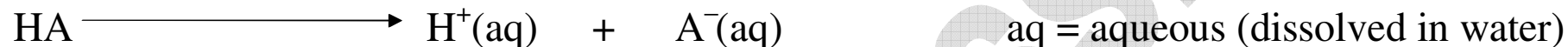


ACIDS

Molecular Compounds that yield hydrogen ions (H^+) and an anion, when dissolved in water
 H_2O



CLASSIFICATION OF ACIDS

Contain	I. BINARY ACIDS (H + NONMETAL)	II. OXOACIDS (H + NONMETAL + O)	
		1. More O atoms	2. Fewer O atoms
Names	Hydro + Nonmetal + ic + acid	nonmetal + ic + acid	nonmetal + ous + acid
Examples	HCl(aq) hydro chloric acid	HClO ₃ (aq) chlor ic acid	HClO ₂ (aq) chlor ous acid
	H ₂ S(aq) hydro sulfuric acid	H ₂ SO ₄ (aq) sulfur ic acid	H ₂ SO ₃ (aq) sulfur ous acid
	-----	HNO ₃ (aq) nit ric acid	HNO ₂ (aq) nit rous acid
	-----	H ₃ PO ₄ (aq) phosphor ic acid	H ₃ PO ₃ (aq) phosphor ous acid
	-----	H ₂ CO ₃ (aq) carbon ic acid	-----
	-----	HC ₂ H ₃ O ₂ (aq) acet ic acid	-----

Other important facts to remember about some common acids.

1. Common Binary Acids (H + Nonmetal) contain Group VIIA and VIA nonmetals:

Nonmetals		Binary Acids	
VIA	VIIA	VIA	VIIA
	F		HF(aq) hydrofluoric acid
S	Cl	H ₂ S(aq) hydrosulfuric acid	HCl(aq) hydrochloric acid
	Br		HBr(aq) hydrobromic acid
	I		HI(aq) hydroiodic acid

2. Some nonmetals form more than two oxoacids with varying number of O atoms

HClO(aq)	HClO ₂ (aq)	HClO ₃ (aq)	HClO ₄ (aq)
?????	chlorous acid	chloric acid	?????
less O			more O
than chlorous acid			than chloric acid
hypochlorous acid			perchloric acid

Summing up:

HClO ₁ (aq)	HClO ₂ (aq)	HClO ₃ (aq)	HClO ₄ (aq)
hypochlorous acid	chlorous acid	chloric acid	perchloric acid
fewer O atoms		more O atoms	

TERNARY IONIC COMPOUNDS

- contain at least **3 elements**
- contain at least one **Polyatomic Ion**
 - an ion consisting of 2 or more atoms bonded together and carrying a common charge. Example: SO_4^{2-} (sulfate ion)
- ending depends on the name of the anion.

TERNARY IONIC COMPOUNDS

CATION(s)		ANION(s)	
Monoatomic	Polyatomic	Monoatomic	Polyatomic
Na^+ , Mg^{2+} , Al^{3+} , etc.	NH_4^+ ammonium ion	Cl^- , O^{2-} , N^{3-} , etc	OH^- hydroxide ion Oxoanions (derived from oxoacids)

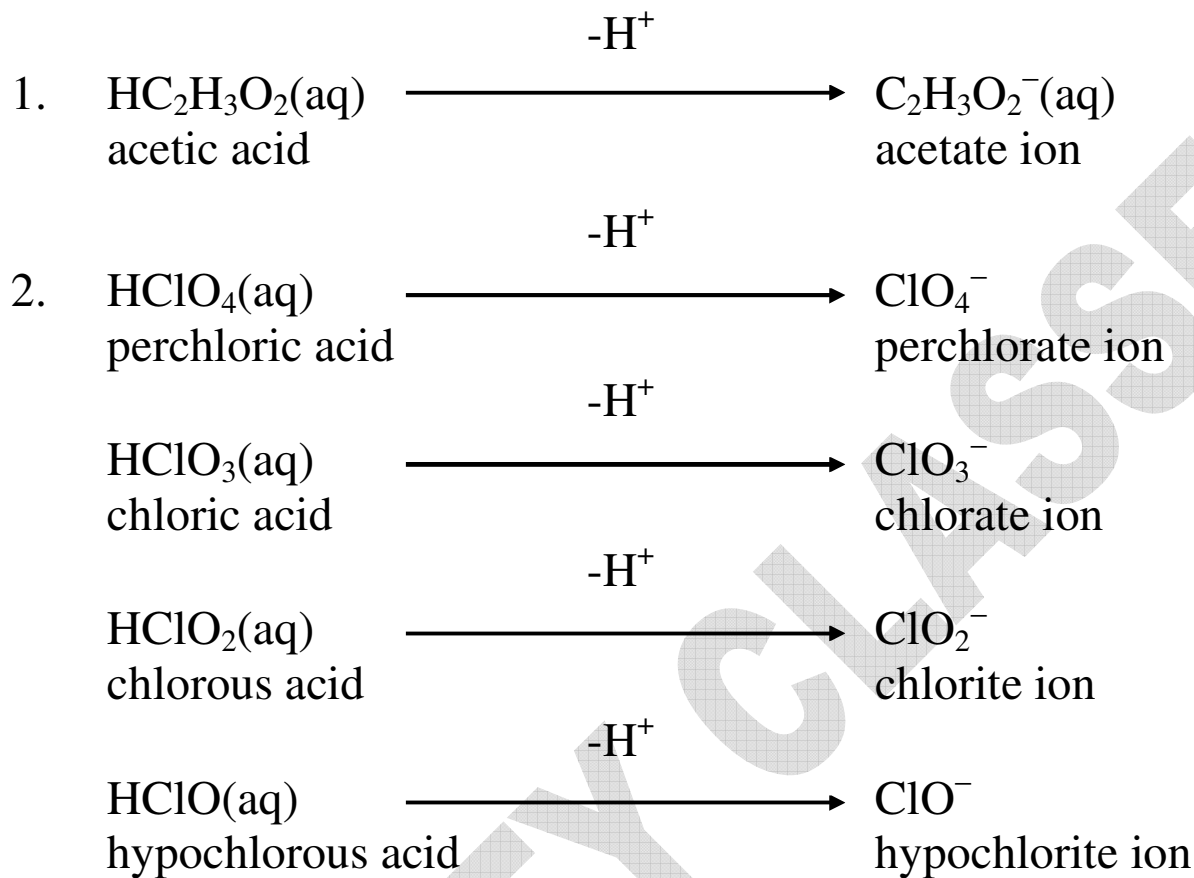
OXOANIONS

- are derived from oxoacids by partial or complete removal of hydrogen ions (H^+)
- Negative Charge of Oxoanion = Number of H^+ ions removed from oxoacids

OXOANIONS

MORE O atoms		FEWER O atoms	
- H ⁺ (s)		- H ⁺ (s)	
Oxoacids (“ ic ”) → Oxoanions (“ ate ”)		Oxoacids (“ ous ”) → Oxoanions (“ ite ”)	
HClO ₃ (aq) chloric acid	ClO ₃ ⁻ chlor ate ion	HClO ₂ (aq) chlorous acid	ClO ₂ ⁻ chlor ite ion
H ₂ SO ₄ (aq) sulfuric acid	HSO ₄ ⁻ hydrogen sulf ate ion SO ₄ ²⁻ sulf ate ion	H ₂ SO ₃ (aq) sulfurous acid	HSO ₃ ⁻ hydrogen sulf ite ion SO ₃ ²⁻ sulf ite ion
HNO ₃ (aq) nitric acid	NO ₃ ⁻ nit rate ion	HNO ₂ (aq) nitrous acid	NO ₂ ⁻ nit rite ion
H ₃ PO ₄ (aq) phosphoric acid	H ₂ PO ₄ ⁻ dihydrogen phosph ate ion HPO ₄ ²⁻ monohydrogen phosph ate ion PO ₄ ³⁻ phosph ate ion	H ₃ PO ₃ (aq) phosphorous acid	H ₂ PO ₃ ⁻ dihydrogen phosph ite ion HPO ₃ ²⁻ monohydrogen phosph ite ion PO ₃ ³⁻ phosph ite ion
H ₂ CO ₃ (aq) carbonic acid	HCO ₃ ⁻ hydrogen carbon ate ion CO ₃ ²⁻ carbon ate ion	-----	-----

NOTE:



FORMULAS AND NAMES OF TERNARY IONIC COMPOUNDS In

writing the correct formulas, keep in mind that:

1. the formulas and the charges of the ions must be known,
2. the ionic charges must cancel (the compound as a whole is neutral)

Examples:

1. Write the formula of sodium sulfate: Na^+ SO_4^{2-}
 $\text{Na}^+ \text{SO}_4^{2-} \longrightarrow \text{Na}_2\text{SO}_4$
??????
2. Write the formula of calcium nitrate: Ca^{2+} NO_3^-
 $\text{Ca}^{2+} \text{NO}_3^- \longrightarrow \text{Ca}(\text{NO}_3)_2$
??????
3. Write the formula of ammonium (NH_4^+) hydroxide (OH^-)
 NH_4OH

4. What is the name of CuCO_3 ?

Copper carbonate

???

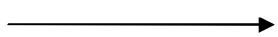
Which copper carbonate ?

- copper (I) carbonate (cuprous carbonate)

OR

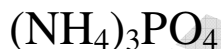
- copper (II) carbonate (cupric carbonate)

The ionic charge of the Copper ion in the compound must be known!



copper (II) carbonate
cupric carbonate

5. Write the formula of ammonium (NH_4^+) phosphate (PO_4^{3-})



6. Write the formula of ammonium (NH_4^+) hydroxide (OH^-)



7. Write the formula of calcium (Ca^{2+}) hydrogen carbonate (HCO_3^-)



8. Write formulas of the following compounds:

sodium (Na^+) carbonate (CO_3^{2-}) : Na_2CO_3

sodium (Na^+) hydrogen carbonate (HCO_3^-) : NaHCO_3

ammonium (NH_4^+) acetate ($\text{C}_2\text{H}_3\text{O}_2^-$) : $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$

barium (Ba^{2+}) hydroxide (OH^-) : $\text{Ba}(\text{OH})_2$

barium (Ba^{2+}) sulfate (SO_4^{2-}) : BaSO_4

9. Give the correct name for the following compounds:

$\text{Fe}_2(\text{SO}_4)_3$? 2- **3+** 2- $\text{Fe}_2(\text{SO}_4)_3$ iron(III) sulfate, or
ferric sulfate

CuSO_4 ? 2- **2+** 2- CuSO_4 copper(II)sulfate, or
cupric sulfate

CaCO_3 calcium carbonate
(Ca ion can have one charge only: Ca^{2+})

Na_2HPO_4 sodium hydrogen phosphate

NH_4Cl ammonium chloride

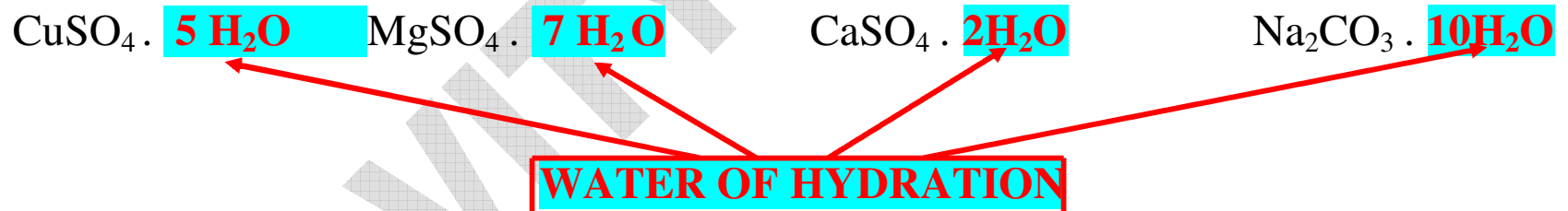
NH_4NO_2 ammonium nitrite

$\text{Ni}(\text{NO}_3)_2$? 1- **2+** 1- $\text{Ni}(\text{NO}_3)_2$ nickel (II) nitrate

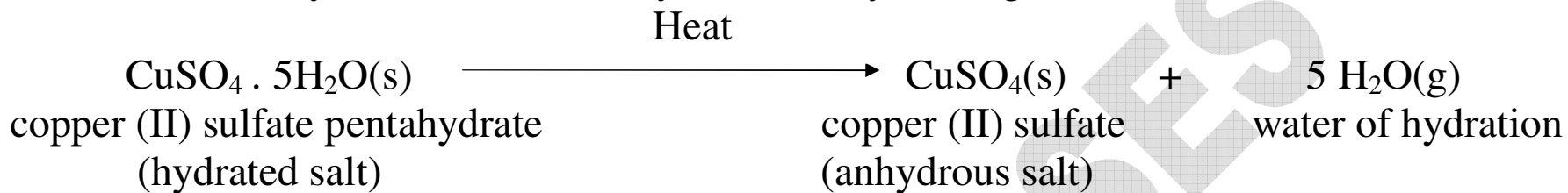
HYDRATES

are Ionic Compounds that contain water molecules chemically bound with the crystals of the Ionic Compound

<u>Examples:</u>	<u>CommonName</u>	<u>IUPACName</u>
$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	Root killer	copper(II) sulfate pentahydrate
$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	Epsom Salt	magnesium sulfate heptahydrate
$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	Gypsum	calcium sulfate dihydrate
$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$	Washing Soda	sodium carbonate decahydrate



The water of hydration can be easily removed by heating:



bluecrystals



white powder

NOTE:

The hydrated salts are crystalline, whereas the corresponding anhydrous salts are powders.



GRAVITY CLASSES