Observing Chemical Reactions Lab

PSI Chemistry

Introduction
Chemistry is the branch of science concerned with identifying the structure and properties of matter, and how matter interacts, combines and changes.

Background
In ancient Greece (460 BC to 370 BC) a philosopher named Democritus formulated what is thought to be the first atomic theory. Democritus reasoned that matter must be made up of tiny, indivisible spheres he called "atomos" (Greek for indivisible) moving through empty space.

Over time our understanding of atoms has grown. In 1808 John Dalton published his atomic theory. It contained 6 postulates:
1. All matter consists of indivisible particles called atoms.
2. Atoms of the same element are similar in shape and mass, but differ from the atoms of other elements.
3. Atoms cannot be created or destroyed.
4. Atoms of different elements may combine with each other in a fixed, simple, whole number ratios to form compound atoms.
5. Atoms of same element can combine in more than one ratio to form two or more compounds.
6. The atom is the smallest unit of matter that can take part in a chemical reaction.

Many of Dalton’s findings are consistent with modern scientific theory, but some of his postulates have been disproved. For example, it turns out atoms are divisible! What are the parts of an atom called?

Dalton arrived at his theory by gathering data from chemical reactions (chemical changes). During a chemical reaction a substance or substances can be transformed into chemically different substances. Chemical changes can be dramatic or subtle but in all cases there is a set of indications that a chemical reaction has occurred. Common indications include:
- A change in temperature such as wood burning or fireworks exploding
- A change in color such as metal rusting
- The production of an odor such as an egg rotting
- The formation a precipitate (a solid formed when two liquids are combined)
- The formation of bubbles (gas) such as the carbon dioxide that makes bread rise

In some cases the properties of a substance may change, although the substance remains the same. These changes are called physical changes. For example, water can be turned from a free flowing liquid into a hard cube (ice). Its properties have changed but it’s still water! Examples of physical changes include:
- Changes in texture such as sanding wood
- Changes in shape such as pulling metal into wires
- Changes in state (freezing, melting, boiling, condensing)
Observing Chemical Reactions Lab

Objectives

- Observe a number of chemical reactions.
- Outline the indications that a chemical reaction has occurred while observing the chemical reactions in this lab.
- Outline those changes in properties or changes in energy that resulted from the chemical reactions you observe.
- Differentiate between a physical and a chemical change.

Pre lab Exercise:
1. What are the indications of a chemical change, a chemical reaction?

2. Specify whether each of the following changes is physical or chemical by placing a P or C on the line in front of the change.
   a. ______ Change in color
   b. ______ A solid melting
   c. ______ Burning in the presence of oxygen
   d. ______ A gas is produced
   e. ______ Bendable when heated

Materials

Acetate sheet
Reaction Grid
A. 1 M hydrochloric acid
B. 0.1 M copper (II) sulfate
C. 0.1 M potassium iodide
D. 0.1 M lead (II) nitrate
E. Mossy zinc metal or zinc chips
goggles
aprons

Procedure

1. Obtain a pair of goggles and a safety apron and wear as you complete this lab.
2. Obtain a reaction grid and an acetate sheet.
3. Place the acetate sheet over the reaction grid and secure with a paper clip.
4. Obtain a set of chemicals.
5. In each column place a 2-3 drops of the solution or a piece of the solid on the acetate sheet in the area indicated by the column label at the top of the reaction grid. Do not place any material on the darkened areas.
6. In each row, place 2-3 drops of the liquid or a piece of the solid on the acetate sheet in the area indicated by the row label at the right side of the reaction grid.
7. Make your observations on the data table on the next page.
DATA TABLE

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**Analysis Questions**

1. List some indications that you saw in this lab that would prove that the changes were chemical and not physical changes.

2. When food begins to spoil it undergoes a chemical change, list two indications that you would observe as food begins to spoil.

3. Explain why freezing water, boiling water and melting ice are all physical changes and not chemical changes.