Department of Chemistry
University of Texas at Austin

Ionic Bonding and Writing Formulas Name: KEY

***Part A. Use the criss-cross method to write the formulas produced from the listed ions.***

| | $Cl^-$ | $CO_3^{2-}$ | $OH^-$ | $SO_4^{2-}$ | $PO_4^{3-}$ | $NO_3^-$ |
|---|---|---|---|---|---|---|
| $Na^+$ | | | | | | |
| $NH_4^+$ | | | | | | |
| $K^+$ | | | | | | |
| $Ca^{2+}$ | | | | | | |
| $Zn^{2+}$ | | | | | | |
| $Fe^{3+}$ | | | | | | |
| $Al^{3+}$ | | | | | | |
| $Co^{3+}$ | | | | | | |
| $Fe^{2+}$ | | | | | | |
| $Mg^{2+}$ | | | | | | |
| $H^+$ | | | | | | |

***Part B. Write the names of the compounds formed in the above table.***

| | $Cl^-$ | $CO_3^{2-}$ | $OH^-$ | $SO_4^{2-}$ | $PO_4^{3-}$ | $NO_3^-$ |
|---|---|---|---|---|---|---|
| $Na^+$ | | | | | | |
| $NH_4^+$ | | | | | | |
| $K^+$ | | | | | | |
| $Ca^{2+}$ | | | | | | |
| $Zn^{2+}$ | | | | | | |
| $Fe^{3+}$ | | | | | | |
| $Al^{3+}$ | | | | | | |
| $Co^{3+}$ | | | | | | |
| $Fe^{2+}$ | | | | | | |
| $Mg^{2+}$ | | | | | | |
| $H^+$ | | | | | | |

Revised ST 7/29/13

# CHEMISTRY CRISSCROSS PRACTICE:
# BINARY IONIC COMPOUNDS

**FORMULA WRITING I:**

a) Write the *formulas* (crisscross method) for the following combinations of elements.
b) *Name* the compounds.

1) Al & O
2) Na & Se
3) Cs & Cl
4) Ca & N
5) Al & F
6) Ba & S
7) K & O
8) Ag & I

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**FORMULA WRITING II:**

Write the *formulas* for the following compounds.

9) iron(III) sulfide
10) magnesium iodide
11) lead(IV) chloride
12) zinc fluoride
13) aluminum selenide
14) sodium nitride
15) lithium oxide
16) barium phosphide

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*Name* the following compounds.

17) $CoCl_3$
18) CuI
19) $Sr_3N_2$
20) NaBr
21) ZnS
22) $Rb_2O$
23) $BaF_2$
24) $K_2Se$

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Ionic Bonding and Writing Formulas  Name: KEY

***Part A. Use the criss-cross method to write the formulas produced from the listed ions.***

| | $Cl^-$ | $CO_3^{2-}$ | $OH^-$ | $SO_4^{2-}$ | $PO_4^{3-}$ | $NO_3^-$ |
|---|---|---|---|---|---|---|
| $Na^+$ | $NaCl$ | $Na_2CO_3$ | $NaOH$ | $Na_2SO_4$ | $Na_3PO_4$ | $NaNO_3$ |
| $NH_4^+$ | $NH_4Cl$ | $(NH_4)_2CO_3$ | $NH_4OH$ | $(NH_4)_2SO_4$ | $(NH_4)_3PO_4$ | $NH_4NO_3$ |
| $K^+$ | $KCl$ | $K_2CO_3$ | $KOH$ | $K_2SO_4$ | $K_3PO_4$ | $KNO_3$ |
| $Ca^{2+}$ | $CaCl_2$ | $CaCO_3$ | $Ca(OH)_2$ | $CaSO_4$ | $Ca_3(PO_4)_2$ | $Ca(NO_3)_2$ |
| $Zn^{2+}$ | $ZnCl_2$ | $ZnCO_3$ | $Zn(OH)_2$ | $ZnSO_4$ | $Zn_3(PO_4)_2$ | $Zn(NO_3)_2$ |
| $Fe^{3+}$ | $FeCl_3$ | $Fe_2(CO_3)_3$ | $Fe(OH)_3$ | $Fe_2(SO_4)_3$ | $FePO_4$ | $Fe(NO_3)_3$ |
| $Al^{3+}$ | $AlCl_3$ | $Al_2(CO_3)_3$ | $Al(OH)_3$ | $Al_2(SO_4)_3$ | $AlPO_4$ | $Al(NO_3)_3$ |
| $Co^{3+}$ | $CoCl_3$ | $Co_2(CO_3)_3$ | $Co(OH)_3$ | $Co_2(SO_4)_3$ | $CoPO_4$ | $Co(NO_3)_3$ |
| $Fe^{2+}$ | $FeCl_2$ | $FeCO_3$ | $Fe(OH)_2$ | $FeSO_4$ | $Fe_3(PO_4)_2$ | $Fe(NO_3)_2$ |
| $Mg^{2+}$ | $MgCl_2$ | $MgCO_3$ | $Mg(OH)_2$ | $MgSO_4$ | $Mg_3(PO_4)_2$ | $Mg(NO_3)_2$ |
| $H^+$ | $HCl$ | $H_2CO_3$ | $H_2O$ | $H_2SO_4$ | $H_3PO_4$ | $HNO_3$ |

***Part B. Write the names of the compounds formed in the above table.***

| | $Cl^-$ | $CO_3^{2-}$ | $OH^-$ | $SO_4^{2-}$ | $PO_4^{3-}$ | $NO_3^-$ |
|---|---|---|---|---|---|---|
| $Na^+$ | Sodium chloride | Sodium carbonate | Sodium hydroxide | Sodium sulfate | Sodium phosphate | Sodium nitrate |
| $NH_4^+$ | Ammonium chloride | Ammonium carbonate | Ammonium hydroxide | Ammonium sulfate | Ammonium phosphate | Ammonium nitrate |
| $K^+$ | Potassium chloride | Potassium carbonate | Potassium hydroxide | Potassium sulfate | Potassium phosphate | Potassium nitrate |
| $Ca^{2+}$ | Calcium chloride | Calcium carbonate | Calcium hydroxide | Calcium sulfate | Calcium phosphate | Calcium nitrate |
| $Zn^{2+}$ | Zinc (II) chloride | Zinc (II) carbonate | Zinc (II) hydroxide | Zinc (II) sulfate | Zinc (II) phosphate | Zinc (II) nitrate |
| $Fe^{3+}$ | Iron (III) chloride | Iron (III) carbonate | Iron (III) hydroxide | Iron (III) sulfate | Iron (III) phosphate | Iron (III) nitrate |
| $Al^{3+}$ | Aluminum chloride | Aluminum carbonate | Aluminum hydroxide | Aluminum sulfate | Aluminum phosphate | Aluminum nitrate |
| $Co^{3+}$ | Cobalt (III) chloride | Cobalt (III) carbonate | Cobalt (III) hydroxide | Cobalt (III) sulfate | Cobalt (III) phosphate | Cobalt (III) nitrate |
| $Fe^{2+}$ | Iron (II) chloride | Iron (II) carbonate | Iron (II) hydroxide | Iron (II) sulfate | Iron (II) phosphate | Iron (II) nitrate |
| $Mg^{2+}$ | Magnesium chloride | Magnesium carbonate | Magnesium hydroxide | Magnesium sulfate | Magnesium phosphate | Magnesium nitrate |
| $H^+$ | Hydrogen chloride | Hydrogen carbonate | water | Hydrogen sulfate | Hydrogen phosphate | Hydrogen nitrate |

Revised ST 7/29/13

Answer Key

# CHEMISTRY CRISSCROSS PRACTICE: BINARY IONIC COMPOUNDS

## FORMULA WRITING I:

a) Write the *formulas* (crisscross method) for the following combinations of elements.
b) *Name* the compounds.

1) $Al^{+3}$ & $O^{-2}$ → $Al_2O_3$
2) $Na^{+1}$ & $Se^{-2}$ → $Na_2Se$
3) $Cs^{+1}$ & $Cl^{-1}$ → $CsCl$
4) $Ca^{+2}$ & $N^{-3}$ → $Ca_3N_2$
5) $Al^{+3}$ & $F^{-1}$ → $AlF_3$
6) $Ba^{+2}$ & $S^{-2}$ → $BaS$
7) $K^{+1}$ & $O^{-2}$ → $K_2O$
8) $Ag^{+1}$ & $I^{-1}$ → $AgI$

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## FORMULA WRITING II:

Write the *formulas* for the following compounds.

9) iron(III) sulfide → $Fe_2S_3$
10) magnesium iodide → $MgI_2$
11) lead(IV) chloride → $PbCl_4$
12) zinc fluoride → $ZnF_2$
13) aluminum selenide → $Al_2Se_3$
14) sodium nitride → $Na_3N$
15) lithium oxide → $Li_2O$
16) barium phosphide → $Ba_3P_2$

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*Name* the following compounds.

17) $CoCl_3$ → $Co^{+3}$ $Cl^{-1}$ → cobalt (III) chloride
18) CuI → $Cu^{+1}$ $I^{-1}$ → copper (I) iodide
19) $Sr_3N_2$ → $Sr^{+2}$ $N^{-3}$ → strontium nitride
20) NaBr → $Na^{+1}$ $Br^{-1}$ → sodium bromide
21) ZnS → $Zn^{+2}$ $S^{-2}$ → zinc sulfide
22) $Rb_2O$ → $Rb^{+1}$ $O^{-2}$ → rubidium oxide
23) $BaF_2$ → $Ba^{+2}$ $F^{-1}$ → barium fluoride
24) $K_2Se$ → $K^{+1}$ $Se^{-2}$ → potassium selenide