

Instructions: Work in pairs to complete the jigsaw activity.

Each pair will be responsible for one section of the material. Take time to discuss and understand your section thoroughly. Once completed, you'll join with another group to share and teach each other what you've learned. Be sure to listen actively and take notes you'll be responsible for understanding all sections by the end of the activity.

You'll have [5minutes] for the first part with your partner and [5 minutes] for the group sharing. Let me know if you have any questions!"

SC.8.P.8.5 - Elements and Compound

A pure substance has a specific, uniform composition and distinct properties. Pure substances can either be elements or compounds. A compound consists of two or more elements combined. An element is a substance that is made up of only one type of atom, which cannot be separated into simpler substances by a chemical process. Each element's symbol has one or two letters, with Beryllium having the symbol Be. A mixture is made up of two or more substances, and the substances retain their individual properties. Methods such as evaporation or using a magnet can be used to separate mixtures. Atoms consist of protons, neutrons, and electrons, with electrons found in energy levels surrounding the atom. The Periodic Table contains rows (periods) running horizontally and columns (groups) going vertically. The group number indicates how many electrons are in the valence shell. The pH scale measures how acidic or basic a substance is, ranging from 0 to 14, where acids range from 0 to 6, a neutral pH is 7, and bases range from 8 to 14. When an acid reacts with a base, the products are salts (such as NaCl) and water.

Elements can be distinguished from compounds as elements consist of only one type of atom, while compounds are chemical combinations of different elements, like water (H₂O). Homogeneous mixtures have a consistent composition throughout, like air and seawater, while heterogeneous mixtures have visible differences, like sand and water or trail mix. The charge of subatomic particles differs, with protons being positive, neutrons having no charge, and electrons being negative. Elements in the same group share the same number of electrons in their outer shell, influencing their chemical properties. Common materials have varying pH values: lemon juice is pH 2, vinegar is pH 4, baking soda is pH 9, and bleach is pH 12. Different ways to measure pH include using pH indicators that change color and electronic pH meters that provide precise readings without relying on color perception.

1. A pure substance has a _____ and properties.
2. Pure substances can either be _____ or _____.
3. A _____ consists of two or more elements combined.
4. An element is a substance that is made up of a _____, which cannot be separated into simpler substances by a _____.
5. Each element's symbol has _____ or a _____. Beryllium has the symbol _____.

6. A mixture is made up of _____, and the substances retain their _____.
7. _____ such as evaporation/boiling or using a magnet to remove iron filings from a mixture of sand and iron can be used to separate mixtures.
8. _____ are the parts of an atom.
9. The _____ in each atom gives us 118 different elements.
10. Electrons can be found in _____ surrounding the atom.
11. _____ are the rows running horizontally across the Periodic Table, and _____ are the columns going vertically up and down the Periodic Table.
12. The _____ tells you how many electrons are in the valence shell, which is the outer shell.
13. The pH scale is a measure of _____ is and runs from 0 to 14.
14. Acids have a range of _____, a neutral pH is _____, and the range of bases are _____.
15. When an acid reacts with a base, the products are _____ (such as NaCl) and _____.

Discussion Questions:

- How can elements be distinguished from compounds?

Elements are composed _____, while compounds are chemical combinations of _____ such as water (H₂O).

- What is the difference between homogeneous and heterogeneous mixtures?

Homogeneous mixtures are ones where the components

_____. Air and sea water are 2 examples of _____.

Heterogeneous mixtures do have _____, such as sand and water in a jar or trail mix.

- How does the charge of the subatomic particles (protons, neutrons, and electrons) differ?

· Protons _____ neutrons _____, and electrons _____.

· What do elements in the same group share, and what effect does that have on their chemical properties?

They share the _____, or the number of electrons in the outer shell, which control the _____ of the elements.

· What are some pH values for common materials?

_____ is pH 2, _____ is pH 4, _____ are pH 9, and _____ is pH 12.

· Why are there different ways to measure pH?

_____ are chemical dyes that change color. _____ do not depend on the human eye's detection of color or on human judgement.

Independent Student Questions

2. H₂O, which is commonly known as water, is found in three different phases. The water we drink from water bottles is H₂O in its liquid form. Ice cubes are frozen solid blocks of water. The steam that escapes from a boiling kettle of water is H₂O in its gas phase. Which statement best compares the three phases of water?

- A. All three phases of water have different chemical properties due to their type of phase.
- B. All three phases of water are different compounds that arise from temperature changes.
- C. All three phases of water have the same physical properties regardless of their current phase.
- D. All three phases of water are the same compound having the same ratio of 2 hydrogen atoms per 1 oxygen atom.

3. Atoms contain protons, neutrons, and electrons. Where in the atom are these particles found?

- A. Protons are in the nucleus, and neutrons and electrons surround the nucleus.
- B. Neutrons are in the nucleus, and protons and electrons surround the nucleus.
- C. Protons and neutrons are in the nucleus, and electrons orbit the nucleus.
- D. The 3 particles do not have a set location, since it varies depending on the element.

4. Atoms can be made up of different elements, which can be combined in various ways to form compounds. Which of the following statements is true about atoms?

- A. Atoms of a particular element can vary in their number of protons.
- B. Atoms have the ability to vibrate and move when part of a compound.
- C. Atoms from various elements may contain different amounts of protons, neutrons, and electrons.
- D. Atoms can be split into smaller units or subatomic particles identical to the original atom.
5. Sugars and starches are part of a biological group of molecules called carbohydrates. All carbohydrates are composed of only carbon, hydrogen, and oxygen. How can a number of different compounds be made from just these 3 atoms?
- A. These elements can be changed into different elements to create many other compounds.
- B. Different numbers of each of the 3 elements can combine in different arrangements.
- C. There are only a few kinds of carbohydrates which join together to make many compounds.
- D. These elements are extremely reactive, which leads to so many versions of carbohydrates.
6. Hydrogen peroxide (H_2O_2) is a disinfectant that can be bought at most drugstores. It comes in a brown bottle to protect it from being broken down by light. Otherwise, hydrogen peroxide would gradually break down into H_2O and O_2 . How are these materials classified?
- A. H_2O_2 is a compound, and H_2O and O_2 are elements.
- B. H_2O_2 and H_2O are compounds, and O_2 is an element.
- C. All 3 materials are elements and are in the Periodic Table.
- D. All 3 materials are compounds made of elements are found in the Periodic Table.
7. Part of a Periodic Table of Elements is shown in a previous question, which can be consulted to answer this question. Based on their location, elements can share similar chemical properties. Which element is likely to go through the same type of chemical reaction as sodium (Na)?
- A. lithium (Li) B. magnesium (Mg)
- C. calcium (Ca) D. aluminum (Al)
8. Continue to use the same Periodic Table as a resource to answer this question. There is quite a bit of information that chemists can determine about individual elements and groups of elements, plus patterns that are called periodic trends because they relate element position to a specific characteristic. Which piece of information cannot be found about an element using the table?
- A. name
- B. symbol

C. atomic number

D. atomic model

9. Certain compounds can be classified as acids, bases, or salts. The pH scale has a range of values to indicate whether a compound is an acid, a base, or is neutral depending on its pH value. Battery acid is found in car batteries, and newer batteries are sealed for the consumer's protection. Since battery acid has a pH of 1, how would it be described?

A. slightly acidic

B. strongly acidic

C. slightly basic

D. strongly basic