



WOW at Home Lesson Plan Acid and Base Chemistry

Program Duration:

30-45 minutes (depends on how many substances tested)

Recommended Grade Levels:

Grades K-5

Materials Needed:

- Red cabbage (about ¼ head)
- Hot water
- Knife, cutting board, blender, strainer, and bowl
- Filter paper or coffee filters
- Substances to test (see suggested substance list)
- Cups or bowls to put test substances in

Learning Objectives

Students will be able to identify the differences between acids and bases.

Preparation

- Discuss with your child the different types of tastes in foods (sour, bitter, sweet) and hypothesize their sources
- Ask them what they may know about acids/bases and their characteristics
- Provide pictures or substances as a prompt to discuss taste, appearance, and other physical characteristics
- Ask them which household substances they would be interested in testing

Background

Chemicals are often described using a scale called the pH scale. In everyday life, one might hear the pH scale used in reference to drinking water or pool conditions. However, all substances have a pH value that describes their chemical nature. The pH scale is a logarithmic representation of the amount of hydrogen ions (also known as protons) present in a substance. The scale itself ranges from 0 to 14, with pure water having a pH of 7 in the middle. A pH value less than 7 is considered acidic, while a pH value greater than 7 is basic/alkaline. Many juices and foods are often found to be acidic, while household cleaners are usually basic. Commercially developed pH test kits are available for multiple purposes, including for pool water testing. However, this experiment provides a simple at-home method to make your very own pH test strips! This exploration of pH is most effective when testing a wide range of household substances.

Activity Preparation (to be completed by an adult though a child can help with steps 2 & 3)

1. Chop red cabbage into thin strips and add to blender; add just enough hot water to cover the red cabbage and blend until thoroughly combined.
2. Strain blended mixture using a strainer and collect liquid in a bowl; fully soak filter or coffee paper.
3. After soaked, remove paper and allow to dry; cut the paper into strips.

Activity

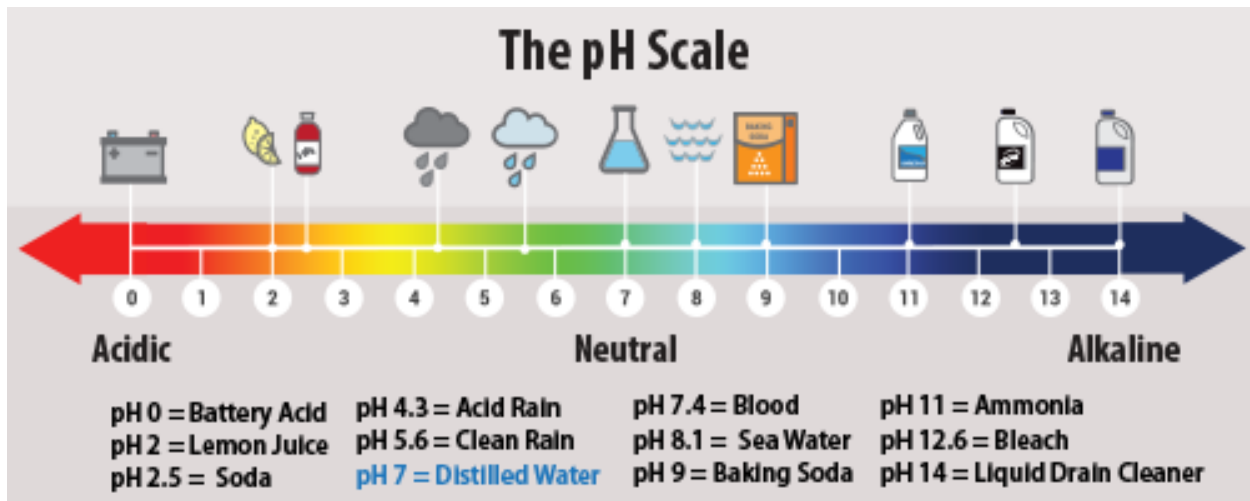
1. Use the worksheet provided to predict the substances before testing.
2. Dip strips in test substances to determine approximate pH by color (acids will turn strips red, bases will turn strips blue, and the strips will remain purple in neutral conditions) and record observations.
3. To test the pH of a solid food, a blending procedure similar to the red cabbage process may be done to produce a testable extract.

Additional Questions

1. What trend do you notice in foods?
2. What trend do you notice in household cleaners?
3. Which results were surprising or unexpected?
4. Can you predict the pH of a given substance?
5. Why is it important to know the pH of a substance?

Summary

Acids and bases are categorized based on their pH, and each group of chemicals have different physical functions, including in our everyday lives. Our blood and chemicals in our bodies even have a specific pH too! Appropriate pH values are important for chemical and biological processes to occur correctly and may be negatively impacted if pH is skewed. Moving forward, try to think about the pH of the substances you encounter in a given day and if they would be classified as acids or bases!

**Source**

“Acids and Bases Experiment Exploring pH Levels – Chemistry Kitchen Science” by Shelley.
<https://www.steampoweredfamily.com/activities/acids-bases-ph-chemistry-experiment/>

“Chemical Demonstrations: A Handbook for Teachers of Chemistry.” Vol. 3., Bassam Shakhshiri, University of Wisconsin Press, 1989.

“Science Is.” Susan V. Bosak, Scholastic Press, 1991.

Acid-Base Worksheet

Substance	Your Guess (Circle one)			Actual pH
Lemon Juice	Acid	Neutral	Base	_____
Cranberry Juice	Acid	Neutral	Base	_____
Apple Juice	Acid	Neutral	Base	_____
Orange Juice	Acid	Neutral	Base	_____
Soda	Acid	Neutral	Base	_____
Milk	Acid	Neutral	Base	_____
Yogurt	Acid	Neutral	Base	_____
Tap Water	Acid	Neutral	Base	_____
Soapy Water	Acid	Neutral	Base	_____
Windex (ammonia)	Acid	Neutral	Base	_____
Bleach	Acid	Neutral	Base	_____
Laundry Detergent	Acid	Neutral	Base	_____
Dishwashing Liquid	Acid	Neutral	Base	_____
Baking Soda	Acid	Neutral	Base	_____
Salt	Acid	Neutral	Base	_____
Vinegar	Acid	Neutral	Base	_____