

Purpose: To investigate the properties of acids, and bases and their effects on the pH.

Equipment:

Beaker	graduated cylinder	pH meter	well plate
Materials: Vinegar	1.0 M NaOH	1.0 M HCl	1.0 M Oxalic acid, $\text{H}_2\text{C}_2\text{O}_4$
Phenolphthalein		Phenol Red	Litmus solution

Procedure:

Part I – Indicators

1. In the well plate put one drop of HCl in 3 or the wells.
2. Add one drop of phenolphthalein to one well, one drop of phenol red to another, and one drop of litmus to the HCl. Describe the colors of the mixtures.
3. Clean and dry the well plate.
4. Repeat steps 1-3 using NaOH in place of the HCl
5. Clean and dry the well plate.

Part II – pH

1. Use the graduated cylinder and pour 20 ml of distilled water into the beaker.
2. Take the cap off the bottom of the pH meter, turn it on and put the probe in the water. Record the pH of the water.
3. Add one drop of HCl to the water, stir the mixture, and record the pH
4. Add another drop of HCl to the water, stir the mixture, and record the pH
5. Repeat step 4 until you reach a total of 5 drops of HCl.
6. Clean and dry the beaker, and rinse the pH meter
7. Use the graduated cylinder and pour 20 ml of distilled water into the beaker.
8. Add one drop of NaOH to the water, stir the mixture, and record the pH
9. Add another drop of NaOH to the water, stir the mixture, and record the pH
10. Repeat step 4 until you reach a total of 5 drops of NaOH.
11. Clean and dry the beaker, and rinse the pH meter

Part III Neutralizing HCl

1. Use the graduated cylinder and pour 20 ml of distilled water into the beaker.
2. Add five drops of HCl, and one drop of phenolphthalein to the water, stir the mixture, and record the pH.
3. Add one drop of NaOH to the mixture, stir the mixture, and record the pH
4. Add another drop of NaOH to the water, stir the mixture, and record the pH
5. Repeat step 4 until you reach a total of 10 drops of NaOH. Note where the color changes.
6. Clean and dry the beaker, and rinse the pH meter

Part IV Neutralizing Vinegar

1. Use the graduated cylinder and pour 20 ml of distilled water into the beaker.
2. Add five drops of Vinegar and one drop of phenolphthalein to the water, stir the mixture, and record the pH.
3. Add one drop of NaOH to the mixture, stir the mixture, and record the pH
4. Add another drop of NaOH to the water, stir the mixture, and record the pH
5. Repeat step 4 until you reach a total of 10 drops of NaOH. Note where the color changes.
6. Clean and dry the beaker, and rinse the pH meter

Part V Neutralizing Oxalic acid

7. Use the graduated cylinder and pour 20 ml of distilled water into the beaker.
8. Add five drops of Oxalic acid and one drop of phenolphthalein to the water, stir the mixture, and record the pH.
9. Add one drop of NaOH to the mixture, stir the mixture, and record the pH
10. Add another drop of NaOH to the water, stir the mixture, and record the pH
11. Repeat step 4 until you reach a total of 10 drops of NaOH. Note where the color changes.
12. Clean and dry the beaker, and rinse the pH meter, turn off the pH meter and put the cap back on.

Data Tables:

Part I

Indicator	Color in HCl	Color in NaOH
Phenolphthalein		
Phenol red		
Litmus		

Part II

pH of water _____

Drops of HCl	pH
1	
2	
3	
4	
5	

Drops of NaOH	pH
1	
2	
3	
4	
5	

Part III

Neutralizing HCl

Drops of NaOH	pH
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Part IV

Neutralizing Vinegar

Drops of NaOH	pH
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Part V

Neutralizing Oxalic acid

Drops of NaOH	pH
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Analysis:

Name _____

1. Looking at Part I, why are litmus, phenolphthalein, and phenol red called indicators?
2. Was the distilled water an acid a base or
3. In Part II, did every drop of HCl have the same effect? Which one had the biggest effect?
4. In Part II, did every drop of NaOH have the same effect? Which one had the biggest effect?
5. Both the vinegar and the oxalic acid, both had the same concentration. Did the NaOH have the same effect on both? Look at the formula for the acid and see why?

Graphing:

Graph the data in part III, part IV and part V, using a different color for each substance.

