

## Sample Problems

**Answers**

- selenide ion
  - barium ion
  - phosphide ion
  - iodide ion
- three electrons lost
  - two electrons gained
  - one electron lost
  - two electrons lost

**Lesson Check Answers**

- Metals in Groups 1A, 2A, and 3A form cations with charges equal to their group numbers. Group A nonmetals form anions with charges equal to 8 minus their group numbers. Often, the charge of a transition metal cation must be determined from the number of electrons lost.
- Both carry a charge. A polyatomic ion is composed of more than one atom; a monatomic ion is a single atom.
- Group 1A metals, 1+; Group 3A (aluminum), 3+; Group 5A nonmetals, 3-
- $K^+$ , cation, potassium ion
  - $O^{2-}$ , anion, oxide ion
  - $Br^-$ , anion, bromide ion
  - $Sn^{2+}$ , cation, tin(II) ion
  - $Be^{2+}$ , cation, beryllium ion
  - $Co^{3+}$ , cation, cobalt(III) ion
- $NH_4^+$
  - $Cr^{2+}$
  - $CrO_4^{2-}$
  - $NO_3^-$
- One has one more oxygen atom than the other. The one with more oxygen atoms ( $PO_4^{3-}$ ) gets the *-ate* ending, while the other ( $PO_3^{3-}$ ) gets the *-ite* ending.

- BIG IDEA** The electron configurations for a cation from a Group 1A element and the preceding noble gas are the same. The electron configurations for an anion from a Group 7A element and the following noble gas are the same. *SC.912.P.8.5*

## Sample Problems

**Answers****FIGURE 9.8**  $\text{Fe}_2\text{O}_3$ **READING SUPPORT** An ionic compound is composed of ions. A molecular compound is composed of molecules.**10. a.**  $\text{BaS}$  **b.**  $\text{Li}_2\text{O}$  **c.**  $\text{Ca}_3\text{N}_2$  **d.**  $\text{CuI}_2$ **11. a.**  $\text{NaI}$  **b.**  $\text{SnCl}_2$  **c.**  $\text{K}_2\text{S}$  **d.**  $\text{CaI}_2$ **FIGURE 9.9** 2+ and 4+, respectively**12. a.** zinc sulfide **b.** potassium chloride**c.** barium oxide **d.** copper(II) bromide**13. a.** calcium oxide **b.** copper(I) selenide**c.** iron(II) sulfide **d.** aluminum fluoride**FIGURE 9.10** to specify the charge (Lead can have a 2+ charge or a 4+ charge.)**14. a.**  $(\text{NH}_4)_2\text{SO}_3$  **b.**  $\text{Ca}_3(\text{PO}_4)_2$ **15. a.**  $\text{LiHSO}_4$  **b.**  $\text{Cr}(\text{NO}_2)_3$ **16. a.** calcium oxalate**b.** potassium hypochlorite**c.** potassium permanganate**d.** lithium sulfite**17. a.** aluminum hydroxide**b.** sodium chlorate**c.** tin(II) phosphate**d.** sodium chromate

**Lesson Check Answers**

18. Write the symbol for the cation then the symbol for the anion. Balance the charges. Write the cation name then the anion name.
19. Write the symbol or formula for the cation then the symbol or formula of the anion. Balance the charges. Name the cation first followed by the anion.
20. Most common names do not tell you about the chemical composition of a compound. Many common names indicate other physical characteristics of the compound.
21. a.  $\text{BeCl}_2$    b.  $\text{Cs}_2\text{S}$    c.  $\text{NaI}$    d.  $\text{SrO}$
22. The charges of the ions must balance.
23. a.  $\text{Cr}(\text{NO}_2)_3$    b.  $\text{NaClO}_4$   
c.  $\text{Mg}(\text{HCO}_3)_2$    d.  $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$
24. when the compound contains more than one of a particular polyatomic ion
25. a. lithium fluoride  
b. tin(IV) sulfide  
c. manganese(II) carbonate  
d. strontium dihydrogen phosphate
26. a. incorrect; charges are not balanced,  $\text{MgSO}_4$   
b. incorrect; anion symbol should be second,  $\text{Rb}_3\text{As}$   
c. incorrect; charges are not balanced,  $\text{BeCl}_2$

## Sample Problems

**Answers**

27. a. oxygen difluoride  
b. disulfur decafluoride  
c. sulfur trioxide  
d. sulfur hexafluoride
28. a.  $\text{N}_2\text{O}_4$    b.  $\text{XeF}_4$    c.  $\text{S}_2\text{F}_{10}$    d.  $\text{IF}_7$

## Lesson Check Answers

29. Name the elements in the order written in the formula, using prefixes as necessary to indicate the number of each kind of atom. Then, use the suffix *-ide* on the name of the second element. Write the symbol for each element with a subscript corresponding to the prefix before each element in the name.
30. **a.** nitrogen trichloride **b.** boron trichloride **c.** nitrogen triiodide **d.** sulfur trioxide **e.** dinitrogen tetrahydride **f.** dinitrogen trioxide
31. **a.**  $\text{PCl}_5$  **b.**  $\text{IF}_7$  **c.**  $\text{ClF}_3$  **d.**  $\text{IO}_2$
32. **a.** carbon disulfide  
**b.** dichlorine heptoxide  
**c.**  $\text{CBr}_4$  **d.**  $\text{P}_2\text{O}_3$
33. No; the correct name is silicon tetrachloride.
34. Yes; chlorine forms only one bond, and silicon forms four bonds.
35. **a.** molecular; two nonmetals  
**b.** ionic; metal and nonmetal ions  
**c.** ionic; metal and nonmetal ions  
**d.** molecular; two nonmetals
36. **BIG IDEA** An ionic compound is composed of ions. A molecular compound is composed of molecules.

## Sample Problems

### Answers

37. **a.** hydrofluoric acid **b.** nitric acid  
**c.** sulfurous acid
38. **a.**  $\text{HClO}_4$  **b.**  $\text{HI}$  **c.**  $\text{HClO}_2$
39. **a.** barium hydroxide  
**b.** calcium hydroxide  
**c.** rubidium hydroxide
40. **a.**  $\text{CsOH}$  **b.**  $\text{Be}(\text{OH})_2$  **c.**  $\text{Mn}(\text{OH})_3$

## Lesson Check Answers

41. See the rules for naming acids on page 286. Use the rules for naming acids in reverse to write the formula.
42. The name of the cation is followed by the name of the anion. To write the formula, write the symbol for the cation then the formula for the anion. Then, balance the charges.
43. a. nitrous acid  
b. permanganic acid  
c. hydrobromic acid  
d. hydrosulfuric acid
44. a. lithium hydroxide  
b. lead(II) hydroxide  
c. magnesium hydroxide  
d. aluminum hydroxide
45. a. base, ammonium hydroxide  
b. acid, chloric acid  
c. base, iron(III) hydroxide  
d. base, potassium hydroxide
46. a.  $\text{H}_2\text{CO}_3$     b.  $\text{H}_2\text{SO}_3$   
c.  $\text{Fe}(\text{OH})_3$     d.  $\text{Zn}(\text{OH})_2$
47. acid, hydrogen; base, hydroxide ion

## Sample Problems

### Answers

**FIGURE 9.16** No, as long as the two samples have the same mass of *B*.

48.  $2.98 \text{ g Pb} / 0.461 \text{ g of Oxygen} = X \text{ Pb} / 1.0 \text{ g Oxygen}$ ;  $X = 6.46$   
 $9.89 \text{ g Pb} / 0.763 \text{ g of Oxygen} = X \text{ Pb} / 1.0 \text{ g Oxygen}$ ;  $X = 12.96$   
 $12.06/6.26 = 2$  Therefore, the lowest mass ration of lead to oxygen is 1:2
49. 7:3 Fe:O    33 g Iron (III) Oxygen is  $23 \text{ g Fe} / 10 \text{ g O} = 2.3:1$   
 7:3 is also a 2.3:1 ratio ... they are the same compound

## Lesson Check Answers

50. Dalton postulated that atoms combine in simple whole-number ratios. If the ratio of atoms of each element in a compound is fixed, then it follows that the ratio of their masses is also fixed.
51. Refer to the rules listed on pages 292 and 293.
52. no; 2:1
53. a. calcium carbonate  
b. lead(II) chromate  
c. tin(II) dichromate
54. a.  $\text{Sn}(\text{OH})_2$  b.  $\text{BaF}_2$  c.  $\text{I}_4\text{O}_9$   
d.  $\text{Fe}_2(\text{C}_2\text{O}_4)_3$
55. a. incorrect; a Roman numeral is not used with a Group A metal, calcium oxide  
d. Incorrect; ammonium ion, a polyatomic cation, will not form a compound with a monatomic cation.
56. **BIG IDEA** As stated in the law of definite proportions, the masses of the elements in  $\text{H}_2\text{O}$ , hydrogen and oxygen, are always in the same

Proportion of 1:8 (H:O).  $\text{H}_2$  has a mass of  $2 \times 1 \text{ g/mol} = 2 \text{ g/mol}$ ; O has a mass of  $16 \text{ g/mol}$ . Therefore,  $2:16 = 1:8$