

Many Materials, Few Elements

Trace how a limited set of elements forms countless compounds.

SC.8.P.8.5 "Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each element name and circle each compound name or chemical formula. Put a star beside the sentence that explains how a finite number of elements can make a multitude of compounds.

Building Matter

- ① Every object around you is made of matter. Matter contains atoms of elements, such as oxygen, carbon, iron, and sodium. Scientists have identified 118 elements, so the list of element types is finite. Some elements occur naturally, while others have been made in laboratories. An atom of one element has its own number of protons. That identity does not change when the atom joins atoms of other elements. A small set of elements can therefore supply the building blocks for many different materials we use.
- ② When atoms from different elements form chemical bonds, they can make a compound. Water, H_2O , contains hydrogen and oxygen. Table salt, NaCl , contains sodium and chlorine. In each compound, atoms are joined in a fixed ratio, giving the substance properties unlike those of its separate elements. Hydrogen is a gas and oxygen is a gas, but water is a liquid under ordinary conditions. The formula names the elements present and shows how many atoms of each are in one unit of the compound.
- ③ Living and nonliving things contain compounds formed from the same limited collection of elements. Plants use carbon dioxide, CO_2 , and water to build glucose, $\text{C}_6\text{H}_{12}\text{O}_6$, a compound that stores energy. Seashells and limestone contain calcium carbonate, CaCO_3 , which includes calcium, carbon, and oxygen. Your body also contains water and compounds with carbon. Because elements can join in different ratios and arrangements, a finite number of elements can produce a multitude of compounds. These compounds help make the materials encountered in daily life.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 How does the passage show that the number of element types is finite?

2 Name the elements in water, H₂O, and in table salt, NaCl.

3 Which two elements are found in both glucose and calcium carbonate?

4 According to the passage, how can a finite number of elements produce a multitude of compounds?

5 Use the examples of hydrogen, oxygen, and water to explain why a compound can have different properties from its elements.

3 YOUR TURN _____ Your own words

Complete the table with two real compounds that are not named in the reading. For each compound, list its elements and write a short sentence explaining how its formula shows elements combining.

COMPOUND AND FORMULA	ELEMENTS IN IT	HOW THE FORMULA SHOWS ELEMENTS COMBINING

PART 1 • READ AND MARK

Underline each element name and circle each compound name or chemical formula. Put a star beside the sentence that explains how a finite number of elements can make a multitude of compounds. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	How does the passage show that the number of element types is finite?	Scientists have identified 118 elements, so there is a limited list of element types.
2	Name the elements in water, H ₂ O, and in table salt, NaCl.	Water contains hydrogen and oxygen. Table salt contains sodium and chlorine.
3	Which two elements are found in both glucose and calcium carbonate?	Carbon and oxygen.
4	According to the passage, how can a finite number of elements produce a multitude of compounds?	Elements can join in different ratios and arrangements, producing many different compounds.
5	Use the examples of hydrogen, oxygen, and water to explain why a compound can have different properties from its elements.	Hydrogen and oxygen are gases, but when they bond to form water, the compound is a liquid under ordinary conditions.

PART 3 • YOUR TURN (SAMPLE ANSWER)

COMPOUND AND FORMULA	ELEMENTS IN IT	HOW THE FORMULA SHOWS ELEMENTS COMBINING
Methane, CH ₄	carbon and hydrogen	The formula shows one carbon atom combined with four hydrogen atoms.
Calcium oxide, CaO	calcium and oxygen	The formula shows calcium and oxygen combined in a one-to-one ratio.

Accept any accurate real compounds that are not named in the passage, with correct formulas and correctly identified elements. Explanations should connect the formula to atoms of different elements combining in a stated ratio.