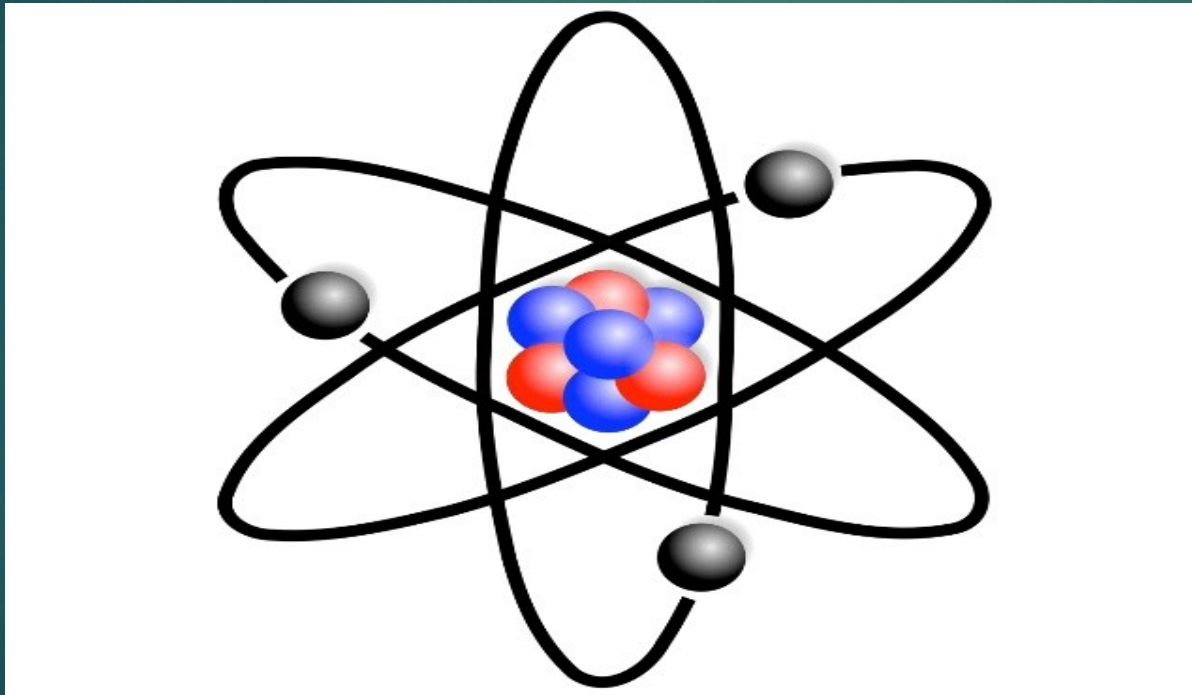


ATOMIC ENERGY



ATOMIC STRUCTURE

- ▶ *Elements consists of thin bits of matter called as atoms.*

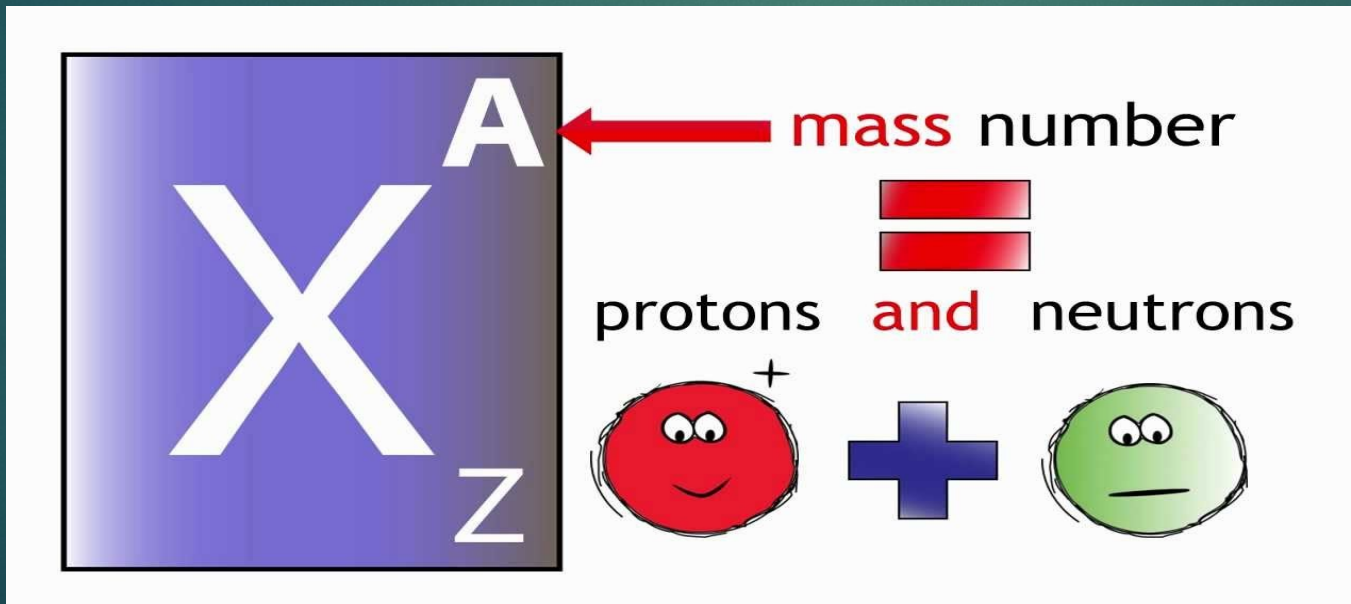
DEFINITION

An atom is defined as the smallest indivisible particle of an element that can take part in the chemical reaction.

- ▶ *The atoms can join together and chemical units are formed they are called as molecules.*
- ▶ *Example; water molecule H₂O.*
- ▶ *The protons and neutrons are clustered at the center of the atom ,called the nucleus.*

ATOMIC NUMBER AND MASS NUMBER

- ▶ The number of protons in an atom is equal to the number of electrons and is called as the atomic number.
- ▶ The sum of the protons and the neutrons present in the nucleus is called as the mass number.



Conti...

- ▶ ISOMER:

- ▶ This is an excited state of nucleus and it will have same number of proton and neutron.

- ▶ ISOBARS:

- ▶ Nuclides having the same mass numbers but different number of protons are called isobars.

- ▶ ISOTONES:

- ▶ Nuclides having same number of neutrons but different number of protons are called as isotones.

- ▶ ISOTOPES:

- ▶ The atoms composed of nuclei with the same number of protons but different number of neutrons are called as isotopes.

X - rays

- ▶ *X-radiation (composed of X-rays) is a form of electromagnetic radiation.*
- ▶ *Most X-rays have a wavelength ranging from 0.01 to 10 nanometers , corresponding to frequencies in the range 30 to 30 exahertz.*
- ▶ *X-ray wavelengths are shorter than those of UV rays and typically longer than those of gamma rays.*

PROPERTIES OF X- RAYS

- ▶ X-rays are electromagnetic radiations of shorter wave length.
- ▶ In free space they travel in the straight line.
- ▶ X-rays cannot be focused on a same point.
- ▶ They cannot be heard.
- ▶ They cannot be smelt.
- ▶ They cannot be reflected , refracted and deflected by magnetic field or electric field.
- ▶ X-rays can penetrate into solids , liquids and gases.
- ▶ An X-RAY is capable of producing an can photographic image.
- ▶ They are not influenced by magnetic filed.
- ▶ X –rays produce chemical changes in substances through which they pass.

PRODUCTION OF X-RAYS

- ▶ **X-rays** are produced due to sudden deceleration of fast moving electrons when they collide and interact with the target anode.
- ▶ In this process of deceleration, more than 99% of the electron energy is converted into heat and less than 1% of energy is converted into X-rays.
- ▶ The moving electron possesses the kinetic energy.
- ▶ When the movement of electron is stopped its kinetic energy is converted into heat and X-rays.

RADIOACTIVITY

- ▶ Radioactivity is a nuclear phenomenon, was first discovered by Henri in 1896. unit is Becquerel(Bq).
- ▶ Radioactivity is the process by which a nuclei undergo disintegration and emits either alpha or beta or gamma radiations.
- ▶ During this process the atom changes its atomic number and chemical identity.
- ▶ An atom with unstable nuclei and perform radioactivity is called radioisotope.
- ▶ Radio activity can be natural or artificial.
- ▶ The elements having atomic number more than 82 is the natural isotopes.
- ▶ The elements having atomic number less than 82 is the artificial isotopes.

PROPERTIES OF GAMMA RAYS

- ▶ Gamma, γ -rays are not deflected by electric and magnetic fields. It shows that they do not have any charge.
- ▶ Gamma, γ -rays are electromagnetic waves like X-rays. The wavelength of γ -ray photon is smaller than that of X-rays.
- ▶ The rest mass of a Gamma, γ -ray photon is zero.
- ▶ Gamma, γ -rays travel with the speed of light.
- ▶ Gamma, γ -rays have very large penetrating power. They can pass through several centimeter of iron and lead.

Conti...

- ▶ Gamma, γ -rays affect a photographic plate more than β -particles
- ▶ Gamma, γ -rays can knock out electrons from the surface of a metal, on which they may fall.
- ▶ Gamma, γ -rays can produce nuclear reactions.
- ▶ Gamma, γ -rays have got small ionizing power.

HALF LIFE PERIOD

- ▶ The half life of a radio active element is defined as the time taken for half the number of atoms to disintegrate.

BIOLOGICAL EFFECTS:

- ▶ When X-ray passes through the human body , they transfer energy to the atoms and release electrons.
- ▶ This will release in the breakage of chemical bonds and production of free radicals such as DNA and RNA.
- ▶ Thus the body experiences damage to the eyes , erythema and sterility .

RADIATION MEASURING DEVICES

▶ GENERAL PURPOSE SURVEY METERS:

- ▶ portable radiation monitors used for a wide range of radiation measurement applications; used to measure radiation levels, quantify surface contamination, detect X-ray leakage, conduct contamination surveys.

▶ ELECTRONIC DOSIMETERS:

- ▶ instruments used to measure and record radiation doses received by individuals and monitor environmental dose rate levels.
- ▶ Indicate radiation dose rates in real time, store dose rate histories for subsequent download, and activate alarms in high radiation fields.

CONTI...

SEARCH INSTRUMENTS OR PRD'S:

- ▶ Personal radiation detectors (PRDs), and instruments designed for the search and localization of radioactive material.
- ▶ Highly-sensitive portable devices used to detect and search for radiation sources either passively or actively.

PORTAL MONITORS:

- ▶ Large, fixed radiation detectors for monitoring entrances or transport infrastructure for the entry/passage of radioactive and nuclear materials. Can be configured to monitor trucks, railways, cars or pedestrians.

Conti...

▶ PORTABLE SPECTROMETERS:

Devices able to distinguish and identify different radioactive isotopes, often multipurpose/multitask instruments used to perform a variety of functions and detect different forms of radiation.

▶ RADON MEASUREMENT:

Instruments for evaluation of radon and thoron gas concentrations in homes, workplaces, construction sites, public buildings, measure radon levels in air, soil and water.

