**Acid Rain**

**Hands-On Labs, Inc.**

**Version 42-0219-00-01**

**Lab RepoRt assistant**

This document is not meant to be a substitute for a formal laboratory report. The Lab Report Assistant is simply a summary of the experiment’s questions, diagrams if needed, and data tables that should be addressed in a formal lab report. The intent is to facilitate student’s writing of lab reports by providing this information in an editable file which can be sent to an instructor

**obseRvations**

**Exercise 1: Acid deposition**

*Part 1: Nitrogen oxides and acid deposition*

|  |  |  |  |
| --- | --- | --- | --- |
| Data Table 1: Nitrogen Oxides | | | |
| **Time (min:sec)** | **Inner Circle** | **Middle Circle** | **Outer Circle** |
| **0:15** |  |  |  |
| **0:30** |  |  |  |
| **0:45** |  |  |  |
| **1:00** |  |  |  |
| **1:15** |  |  |  |
| **1:30** |  |  |  |
| **1:45** |  |  |  |
| **2:00** |  |  |  |
| **2:15** |  |  |  |
| **2:30** |  |  |  |

*Part 2: Sulfur dioxide and acid deposition*

|  |  |  |  |
| --- | --- | --- | --- |
| Data Table 2: Sulfur Dioxide | | | |
| **Time (min:sec)** | **Inner Circle** | **Middle Circle** | **Outer Circle** |
| **0:15** |  |  |  |
| **0:30** |  |  |  |
| **0:45** |  |  |  |
| **1:00** |  |  |  |
| **1:15** |  |  |  |
| **1:30** |  |  |  |
| **1:45** |  |  |  |
| **2:00** |  |  |  |
| **2:15** |  |  |  |
| **2:30** |  |  |  |

**Exercise 2: Buffering the effects of acid deposition**

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| --- | --- | --- | --- | --- | --- | --- |
| Data Table 3: Using Sodium Bicarbonate to Buffer Against the Effects of Sulfur Dioxide | | | | | | |
| **Time min:sec** | **Inner**  **Circle** | **Inner Circle**  **Buffered** | **Middle**  **Circle** | **Middle Circle**  **Buffered** | **Outer**  **Circle** | **Outer Circle**  **Buffered** |
| **0:15** |  |  |  |  |  |  |
| **0:30** |  |  |  |  |  |  |
| **0:45** |  |  |  |  |  |  |
| **1:00** |  |  |  |  |  |  |
| **1:15** |  |  |  |  |  |  |
| **1:30** |  |  |  |  |  |  |
| **1:45** |  |  |  |  |  |  |
| **2:00** |  |  |  |  |  |  |
| **2:15** |  |  |  |  |  |  |
| **2:30** |  |  |  |  |  |  |

**Exercise 3: Effect of acid on building materials**

*Part 1: Effect of acid deposition on rocks*

|  |  |  |  |
| --- | --- | --- | --- |
| Data Table 4: Reaction of rocks with hydrochloric acid | | | |
|  | **Granite** | **Limestone** | **Marble** |
| **Observations** |  |  |  |

*Part 2: Limestone, marble, granite, and acid deposition*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data Table 5: Rocks and Vinegar | | | | | |
|  | **Evidence**  **of reaction** | **Color of vinegar/BCG solution after**  **2 minutes** | **Color of vinegar/BCG solution after**  **2 hours** | **Mass (g)**  **start** | **Mass (g)**  **end** |
| **Marble** |  |  |  |  |  |
| **Limestone** |  |  |  |  |  |
| **Granite** |  |  |  |  |  |

*Part 3. Effects of acid deposition on metals*

|  |  |  |  |
| --- | --- | --- | --- |
| Data Table 6: Acid Deposition and Metal | | | |
|  | **Initial appearance of**  **metal** | **Observations, evidence of reaction** | **Appearance of metal and acid after 1 hour** |
| **Iron wire** |  |  |  |
| **Paper clip** |  |  |  |

**Questions**

**Exercise 2: Buffering the effects of acid deposition**

A. Compare how quickly the changes occurred in the petri dish in both Parts 1 and 2. B. Knowing that bromcresol green is a pH indicator, analyze the results in terms of pH. C. How does this demonstration correlate to acid deposition?

D. What effect did adding the sodium bicarbonate have on the bromcresol green?

**Exercise 3: Effect of acid on building materials**

A. Which rocks experienced the greatest reaction with the acid? B. Which rocks appeared to be the most resistant to the acid?

C. What might happen to buildings and statues made with these different stones over time in the presence of acid deposition?

D. What happened to the pH of the vinegar solution containing the limestone? What about the vinegar solution that had the marble in it? What about the vinegar solution that had the granite?

E. If you removed the limestone or the marble and added more vinegar, what would happen to the pH? What does this tell us about adding pulverized limestone to a lake to restore the pH if levels of sulfur oxides and nitrogen oxides are not reduced?

F. How did the solutions of vinegar appear after 2 hours with limestone? With marble?

G. Was there a measureable change in the mass of the limestone after one day? If you let it sit in the vinegar for more time, was there a change after this longer time period.

H. What happened when hydrochloric acid was added to the iron wire? When it was added to the paperclip?

I. The alveoli in our lungs, where oxygen is absorbed into the blood, are moist. What do you think happens when nitrogen oxides and sulfur oxides in the air we breathe reach the alveoli in our lungs?