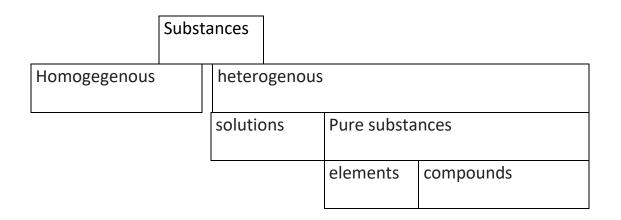# Chemical Foundations

Classification of Matter

Chemistry is a science concerned with substances; Chemistry is the study of matter and the changes it undergoes for example identification, characterization and transformation of their. A substance is a form of matter that has adefinite composition and distinct properties.

Substances, firstly are divided into two major groups.

Substances		
Homogegenous	heterogenous	
	solutions	Pure substances
		elements	compounds

Basic Definitions

Homogeneous substances consist of only region. That is., homogeneous materials consist of two or more substance that can be easily seperated from each other by some physical process such as distillation or crystallization. For example a solution of sugar completely dissolved in water is a homogenous substance (mixture).

Heterogenious substances consist of more than one phase. Example to heterogenios system is that a mixture of ice and water.

Pure substances can be divided into two groups, also can not be further broken down by distillation and crystallization The elements are pure substances and can not be decompose into simpler chemical entities.

An **element** is a substance that cannot be separated into simpler substances by chemical means.

Compounds are substances that are composed of two or more different element and that can be decomposed by chemical changes. They are of definite chemical and physical properties. For compounds H_2O, CH_4.

Atom is defined as smallest particle of an element. Examples of elements that composed of monoatomic molecules are helium, neon etc that is VIII A group elements. On the other hand, the elements hydrogen, oxygen, nitrogen, VII A group elements such as fluorine, chlorine consist of diatomic molecules.

Periodic law shows that the properties of the elements are periodic functions of their atomic number.

Fundamental Chemical Laws

Dalton's Atomic Theory

Elements are composed of extremely small particles called atoms. All atoms of a given element are identical, having the same size, mass and chemical properties. The atoms of one element are different from the atoms of all other elements. Compounds are composed of atoms of more than one element. In any compound, the ratio of the numbers of
atoms of any two of the elements present is either an integer or a simple fraction. A chemical reaction involves only the separation, combination, or rearrangement of atoms; it does not result in their creation or destruction

The Law of definite proportions

In a given compound, the constitüent (kınstiçüvent) elements are always combined in the same proportions by weight, regardless of the origin or made of preparation of the compound. Like nitric oxide NO, it is clear that in order to make the etomic composition of nitric oxide molecule to be need a 1/1 ratio.The smallest possible structure this nitric oxide, but we must in some way change the atomic composition adding to it one atom pf nitrogen or one aton of oxygen. Thus results N2O or NO2 both of which are quite distinct from nitric oxide. We conclude that no change in the atomic composition of nitric oxide is possible without creating a new chemical species and therefore atomic and

weight compositions of nitric oxide are constant. This and other compounds obey the law of definite proportions.

The Law of multiple proportions

If two elements form more than one compound, then different weights of one of which combine with the same weight of the other are in the ratio of small whole numbers. The oxides of nitrogen provide a very satisfoctory demonstration of this principle: The weights of nitrogen which combine with 10 grams of oxygen in N_2O, NO and NO_2 are respectively 28, 14 and 7 grams, which stand in the ratio 4:2:1.

The law of equivalent proportions

It is also called The law of reciprocal proportions or law of permanent ratios) is one of the basic laws of stoichiometry

"Law stating that the proportions in which two elements separately combine with a third element are also the proportions in which they combine together"

"The weights of the elements which separately combine with the fixed weight of the third element are either the same or are the simple multiples of which they combine with each other."

Consider two substances A and B, either elemets or compound, which can react with each other and with a third substance C. Now a constant weight of C will react with different weights of A and B, and the ratio of reacting weight of A to that of B is some number.

If element A combines with element B and also with C, then, if B and C combine together, the proportion by weight in which they do so will be simply related to the weights of B and C which separately combine with a constant weight of A.