**2.** Answers will vary. For example:

| Steps | How I Form a Picture in My Mind |
|---|---|
| 1. Start with a part of the text that is familiar. | "Molecules are held together with covalent bonds" makes me think of the sharing of electrons. |
| 2. Look for specifics in the text to make your picture more accurate. | "Atoms of these elements share one electron in a covalent bond" makes me think of a Bohr diagram showing electrons between two atoms. |
| 3. Once you have created a picture in your mind, sketch it. | Answer will vary depending on the molecule that students pick. |

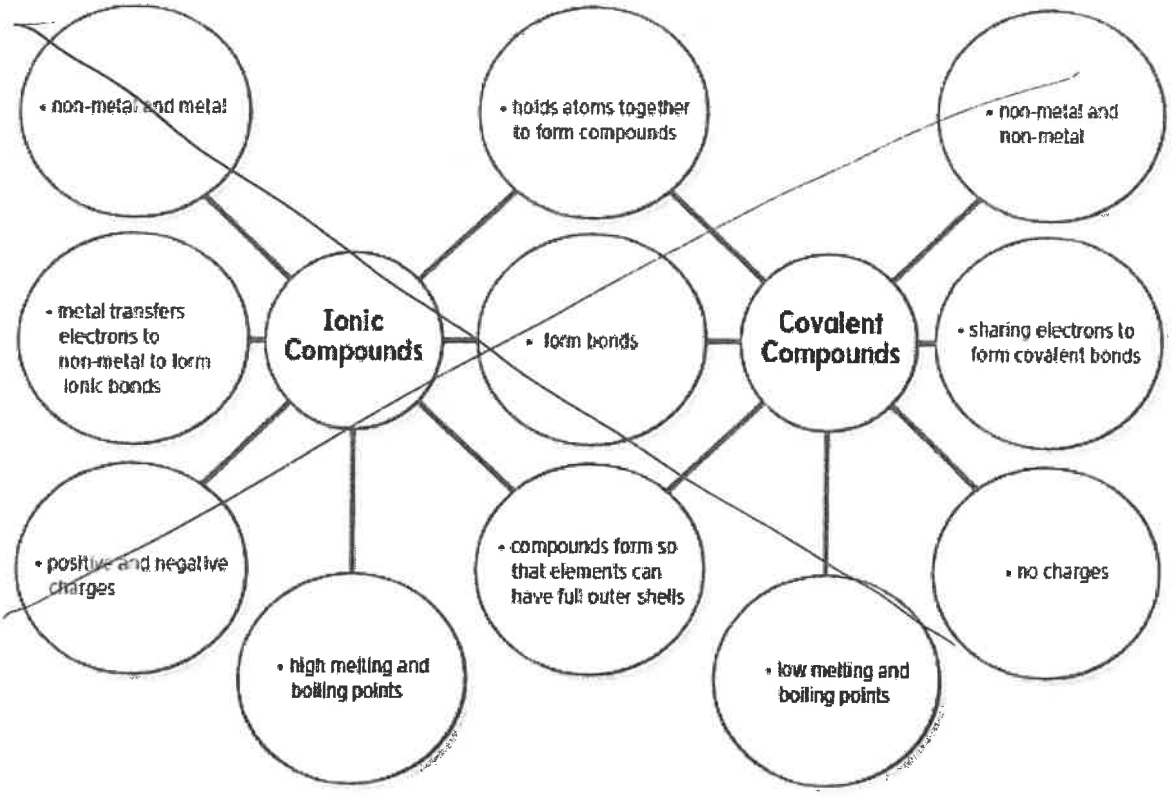
**3.** Answers will vary. Ensure student mnemonics represent all seven diatomic elements.

## *2.4 Assessment, pages 90–92*

Review Pack #2

| | | | |
|---|---|---|---|
| **1.** C | **5.** E | **9.** A | **13.** B |
| **2.** D | **6.** B | **10.** C | **14.** D |
| **3.** A | **7.** B | **11.** D | **15.** C |
| **4.** B | **8.** D | **12.** D | **16.** B |

**17.**



## Topic 2.5 How do we name and write formulas for compounds?

***Writing Chemical Names and Formulas of Ionic Compounds,*** *pages 94–95*

**1. a)** An ion is an atom with a charge.

**b)** An ionic bond is a strong bond that holds together a positively charged ion with a negatively charged ion.

**c)** A binary ionic compound consists of a positively charged metal and a negatively charged non-metal, which are held together by ionic bonds.

**2.**

| | Ions | Chemical Formula | Compound Name |
|---|---|---|---|
| a) | $Li^+$ $F^-$ | LiF | lithium fluoride |
| b) | $Be^{2+}$ $Br^-$ | $BeBr_2$ | beryllium bromide |
| c) | $Na^+$ $O^{2-}$ | $Na_2O$ | sodium oxide |
| d) | $Sc^{3+}$ $I^-$ | $ScI_3$ | scandium iodide |
| e) | $Mg^{2+}$ $S^{2-}$ | MgS | magnesium sulfide |
| f) | $K^+$ $P^{3-}$ | $K_3P$ | potassium phosphide |
| g) | $Ca^{2+}$ $N^{3-}$ | $Ca_3N_2$ | calcium nitride |
| h) | $Al^{3+}$ $Br^-$ | $AlBr_3$ | aluminum bromide |
| i) | $Ba^{2+}$ $Se^{2-}$ | BaSe | barium selenide |
| j) | $Zn^{2+}$ $O^{2-}$ | ZnO | zinc oxide |

**3. a)** rubidium iodide

**b)** cesium oxide

**c)** strontium sulfide

**d)** barium chloride

**e)** indium phosphide

**f)** lithium nitride

**g)** magnesium bromide

**h)** calcium oxide

**i)** potassium chloride

**j)** zirconium selenide

**4. a)** CsF

**b)** $Be_3P_2$

**c)** $Al_2O_3$

**d)** $SrBr_2$

**e)** GaN

**f)** ZnS

**g)** RbI

**h)** AgCl

**i)** CdO

## *Ionic Compounds with Multivalent Metals, page 96*

**1.**

| | Positive Ion | Negative Ion | Chemical Formula | Compound Name |
|---|---|---|---|---|
| a) | $Ti^{3+}$ | $Cl^-$ | $TiCl_3$ | titanium(III) chloride |
| b) | $Fe^{2+}$ | $O^{2-}$ | FeO | iron(II) oxide |
| c) | $Pd^{2+}$ | $Br^-$ | $PdBr_2$ | palladium(II) bromide |
| d) | $Sn^{4+}$ | $F^-$ | $SnF_4$ | tin(IV) fluoride |
| e) | $Au^+$ | $Cl^-$ | AuCl | gold(I) chloride |
| f) | $Pt^{4+}$ | $O^{2-}$ | $PtO_2$ | platinum(IV) oxide |
| g) | $Co^{2+}$ | $F^-$ | $CoF_2$ | cobalt(II) fluoride |
| h) | $Ni^{2+}$ | $I^-$ | $NiI_2$ | nickel(II) iodide |
| i) | $Nb^{3+}$ | $N^{3-}$ | NbN | niobium(III) nitride |
| j) | $Mn^{4+}$ | $O^{2-}$ | $MnO_2$ | manganese(IV) oxide |

**2.** a) $CoF_3$
b) $OsCl_4$
c) $Cr_2O_3$
d) HgSe
e) $CuCl_2$
f) PbS
g) TiN
h) $Bi_2S_3$
i) $RuO_2$
j) $NiF_2$

**3.** a) niobium(V) chloride
b) tin(IV) fluoride
c) manganese(III) oxide
d) rhodium(III) chloride
e) nickel(III) fluoride
f) mercury(II) sulfide
g) thallium(I) iodide
h) iridium(IV) oxide
i) iron(II) chloride
j) vanadium(V) oxide

## *Ionic Compounds with Polyatomic Ions, page 97*

**1.**

| Formulas for Some Ionic Compounds | | | | |
|---|---|---|---|---|
| | fluoride | hydroxide | carbonate | phosphate |
| a) sodium | NaF | NaOH | $Na_2CO_3$ | $Na_3PO_4$ |
| b) aluminum | $AlF_3$ | $Al(OH)_3$ | $Al_2(CO_3)_3$ | $AlPO_4$ |
| c) copper(II) | $CuF_2$ | $Cu(OH)_2$ | $CuCO_3$ | $Cu_3(PO_4)_2$ |
| d) manganese(IV) | $MnF_4$ | $Mn(OH)_4$ | $Mn(CO_3)_2$ | $Mn_3(PO_4)_4$ |
| e) ammonium | $NH_4F$ | $NH_4OH$ | $(NH_4)_2CO_3$ | $(NH_4)_3PO_4$ |

2. a) $Ba(ClO_2)_2$
   b) $Ni(NO_3)_2$
   c) $K_2CrO_4$
   d) $Pb_3(PO_4)_4$
   e) $CdO_2$
   f) $Cu_2CO_3$
   g) $Cr_2(SO_3)_3$
   h) $Ca_3(PO_3)_2$
   i) $Fe(CH_3COO)_3$
   j) $Sr(MnO_4)_2$

3. a) vanadium(IV) chlorate
   b) aluminum carbonate
   c) cobalt(II) nitrite
   d) ammonium sulfate
   e) titanium(IV) chromate
   f) lithium phosphate
   g) chromium(III) permanganate
   h) silver dichromate
   i) magnesium hydrogen carbonate
   j) tin(IV) hydroxide

***Covalent Compounds, page 98***

1. a) $SO_2$
   b) $CF_4$
   c) $SeO_3$
   d) $NCl_3$
   e) $CO_2$
   f) $BF_3$
   g) $S_4N_4$
   h) $P_2O5$
   i) $CS_2$
   j) NO
   k) $Ar_2O_3$
   l) $SF_6$

2. a) dichlorine heptoxide
   b) dinitrogen tetroxide
   c) sulfur trioxide
   d) phosphorus pentachloride
   e) nitrogen trifluoride
   f) carbon disulfide
   g) silicon tetrafluoride
   h) dinitrogen trioxide
   i) boron triiodide
   j) chlorine trifluoride
   k) sulfur dichloride
   l) carbon monoxide

STOP!

***Ionic Compounds in Fireworks, pages 99–100***

1. Answers will vary. Ensures students have identified six questions. For example, "What colours are produced by different ionic compounds?" "Who attends the fireworks?" "Where is the fireworks display?" etc.

2. a) potassium nitrate = $KNO_3$
   strontium carbonate = $SrCO_3$
   copper(I) chloride = CuCl
   barium chloride = $BaCl_2$
   b) Combustibility and reactivity with other chemicals are some chemical properties.

## 2.4 Assessment

*Match each term on the left with the best description on the right. Each descriptor may be used only once.*

| Term | Description |
|---|---|
| 1. ____ molecule | A. bond that forms when atoms share electrons |
| 2. ____ ionic bond | B. a compound that consists of a metallic ion and a non-metallic ion |
| 3. ____ covalent bond | C. a particle that has two or more atoms held together by covalent bonds |
| 4. ____ ionic compound | D. bond that forms between a positively charged ion and a negatively charged ion |
| 5. ____ covalent compound | E. a compound that consists of two or more elements that are covalently bonded together |

*Circle the letter of the best answer for questions 6 to 16.*

6. Which of the following represents a diatomic molecule?

   A. $H^+$ C. KI

   B. $F_2$ D. $H_2O$

7. Which of the following correctly shows an example of an ionic compound and a covalent compound?

| | Ionic Compound | Covalent Compound |
|---|---|---|
| A. | $H_2$ | $CO_2$ |
| B. | $SrCl_2$ | $CH_4$ |
| C. | $C_6H_{12}O_6$ | NaOH |
| D. | $KMnO_4$ | RbCl |

8. Which of following will have ionic bonds holding the compound together?

   A. ozone, $O_3$ C. sucrose, $C_{12}H_{22}O_{11}$

   B. ethanol, $C_2H_6O$ D. beryllium sulfide, BeS

9. Which of the following correctly describes what happens when a magnesium atom and an oxygen atom form a compound?

   A. A magnesium atom transfers its valence electrons to an oxygen atom.

   B. An oxygen atom transfers its valence electrons to a magnesium atom.

   C. A magnesium atom shares its valence electrons with an oxygen atom.

   D. A magnesium atom and an oxygen atom both switch valence electrons with each other.

10. Which of the following compounds has a lattice structure?

A. CO

B. $CCl_4$

C. ZnS

D. $H_2O$

11. Calcium fluoride is a crystalline solid at room temperature. What accounts for this compound being hard and brittle?

A. the low melting point of the compound

B. the sharing of the electrons between calcium and fluorine

C. the repulsive force between the calcium and fluoride ions

D. the strength of the ionic bond that holds the calcium and fluoride ions together

12. Which of the following correctly compares the melting points of ionic compounds to covalent compounds?

| | Ionic Compound | Covalent Compound |
|---|---|---|
| A. | Has low melting point | Has low melting point |
| B. | Has high melting point | Has high melting point |
| C. | Has low melting point | Has high melting point |
| D. | Has high melting point | Has low melting point |

13. Which of the following explains why potassium bromide (KBr) has a high melting point of 734 °C?

A. It requires high temperatures to form the lattices.

B. It requires a lot of energy to break the ionic bonds.

C. It requires high temperatures to maintain the strong electrostatic forces.

D. It requires a lot of energy to produce forces of repulsion to break the crystals.

14. Which of the following will allow an electric current to flow through it?

A. a beaker of distilled water, $H_2O$

B. a beaker of solid lithium chloride, LiCl

C. a beaker of methanol solution, $CH_3OH$

D. a beaker of lithium chloride solution, LiCl

Name _____ Date _____

Communicating
Topic 2.5

## Writing Chemical Names and Formulas of Ionic Compounds

*Use with textbook pages 154–161.*

*You can use the periodic table on page 106 to help you answer these questions.*

1. Define the following terms:

   a) ion

   _____

   b) ionic bond

   _____

   _____

   c) binary ionic compound

   _____

   _____

2. Write the formulas for the ionic compounds formed from the following positive and negative ions. Then name the binary ionic compounds.

| | Ions | Chemical Formula | Compound Name |
|---|---|---|---|
| a) | $Li^+$ $F^-$ | | |
| b) | $Be^{2+}$ $Br^-$ | | |
| c) | $Na^+$ $O^{2-}$ | | |
| d) | $Sc^{3+}$ $I^-$ | | |
| e) | $Mg^{2+}$ $S^{2-}$ | | |
| f) | $K^+$ $P^{3-}$ | | |
| g) | $Ca^{2+}$ $N^{3-}$ | | |
| h) | $Al^{3+}$ $Br^-$ | | |
| i) | $Ba^{2+}$ $Se^{2-}$ | | |
| j) | $Zn^{2+}$ $O^{2-}$ | | |

Name _____ Date _____

**Evaluating**
Topic 2.5

## Ionic Compounds with Multivalent Metals

*Use with textbook pages 162–163.*

*You can use the periodic table on page 106 and Roman numerals listed on page 162 to help you answer these questions.*

1. Write the formulas and names of the ionic compounds with the following combination of ions. The table has been partially completed to help guide you.

| | Positive Ion | Negative Ion | Chemical Formula | Compound Name |
|---|---|---|---|---|
| a) | $Ti^{3+}$ | $Cl^-$ | | |
| b) | | | | iron(II) oxide |
| c) | | | $PdBr_2$ | |
| d) | $Sn^{4+}$ | $F^-$ | | |
| e) | | | | gold(I) chloride |
| f) | $Pt^{4+}$ | $O^{2-}$ | | |
| g) | | | $CoF_2$ | |
| h) | | | | nickel(II) iodide |
| i) | $Nb^{2+}$ | $N^{3-}$ | | |
| j) | | | $MnO_2$ | |

2. Write the chemical formulas for the following ionic compounds.

a) cobalt(III) fluoride _____
b) osmium(IV) chloride _____
c) chromium(III) oxide _____
d) mercury(II) selenide _____
e) copper(II) chloride _____
f) lead(II) sulfide _____
g) titanium(III) nitride _____
h) bismuth(III) sulfide _____
i) ruthenium(IV) oxide _____
j) nickel(II) fluoride _____

3. Write the names of the following ionic compounds.

a) $NbCl_5$ _____
b) $SnF_4$ _____
c) $Mn_2O_3$ _____
d) $RhCl_3$ _____
e) $NiF_3$ _____
f) $HgS$ _____
g) $TlI$ _____
h) $IrO_2$ _____
i) $FeCl_2$ _____
j) $V_2O_5$ _____

Name _____ Date _____

Evaluating
Topic 2.5

## Ionic Compounds with Polyatomic Ions

*Use with textbook pages 164–165.*

*You can use the periodic table on page 106 and the list of polyatomic ions on page 164 to help you answer these questions.*

**1.** Complete the following table by providing the correct chemical formula for each compound formed from the ions indicated.

| Formulas for Some Ionic Compounds | | | | |
|---|---|---|---|---|
| | fluoride | hydroxide | carbonate | phosphate |
| a) sodium | | | | |
| b) aluminum | | | | |
| c) copper(II) | | | | |
| d) manganese(IV) | | | | |
| e) ammonium | | | | |

**2.** Write the chemical formulas for the following ionic compounds.

a) barium chlorite _____

b) nickel(II) nitrate _____

c) potassium chromate _____

d) lead(IV) phosphate _____

e) cadmium peroxide _____

f) copper(I) carbonate _____

g) chromium(III) sulfite _____

h) calcium phosphite _____

i) iron(III) acetate _____

j) strontium permanganate _____

**3.** Write the names of the following ionic compounds.

a) $V(ClO_3)_4$ _____

b) $Al_2(CO_3)_3$ _____

c) $Co(NO_2)_2$ _____

d) $(NH_4)_2SO_4$ _____

e) $Ti(CrO_4)_2$ _____

f) $Li_3PO_4$ _____

g) $Cr(MnO_4)_3$ _____

h) $Ag_2Cr_2O_7$ _____

i) $Mg(HCO_3)_2$ _____

j) $Sn(OH)_4$ _____

## Covalent Compounds

*Use with textbook pages 168–172.*

1. Write the chemical formula for each of the following binary covalent compounds.
   a) sulfur dioxide _____
   b) carbon tetrafluoride _____
   c) selenium trioxide _____
   d) nitrogen trichloride _____
   e) carbon dioxide _____
   f) boron trifluoride _____
   g) tetrasulfur tetranitride _____
   h) diphosphorus pentoxide _____
   i) carbon disulfide _____
   j) nitrogen monoxide _____
   k) diarsenic trioxide _____
   l) sulfur hexafluoride _____

2. Write the name for each of the following binary covalent compounds.
   a) $Cl_2O_7$ _____
   b) $N_2O_4$ _____
   c) $SO_3$ _____
   d) $PCl_5$ _____
   e) $NF_3$ _____
   f) $CS_2$ _____
   g) $SiF_4$ _____
   h) $N_2O_3$ _____
   i) $BI_3$ _____
   j) $ClF_3$ _____
   k) $SCl_2$ _____
   l) $CO$ _____