

Naming Ionic Compounds

Key Concepts

- Positively charged ions are called *cations*
- Negatively charged ions are called *anions*
- The cation is always named first.

Cations

Cations can be metals or polyatomic ions (found on Table E)

- The ammonium ion (NH_4^+) is an example of a polyatomic cation
- Hydrogen can also form a cation, H^+ , in which case the name hydrogen is used in naming.
- For metals that have only one possible charge (oxidation #) the name of the metal is used. Examples are Group I metals (charge 1+), Group II metals (charge 2+), Aluminium (charge 3+), Zinc (charge 2+), Silver (charge 1+)
- For metals that can have more than one charge (oxidation #) the name of the metal is followed by the oxidation # that was used in the formula in capital Roman numerals in brackets

MS NUGENT WHAT DOES THIS MEAN?

1. Metals always keep their name
2. Metals/cations always come first
3. If you happen to use one of those funky transition metals (that have multiple positive oxidation numbers) put the number you used in parenthesis as a roman numeral. Look at the chart below.

Element	Cation	Will be Written as	Traditional Name
copper	Cu^+	copper (I)	cuprous
	Cu^{2+}	copper (II)	cupric
iron	Fe^{2+}	iron (II)	ferrous
	Fe^{3+}	iron (III)	ferric
lead	Pb^{2+}	lead (II)	plumbous
	Pb^{4+}	lead (IV)	plumbic
mercury	Hg_2^{2+}	mercury (I)	mercurous
	Hg^{2+}	mercury (II)	mercuric
tin	Sn^{2+}	tin (II)	stannous
	Sn^{4+}	tin (IV)	stannic

Anions

Anions can be a negatively charged element or a polyatomic ion

- Negatively charged elements have the suffix -ide DROP THE ENDING, ADD 'IDE'
Examples are oxide (O^{2-}), sulfide (S^{2-}), fluoride (F), chloride (Cl^-), bromide (Br^-), iodide (I^-), nitride (N^{3-}), hydride (H^-)
- Polyatomic ions which include oxygen in the anion have the suffixes -ate or -ite. "ate" means there is more oxygen in the anion than one ending in "ite"
Examples: sulfate (SO_4^{2-}) has more oxygen than sulfite (SO_3^{2-}), nitrate (NO_3^-) has more oxygen in the anion than nitrite (NO_2^-)
Other examples are carbonate (CO_3^{2-}), phosphate (PO_4^{3-}) and permanganate (MnO_4^-)
Exception: OH^- is named hydroxide

YOU DO NOT NEED TO USE DI, TRI, Etc...unless it is an actual part of the polyatomic name (like dichromate)

Examples

Ionic Compounds containing ions of elements

- CATION: is named magnesium as magnesium belongs to Group (II) and can only have one charge
ANION: is named oxide
Name of compound is
- CATION: is named iron (II) or ferrous as iron can have a charge of either 2+ or 3+
ANION: is named as sulfide
Name of compound is or ferrous sulfide
- CATION: is named as lithium since lithium is a Group I metal and can have only one charge (valency)
ANION: is named as hydride
Name of compound is
- CATION: is named as hydrogen
ANION: is named as sulfide
Name of compound is

Ionic compounds containing polyatomic ions

- CATION: is named as sodium (Group I metal)

ANION: is named as hydroxide

Name of compound is

Name: _____
 Hour: _____ Date: _____

Chemistry: *Ions in Chemical Compounds*

Complete the following table, being sure that the total charge on the resulting compound is *zero*.

<u>Ions</u>	Chloride Cl¹⁻	Hydroxide OH¹⁻	Nitrate NO₃¹⁻	Sulfate SO₄²⁻	Sulfide S²⁻	Carbonate CO₃²⁻	Phosphate PO₄³⁻
Hydrogen H ¹⁺							
Sodium Na ¹⁺							
Ammonium NH ₄ ¹⁺							
Potassium K ¹⁺							
Calcium Ca ²⁺							
Magnesium Mg ²⁺							
Aluminum Al ³⁺							
Ferrous Fe ²⁺							
Iron (II) Fe ²⁺							
Ferric Fe ³⁺							
Iron (III) Fe ³⁺							
Plumbous Pb ²⁺							
Stannic Sn ⁴⁺							
Copper (I) Cu ¹⁺							
Cupric Cu ²⁺							

★ can check answers once finished.

Compound Names and Formulas

For the list on the left, name the compound. For the list on the right, give the chemical formula that corresponds to the name

	Name	Formula
1)	NaF	13) potassium fluoride
2)	K ₂ CO ₃	14) ammonium sulfate
3)	MgCl ₂	15) magnesium iodide
4)	Be(OH) ₂	16) copper (II) sulfite
5)	SrS	17) aluminum phosphate
★ 6)	Cu ₂ S	18) lead (II) nitrite
7)	ZnI ₂	19) cobalt (II) selenide
8)	Ca ₃ (PO ₄) ₂	20) silver cyanide
9)	NH ₄ I	21) copper (II) bicarbonate
★ 10)	Mn(NO ₃) ₃	22) iron (II) oxide
★ 11)	FePO ₄	23) lithium cyanide
★ 12)	CoCO ₃	24) lead (IV) sulfite

★ = Transition Metal - use Roman Numerals

R. Chem Worksheet 1 (Back Too!)

Straight naming - no Roman num.

Name: _____
Hour: _____ Date: _____

Chemistry: Ionic Binary Compounds: Single-Charge Cations

Write the name of each of the following compounds.

1. Na_2S
2. Al_2O_3
3. NaCl
4. RbI
5. ZnBr_2
6. AgCl
7. BN
8. BaF_2
9. Sr_3N_2
10. MgCl_2

1. sodium sulfide

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Write the chemical formula for each of the given names.

11. magnesium nitride ^{+2 -3} ← Found on P.T.

12. calcium oxide

13. silver fluoride

14. beryllium chloride

15. potassium iodide

16. aluminum chloride

17. zinc oxide

18. barium bromide

19. lithium nitride

20. potassium sulfide

11. Mg_3N_2

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

18. _____

19. _____

20. _____

USE Table E!

Name: _____

Hour: _____ Date: _____

Chemistry: Ionic Compounds: Polyatomic Ions

Write the name of each of the following compounds.



1. _____



2. _____



3. _____



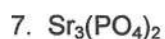
4. _____



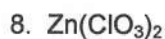
5. _____



6. _____



7. _____



8. _____



9. _____



10. _____

Write the chemical formula for each of the given names.

11. sodium chromate

11. _____

12. barium nitrate

12. _____

13. ammonium sulfate

13. _____

14. aluminum hydroxide

14. _____

15. calcium phosphate

15. _____

16. cesium cyanide

16. _____

17. sodium nitrite

17. _____

18. calcium acetate

18. _____

19. beryllium chlorite

19. _____

20. rubidium sulfite

20. _____

Chemistry: *Chemical Bonding and Nomenclature*

Chemical Bonding:

You will need to understand four types of chemical bonds:

Chemical Nomenclature:

In this unit, you will learn how to:

- 1) write the chemical formula if given the name of the compound, and
- 2) name the compound if given its chemical formula.

Ionic Bonding

ionic bond =

Ionic bonds occur most often between metals (the cations, +) and nonmetals (the anions, -).

Sometimes, though, the anion or cation can be a...

polyatomic ion =

Several polyatomic ions are listed on the handout: *Chart of Ions and Polyatomic Ions*.

Writing Chemical Formulas for Ionic Compounds (Salts)

In order to be able to write chemical formulas and name chemical compounds, you must know the charges on the ions in the compound. In terms of finding their charges, we can group ions into three classes:

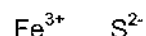
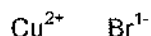
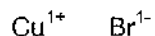
- 1) ions from Groups 1, 2, 13, 15, 16, and 17:
- 2) polyatomic ions:
- 3) the transition elements, tin (Sn), and lead (Pb):

The “**criss-cross rule**” is a simple method for finding the chemical formula if you know what ions are in the compound.

First rule for writing chemical formulas: *Always write the cation first.*

Second rule for writing chemical formulas: *Never write any charges in the formula.*

The ions in various chemical compounds are given below. Find the formula of each compound

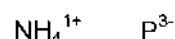
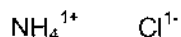


aluminum iodine

lithium oxygen

calcium oxygen

The process is the same for compounds with polyatomic ions. Find the chemical formulas below.



Name _____

Naming Binary Ionic Compounds

Given formula, write name

- 1) MgS _____
- 2) KBr _____
- 3) Ba_3N_2 _____
- 4) Al_2O_3 _____
- 5) NaI _____
- 6) SrF_2 _____
- 7) Li_2S _____
- 8) RaCl_2 _____
- 9) CaO _____
- 10) AlP _____
- 11) K_2S _____
- 12) LiBr _____
- 13) Sr_3P_2 _____
- 14) BaCl_2 _____
- 15) NaBr _____
- 16) MgF_2 _____
- 17) Na_2O _____
- 18) SrS _____
- 19) BN _____
- 20) AlN _____

Given name, write formula

- 1) magnesium oxide _____
- 2) lithium bromide _____
- 3) calcium nitride _____
- 4) aluminum sulfide _____
- 5) potassium iodide _____
- 6) strontium chloride _____
- 7) sodium sulfide _____
- 8) radium bromide _____
- 9) magnesium sulfide _____
- 10) aluminum nitride _____
- 11) cesium sulfide _____
- 12) potassium chloride _____
- 13) strontium phosphide _____
- 14) barium iodide _____
- 15) sodium fluoride _____
- 16) calcium bromide _____
- 17) beryllium oxide _____
- 18) strontium sulfide _____
- 19) boron fluoride _____
- 20) aluminum phosphide _____