Regents Chemistry
Ms. Randall
Lab Activity: Physical and Chemical Changes

Background:
Chemistry is the study of matter and the changes it undergoes. These changes can be broken down into two classes - physical changes and chemical changes. In a **physical change**, one or more physical properties of a substance are altered. Examples of such physical properties include size, shape, color, and physical phase. Grinding, melting, dissolving, and evaporating are all physical changes. No new substance or substances are formed as a result of a physical change. A **chemical change** results in the formation of one or more "new" substances. These new substances differ in chemical properties and composition from the original substance. The rusting of iron and the burning of paper are two examples of chemical change. This experiment will help you to understand the difference between physical and chemical change and to recognize each type of change when it occurs.

Objective: To recognize and distinguish between chemical and physical changes.

Materials:
Lab balance, lab burner, 5 test tubes, test tube rack, test tube holder, watch glass, glass square, scoopula, dropper pipet, insulating pad, beaker, sodium chloride (NaCl), hydrochloric acid (6M HCl), silver nitrate (0.1M $AgNO_3$), magnesium ribbon , zinc, newspaper , birthday candle, matches, burner, crucible tongs, funnel, filter paper, sand

Safety: Goggles must be worn at all times. Pull hair back into a pony tail and out of the way. Any spills must be cleaned up immediately. When burning substances, make sure all your lab papers and books are out of the way.

Disposal: Leave test tubes with wax in them for the next class. All other solids are to be placed in the trash can. All spent matches, those that have been used, are to be cooled with water and placed in the trash can. The hydrochloric acid solution may go down the sink with water. The silver nitrate solution is to be given to the teacher for disposal.

Pre-lab: In this lab, you will make qualitative observations. For each procedure, write down as many observations as you can make. Be clear and very specific. Create a data table for your observations based on the lab procedure for each activity.

Procedure:

1. Candle and Wax:

a. A small amount of wax from a candle is in a test tube. Heat gently over a burner flame until the wax melts completely. Review safety when using a burner. Do not point the open end of the test tube towards anyone. Pull all long hair back with a band. No loose clothes in the lab. The test tube will be hot. Do not touch it. Use a test tube holder. Make sure the test tube is Pyrex. Now allow the wax to cool. Place it in a test tube rack.

Observations of melting candle wax:

- Color of wax as a solid
- Color of melted wax
- Did a new substance form during this activity?
- Was this a physical change or a chemical change?

b. Next, light a candle, drip a drop of wax and secure it to a glass square, and allow it to burn for 2 minutes. Record your observations

- Describe the color of the flame
- Describe the actual flame as the candle burns
- Does the wax drip or does it disappear?
- Was the burning of the candle a physical or a chemical change?

c. Now light a match and hold it to the side. Have your partner blow out the candle. Try to relight the candle by placing the lit match in the white smoke of the candle. Can you get your candle to relight? What do you observe?

2. **<u>Paper</u>**

a. Tear a piece of newspaper (5 cm x 5 cm) into 4 small pieces.

- Is this a physical change or a chemical change?

b. Set a watch glass on the lab table and place the pieces of paper on the glass. Ignite the paper with a match and allow to burn. Record observations in your notebook.

c. Now take a piece of the newspaper (5 cm x 5 cm) and crumble it up lightly. Light it with a match on your watch glass.

Observations:

- When the paper burned, was this a physical change or a chemical change?
- Which burned better? The single piece of straight paper or the crumpled paper? Why do you think this happens?

<u>3. Sodium chloride and Silver nitrate</u>

a. Add a micro spatula of NaCl (sodium chloride) to a test tube. Add a small quantity of water (about3 mL) to the test tube. Mix the contents of the tube. Review with teacher correct way to mix in a test tube. This process was called dissolving. A solution that has the solvent water is called an aqueous solution.

- Was the dissolving of sodium chloride in water a physical change or a chemical change?

b. Next, use a dropper to add 2 drops of 0.1M $AgNO_3$ (silver nitrate) solution to the NaCl-water mixture. Take care with silver nitrate. If it gets on your skin it will turn the skin very dark and blotchy. Wash with soap and water if this occurs.
As soon as you add the silver nitrate, describe what happens inside of the test tube.

- Was this a physical change or a chemical change?
- What color is the precipitate (solid that fell to the bottom of the test tube)?

c. Place the test tube in a test tube holder and allow it to sit for 10 minutes. Go on to the next step and come back and make observations later.

- After 10 minutes, what color does the precipitate turn?

4. Zinc + HCl

a. Obtain a piece of zinc.

- Describe the zinc in your observations.

b. Place the piece into a test tube and add a few drops of 6M HCl (hydrochloric acid). CAUTION: Use extreme care in handling this acid. It will cause severe burns if allowed to come in contact with the skin. In case of contact, wash with water and notify your instructor. Touch the bottom of the test tube with your fingertip.

Observations:

- Describe what happens when zinc metal is placed in hydrochloric acid
- Does the bottom of the test tube get hotter or colder
- Is this type of reaction a physical change or a chemical change?

c. Now collect some of the gas in a dry test tube. Light a splint and hold it near the mouth of the test tube. Record your observations.

5. Magnesium ribbon

1. Take a small piece of magnesium ribbon. Light your Bunsen burner. Hold the magnesium with tongs. Place the magnesium ribbon in the hottest portion of the flame until it ignites. **Turn your head to the side and do not stare at the burning ribbon**. Hold it over your evaporating dish as it burns. Make observations to the product after burning.

Observations:

- Describe what happens as magnesium ribbon burns.
- What color was the smoke formed
- Was this a physical change or a chemical change?

6. Sodium chloride

Use a mortar and pestle to grind several crystals of table salt into a uniform powder.
Observations:

- Was this a chemical change or a physical change?

7. Sand and Salt

1. Using the process of filtration, separate a mixture of sand and salt.

Observations:

- Was this a chemical change or a physical change?
- What technique could be used to retrieve the salt?

Analysis:

1. Indicate whether the following changes are physical or chemical:

a. _____melting candle wax

b. _____burning a candle

c. _____tearing paper

d. _____burning paper

e. _____dissolving NaCl

f. _____mixing NaCl solution with $AgNO_3$ solution

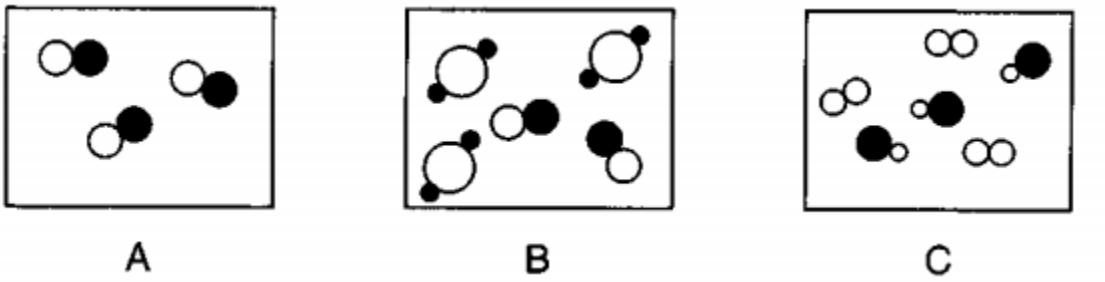
g._____tearing magnesium ribbon

h._____adding HCl to Magnesium ribbon

i. _____grinding NaCl into powder

j._____Separating sand and salt

Base your answers to questions 1 and 2 on the pictures below



1. Contrast sample A and sample B, in terms of compounds and mixtures. Include both sample A and sample B in your answer.

2. Explain, in terms of the composition, why sample A represents a pure substance.