Experiment #3 Types of Reactions Lab
(for this lab, this handout IS your report)
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Date:

Lab Title (come up with a descriptive title that reflects the point of this lab activity and write it in the space below; look back at the Unit 1 lab handout for an example of a proper lab title)

Lab Essential Question:
What are the correct balanced equations and classification for several lab chemical reactions?

Pre-Lab Questions: (complete the questions below)

Sodium metal reacts with oxygen to form one solid product.

$Na^{+1} + O^{-2} \rightarrow$ (s)

1. Write a symbol equation for the above reaction. Don't forget to balance it! Include states of matter subscript labels after each formula.

$4Na_{(s)} + O_{2(g)} \rightarrow 2Na_2O_{(s)}$

2. Write a more specific word equation for the reaction above. Include states of matter, how the reaction is taking place and proper names for anything in the symbol equation.

mixing a metal (sodium) with a gas (oxygen) causes an ionic bond forming sodium oxide.

3. Classify the type of reaction. Synthesis

Procedure and Data and Conclusion: (before you turn in this handout, make sure you have states of matter for every chemical in both types of equations, roman numerals included in names if needed and all symbol equations are balanced)

1. a. Place a copper ball in the bottom of the small crucible. Place the crucible on a clay triangle on an iron ring over a Bunsen burner. Heat the crucible as strongly as you can for five minutes. Using the tongs, rotate the ball of copper each minute so that it "cooks" evenly. The copper will react with the oxygen in the air, forming the compound that coats the copper wool. [HINT: as the copper reacts with oxygen it will turn into the Cu^{+2} ion]. **Include heat** in the equations.

smells like burning

Observations: changing color - purple/silver / drying out (light)

Balanced Equation: $2Cu_{(s)} + O_{2(g)} \xrightarrow{heat} 2CuO_{(s)}$

Word Equation: heating solid (copper (II)) with gas (oxygen) creates a solid compound copper (II) oxide.

Reaction type: Synthesis

1. b. Using tongs, place the grey-coated copper wad from Step 1a into a small beaker. Add 10 mL of 3 M sulfuric acid and stir the mixture. Set up a filter funnel and filter the liquid from the solids. WET THE FILTER PAPER BEFORE FILTERING! Catch the blue filtrate in an Erlenmeyer Flask. Water is one of the products.

Observations: liquid was blue - copper is returning to copper color

Balanced Equation: $CuO_{(s)} + H_2SO_{4(aq)} \longrightarrow HOH_{(l)} + CuSO_{4(aq)}$

Word Equation: combining solid (copper (II) oxide) and aqueous solution (sulfuric acid) creates a liquid (water) and solid (copper (II) sulfate)

Reaction type: double replacement

1. c. Slowly add 10 mL of 6 M Sodium Hydroxide solution to the filtrate from Step 1b, do NOT pour the solution through the filter paper/funnel. One of the products from this reaction is a precipitate. Note its color immediately and record. It is a copper compound. Disregard the water from 1b.

Observations: blue cloudy precipitate / green patches after time

Balanced Equation: $2NaOH_{(aq)} + CuSO_{4(s)} \rightarrow Cu(OH)_{2(s)} + Na_2SO_{4(aq)}$

Word Equation: mixing an aqueous solution (sodium hydroxide) with solid (copper sulfate) results in a solid (copper(II) hydroxide) and a aqueous solution (sodium sulfate).

Reaction type: double replacement

1. d. Using your plastic pipet, transfer 20 drops of the mixture from Step 1c to a medium sized test tube. Add 3 M sulfuric acid drop-by-drop, while gently shaking the test tube, until the precipitate disappears. The sulfuric acid reacted with the copper precipitate. Disregard the non-copper containing compound from 1c. One of the products is water.

Observations: blue precipitate/chunks → light blue liquid

Balanced Equation: $Cu(OH)_{2(s)} + H_2SO_{4(aq)} \rightarrow CuSO_{4(aq)} + 2H_2O_{(l)}$

Word Equation: combining solid (copper(II) hydroxide) and aqueous solution (sulfuric acid) results in dissolved solid to an aqueous solution (copper(II) sulfate) and liquid (water)

Reaction type: double replacement

1. ***e. **Check with Ms. K before starting this step, the heat of the room may have already caused the reaction to occur**** Using the remaining products from Step 1c (the blue solution), place the E-flask onto a wire screen sitting on a metal ring. Heat until the color changes from what it was when the precipitate formed in Step 1c. Disregard the non-copper containing compound from 1c. Water is again one of the products. **Include "heat"** in the equations.

Observations: dark murky color chunks (brownish green)

Balanced Equation: $Cu(OH)_{2(s)} \xrightarrow{heat} H_2O_{(l)} + CuO_{(s)}$

Word Equation: Heating solid precipitate (copper(II) hydroxide) splits into Liquid (water) and a solid (copper oxide).

Reaction type: Decomposition