11 Measuring pH of Household Chemicals

Purpose:
The pH values of name brand products will be compared to those of generic brands.

Introduction
Some generic brands are the same as the name brands, except for the packaging, for example (uniodized) table salt is all NaCl. Other generic brands can be very different from the name brands. In this experiment, you will investigate washing soda and vinegar by comparing the pH of their aqueous solutions.

Washing soda is a solid laundry booster product containing the active ingredient, sodium carbonate, Na_2CO_3 along with detergent filler. Sodium carbonate, a white solid, is basic or alkaline when dissolved in water. In fact, the word alkaline comes from the Arabic *al kali* for the ashes of the plant that produces sodium carbonate. Bases such as Na_2CO_3 have a pH >7. We have prepared aqueous solutions in which the washing soda product is dissolved in water. A higher pH indicates a greater amount of Na_2CO_3.

Vinegar is an aqueous solution of the organic compound, acetic acid, CH_3COOH, a liquid with an intense odor. The solution is vinegar from the bottle. A lower pH indicates a greater concentration of acetic acid.

Apparatus:

Measuring pH of Products

1. Rinse and dry the electrode. *(When electrode is not in use for more than a few minutes, return to storage solution bottle.)*

2. Immerse the electrode into one of the sample solutions and record the pH on the data sheet as trial #1.

3. Repeat Steps 1 and 2 for trial #2.
Note: Do a third trial if the values differ by more than 0.05 pH units.

4. Repeat Steps 1, 2 and 3 for all samples. Find the average pH for each sample.

Data and Results (Measuring pH)

Name(s) _____

Product	Brand Name	pH Trial 1	pH Trial 2	Average of Trials
Vinegar				
Vinegar				
Washing soda				
Washing soda				

Question:
Compare the brand name products to the generic ones.

_____

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Data and Results (Measuring pH)

Product	Brand Name	pH Trial 1	pH Trial 2	Average of Trials
Vinegar	*Heinz*	*2.16*	*2.18*	*2.17*
Vinegar	*Pathmark*	*2.11*	*2.11*	*2.11*
Washing soda	*Arm & Hammer*	*10.68*	*10.65*	*10.66*
Washing soda	*Pathmark*	*9.17*	*9.19*	*9.18*

Question:
Compare the brand name products to the generic ones.

The pH values of the vinegars were nearly identical.

The pH values of the washing sodas were very different. The Arm & Hammer contains much more of the active ingredient, sodium carbonate.

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pH of Household Chemicals (cont'd)

Time: 1 h

Equipment and Materials: per group

Items	Number	Comment
Labquest 2	1	With pH sensor
Short ring stand clamp	1	To hold pH sensor in place
250-mL beakers	1	Used to catch runoff when cleaning electrode
20-mL vials	2	For additional samples
Kimwipes, box	1	Used to dry electrode
Vinegar, Heinz	1	20-mL vial
Vinegar, generic	1	20-mL vial
Na_2CO_3 Arm & Hammer (aq)	1	20-mL vial
Na_2CO_3 generic (aq)	1	20-mL vial
wash bottles	1	distilled water
Safety glasses	1 per student	
Display bottles of vinegar	1 ea	Heinz & Pathmark
Display boxes of detergent	1 ea	Arm & Hammer and Pathmark

Ideas/ Information

Arm & Hammer washing soda contains 98% sodium carbonate.

After testing both of the washing sodas and vinegars, students should feel free to test other available liquids such as tap water, juice, and soda.