

ACID STRENGTH EXPERIMENT

Objectives:

To have students observe the reaction between acids and bases.

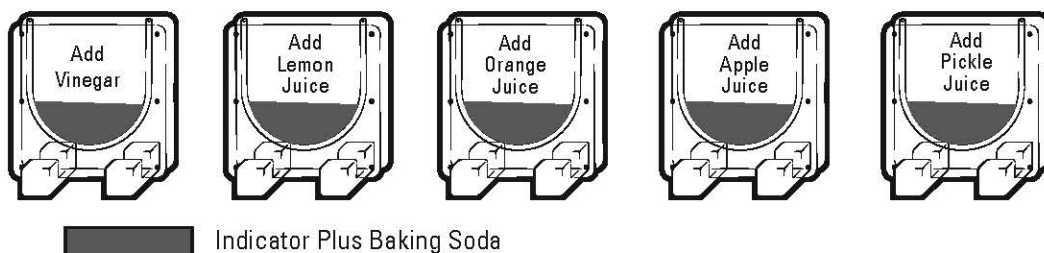
To have students compare different acids by reacting them with baking soda.

To have students predict which liquids might be acids and which might be bases from the product description on the label.

To have students measure and graph the data from their acid/base reactions.

Materials: Base (Baking Soda) 5 Teaching Tanks 5 Graduated Cylinders
5 Funnels Red Cabbage Indicator* 5 Stirring Rods
Tape 5 Sheets Blank Paper Safety Glasses
Acids (Vinegar, Lemon Juice, Orange Juice, Apple Juice, Pickle Juice)

*See Appendix for instructions on mixing Red Cabbage Indicator



Procedure:

1. Assemble the Teaching Tanks as shown. Place them on a cafeteria tray to catch any spilt liquid.
2. Tape a piece of unlined white paper to one side of each tank to make viewing easier.
3. Record the color of the red cabbage indicator solution (see Appendix for instructions to prepare the indicator) and add 5 mL of the indicator to each tank.
4. Add 100 mL of baking soda solution (5 mL of baking soda into 500 mL of water) to the red cabbage indicator in each tank, mix, and record the color.
5. You are now ready to add a different acid (ie: vinegar, lemon juice, etc.) to each of the tanks, in increments of 5 mL, until the solution changes to a blue color. Mix well after each addition. Record the total amount needed to change the color of each tank.
6. Ask your students to make a bar graph with each of the acids along the horizontal axis and the number of mLs of acid added to obtain the color change along the vertical axis. See Figure 1. The graph is not from experimental data.

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Thinking Questions:

What can be said about the acidity if more acid must be added to neutralize the base?

Which acid is the strongest?

Which acid is the weakest ?

Why does exactly the same amount of base have to be added to each tank?

Does the amount of liquid from the red cabbage have to be measured exactly the same every time?

How could the solution be changed back to the original color?

Teaching Notes:

The various acids are being neutralized by the baking soda (which is a base). The liquid from the red cabbage is an indicator which changes color from red in acids to blue in bases. If more acid must be added, that acid is said to be weaker. Weak acids aren't able to neutralize the baking soda as well. Exactly the same amount of base should be added to each tank as a control, so that comparisons can be made between acids. The indicator doesn't have to be measured exactly (only the color intensity will change). The acidic solutions (red color) can be changed back to basic solutions (blue color) by adding baking soda (or another base).

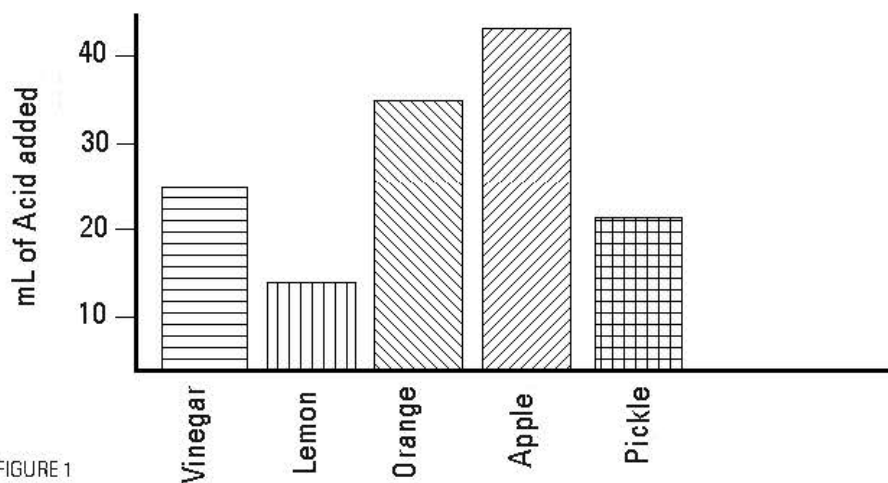


FIGURE 1