

## ChemQuest 3

# Changes and Matter

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Hour: \_\_\_\_\_

**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.

**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.

<b>Elements</b>	<b>Compounds</b>
Sodium (Na)	Water (H <sub>2</sub> O)
Chlorine (Cl)	<i>Methane (CH<sub>4</sub>)</i>
<i>Carbon (C)</i>	Sodium chloride, salt (NaCl)
Oxygen (O)	<i>Carbon dioxide (CO<sub>2</sub>)</i>
Hydrogen (H)	Hydrogen Peroxide (H <sub>2</sub> O <sub>2</sub> )

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

## **Critical Thinking Questions**

- How are elements different from compounds?
- How are compounds different from mixtures?
- How are pure substances different from mixtures?
- Can something be both a mixture and a pure substance? Explain using examples from the tables.
- 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.
- element:
  - compound:
  - mixture:
  - 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.)
- \_\_\_\_\_ Popsicle
  - \_\_\_\_\_ Sugar
  - \_\_\_\_\_ Gold
  - \_\_\_\_\_ 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. 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 or heterogeneous.
 

_____ a) salad	_____ b) ice water
_____ c) dishwater	_____ d) 14 kt. Gold