

UNIT 2: Matter and Energy

Lesson 8: Analyzing Chemical Formulas

Engage



Which Does Not Belong?

In your science notebook, copy the list below. Circle the one word that does not belong in the group. Finish the statement that explains why it does not belong.

1. silver, nickel, cobalt, iron (not . . .)
2. neon, nitrogen, helium, argon (not . . .)
3. group, period, seven, horizontal rows (not . . .)
4. vertical column, group, period, valence electrons (not . . .)
5. sodium chloride, carbon dioxide, lead, lithium sulfide (not . . .)
6. Cu, Ag, H₂O, Au (not . . .)
7. CH₄, NaOH, C₆H₆, C₆H₁₂O₆ (not . . .)

Explore

Matching Game

Working in small groups, match the graphic card model with a possible chemical formula.



Lesson 8: Analyzing Chemical Formulas

Explain, Part 1

Review the Explore card matching activity in a class discussion.

- What do the letters represent?
- What is the total number of shapes on each card?

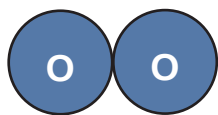
Explain, Part 2

Analyzing Chemical Formulas

All compounds have definite compositions that can be represented by a chemical formula. Remember that chemical formulas use symbols or a combination of symbols and subscripts to show the elements and the number of atoms of each element that make up the molecule.

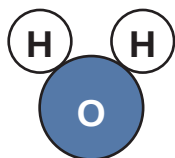
For example, the formula for oxygen gas is O_2 . The subscript indicates two oxygen atoms are bonded in an oxygen molecule as shown in Figure 2.32.

Figure 2.32. Oxygen Molecule



Another common chemical formula is H_2O . As shown in Figure 2.33, H_2 represents 2 atoms of hydrogen and O represents 1 atom of oxygen. H_2O is the chemical formula for the inorganic compound known as water.

Figure 2.33. Molecule of Water



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The inorganic compound magnesium hydroxide is written as $\text{Mg}(\text{OH})_2$. Notice the subscript after the parentheses in Figure 2.34. The subscript indicates there are 2 sets of the OH molecule.

Chemical formulas are a shorthand way to communicate the parts of a molecule. Subscripts are used in formulas to identify how many atoms of a particular element are present. In some cases, parentheses are used to indicate elements grouped together as a molecule within the compound.

Figure 2.34. Magnesium Hydroxide



Atoms per Element

Identify the elements found in each of the following compounds. Then determine the number of atoms in each element.

1. carbon dioxide— CO_2
2. glucose— $\text{C}_6\text{H}_{12}\text{O}_6$
3. calcium hydroxide— $\text{Ca}(\text{OH})_2$



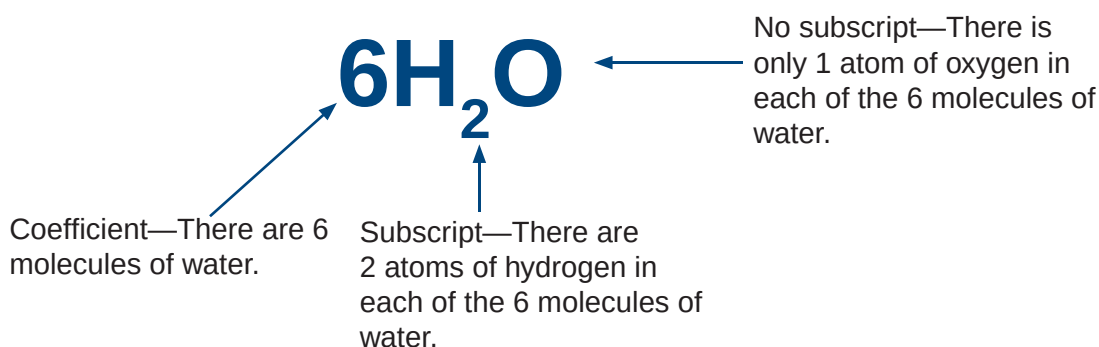
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Explain, Part 3

Using Coefficients and Subscripts

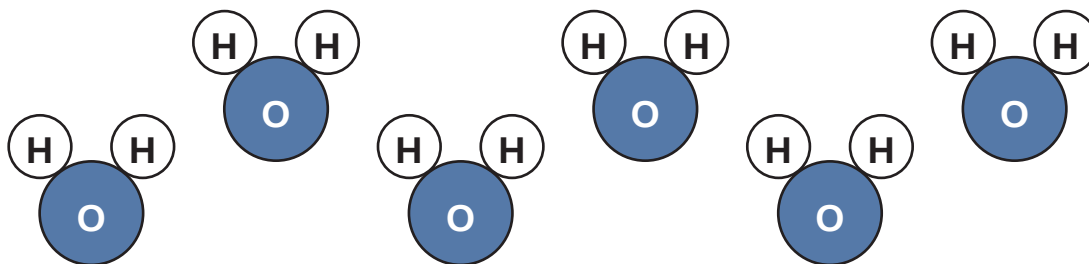
A coefficient indicates the number of molecules of a compound or element. For example, 6 molecules of water is written as $6\text{H}_2\text{O}$.

Figure 2.35. Parts of a Compound



A visual can also be used to help determine the total number of atoms. The coefficient indicates there are 6 molecules of water.

Figure 2.36. Visual Model of a Compound



Here's another way to determine the number of atoms of each element:.

To determine the number of atoms in $6\text{H}_2\text{O}$:

6 molecules $\times$ 2 hydrogen atoms = 12 hydrogen atoms

6 molecules $\times$ 1 oxygen atom = 6 oxygen atoms

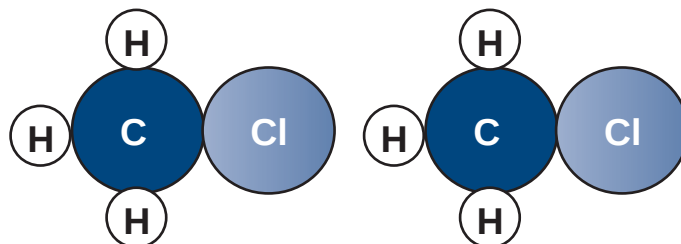
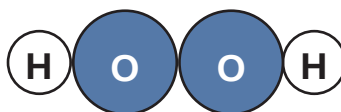
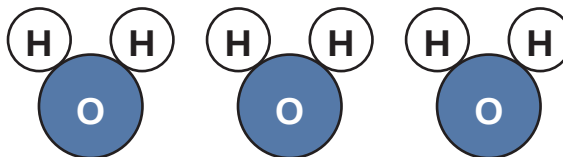
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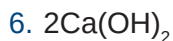


Chemical Formulas

In your science notebook, write the chemical formula for each of the following. Place the proper coefficient in the blank and any subscripts needed in the appropriate boxes.



Copy the following formulas into your science notebook. Determine the number of atoms per element represented in each of the following substances. Justify your answers mathematically or with a drawing.



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Elaborate

Follow your teacher's instructions to complete the *Composition of Compounds* handout.



Reflection

A friend is having difficulty writing chemical formulas. Create a list of guidelines to help your friend write chemical formulas.

Evaluate

Use the Periodic Table and your knowledge of compounds and chemical formulas to complete the assessment.