gas through which they pass

they affect the photographic plates

Characteristics of Cathode Rays (cont)

they possess penetrating effect

These characteristics were concluded as a result of various experiments performed by JJ Thomson (1897) and others.

CHARGE AND MASS OF ELECTRON

CHARGE TO MASS RATIO

**CHARGE ON THE ELECTRON:
Milikan's Oil Drop Exp.

By measuring the amount of deflections the electric field strength or magnetic field strength Thomson calculated the value of the ratio

$$e/m_e = 1.758 \times 10^{11} \text{ C kg}^{-1}$$

Using an atomiser small drops of oil are allowed to fall between 2 electrically charged plates

Milikan observed the rate of their fall as to measure mass of these droplets

$$m_e = e/e/m_e = 1.6022 \times 10^{-19} \text{ C} / 1.75882 \times 10^{11} \text{ C kg}^{-1}$$

$$m_e = 9.1094 \times 10^{-31} \text{ kg}$$

CHARGE AND MASS OF ELECTRON (cont)

Using x-ray he ionised the gas inside the chamber the mass $9.11 \times 10^{-28} \text{ g}$ is nearly $1/1837^{\text{th}}$ of the hydrogen atom

because of the collisions with gaseous ions their droplets now had electrical charge on them.

By observing the effects of electrical field strength on the motion of oil droplets milikan concluded that the magnitude of electrical charge q , on the droplets is always an integral multiple of the electrical charge, e .

i.e. $q = ne$ where $n =$ integer sub as 1,2,3...



By Purvanshee (purvanshee)

cheatography.com/purvanshee/

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CHARGE AND MASS OF ELECTRON

(cont)

the value of this charge is -1.6022×10^{-19} or 4.8×10^{-10} esu

esu is the smallest measurable quantity of charge and is called one unit.



By **Purvanshee** (purvanshee)

cheatography.com/purvanshee/

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