Name _____ Date _____ Period _____ Page _____

pH and Color Change - Activity Sheet

Objective: 1. To be able to explain, on the molecular level, that _____ is a measure of the _____ in water and that adding an _____ or a _____ to water affects the concentration of these _____.

DEMONSTRATION

Your teacher poured green universal indicator into each of two cups. What does the change in color of the indicator solution tell you about the substance your teacher placed in each cup?

PREPARRE FOR THE ACTIVITY

Materials for Each Group

- 2 clear plastic cups
- 3 droppers
- Universal indicator
- Water
- Graduated cylinder
- Sodium carbonate
- Citric acid
- 2 flat toothpicks

Procedure

Label your equipment

1. Use masking tape and a pen to label one cup **citric acid solution** and another cup **sodium carbonate solution.**

2. Use a small piece of masking tape and a pen to label one dropper **citric acid solution** and the other dropper **sodium carbonate solution.**

Make a citric acid solution

3. Use the graduated cylinder to add 5 mL of water to the cup labeled **citric acid.**
4. Use a flat toothpick to pick up as much citric acid as you can on the end of the toothpick as shown.
5. Add this citric acid to the water in the citric acid cup. Gently swirl until the citric acid dissolves.

Make a sodium carbonate solution

6. Use the graduated cylinder to add 5 mL of water to the cup labeled **sodium carbonate.**
7. Use a flat toothpick to pick up as much sodium carbonate as you can on the end of the toothpick as shown.
8. Add this citric acid to the water in the sodium carbonate cup. Gently swirl until the sodium carbonate dissolves.

ACTIVITY

Question to investigate
How does the concentration of citric acid affect the color of universal indicator solution?

Materials for Each Group

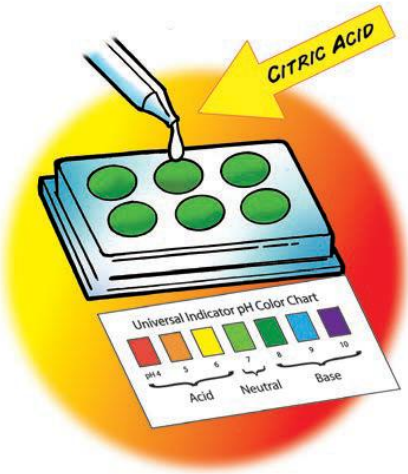
- Universal indicator solution
- pH color chart
- Citric acid solution
- At least 6 toothpicks
- Spot plate
- 2 droppers

Procedure

Test your citric acid solution

1. Use one of your droppers to nearly fill 6 small wells in your first spot plate with universal indicator solution. Place the Universal Indicator pH Color Chart in front of the spot plate.

2. Use your dropper to add 1 drop of citric acid solution to the second well. Gently mix the liquid with a clean toothpick.



3. Compare the color of the liquid to the control and to the Universal Indicator pH Color Chart. Record the color of the indicator, the number of toothpicks of citric acid, and the pH number in the chart for well 2.

Test a more concentrated citric acid solution

4. Add another toothpick scoop of citric acid to the citric acid cup. Gently swirl until the citric acid dissolves.

5. Add 1 drop of this more concentrated citric acid solution to the *third* well. Gently mix the solution with a clean toothpick.

6. Compare the color of the solution to the control and to the Universal Indicator pH Color Chart. Record the color of the indicator, the number of toothpick scoops of citric acid added, and the pH number in the chart for well 3.

7. Continue adding toothpicks of citric acid and testing the solution in the last three wells to see how many different colors you can get.

The color and pH of different concentrations of citric acid			
Well number	Number of tiny scoops of citric acid used in 5 mL of water	Color	pH
1	0		7
2	1		
3	2		
4	3		
5	4		
6	5		

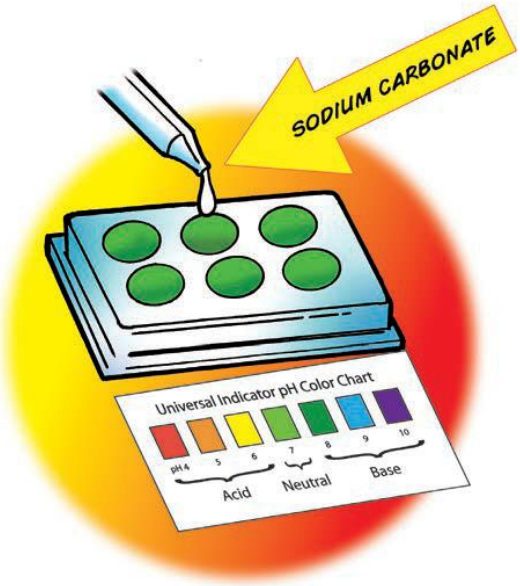
2. How does the color of the indicator solution change as the citric acid solution becomes more concentrated?

3. How does the number on the pH scale change as the concentration of citric acid solution increases?

Question to investigate
How does the concentration of sodium carbonate affect the color of universal indicator solution?

Materials for Each Group

- Universal indicator solution
- pH color chart
- Sodium carbonate solution
- At least 6 toothpicks
- Spot plate
- 2 droppers



Procedure
Test your sodium carbonate solution

1. Use one of your droppers to nearly fill 6 small wells in your first spot plate with universal indicator solution. Place the Universal Indicator pH Color Chart in front of the spot plate.

2. Use your dropper to add 1 drop of sodium carbonate solution to the second well. Gently mix the liquid with a clean toothpick.

3. Compare the color of the liquid to the control and to the Universal Indicator pH Color Chart. Record the color of the indicator, the number of toothpicks of sodium carbonate, and the pH number in the chart for well 2.

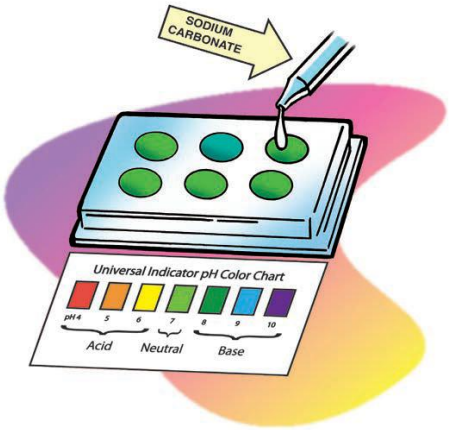
Test a more concentrated sodium carbonate solution

4. Add another toothpick scoop of citric acid to the sodium carbonate cup. Gently swirl until the sodium carbonate dissolves.

5. Add 1 drop of this more concentrated sodium carbonate solution to the *third* well. Gently mix the solution with a clean toothpick.

6. Compare the color of the solution to the control and to the Universal Indicator pH Color Chart. Record the color of the indicator, the number of toothpick scoops of sodium carbonate added, and the pH number in the chart for well 3.

7. Continue adding toothpicks of sodium carbonate and testing the solution in the last three wells to see how many different colors you can get.



The color and pH of different concentrations of sodium carbonate			
Well number	Number of tiny scoops of sodium carbonate used in 5 mL of water	Color	pH
1	0		7
2	1		
3	2		
4	3		
5	4		
6	5		

4. How does the color of the indicator solution as the sodium carbonate solution becomes more concentrated?

5. How does the number on the pH scale change as the concentration of base increases?

6. In this activity, you did not add any citric acid solution or sodium carbonate to the first well in each spot plate. What is the purpose of leaving the first well green?

TAKE IT FURTHER

Question to Investigate
How will the color change as you slowly pour your acid and base solutions into the indicator?

Materials for Each Group

- Universal indicator solution
- pH color chart
- Citric acid solution
- Sodium carbonate solution

Procedure

1. Pour a small amount of either your citric acid solution or sodium carbonate solution into your indicator solution. Swirl and compare the color to your Universal Indicator pH Color Chart.

2. Pour a small amount of the other solution into your indicator solution. Swirl and compare the color to your color chart.

3. Continue to pour small amounts of the acid and base solutions into your indicator until the solutions are used up.

7. What did you observe as you slowly poured your acid and base solutions into the indicator solution?