**Bohr’s Atomic Model**  
  
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**Postulates of Bohr’s Atomic Model**  
  
The main postulates of Bohr’s Model are given below:  
1. Electrons revolve around the nucleus in a fixed orbit.  
2. As long as electron revolves in a fixed orbit it does not emit and absorb energy. Hence energy of electron remains constant.  
3. The orbit nearest to the nucleus is the first orbit and has lowest energy. When an electron absorbs energy it jumps from lower energy orbit to higher energy orbit. Energy is emitted in the form of radiations, when an electron jumps from higher energy orbit to lower energy orbit. The unit of energy emitted in the form of radiations is called quantum. It explains the formation of atomic spectrum.  
4. The change in energy is related with the quantum of radiation by the equation :  
E2 – E1 = hv  
where  
E1 = Energy of first orbit  
E2 = Energy of the second orbit  
h = Planck’s constant  
v = Frequency of radiation

**Dalton’s Atomic Theory**  
  
The important postulates of Dalton’s atomic theory are:  
1. All elements are composed of atoms. Atom is too small so that it could not be divided into further simpler components.  
2. Atom cannot be created nor destroyed in any chemical reactions.  
3. Atoms of an element are similar in all respects. They have same mass and properties.  
4. Atoms of different elements combine in a definite simple ratio to produce compounds.  
 **Discovery of Electron**  
  
A discharge tube is a glass tube. It has two electrode, a source of electric current and a vacuum pump.  
(Diagram)  
Sir William Crooks (1895 performed experiments by passing electric current through gas in the discharge tube at very low pressure. He observed that at 10-4 (-4 is power to 10) atmosphere pressure, shining rays are emitted from cathode. These rays were named cathode rays. Cathode rays are material particles as they have mass and momentum.  
  
**Properties of Cathode Rays**  
  
The properties of these particles are given below:  
  
1. These particles are emitted from cathode surface and move in straight line.  
2. The temperature of the object rises on which they fall.  
3. They produce shadow of opaque object placed in their path.  
4. These particles are deflected in electric and magnetic fields.  
5. These particles are deflected towards positive plate of electric field.  
  
**Discovery of Proton**  
  
Gold Stein (1886) observed that in addition to the cathode rays, another type of rays were present in the discharge tube. These rays travel in a direction opposite to cathode rays. These rays were named positive rays. By using perforated cathode in the discharge tube the properties of these rays can be studied. Positive rays are also composed of metered particles. The positive rays are not emitted from anode. They are produced by the ionization of residual gas molecules in the discharge tube. When cathode rays strike with gas molecule, electrons are removed and positive particles are produced.  
  
**Properties of Positive Rays**  
  
1. They are deflected towards negative plate of electric field. Therefore these rays carry positive charge.  
  
2. The mass of positive rays is equal to the mass of the gas enclosed in the discharge tube.  
3. The minimum mass of positive particles is equal to the mass of hydrogen ion (H+). These positive ions are called Protons.  
4. The charge on proton is equal to +1.602×10-19 Coulomb. (-19 is power of 10)  
  
**Natural Radioactivity**  
  
The phenomenon in which certain elements emit radiation which can cause fogging of photographic plate is called natural radioactivity. The elements which omit these rays are called radioactive elements like Uranium, Thorium, Radium etc. There are about 40 radioactive elements. Henri Bequrel (1896) discovered radioactivity.Madam Curei also has valuable contribution in this field.  
In natural radioactivity nuclei of elements are broken and element converted to other elements. Natural radioactivity is nuclear property of the elements.  
  
**Alpha Rays**  
  
1. They are helium nuclei. They are doubly positively charged, He2+.  
  
2. They move with speed equal to the 1/10th of the velocity of the light.  
3. They cannot pass through thick-metal foil.  
4. They are very good ionizer of a gas.  
5. They affect the photographic plate.  
  
**Beta Rays**  
  
1. They are negatively charged.  
2. They move with the speed equal to the velocity of light.  
3. They can pass through a few millimeter thick metal sheets.  
4. They are good ionizer of a gas.  
5. They can affect the photographic plate.  
  
**Gamma Rays**  
  
1. They are electromagnetic radiations.  
2. They travel with speed equal to velocity of light.  
3. They carry no charge.  
4. They have high penetration power than alpha and beta rays.  
5. They are weak ionizer of gas.  
  
**Rutherford Experiment and Discovery of Nucleus**  
  
Lord Rutherford (1911) and his coworkers performed an experiment. They bombarded a very thin, gold fail with Alpha particles from a radioactive source. They observed that most of the particles passed straight through the foil undeflected. But a few particles were deflected at different angles. One out of 4000 Alpha particles was deflected at an angle greater than 150.  
(Diagram)  
  
**Conclusion**  
  
Following conclusions were drawn from the Rutherford’s Alpha Particles scattering experiment.  
1. The fact that majority of the particles went through the foil undeflected shows that most of the space occupied by an atom is empty.  
2. The deflection of a few particles over a wide angle of 150 degrees shows that these particles strike with heavy body having positive charge.  
3. The heavy positively charged central part of the atom is called nucleus.  
4. Nearly all of the mass of atom is concentrated in the nucleus.  
5. The size of the nucleus is very small as compared with the size of atom.  
  
**Defects of Rutherford Model**  
  
Rutherford model of an atom resembles our solar system. It has following defects:  
1. According to classical electromagnetic theory, electron being charged body will emit energy continuously. Thus the orbit of the revolving electron becomes smaller and smaller until it would fall into the nucleus and atomic structure would collapse.  
2. If revolving electron emits energy continuously then there should be a continuous spectrum but a line spectrum is obtained.  
(Diagram)  
  
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**Atomic Number**  
  
The number of protons present in the nucleus of an atom is called atomic number or proton number. It is denoted by z. The proton in the nucleus of an atom is equal to number of electrons revolving around its nucleus.  
  
**Mass Number**  
  
The total number of the protons and neutrons present in the nucleus of an atom is called mass number. The protons and neutrons together are called nucleon. Hence it is also known as nucleon number. It is denoted by A. the number of neutrons present in the nucleus of an atom is rperesented by N.  
Mass Number = No of Protons + No of neutrons  
A = Z + N  
  
**Isotopes**  
  
The atoms of same elements which have same atomic number but different mas number are called Isotopes. The number of protons present in the nucleus of an atom remains the same but number of neutrons may differ.  
**Isotopes of Different Elements**  
  
**Isotopes of Hydrogen**  
Hydrogen has three isotopes:  
1. Ordinary Hydrogen or Protium, H.  
2. Heavy Hydrogen or Deutrium, D.  
3. Radioactive Hydrogen or Tritium, T.  
  
**Protium**  
Ordinary naturally occurring hydrogen contains the largest percentage of protium. It is denoted by symbol H. It has one proton in its nucleus and one electron revolve around the nucleus.  
Number of Protons = 1  
Number of Electrons = 1  
Number of Neutrons = 0  
Atomic Number = 1  
Mass Number = 1  
  
**Deutrium**  
Deutrium is called heavy hydrogen. The percentage of deutrium in naturally occuring hydrogen is about 0.0015%. It has one proton and one neutron in its nucleus. It has one electron revolving around its nucleus. It is denoted by symbol D.  
Number of Proton = 1  
Number of Electron = 1  
Number of Neutrons = 1  
Atomic Number = 1  
Mass Number = 2  
  
**Tritium**  
Radioactive hydrogen is called tritium. It is denoted by symbol T. The number of tritium isotope is one in ten millions. It has one proton and 2 neutrons in its nucleus. It has one electron revolving around its nucleus.  
Number of Proton = 1  
Number of Electron = 1  
Number of Neutron = 2  
Atomic Number = 1  
Mass Number = 3