Atom :

The smallest portion of an element, that retain all of the properties of the element.

{Diameter (1/100,000,000 cm.)}

The number atoms in 1 gram– atom is 6.0235×10^{23} (Avogadro number) .

Element :

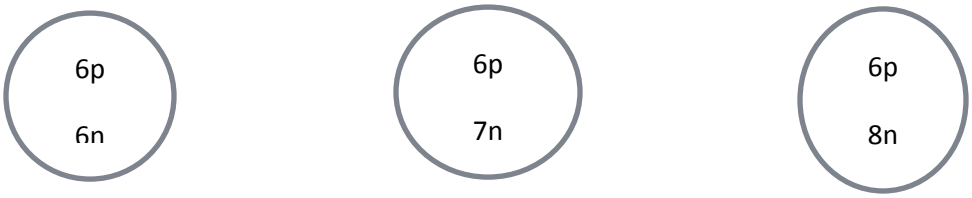
Element are the building blocks of all matter.

An element can be defined as a substance that cannot be broken down into any simpler substance by ordinary chemical means.

(E.g. oxygen, iron) .

Isotopes :

Atoms of an element having the same atomic number but different mass number .



Mass number =12 Mass number =13 Mass number =14

* Three isotopes of carbon , atomic number 6.

Radioisotopes in medicine :

Iodine -131 :

This isotopes is used in the diagnosis and treatment of thyroid conditions .

Technetium -99m :

Tc^{99m} (m for metastable) is one of the most widely used radioisotopes for various types of scans.

Cobalt - 60:

This radioisotopes is employed in the treatment of many different types of cancer.

Radioactivity :

Radioactivity is the property of emitting radiation from the nucleus of an atom.

The three types of radiation are :

1- alpha particles are positively charged helium nuclei.

2- beta particles are high speed electrons and are negatively charged .

3- gamma rays are a high - energy from electromagnetic radiation and have no charge .

De Broglie equation :

De Broglie concluded that electrons might have wavelength by first combining tow relationships, one derived by Einstein, the other by plank.

Einstein showed that the total energy E of any particle is proptional to its mass M, the proportionality constant being the square of the speed of light in a vacuum, c, or

$E = mc^2$ (energy of particle of mass m)

The plank relationship relating the energy of a wave to its frequency has already

$E = h\upsilon$ (energy of a wave of frequency)

$mc^2 = h\upsilon$ υ : wave of frequency

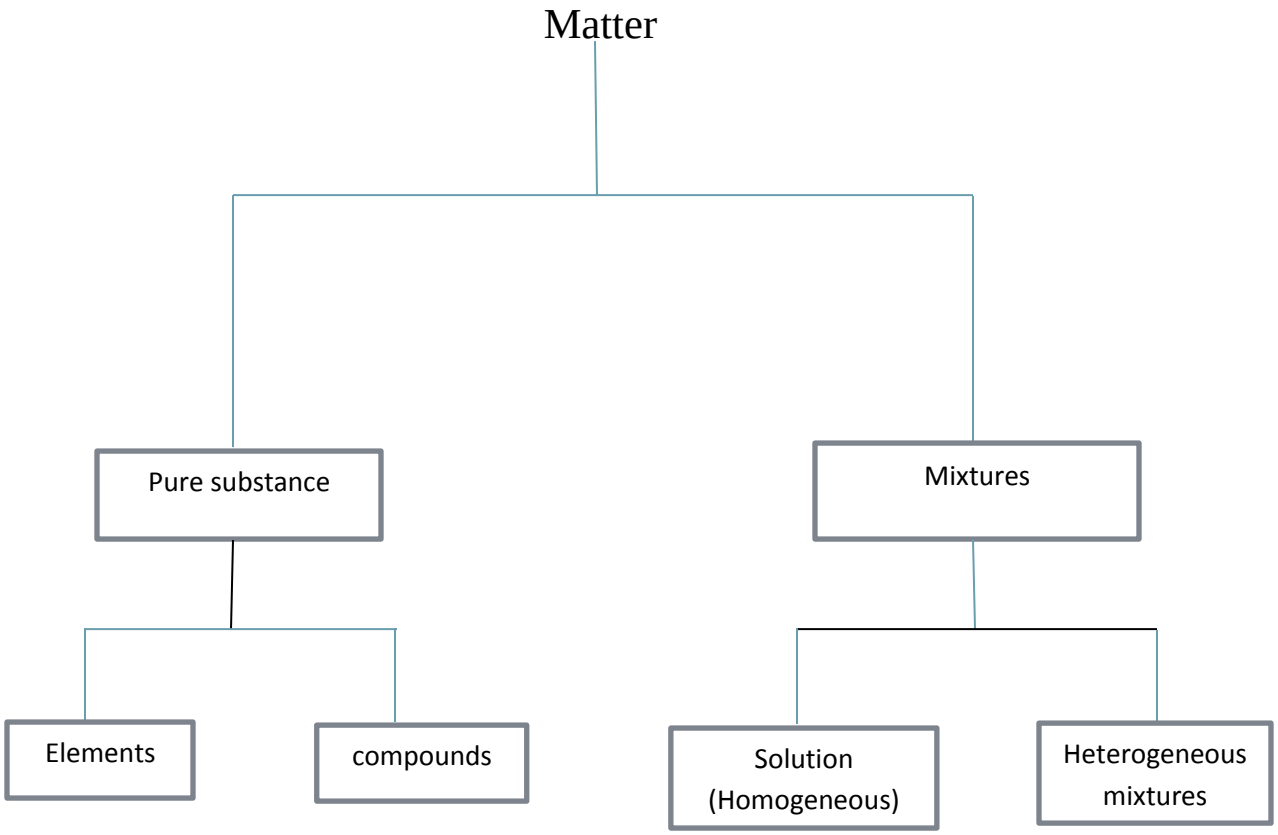
$\upsilon\lambda = c$ λ : wave length

$mc^2 = h(\frac{c}{\lambda})$ and $m = \frac{h}{\lambda c}$

Matter :

Matter is anything that occupies space and has weight. States of Matter are solid, liquid ,and gas.

Classification of Matter

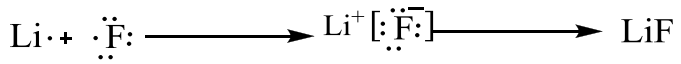


- Simplest pure substances	**- Composed of 2 or more components**	**- composed of 2 or more elements**	**- composed of 2 or more components**
- Cannot be decomposed	**- Can be decomposed (separated by chemical means)**	**- single phase**	**- 2 or more phases**

Chemical Bonds

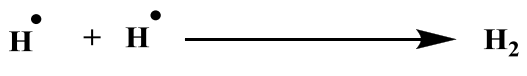
Chemical Bonds can be divided into :

1. **Ionic bond** : An ionic bond occurs when one or more electrons are transferred from one to another



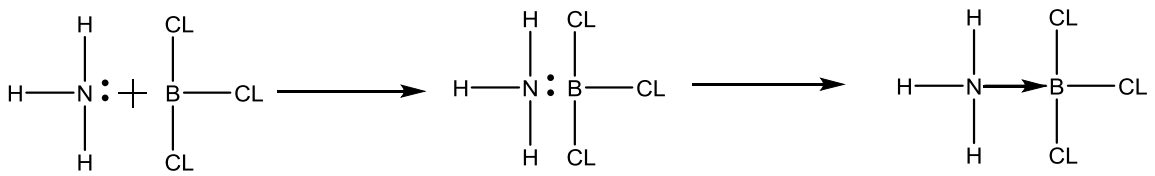
e.g. $CaCl_2$, NaCl , AgCl …….. etc.

2. **Covalent bond** : A covalent bond results from sharing of a pair of electrons between atoms.

e.g. 

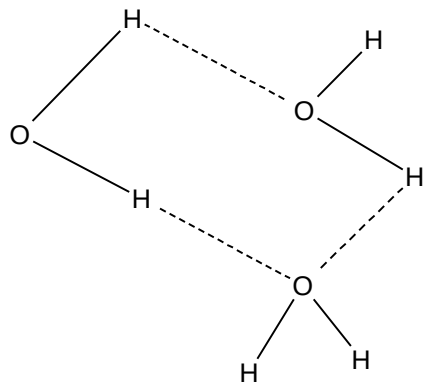
e.g. **C_2H_6 , C_2H_4 , C_2H_2 …… etc.**

3 - Coordinate covalent bond : where a pair of electrons from one atom is shared by two atoms.



e.g. NH_3BF_3

4 - Hydrogen bonding : A particularly strong dipole attraction occurs when hydrogen is covalently bonded to a very small highly electronegative element such as fluorine, oxygen or nitrogen.



CH_3OH , CH_3COOH ……..etc.

Errors and statistics

Accuracy :

The accuracy of a determination may be defined as the concordance between it and the true or most probable value (relative error).

Precision :

Precision may by defined as the concordance a series of measurements of the same quantity . The mean deviation or relative is a measure of precision .

Classification of errors :

The errors may be divided into :

A) Determinate (systematic, constant) errors :

1- instrumental errors :

(Impurities in reagents).

2- Methodic errors :

(Solubility of a precipitate, in complete reaction)

3- Operative errors :

(loss of precipitate, in complete reaction)

4- Personal errors : (Color blindness)

B) Indeterminate errors :

Indeterminate errors are frequently called accidental or random, errors, such errors can be attributed to no known cause nor can they be