Investigating pH of common household substances
From http://serc.carleton.edu/sp/mnstep/activities/27573.html
Katherine Craun, Worthington MS, Worthington, MN

Summary
Students investigate the pH level of household substances by testing a variety of common compounds. Substances are tested with pH strips and placed on the continuum of the pH scale range of 1 to 14. After testing a solution, the student compares the strip color to the scale provided on the container and gives the solution a rating from 1-14. Using the determined number, the name of the solution is placed on the continuum. Students will find that household substances have a specific pH property which is a characteristic needed for the substance's use. Following the lab, students will be assigned the task of testing other substances in their home to determine the pH of those substances.

Learning Goals
This activity is designed for students to identify the pH level of compounds. By testing common household substances, they will understand how the pH determines why a compound reacts with other substances and for what purpose. Students will understand the property of acid and base; and how to test the pH of a liquid.

Concepts:
Identify acids and bases by using the pH scale. Explain differences between strong acids and bases, and weak acids and bases.
Identify uses of acid and base liquids.

Vocabulary:
pH scale, acid, acidity, base, basicity, neutral, neutralization indicator

Context for Use
Context for Use: Investigating pH of common household substances is designed for a 6th grade middle school classroom. The activity is conducted as a lab with emphasis on prior determined safety rules. Rules include: no tasting, keep area clear of other materials, place used materials on paper towel, self-monitor movement between lab stations. Skills used and developed are pH testing method, observation of strip color, comparison of test strip to pH scale and recording data on a continuum. In addition, students will be asked to discover how the household use of a substance relates to the substance's pH level. The homework assignment will ask the students to transfer the skills to another setting. Later in the school year, students will be engaged in a water quality field study and will be testing the pH of water in a local wetland area.

Subject:
Chemistry:General Chemistry:Acids & Bases,

Grade Level: Middle (6-8)

Activity Description:
Materials for a class of 30 students:
pH strips which indicate an acid-base range from 1-14
Assorted common household substances in liquid form

Suggested household substances to test:

Lemon juice	cola	Shampoo	Distilled water
Sparkling water	Baking soda solution	Bleach	Hydrogen peroxide
Ammonia	antacid	vinegar	milk
detergent	human saliva	mouthwash	orange juice
apple juice	coffee	tea	oven cleaner

plastic cups
Q-tip swabs
eye droppers or pipettes (optional)
paper towels
water, for clean-up and safety procedure
sink with drain or plastic lined disposal container
lab data forms

Lab preparation:
1. Label a cup with each for the liquids to be tested
2. Fill cup approximately ½ full with liquid
3. Arrange liquids to be tested at 14 stations
4. At saliva testing station, provide a Q-tip swab for each student and a container for disposal of used swab and testing strip.
5. Provide paper toweling at each station
6. Place one eye dropper or pipette at each station if using

Student preparation and procedure:
1. If guided activity, review properties of acids and bases; and the uses of each. Discuss characteristics of acids - sour, corrosive, etc.; and bases - bitter, slippery, etc. Acids are used to break down other substances and react chemically with metals. Bases are used for cleaning and react to neutralize acids.
2. Assign students a lab partner and place students in groups of 2.
3. Explain procedure. Each group will be assigned a station and when told will move to the next moving from lower to higher numbered station.
4. Give specific directions for the saliva test. Each student is to test their own saliva by swabbing the inside of their mouth with a clean Q-tip and test it by touching the Q-tip to an un-used pH testing strip. Discard Q-tip and used strip in container provided at that station.
5. Give each student a lab sheet to record the test result of each substance. Explain that they are to write name of liquid next to the number which corresponds to the tested result.
6. Provide each group a pH color testing guide and enough pH testing strips for the activity.
7. Begin the activity. Allow 2-3 minutes per station.

8. Conclude with students cleaning up the station at which they finish.
9. Dispose of acids and bases appropriately in separate containers or at separate sinks.
10. Have students compare the similarities and differences of liquids next to each other on the scale and those which are farther apart. Example: 2 to 3, 4 to 5, 7 to 8, 10 to 11; and 2 to 10, 4 to 9.
11. Discuss uses of liquids 1-6 and liquids 8-14.
12. Explain the characteristics of liquids which tested 7.
13. Students should record their observations and discussion notes.
14. Lab report can be graded for completion, accuracy of test results and thought process.

Homework: Students receive a second lab sheet and a length of pH testing strip with scale. They are to test a minimum of four additional and different liquids in their home and record the pH of each.

Teaching Notes and Tips

Safety rules must be emphasized for this lab. It is also important that infection control protocol be used at the saliva testing station. The most difficult process for students is matching the test strip to the key on container. Contamination of strips occurs when students touch the area used to test liquid creating a testing error. pH strips which show a range is critical. The blue/pink individual testing strips do not work for this activity. Specific directions for rotating through the stations is helpful for classroom management. It is beneficial to have another adult in the classroom with a class over 20 students.

Previous to teaching with this activity, acids and bases were taught with overheads, large pH scale and reading the textbook. On occasion liquids were tested simply for acidity or basicity, which did not show the continuum of pH nor allow comparisons.

Assessment

The lab is assessed as indicated above. The homework provides an evaluation of the testing procedure and transfer to real life setting. Students demonstrate their testing skills and understanding of acid/base properties during our Ecology Bus Field Trip. During the study of a local wetland, students test the water's pH.