LESSON 88

LAB

Neutral Territory Neutralization Reactions

Name _____

Date _____ Period _____

Purpose

To examine reactions between acids and bases.

Safety Instructions

Acids and bases are corrosive. Do not get any on skin or near eyes.

In case of a spill, rinse with large amounts of water. Wear safety goggles.

Materials

- well plate
- toothpicks (6)
- waste container
- set of five labeled dropper bottles: 0.10 M HCl, 0.10 M HNO_3, 0.10 M NaOH, 0.10 M NH_4OH, and bromothymol blue indicator

Procedure

1. Add 20 drops of 0.10 M NaOH to well 1 in the well plate.
2. Add 20 drops of 0.10 M HNO_3 to wells 2 and 5 in the well plate.
3. Add 20 drops of 0.10 M NH_4OH to wells 3 and 6 in the well plate.
4. Add 20 drops of 0.10 M HCl to well 4 in the well plate.
5. Add 1 drop of bromothymol blue indicator to each well plate. Bromothymol blue is yellow in acid, blue in base, and green in neutral solution.
6. Test with HCl: Try to turn the solutions in wells 1, 2, and 3 green using 0.10 M HCl. Record how many drops are needed. To do this, add HCl drop by drop and stir with a toothpick. Discard your toothpicks in the waste container after use.

Reactions With HCl

Solution in the well plate	Indicator color	Acid, base, or neutral?	Drops of 0.10 M HCl to turn solution green	Indicator color after mixing	Acid, base, or neutral?	Does a reaction occur?
20 drops 0.10 M NaOH						
20 drops 0.10 M HNO_3						
20 drops 0.10 M NH_4OH						

7. Test with NaOH: Try to turn the solutions in wells 4, 5, and 6 green using 0.10 M NaOH. Add NaOH drop by drop and stir with a toothpick. Discard used toothpicks in the waste container.

Reactions With NaOH

Solution in the well plate	Indicator color	Acid, base, or neutral?	Drops of 0.10 M NaOH to turn solution green	Indicator color after mixing	Acid, base, or neutral?	Does a reaction occur?
20 drops 0.10 M HCl						
20 drops 0.10 M HNO_3						
20 drops 0.10 M NH_4OH						

Questions

1. Which of the compounds in the tables are acids? Which are bases?

2. What did you observe when you mixed an acid with a base?

3. Acids react with bases to form an ionic salt and water. Label the acid, base, and ionic salt in this chemical equation:

   $HCl(aq) + NaOH(aq) \longrightarrow NaCl(aq) + H_2O(l)$

4. Complete and balance the equations below for the reactions in the well plate. If no reaction occurred, simply write "no reaction" on the products side of the equation.

   Reactions With HCl

   Well 1: $NaOH(aq) + HCl(aq) \longrightarrow$

   Well 2: $HNO_3(aq) + HCl(aq) \longrightarrow$

   Well 3: $NH_4OH(aq) + HCl(aq) \longrightarrow$

   Reactions With NaOH

   Well 4: $HCl(aq) + NaOH(aq) \longrightarrow$

   Well 5: $HNO_3(aq) + NaOH(aq) \longrightarrow$

   Well 6: $NH_4OH(aq) + NaOH(aq) \longrightarrow$

5. **Making Sense** List three things you learned about acids and bases as a result of performing this laboratory procedure.

6. **If You Finish Early** Write a balanced equation for this acid-base reaction: nitric acid, HNO_3, reacts with calcium hydroxide, $Ca(OH)_2$.