Melissa Moreno

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Chem1045 Lab

Studying Chemical Reactions and Writing Chemical Equations

Reacting Mg with HCl Solution

I. Introduction

We are reacting Mg with an HCl solution to determine the results and record observations.

II. Procedures

1. Transfer a 0.5 cm piece of Mg ribbon to the bottom of a clean test tube.

2. Measure 2 mL of 0.1 M HCl solution in a 10 mL graduated cylinder. Record your observations.

3. Transfer the HCl solution to the test tube containing the Mg. Observe the reaction mixture for evidence of a chemical reaction.

4. Transfer the contents of your test to the container specified by your instructor.

III. Data/ Results

Appearance of Mg: malleable solid metal, silver

Appearance of HCl solution: clear, colorless, non heavy liquid

Evidence that a chemical reaction occurred: gaseous bubbles that were whitish in appearance, Mg is now becoming more shinny

Complete ionic equation: Mg (OH)2 (s)+ 2HCl (aq)----🡪 MgCl2 (aq)+2H2O(l)

Net ionic equation: Mg(s) + 2H+(aq) 🡪 Mg+2(aq) + H2(g)

General reaction type: Single replacement

IV. Conclusion

The HCl was replacing the top layer of Mg with the Cl. H2O separated itself from the equation to make the Mg aqueous.

Reacting Pb(NO3)2 Solution with Kl Solution

I. Introduction

Reacting Pb(NO3)2 with Kl and record the observations and findings.

II. Procedures

1. Transfer 10 drops of 0.1 M Pb(NO3)2 solution into a clean test tube.

2. Record on your Data Sheet you description of the Pb(NO3)2.

3. Using a clean Pasteur or Beral pipet, transfer 2 drops of 0.1 m Kl solution into a test tube containing the Pb (NO3)2 solution.

4. Transfer the reaction mixture in the test tube into the waste container specified by your laboratory instructor and labeled “Discarded Pb(NO3)2- Kl reaction Mix”. Rinse the test tube with 5 mL tap water three times, and the once with the 5 mL of distilled water.

III. Data/ Results

Appearance of Pb(NO3)2: clear, colorless, liquid

Appearance of KI solution: clear, colorless, liquid

Appearance of the reaction mixture: when the KI was added to the test tube, the precipitation was yellow

Complete ionic equation:

Pb+2(aq) + 2NO3-(aq) + 2K+(aq) + 2I-(aq) 🡪 PbI2(s) + 2K+(aq) + 2NO3-(aq)

Net ionic equation: Pb+2(aq) + 2I-(aq) 🡪 PbI2(s)

General reaction type: Double replacement reaction (metathesis)

IV. Conclusion

The addition of KI made the Pb(NO3)2 because it is replacing the Pb and (NO3)2.

Heating Steel Wool (Fe) with S8

I. Introduction

We are heating the Steel Wool (Fe) with a Bunsen Burner and adding S8 and observing the results.

II. Procedures

1. Transfer a porcelain crucible with enough flattened steel wool to cover the crucible bottom.

2. Sprinkle the amount of powered S8 that fills the end of a microspatula over the Fe (steel wool). Rinse and clean the microspatula.

3. Working inside the fume hold, carefully place the crucible and its contents in a wire triangle resting on a ring attached to a ring stand. Cover the crucible with a crucible cover.

4. Still inside the fume hood, strongly heat the mixture from beneath with the flame of a Bunsen Burner for 5minutes. Using crucible tongs, carefully remove the crucible cover and look for evidence of unreacted S8 in the crucible. If you find unreacted S8, reheat the crucible for a minute or two. Check again for unreacted S8. Stop heating hen all visible evidence of unreacted S8 has disappeared. Allow the crucible and its contents to cool to room temperature.

5. Using gentle pressure from a glass stirring rod, crush the reaction product. Observe the appearance of the reaction product. Record your observations.

6. Transfer the reaction product from the crucible into the container specified by your laboratory instructor.

III. Data/ Results

Appearance of steel wool (Fe): fine metallic threads , dull gray color

Appearance of the S8: fine yellow powder

Appearance of the reaction product: the metallic threads after being reacted with the heat of the Bunsen Burner and the S8 have now turned into a black powder

Chemical equation: 8Fe(s) + S8(s) 🡪 8FeS(s)

General reaction type: Combination or synthesis reaction

IV. Conclusion

The S8 turned the Steel Wool (Fe) into black powder because the Fe and S8 have combined together in a combination reaction.

Heating CuSO4\*5H2O

I. Introduction

We are heating CuSO4\*5H2O and observing the results.

II. Procedures

1. Transfer the amount of CuSO4\* 5H2O that fills the end of a clean, dry microspatula to the bottom of clean and dry test tube.

2. Grasp the test tube containing CuSO4\*5H2O with a test tube holder. Holding the test tube at a 45 degree angle from the vertical, strongly heat the bottom of the test tube in a Bunsen Burner flame. Carefully observe both the solid and the test tube walls near the open end of the test tube.

3. Record your observations.

4. Discard the test tube into the container specified by your instructor.

III. Data/ Results

Appearance of CuSO4\*5H2O: solid, tiny, blue, crystallized

Appearance of solid after heating: After heating for a couple of minutes, the tiny blue crystal have now turned white. After more heating, the crystals were turning into an orange copper color.

Appearance of the inside wall of the test tube after heating: water vapor was living the inside of the test tube walls

Chemical Equation: CuSO4 (s) +5H2O (aq)--🡪 CuSO4 + H2O

General reaction type: Decomposition

IV. Conclusion

After heating the H2O from the CuSO4 (s)\*5H2O was evaporated and severing the bond it had with CuSO4.

Reacting HCl Solution with NaOH Solution

I. Introduction

Combine HCl solution with NaOH solution and record the observations.

II. Procedures

1. Measure 2 mL of 0.1 M NaOH solution into the rinsed 10 mL graduated cylinder. Transfer the NaOH solution into a clean test tube.

2. Add one drop of phenolphthalein indicator solution into the NaOH solution test tube and record your observations.

3. Measure 3 mL of 0.1 M HCL solution into the rinsed 10 ml graduated cylinder.

4. Add one drop of phenolphthalein solution to the HCl solution in the graduated cylinder. Record your observations.

5. Carefully pour 1.0 mL of the HCL solution from the graduated cylinder into the test tube containing the NaOH solution. Use a Pastuer or Barel pipet to add the remaning 2.0 mL of HCl solution dropwise from the graduated cylinder until you see a color change in the solution.

6. Pour the test tube contents into the proper discarding container. Rinse and clean all glassware.

III. Data/ Results

Appearance of NaOH solution: clear, colorless , liquid

Appearance of the NaOH solution with phenolphthalein: clear light pink liquid

Appearance of HCl solution: clear, colorless , liquid

Appearance of the solution in the graduated cylinder: clear, colorless , liquid

Evidence that a chemical reaction occurred:

When we added 1 ml of the HCl and phenolphthalein mixture to the NaOH and phenolphthalein mixture, the liquid turned light pink. After we added the remaining 2 ml of mixture dropwise ,the pink liquid gravitated towards the bottom and the clear liquid was floating on top.

Complete ionic equation: NaOH (s) + HCl (aq) ---🡪 NaCl (aq) + H2O (l)

Net ionic equation: H2 (g)+ Cl2 (g) -🡪 2HCL (g)

General reaction type: Synthesis

IV. Conclusion

The HCL and NaOH synthesized together because they the H2O combines automatically and the NaCl combines because they are polar opposites

Heating Cu with Atmospheric O2

I. Introduction

Heating Cu with atmospheric O2 and observing the results.

II. Procedures

1. Obtain enough Cu mesh to sparsely cover the bottom of the crucible.

2. Position the crucible in a wire triangle. Do not use a crucible cover.

3. Heat the crucible and its contents until the crucible bottom is glowing red. Remove the heat, and allow the crucible and its contents to cool to room temperature.

4. Record your observations.

5. Dispose of the Cu Mesh in the container specified.

III. Data/ Results

Appearance of the unreacted Cu mesh: shinny, orange, bronze color fine fibers

Appearance of Cu of mesh after heating and cooling: After heating, the Cu mesh turned a dark charcoal color. Once it cooled, it had red/pink hues.

Chemical equation: 2Cu + O2 ----> 2CuO

General reaction type: Synthesis

IV. Conclusion

Heating the Cu mesh caused a bond because the oxygen has taken two electrons from the Cu.

Reacting CuSO4 Solution with Steel Wool (Fe)

I. Introduction

Combine CuSO4 with Steel Wool (Fe) and record your observations.

II. Procedures

1. Obtain an amount of steel wool (Fe) equivalent to the volume of a pencil eraser. Use a clean, dry glass stirring rod to carefully slide the steel wool to the bottom of a clean, dry test tube.

2. Measure 2 mL of 0.1 M CuSO4 solution into the rinsed 10 mL graduated cylinder.

3. Transfer the CuSO4 solution into the test tube containing the steel wool (Fe).

4. Record your observations.

5. Dispose of the steel wool (Fe) into the proper waste container.

III. Data/ Results

Appearance of the steel wool (Fe) before reaction: dull grey metallic fine fibers

Appearance of CuSO4 solution before reaction: light blue clear liquid

Appearance of the steel wool (Fe) after the reaction has occurred: The steel woold (fe) began to rust and change into more red and bronze tones.

Appearance of CuSO4 solution after the reaction has occurred: the CuSO4 solution was turning into a colorless clear liquid

Complete ionic equation: Fe (s) + Cu SO4 (aq) → Fe SO4 (aq) + Cu (s)

Net ionic equation: Fe 2+ (aq) + Cu+1 (aq) → Fe(s) + Cu(s)

General reaction type: Single Replacement Reaction

IV. Conclusion

The top layer of the steel wool becomes oxidized with the SO4.

Reacting FeCl3 solution with NaOH Solution

I. Introduction

Combine FeCl3 and NaOH and record your observations.

II. Procedures

1. Obtain 1 mL of 0.1 M FeCl3 solution in the rinsed 10 mL graduated cylinder and transfer the solution into a clean test tube. Rinse the graduated cylinder twice using 5 mL of tap water each time, and then rinse once with 5 mL of distilled water.

2. Transfer 1 mL of 0.1 M NaOH solution in the rinsed 10 mL graduated cylinder.

3. Transfer the NaOH solution from the graduated cylinder into the test tube containing the FeCl3 solution. Record your observations.

4. Transfer the reaction mixture in the test tube into the proper discarding container.

III. Data/ Results

Appearance of the FeCl3 solution: a yellow thick looking liquid

Appearance of NaOH solution: clear, colorless liquid

Appearance of the reaction mixture:

Once the NaOH was added to the FeCl3 liquid there was a precipitation of an orange color which resemble gelatin.

Complete ionic equation: FeCl3 + 3NaOH-🡪 3NaCl + FeOH3

Net ionic equation: Fe +3 + 3OH -1 -🡪FeOH3

General reaction type: Double Displacement Reaction

IV. Conclusion

The Fe and OH combine while the Na and Cl combine, and this reaction created the orange gelatin appearance.

Heating (NH4)2CO3

I. Introduction

Heat (NH4)2CO3 and record your observations.

II. Procedures

Place a piece of red litmus paper on a small watch glass. Moisten the litmus paper with a drop of distilled water. The moist paper will cling to the watch glass.

2. Grasp the test tube containing (NH4)2CO3 with a test tube holder. Holding the test tube at a 45 degrees angle from the vertical, strongly heat the bottom of the test tube ina Bunsen Burner flame. Record your observations.

3. Holding the mouth of the test tube 15 cm from your face, carefully fan the fumes coming from the test tube toward your nose.

4. Position the watch glass and litmus paper so that the moist paper is next to the test tube mouth. Observe the color change of the litmus paper.

5. Record your observations.

6. Discard the contents of the test tube in the proper containers.

III. Data/Results

Appearance of (NH4)2CO3: white fine powder.

Initial appearance of the moist red litmus paper: When the red litmus paper came in contact with the drop of the distilled water it clung to the glass and became a darker red.

Description of what happened to the solid (NH4)2CO3 upon heating: The (NH4)2CO3 eventually evaporated and the powder disappeared.

Appearance of the inside wall of the test tube after heating: water was condensing to the sides.

Description of the odor of the fumes from (NH4)2CO3 upon heating: strong and pungent odor

Appearance of the moist red litmus paper after exposure to the fumes: turned blue

Complete ionic equation: (NH4)2CO3 >> 2 NH3 + H2O + CO2

Net ionic equation: (NH4)2CO3 (s) --> 2NH3 (g) + CO2 (g) + H2O (l)

General reaction type: Precipitation Reaction

IV. Conclusion

When the (NH4)2CO3 was heated, the H2O started to evaporated, causing the powder to disappear.

Post Lab Questions

1. Why would it be dangerous to perform Part I of the procedure of this experiment close to a lighted Bunsen Burner?

The gas produced by the reaction of the HCL and Mg is very flammable.

2. Why is it necessary to perform the reaction of Fe and S8 solution under a fume hood?

The fumes from burning S8 are toxic and irritating.

3. What solutions are used in Part II of the Procedure?

Both NaOH and HCl solutions are toxic and corrosive. They can cause skin burns. Prevent contact with your eyes, skin, and clothing. Don’t ingest these solutions.

4. Although the crucible is covered while heating in Part III of this experiment, why should you heat an uncovered crucible in Part IV?

So that the evaporated H2O has somewhere to escape.

5. Why is it important to wash your hand before leaving the laboratory?

To ensure that no toxic chemicals come in contact with your eyes, mouth, etc.