

# Standard #: SC.912.P.8.7

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Interpret formula representations of molecules and compounds in terms of composition and structure.

## General Information

**Subject Area:** Science

**Grade:** 912

**Body of Knowledge:** Physical Science

**Idea:** Level 2: Basic Application of Skills & Concepts

**Standard:** [Matter](#) -

**Date Adopted or Revised:** 02/08

A. A working definition of matter is that it takes up space, has mass, and has measurable properties. Matter is comprised of atomic, subatomic, and elementary particles.

B. Electrons are key to defining chemical and some physical properties, reactivity, and molecular structures. Repeating (periodic) patterns of physical and chemical properties occur among elements that define groups of elements with similar properties. The periodic table displays the repeating patterns, which are related to the atom's outermost electrons. Atoms bond with each other to form compounds.

C. In a chemical reaction, one or more reactants are transformed into one or more new products. Many factors shape the nature of products and the rates of reaction.

D. Carbon-based compounds are building-blocks of known life forms on earth and numerous useful natural and synthetic products.

**Content Complexity Rating:** [Level 2: Basic Application of Skills & Concepts](#) - [More Information](#)

**Date of Last Rating:** 05/08

**Status:** State Board Approved

## Related Courses

Course Number	Course Title
<a href="#">2002110:</a>	M/J Comprehensive Science 3, Advanced (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2000320:</a>	Biology 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2003340:</a>	Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2003350:</a>	Chemistry 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2002480:</a>	Forensic Science 1 (Specifically in versions: 2014 - 2015, 2015 - 2017, 2017 - 2022 (current), 2022 and beyond)
<a href="#">2002490:</a>	Forensic Sciences 2 (Specifically in versions: 2014 - 2015, 2015 - 2017, 2017 - 2022 (current), 2022 and beyond)
<a href="#">2002400:</a>	Integrated Science 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2002410:</a>	Integrated Science 1 Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2003310:</a>	Physical Science (Specifically in versions: 2015 - 2022 (current), 2022 and beyond)
<a href="#">2003320:</a>	Physical Science Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2003020:</a>	M/J Physical Science, Advanced (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2003800:</a>	Florida's Preinternational Baccalaureate Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">7920011:</a>	Access Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
<a href="#">7920025:</a>	Access Integrated Science 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
<a href="#">2002055:</a>	M/J Comprehensive Science 1 Accelerated Honors (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">2002405:</a>	Integrated Science 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
<a href="#">2003345:</a>	Chemistry 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2022 (current), 2022 and beyond)
<a href="#">7920022:</a>	Access Physical Science (Specifically in versions: 2016 - 2018, 2018 and beyond (current))

## Related Access Points

Access Points Number	Access Points Title
<a href="#">SC.912.P.8.Pa.4:</a>	Match common compounds to their names or communication symbols.
<a href="#">SC.912.P.8.In.6:</a>	Identify formulas for common compounds, such as H <sub>2</sub> O and CO <sub>2</sub> .
<a href="#">SC.912.P.8.Su.6:</a>	Match common chemical formulas to their common name, such as H <sub>2</sub> O to water.

## Related Resources

### Formative Assessment

Name	Description
<a href="#">Balancing Act:</a>	This activity allows students to practice balancing chemical equations. It has three difficulty levels, and the students can practice with 5, 10, or 15 questions.

### Lesson Plans

Name	Description
<a href="#">Modeling Compounds with Fruit Loops:</a>	In this activity students will model ionic and covalent bonds. Students will use colored fruit loops to represent electrons of various atoms.
<a href="#">Dancing Ionic Compounds:</a>	This lesson concentrates on teaching students to name and create formulas for ionic compounds with transition metals and group 1 and 2 metals. It uses a gradual release model by first guiding students through different scenarios, allowing them to work in groups, and finally working on an individual question. The Dancing Ionic Compounds activity is meant to be fun and engaging, helping students master the writing and naming of ionic compounds.
<a href="#">I-on-it (Ionic) or not?:</a>	In this physically engaging activity students will debate with their peers whether a randomly drawn statement/diagram/compound name or formula applies to ionic bonds, covalent bonds or both types of bonds. Then sort themselves throughout the room accordingly. Peer support and collaboration are encouraged while the teacher facilitates proper placement. Activity concludes with a T chart graphic organizer and a writing assignment where students personify the bond types.
<a href="#">Determining the Empirical Formula of Hydrates:</a>	Students will apply the mole concept and the law of conservation of mass to determine the empirical formula of a hydrate. Students will also use data from their experiment to understand the concept of mole ratios, formulas and predicting products from reactions. Students will interpret formula representation of compounds and understand their percent composition.
<a href="#">Balancing Chemical Equations Using a Visual Aid:</a>	Students will use this kinesthetic activity to further their knowledge regarding balancing chemical equations.

### Lesson Study Resource Kit

Name	Description
<a href="#">Atomically Correct:</a>	A Lesson Study Resource Kit that addresses interpreting chemical reactions at three areas of cognition: the macroscopic world of observable properties (sensory); the microscopic world of atoms, molecules, ions, and subatomic particles (diagrams); and the symbolic world of chemical formulas, equations, and symbols.

### Teaching Idea

Name	Description
<a href="#">Recognizing Chemical Reactions:</a>	This resource describes activity that will allow students to observe the effects of a chemical change as opposed to a physical change. It also gives them the opportunity to observe conservation of matter by modeling chemical equations. The main learning objective is the recognition that all chemical reactions create new molecules and that in a chemical reaction the original atoms get rearranged, bonding together in different ways.

### Text Resources

Name	Description
<a href="#">Demystifying Gross Stuff:</a>	This informational text resource is intended to support reading in the content area. From pimples to bad breath to passing gas, this article clears up the science behind some of the gross things our bodies do—acne, bad breath, and flatulence—in an attempt to make the gross seem a little less so.
<a href="#">Snapshots Differentiate Molecules From Their Mirror Image:</a>	This informational text is intended to support reading in the content area. This article describes how scientists were able to reveal the spatial structure of left-handed and right-handed chiral molecules in gaseous solutions by using a combination of mass spectrometry and the Coulomb explosion.
<a href="#">Salty Surprise: Ordinary Table Salt Turns into 'Forbidden' Forms:</a>	This informational text is intended to support reading in the content area. Scientists use normal table salt and expose it to extreme conditions to create new compounds that defy the classical rules of chemistry. These new compounds may help to produce better products with new applications and understand planetary cores.

### Tutorial

Name	Description
<a href="#">Atoms and Bonding:</a>	This tutorial will help the learner understand the relationship between atoms, their electrons, and the chemical bonds they can form.

### Video/Audio/Animation

Name	Description
<a href="#">Shapes of Molecules:</a>	<ul style="list-style-type: none"><li>Differentiate between electron pair and molecular geometry</li><li>Learn how to name electron pair and molecular geometries for molecules with up to six electron groups around the central atom</li><li>Illustrate how electron pair repulsion affects bond angles</li></ul>

### Virtual Manipulatives

Name	Description
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[Create Molecular Shape:](#)

This simulation will provide the learners with a chance to increase their understanding of a molecular shape. The learners will be required to follow a "Lewis dot structure" which involves two basic principles:

1. The shapes of the molecule is determined by the repulsion between electron pairs in the outer shell of the central atom. Both bond pairs and lone pairs must be considered.
2. Lone pairs repel more than bond pairs.

[Introduction to Compounds - How Atoms Bond:](#)

I use this simulation as an introduction to molecules and compounds to help students understand that atoms are not randomly joined to form a compound/molecule, but join in very specific patterns. In order to successfully complete the simulation activity, students must re-arrange molecules various ways. (In CH<sub>3</sub>COOH, both oxygens are bonded to the carbon atom, for example)

This activity will allow you to practice balancing a chemical equation. You will have to make sure you are following the law of conservation of mass and recognize what can change to balance an equation.

You can:

[Balancing Chemical Equations:](#)

- Balance a chemical equation.
- Recognize that the number of atoms of each element is conserved in a chemical reaction.
- Describe the difference between coefficients and subscripts in a chemical equation.
- Translate from symbolic to molecular representation.

Understanding molecular polarity by changing the electron-negativity of atoms in a molecule to see how it affects polarity. See how the molecule behaves in an electric field. Change the bond angle to see how shape affects polarity. See how it works for real molecules in 3D.

[Understanding Polarity:](#)

Some learning goals:

- predict bond polarity using electron-negativity values
- indicate polarity with a polar arrow or partial charges
- rank bonds in order of polarity
- predict molecular polarity using bond polarity and molecular shape

## Student Resources

### Tutorial

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<a href="#">Balancing Chemical Equations:</a>	<p>This activity will allow you to practice balancing a chemical equation. You will have to make sure you are following the law of conservation of mass and recognize what can change to balance an equation.</p> <p>You can:</p> <ul style="list-style-type: none"><li>• Balance a chemical equation.</li><li>• Recognize that the number of atoms of each element is conserved in a chemical reaction.</li><li>• Describe the difference between coefficients and subscripts in a chemical equation.</li><li>• Translate from symbolic to molecular representation.</li></ul>
<a href="#">Understanding Polarity:</a>	<p>Understanding molecular polarity by changing the electron-negativity of atoms in a molecule to see how it affects polarity. See how the molecule behaves in an electric field. Change the bond angle to see how shape affects polarity. See how it works for real molecules in 3D.</p> <p>Some learning goals:</p> <ul style="list-style-type: none"><li>•predict bond polarity using electron-negativity values</li><li>•indicate polarity with a polar arrow or partial charges</li><li>•rank bonds in order of polarity</li><li>•predict molecular polarity using bond polarity and molecular shape</li></ul>

## Parent Resources

### Formative Assessment

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