**Name: Period:**

**8 Bottle Analysis Lab**

OBJECTIVE

The concepts of qualitative analysis are introduced utilizing some basic descriptive chemistry. The process of deduction by elimination is used to help make choices as well as organization of work is taught through the lab.

INTRODUCTION

Analytical chemists are faced with two questions: what is in it and how much is there? The study of what is in a sample is called qualitative analysis; the study of how much is called quantitative analysis. You will be introduced to qualitative analysis in this lab.

Today’s chemist has many instruments utilizing a variety of properties of substances to analyze samples. You will use two old fashioned “instruments”, your nose and your eyes, along with some known chemical reactions between solutions of compounds to identify which bottle contains each of 8 different solutions of common compounds.

PROCEDURE

You will determine which compound is in each of 8 bottles by either sniffing the contents or mixing one drop of each of two chemicals on a reaction plate.

To sniff a chemical, wave the fumes from the top of the open bottle towards your nose. Do NOT put the bottle to your nose and take a good inhalation.

When two chemicals are mixed you will be looking for the appearance of a preciptate, the disappearance of a preciptate (upon adding a third chemical), or the appearance of bubbles of gas. Several drops of each of the two liquids being tested are added together on a reaction plate. Any reactions should be immediatedly evident.

STRATEGY

You should think about your plan of attack before beginning. You should be able to smell the chemicals ammonia and acetic acid from your household experience with each. Your remaining observations will derive from the results of mixing drops of each liquid with drops of the remaining liquids. The following is known about the chemical reactions for the solutions of the various compounds:

* The copper solution will turn deep blue when ammonia is added to it.
* Silver will be precipitated (as an insoluble material) as silver chloride (white) when the sodium chloride solution is added to it; it then will redissolve when ammonia is added to the precipitate.
* Silver will be precipitated by sodium carbonate (white precipitate) and can be redissolved by addition of acetic acid with the evolution of bubbles.
* Silver will be precipitated by the sodium chromate solution (reddish brown precipitate). This precipitate may redissolve with ammonia.
* When the lead nitrate solution is used, you will form a white precipitate with both sodium carbonate and ammonia. These precipitates can both be dissolved by adding acetic acid with the carbonate precipitate evolving gas in the process.
* You get some white precipitate with the addition of sodium chloride to lead nitrate as well.
* A yellow precipitate is formed upon addition of sodium chromate to lead nitrate.
* Sodium carbonate can be identified as the only original solution which envoles gas (carbon dioxide) upon addition of acetic acid to the solution.

All of the above information can be tabulated as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | AgNO3 | NaCl | NH4OH | CH3COOH | Na2CO3 | Na2CrO4 |
| Cu(NO3)2 | ----------- | ------------ | Cu(NH3)4  deep blue | ------------- | ------------- | -------------- |
| AgNO3 | XXXX | AgCl  white  (ammonia) | Ag(NH3)4  colorless | ------------- | Ag2CO3  white  (acid/bubbles) | Ag2CrO4  red-brown  (ammonia) |
| NaCl |  | XXXX | ------------- | -------------- | -------------- | ------------- |
| NH4OH |  |  | XXXX | -------------- | -------------- | ------------ |
| CH3COOH |  |  |  | XXXX | bubbles | -------------- |
| Na2CO3 |  |  |  |  | XXXX | ------------- |
| Na2CrO4 |  |  |  |  |  | XXXX |
| Pb(NO3)2 | -------------- | PbCl2  white | Pb(OH)2  white  (acid/bubbles) | ------------- | PbCO3  white  (acid/bubbles) | PbCrO4  yellow |

Those boxes with information in the box indicate some type of reaction. The dark boxes are duplicate reactions of the other boxes and are therefore left blank as to not confuse additional reactions. XXX means it would be a compound reacting with itself which nothing will happen. Finally, ------ means no reaction can be detected from those chemicals.

***Color Top:* Black White**

***Letter of Bottle Set:* A B C D**

|  |  |  |
| --- | --- | --- |
| **Chemical** | **Formula** | **Bottle #** |
| Ammonium Hydroxide (ammonia) | NH4OH |  |
| Acetic Acid (vinegar) | CH3COOH |  |
| Copper Nitrate | Cu(NO3)2 |  |
| Sodium Carbonate | Na2CO3 |  |
| Lead Nitrate | Pb(NO3)2 |  |
| Sodium Chloride | NaCl |  |
| Silver Nitrate | AgNO3 |  |
| Sodium chromate | Na2CrO4 |  |