Welland Gouldsmith School ,Patuli
Class- IX
Chemistry
Session 2020-21

LANGUAGE OF CHEMISTRY

Valency

Valency is the combining capacity of an element. The number of electrons donated or accepted by an atom of an element so as to have electronic configuration of nearest noble gas is called its valency.

Variable Valency

Certain elements have more than one valency. They exhibit variable valency. For example, copper, tin, iron and mercury exhibit variable valency. Copper combines with oxygen to form cuprous oxide (Cu_2O) and cupric oxide (CuO).

Valency of oxygen being two, combining capacity of copper in the first case is one and that in the second case is two. The suffix "ous" is used to indicate the lower valency and the suffix "ic" to indicate the higher valency. The following table gives the names of some compounds with variable valencies of elements.

Compound	**Valency**	**Ion**
Cuprous (Cu_2O)	1	Cu^{+}
Cupric oxide (CuO)	2	Cu^{2+}
Ferrous oxide (FeO)	2	Fe^{2+}
Ferric oxide (Fe_2O_3)	3	Fe^{3+}

LIST OF COMMON ACIDIC AND BASIC RADICALS.

Basic Radicals

Monovalent electropositive	
Ammonium	NH_4^+
Aurous [Gold (I)]	Au^+
Argentous [Silver (I)]	Ag^+
Cuprous [Copper(I)]	Cu^+
Hydrogen	H^+
Lithium	Li^+
Sodium	Na^+
Potassium	K^+
Mercurous [Mercury (I)]	Hg^+

Divalent electropositive	
Argentic	Ag^{2+}
Barium	Ba^{2+}
Calcium	Ca^{2+}
Cupric [Copper (II)]	Cu^{2+}
Ferrous [Iron (II)]	Fe^{2+}
Magnesium	Mg^{2+}
Manganese	Mn^{2+}
Mercuric [Mercury (II)]	Hg^{2+}
Nickel	Ni^{2+}
Plumbous [Lead (II)]	Pb^{2+}
Platinous [Platinum (II)]	Pt^{2+}
Stannous [Tin (II)]	Sn^{2+}
Zinc	Zn^{2+}

Trivalent electropositive	
Aluminium	Al^{3+}
Arsenic	As^{3+}
Auric [Gold (III)]	Au^{3+}
Bismuth	Bi^{3+}
Chromium	Cr^{3+}
Ferric [Iron (III)]	Fe^{3+}

Tetravalent electropositive	
Plumbic [Lead (IV)]	Pb^{4+}
Platinic [Platinium (IV)]	Pt^{4+}
Stannic [Tin (IV)]	Sn^{4+}

ACIDIC RADICAL LIST

Ion	Formula
Nitrate	NO_3^-
Nitrite	NO_2^-
Phosphate	PO_4^{3-}
Hydrogen Phosphate	HPO_4^{2-}
Dihydrogen Phosphate	$H_2PO_4^-$
Sulfate	SO_4^{2-}
Carbonate	CO_3^{2-}
Hydrogen Carbonate	HCO_3^-
Hydroxide	OH^-

Ion	Formula
Ammonium	NH_4^+
Acetate	$C_2H_3O_2^-$
Hypochlorite	ClO^-
Chlorite	ClO_2^-
Chlorate	ClO_3^-
Perchlorate	ClO_4^-
Permanganate	MnO_4^-
Chromate	CrO_4^{-2}
Dichromate	$Cr_2O_7^{-2}$

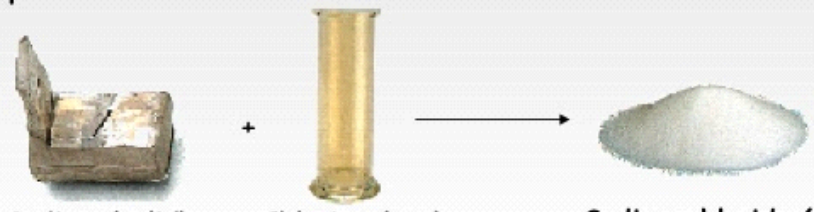
COMPOUND AND ITS CHARACTERISTICS

A **compound** is a substance made up of a definite proportion of two or more elements. A **chemical formula** tells us the number of atoms of each element in a compound. It contains the symbols of the atoms of the elements present in the compound as well as how many there are for each element in the form of subscripts.

Characteristics of Compounds

All compounds share some common properties which enable us to identify them.

- Compounds are formed by chemical reactions, which usually involve an exchange of energy (heat/light) with the surroundings.
- A compound has properties that are different from the properties of its constituent elements



Sodium (solid) Chlorine (gas) Sodium chloride (solid)

How is sodium chloride different from sodium or chlorine?

COMMON AND CHEMICAL NAMES OF SOME COMPOUNDS

Common Name	Chemical Name	Chemical Formulae
Dry Ice	Solid Carbondioxide	CO_2
Slaked Lime	Calcium Hydroxide	$Ca(OH)_2$
Bleaching Powder	Calcium Oxychloride	$CaOCl_2$
Nausadar	Ammonium Chloride	NH_4Cl
Caustic Soda	Sodium Hydroxide	NaOH
Rock Salt	Sodium Chloride	NaCl
Caustic Potash	Potassium Hydroxide	KOH
Potash Alum	Potassium Aluminium Sulphate	$K_2SO_4 . Al_2(SO_4)_3 . 24H_2O$
Epsom	Magnesium Sulphate	$MgSO_4 . 7H_2O$
Quick Lime	Calcium Oxide	CaO
Plaster of Paris	Calcium Sulphate	$(CaSO_4)^{1/2} H_2O$
Gypsum	Calcium Sulphate	$CaSO_4 . 2H_2O$
Green Vitriol	Ferrous Sulphate	$FeSO_4 . 7H_2O$
Mohr's Salt	Ammonium Ferrous Sulphate	$FeSO_4 (NH_4)_2 SO_4 . 6H_2O$
Blue Vitriol	Copper Sulphate	$CuSO_4 . 5H_2O$
White Vitriol	Zinc Sulphate	$ZnSO_4 . 7H_2O$
Marsh Gas	Methane	CH_4
Vinegar	Acetic Acid	CH_3COOH
Potash Ash	Potassium Carbonate	K_2CO_3
Hypo	Sodium Thiosulphate	$Na_2S_2O_3 . 5H_2O$
Baking Powder	Sodium Bicarbonate	$NaHCO_3$
Washing Soda	Sodium Carbonate	$Na_2CO_3 . 10H_2O$
Magnesia	Magnesium Oxide	MgO
Chalk (Marble)	Calcium Carbonate	$CaCO_3$

WRITING CHEMICAL FORMULA

Iron(III)hydroxide

write symbol	Fe OH
Remember charge	+3 -1
Cross the charge	$Fe(OH)_3$

BALANCING CHEMICAL EQUATION

Balance the following equation:

$$Mg+HCl \rightarrow MgCl2+H2$$

Identify the reactants and products This has been done in the question.

Write the equation for the reaction This has been done in the question.

Count the number of atoms of each element in the reactants and products

Reactants: Mg=1 atom H=1 atom, Cl=1 atom
Products: Mg=1 atom, H=2 atoms, Cl=2 atoms

Balance the equation The equation is not balanced since there are two chlorine atoms in the product and only one in the reactants. If we add a coefficient of two to the HCl to increase the number of H and Cl atoms in the reactants, the equation will look like this:

$$Mg+2HCl \rightarrow MgCl2+H2$$

Check that the atoms are balanced
If we count the atoms on each side of the equation, we find the following:

Reactants: Mg=1 atom, H=2 atoms, Cl=2 atoms

Products: Mg=1 atom, H=2 atoms, Cl=2 atoms

The equation is balanced. The final equation is:

$$Mg+2HCl \rightarrow MgCl_2+H_2$$

DETERMINATION OF MOLECULAR MASS AND PERCENTAGE COMPOSITION

Relative Molecular Mass

The Relative Molecular Mass (M_r) is the sum of the Relative Atomic Mass (A_r) of each atom in the molecule.

How to find the relative molecular mass?

1. Determine the molecular formula of the molecule.
2. Determine the number of atoms of each element in the molecule.
3. Use the periodic table to determine the atomic mass of each element.
4. Multiply the number of atoms of each element with the atomic mass.
5. Add the values to get the relative molecular mass.

Example:

Find the M_r of ammonia

Molecular formula of ammonia is NH_3

N = 1 x 14 = 14

H = 3 x 1 = 3

M_r of ammonia = 14 + 3 = 17

A_r of N = 14
A_r of H = 1

Example:

Find the M_r of ammonium sulfate

Molecular formula is $(NH_4)_2SO_4$

N = 2 x 14 = 28

H = 4 x 2 x 1 = 8

S = 1 x 32 = 32

O = 4 x 16 = 48

M_r of $(NH_4)_2SO_4$ = 28 + 8 + 32 + 48 = 116

A_r of N = 14
A_r of H = 1
A_r of S = 32
A_r of O = 16

Calculating Percentage Composition

Calculate the percentage composition of magnesium carbonate, $MgCO_3$.

Formula mass of magnesium carbonate:

24.31 g + 12.01 g + 3(16.00 g) = 84.32 g

$$Mg = \left(\frac{24.31}{84.32}\right) \bullet 100 = 28.83\%$$

$$C = \left(\frac{12.01}{84.32}\right) \bullet 100 = 14.24\%$$

$$O = \left(\frac{48.00}{84.32}\right) \bullet 100 = 56.93\%$$

$$100.00$$