Inquiry Problem Based Laboratory Experiments

**Creating An Effective Airbag**

**Problem:**

Your goal is to evaluate the reaction of sodium hydrogen carbonate with an acid as a potential replacement reaction for automobile air bags. You may use any of the acids available in the laboratory. You may use Zip Lock bags to deploy and test this reaction. You will have available one bags to test your reaction conditions. The optimum situation is one in which the bag inflates fully but does not burst. Good Luck! Someone's life may ultimately depend upon your success.

**Equipment Available:**

• One zip lock (or Hefty One Zip bags)

• Beakers

• Graduated cylinder

• Funnel

• Balance

• Thermometer

• Metal scoop

• Empty pipets

• Tissue paper (kimwipes)

• Sample: sodium carbonate & 80 ml of 1.0 M HCI

• Sample: sodium hydrogen carbonate and 40 ml of 1.0 M HCl

**Safety Concerns:**

Students should wear safety goggles and laboratory aprons throughout this experiment. Students should exercise care when working with and filling the bag.

**Lab Report:**

Your lab report should consist of the following:

• Purpose (5 pts)

• Observations (5 pts)

• Data table with calculated and measured lab data including the volume of gas preferred (10 pts)

• Calculations involved in your experiment (10 pts)

 -Stoichiometry related to amount of solid

• Show your bag to the teacher ( 10 pts)

© Jesse Bernstein and Jeffrey Bracken 2002

|  |  |  |
| --- | --- | --- |
| **Creating an Effective Airbag** | **Poss.** | **Earned** |
|  |  |  |
| **Purpose** |  |  |
|  Lists the overall task or the goal of the lab | 3.5 |  |
|  List the method used to complete the task in 1-2 sentences. | 1.5 |  |
| **Objective Total** | 5 |  |
| **Procedures** Summarizes the lab procedures in 2-5 sentences | 5 |  |
| **Data (Quantitative)** |  |  |
|  Data is represented in a data table  | 2 |  |
|  All measured data is included  | 3 |  |
|  All calculated data is included ( % error & theoretical values) | 2 |  |
|  Units are clearly expressed | 2 |  |
|  Measurements are expressed with significant figures | 1 |  |
| **Data Quantitative Total** | 10 |  |
| **Data-Observations (Qualitative)** |  |  |
|  Describes the characteristics of all reactants and products  | 4 |  |
|  Mentions any anomalies in lab procedures or results | 1 |  |
| **Data Qualitative Observation Total** | 5 |  |
| **Calculations** |  |  |
|  Includes balanced equation | 2 |  |
|  Includes calculations with substituted values in equation | 2 |  |
|  Includes units on all values | 2 |  |
|  Calculation is correct | 3 |  |
|  Answer is expressed in appropriate significant figures | 1 |  |
| **Calculations Total** | 10 |  |
| **Results** |  |  |
|  Airbag inflates | 8 |  |
|  Airbag inflates to an appropriate volume and saves Furby | 2 |  |
| **Results Total** | 10 |  |
| **Total** | 40 |  |

Obtain the teacher’s signature once you have inflated your airbag for verification.

Teacher Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rubric by Bridgette Sparks