

NAMING OF COMPOUNDS:

KEY TERMS:

Chemical Nomenclature: A system such as the one approved by IUPAC

International Union of Pure and Applied Chemistry or IUPAC

An organisation in Paris France which is the regulating body for naming of compounds and providing standards for measurement of other units like mass , length, time etc.

Binary compounds:

A compound formed from 2 kinds of atoms or two kinds of monoatomic ions.

Oxidation number or valency of an ion:

The number indicated on a cation or anion showing the number of electrons gained or lost also known as valency.

Tertiary compounds:

A compound composed of 3 different elements

Oxyanions:

A polyatomic ion containing oxygen.

Multivalent ions:

A cation (metal ion) capable of showing more than one valency e.g. Pb^{2+} and Pb^{4+}

Classical Approach for multivalent ions:

-ous lower oxidation state Fe^{2+} Ferrous

-ic higher oxidation state Fe^{3+} Ferric

Hydrates

Tertiary ionic compounds which contain water molecules within the crystal structure are called hydrates e.g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Acids:

Common definition would be compounds that are capable of furnishing H^+ ions in aqueous solutions.

Bases

Classical definition would be compounds capable of furnishing OH^- ions in aqueous solution.

Table 2 Page 92 Classical name and IUPAC name of Multivalent ions

Table 3 Page 95 Names and formulas of polyatomic ions

Binary Compounds:

- Metals first followed by non-metals
- For multivalent ions indicate oxidation number or ionic charge in brackets using roman numerals

Tertiary Compounds:

- Polyatomic ions are a group of covalently bonded atoms which has a net charge may be positive or negative.
- Metals first followed by poly atomic ions that are negatively charged
- Poly atomic cat ion first followed by poly atomic negative ion

Polyatomic oxyanions of halogens:

General Formula	Name	Cl	Br	I
XO ⁻	Hypohalite	Hypochlorite ClO ⁻		
XO ₂ ⁻	Halite	Chlorite ClO ₂ ⁻		
XO ₃ ⁻	Halate	Chlorate ClO ₃ ⁻		
XO ₄ ⁻	Perhalate	Perchlorate ClO ₄ ⁻		

Ending	Number of Oxygen atoms	Formula of ion
<i>-hyposulphite</i>	2	SO ₂ ²⁻
<i>-sulphite</i>	3	SO ₃ ²⁻
<i>-sulphate</i>	4	SO ₄ ²⁻
<i>-per sulphate</i>	5	SO ₅ ²⁻

Hypo is low less oxygen

Hyper is high more oxygen

Di	Tri	Tetra	Penta	Hexa	Hepta	Octa	Nona	Deca
2	3	4	5	6	7	8	9	10

Hydrates:

Name of the compound followed by the number of molecules of water of crystallization using the above terminology.

Compound	IUPAC Name
$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	
$\text{Na}_2\text{SO}_4 \cdot 10 \text{H}_2\text{O}$	
$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	
$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	
$\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$	

Acids:

Binary Acids: Ending Aqueous hydrogen -----

Formula	Classical or Trivial Name	IUPAC
$\text{HF}_{(\text{aq})}$	Hydrofluoric acid	
$\text{HCl}_{(\text{aq})}$	Hydrochloric acid	
$\text{HBr}_{(\text{aq})}$	Hydrobromic acid	
$\text{HI}_{(\text{aq})}$	Hydroiodic acid	
$\text{H}_2\text{S}_{(\text{aq})}$	Hydrosulfuric acid	

Oxy acids of Chlorine:

Formula	IUPAC	Classical Name
$\text{HClO}_{(\text{aq})}$	Aqueous hydrogen hypochlorite	Hypochlorous acid
$\text{HClO}_2_{(\text{aq})}$	Aqueous hydrogen chlorite	Chlorous acid
$\text{HClO}_3_{(\text{aq})}$	Aqueous hydrogen chlorate	Chloric acid
$\text{HClO}_4_{(\text{aq})}$	Aqueous hydrogen perchlorate	Perchloric acid

Hypo is low less oxygen

Hyper is high more oxygen

Acids dissolved in water are aqueous hydrogen----

Bases:

Hydroxides

Bases dissolved in water are aqueous metal hydroxide....

Chemical Formula	Chemical Name	Chemical Name	Chemical Formula
LiNO_3		Lithium Chlorate	
Ag_2SO_4		Silver Nitrite	
KNO_2		Iron (II) Chlorite	
$\text{Fe}_2(\text{SO}_3)_3$		Potassium Nitrate	
$\text{Be}(\text{IO})_2$		Iron (III) Hypochlorite	
MnSO_4		Zinc Carbonate	
NaIO_2		Lead (II) Perchlorate	
$\text{Ni}_2(\text{SO}_3)_3$		Beryllium Sulfite	
$\text{Mg}(\text{IO}_3)_2$		Nickel (III) Iodate	
$\text{Hg}_3(\text{PO}_4)_2$		Magnesium Sulfate	
$\text{Ca}(\text{BrO})_2$		Lead (IV) Periodate	
$\text{Pb}_3(\text{PO}_4)_4$		Calcium Phosphite	
$\text{Ba}(\text{BrO}_2)_2$		Nickel (II) Hypiodite	
$\text{Sn}_3(\text{PO}_3)_2$		Barium Phosphate	
LiBrO_3		Gold (I) Iodite	
Ag_3PO_5		Lithium Perphosphate	
KBrO_4		Silver Phosphate	
FeCO_3		Gold (III) Hypiodite	
$\text{Be}(\text{IO}_4)_2$		Potassium Phosphite	
MnSO_4		Copper (II) Periodate	
NaClO		Zinc Sulfate	
NiSO_3		Copper (I) Iodate	
$\text{Mg}(\text{ClO}_2)_2$		Beryllium Sulfite	
HgSO_4		Manganese(II) Perchlorate	
$\text{Ca}(\text{ClO}_3)_2$		Magnesium Carbonate	
PbCO_3		Manganese (IV) Hypochlorite	
$\text{Ba}(\text{ClO}_4)_2$		Calcium Nitrate	
$\text{Sn}(\text{SO}_4)_2$		Tin (II) Chlorite	
ZnCO_3		Barium Nitrite	
AuPO_4		Tin (IV) Chlorate	
AgNO_3		Tin (II) Chloride	

AlPO_3		Sodium Phosphide	
$\text{Ba}(\text{ClO}_2)_2$		Antimony (V) Sulphide	
FeSO_3		Hydrogen Iodide	
KIO_3		Potassium Nitride	
H_3PO_2		Arsenic (III) Oxide	
$\text{Sn}(\text{SO}_4)_2$		Mercury (I) Oxide	
$\text{As}(\text{NO}_3)_3$		Potassium Chloride	
NaCH_3COO		Zinc Phosphide	
$\text{Cr}(\text{NO}_3)_3$		Iron (III) Fluoride	
HgClO		Lead (IV) Oxide	
CuSO_4		Phosphorus (V) Chloride	
$(\text{NH}_4)_2\text{CO}_3$		Zinc Chloride	
$\text{Fe}_3(\text{PO}_3)_2$		Carbon Monoxide	
$\text{Zn}(\text{ClO})_2$		Carbon Dioxide	
SbPO_3		Sulfur Dioxide	
$\text{Cu}(\text{ClO}_4)_2$		Sulfur Trioxide	
KBrO_4		Hydrogen Peroxide	
$(\text{NH}_4)_2\text{SO}_4$		Carbon Tetrachloride	
K_3PO_2		Iron (II) Sulfide	
HIO_3		Barium Chloride	
Na_2O_2		Tin (IV) Oxide	
K_2O_2		Arsenic (III) Hydride	
NaClO_4		Phosphorus (III) Oxide	
$\text{As}(\text{NO}_3)_5$		Arsenic (III) Hydride	
$\text{Sb}_2(\text{SO}_3)_3$		Phosphorus (III) Oxide	
$\text{Zn}_3(\text{PO}_4)_2$		Arsenic (V) Sulphide	
Ag_2SO_4		Gold (I) Bromide	
$\text{Au}(\text{ClO}_3)_3$		Magnesium Iodide	
$\text{Mg}(\text{BrO}_4)_2$		Beryllium Chloride	
$\text{Ca}_3(\text{PO}_2)_2$		Boron Hydride	
$\text{Al}_2(\text{SO}_3)_3$		Aluminum Oxide	
MnSO_3		Antimony (III) Iodide	
$\text{Pb}(\text{IO}_2)_2$		Cuprous Sulfide	

$\text{Cu}(\text{BrO}_4)_2$		Hydrogen oxide	
H_2SO_3		Silver Chloride	
$\text{Fe}_2(\text{SO}_3)_3$		Lithium Sulfide	
KClO_4		Barium Sulfide	
Na_2SO_4		Strontium Phosphide	
HgClO_2		Ferric Iodide	
$\text{Ca}(\text{CH}_3\text{COO})_2$		Stannic Chloride	
Ag_2CO_3		Plumbous Nitride	
$\text{Sr}(\text{NO}_3)_2$		Antimony (III) Carbide	
$(\text{NH}_4)_3\text{PO}_3$		Hydrogen Sulfide	
Ag_3N		Ammonia	
Cu_3N_2		Plumbic Oxide	
LiCl		Copper (II) Chloride	
PbO_2		Silicon Dioxide	
Na_2S		Chromium (III) Chloride	
SnBr_2		Nickel (III) Fluoride	
CaBr_2		Beryllium Oxide	
MnI_4		Carbon Disulphide	
MgI_2		Manganese (II) Oxide	
HgF		Phosphorus Trioxide	
BeF_2		Cobalt (II) Sulfide	
Au_2O_3		Carbon Tetrafluoride	
BaO		Ferrous Sulphide	
NiS		Nitrogen Hydride	
ZnS		Cupric Oxide	
FeO		Mercury (II) Carbide	
AlN		Phosphorus (V) Oxide	
CuCl_2		Antimony (V) Nitride	
BF_3		Nickel (II) Bromide	
PbCl_2		Chlorine Oxide	
AgIO_2		Chromium (II) Sulphide	
$\text{Zn}_3(\text{PO}_3)_2$		Boron Sulfide	
$\text{Fe}(\text{BrO}_4)_2$		Aluminum Nitride	

$\text{Ca}(\text{ClO}_4)_2$		Sodium Oxide	
LiIO		Stannous Fluoride	
SnSO_3		Copper (I) Sulfide	
$\text{Mg}_3(\text{PO}_2)_2$		Silver Sulfide	
$\text{As}(\text{IO}_4)_5$		Lithium Carbide	
$\text{Pb}(\text{OH})_2$		Calcium Phosphide	
$\text{Ba}(\text{ClO})_2$		Strontium Bromide	
HgNO_3		Magnesium Phosphide	
K_2SO_3		Sodium Phosphite	
$(\text{NH}_4)_3\text{PO}_4$		Iron (II) Perchlorate	
H_2CO_3		Zinc Sulfite	
As_2S_3		Cupric Chlorite	
$\text{Al}(\text{IO})_3$		Calcium Hypochlorite	
NaIO_2		Tin (IV) Chlorite	
$\text{Pb}(\text{OH})_4$		Copper (II) Hypobromite	
HBrO_2		Manganic Hypophosphite	
$\text{Mg}_3(\text{PO}_3)_2$		Zinc Carbonate	
Sb_2O_5		Arsenic Nitrite	
$\text{Ag}(\text{CH}_3\text{COO})$		Calcium Acetate	
SnF_2		Antimonous Chlorite	
$\text{Cu}(\text{ClO}_2)_2$		Silver Acetate	
$\text{Mn}(\text{IO}_4)_4$		Tin (II) Chlorite	
$\text{Mg}(\text{ClO})_2$		Sodium Sulphate	
Na_2SO_3		Mercury (II) Perchlorate	
$\text{Ca}(\text{IO}_3)_2$		Calcium Hypophosphite	
$\text{Al}(\text{BrO}_4)_3$		Barium Sulfite	
$\text{Be}_3(\text{PO}_3)_2$		Plumbic Phosphite	
$\text{Sn}(\text{OH})_2$		Mercury (II) Nitrate	
$\text{Hg}(\text{IO})_2$		Potassium Iodate	
KClO		Aluminum Hypophosphite	
NH_4NO_3		Ferric Nitrate	
CaF_2		Sodium Nitride	
ZnBr_2		Lead (II) Perchlorate	

CO ₂		Antimony (V) Sulfit	
SnCl ₂		Aluminium Sulfate	
CrF ₂		Magnesium Carbonate	
CoO		Iron (II) Hypochlorite	
Mg ₃ N ₂		Permanganic Acid	
AsBr ₃		Ammonium Sulphite	
CuO		Zinc Iodate	
AlBr ₃		Gold (III) Nitrate	
FrH		Copper(I)Hypophosphite	
OBr ₂		Manganous Sulphate	
CuCl		Potassium Periodate	
MnO ₂		Magnesium Hypobromite	
NH ₃		Ammonium Acetate	
Cu ₃ N ₂		Zinc Cyanide	
MnS ₂		Lithium Peroxide	
SO ₂		Aluminium Cyanide	

Formula	Name	Uses
KMnO_4		Solution reduces odours
MgO		Used in Toothpaste
$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$		Epsom salts – Laxative
NaCl		Road salt; water softner
NaClO_3		Toothpaste, mouthwashes, antiseptics
NaF		Toothpaste – helps prevent cavities
NaHSO_4		Toilet bowl cleaner
NaI		Iodized salt to prevent goitre
NaNO_2		Curing Meat
NaNO_3		Curing Meat
NaOH		Drain Cleaner; pulp & paper industry
Na_3PO_4		Jello Pudding; cheese spread
Na_2S		Kraft process for making paper
Na_2SO_4		Glass making
NH_4Cl		Cough Syrups
$(\text{NH}_4)_2\text{CO}_3$		Smelling Salts
PF_3		Insecticide and rodenticide
PbO		Glass making
SnF_2		Toothpaste – helps prevent cavities
SO_2		Bleaching; preservation
ZnCO_3		Suntan Lotion
ZnO		Skin Lotions; White Glue

Formula	Name	Uses
$\text{Al}(\text{OH})_3$		Antacid tablets
CaCO_3		Antacid tablets
Na_2CO_3		Antacid tablets
BaS		Fluorescent Paint
BaSO_4		To X-ray the stomach and intestines
AlCl_3		Deodorant protects against wetness
CaCl_2		Road Salt
$\text{Ca}(\text{CN})_2$		Extraction of gold from its ores
CaO		Removes warts
Ca_3P_2		Emergency signal lights
Cl_2		Bleaching
ClO_2		Bleaching
CS_2		Used in making cellophane & rayon
CuSO_4		Dyeing leather; fungicide; algicide
H_2SO_4		Silver tarnish cleaner
$\text{HCl}_{(\text{aq})}$		Silver tarnish cleaner
H_3PO_4		Denture cleaners
HCOOH		Kettle scale remover
$\text{HF}_{(\text{aq})}$		Frosts light bulbs
$\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$		(alum) Dyes, glue, cement, tanning
KClO_3		Matches, explosives
$\text{K}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$		Tanning Leather

1. How does an ionic bond differ from a covalent bond?
2. Briefly summarise and explain the properties of ionic and covalent compounds
3. Explain why electrical conductivity is a suitable test for ionic compounds
4. What are intra molecular and inter molecular bonding? Give suitable examples and explain
5. The most common oxides of period three are as follows
 Na_2O , MgO , Al_2O_3 , SiO_2 , P_2O_5 , SO_2 , Cl_2O ,
 - Classify the compounds as either ionic or molecular
 - Use electron dot diagrams or Lewis structures to show the formation of each compound
 - What properties would expect to observe in the properties of each of the compound?
6. Explain why NH_3 is pyramidal where as BF_3 is planar?
7. What is the shape of the water molecule?
8. Design an experiment using known solvents to study the difference in the intermolecular forces and predict your observations using the structure of the molecule.
9. Which of the following molecules would be polar and which of them would have only polar bonds.
10. H_2O , NH_3 , BF_3 , BeCl_2 , CCl_4 , CHCl_3 , CO_2 ,
11. The dipole moments of the following molecules are not zero how would you explain it? SO_2 , HF , NF_3 ,
12. Explain bonding in the following molecules using lewis structures
13. PCl_3 , NH_4Cl , PCl_5 , ClO_4^- , N_2H_2 , OF_2 , H_2O_2