What is My Ionic Compound? Lab Report

**Background Information:** Ionic compounds are compounds that occur between two or more molecules that allows for equilibrium of charge to be reached through the offset provided by anion and cation ions. The electrostatic forces that hold the compound together dictate the ionic bonding in ionic compounds. One major benefit of Ionic Compounds is they are stable due to their anions and cations offsetting each other. Ionic compounds when solid make for very good insulators but they are usually brittle and once melted can become highly conductive.

**Purpose:** Conduct tests to confirm the presence of known ions in a solution and to analyze an unknown for certain ions.

**Hypothesis:** An unknown can be identified by testing for specific cations and anions. If the unknown is an uncontaminated ionic compound it will test positive for one cation and one anion.

**Procedure:** In order to obtain our data in this lab we utilized a two-step process. First we mixed three drops of the test regent with three drops of the known solution that contained either the cation or anion we where testing for and then marked down the results. We than repeated the same method of testing with each of the three unknowns and marked down our observations. We then cross referenced the results for each known solution with the results of each unknown in order to identify the anion and cation present in the unknown compound.

**Data:**

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| --- | --- | --- | --- | --- | --- | --- |
| **Cation Tests** | **Test Regent** | **Known Solution** | **Positive Result on Known** | **Result on Unknown A** | **Result on Unknown B** | **Result on Unknown C** |
| Copper II Cation | NH4OH | CuSO4 | Light Blue | Cloudy White | Yellowish Gold | Light Blue |
| Calcium Cation | Na2C2O4 | Ca(NO3)2 | Milky White | Milky White | Cloudy Gold | Cloudy Blue |
| Iron III Cation | Sn-1 | FeCl3 | Dark Red | Clear | Dark Red | Light Yellow |
| Lead II Cation | KI | Pb(NO3)2 | Solid Yellow | Clear | Urine | Greenish Brown |
| Acid (Hydrogen Cation) | Blue Litmos Paper | HNO3 | Orangish Red | Dark Blue | Slightly Red | Light Red |
| **Anion Tests** | **Test Regent** | **Known Solution** | **Positive Result on Known** | **Result on Unknown A** | **Result on Unknown B** | **Result on Unknown C** |
| Carbonate Anion | HCl | Na2CO3 | Bubbles | Clear | Clear | Light Blue |
| Sulfate Anion | BaCl2 | Na2SO4 | Bright Cloudy White | Spotted | Dark Cloudy White | Light Blue |
| Thiocyannate Anion | FeCl3 | KSCN | Dark Purple | Clear | Dark Purple | Lime Green |
| Chloride Anion | AgNO3 | BaCl2 | Cloudy White | Cloudy White | Clear | Cloudy Blue |
| Base Test (Hydroxide) | Red Litmos Paper | NaOH | Dark Blue | Dark Red | Dark Red | Dark Red |
| Unknown Solution | Cation Present | | Anion Present | Compound Name/Formula | |
| A | Ca | | Cl2 | CaCl/Calcium Chloride | |
| B | Fe | | SCN | FeSCN/Thiocyanatoiron | |
| C | Cu | | Cl2 | CuCl/Copper (II) Chloride | |

**Analysis:** In order to determine the cation and anion present in each unknown we had to compare its results with those of a know substance. Since Unknown A turned cloudy white when mixed with Na2C2O4 it must contain the Calcium cation since the reaction was the same. Since Unknown B turned dark red when mixed with FeCl3 it must contain the Iron cation since the reaction was the same. Since Unknown C turned light blue when mixed with NH4OH it must contain the Copper cation since the reaction was the same. Since Unknown A turned cloudy when mixed with AgNO3 it contain the Chloride anion because the reaction was the same. Since Unknown B turned dark purple when mixed with FeCl3 it must contain the KSCN because the reaction was the same. Since Unknown C became spotted when mixed with AgNO3 it must contain the Chloride anion because the reaction was very similar.

**Summery:** In this lab we test unknown solutions to cations and anions where present in them. We did this by conducting a mixture test on ten known solutions and then repeating those tests on each of the unknowns. We then crossed referenced our results for each unknown with that of each known in order to determine if the given anion or cation was present. For our results we found that unknown A was Calcium chloride, unknown B was Thiocyanatoiron, and unknown C was Copper (II) Chloride. While we didn’t any encounters where multiple ions where present or where none where, I’m not the most confident with our results since there are multiple ways that we might have messed up our test. These includes contaminating samples which would lead to incorrect reactions, using the wrong bottles since we where mildly rushed, and mixing up our test regent with our known solution which happened once and we had to redo that test. This form of testing through cross-reference is very useful for scientists since it allows them to identify unknown substance purely by comparing them to already known substances. In terms of comparison to other labs in which we must discern unknowns this is probably my favorite since it uses a very methodical approach that can be conducted very simply as long as the conductor is diligent about their data. While this lab may not have been the most complicated it definetley required a lot of effort and patience from those involved since it consisted of forty separate tests.