

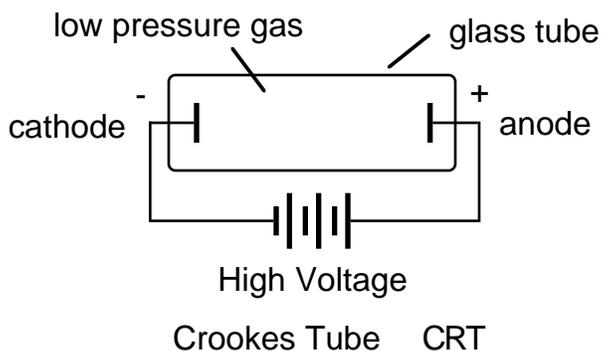
## History of Chemistry 2 : Notes-50

Mendeleev knew of 63 elements, so his table had gaps in it. He thought that the gaps contained elements that had not yet been discovered, and he even predicted the properties of some of these undiscovered elements. He was correct.

By 1900, Lord Raleigh discovered argon, and William Ramsey discovered several other noble gases; neon, krypton and xenon. They are found in small amounts in the air. Mendeleev had not known about these elements. Helium was discovered in natural gas. Eventually other metals were discovered that filled the gaps in Mendeleev's table.

Between 1870 and 1930, many discoveries were made about the atom.

1875 Sir William Crookes invented the Crookes tube. The tube contains a gas at a low pressure ( $< 1$  Pascal).



Using his tube, Crookes discovered cathode rays. The rays; were small negatively charged particles emitted by the cathode, traveled in straight lines, could be stopped by cardboard, and they could also be deflected by a magnet

1895 Wilhelm Roentgen discovered that X-rays are emitted from cathode ray tubes.

1896 Henri Becquerel discovered radioactivity.

1897 J.J. Thomson used a CRT (cathode ray tube) to show that the cathode rays were small negatively charged particles that were found in all atoms. He discovered the electron.

- 1903 Thomson came up with a new model of the atom. The atom consisted of a positively charged ball with negatively charged electrons embedded in it. This is sometimes called the "Raisin Muffin" (or "Plum Pudding") model.
- 1907 Ernest Rutherford showed that alpha particles were helium nuclei (heavy compared to electrons).
- 1911 Rutherford showed that most alpha particles (emitted by radioactive radium) would pass through a thin sheet of gold foil (< 1000 atoms thick). Some would be deflected through large angles. From this, Rutherford assumed that;
- a) most of the mass of the atom, is contained in a small massive (contains 99.9% of the atom's mass) positively charged nucleus.
  - b) the light, negatively charged electrons move around the nucleus.
  - c) most of the atom consists of empty space.
- This was known as the planetary model of the atom.
- 1913 H.G.J. Moseley used X-rays to show that the elements should be arranged in a table according to atomic number, not atomic mass. He showed that all elements have a unique atomic number.
- 1913 Niels Bohr discovered the shell model of the atom. Electrons move about the nucleus in specific orbits. Higher orbits have higher energy.
- 1920 By this time, the proton was known to exist, and that it was a part of all atoms.
- 1932 James Chadwick discovered the neutron. It was assumed to exist earlier.