Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pd: \_\_\_\_\_ Ast #: \_\_\_\_\_

**Acids and Bases Investigation**

**INTRODUCTION:** Scientists classify, or group things, based on their characteristics. One way that scientists ***classify*** solutions is by their pH. “pH” is a measure of hydrogen-based ions present in the solution. ***Acidic*** substances produce hydronium ions (H3O+) in water; the stronger the acid, the more hydronium ions are produced. ***Basic (Alkaline)*** substances produce hydroxide ions (OH-) in water; the stronger the base, the more hydroxide ions are produced. Substances which produce an equal number of these ions in solution are considered **neutral**.

***Litmus paper*** is a tool that scientists use to determine if a solution is acidic or basic. There are two types of litmus paper, red and blue. The paper is treated with chemicals that cause it to change color in the presence of certain types of solutions. If blue litmus paper is placed in an acidic solution it will turn red; if red litmus paper is placed in a basic (alkaline) solution it will turn blue.

***pH paper*** is used to assign a value to the strength of the acidity or basicity (alkalinity) of a substance. When placed in a solution, pH paper will turn a certain color that corresponds to numbers on the pH scale from 0-14.

**TASK:** Classify the 15 substances as acid, base, or neutral; then sort them based on strength (pH).

**GUIDING QUESTION:** **How does pH indicate the acidity or alkalinity (basicity) of a substance?**

**MATERIALS:** You will use the following materials during your investigation.

* Red Litmus Paper
* Blue Litmus Paper
* pH Paper
* pH Paper Key
* Water
* Soapy Water
* Salt Water
* Baking soda solution
* Milk
* Apple Juice
* Lemon Juice
* Orange Juice
* Soda
* Vinegar
* Ammonia
* Alcohol
* Hydrogen Peroxide
* Shower Cleaner
* Laundry Detergent

**SAFETY PRECAUTIONS:**

* Wear safety goggles.
* Do NOT mix substances.
* Do NOT taste or touch substances.

**GETTING STARTED:**

1. Use the litmus paper to determine whether each substance is an acid, a base, or neutral.
2. Use the pH paper to determine the pH of each solution.
3. Compare the data from the litmus paper and the pH paper for each solution to determine how a substance’s pH relates to its classification as an acid or a base.

**DATA:** Fill in the data table on the back of this sheet.

**ANALYSIS:** Answer the questions on the back of this sheet.

**DATA TABLE:** Fill in the data table below as you complete the investigation.

|  |  |  |  |
| --- | --- | --- | --- |
| **SUBSTANCE** | **Red Litmus turned Blue?**  (check if “yes”) | **Blue Litmus turned Red?**  (check if “yes”) | **pH value**  **(0-14)** |
| Alcohol |  |  |  |
| Ammonia |  |  |  |
| Apple Juice |  |  |  |
| Baking Soda Solution |  |  |  |
| Hydrogen Peroxide |  |  |  |
| Laundry Detergent |  |  |  |
| Lemon Juice |  |  |  |
| Milk |  |  |  |
| Orange Juice |  |  |  |
| Salt Water |  |  |  |
| Shower Cleaner |  |  |  |
| Soapy Water |  |  |  |
| Soda |  |  |  |
| Vinegar |  |  |  |
| Water |  |  |  |

**DATA ANALYSIS:** After completing the data table above, sort the substances **from lowest to highest pH** in the table below. Use this table to compare the pH to the classification of “acid” or “base” for each substance.

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| --- | --- | --- |
| **SUBSTANCE** | **pH** | **Acid, Base, or Neutral** |
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1. Which pH values seem to represent an ACID?
2. Which pH values seem to represent a BASE?
3. Which pH value(s) would be considered NEUTRAL?
4. Where do you think the STRONGEST ACIDS are on the pH scale?
5. Where do you think the STRONGEST BASES are on the pH scale?