CK-12 Chemistry - Basic
Answer Key

Chapter 7: Chemical Nomenclature

7.1 Ionic Compounds

Lesson Review Questions

Questions

1. What is the purpose of an empirical formula?
2. Define binary and ternary ionic compounds.
3. What is the difference between a monatomic and a polyatomic ion?
4. For each of the following ionic compounds, what ions are present and in what ratio?
   (a) $MgBr_2$
   (b) Li_2CO_3
   (c) $Fe_2(SO_4)_3$

5. Predict the compound that forms when gallium combines with oxygen. What would the name of this compound be?
6. Give the formula for each of the following ionic compounds:
   (a) ammonium nitrate
   (b) cobalt(II) sulfate
   (c) nickel(II) cyanide
   (d) vanadium(III) oxide
   (e) barium oxide
   (f) calcium hypochlorite

7. Name the following ionic compounds:
   (a) $MgBr_2$
   (b) (d) $KMnO_4$
   (c) Li_2CO_3
   (d) $(NH_4)_2S$
   (e) $KHSO_3$
   (f) $CuCl$
   (g) $CuCl_2$
8. Write the correct formulas for the following ionic compounds:
   a. Barium chloride
   b. Chromium(III) oxide
   c. Potassium sulfate
   d. Zinc phosphate

Answer:

1. The empirical formula is the most straightforward way to describe the structure of a molecule, using a chemical formula that gives the lowest whole number ratio between the ions involved.

2. Binary ionic compounds are compounds composed of only two elements (like NaCl). Ternary ionic compounds are those composed of more than two elements (like KOH).
3. Monatomic ions form when a single atom gains or loses electrons (Na+). A polyatomic ion is an ion composed of more than one atom (Ammonium ion)
4. Answers:
    a. Mg^{2+} and 2 Br^{-}
    b. $2Li^{+}$ and CO_3^{2-}
    c. $2Fe^{3+}$ and 3 SO_4^{2-}
5. Ga_2O_3 gallium oxide
6. Answers:
    a. NH_4NO_3
    b. $CoSO_4$
    c. $Ni(CN)_2$
    d. V_2O_3
    e. BaO
    f. $CaClO_2$
7. Answers:
    a. magnesium bromide
    b. lithium carbonate
    c. potassium hydrogen sulfite or potassium bisulfite
    d. potassium permanganate
    e. ammonium sulfide
    f. copper (I) chloride or copper (II) chloride
8. Answers:
    a. $BaCl_2$
    b. Cr_2O_3
    c. K_2SO_4
    d. $Zn_3(PO_4)_2$

7.2 Molecular Compounds

Check Your Understanding

1. Give an example of a cation and an anion.

    Answer: a cation would be any positively charged ion. An anion would include any negatively charged ion. Figure(s) 7.3 and 7.4 list a variety of cations and anions. Examples include: Na^{+}, Mg^{2+}, F^{-}, O^{2-}.

2. Give an example of an ionic compound. What makes it ionic?

    Answer: An example of an ionic compound would be calcium oxide (CaO).

3. Name the following compounds

    - MgO – magnesium oxide

- CuO – copper (II) oxide

Lesson Review Questions

Questions

1. How is a covalent bond characterized?
2. What differs between ionic compounds and molecules?
3. What are binary molecular compounds?
4. What differs between a molecular formula and an empirical formula?
5. Give the formula for each of the following binary, covalent compounds:
   (a) carbon dioxide
   (b) phosphorus triiodide
   (c) sulfur dichloride
   (d) boron trifluoride
   (e) dioxygen difluoride
   (f) xenon trioxide

6. Name the following binary, covalent compounds:
   (a) N_2F_4
   (b) HBr
   (c) SF_4
   (d) BCl_3
   (e) P_2O_5
   (f) ClF_3

7. Is “nitrogen oxide” an appropriate name for the compound NO? Why or why not?
8. Is “calcium oxide” an appropriate name for the compound CaO? Why or why not?

Answers:

1. A covalent bond is a bond in which two or more atoms are bonded together by sharing electrons.
2. Ionic compounds are formed when atoms of various elements have either gained or lost electrons. Molecules are formed when a group of atoms are joined together by covalent bonds.
3. A molecular compound that is composed of two elements.
4. Because ionic substances exist in extended networks, we give the lowest whole-number ratio of cations to anions as the empirical formula. The molecular formula is not simply a ratio, but rather designates how many of each atom is in a single molecule of that substance.
5. Answers:
   a. CO_2
   b. PI_3
   c. SCl_2
   d. BF_3
   e. O_2F_2
   f. XeO_3
6. Answers:
   a. dinitrogen tetrafluoride
   b. hydrogen bromide
   c. sulfur hexafluoride
   d. boron trichloride
   e. diphosphorus pentoxide

f. chlorine trifluoride

7. It would not be appropriate because there are other N-O compounds with varying rations of N and O.
8. It is appropriate to name this compound calcium oxide, because there is only one common ion form of calcium and oxygen.

7.3 Acids and Bases

Check Your Understanding

1. Name the following compounds:
    a. $NaNO_3$ sodium nitrate
    b. BF_3 boron trifluoride
    c. $FeSO_3$iron (II) sulfite
2. Which of the following are covalent or ionic:
    a. H_2O covalent
    b. CH_4 covalent
    c. $BaSO_4$ ionic

Lesson Review Questions

Questions:

1. How do acids behave in water?
2. What defines a binary acid?
3. What defines an oxoacid?
4. How do bases behave in water?
5. Complete the following table.

#	Acid Name	Formula of Acid	Name of Anion
1.	hydrobromic acid	HBr	bromide
2.	carbonic acid	H_2CO_3	carbonate
3.		HCl	
4.			sulfite
5.	chlorous		
6.	nitric		
7.			sulfide

8.		HNO_2	
9.	chromic		
10.			phosphate

6. Name the following acids:

(a) HF
(b) HI
(c) H_2S
(d) H_3PO_4
(e) H_2SO_4

7. Write the formula for the following acids:

(a) sulfurous acid
(b) hydrosulfuric acid
(c) nitric acid
(d) carbonic acid
(e) chloric acid
(f) acetic acid

Answers:

1. Acids produce hydrogen ions (H+) when dissolved in water.

2. Binary acids are acids in which one or more acidic hydrogen atoms are bound directly to a single atom. As a result, the anion left behind when a binary acid is dissolved in water is a monatomic anion.

3. Many strong acids leave behind polyatomic anions. An oxoacid is a strong acid produced by combining oxoanions with one or more hydrogen ions to make a neutral molecule.

4. Bases are compounds that produce hydroxide ions (OH-) when dissolved in water.

5.

#	Acid Name	Formula of Acid	Name of Anion
1.	hydrobromic acid	HBr	bromide
2.	carbonic acid	H_2CO_3	carbonate
3.	hydrochloric acid	HCl	chloride
4.	sulfurous acid	H_2SO_3	sulfite
5.	chlorous	$HClO_2$	chlorite
6.	nitric	HNO_3	nitrate
7.	hydrosulfuric acid	H_2S	sulfide
8.	nitrous acid	HNO_2	nitrite
9.	chromic	H_2CrO_4	chromate
10.	phosphoric acid	H_3PO_4	phosphate

6. Answers:
   a. hydrofluoric

b. hydroiodic
c. hydrosulfuric
d. phosphoric
e. sulfuric

7. Answers:
   a. H_2SO_3
   b. H_2S
   c. HNO_3
   d. H_2CO_3
   e. $HClO_3$
   f. CH_3COOH