

Changes and Matter

Name: _____

Date: _____

Information: Changes in Matter

Books are made of matter. You are made of matter. “Matter” is a fancy word for the “stuff” of which all objects are made. Every day, matter is changed in different ways. For example, paper can be changed in many ways—it can be torn, folded, or burned.

A chemical change is any alteration that changes the identity of matter. For example, by passing electricity through water it can be broken down into hydrogen and oxygen. Burning paper is a chemical change because after the change takes place, the paper has been changed into different substances (like ash, carbon dioxide, etc.).

A physical change is any alteration that does not change the identity of the matter. Shredding paper does not change the paper into a different substance. Dissolving salt in water is a physical change because after the change, the salt and water are both still there.

One more example: consider two *elements*—sodium and chlorine. Sodium is a metal so reactive that if you put a small piece of it in water, it will explode! Chlorine is a gas so toxic that it was used as a weapon in World War 1. If you put sodium metal and chlorine gas in the same container together all you have done is *mixed* them. Creating a *mixture* is a physical change because the original properties of explosiveness and toxicity are still there. But if you heat the container, you would see bright light and smoke. After the smoke clears you would notice white crystals coating the inside of the container. Those crystals are called sodium chloride—ordinary table salt! The explosive metal and the toxic chlorine have been chemically changed—instead of explosive and toxic, the resultant product is salty! That’s a chemical change!

Critical Thinking Questions

1. Explain why each of the following is a physical change.
 - a) boiling water until no water remains

 - b) mixing sugar with coffee

2. Explain why each of the following is a chemical change.
 - a) a car rusting

 - b) food digesting

3. Identify each of the following changes as chemical or physical by placing a C or P in each blank.

- _____ a) acid rain corroding the statue of liberty _____ d) melting steel
_____ b) dissolving salt in water _____ e) dissolving steel in acid
_____ c) boiling salt water until just salt remains _____ f) cracking ice

Information: Elements, Compounds, Mixtures

Examine the following tables. Following the name of each element or compound is the “chemical formula” of the element or compound; please see the periodic table for the meaning of some of the symbols (i.e. Na = sodium). *Italics* tell you that substance is organic.

Elements	Compounds
Sodium (Na)	Water (H ₂ O)
Chlorine (Cl)	<i>Methane (CH₄)</i>
<i>Carbon (C)</i>	Sodium chloride, salt (NaCl)
Oxygen (O)	<i>Carbon dioxide (CO₂)</i>
Hydrogen (H)	Hydrogen Peroxide (H ₂ O ₂)

Pure Substances	Mixtures
Salt (NaCl)	Salt water (NaCl and H ₂ O)
Hydrogen (H)	Sand
<i>Carbon dioxide (CO₂)</i>	Hydrogen (H) and Oxygen (O)
Water (H ₂ O)	Sodium (Na) and Chlorine (Cl)
Aluminum (Al)	Kool-aid (sugar, water, etc.)

Critical Thinking Questions

4. How are elements different from compounds?
5. How are compounds different from mixtures?
6. How are pure substances different from mixtures?
7. Can something be both a mixture and a pure substance? Explain using examples from the tables.

8. Is it always possible to identify something as an element, compound, pure substance or mixture just by looking at it? Explain using examples from the tables.
9. Formulate a definition for each of the following terms.
- a) element:

 - b) compound:

 - c) mixture:

 - d) pure substance:
10. Categorize each of the following as an element, compound, mixture, or pure substance. If more than one label applies, then include both labels. (You will need more than one label sometimes.)
- a) _____ Popsicle
 - b) _____ Sugar
 - c) _____ Gold
 - d) _____ Dishwater
11. If you have a container with hydrogen gas and oxygen gas in it do you have water? Why or why not?
12. Give an example of something that is an element. Your example should not already be on this sheet.
13. Give an example of something that is a compound. Your example should not already be on this sheet.
14. Give an example of something that is a mixture. Your example should not already be on this sheet.

15. Using the earlier table, what do all organic substances have in common?

Information: Homogeneous and Heterogeneous Mixtures

Examine the following table.

Example of Mixture	# of <u>phases</u> in mixture	How many kinds of <u>states</u> in mixture	Homogeneous or heterogeneous?
Salt water	1	2	Homogeneous
Oil and water	2	1	Heterogeneous
Sugar and salt (no water)	2	1	Heterogeneous
Sugar and salt in water	1	2	Homogeneous
Sand and water	2	2	Heterogeneous
Carbon dioxide, water, and ice	3	3	Heterogeneous
14 kt. gold (mixture of silver and gold)	1	1	Homogeneous

Critical Thinking Questions

16. What is the difference between a "phase of matter" and a "state of matter"? Define each term as best you can.
17. What relationship exists between a homogeneous mixture and the number of phases in the mixture?
18. What is the difference between homogeneous and heterogeneous mixtures?
19. If you had to categorize elements as homogeneous or heterogeneous, what category would you put them in?
20. If you had to categorize compounds as homogeneous or heterogeneous, what category would you put them in?
21. Categorize each of the following as homogeneous (homo) or heterogeneous (hetero).
_____ a) salad _____ b) ice water _____ c) dishwater _____ d) 14 kt. Gold