Introduction – Atomic Structure

Lecture – 1

TDC PART – I

Paper - I (Group - B)

Chapter - 4

by:

Dr. Navin Kumar,

Assistant Professor (Guest Faculty)

Department of Electronics

L.S. College, BRA Bihar University, Muzaffarpur.

Electronic and structural Properties of an Atom

- An atom is composed of two regions: the nucleus, which is in the canter of the atom and contains protons and neutrons, and the outer region of the atom, which holds its electrons in orbit around the nucleus.
- Protons and neutrons have approximately the same mass, about 1.67 × 10-24 grams, which scientists define as one atomic mass unit (amu) or one Dalton.
- Each electron has a negative charge (-1) equal to the positive charge of a proton (+1).
- Neutrons are uncharged particles found within the nucleus.

Atomic Particles

Atoms consist of three basic particles: protons, electrons, and neutrons. The nucleus (center) of the atom contains the protons (positively charged) and the neutrons (no charge). The outermost regions of the atom are called electron shells and contain the electrons (negatively charged). Atoms have different properties based on the arrangement and number of their basic particles. The hydrogen atom (H) contains only one proton, one electron, and no neutrons. This can be determined using the atomic number and the mass number of the element (see the concept on atomic numbers and mass numbers).

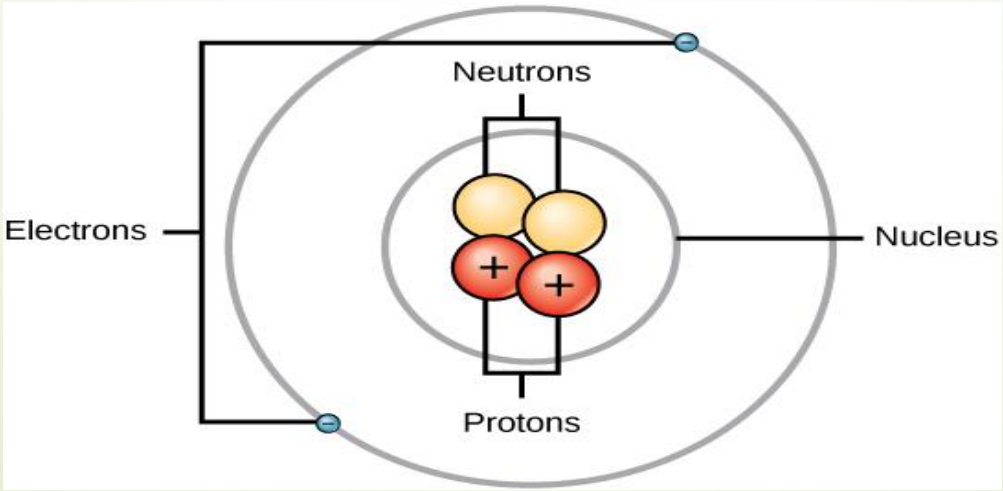


Fig-1, Lecture-1

Atomic Mass

-Protons and neutrons have approximately the same mass, about 1.67×10^{-24} grams

- Electrons are much smaller in mass than protons, weighing only 9.11×10^{-28} grams, or about 1/1800 of an atomic mass unit. Therefore, they do not contribute much to an element's overall atomic mass

Protons, Neutrons, and Electrons			
	Charge	**Mass (amu)**	**Location**
Proton	+1	1	nucleus
Neutron	0	1	nucleus
Electron	–1	0	orbitals

Fig-2, Lecture-1

Discovery of Subatomic Particles

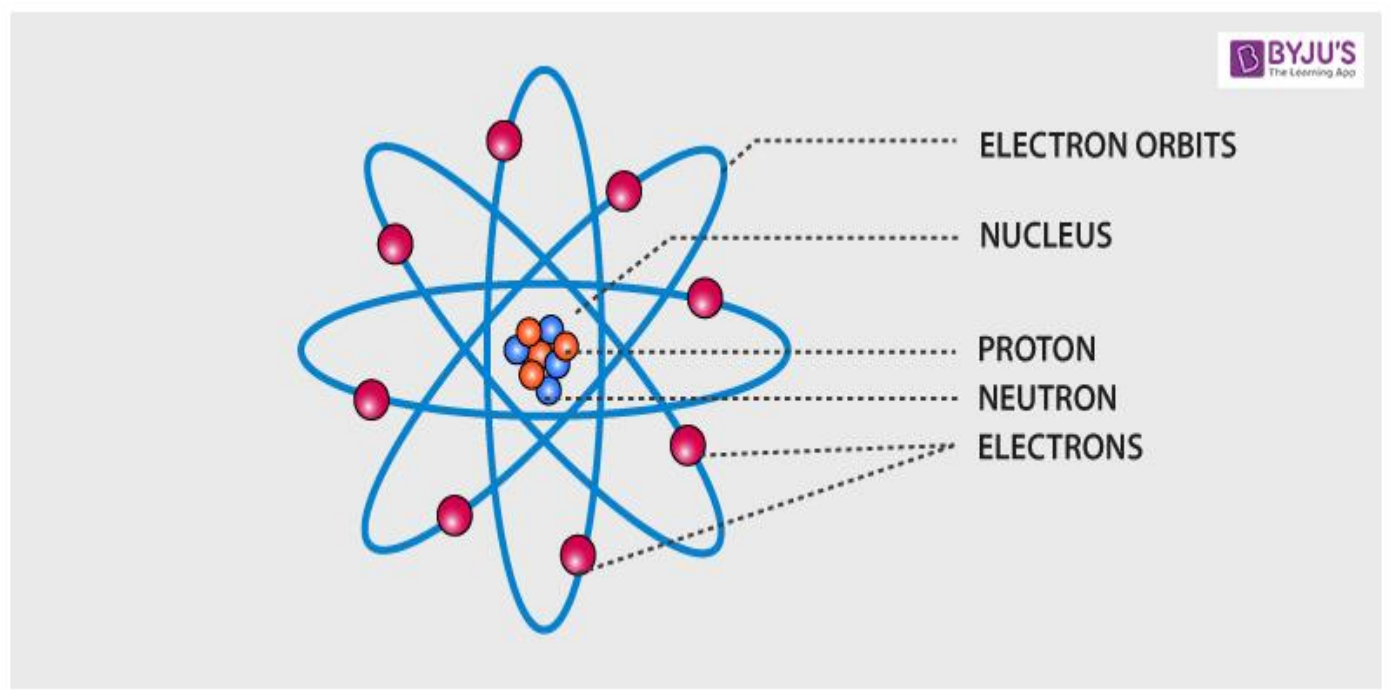


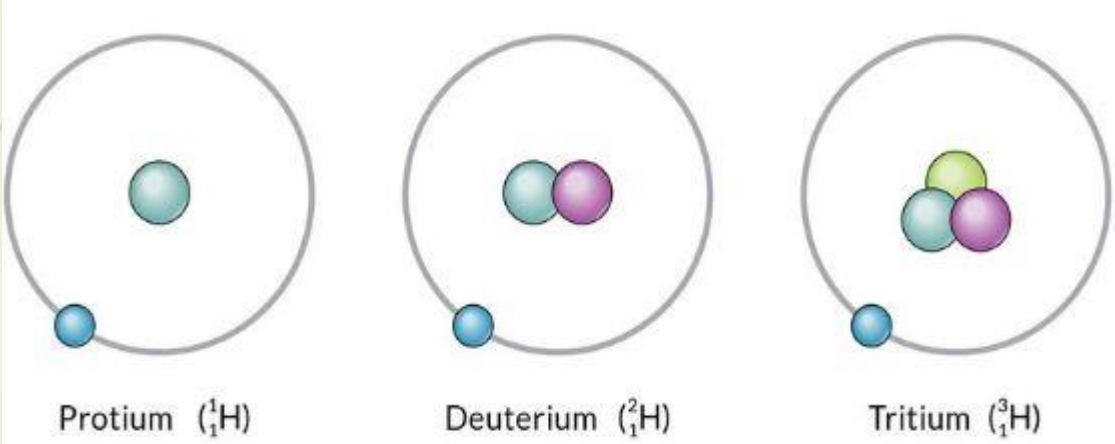
Fig-3,Lecture1 The Structure of Atom – Electrons, Protons and Neutrons

Dalton's Atomic Theory
The English chemist John Dalton suggested that all matter is made up of atoms, which were indivisible and indestructible. He also stated that all the atoms of an element were exactly the same, but the atoms of different elements differ in size and mass.

Thomson Atomic Model
The English chemist Sir Joseph John Thomson put forth his model describing the atomic structure in the early 1900s.He was later awarded the Nobel prize for the discovery of "electrons". His work is based on an experiment called cathode ray experiments

Rutherford Atomic Theory

Atomic Structure of Isotopes



The atomic structure of an isotope is described with the help of the chemical symbol of the element, the atomic number of the element, and the mass number of the isotope. For example, there exist three known naturally occurring isotopes of hydrogen, namely, protium, deuterium, and tritium. The atomic structures of these hydrogen isotopes are illustrated below.

Some Frequently asked

MCQs

1. In 1903 who had proposed the model of an atom, due to which electrons and protons were known to us?

A. Dalton
B. J.J. Thomson
C. Rutherford
D. Goldstein

Ans. B

2. Which model of an atom is similar to a Christmas pudding?

A. Thomson's model
B. Rutherford model
C. Dalton's Model
D. None of the above

Ans. A

3. The present concept of the structure of an atom is given by which scientist?

A. Rutherford
B. Goldstein
C. Niels Bohr
D. J.J. Thomson

Ans. C

Some Frequently asked

MCQs

4. Name an atom in which the nucleus of that atom does not contain any neutrons?

A. Oxygen
B. Hydrogen
C. Phosphorous
D. Sodium

Ans. B

5. Which model does not able to explain the stability of an atom?

A. Bohr's Model
B. Rutherford's Model
C. Thomson's Model
D. None of the above

Ans. B

6. According to Goldstein's experiment, on passing high voltage electricity through gases at very low pressure resulted in the discovery of:

A. Electron
B. Proton
C. Nucleus
D. Neutron

Ans. B

7. Who had discovered electron?

A. Niels Bohr
B. E. Goldstein
C. J.J.Thomson
D. James Chadwick

Ans. A

Thank you