**Properties of Acids and Bases:**

**Purpose**

1. To classify substances as acids or bases using their characteristic properties.
2. To observe the effect acids and bases have on indicators.
3. To examine the reactivity of acids with metals.

**Equipment/Materials**

* Safety goggles
* Red and blue litmus paper
* Indicators (universal indicator, phenolphthalein, bromothymol blue)
* Microtrays
* Acids
	+ Hydrochloric acid, HCl Dilute and 6M
	+ Acetic acid, CH3COOH or HC2H3O2
* Bases
	+ Sodium hydroxide, NaOH
	+ Ammonia NH3
* Metals
	+ copper, zinc, aluminum and magnesium

**Safety**

* **Hydrochloric acid and sodium hydroxide are very corrosive or caustic and will irritate the skin and eyes.**
* **Wear your goggles at all times.**
* **If you spill any acids or bases on your skin, in your eyes or on your clothes, wash with water.**

**Disposal**

* **Solutions can be rinsed with water down the drain.**
* **Litmus paper goes into the waste basket.**
* **Any solid metals can be reused or thrown away. They should not end up in the sink.**
* **Any dissolved metals in solution can be rinsed down the drain.**

**Procedure**

**Part A: Effects of Acids and Bases on Indicators**

1. Place about 5 drops of each of the following into separate wells of a microtray:

 **Dilute Hydrochloric acid (HCl),** acetic acid, sodium hydroxide, and ammonia.

1. Using different pieces of litmus paper for each solution, dip one end of the paper into each solution. Record your results in the data table.
2. Repeat step 2 using blue litmus paper. Record your results in the data table.
3. Wash the microtray.

**Part B: Using Indicators to Identify Acids and Bases**

1. Place 5 to 10 drops of each of the following into separate wells of a microtray:

 **Dilute HCl,** acetic acid, sodium hydroxide, and ammonia.

1. Add two drops of bromothymol blue indicator to each sample well. Record your observations in a data table.
2. Repeat steps 1 and 2 with phenolphthalein.
3. Repeat steps 1 and 2 with universal indicator.
4. Place one drop of **Dilute HCl**, five drops of water and two drops of universal indicator in a microtray. Add NaOH noting the color after each drop until the solution turns blue/violet. This step is just for observation and no data needs to be recorded.

**Part C: Determine the Reactivity of Acids and Bases with Metals**

1. Place a small sample of each metal to be tested in the different wells of a microtray.
2. Use an eyedropper to add 5 to 10 drops of the **6M** hydrochloric acid onto each sample of metal. Note any signs of chemical change and record your observations in a data table.
3. Repeat steps 1 and 2 using the acetic acid.

**Data Collection Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

 **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Hr\_\_\_\_\_**

**Part A**

|  |  |  |
| --- | --- | --- |
| Sample | Reaction with **red** litmus paper | Reaction with **blue** litmus paper |
| Hydrochloric acid, HCl |  |  |
| Acetic Acid, CH3COOH |  |  |
| Sodium Hydroxide, NaOH |  |  |
| Ammonia, NH3  |  |  |

**Part B**

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Bromothymol Blue | Phenolphthalein | Universal indicator |
| Hydrochloric acid, HCl |  |  |  |
| Acetic Acid, CH3COOH |  |  |  |
| Sodium Hydroxide, NaOH |  |  |  |
| Ammonia, NH3  |  |  |  |

**Part C**

|  |  |  |
| --- | --- | --- |
| Metal | Reaction with hydrochloric acid | Reaction with acetic acid |
| Zinc |  |  |
| Magnesium |  |  |
| Aluminum |  |  |
| Copper |  |  |

**Data Analysis**

Fill out the table below according to your findings in parts A, B and C.

 **Acids Bases**

 - Hydrochloric Acid - Sodium Hydroxide

 - Acetic Acid - Ammonia

|  |  |  |
| --- | --- | --- |
| Tests | With Acid | With Base |
| Red litmus paper |  |  |
| Blue litmus paper |  |  |
| Bromothymol Blue |  |  |
| Phenolphthalein |  |  |
| Universal indicator |  |  |
| Reaction with a metal |  |  |

**Questions**:

1. Explain how litmus paper be used to identify acids and bases.
2. What signs of chemical change were observed when acids were placed on metals?
3. List the general properties of acids and bases.