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ATOMS AND MOLECULES

SUBJECT-CHEMISTRY

CHAPTER NO- 3

Concept of Valency, Variable Valency, Radicals, Symbols and Writing a chemical formula.

PERIOD-4

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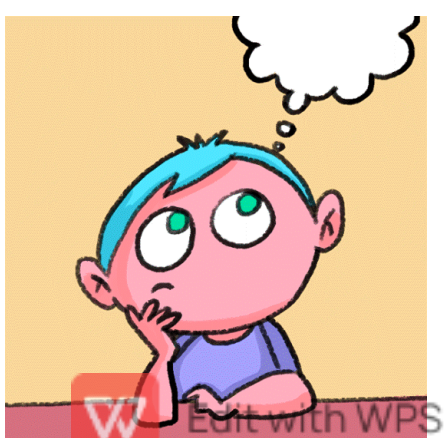
LEARNING OBJECTIVE

Students will be able to

- Know about the concept of Valency, Variable Valency.
- Get aware of the Radicals and its types.
- Know about the concept of Electro valency and Covalency
- Know about the steps to write the chemical formula of the compounds.



THE CONCEPT OF VALENCY

Valency

- Valence electrons are those electrons which are present in the outermost orbit of the atom.
- The capacity of an atom to lose, gain or share valence electrons in order to complete its octet determines the valency of the atom.
- Examples: - The valency of hydrogen is one
- In hydrogen chloride molecule (HCl) one atom of chlorine combines with one atom of hydrogen, hence valency of chlorine is 1

THE CONCEPT OF VARIABLE VALENCY

Variable Valency

- Some elements show more than one valency or simply variable valency.
- The suffix *ous* are used for the lower valency and the suffix *ic* is used for the higher valency
- For example, IRON (II) is known as Ferrous with valency 2 and IRON (III) is known as Ferric with valency 3.

ELECTROVALENCY

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- The property of an element to lose or gain electrons to form positive or negative ions is known as Electro valency.
- An ion with a positive charge is known as Cation, Example, Calcium (Ca2+), Sodium (Na+) etc.
- An ion with a negative charge is known as Anion, Example, Chlorine (Cl-) and Oxygen (O2-)
- These elements always form Ionic Bond or Electrovalent Bond.
- The number of electrons present in the outermost shell is known as Valence Electrons.

COVALENCY

- The property of the element to share electrons to form covalent bond is known as Covalency.
- Covalent Compounds have low Melting point.
- For example, carbon share its four electrons with four hydrogen atoms to forms methane (CH4)

SYMBOLS OF ELEMENTS

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1 - Hydrogen H	21 - Scandium Sc	41 - Niobium Nb
2 - Helium He	22 - Titanium Ti	42 - Molybdenum Mo
3 - Lithium Li	23 - Vanadium V	43 - Technetium Tc
4 - Beryllium Be	24 - Chromium Cr	44 - Ruthenium Ru
5 - Boron B	25 - Manganese Mn	45 - Rhodium Rh
6 - Carbon C	26 - Iron (Ferrum) Fe	46 - Palladium Pd
7 - Nitrogen N	27 - Cobalt Co	47 - Silver (Argentum) Ag
8 - Oxygen O	28 - Nickel Ni	48 - Cadmium Cd
9 - Fluorine F	29 - Copper (Cuprum) Cu	49 - Indium In
10 - Neon Ne	30 - Zinc Zn	50 - Tin (Stannum) Sn
11 - Sodium (Natrium) Na	31 - Gallium Ga	51 - Antimony (Stibium) Sb
12 - Magnesium Mg	32 - Germanium Ge	52 - Tellurium Te
13 - Aluminium (Aluminum) Al	33 - Arsenic As	53 - Iodine I
14 - Silicon Si	34 - Selenium Se	54 - Xenon Xe
15 - Phosphorus P	35 - Bromine Br	55 - Caesium (Cesium) Cs
16 - Sulfur S	36 - Krypton Kr	56 - Barium Ba
17 - Chlorine Cl	37 - Rubidium Rb	57 - Lanthanum La
18 - Argon Ar	38 - Strontium Sr	58 - Cerium Ce
19 - Potassium (Kalium) K	39 - Yttrium Y	59 - Praseodymium Pr
20 - Calcium Ca	40 - Zirconium Zr	60 - Neodymium Nd

CONCEPT OF RADICALS

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Radicals

- A Radical is an atom of an element or a group of atoms of different elements that behaves like a single unit.
- Radicals are of two types: -
- Basic Radical: - They have positive charge and are also called Cations.
- Acid Radical: - They have negative charge and are also called Anions.

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NEGATIVE RADICAL

- A RADICAL IS A GROUP OF ATOMS WITH A CHARGE.
- A GROUP OF NEGATIVE RADICALS AND SOME OF THE CATIONS ARE GIVEN BELOW.

Name of Radical	Representation	Valency
Chloride	Cl^-	1
Bromide	Br^-	1
Hydroxide	OH^-	1
Acetate	CH_3COO^-	1
Nitrate	NO_3^-	1
Nitrite	NO_2^-	1
Bisulphate	HSO_4^-	1
Bisulphite	HSO_3^-	1
Bicarbonate	HCO_3^-	1
Oxide	O^{2-}	2
Carbonate	CO_3^{2-}	2
Sulphate	SO_4^{2-}	2
Sulphite	SO_3^{2-}	2
Dichromate	$Cr_2O_7^{2-}$	2
Nitrite	N^{3-}	3
Phosphate	PO_4^{3-}	3

POSITIVE RADICALS

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Valency	Symbol	Name
Monovalent (1)	Hydrogen	H^+
	Sodium	Na^+
	Potassium	K^+
	Ammonium	NH_4^+
	Copper (I) / Cuprous	Cu^+
	Silver (I) / Argentous	Ag^+
	Mercury (I) / Mercurous	Hg^+
Bivalent (2)	Magnesium	Mg^{2+}
	Calcium	Ca^{2+}
	Barium	Ba^{2+}
	Zinc	Zn^{2+}
	Nickel	Zn^{2+}
	Copper (II) / Cupric	Cu^{2+}
	Iron (II) / Ferrous	Fe^{2+}
	Lead (II) / Plumbous	Pb^{2+}
	Tin (II) / Stannous	Sn^{2+}
	Silver (II) / Argentite	Ag^{2+}
	Mercury (II) / Mercuric	Hg^{2+}
	Manganese (II) / Manganous ion	Mn^{2+}
Trivalent (3)	Aluminium	Al^{3+}
	Iron (III) / Ferric	Fe^{3+}
	Chromium (III)	Cr^{3+}

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STEPS FOR WRITING A CHEMICAL FORMULA

To write the chemical formula, the following steps must be followed.

1. Write the Symbols
2. Interchange the valence number
3. Write the valency of the symbols.
4. Write the interchanged numbers at the base.
5. Write the formula of the compound

For example, the step wise method for writing the formula of CALCIUM OXIDE is given below

CALCIUM OXIDE

Step 1: Write the symbols and valencies.

Symbols	
Calcium	Oxide
Ca	O

Valencies	
Calcium	Oxide
2^+	2^-

Step 2: Ca^{2+} O^{2-}

Step 3: Ca^{2+} O^{2-}

Step 4: Ca_2O_2

Step 5: Reduce the valency numbers to the lowest ratio, if possible.

$\therefore$ the formula is CaO

HOME ASSIGNMENT

WRITE THE CHEMICAL FORMULA OF THE FOLLOWING BY CRISS-CROSS METHOD.

1)MAGNESIUM CHLORIDE
2)AMMONIUM NITRATE
3)CALCIUM PHOSPHATE
4)SODIUM SULPHATE
5)CALCIUM BICARBONATE
6)POTTASIUM HYDROXIDE
7)HYDROGEN PEROXIDE
8)ALUMINIUM CHLORIDE
9)AMMONIUM CHLORIDE
10)HYDROGEN SULPHIDE
11)Exercise-1 Q7 & Q8 Exercise-II Q4 & Q5

THANKING YOU

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