

Name: \_\_\_\_\_

Exercise 1. Provide the name for each ion:

Cl <sup>-</sup>	<u>chloride ion</u>	Li <sup>+</sup>	<u>lithium ion</u>
Br <sup>-</sup>	<u>bromide ion</u>	Na <sup>+</sup>	<u>sodium ion</u>
F <sup>-</sup>	<u>fluoride ion</u>	K <sup>+</sup>	<u>potassium ion</u>
S <sup>2-</sup>	<u>sulfide ion</u>	Mg <sup>2+</sup>	<u>magnesium ion</u>
O <sup>2-</sup>	<u>oxide ion</u>	Ca <sup>2+</sup>	<u>calcium ion</u>
N <sup>3-</sup>	<u>nitride ion</u>	Al <sup>3+</sup>	<u>aluminum ion</u>
P <sup>3-</sup>	<u>phosphide ion</u>		
C <sup>4-</sup>	<u>carbide ion</u>		

Exercise 2. Complete the table of neutral ionic compounds with the formulas and names for each cation-anion pair.

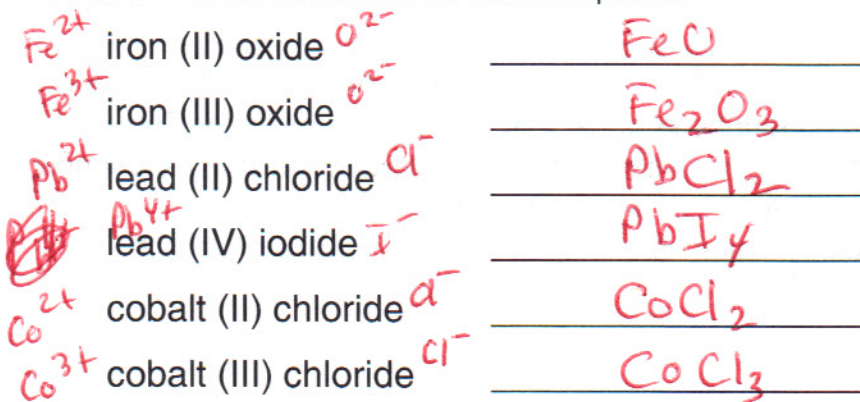
	Cl <sup>-</sup>	I <sup>-</sup>	S <sup>2-</sup>	O <sup>2-</sup>	Br <sup>-</sup>	N <sup>3-</sup>
Na <sup>+</sup>	NaCl sodium chloride	NaI sodium iodide	Na <sub>2</sub> S sodium sulfide	Na <sub>2</sub> O sodium oxide	NaBr sodium bromide	Na <sub>3</sub> N sodium nitride
K <sup>+</sup>	KCl potassium chloride	KI potassium iodide	K <sub>2</sub> S potassium sulfide	K <sub>2</sub> O potassium oxide	KBr potassium bromide	K <sub>3</sub> N potassium nitride
Mg <sup>2+</sup>	MgCl <sub>2</sub> magnesium chloride	MgI <sub>2</sub> magnesium iodide	MgS magnesium sulfide	MgO magnesium oxide	MgBr <sub>2</sub> magnesium bromide	Mg <sub>3</sub> N <sub>2</sub> magnesium nitride
Al <sup>3+</sup>	AlCl <sub>3</sub> aluminum chloride	AlI <sub>3</sub> aluminum iodide	Al <sub>2</sub> S <sub>3</sub> aluminum sulfide	Al <sub>2</sub> O <sub>3</sub> aluminum oxide	AlBr <sub>3</sub> aluminum bromide	AlN aluminum nitride

### Cations with a variable/multiple charges

Some transition metals have multiple possible cation charges. A roman numeral (I, II, III, IV, V, ...) must be used in the cation and ionic compound naming system to distinguish between the charges. For example, iron (Fe) can form the iron (II) ion and also the iron (III) ion, denoted Fe<sup>2+</sup> and Fe<sup>3+</sup>, respectively. Iron (II) oxide and iron (III) oxide are distinct compounds, with electrically neutral formulas FeO and Fe<sub>2</sub>O<sub>3</sub>, respectively.

Name: \_\_\_\_\_

Exercise 3. Provide the formula for each compound.

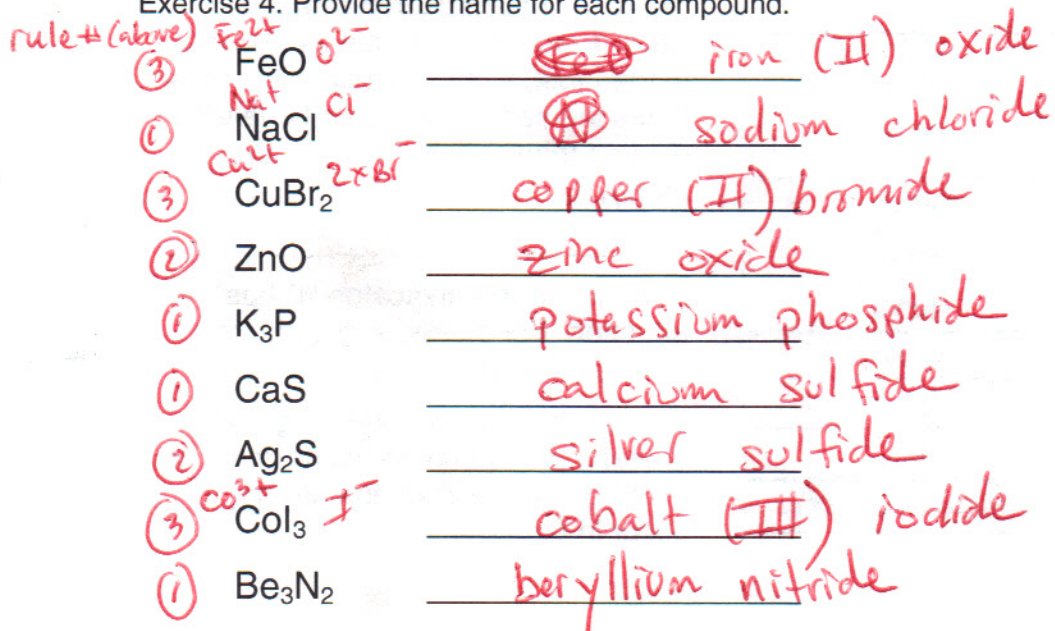


### Mixed cation types

The first step in naming an ionic compound is to determine whether or not the cation can exhibit multiple charges. This requires memorization. Learn the following procedure.

1. The main group (Groups 1-8) elements always have a single charge, determined by the column on the periodic table.
2. Silver and zinc are the only transition metals with a single charge. Memorize the ionic charges for  $\text{Ag}^+$  and  $\text{Zn}^{2+}$ .
3. All other transition metals have multiple charges. Use a roman numeral to indicate the cation charge, which can be figured out from the given information.

Exercise 4. Provide the name for each compound.



Name: \_\_\_\_\_

Exercise 5. Complete the table of neutral ionic compounds with the formulas and names for each cation-anion pair, similar to Exercise 2.

	$\text{SO}_4^{2-}$	$\text{NO}_3^-$	$\text{PO}_4^{3-}$	$\text{CO}_3^{2-}$	$\text{SO}_3^{2-}$	$\text{NO}_2^-$
$\text{Na}^+$	$\text{Na}_2\text{SO}_4$ sodium sulfate	$\text{NaNO}_3$ sodium nitrate	$\text{Na}_3\text{PO}_4$ sodium phosphate	$\text{Na}_2\text{CO}_3$ sodium carbonate	$\text{Na}_2\text{SO}_3$ sodium sulfite	$\text{NaNO}_2$ sodium nitrite
$\text{Mg}^{2+}$	$\text{MgSO}_4$ magnesium sulfate	$\text{Mg}(\text{NO}_3)_2$ magnesium nitrate	$\text{Mg}_3(\text{PO}_4)_2$ magnesium phosphate	$\text{MgCO}_3$ magnesium carbonate	$\text{MgSO}_3$ magnesium sulfite	$\text{Mg}(\text{NO}_2)_2$ magnesium nitrite
$\text{Co}^{3+}$ cobalt(III)	$\text{Co}_2(\text{SO}_4)_3$ cobalt(III) sulfate	$\text{Co}(\text{NO}_3)_3$ cobalt(III) nitrate	$\text{Co}_3\text{PO}_4$ cobalt(III) phosphate	$\text{Co}_2(\text{CO}_3)_3$ cobalt(III) carbonate	$\text{Co}_2(\text{SO}_3)_3$ cobalt(III) sulfite	$\text{Co}(\text{NO}_2)_3$ cobalt(III) nitrite
$\text{NH}_4^+$	$(\text{NH}_4)_2\text{SO}_4$ ammonium sulfate	$\text{NH}_4\text{NO}_3$ ammonium nitrate	$(\text{NH}_4)_3\text{PO}_4$ ammonium phosphate	$(\text{NH}_4)_2\text{CO}_3$ ammonium carbonate	$(\text{NH}_4)_2\text{SO}_3$ ammonium sulfite	$\text{NH}_4\text{NO}_2$ ammonium nitrite
$\text{K}^+$	$\text{K}_2\text{SO}_4$ potassium sulfate	$\text{KNO}_3$ potassium nitrate	$\text{K}_3\text{PO}_4$ potassium phosphate	$\text{K}_2\text{CO}_3$ potassium carbonate	$\text{K}_2\text{SO}_3$ potassium sulfite	$\text{KNO}_2$ potassium nitrite
$\text{Cu}^{2+}$ copper(II)	$\text{CuSO}_4$ copper(II) sulfate	$\text{Cu}(\text{NO}_3)_2$ copper(II) nitrate	$\text{Cu}_3(\text{PO}_4)_2$ copper(II) phosphate	$\text{CuCO}_3$ copper(II) carbonate	$\text{CuSO}_3$ copper(II) sulfite	$\text{Cu}(\text{NO}_2)_2$ copper(II) nitrite
$\text{Al}^{3+}$	$\text{Al}_2(\text{SO}_4)_3$ aluminum sulfate	$\text{Al}(\text{NO}_3)_3$ aluminum nitrate	$\text{AlPO}_4$ aluminum phosphate	$\text{Al}_2(\text{CO}_3)_3$ aluminum carbonate	$\text{Al}_2(\text{SO}_3)_3$ aluminum sulfite	$\text{Al}(\text{NO}_2)_3$ aluminum nitrite
$\text{Ba}^{2+}$	$\text{BaSO}_4$ barium sulfate	$\text{Ba}(\text{NO}_3)_2$ barium nitrate	$\text{Ba}_3(\text{PO}_4)_2$ barium phosphate	$\text{BaCO}_3$ barium carbonate	$\text{BaSO}_3$ barium sulfite	$\text{Ba}(\text{NO}_2)_2$ barium nitrite

Name: \_\_\_\_\_

Exercise 6. Provide the formula for each compound.

$Ni^{3+}$	nickel (III) carbonate	$CO_3^{2-}$	<u><math>Ni_2(CO_3)_3</math></u>
$Ca^{2+}$	calcium nitrate	$NO_3^-$	<u><math>Ca(NO_3)_2</math></u>
$Cu^{2+}$	copper (II) acetate	$CH_3COO^-$	<u><math>Cu(CH_3COO)_2</math></u>
$K^+$	potassium phosphate	$PO_4^{3-}$	<u><math>K_3PO_4</math></u>
$Ag^+$	silver acetate	- no roman	<u><math>AgCH_3COO</math></u>
$Zn^{2+}$	zinc chromate	$CrO_4^{2-}$	<u><math>ZnCrO_4</math></u>
$Sn^{2+}$	tin (II) nitrate	$NO_3^-$	<u><math>Sn(NO_3)_2</math></u>
$Sn^{2+}$	tin (II) nitrite	$NO_2^-$	<u><math>Sn(NO_2)_2</math></u>
$NH_4^+$	ammonium bicarbonate	$HCO_3^-$	<u><math>NH_4HCO_3</math></u>
$Cu^{2+}$	copper (II) sulfite	$SO_3^{2-}$	<u><math>CuSO_3</math></u>
$Na^+$	sodium hydroxide	$OH^-$	<u><math>NaOH</math></u>
$K^+$	potassium cyanide	$CN^-$	<u><math>KCN</math></u>
$K^+$	potassium phosphide	$P^{3-}$	<u><math>K_3P</math></u>
	nitric acid		<u><math>HNO_3</math></u>
	nitrous acid		<u><math>HNO_2</math></u>

acetate BONUS on exam  
 chromate NOT on exam  
 "bi" NOT on exam

Exercise 6. Provide the name for each compound.

$Cu^+$	$CuCN$	$CN^-$	<u>copper (I) cyanide</u>	hydrochloric acid	<u><math>HCl</math></u>
$Fe^{2+}$	$FeO$	$O^{2-}$	<u>iron (II) oxide</u>	hydrofluoric acid	<u><math>HF</math></u>
	$ZnO$		<u>zinc oxide</u>		
	$Al_2O_3$		<u>aluminum oxide</u>		
	$AgCl$		<u>silver chloride</u>		
	$NH_4NO_3$		<u>ammonium nitrate</u>		
	$NaNO_3$		<u>sodium nitrate</u>		
	$NaNO_2$		<u>sodium nitrite</u>		
	$Ca(NO_2)_2$		<u>calcium nitrite</u>		
$Fe^{2+}$	$FeCrO_4$	$CrO_4^{2-}$	<u>iron (II) chromate</u>		

chromate NOT on exam