

Matter can be classified in different ways using physical and chemical properties. Some physical properties are color, odor, density, hardness, structure, solubility, melting point, and boiling point. Chemical properties are determined by the reaction of a substance with other substances. Examples of chemical properties are the following: reacts with acids, reacts with oxygen in the air, decomposes on heating, and is acidic or basic.

#### Signs of a chemical reaction (change)

- Gains mass due to combining with a gas or loses mass due to releasing a gas
- Releases multiple substances that are solids, liquids, and gases
- Soluble compounds form insoluble compounds (precipitates)
- Color changes as new compound formed
- Ability to conduct electricity or magnetism changes
- Substance is formed of a fixed ratio of elements
- Requires a chemical reaction to reverse the change

#### Signs of a physical change

- A mixture is formed that can be easily separated by evaporation or other simple physical methods
- A phase change occurs that can be reversed by changing temperature
- Substances can be combined in any ratio

#### Objectives:

In this lab you will investigate the differences between chemical and physical changes in matter by performing four experiments and classifying the changes as chemical or physical. You will compare and contrast physical and chemical changes in matter. Be sure to record both qualitative and quantitative data in your Data Table for each change listed below.

#### Equipment:

Well plate	crucible	glass slide	Bunsen burner
Ring stand & ring	clay triangle	forceps	dropper
spatula	dissecting microscope		

#### Procedures

##### I. Heating Steel wool

1. Obtain a crucible, clean with soap/water, and heat strongly for 2-3 minutes and cool.
2. Obtain some steel wool and roll it into a large tight ball.
3. After the crucible has cooled measure the mass of the crucible and unheated steel wool to the nearest 0.001 gram and record the value in the data table.
4. Heat the crucible and steel wool over a hot flame for fifteen minutes. Let the crucible cool, measure the mass of the crucible and steel wool together to the nearest 0.001 gram and record the new mass in the data table.
5. Dispose of the cooled steel wool in the trash can.

##### II. NaCl and water

1. Place a few crystals of sodium chloride on a glass slide and examine them under a microscope.
2. Place 2 drops of the sodium chloride solution on a glass slide.
3. Hold the glass slide with forceps and very gently evaporate the liquid over a low, cool Bunsen burner flame.
4. Let the slide cool and examine the solid formed with the dissecting microscope. Compare the solid with the crystals of NaCl.

##### III. Combining solutions

1. Combine 3 drops of barium nitrate solution with 3 drops of sodium chromate in a well plate. **Barium nitrate is poisonous; avoid skin contact.** Record your observations in the data table.
2. Combine 3 drops of iron(III) chloride solution with 3 drops of silver nitrate solution in a well plate. **Avoid contact with the silver nitrate.** Record your observations in the data table.
3. Rinse the well plate into the solid waste disposal jar.

## Data Table

### I. Heating Steel wool

Mass before heating \_\_\_\_\_  
Mass after heating \_\_\_\_\_  
Difference in mass \_\_\_\_\_

Chemical or Physical change? \_\_\_\_\_

Give supporting evidence for type of change:

### II. Evaporation of NaCl

Chemical or Physical change? \_\_\_\_\_

Give supporting evidence for type of change:

### III.

#### 1. Reaction of $\text{Ba}(\text{NO}_3)_2$ with $\text{Na}_2\text{CrO}_4$

Chemical or Physical change? \_\_\_\_\_

Give supporting evidence for type of change:

#### 2. Reaction of $\text{FeCl}_3$ with $\text{AgNO}_3$

Chemical or Physical change? \_\_\_\_\_

Give supporting evidence for type of change:

### Answer the following questions

1. What kinds of evidence normally indicate chemical changes?
2. What kinds of evidence normally indicate physical changes?
3. Explain why the evaporation of the sodium chloride solution is a physical rather than a chemical change.
4. Explain why a chemical reaction would be needed to separate the copper from the oxygen after the copper oxide was formed.
5. How would you tell if a material is a mixture or compound?