***Demonstration 2***

***Chemical Reactions***

***OBJECTIVES***

The objectives of this experiment are: (a) to observe evidence of chemical reaction, (b) to observe exothermic reactions, (c) to write chemical equations representing chemical reactions that occur.

***INTRODUCTION***

A chemical reaction, or a chemical change, is defined as the process of transformation of one or more substances into one or more other substances. Such a change is illustrated by:

* The conversion of iron and oxygen into iron rust.
* The reduction of ores to metals.
* The production of new drugs.
* Biochemical reactions that take place in living organisms.

The study of chemical reactions constitutes a large part of the study of chemistry. That is because chemical reactions bring useful things to life. Look at the new drugs that are made every day, the new technology that is implemented, the new industrial products, and more. Chemistry is behind every effort to improve the quality of life and bring prosperity and civilization to people. Chemical reactions allow us to produce energy, as a driving force of life, in industry and in living systems. A chemical reaction is usually accompanied by one or more of the following observations.

1. Color change
2. Solid formation (precipitate)
3. Gas formation (bubbling or effervescence)
4. Heat being absorbed or released

* Exothermic reactions release heat (feels hot)
* Endothermic reactions absorb heat (feels cold)

This demonstration illustrates typical phenomena associated with such reactions.

EXPERIMENTAL PROCEDURE

1. ***Reactions of Hg2+ and I-:***

In this experiment, the reactants are Hg(NO3)2 as a source of Hg2+ ions and KI as a source for I- ions. These ionic compounds are prepared as aqueous solutions and labeled solution A and solution B respectively.

Equal volumes (~ 2.0 mL) of the two solutions are mixed in a large test tube by adding solution A to solution B while stirring.

*Question 1: Note any evidence of a chemical reaction.*

***Color change and precipitate formation. (2pnt)***

*Question 2: Add more of solution A to the resulting mixture. Observe the result.*

***The mixture becomes clear. (1pnt)***

The above procedure is repeated, except this time solution B is initially added to solution A, followed by addition of more of solution B.

*Question 3: Compare the results for the two procedures.*

***Same result. Orange precipitate is formed in both procedures. (2pnt)***

The resulting two solutions might look similar. If so, mix the two solutions and observe the result.

*Question 4: Are the two solutions the same? Explain your answer.*

***No! The two solutions are different because they reacted upon mixing as evidenced by the color change. (2pnt)***

1. ***Reactions of Potassium Permanganate (KMnO4) with Glycerol:***

Examine the physical properties of the two reactants. The instructor will show you a sample of KMnO4.

*Question 1: What are its apparent properties?*

***Crystalline solid that is dark in color. (2pnt)***

The instructor will also show you a sample of glycerol.

*Question 2: What are its apparent properties?*

***Thick (viscous) clear liquid. (2pnt)***

A finely ground sample of KMnO4 (approximately 1 gram) is treated with three drops of glycerol. *(Note: it is recommended to use the fume hood for this part. Pile the KMnO4 on wire gauze or a piece of asbestos tile, make a small shallow well in the middle, then add glycerol to the well)*

*Question 3: Note evidence for chemical reaction.*

***Heat (fire). (1pnt)***

*Question 4: is the reaction exothermic or endothermic?*

***Exothermic. (1pnt)***

To compare the color of the product to the color of KMnO4, some of the solid KMnO4 is added to a dilute solution of sodium hydroxide.

*Question 5: Note the results.*

***Purple color solution is observed. (1pnt)***

Some of the resulting residueis treated the same way.

*Question 6: Note the results.*

***Green color solution is observed. (1pnt)***

*Question 7: What do your observations indicate*?

***The color has changed, that is another evidence of chemical reaction. (2pnt)***

1. ***Reactions of Baking Soda and Vinegar:***

Add two teaspoons of baking soda to a large Erlenmeyer flask followed by addition of 20 mL of vinegar.

*Question 1: Note evidence of chemical reaction.*

*Bubbles (effervescence). (1pnt)*

*Question 2: What gas is produced?*

*Carbon dioxide. (1pnt)*

Test the flammability of the gas produced by bring a burning wood splint in to the flask.

*Question 3: Is the gas produced flammable? Explain.*

*Not flammable! Because it puts off the flame. (1pnt)*