

CHEMICALS AND THEIR PROPERTIES**I. INTRODUCTION**

In today's lab you will observe some physical properties of elements and some physical and chemical changes.

Background

1) A pure substance is a sample of matter that has a definite, fixed composition, and the same properties throughout the sample. Each pure substance has its own set of characteristic properties.

Physical properties can be observed without changing the chemical composition of the substance. Common physical properties that can be measured without changing the chemical composition are color, melting point, boiling point, solubility and density. Taste and odor are usually considered to be physical properties although they depend on the physiology of the person making the observations.

Physical changes do not cause a change in chemical composition, but only a change in appearance. When a substance simply changes from a solid to a liquid, liquid to a gas or vice-versa (liquid water to solid water, for example) without a change in composition it is a change in state. This is a physical change. (The three physical states are: gas, liquid, and solid).

Chemical properties describes the ability of a substance to react and change into another substance with a different chemical composition. The new substance would have new properties.

- 2) Evidence that a chemical change is taking place includes:
- A color change
 - A solid product, a precipitate is formed
 - A gas is formed
 - Energy such as heat, light or electricity is produced.

Purpose: To learn how to classify matter and its changes

II. PROCEDURE

Safety goggles **must** be worn at all times
Hydrochloric acid (HCl) and sodium hydroxide (NaOH) can harm eyes, skin, and clothing. Handle with care. Any acid spilled on the skin should be rinsed with a large volume of water for 15 minutes.

Wash your hands before you leave the lab.

A Classifying Physical and Chemical Change:

For the following, record your observations, decide if the change is chemical or physical, and give a reason for your conclusion

Perform the following tests at your lab bench.

1. Your instructor will show you how to properly light a laboratory burner and how to properly obtain chemicals from the reagent bench.

What color is the flame that is correct for most laboratory procedures?

2. Do this in the fume hood! Obtain a piece of magnesium ribbon from the reagent bench and place it in the burner, holding it with your crucible tongs.



Do not look directly at the flame.

Observation:

Type of Change: _____

Evidence/Explanation:

Is a new substance present at the end of this experiment? _____

3. Obtain about 2 ml of Copper sulfate solution from the reagent bench. Put it into a test tube. Add about 2 ml of sodium hydroxide solution and mix them together in the tube with your stirring rod.

Observation:

Type of Change: _____

Evidence/Explanation:

Is a new substance present at the end of this experiment? _____

4. In a 50 ml beaker obtain about 10 ml of milk in a beaker and mix with about 3 ml of vinegar. Stir with your glass stirring rod

Note: Do not pour any solid down the sink.

Observation:

Type of Change: _____

Evidence/Explanation:

Is a new substance present at the end of this experiment? _____

Observe the following demonstrations by the instructor

5. Your instructor will show you a distillation of Copper (II) Sulfate (CuSO_4) solution.

Observation:

Type of Change: _____

Explanation:

Is a new substance present at the end of this experiment? _____

6. Change of state of iodine

Observation:

Type of Change: _____

Explanation:

Is a new substance present at the end of this experiment? _____

7. Electrolysis of water

Observation:

Type of Change: _____

Evidence/Explanation:

Is a new substance present at the end of this experiment? _____

8. Reaction of Zinc and sulfur

Observation:

Type of Change: _____

Evidence/Explanation:

Is a new substance present at the end of this experiment? _____

9. Reaction of sodium in water

Observation:

Type of Change: _____

Evidence/Explanation:

Is a new substance present at the end of this experiment? _____

B. Using Chemical and Physical Changes to Identify an Unknown Substance

At the reagent bench are samples of 7 common substances. Your instructor will assign you an unknown, which is the same as one of the 7 known substances. Based on the observations of the chemical and physical properties of the known and unknown substances, you will determine the identity of the unknown. Procedures 3-5 do not need to be done in order. You will perform all of the tests on the unknown that you perform on each of the known samples.

1. Observe each sample, including the unknown, and then record your observations as to the color, texture and any other important properties in table 1.
2. In a spot plate place small pea-sized amounts of each substance in 2 different rows of wells. Be careful to note which substance is in which well. Do not use more than a small pea-sized amount, or it will be difficult to perform the tests. (On a paper towel write the name of each substance in the order it is placed in your spot plate, and place this paper towel next to the spot plate.)
3. a. Into the first row of wells of the different substances, put about 1 ml of de-ionized water. See if the substances dissolve completely or partially, or change in any other way. Record any evidence of change that occurs in table 1.
b. In the row of wells that contains the substances mixed with water, put 3 drops of universal indicator. Record any evidence of change in table 1.
4. In the other row of wells containing the samples put 3 drops of dilute acetic acid (vinegar) and record any evidence of change in table 1 below.
5. Cover your wire gauze with a piece of the aluminum foil that is set out on the reagent bench. Place about pea-sized amounts of each substance onto the foil covered gauze. Make sure there is plenty of space between each sample on the foil. Place the gauze on the ring stand and ring apparatus that is in the fume hood. Light the burner and place the heat under each sample to see if any change occurs. Record any evidence of change in table 1.

Using the data that you recorded in table 1, determine the identity of the unknown sample and answer the questions that follow the table.

Table 1: Determining the identity of an Unknown substance

	Appearance (1)	Reaction with water (2)	Reaction with universal indicator (3)	Reaction with vinegar (4)	Reaction with heat (5)
Sodium Chloride					
Sugar (Sucrose)					
Baking Powder					
Baking Soda (Sodium Bicarbonate)					
Citric Acid					
White Flour					
Calcium Carbonate					
Unknown #					

Unknown # _____

Based on you observations in the above table identify the unknown _____

Explain the reason for you answer to the above question:

C. Classifying compounds elements, heterogeneous and homogeneous mixtures by appearance

On the reagent bench are several samples of various substances. Write the name of the substance, a brief description of its state, color and any other pertinent observation, state if the substance appears homogeneous or heterogeneous and finally classify it as a compound element or mixture.

Table 2: Classifying Types of Matter by Appearance

Substance	Description	Homogeneous or heterogeneous	Classification : Compound Element or Mixture
Rock			
Carbon			
Windex			
Distilled Water			
Copper			
Copper (II) Sulfate Solution			
Copper (II) Sulfate CuSO ₄			
C ₁₂ H ₂₂ O ₁₁			
Sulfur			

Compounds

Compounds are groups of atoms of different elements that are chemically bonded together. They do not have the same properties as the original elements. In table 3 are some examples of everyday compounds with their common name, chemical name and formula. Complete the table.

Table 3

Common Name	Chemical Name	Formula	Symbols of elements in compound	How many of each element
Baking soda	Sodium Bicarbonate	NaHCO ₃		
Table salt	Sodium Chloride	NaCl		
Aspirin	Acetylsalicylic Acid	C ₉ H ₈ O ₄		

D. Classifying Elements by Physical Properties :

A number of elements in labeled bottles are on display. Your instructor will show you a sample of sodium. Classify them as metals, nonmetals and those you are unsure of. Put them in a table that shows their name and classification.

Table 4: Classifying Elements by Appearance

Metals	Nonmetals	Unsure

Once you have completed all of the experiments and observed the demonstrations, draw a “Black box diagram” of one compound, one element and one mixture.

Compound	Element	Mixture
Name of material: Diagram:	Name of material: Diagram:	Name of material: Diagram:

Questions and Answers:

1. What is the difference between chemical and physical change?

2. What is the difference between zinc and a compound of zinc?

3. In a different colored pen or pencil, make corrections to the table in which you classified the elements into metals, nonmetals. Cross out the word unsure and put the word metalloids.

Conclusions and Reflections

Have you learned the difference between compounds, mixtures and elements? If not, what is a question you have that would help you see the difference.

What was it that you did today that helped you see the difference between chemical and physical change?

What is something you are confused about?

Chemistry 100 Lab Report

Name _____

Date _____

Lab Section _____

Initials _____

EXPERIMENT 3 CHEMICALS AND THEIR PROPERTIES

A Classifying Physical and Chemical Change:

For the following, record your observations, decide if the change is chemical or physical, and give a reason for your conclusion.

1. Magnesium in the flame.

Type of Change: _____

Was a new substance(s) present at the end of this change? _____

2. Copper sulfate solution mixed with sodium hydroxide solution the tube.

Type of Change: _____

What substance(s) is (are) present at the end of this change? _____

3. Vinegar mixed with milk.

Type of Change: _____

Was a new substance(s) present at the end of this change? _____

Demonstrations by the instructor

4. Distillation

Type of Change: _____

Was a new substance(s) present at the end of this change? _____

5. Change of state of iodine

Type of Change: _____

Was a new substance(s) present at the end of this change? _____

6. Electrolysis of water

Type of Change: _____

Was a new substance(s) present at the end of this change? _____

7. Reaction of Zinc and sulfur

Type of Change: _____

Was a new substance(s) present at the end of this change? _____

8. Reaction of Sodium in water

Type of Change: _____

Was a new substance(s) present at the end of this change? _____

B. Using Chemical and Physical Changes to Identify an Unknown Substance

Table 1: Determining the identity of an Unknown substance

	Appearance	Reaction with water	Reaction with universal indicator	Reaction with vinegar	Reaction with heat
Sodium Chloride					
Sugar (Sucrose)					
Baking Powder					
Baking Soda (Sodium Bicarbonate)					
Citric Acid					
White Flour					
Calcium Carbonate					
Unknown #					

Unknown # _____

What was the identity of the unknown substance? _____

C. Classifying compounds elements, heterogeneous and homogeneous mixtures by appearance

Table 2: Classifying Types of Matter by Appearance

Substance	Description	Homogeneous or heterogeneous	Classification : Compound Element or Mixture

D. Classifying Elements by Physical Properties :

Table 3: Classifying Elements by Appearance

Metals	Nonmetals	Unsure

Questions:

1. Explain the difference between chemical and physical change? (You can use examples from this lab in your explanation.)

2. What is the difference between zinc and a compound of zinc such as zinc sulfide?

3. Explain how today's lab did or did not help you understand the difference between chemical and physical change?

4. Explain how you determined the identity of your unknown.
