

Additional Volume from Acid/Base Reaction

Instructions

Materials:

6.0 M hydrochloric acid, $\text{HCl}_{(aq)}$
6.0 M sodium hydroxide, $\text{NaOH}_{(aq)}$
2 250-mL volumetric flasks
1 500-mL volumetric flask
Paper clip
Thermometer

Set Up:

1. Fill the first 250-mL flask with 6.0 M hydrochloric acid solution.
2. Fill the second 250-mL flask with 6.0 M sodium hydroxide solution.
3. Set out 1 empty 500-mL flask with a glass funnel
4. Optional: As demonstrated in the video, you can hang a paper clip on the edge of the 200-mL flask so that the glass funnel sits slightly above the lip of the flask, this will allow the liquids to drain more smoothly into the flask.

Demo Procedure:

1. Pour the first 250 mL of $\text{HCl}_{(aq)}$ into the larger flask. Point out that the solution is room temperature.
2. Carefully pour the second solution, $\text{NaOH}_{(aq)}$, into the larger flask. You want to do this step slowly because not all of the NaOH solution is going to fit into the flask.
3. The combined volume will be greater than 500mL and you can observe this because the solution is clearly above the single ring graduation mark on the neck of the 500-mL flask. You can also point out that there is still NaOH left over in the 250-mL flask.
4. A thermometer is inserted into the flask to record the rise in temperature. This is an exothermic reaction.
5. After a few minutes, you can also point out the white streaks on the outside of the flask. This is dried sodium chloride salt, another visible product of this acid/base reaction.

Waste Disposal: The final solution should be close to neutral and can be poured down the drain with large quantity of water. If the solution is acidic, it can be neutralized safely with sodium bicarbonate (baking soda). If the solution is basic, it can be neutralized safely with household distilled vinegar (~5-8% acetic acid). Solution with pH range between 5-9 typically can be poured down the drain safely with water running.