Marwari college Darbhanga

Subject---physics (Hons)

Class---. B. Sc. Part 3

Paper –06 ; Group – A

Topic---Structure of Nuclei (Nuclear physics)

Lecture series – 51

By:- Dr. Sony Kumari,

Assistant professor

Marwari college Darbhanga

Structure of Nuclei

The Nucleus

The **atomic nucleus** is the central area of the atom. It is composed of two kinds of subatomic particles: protons and neutrons.

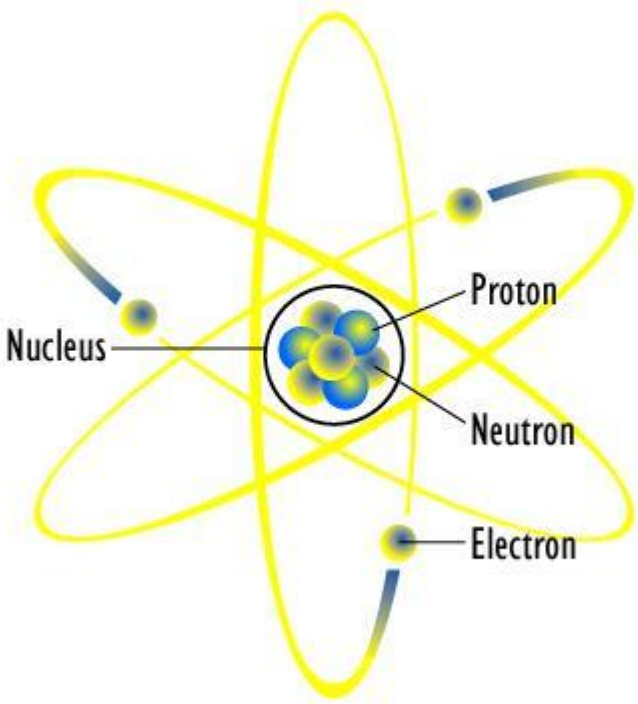

Diagram showing the atomic structure with the protons and neutrons held together to form the dense area of the nucleus

Atoms are the building blocks of all matter. Everything you can see, feel and touch is all made of atoms. There are even things you cannot see, feel, hear or touch that are also made of atoms. Basically, everything is made up of atoms.

In 1909, Ernest Rutherford led Hans Geiger and Ernest Marsden through what is known as the Gold Foil Experiments. During the experiments they would shoot particles through extremely thin sheets of gold foil. In 1911, Rutherford came to the conclusion that the atom had a dense nucleus because most of the particles shot straight through, but some of the particles were deflected due to the dense nucleus of the gold atoms. This theory would eliminate the idea that the atom was structured more like plum pudding. The plum pudding model was the leading model of atomic structure until Rutherford's findings.

Atomic Numbers

The atomic nucleus is in the center of the atom. The number of protons and neutrons in the atom define what type of atom or element it is. An **element** is a bunch of atoms that all have the same type of atomic structure. For instance, hydrogen is an element.

The composition of the atomic nucleus gives us lots of information about the element it represents. The number of protons inside the nucleus gives us the **atomic number**. The **protons** have a positive (+) charge. In order for the atom to have a neutral charge, the electrons (-) need to balance it out with their negative charge. Therefore, in a **neutral atom** there are just as many protons as electrons. So, if you know the atomic number and know the charge of the atom then the number of electrons is easy to find. For instance, hydrogen has 1 proton, 1+, so in order for the hydrogen atom to be neutral

it must have 1- charge. Therefore, hydrogen has 1 electron.

Where do the neutrons fit in all of this? Well, **neutrons** are neutral. To keep it all straight I use the first letters: **N**eutrons are **N**eutral, and **P**rotons are **P**ositive. I then remember **E**lectrons through the process of **E**limination.

Although the neutrons do not give the atom any charge, they still hold their own weight in the importance of the atomic structure. The neutron is the largest of the subatomic particles. When you put the neutrons and protons together we get the **atomic mass**. The electrons are so small that their mass only counts for .01%. The electrons are not inside of the nucleus; instead they are flying around like crazy on the outside of the nucleus.

Since the atomic number gives us the number of protons in an atom and the atomic mass gives us the number of protons and neutrons, we can find the number of neutrons by subtracting the atomic number from the atomic mass.

Atomic mass - atomic number = number of neutrons.