TURNING PHENOLPHTHALEIN RED WITH ACID

1. MATERIALS NEEDED:

sulfuric acid, H_2SO_4, 3 M. Prepare 100 mL of solution by pouring 16.7 mL of concentrated sulfuric acid into 83.3 mL of water. If necessary, add water to a volume of 100 mL after solution cools.

sodium hydroxide, NaOH, 3 M. Prepare 100 mL of solution by dissolving 12 g of sodium hydroxide in 90 mL of water. Add water to a volume of 100 mL after solution cools.

phenolphthalein, 0.5%. Prepare 100 mL of solution by dissolving 0.5 g phenolphthalein in 60 mL ethyl alcohol and dilute to 100 mL with water.

test tube, 18 x 150 mm or larger.

litmus paper, red and blue

stirrer

2. SAFETY PRECAUTIONS:

Wear safety goggles or glasses

Sulfuric acid is corrosive. Avoid skin contact. In the event of skin contact, flush affected areas well with water.

Sodium hydroxide is caustic. Avoid skin contact. In the event of skin contact, flush affected areas well with water.

3. DISPOSAL:

The materials used in this experiment should be diluted and neutralized and can be disposed of down the drain with running water.

4. PROCEDURE:

Place 10 mL of 3 M sodium hydroxide in a test tube. Add 2 or 3 drops of phenolphthalein solution and shake gently from side to side or stir until the pink color fades to colorless.

Test the sodium hydroxide solution with red litmus to show that the solution is basic. Test the sulfuric acid solution with blue litmus to show that it is acid.

Add 3 M sulfuric acid to the sodium hydroxide-phenolphthalein mixture dropwise, with gentle shaking or stirring until the solution turns red.

5. EXPLANATION:

Phenolphthalein has two color changes one at pH 8.2, where it turns pink, and one above pH 12, where it turns colorless. In 3 M sodium hydroxide, the phenolphthalein is in its upper range.

When sulfuric acid is added to the sodium hydroxide solution, the base is partially neutralized and the pH is lowered sufficiently to turn the phenolphthalein pink.

The reaction for the neutralization is:

$$H_2SO_4 + 2\ NaOH \rightarrow Na_2SO_4 + 2\ H_2O$$

6. UTILIZATION AND VARIATIONS:

This demonstration is appropriate in a discussion of acids and bases and indicators. It is particularly effective since many students have been exposed to phenolphthalein as an indicator.