Orange Juice to Strawberry Float

Purpose

To introduce reactions between acids and bases with a foamy demonstration.

Materials

Sodium Bicarbonate	Large tray
Alconox Soap	Long stirring rod
Methyl Orange (0.5% Soltn)	4L beaker
Hydrochloric Acid (3M)	600 mL Beaker
Water	

Procedure

1. Place a very large tray on the demonstration area.
2. Add 600 mL tap water to the 4L beaker
3. Add 100g sodium bicarbonate and 100g Alconox soap to the 4L beaker.
4. Stir the solution with a long stirring rod. All of the solid may not dissolve.
5. Pour 200 mL of 0.5% methyl orange solution (standard indicator) into the 4L beaker. Solution should look similar to orange juice.
6. Place the 4L beaker on the center of the large tray.
7. Wearing safety goggles, quickly and carefully add all of the 540-560 mL 3M HCl in one pour to the 4L beaker and stand back.
8. The mixture will immediately erupt out of the beaker. A color change will occur and the mixture will have the appearance of a strawberry float.
9. After some time, parts of the solution will turn yellow.

Additional Information

1. Sodium bicarbonate reacts with the hydrochloric acid in a neutralization reaction to give the following equation:

   $$NaHCO_3\ (aq) + HCl\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l) + CO_2\ (g)$$

2. Acid-base indicators such as methyl orange change over a certain color range with the change in pH. Methyl orange turns from a yellow-orange color at pH =4.4 to a red color at pH = 3.
3. The high indicator concentration creates the deep orange color in the basic solution and a berry red color in the end solution.

Questions for the Students

1. What gas creates but also becomes trapped in the soap bubbles?
2. What is the pH of the end solution?

3. What would happen to the solution if it were allowed to sit in the open air over an extended time period?

Safety

Hydrochloric acid is corrosive to body tissue, so be sure to wear PPE.

Disposal

End mixture can be disposed of down the drain with excess amounts of water.

Reference

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