

General chemistry

lab component CHE101L

Guided Inquiry Experiments

Content: Lab 1

Acid and Base Classifications

**Name ……………………………………………… Section …………..**

**Student ID………………………………………..**

**Date ………………………………… Time……………………..**

**Name of the instructor ………………………………………………………..**

**Signature & date ………………………………………….**

**report submission date (assigned by instructor) ……………………………**

**Experiment 1**

**Acid and Base Classifications**

Acids and bases are classes of chemical compounds. There are weak and strong acids and bases based

on their ability to dissociate in aqueous solution. They can interact with each other. Be careful when

you handle acid or base in any situation. Please read the lab safety section carefully and consult with

your instructor if necessary.

***Problem Statement:*** *What are the characteristics of acid and base solutions?*

**Part I**

**Data Collection:** *Properties of acids and bases*

1. Set up a 96 well micro-plate on the lab bench. Label rows and columns which can be seen in figure below. With a medicinal dropper or dropper bottle carefully ½ fill each well of column 1(***rows A-F***) with 1.00 M NaOH solution.



1. Do the same with columns 2-7 with 1.00 M HCl, 1.00 M H2SO4, 1.00 M HNO3, saturated Ca(OH)2,

1M KOH and distilled water respectively. Rinse the dropper when changing solutions.

1. Dip small pieces of red and blue litmus paper in each of the solutions in row **A** (see diagram) and record your observations in the table on the next below.
2. Add one microdrop bromothymol blue (BTB) to each of the solutions in row **B** and one microdrop of phenolphthalein (PHN) to each of the solutions in row **C**. Record your observation in the table.
3. Place a small piece of magnesium (Mg) metal in each of the solutions in row **D**. Record your observation in the table.
4. Place a small amount of CaCO3 in each of the solutions in row **E**. Record your observation in the table.
5. Add one microdrop of Mg(NO3)2 solution to each of the solutions in row **F**. Record your observation in the table.

**Record your observations**

[2]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **NaOH** | **HCl** | **H2SO4** | **HNO3** | **Ca (OH)2** | **KOH** | **Distilled Water** |
| **Litmus (Red)** |  |  |  |  |  |  |  |
| **Litmus (Blue)** |  |  |  |  |  |  |  |
| **Bromothymol blue** |  |  |  |  |  |  |  |
| **Phenolphthalein** |  |  |  |  |  |  |  |
| **Mg** |  |  |  |  |  |  |  |
| **CaCO3** |  |  |  |  |  |  |  |

**Data Analysis**

1. Group the seven solutions according to similar properties. What are the least number of groups needed? What substances are in each group? [3]
2. Write an equation for any one of the reaction you observed when you added the Mg(NO3)2 solutions? [2]

**Part II**

**Data Collection:** *Reactions of acids and bases*

Obtain 20.00 mL of 1.00 M HCl and divide it equally into two 50.00 mL beakers. Mark them as beaker 1 and beaker 2.

**Beaker 1**

Put several pieces of Mg metal into beaker 1 and cover it with a watch glass. Wait few minutes, don’t remove the watch glass. Hold a lighted match to the pouring spout of the beaker. Write down your observations. Write a chemical equation which represents the reaction. [2]

**Beaker 2**

Put several chips of CaCO3 into the second beaker of 1.00 M HCl solution and test with a lighted match. Record your observation and write a chemical equation which represents the reaction. [2]

**Data Interpretation for part I and part II**

1. Suppose HCl is one of a class of compounds call “acid” and NaOH is one of class of compounds called “base”. What did you learn about them in this experiment so far? [3]
2. From there chemical formula given, identify the similarities and differences among each of the groups you identified in the data analysis section of **Part I**. [3]

**Part III**

**Data Collection:** Concentrations of acids and bases

1. Obtain 10.00 mL of a 0.10 M HCl solution in a clean test tube and label it “10-1 M H+”. Transfer 1.00 mL of 10-1 M HCl solution to a test tube and add 9.00 mL of distilled water in it. Mix it thoroughly and label the test tube as “10-2 M H+”. Rinse and shake dry the transferring glass wires. Repeat the procedure to prepare solutions 10-3 M H+”, 10-4 M H+” and “10-5 M H+”.
2. Again obtain 10.00 mL of 0.10 M NaOH in a test tube and label it as “10-1 M OH-”. Repeat above serial dilution procedure to prepare up to “10-5 M OH-” solution.
3. Obtain a centimeter long strip of a broad range pH paper. Dip a glass rod into distilled water and touch that to a small section of a pH paper. Compare the color of the paper with the color code provided with the paper and record the value in the table below. Using the same procedure, test the 10 solutions you made in sections and b above.

Distilled water pH = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[2]

|  |  |  |  |
| --- | --- | --- | --- |
| **Acid** | | **Base** | |
| **Dilution** | **pH** | **Dilution** | **pH** |
| 10-1 |  | 10-1 |  |
| 10-2 |  | 10-2 |  |
| 10-3 |  | 10-3 |  |
| 10-4 |  | 10-4 |  |
| 10-5 |  | 10-5 |  |

**Data Analysis and Interpretation**

1. What conclusions can be drawn from these data? [4]
2. **Mental Model:** Draw a series of pictures that contrasts four of your dilutions (two acids and two bases) with each other and represents the atomic and molecular species involved. Explain how your picture illustrates your observations. [2]