2.58 Using the periodic table, predict the charges of the ions of the following elements: **(a)** Ga, **(b)** Sr, **(c)** As, **(d)** Br, **(e)** Se.

2.59 Using the periodic table to guide you, predict the chemical formula and name of the compound formed by the following elements: **(a)** Ga and F, **(b)** Li and H, **(c)** Al and I, **(d)** K and S.

2.60 The most common charge associated with scandium in its compounds is 3+. Indicate the chemical formulas you would expect for compounds formed between scandium and **(a)** iodine, **(b)** sulfur, **(c)** nitrogen.

2.61 Predict the chemical formula for the ionic compound formed by **(a)** Ca^{2+} and Br^-, **(b)** K^+ and CO_3^{2-}, **(c)** Al^{3+} and CH_3COO^-, **(d)** NH_4^+ and SO_4^{2-}, **(e)** Mg^{2+} and PO_4^{3-}.

2.62 Predict the chemical formulas of the compounds formed by the following pairs of ions: **(a)** Cr^{3+} and Br^-, **(b)** Fe^{3+} and O^{2-}, **(c)** Hg_2^{2+} and CO_3^{2-}, **(d)** Ca^{2+} and ClO_3^-, **(e)** NH_4^+ and PO_4^{3-}.

2.63 Complete the table by filling in the formula for the ionic compound formed by each pair of cations and anions, as shown for the first pair.

Ion	K^+	NH_4^+	Mg^{2+}	Fe^{3+}
Cl^-	KCl			
OH^-				
CO_3^{2-}				
PO_4^{3-}				

2.64 Complete the table by filling in the formula for the ionic compound formed by each pair of cations and anions, as shown for the first pair.

Ion	Na^+	Ca^{2+}	Fe^{2+}	Al^{3+}
O^{2-}	Na_2O			
NO_3^-				
SO_4^{2-}				
AsO_4^{3-}				

2.65 Predict whether each of the following compounds is molecular or ionic: **(a)** B_2H_6, **(b)** CH_3OH, **(c)** $LiNO_3$, **(d)** Sc_2O_3, **(e)** CsBr, **(f)** NOCl, **(g)** NF_3, **(h)** Ag_2SO_4.

2.66 Which of the following are ionic, and which are molecular? **(a)** PF_5, **(b)** NaI, **(c)** SCl_2, **(d)** $Ca(NO_3)_2$, **(e)** $FeCl_3$, **(f)** LaP, **(g)** $CoCO_3$, **(h)** N_2O_4.

Naming Inorganic Compounds; Some Simple Organic Compounds (Sections 2.8 and 2.9)

2.67 Give the chemical formula for **(a)** chlorite ion, **(b)** chloride ion, **(c)** chlorate ion, **(d)** perchlorate ion, **(e)** hypoite ion.

2.68 Selenium, an element required nutritionally in trace quantities, forms compounds analogous to sulfur. Name the following ions: **(a)** SeO_4^{2-}, **(b)** Se^{2-}, **(c)** HSe^-, **(d)** $HSeO_3^-$.

2.69 Give the names and charges of the cation and anion in each of the following compounds: **(a)** CaO, **(b)** Na_2SO_4, **(c)** $KClO_4$, **(d)** $Fe(NO_3)_2$, **(e)** $Cr(OH)_3$.

2.70 Give the names and charges of the cation and anion in each of the following compounds: **(a)** CuS, **(b)** Ag_2SO_4, **(c)** $Al(ClO_3)_3$, **(d)** $Co(OH)_2$, **(e)** $PbCO_3$.

2.71 Name the following ionic compounds: **(a)** Li_2O, **(b)** $FeCl_3$, **(c)** NaClO, **(d)** $CaSO_3$, **(e)** $Cu(OH)_2$, **(f)** $Fe(NO_3)_2$, **(g)** $Ca(CH_3COO)_2$, **(h)** $Cr_2(CO_3)_3$, **(i)** K_2CrO_4, **(j)** $(NH_4)_2SO_4$.

2.72 Name the following ionic compounds: **(a)** KCN, **(b)** $NaBrO_2$, **(c)** $Sr(OH)_2$, **(d)** CoTe, **(e)** $Fe_2(CO_3)_3$, **(f)** $Cr(NO_3)_3$, **(g)** $(NH_4)_2SO_3$, **(h)** NaH_2PO_4, **(i)** $KMnO_4$, **(j)** $Ag_2Cr_2O_7$.

2.73 Write the chemical formulas for the following compounds: **(a)** aluminum hydroxide, **(b)** potassium sulfate, **(c)** copper(I) oxide, **(d)** zinc nitrate, **(e)** mercury(II) bromide, **(f)** iron(III) carbonate, **(g)** sodium hypobromite.

2.74 Give the chemical formula for each of the following ionic compounds: **(a)** sodium phosphate, **(b)** zinc nitrate, **(c)** barium bromate, **(d)** iron(II) perchlorate, **(e)** cobalt(II) hydrogen carbonate, **(f)** chromium(III) acetate, **(g)** potassium dichromate.

2.75 Give the name or chemical formula, as appropriate, for each of the following acids: **(a)** $HBrO_3$, **(b)** HBr, **(c)** H_3PO_4, **(d)** hypochlorous acid, **(e)** iodic acid, **(f)** sulfurous acid.

2.76 Provide the name or chemical formula, as appropriate, for each of the following acids: **(a)** hydroiodic acid, **(b)** chloric acid, **(c)** nitrous acid, **(d)** H_2CO_3, **(e)** $HClO_4$, **(f)** CH_3COOH.

2.77 Give the name or chemical formula, as appropriate, for each of the following binary molecular substances: **(a)** SF_6, **(b)** IF_5, **(c)** XeO_3, **(d)** dinitrogen tetroxide, **(e)** hydrogen cyanide, **(f)** tetraphosphorus hexasulfide.

2.78 The oxides of nitrogen are very important components in urban air pollution. Name each of the following compounds: **(a)** N_2O, **(b)** NO, **(c)** NO_2, **(d)** N_2O_5, **(e)** N_2O_4.

2.79 Write the chemical formula for each substance mentioned in the following word descriptions (use the front inside cover to find the symbols for the elements you do not know). **(a)** Zinc carbonate can be heated to form zinc oxide and carbon dioxide. **(b)** On treatment with hydrofluoric acid, silicon dioxide forms silicon tetrafluoride and water. **(c)** Sulfur dioxide reacts with water to form sulfurous acid. **(d)** The substance phosphorus trihydride, commonly called phosphine, is a toxic gas. **(e)** Perchloric acid reacts with cadmium to form cadmium(II) perchlorate. **(f)** Vanadium(III) bromide is a colored solid.

2.80 Assume that you encounter the following sentences in your reading. What is the chemical formula for each substance mentioned? **(a)** Sodium hydrogen carbonate is used as a deodorant. **(b)** Calcium hypochlorite is used in some bleaching solutions. **(c)** Hydrogen cyanide is a very poisonous gas. **(d)** Magnesium hydroxide is used as a cathartic. **(e)** Tin(II) fluoride has been used as a fluoride additive in toothpastes. **(f)** When cadmium sulfide is treated with sulfuric acid, fumes of hydrogen sulfide are given off.

2.81 **(a)** What is a hydrocarbon? **(b)** Pentane is the alkane with a chain of five carbon atoms. Write a structural formula for this compound and determine its molecular and empirical formulas.

2.82 (a) What is meant by the term *isomer*? (b) Among the four alkanes, ethane, propane, butane, and pentane, which is capable of existing in isomeric forms?

2.83 **(a)** What is a functional group? **(b)** What functional group characterizes an alcohol? **(c)** Write a structural formula for 1-pentanol, the alcohol derived from pentane by making a substitution on one of the carbon atoms.

2.84 **(a)** What do ethane and ethanol have in common? **(b)** How does 1-propanol differ from propane?

2.85 Chloropropane is derived from propane by substituting Cl for H on one of the carbon atoms. **(a)** Draw the structural formulas for the two isomers of chloropropane. **(b)** Suggest names for these two compounds.

2.86 Draw the structural formulas for three isomers of pentane, C_5H_{12}.