

May 18, 2009

pH of Orange Juice

Purpose:

To investigate the change in pH as the concentration of orange juice solution changes.

Key Concepts:

pH
Acid Concentration

What is pH?

The pH scale ranges from 1 to 14 and is a measure of the acidic or basic nature of a solution. The pH scale is logarithmic, so each whole value of pH above 1 is ten times less acidic than the next higher whole number. Thus, pH is the negative logarithm of the molar concentration of hydrogen ion (H^+) in grams per liter. The mathematical equation for pH is:

$$pH = -\log_{10}(H^+)$$

A value of 7 indicates a neutral solution; it is neither acidic nor basic. Values between 7 and 14 indicate a basic solution.

Materials & Equipment









One can of frozen Minutemaids orange juice (OJ), 12 ounces (355 ml), thawed
Indigo pH Precision pH 4070 Test Strips (available from www.indigo.com)

**"PRECISION" pH 4070 Test Strip
NO. 4070**

PROCEDURES:

1. Remove one strip of 4070 pH test strips.
2. Hold one end of test strip between index finger and thumb.
3. Dip the test strip into solution to be tested to about 1/2" for 1-2 seconds.
4. Shake off excess liquid and match color of strip to color chart provided with test strips.
5. Do not allow test strip to dry before reading color against chart.

pH RANGE

4.0	4.4	4.8	5.2	5.6	6.0	6.5	7.0
							

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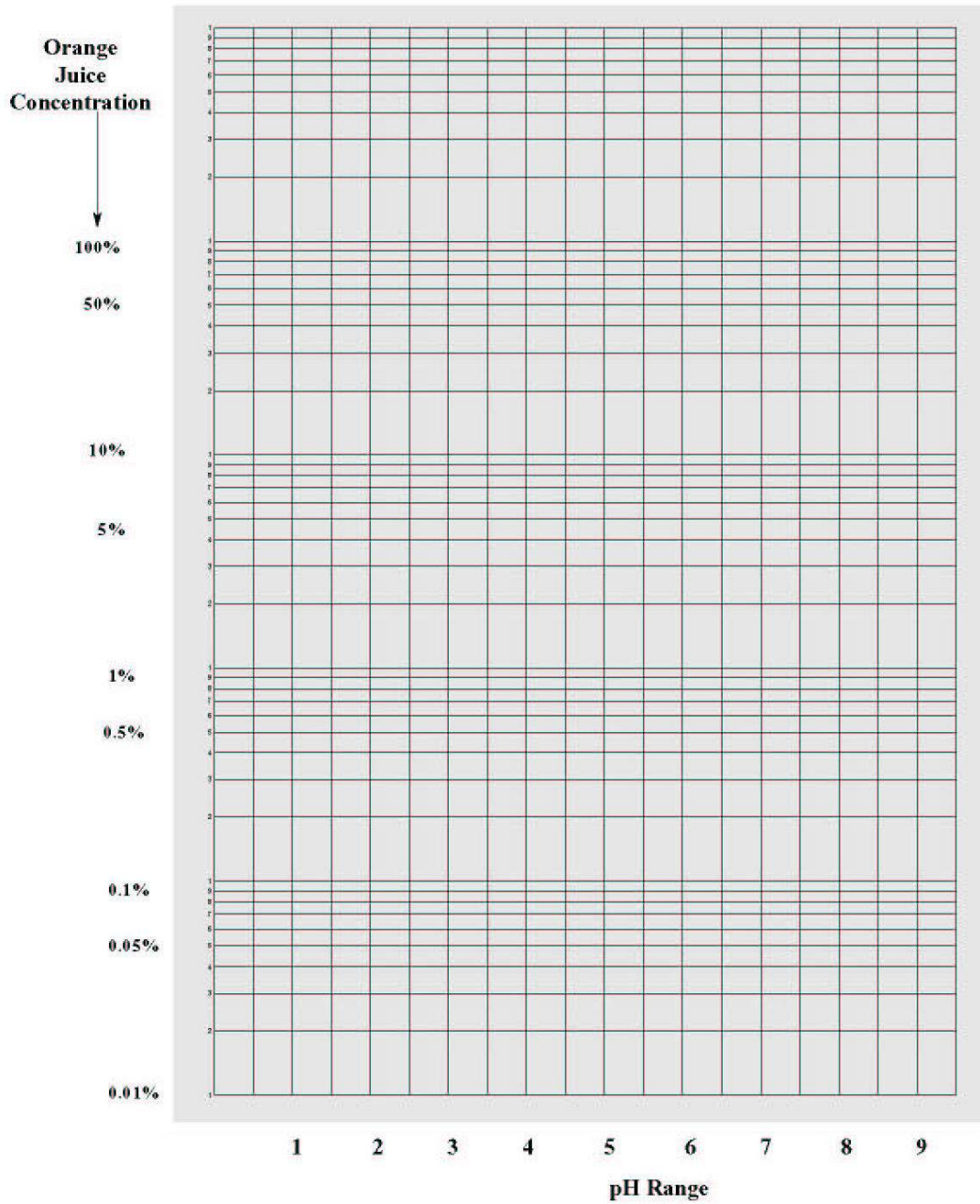
Large glass or polyethylene container with a capacity of at least 1.5 liters
 Five graduated Erlenmeyer flasks with a capacity of 500 ml each
 Graduated cylinder (10 ml)
 Five sets of Eight 100 ml Beakers (40 beakers total)

Procedure:

1. Fill a graduated Erlenmeyer flask with tap water to the 500 ml mark. Place one of the pH test strips in the water following the instructions on the pH test strip color chart. Record the pH based on a comparison with the color chart. Label this value as **0% OJ**.
2. Open the can of thawed orange juice and pour the liquid into a large, 1.5 liter container. Fill the empty orange juice can with tap water and pour the water into the container. Repeat this twice more, so that 3 full cans of water have been added to the container. Label this value as **100% OJ**.
3. Measure **2.5 ml** of the orange juice stock solution in a 10 ml graduated cylinder and pour it into one of the 500 ml Erlenmeyer flasks that has been filled to the 500 ml mark with tap water. Swirl the flask to stir the mixture. Pour about 50 ml of the mixture into a 100 ml beaker. Label this value as **0.5% OJ**.
4. Repeat step 3 using **5 ml, 10 ml, 25 ml, and 50 ml** of the 100% OJ solution. Label these **1%, 2%, 5%, and 10% OJ**, respectively.
5. Hold the white end of a 4070 test strip and dip it into one of the solutions prepared in 4 above to about 1/2-inch for 2 seconds.
6. Shake off excess liquid and match the color of the strip to the color chart before it dries. Record the pH value on the data table.
7. Repeat the process with all the OJ solutions and record the results in the data table.

OJ Concentration		pH
<u>ml</u>	<u>%</u>	
0	0.0% (tap water)	_____
2.5	0.5%	_____
5	1.0%	_____
10	2.0%	_____
25	5.0%	_____
50	10.0%	_____
Stock Solution	100.0%	_____

8. Make a graph of the results using “semi-log” paper – this paper has a logarithmic scale on the y-axis and a linear scale on x-axis. Show the OJ Concentration on the y-axis and the pH value on the x-axis.



Questions:

1. Which solution is the most acidic? _____.
2. What is the pH of tap water? _____.
3. Using you graph, predict the pH value of a solution prepared with 15 ml of orange juice stock solution in 500 ml of water.

Concentration (%) _____ pH value _____

**Orange
Juice
Concentration**



100%

50%

10%

5%

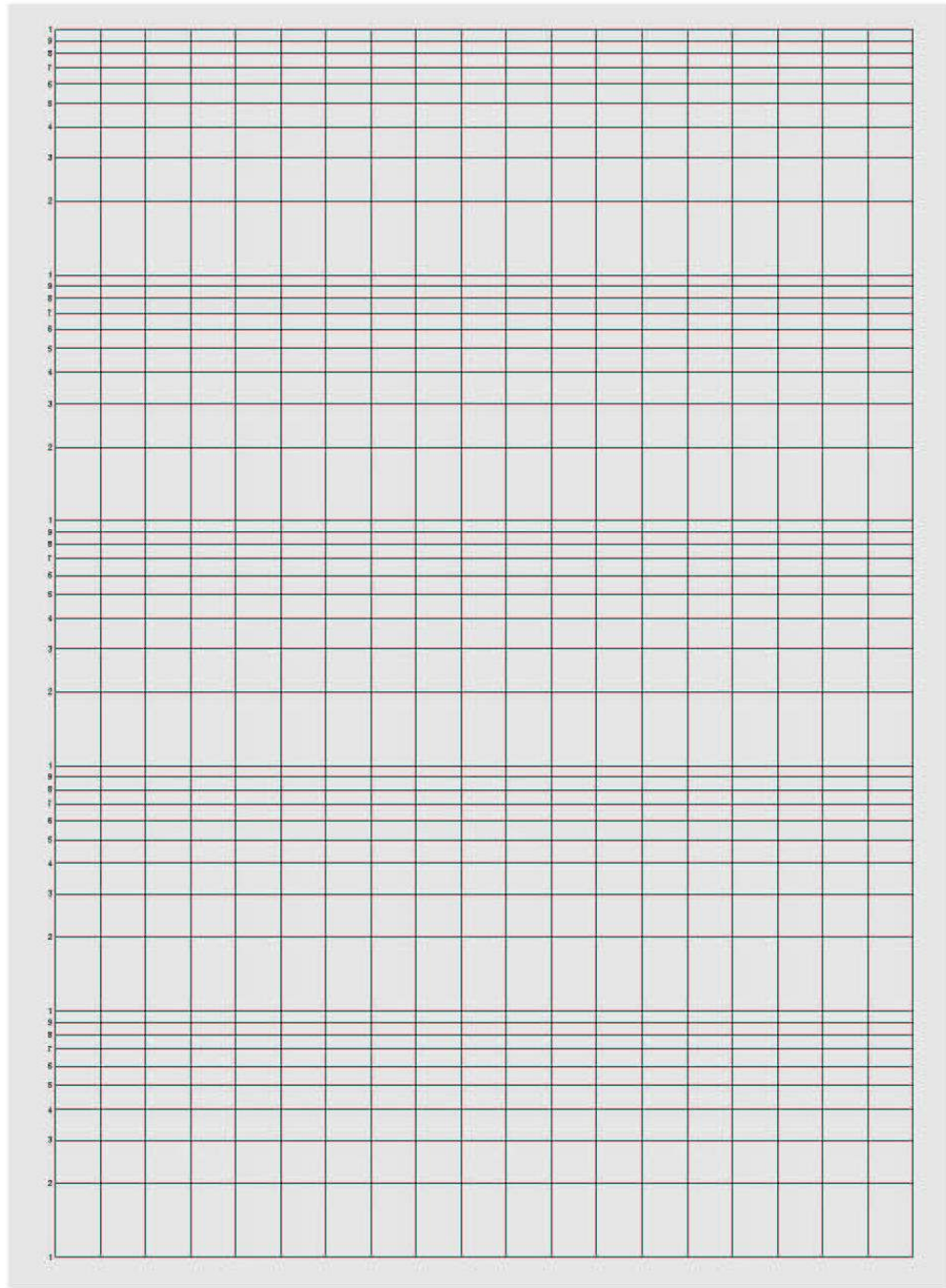
1%

0.5%

0.1%

0.05%

0.01%



1

2

3

4

5

6

7

8

9

pH Range