

Acids and Bases Experiment Lesson Plan

Beckman Center Collection Area: pH Meter

Grade: Middle School (recommended 6th grade)

Subject Area: Science, English Language Arts

Duration: 45 minutes

Objectives:

1. Students will be able to define pH scale and share common acidic and basic substances with their pH number
2. Students will be able to conduct an experiment to measure, record, and analyze the pH levels of substances using a variety of pH testing methods
3. Students will be able to explain how a chemical reaction is involved in pH scale testing with indicators

Standards:

Next Generation Science Standards:

MS-PS1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred

MS-PS1.A: Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants

Common Core State English Language Arts Standards:

CCSS.ELA-LITERACY.RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks

CCSS.ELA-LITERACY.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table)

Materials:

1. Each student group will have 9 labeled cups containing the following substances:
 - Tap Water
 - Coffee
 - Salt Water
 - Pop
 - Baking Soda in Water
 - Lemon Juice
 - Vinegar
 - Laundry Detergent
 - Ivory Soap Water
2. Each student group will have 9 sets of pH papers, neutral litmus papers, acid litmus papers, and base litmus papers
3. Acids and Bases Experiment Student Handout

Classroom Activities:

1. Warm-up Discussion: Make a list of spicy and sour foods you like to eat. What do you do when food is too spicy or sour? What do you think is happening in your mouth?
2. Pass out the Acids and Bases Experiment Student Handout and read as a whole class or in pairs. Suggested comprehension questions:
 - *What is a pH scale?*
 - *What pH numbers indicate an acid? base?*
 - *What is an indicator?*
 - *When an indicator changes, is it an example of a chemical or physical change? How do you know?*
 - *What color indicates an acid?*
 - *What color indicates a base?*
3. Demonstrate each of the four pH testing methods to the class. Have students record down their hypothesis of which substances are acids, bases, or neutral.
4. In groups, have students follow the instructions and complete the lab recording their results in the table and answering the questions.
5. As a whole class, discuss results and share as a class:
 - *What surprised you today?*
 - *What is something new you learned?*

Extension Ideas:

- Students list other household items or foods they would like to measure pH. Students will predict if they think they are acids and bases. Students will bring in a new substance to test and see if their hypothesis was correct.
- Students divide into groups and explore careers such as a chemist, doctor, nurse, food and beverage manufacturers, and chefs. Students will report back how these jobs depend on knowledge of pH levels to best serve their customers.

Additional Beckman Center Resources:

- Arnold & Mabel Beckman Foundation Acidimeter/pH Meter Reading <https://www.beckman-foundation.org/about-foundation/inventions/ph-meter/>
- Beckman Foundation pH Meter Video <https://youtu.be/7cHa2wHrhQk>

Sources:

Acids and Bases Lab - Park Rapids.

www.parkrapids.k12.mn.us/cms/lib/MN02207558/Centricity/Domain/339/AcidsandBasesLab.pdf.

pH Scale Defined - What is pH? JAN/SAN CONSULTING. (n.d.). <https://www.jansanconsulting.com/ph-scale.html>.