Experiment 6
Stoichiometry : Chemical Teaser
Acid Concentration in Lime-A-Way©

TA Evaluations:

There is no pre-lab quiz associated with this experiment. Instead you are expected to complete the on-line. This evaluation is equivalent to one perfect pre-lab quiz.

Introduction:

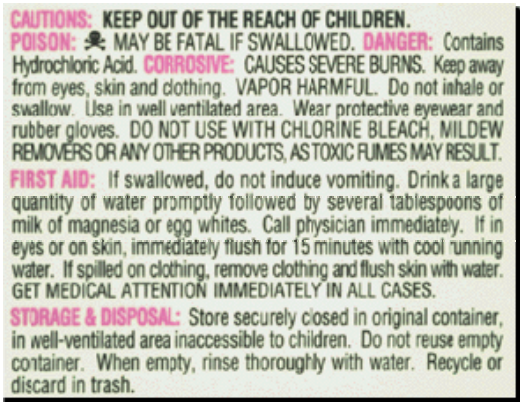
In terms of theory, this lab introduces nothing new. It does however review all aspects of stoichiometry to which you have been exposed and poses a problem that will test your stoichiometric skills and your ingenuity.

The other notable difference here is that whereas up to now we have given you a detailed procedure and provided you with a data table to fill in, this time it is up to you to design your own procedure and to present your results in an orderly fashion.

Household Chemicals:

It is always of interest to read the labels of household cleaners and products, particularly to see the various primary chemicals associated with each. Some of which you have met in the lab to date. To list just a minor few:

Chloride Ion:	Found in bleach and many of the dishwasher detergents.
Ammonia:	Found in household ammonia and smelling salts.
Sodium Hydroxide:	Found in some drain cleaners, oven cleaners and some bathroom cleaners.
Phenol:	Found in air-fresheners and furniture polish.
Hydrochloric Acid:	Found in the majority of drain and toilet bowl cleaners.
Formaldehyde:	Found in air-fresheners and mold and mildew cleaners.
Hypochlorite:	Toilet bowl cleaners and mold and mildew cleaners.


CAUTIONS: KEEP OUT OF THE REACH OF CHILDREN.
POISON: MAY BE FATAL IF SWALLOWED. DANGER: Contains Hydrochloric Acid. CORROSIVE: CAUSES SEVERE BURNS. Keep away from eyes, skin and clothing. VAPOR HARMFUL. Do not inhale or swallow. Use in well ventilated area. Wear protective eyewear and rubber gloves. DO NOT USE WITH CHLORINE BLEACH, MILDEW REMOVERS OR ANY OTHER PRODUCTS, AS TOXIC FUMES MAY RESULT.
FIRST AID: If swallowed, do not induce vomiting. Drink a large quantity of water promptly followed by several tablespoons of milk of magnesia or egg whites. Call physician immediately. If in eyes or on skin, immediately flush for 15 minutes with cool running water. If spilled on clothing, remove clothing and flush skin with water. GET MEDICAL ATTENTION IMMEDIATELY IN ALL CASES.
STORAGE & DISPOSAL: Store securely closed in original container, in well-ventilated area inaccessible to children. Do not reuse empty container. When empty, rinse thoroughly with water. Recycle or discard in trash.

The above is by no means a comprehensive list but rather a sampling. Next time you start a cleaning job have a look at the label. There are all sorts of warning on these labels concerning the use of these products and which combinations should not be used in tandem.

In this experiment the household chemical of interest is Lime-A-Way©, a toilet bowl cleaner whose primary ingredient is a strong (dissociates 100%) acid. The warning on this product is pretty explicit but nowhere does it give any indication as to the actual concentration of the acid involved. Your goal is to determine this.

Experimental Procedure

General:

There isn't one! You are expected to come up with your own and give a written description of it to your TA. Remember, your TA will have little recollection of what you did in this experiment and if you do not provide a detailed description they will assume that you did only what is contained in your report. Use plenty of headings to differentiate the different aspects of the experiment that you did.

Your TA is looking for at least the following items addressed in the report.

1. A detailed method used to determine the molarity of the original Lime-A-Way© solution.
2. A description on how you distinguished between the two salts given.
3. Of course, balanced chemical equations where appropriate.
4. Details on all calculations made.
5. Whether at least duplicate trials were performed in all critical areas.

Chemicals and Equipment:

I would not want to suggest that we are being a little sadistic with this experiment but there are a couple of wrinkles that you should think about prior to this lab. You are confined to the chemicals (some of which have had their labels mysteriously removed) and the equipment listed below.

Chemicals

1. A dilute solution of Lime-A-Way©.

   (10mL of the original solution was diluted with distilled water to a final volume of 50mL)

2. Two vials, one containing Na_2CO_3 the other $CaCO_3$. Unfortunately there are no labels on the vials.

Equipment

1. An eye dropper.
2. A 10mL graduated cylinder.
3. The analytical balance.
4. The beakers and Erlenmeyer's in your drawers can only be used as containment vessels.

Stoichiometry: Acid Concentration in a Household Chemical... Lime-A-Way©

Name: _____ **Lab TA:** _____

Lab Day	**Mon**	**Tue(am)**	**Tue(pm)**	**Wed**	**Thu(am)**	**Thur(pm)**	**Fri**
	☐	☐	☐	☐	☐	☐	☐

Grade

	>95	**>90**	**>85**	**>80**	**>70**	**<70**
Report:						

Prelaboratory Quiz Score: ☐

Announcement:

There is no pre-lab quiz associated with this experiment. Instead you are expected to complete the on-line TA evaluation. This evaluation is equivalent to one perfect pre-lab quiz.

Procedure:

Remember you need to address at least how:

1 You identified the salts.
2 You calibrated the eyedropper.
4. You determined the concentration of the acid in the cleaner.

Use headings and sub headings. Don't forget to include all balanced chemical equations.

Data Collection:

Use headings to identify the data collected and remember one determination is essentially useless.

Calculations:

Brief Concluding Discussion: