Cabbage Chemistry Lesson Plans and Activities

Beckman Center Collection Area: pH Meter
Grade: Middle School (recommended 7th grade)
Subject Area: Science, English Language Arts
Duration: 1-2 classes of 40 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
4. Students will be able to make a pH indicator and use it to test the pH of various household solutions

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
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)

Before Exhibit Tour Activities:

Activity One: Cabbage Chemistry

Materials:

1. Small red cabbage
2. Pot of boiling water
3. Strainer
4. Small white Dixie cups (one for each solution you want to test pH of)
5. Pipette
6. Large bowls or pots (2)

7. Notebook
8. Various household solutions to test pH of
    a. Fruit juices: lemon, lime, orange, apple, etc
    b. Light colored soda
    c. Vinegar
    d. Baking soda solution
    e. Anything!
9. Cabbage Chemistry Student Handout

Classroom Activities:

1. Warm-up Discussion: Make a list of drinks you enjoy and whether you think they are acidic or basic based on their taste/flavor.
2. Pass out the Cabbage Chemistry Student Handout and read as a whole class or in pairs. Suggested comprehension questions:
    - *What is a pH scale?*
    - *What pH number indicates an acid? base?*
    - *When an indicator changes, is it an example of a chemical or physical change? How do you know?*

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?*

Activity Two:

During Exhibit Tour Activities:

- **Matching Terms Worksheet** - Students are given a set of terms and a list of clues pertaining to the exhibit at Beckman Center, and will match each term to its corresponding clue. An answer key is provided for teachers.
- **Crossword Puzzle Worksheet** - Students are given a set of across and down clues to complete a crossword puzzle themed around the exhibit. An answer key is provided for teachers, as well as an optional Word Bank supplement.
- **Note Taking Worksheet** - Students are given a worksheet with prompts they can answer as they move through the exhibit tour. The information they collect helps them create an outline and arrange their thoughts in preparation for completing an informational essay.

After Exhibit Tour Extension Activities:

- 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 the careers such as a chemist, doctor, nurse, food and beverage manufacturers, and chefs. Students will report back how these jobs depend on pH levels knowledge 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