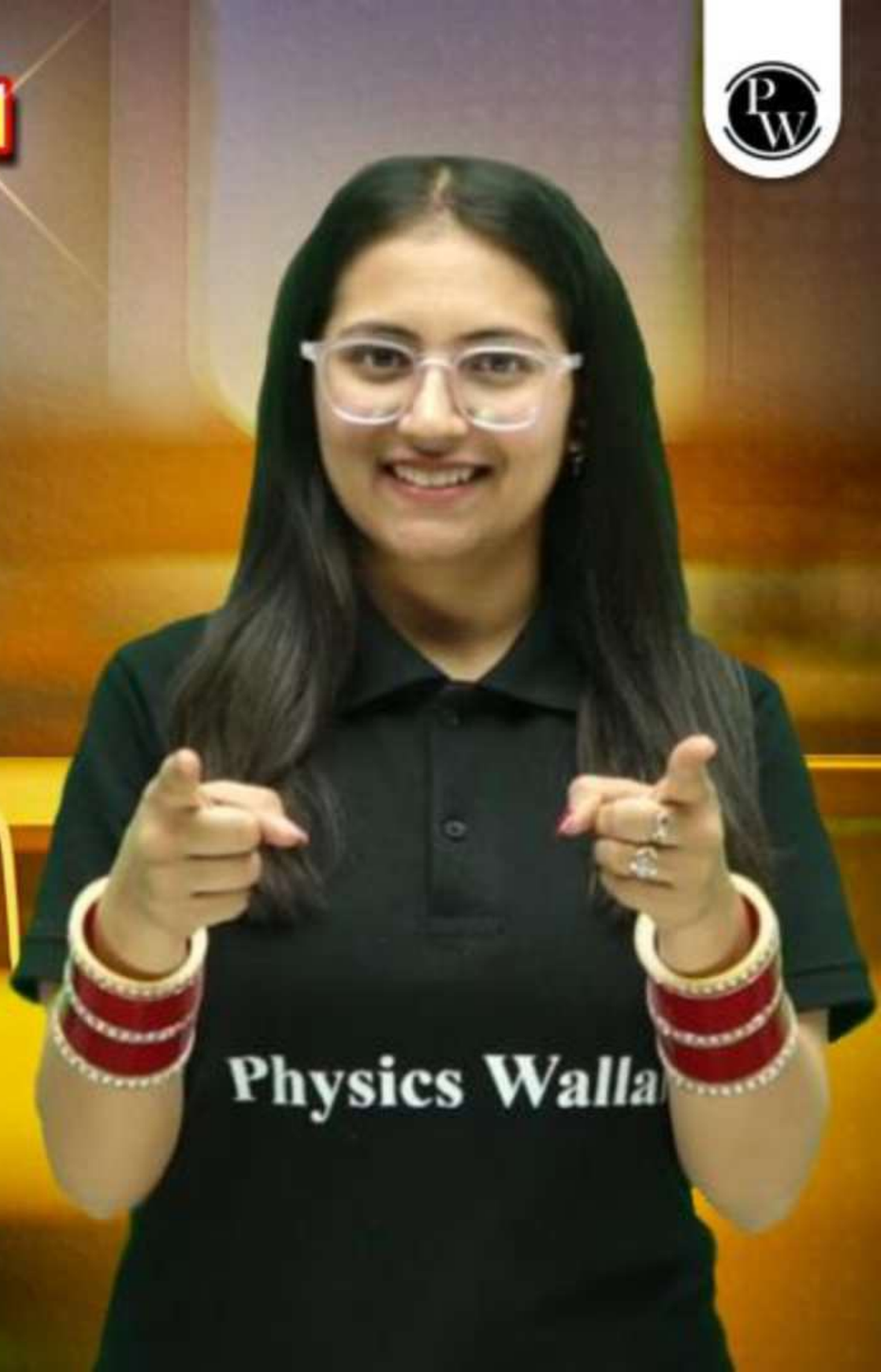
RADIANT 2026

Chemistry

The Language of Chemistry

Lecture-02

By- Bharti Ma'am

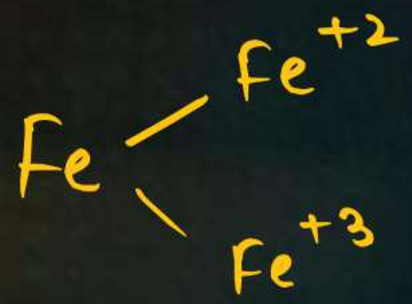


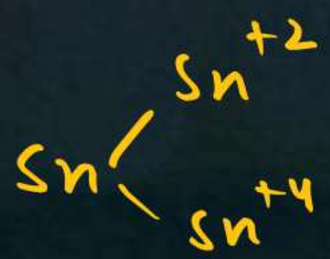
Topics *to be covered*

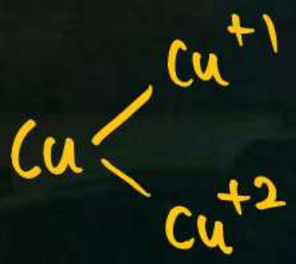
1. Type of Radical
2. Chemical Name
3. Que / KBC
4. Elements and Their Relation with Molecules || Rules to Write a Chemical Symbol || Ions and its Types

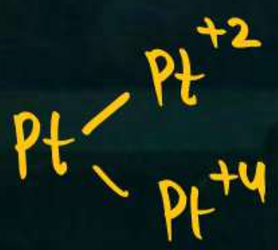
Variable valency

Quick-Revision



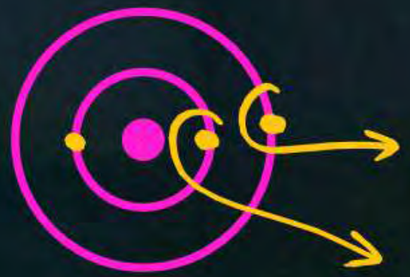






Reasons for variable valency

→ they loses or gain e^- both from ultimate as well as penultimate shell.



Outermost shell = Valence shell (ultimate shell)

Penultimate shell

Examples of Variable Valency

Metal	Valency	Name of Compound Formed		Formula
Iron (Fe)	2	Ferrous	[Iron (II)] oxide	FeO
	3	Ferric	[Iron (III)] oxide	Fe_2O_3
Copper (Cu)	1	Cuprous	[Copper (I)] oxide	Cu_2O
	2	Cupric	[Copper (II)] oxide	CuO
Mercury (Hg)	1	Mercurous	[Mercury (I)] oxide	Hg_2O
	2	Mercuric	[Mercury (II)] oxide	HgO
Lead (Pb)	2	Plumbous	[Lead (II)] oxide	PbO
	4	Plumbic	[Lead (IV)] oxide	PbO_2
Tin (Sn)	2	Stannous	[Tin (II)] chloride	$SnCl_2$
	4	Stannic	[Tin (IV)] chloride	$SnCl_4$

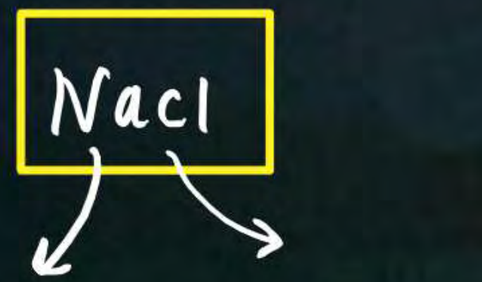
Formula

The symbolic representation of a molecule is known as Chemical formula or molecular formula.

$ClNa$ ✗

Cl_2Mg ✗

$MgCl_2$ ✓



Chemical Formula

"It is the Symbolic Representation of the composition of a compounds".

Note:- Chemical formula show chemical Composition of Compound.

eg: KOH { one atom K, one atom O, one atom H }

Radicals

v.Imp

Radical = charged atom

→ A radical is an atom or a group of atoms of the same or of different elements that behaves as a single unit with a positive or negative charge.

1. **Simple Radical:** A radical is called a simple radical when it is an atom only like sodium (Na^+) and magnesium (Mg^{2+}).

2. **Compound Radical:** when it is made up of a group of two or more different atoms (polyatomic) like sulphate (SO_4^{2-}) which is made up of one sulphur atom and four oxygen atoms.

SO_4^{2-}, $\bar{O}H$, NO_3^- } Compound radical = 'Polyatomic ion'

Na^{+}
Mg^{+2}
Al^{+3}

Ion = simple (Cation)

Radical

Poly + atomic Ion

two or more atom

NO_3^-, CO_3^{2-}, OH^-

Compound Radical

Type of Radical

Base → $\bar{O}H$ ion
Acid → H^+ ion

Basic Radical
(Positively charged)

$NaOH(aq) \rightleftharpoons Na^+ + \boxed{\bar{O}H}$

↓

Basic Radical

Acidic Radical
(negatively charged)

$HCl \longrightarrow H^+ + (Cl^-)$

Cl^-, Br^- } Acidic Radical

Concept of Acidic and Basic Radical :-

(water)

NaOH

aq NaOH

$NaOH\ (aq) \longrightarrow Na^+ + \bar{O}H$

(Base)

Basic Radical

$HCl\ (aq) \longrightarrow Cl^- + H^+$

(Acid)

Acidic Radical

aq HCl

↳ $(HCl + H_2O)$

Alkali

↓

'water soluble Base'

(NaOH, KOH)

$Cu(OH)_2$

↳ Not soluble in H_2O

Basic Radicals

K^+, Na^+, Cu^+, Hg^+ (Basic)

Monovalent (unipositive)		Divalent (Dipositive)	
Potassium	K^+	Calcium	Ca^{2+}
Sodium	Na^+	Magnesium	Mg^{2+}
Cuprous (I)	Cu^+	Barium	Ba^{2+}
Mercurous (I)	Hg^+	Ferrous (less)	Fe^{2+}
Hydrogen	H^+	Cupric (Adhic)	Cu^{2+}
Silver	Ag^+	Plumbous	Pb^{2+}
Ammonium	NH_4^+	Manganese	Mn^{2+}
		Zinc	Zn^{2+}
		Nickel	Ni^{2+}
		Stannous	Sn^{2+}
		Mercuric	Hg^{2+}

Cr^{+3}

Trivalent (tripositive)		Tetravalent (tetrapositive)	
Ferric	Fe^{3+}	Stannic	Sn^{4+} ✓
Aluminum	Al^{3+}	Plumbic	Pb^{4+} ✓
Chromium	Cr^{3+} ✓	Platinum	Pt^{4+}
Antimony	Sb^{3+}		

Pt
- Pt^{+2} (Platinous)
- Pt^{+4} (Platinic)

Acidic Radicals

ate = Max. no. of oxy

Monovalent (Uninegative)		Divalent (Dinegative)	
Fluoride	F^-	Sulphate	SO_4^{2-}
Chloride	Cl^-	Sulphite (one oxy less)	SO_3^{2-}
Bromide	Br^-	Sulphide (No oxy atom)	S^{2-}
Iodide	I^-	Carbonate	CO_3^{2-}
Hydride	H^-	Oxide	O^{2-}
Hydroxide	OH^-	Peroxide	O_2^{2-}
Bicarbonate	HCO_3^-	Thiosulphate	$S_2O_3^{2-}$
Bisulphate	HSO_4^-	Zincate	ZnO_2^{2-}
Bisulphite	HSO_3^-	Stannate	SnO_3^{2-}
Bisulphide	HS^-	Plumbate	PbO_2^{2-}
Hypochlorite	ClO^-	Manganate	MnO_4^{2-}

Nitride = N^{3-} (2,5) gain of $3e^-$

CH_3COO^- (Acetate ion)

Monovalent (Uninegative)		Divalent (Dinegative)	
Chlorate	ClO_3^-	Chromate	CrO_4^{2-}
Perchlorate	ClO_4^-	Dichromate	$Cr_2O_7^{2-}$
Nitrate (one oxy less)	NO_3^-	Oxalate	$C_2O_4^{2-}$
Nitrite	NO_2^-	Silicate	SiO_3^-
Permanganate	MnO_4^-	Acetylide	C_2^{2-}
Acetate	CH_3COO^-		
Cyanide	CN^-		
Aluminate	AlO_2^-		

Trivalent and Tetravalent

	Trivalent (Trinegative)		Tetravalent (Tetranegative)	
(i)	Nitride	N^{3-}	Methanide	C^{4-}
(ii)	Phosphate	PO_4^{3-}	Ferrocyanide	$[Fe(CN)_6]^{4-}$
(iii)	Phosphite	PO_3^{3-}		
(iv)	Phosphide	P^{3-}		
(v)	Ferricyanide	$[Fe(CN)_6]^{3-}$		

Modern Periodic table ~ 118 element → groups, Periods

18 group

Group-1 (+1)

H
Li
Na
K
Rb
Cs
Fr

Hdina
Ki
Rab
Cs(ख)
Fariyaad

Valence shell = $1e^-$

H → H^- (Hydride), H^+ (Hydrogen)

$Li \rightarrow Li^+$ ✓

$Na \rightarrow Na^+$ ✓

$K \rightarrow K^+$ ✓

$Rb \rightarrow Rb^+$ ✓

$Cs \rightarrow Cs^+$

Fr

H.W

group-2 (+2)

Beta Be → Be^{+2}
Mange Mg → Mg^{+2}
Car Ca → Ca^{+2}
Santro Sr → Sr^{+2}
Baap Ba → Ba^{+2} *
Raji Ra

(Halogen)

Group no → 17 → valence shell = $7e^-$ → $8e^-$ gain of $1e^-$

Valency = 1

F → F^-
Cl → Cl^-
Br → Br^-
I → I^-
At

ide = Anion

// H.W

Nitrate = NO_3^-

Nitrite = NO_2^-) one oxy less

Nitride = N^{3-}

Sulphate = SO_4^{2-}

Sulphite = SO_3^{2-}

Sulphide = S^{2-}

Oxide = O^{2-}

// H.W

ium = cation (+ve)

Carbonate = CO_3^{2-} ← H^+

Hydrogen carbonate = HCO_3^-

OR

Bicarbonate

Ammonium = NH_4^+

(+1) ✓

H.W

Rules for writing chemical formulas

- We have to first write symbols of elements which form a compound
- Below the symbol of each element, we should write their valency.
- Now cross over the valences of combining atom.

H.W

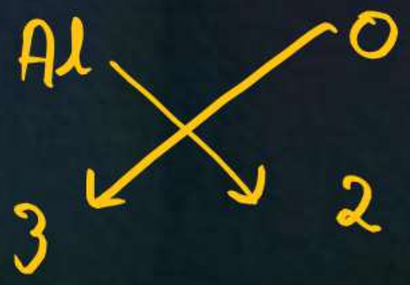
Chemical Name

Al (2,8,3) → loss of $3e^-$

Al^{+3} ✓

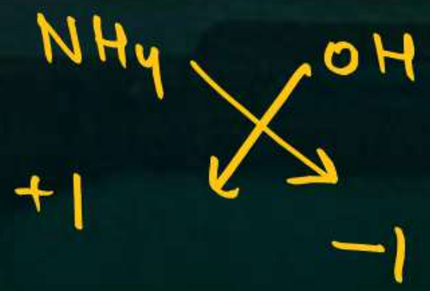
O^{2-} ✓

Aluminium oxide



Al_2O_3 ✓

Ammonium Hydroxide



NH_4OH

Nitric Acid

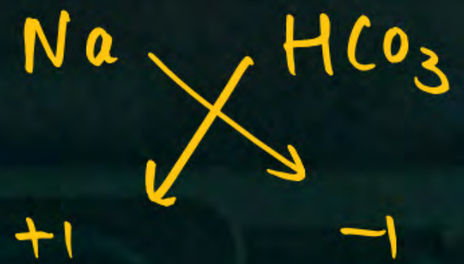
HNO_3

CO_3^{2-} Carbonate

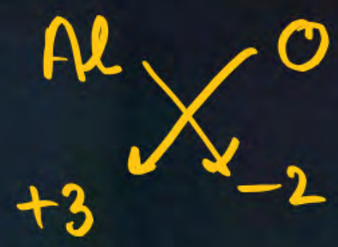
H^+

Sodium Bicarbonate

$NaHCO_3$



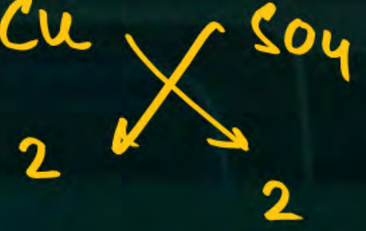
Dihydrate aluminium oxide:



$Al_2O_3 \cdot 2H_2O$

(II)

Pentahydrate Copper Sulphate:

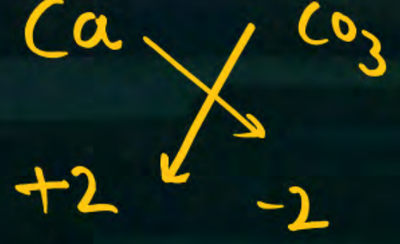


$CuSO_4 \cdot H_2O$

Sodium Nitrate:

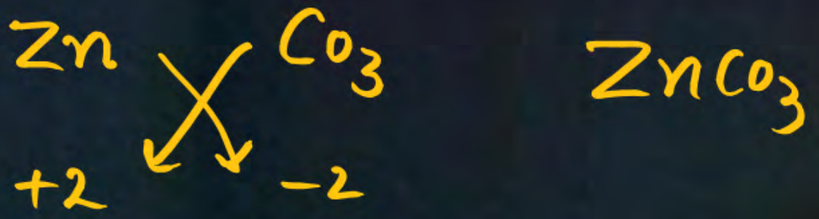
$NaNO_3$

Calcium Carbonate:



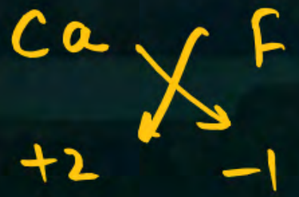
$CaCO_3$

Zinc Carbonate:



$ZnCO_3$

Calcium Fluoride:



CaF_2


KAUN BANEGA
Chemoपुत्र
KAUN BANEGA

Question

The valency of ammonium in ammonium chlorides

NH_4Cl

A +2

B +1

C +3

D +4

Question

The formula of lead nitrate is

A $PbNO_3$

B $Pb(NO_3)_2$

C $Pb(NO_2)_2$

D $PbNO_2$

Question

The valency of copper in copper nitrate is

$Cu(NO_3)_2$

Cu^{+1} Cu^{+2}

A +1

B +2

C +3

D 0

Question

The valency of iron in $FeSO_4$ and $Fe_2(SO_4)_3$ are respectively.

A. +1, +2

B. +3, +2

C. +1, +3

D. +2, +3

Ferrous sulphate

Fe^{+2} SO_4^{2-}

Ferric sulphate

Fe SO_4

+3 2

$Fe_2(SO_4)_3$

Question

The pair elements which exhibit variable valency are

A Pb and Cu

B Hg and Sn

C Fe and Pt

D All of these

Question

What is the correct chemical formula for calcium chloride?

A $CaCl$

B Ca_2Cl

C $CaCl_2$

D Ca_2Cl_2

$CaCl_2$

Question

What is the correct formula for magnesium nitrate?

A $MgNO_3$

B $Mg(NO_3)_2$

C Mg_2NO_3

D $Mg_2(NO_3)_3$

(B)

Mg^{+2} NO_3^{-1}

$Mg(NO_3)_2$

Question

What is the chemical formula for potassium oxide?

A K_2O ✓

B KOC

C K_2O_2

D KO_2

K_2O

Question

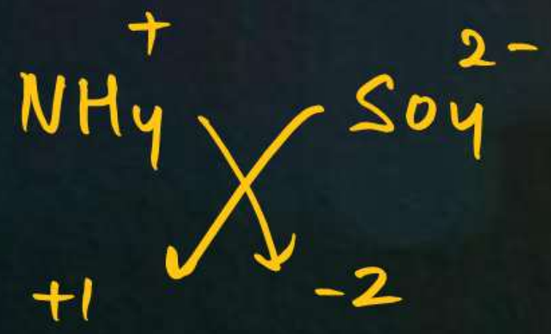
What is the correct formula for ammonium sulfate?

A $(NH_4)_2SO_4$

B NH_4SO_4

C $NH_{42}SO_4$

D $(NH_4)SO_4$



$(NH_4)_2SO_4$

Homework

→ Valency and charge

→ Notes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Thank You