

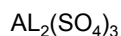
7-1 Chemical Names and Formulas

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Counting Atoms in Compounds



→ 8 Carbon & 18 Hydrogen Atoms



→ 2 Al atoms & 3 SO_4^{2-} ions

→ 2 Al atoms, 3 S atoms, & 12 O atoms

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7-1 Chemical Names and Formulas

Anions (usually nonmetals)

Group 15 → 3- N^{3-} , P^{3-} , As^{3-}

Group 16 → 2- O^{2-} , S^{2-} , Se^{2-}

Group 17 → 1- F^- , Cl^- , Br^- , I^-

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7-1 Chemical Names and Formulas

Stock System of Naming

Cations are called by the element's name.

For metals with multiple cations, Roman numerals are used to show charge.

Na^+ → sodium Pb^{2+} → lead(II) Pb^{4+} → lead(IV)

Anions drop the ending of the name and add "ide"

F^- → fluoride O^{2-} → oxide N^{3-} → nitride

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7-1 Chemical Names and Formulas

Monatomic Ions – ions formed from a single atom

Cations (usually metals)

Group 1 → 1+ Li^+ , Na^+ , K^+

Group 2 → 2+ Ca^{2+} , Mg^{2+} , Ba^{2+} , Sr^{2+}

Group 13 → 3+ Al^{3+} , B^{3+} , Ga^{3+}

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7-1 Chemical Names and Formulas

Special Cases

Silicon and Carbon tend to form covalent bonds instead of forming ions.

d-block and p-block metals can have more than one type of positive ion.

Ex. Pb^{2+} , Pb^{3+} , Pb^{4+}

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7-1 Chemical Names and Formulas

Binary Compounds – compounds made of two different elements.

The net charge of all ions must equal 0 for a compound.

$MgCl_2$ is composed of Mg^{2+} , Cl^+ , and Cl^-

The total net charge of 2+, 1-, and 1- will be 0.

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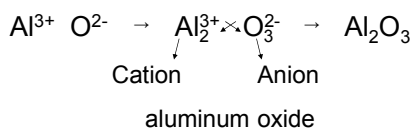
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“**Crossing Over**” is a way to find the chemical formula from ion charges.

aluminum oxide is composed of Al^{3+} and O^{2-}

The subscripts can be found by crossing over ion charges

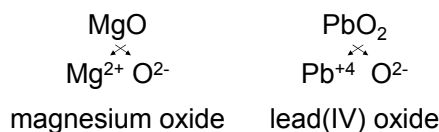


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7-1 Chemical Names and Formulas

The “**Crossing Over**” can be used in reverse to determine a name for a compound.

WARNING: Crossing over will only give the ratio in lowest terms. You may need to determine a charge.



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7-1 Chemical Names and Formulas

Polyatomic Ions

Some elements form multiple polyatomic ions.

- Most common ion with oxygen ends in “ate”.
- One less oxygen atom than “ate” ends with “ite”.
- Two less oxygen ends with “ite” and prefix “hypo”.
- One more oxygen ends with “ate” prefix “per”.

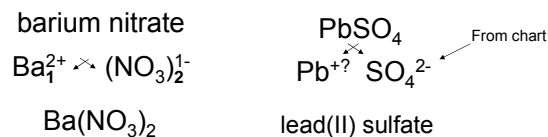


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Compounds with Polyatomic Ions

- Names of the polyatomic ion are used
- The entire ion charge is used in “crossing over”
- Parenthesis are used for more than one ion

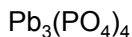
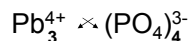


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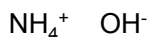
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Provide the formula for:

lead(IV) phosphate



Provide the name for:



Ammonium hydroxide

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7-1 Chemical Names and Formulas

Naming Molecules – Prefix System

- 1) Less electronegative element first
- 2) First element given prefix if more than one atom
- 3) Second element has prefix and ends with “ide”
- 4) Drop prefix vowel ending if atom starts with one (monoxide, not monooxide)

General electronegativity order for molecules

C, P, N, H, S, I, Br, Cl, O, F

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7-1 Chemical Names and Formulas

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Naming Molecules – Prefix System

1 = mono	CO
2 = di	carbon monoxide
3 = tri	
4 = tetra	
5 = penta	N ₂ O ₄
6 = hexa	dinitrogen tetroxide
7 = hepta	
8 = octa	H ₂ O
9 = nona	dihydrogen monoxide
10 = deca	

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Common Names for Molecules

Some molecules in every day life have been given a common name.

H₂O - Water

CH₄ - Methane

NH₃ - Ammonia

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7-1 Chemical Names and Formulas

Acid = hydrogen + anion dissolved in water

Binary acid → hydrogen + halogen

hydro + halogen, ends with "ic"

How do we name:

HCl

Hydrochloric acid

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7-1 Chemical Names and Formulas

Other Acids → Hydrogen + polyatomic ion

Use name of the ion and change

"ate" to "ic" and "ite" to "ous"

HClO → ClO⁻
Hypochlorous acid

HClO₃ → ClO₃⁻
Chloric acid

HClO₂ → ClO₂⁻
Chlorous acid

HClO₄ → ClO₄⁻
Perchloric acid

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7-1 Chemical Names and Formulas

Salt – ionic compound composed of a cation and an anion from an acid

ex. HCl → NaCl

If an acid polyatomic ion can have more than one H, "bi" becomes a prefix to ion if it has an H

H₂CO₃
Carbonic acid

NaHCO₃
Sodium bicarbonate

Na₂CO₃
Sodium carbonate

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7-1 Chemical Names and Formulas

Hydrate – A solid compound with water molecules absorbed in the crystal.

Hydrates are written in the form:

COMPOUND • nH₂O

They are named as:

COMPOUND prefix+hydrate

When water is removed, the compound is becomes "**anhydrous**", without water.

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Name: $\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$

sodium carbonate decahydrate

Name: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Copper(II) sulfate pentahydrate