

Nomenclature: Polyatomic Ions, Hydrates, Acid Salts and Acids

- Polyatomic Ions
- Oxyanions
- Naming Binary Compounds
- Polyatomic Exceptions
- Hydrates
- Acid Salts
- Naming Acids
- Naming Covalent Compounds

Common Polyatomic Ions			
$\text{C}_2\text{H}_3\text{O}_2^-$	Acetate	OH^-	Hydroxide
NH_4^+	Ammonium	ClO^-	Hypochlorite
CO_3^{2-}	Carbonate	NO_3^-	Nitrate
ClO_3^-	Chlorate	NO_2^-	Nitrite
ClO_2^-	Chlorite	$\text{C}_2\text{O}_4^{2-}$	Oxalate
CrO_4^{2-}	Chromate	ClO_4^-	Perchlorate
CN^-	Cyanide	MnO_4^-	Permanganate
$\text{Cr}_2\text{O}_7^{2-}$	Dichromate	PO_4^{3-}	Phosphate
HCO_3^-	Bicarbonate	SO_4^{2-}	Sulfate
HSO_4^-	Bisulfate	SO_3^{2-}	Sulfite
HSO_3^-	Bisulfite		

Acid Salts

Complete the following chart:

	Cation	Anion	Name
NaHCO_3	Na^+	HCO_3^-	
$\text{Fe}(\text{HSO}_4)_3$	Fe^{+3}	HSO_4^-	
$\text{Ca}(\text{HSO}_3)_2$	Ca^{+2}	HSO_3^-	
$\text{Ca}(\text{H}_2\text{PO}_4)_2$	Ca^{+2}	H_2PO_4^-	
K_2HPO_4	K^+	HPO_4^{2-}	

Acid Salts

Complete the following chart:

	Cation	Anion	Name
NaHCO_3	Na^+	HCO_3^-	<u>Sodium hydrogencarbonate</u>
$\text{Fe}(\text{HSO}_4)_3$	Fe^{+3}	HSO_4^-	<u>Iron(III) hydrogensulfate</u>
$\text{Ca}(\text{HSO}_3)_2$	Ca^{+2}	HSO_3^-	<u>Calcium hydrogensulfite</u>
$\text{Ca}(\text{H}_2\text{PO}_4)_2$	Ca^{+2}	H_2PO_4^-	<u>Calcium dihydrogenphosphate</u>
K_2HPO_4	K^+	HPO_4^{2-}	<u>Potassium hydrogenphosphate</u>

Naming Acids

- Binary Acids (2 elements bonded together) that contain hydrogen and one other element are easy to name
- Start the name with "hydro" then connect it with the name of the second element, but change the ending of its name to "ic"
- Finish by naming it an acid in an aqueous solution (aq)
 - E.g. $\text{HBr}_{(\text{aq})}$ → Hydrobromic Acid
 - E.g. $\text{HCl}_{(\text{aq})}$ → Hydrochloric Acid

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Polyatomic Ions

- Almost all polyatomic ions contain oxygen and only one other element
- _____
- They can form ionic bonds (usually with a metal)

Common Polyatomic Ions				
$\text{C}_2\text{H}_3\text{O}_2^-$	Acetate		OH^-	Hydroxide
NH_4^+	Ammonium		ClO^-	Hypochlorite
CO_3^{2-}	Carbonate		NO_3^-	Nitrate
ClO_3^-	Chlorate		NO_2^-	Nitrite
ClO_2^-	Chlorite		$\text{C}_2\text{O}_4^{2-}$	Oxalate
CrO_4^{2-}	Chromate		ClO_4^-	Perchlorate
CN^-	Cyanide		MnO_4^-	Permanganate
$\text{Cr}_2\text{O}_7^{2-}$	Dichromate		PO_4^{3-}	Phosphate
HCO_3^-	Bicarbonate		SO_4^{2-}	Sulfate
HSO_4^-	Bisulfate		SO_3^{2-}	Sulfite
HSO_3^-	Bisulfite			

Different forms of Oxyanions

- Sometimes elements form more than one oxyanion
- To distinguish between them we can alter the prefix and suffix

	Prefix	Suffix
One more oxygen atom	per-	<i>-ate</i>
“Normal” atom		<i>-ate</i>
One less oxygen atom		<i>-ite</i>
Two less oxygen atoms	hypo-	<i>-ite</i>

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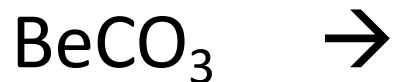
Naming Binary Compounds with Oxyanions or Polyatomics

1. Write the name of the metal (including the roman numeral if necessary).
2. _____

Remember: In ionic compounds, ...

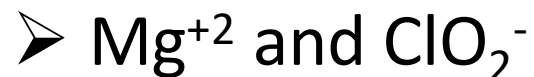
Check Your Understanding

Name the following:



Check Your Understanding

Name the following compounds:



➤ _____



➤ _____

Give the chemical formula for the following:

Calcium perchlorate



➤ _____

Iron (III) hypocarbonite



➤ _____

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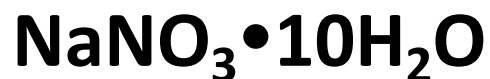
Hydrates

- Hydrates are compounds that have water molecules loosely bonded within the solid crystal
 - E.g. Copper (II) sulfate pentahydrate: _____
- We put the • to indicate a weak bond between the molecules
- Use the following prefixes to identify # of waters:

Greek Prefix	Number	Greek Prefix	Number
mono-	1	hexa-	6
di-	2	hepta-	7
tri-	3	octa-	8
tetra-	4	nona- (or ennea-)	9
penta-	5	deca-	10

Check Your Understanding

What would be the name for the following compound:



Acid Salts

- Salts whose anions contain one or more covalently bonded hydrogen atom

➤ E.g. NaHSO_4 : _____

- Here are acid salts you will need to know:

Formula	Name
HCO_3^-	hydrogen carbonate
HSO_4^-	hydrogen sulfate
HSO_3^-	hydrogen sulfite
HPO_4^{2-}	hydrogen phosphate
H_2PO_4^-	dihydrogen phosphate

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Naming Acids

- Binary Acids (2 elements bonded together) that contain hydrogen and one other element are easy to name
- _____
- Finish by naming it an acid in an aqueous solution (aq)
 - E.g. $\text{HBr}_{(\text{aq})} \rightarrow$ Hydrobromic Acid
 - E.g. $\text{HCl}_{(\text{aq})} \rightarrow$ Hydrochloric Acid

Naming Acids

- Ternary Acids (3 elements bonded together) contain an oxyanion as well
- When naming:

— _____

— _____

Formula	Name
$\text{HNO}_{3(\text{aq})}$	nitric acid
$\text{H}_2\text{SO}_{4(\text{aq})}$	sulfuric acid
$\text{H}_2\text{SO}_{3(\text{aq})}$	sulfurous acid
$\text{HClO}_{4(\text{aq})}$	perchloric acid
$\text{HClO}_{3(\text{aq})}$	chloric acid
$\text{HClO}_{2(\text{aq})}$	chlorous acid
$\text{HClO}_{(\text{aq})}$	hypochlorous acid

Naming Covalent Compounds

All covalent compounds have two-word names. When naming:

- Write the first element in the formula
- _____
- _____
- If the first element in the compound has only one atom, the 'mono' is not written
- The less electronegative atom is written first

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Check Your Understanding

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