 **Indicators of Chemical Reactions**

There are many ways to tell if a chemical reaction is happening. You have already seen many of these in your everyday life – chemical reactions happen all around you every day! In this lab we will explore some common signs that a chemical reaction is happening, so you can learn to recognize these signs.

The easiest signs of a reaction that we can see are changes in heat (or cold), changes in color, forming a precipitate, forming a gas and creating light. This lab will show you a demonstration of each so you can see them for yourself.

*How do you think you would be able to tell if a chemical reaction is happening? What are the 5 signs?*



**Part 1: Chemical Safety Rules**

* Wear eye protection while doing these experiments.
* If you spill any chemicals, inform your instructor immediately. Wash any areas

of skin or clothing with cold water.

**Station #1: Changes in Color – Hydration**

1. Put 5 g of ***dry*** copper (II) sulfate (CuSO4) powder into a clean, dry beaker.
   1. Record your observations of the color of the dry salt below.

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1. Pour 20 mL of water into this beaker.
   1. Record your observations of what happens below.

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1. Clean out your beaker in the sink.
2. How could you tell that a reaction happened?
3. This is an example of a *hydration reaction*, where a dry (anhydrous) salt absorbs water. What does the word “anhydrous” mean? (Hint: separate into the prefixes “an” and “hydro”. What do they mean?)
4. What do you think would happen to the salt if the water were taken back out (if the solution was dried)?

**Station #2: Acid and base reactions**

1. Place approximately 2 mL of vinegar in a test tube. The acid in the vinegar is called acetic acid, HC2H3O2.
2. Add 2-3 drops of phenolphthalein (C20H14O4) indicator to the vinegar. Swirl to mix.
   1. Record your observations of what happens below.

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1. Using a dropper bottle, slowly add drops of 1.0 M Sodium Hydroxide (NaOH) to the vinegar, until a noticeable change occurs.
   1. Describe that change below.

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1. How could you tell that a chemical reaction happened in this experiment?
2. What color formed in the test tube?
3. What do you think would happen if you added a few drops of vinegar?



**Station #3: A reaction might need time to happen**

1. Put 10mL of water in a test tube. Add 4mL of Vitamin C (C6H8O6) solution and 4mL of iodine (I2) tincture to this test tube. The liquid should be clear.
2. Put 20mL of water in a second test tube. Add 4mL of hydrogen peroxide (H2O2) and 4mL of liquid starch solution to this second test tube.
3. Pour the contents of the second test tube into the first one. Watch the test tube for a couple of minutes.
   1. Record your observations of what happens below.

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1. Wash your test tubes out in the sink.
2. How could you tell that a chemical reaction happened in these experiments?
3. What color formed in the test tube?

**Station #4: Precipitate formation reactions**

1. Put 10mL water into a test tube.
2. **Safety note: Use gloves. Do not get AgNO3 on your skin.** Add 40 drops of Silver Nitrate (AgNO3) into a small beaker.
3. Add Sodium Hydroxide (NaOH) drop by drop.
   1. Record your observations of what happens below.

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1. After the reaction has occurred place the contest of the test tube in the waste container on the table.
2. How could you tell that a chemical reaction had occurred?
3. The precipitate formed is Silver Hydroxide (AgOH). Why do you think AgOH has a color to it while AgNO3 does not?

**Station #5: Reactions that result in temperature changes**

1. Put 20 mL of water in a test tube. Measure the temperature of the water and record the value. T: \_\_\_\_
2. **Safety Note: Do not touch the NaOH pellets with your bare hands.**  Add 4 pellets of Sodium Hydroxide (NaOH) using a scoopula or gloves and tweezers.
3. Now measure the temperature of the water in the test tube and record the value. T: \_\_\_\_

**Part 11: Thinking about what you have observed**

1. What was the change in temperature (Tfinal – Tinitial)?
2. Where do you think the energy for the temperature change came from?



1. Why do you think the temperature increased?

**Station #6: Gas Creation**

1. Pour about 20 mL of 1M HCl solution in a clean test tube.
2. Add 1 shot of mossy Zinc, Zn, to the test tube.
3. Record your observations of what happens below.
4. How could you tell that a chemical reaction happened?
5. What type of gas do you think is forming? HINT look at the reactants.