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Student Exploration: pH Analysis

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

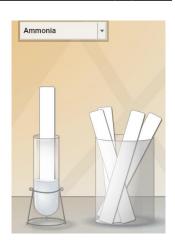
Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

- 1. Acids are substances that produce hydrogen ions (H⁺) when dissolved in water. Lemon juice is an example of an acid.
 - A. What does lemon juice taste like?
 - B. 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.
 - A. What does soap feel like?
 - B. What does soap taste like? _____
 - C. 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* GizmoTM 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**. Wait until the animation is finished.



1. Indicators change color in acids or bases. What is the color of the pH paper? _

- 2. Compare the paper to the pH color chart. What is the pH of ammonia?
- 3. Is ammonia acidic or alkaline?

Activity A:	Get the Gizmo ready:				
Measuring pH	 Click Reset. Check that the 0-14 paper is selected. 	4	 6 DH co	8 chart	9 t

Goal: Find the pH of 18 common substances.

1. <u>Test</u>: 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)			

2. <u>Summarize</u>: Compare all the acidic substances and all the alkaline substances.

A. In general, what types of substances tend to be acidic?

B. What types of substances tend to be alkaline?



Activity B:	Get the Gizmo ready:	
2	Click Reset.	5 5.5 6 6.5 7
More accurate pH	• Select the 4.5-7.5 paper .	pH color chart

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)				

- 2. <u>Analyze</u>: Compare the pH values in each column.
 - A. How do these values compare?
 - B. What is an advantage of using the 4.5-7.5 paper? _____
 - C. What is a disadvantage of using the 4.5-7.5 paper? _____

D. Given the results from two kinds of indicator paper, which substances appear to be

neutral (pH = 7)? _____