Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Student Exploration:** **pH Analysis: Quad Color Indicator**

**Vocabulary:** acid, acidic, alkaline, base, indicator, neutral, pH

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. **Acids** are substances that produce hydrogen ions (H+) when dissolved in water. Lemon juice is an example of an acid.
   1. What does lemon juice taste like? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. What does it feel like if lemon juice gets in your eye? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **Bases** are substances that produce hydroxide ions (OH-) when dissolved in water. Hand soap is an example of a base.
   1. What does soap feel like? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. What does soap taste like? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. What does it feel like if soap gets in your eye? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Gizmo Warm-up**

The strength of an acid or base is measured on the **pH** scale. The term “pH” is short for “potential of hydrogen.” It is a measure of how many excess H+ ions there are in a solution. The pH scale runs from 0 to 14, with 0 representing the highest concentration of hydrogen ions. **Acidic** substances have a pH below 7, while **alkaline** substances (bases) have a pH above 7. Pure water has a pH of 7 and is considered **neutral**.

The *pH Analysis: Quad Color Indicator* Gizmo allows you to find the pH of a variety of liquids. In the Gizmo, check that the **Substance in the tube** is **Ammonia**, and click **Test**.

1. **Indicators** change color in acids or bases. What are the colors of the pH paper?

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1. Compare the paper to the **pH color chart**. What is the pH of ammonia? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Is ammonia acidic or alkaline? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Activity A:**  **Measuring pH** | Get the Gizmo ready:   * Click **Reset**. * Check that the **0-14 paper** is selected. | 458SE2 |

**Goal: Find the pH of 18 common substances.**

1. Test: Use the Gizmo to find the pH of each of the available substances. Classify each substance as acidic (pH < 7), alkaline (ph > 7), or neutral (pH = 7).

|  |  |  |
| --- | --- | --- |
| **0-14 pH indicator paper** | | |
| **Material in the tube** | **pH value** | **Acidic, alkaline, or neutral?** |
| Baking soda |  |  |
| Bleach |  |  |
| Coffee |  |  |
| Cola |  |  |
| Drain cleaner |  |  |
| Hand soap |  |  |
| Juice (lemon) |  |  |
| Juice (orange) |  |  |
| Juice (tomato) |  |  |
| Milk |  |  |
| Milk of magnesia |  |  |
| Oven cleaner |  |  |
| Saliva (human) |  |  |
| Shampoo |  |  |
| Stomach acid |  |  |
| Vinegar |  |  |
| Water (distilled) |  |  |
| Water (ocean) |  |  |

1. Summarize: Compare all the acidic substances and all the alkaline substances.
   * 1. In general, what types of substances tend to be acidic? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + 1. What types of substances tend to be alkaline? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Activity B:**  **More accurate pH** | Get the Gizmo ready:   * Click **Reset**. * Select the **4.5-7.5 paper**. | 458SE3 |

**Goal: Find the pH of substances in a more accurate way.**

1. Test: Before you begin testing with the 4.5-7.5 paper, list the pH values of the substances below that you found using the 0-14 pH indicator paper. Then find the pH of each substance with the 4.5-7.5 paper.

|  |  |  |
| --- | --- | --- |
| **4.5-7.5 pH indicator paper** | | |
| **Material in the tube** | **pH value (0 to 14 paper)** | **pH value (4.5 to 7.5 paper)** |
| Coffee |  |  |
| Milk |  |  |
| Oven cleaner |  |  |
| Saliva (human) |  |  |
| Shampoo |  |  |
| Stomach acid |  |  |
| Water (distilled) |  |  |

1. Analyze: Compare the pH values in each column.
2. How do these values compare? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. What is an advantage of using the 4.5-7.5 paper? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. What is a disadvantage of using the 4.5-7.5 paper? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Given the results from two kinds of indicator paper, which substances appear to be neutral (pH = 7)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_