

EXAMPLE 2.4 — **Formulas from Names for Type I Binary Compounds**

Given the following systematic names, write the formula for each compound:

- potassium iodide
- calcium oxide
- gallium bromide

EXAMPLE 2.5 — **Naming Type II Binary Compounds**

- Give the systematic name for each of the following compounds:
 - CuCl
 - HgO
 - Fe₂O₃
- Given the following systematic names, write the formula for each compound:
 - Manganese(IV) oxide
 - Lead(II) chloride

EXAMPLE 2.7 — **Naming Compounds Containing Polyatomic Ions**

- Give the systematic name for each of the following compounds:
 - Na₂SO₄
 - KH₂PO₄
 - Fe(NO₃)₃
 - Mn(OH)₂
 - Na₂SO₃
 - Na₂CO₃
- Given the following systematic names, write the formula for each compound:
 - Sodium hydrogen carbonate
 - Cesium perchlorate
 - Sodium hypochlorite
 - Sodium selenate
 - Potassium bromate

EXAMPLE 2.8 — **Naming Type III Binary Compounds**

- Name each of the following compounds:
 - PCl₅
 - PCl₃
 - SO₂
- From the following systematic names, write the formula for each compound:
 - Sulfur hexafluoride
 - Sulfur trioxide
 - Carbon dioxide

EXAMPLE 3.2 — **Determining the Mass of a Sample of Atoms**

Americium is an element that does not occur naturally. It can be made in very small amounts in a device known as a *particle accelerator*. Compute the mass in grams of a sample of americium containing six atoms.

EXAMPLE 3.4 — **Calculating Numbers of Atoms**

A silicon chip used in an integrated circuit of a microcomputer has a mass of 5.68 mg. How many silicon (Si) atoms are present in the chip?

EXAMPLE 3.5 — **Calculating the Number of Moles and Mass**

Cobalt (Co) is a metal that is added to steel to improve its resistance to corrosion. Calculate both the number of moles in a sample of cobalt containing 5.00×10^{20} atoms and the mass of the sample.

EXAMPLE 3.6 — **Calculating Molar Mass I**

Juglone, a dye known for centuries, is produced from the husks of black walnuts. It is also a natural herbicide (weed killer) that kills off competitive plants around the black walnut tree but does not affect grass and other noncompetitive plants. The formula for juglone is C₁₀H₆O₃.

- Calculate the molar mass of juglone.
- A sample of 1.56×10^{-2} g of pure juglone was extracted from black walnut husks. How many moles of juglone does this sample represent?

EXAMPLE 3.9 — **Calculating Mass Percent**

Carvone is a substance that occurs in two forms having different arrangements of the atoms but the same molecular formula ($C_{10}H_{14}O$) and mass. One type of carvone gives caraway seeds their characteristic smell, and the other type is responsible for the smell of spearmint oil. Compute the mass percent of each element in carvone.

EXAMPLE 3.10 — **Determining Empirical and Molecular Formulas I**

Determine the empirical and molecular formulas for a compound that gives the following percentages on analysis (in mass percents):

$$71.65\% \text{ Cl} \quad 24.27\% \text{ C} \quad 4.07\% \text{ H}$$

The molar mass is known to be 98.96 g/mol.

EXAMPLE 3.14 — **Balancing a Chemical Equation II**

At 1000°C , ammonia gas, $\text{NH}_3(\text{g})$, reacts with oxygen gas to form gaseous nitric oxide, $\text{NO}(\text{g})$, and water vapor. This reaction is the first step in the commercial production of nitric acid by the Ostwald process. Balance the equation for this reaction.

EXAMPLE 3.15 — **Chemical Stoichiometry I**

Solid lithium hydroxide is used in space vehicles to remove exhaled carbon dioxide from the living environment by forming solid lithium carbonate and liquid water. What mass of gaseous carbon dioxide can be absorbed by 1.00 kg of lithium hydroxide?

EXAMPLE 3.17 — **Stoichiometry: Limiting Reactant**

Nitrogen gas can be prepared by passing gaseous ammonia over solid copper(II) oxide at high temperatures. The other products of the reaction are solid copper and water vapor. If a sample containing 18.1 g of NH_3 is reacted with 90.4 g of CuO , which is the limiting reactant? How many grams of N_2 will be formed?

EXAMPLE 3.18 — **Calculating Percent Yield**

Methanol

Methanol (CH_3OH), also called *methyl alcohol*, is the simplest alcohol. It is used as a fuel in race cars and is a potential replacement for gasoline. Methanol can be manufactured by combining gaseous carbon monoxide and hydrogen. Suppose 68.5 kg $\text{CO}(\text{g})$ is reacted with 8.60 kg $\text{H}_2(\text{g})$. Calculate the theoretical yield of methanol. If 3.57×10^4 g CH_3OH is actually produced, what is the percent yield of methanol?

Solution**EXAMPLE 4.2** — **Calculation of Molarity II**

Calculate the molarity of a solution prepared by dissolving 1.56 g of gaseous HCl in enough water to make 26.8 mL of solution.

EXAMPLE 4.3 — **Concentration of Ions I**

Give the concentration of each type of ion in the following solutions:

- 0.50 M $\text{Co}(\text{NO}_3)_2$
- 1 M $\text{Fe}(\text{ClO}_4)_3$

EXAMPLE 4.7 — **Concentration and Volume**

What volume of 16 M sulfuric acid must be used to prepare 1.5 L of a 0.10 M H_2SO_4 solution?

EXAMPLE 7.6 — Electron Subshells

For principal quantum level $n = 5$, determine the number of allowed subshells (different values of ℓ), and give the designation of each.

EXAMPLE 7.7 — Electron Configurations

Give the electron configurations for sulfur (S), cadmium (Cd), hafnium (Hf), and radium (Ra) using the periodic table inside the front cover of this book.

EXAMPLE 7.8 — Trends in Ionization Energies

The first ionization energy for phosphorus is 1060 kJ/mol, and that for sulfur is 1005 kJ/mol. Why?

EXAMPLE 7.10 — Trends in Radii

Predict the trend in radius for the following ions: Be^{2+} , Mg^{2+} , Ca^{2+} , and Sr^{2+} .

EXAMPLE 8.1 — Relative Bond Polarities

Order the following bonds according to polarity: H—H, O—H, Cl—H, S—H, and F—H.

EXAMPLE 8.4 — Relative Ion Size II

Choose the largest ion in each of the following groups.

- Li^+ , Na^+ , K^+ , Rb^+ , Cs^+
- Ba^{2+} , Cs^+ , I^- , Te^{2-}

EXAMPLE 8.6 — Writing Lewis Structures

Give the Lewis structure for each of the following.

- HF
- N_2
- NH_3
- CH_4
- CF_4
- NO^+

EXAMPLE 8.7 — Lewis Structures for Molecules That Violate the Octet Rule I

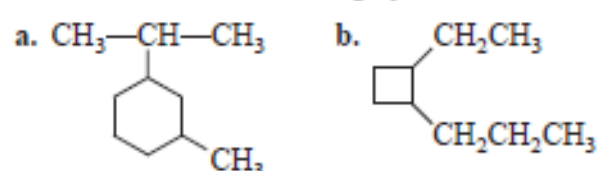
Write the Lewis structure for PCl_5 .

EXAMPLE 22.2 — Isomerism and Nomenclature

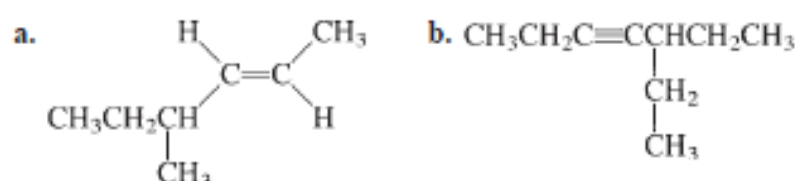
Draw the structural isomers for the alkane C_6H_{14} and give the systematic name for each one.

EXAMPLE 22.4 — Naming Cyclic Alkanes

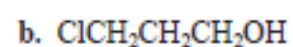
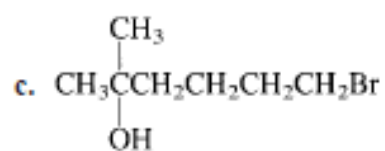
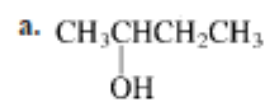
Name each of the following cyclic alkanes.

**EXAMPLE 22.5 — Naming Alkenes and Alkynes**

Name each of the following molecules.



For each of the following alcohols, give the systematic name and specify whether the alcohol is primary, secondary, or tertiary.



Functional Groups

47. Identify each of the following compounds as a carboxylic acid, ester, ketone, aldehyde, or amine.

a. Anthraquinone, an important starting material in the manufacture of dyes:

