Lab #2: Chemical Reactions Investigation

Ask a Question: How can I investigate evidence of chemical reactions on a microscale?

Introduction: Chemistry is a science that investigates changes in matter. Chemical reactions are the changes matter undergoes. The changes you can observe are called "macroscopic" changes. Often these changes, such as color changes, the formation of a solid, or the formation of gas bubbles, are visible. Thus, though we cannot see the atoms and molecules reacting, we can see indications that chemical changes have taken place. Different atoms and molecules often react in different ways. Chemistry attempts to explain macroscopic changes in terms of the behavior of atoms and molecules, that is, on the submicroscopic level. You can use these different reactions to detect the presences of specific kinds of chemicals in mixtures. In this lab you will study some reactions of common chemicals contained in consumer products. The purpose of this lab is to observe the microscopic changes in terms of submicroscopic changes and to relate these changes to the behavior of atoms and molecules. As the name implies, submicroscopic changes are changes we cannot see, even with a microscope. The essence of understanding chemistry is to infer from macroscopic changes the submicroscopic behavior of atoms and molecules. **Safety:** Wear your safety glasses and use full small-scale pipets only for the carefully controlled delivery of liquids.

Materials:

Sodium Hydrogen Carbonate ($NaHCO_3$)	Blue Dye (Methylene Blue or BTB)	Potassium Iodide (KI)	Calcium Chloride ($CaCl_2$)
Sodium Carbonate (Na_2CO_3) if available	0.5 M Sodium Hydroxide (NaOH)	Ammonia (NH_3)	0.5 M Hydrochloric Acid (HCl)
Sodium Hypochlorite (NaClO)	Lead(II) nitrate $Pb(NO_3)_2$	Bromothymol Blue (BTB)	Phenolphthalein (PHEN)
Silver Nitrate ($AgNO_3$)	Copper(II) sulfate ($CuSO_4$)	Starch Solution	Copious water

Research and collect evidence and data to address your question:
Use small-scale pipets to put 2 drops of each chemical into a small petri dish or a watch glass. Slide the dish or plate onto the X's in the indicated spaces below to help view the reactions. For background contrast, view the drops on black and white backgrounds provided by the X's. Stir each mixture by squeezing air through your empty pipet. Record your qualitative data for reactions (a-n) in your lab notebook.

a.	X	$NaHCO_3$ + HCl	h.	X	NH_3 + Bromothymol Blue (BTB)
b.	X	HCl + Bromothymol Blue (BTB)	i.	X	$NaHCO_3$ + PHEN
c.	X	Blue Dye (BTB) + NaClO Now add 1 drop HCl	j.	X	PHEN + NaOH

d.	X	NaClO + KI Now add 1 drop starch	k.	X	NaOH + $AgNO_3$
e.	X	KI + $Pb(NO_3)_2$	l.	X	$AgNO_3 + NH_3$ Absorb onto scrap of paper and expose to sunlight: Tape to your data table
f.	X	$Pb(NO_3)_2$ + $CaCl_2$ (stereoscope)	m.	X	NH_3 + $CuSO_4$
g.	X	2HCl + 1 PHEN +1 more PHEN	n.	X	$CuSO_4$ + $NaHCO_3$

Make a claim to answer the question based on your evidence.

Summarize and reflect on the evidence. Address any aberrations from expected results. Reflect on the various reactions and the signs indicative a reaction indeed occurred. If any reactions were not observed, why might this have been? Write your conclusion to the lab.

Self-assess the lab using your STEM journal rubric.
A.R.M.S.