

Investigating Acidity - Primary

Title: Investigating Acidity

Level: Primary, Intermediate, Middle School

Time: Preparation cabbage indicator --1 hour, Activity --1-2 Days

KERA Goals: 2.1

Objective: Students will practice scientific investigative procedures as they use indicators to identify acidic, basic, or neutral solutions.

Materials: For each group of students:

1. Samples of acids, such as: lemon juice, aspirin-water, vinegar-water, pickle juice.
2. Samples of bases, such as: bleach-water, ammonia-water, soap-water, baking soda-water, milk of magnesia
3. Samples of neutrals, such as: milk, plain water, lemon juice mixed with baking soda, sugar water.
4. Purple cabbage indicator solution
5. Small clear plastic cups
6. Medicine droppers
7. Data sheets
8. Red and blue litmus paper

Background Information: Before the lesson: Prepare a purple cabbage indicator solution by simmering a half-head of cut-up purple cabbage in a liter of water for twenty minutes. Drain the liquid indicator from the cabbage. It should be purple. This liquid will turn red if an acid is added, and blue or green if a base is added. If there is no change in the color of the indicator, the substance being tested is neutral.

Activity:

Directions:

1. Divide the class into groups of three to four students, and distribute to each group: small plastic cups, a medicine dropper, small jars with various liquid samples for testing (preferably some acids, some bases, and some neutral solutions), and a data sheet to record observations.
2. Have each group predict before the testing begins, whether each of their liquid samples is an acid, a base, or neutral. **Point out that students should never taste a substance to find out if it is an acid or base.**
3. Have the students place a small amount (1 tbsp.) of purple cabbage juice into a cup and add water to the cup until the cup is $\frac{1}{2}$ full. With a medicine dropper, students should then add a few drops of the liquid to be tested.
4. Students should record the cabbage indicator color change (or lack of one) for each liquid sample they tested. They should then decide, based upon the color change, whether each sample was an acid, a base, or neutral.
5. Then explain that scientists use a special kind of indicator called red or blue litmus paper instead of cabbage indicator. The students should then repeat their tests of each liquid sample by dipping litmus paper into each jar of liquid, referring to the "Color Key" on the data sheet.
6. Ask the students to compare the results of both methods.

Cabbage Juice Indicator Observation Sheet

How can we determine if a liquid is an acid or a base? Pair up with a friend and do the following experiment.

Objective: Find out which liquids are acids, which are bases, and which are neutral by using red cabbage juice as an indicator.

Hypothesis: Which liquids do you think are acids?

Materials:

Small, clear plastic cup
Medicine dropper
Purple cabbage juice indicator
Liquids to test (provided by the teacher)
Water
Waste container

Student Directions:

1. Pour a little purple cabbage juice indicator into a clear plastic cup, and add water until the cup is $\frac{1}{2}$ full.
2. Add one dropperful (or spoonful) of the liquid to be tested to the purple cabbage juice solution in your cup.
3. Observe the color of the cabbage juice: (a) If the juice turns red, the liquid you tested is an acid (b) If the juice turns blue or green, the liquid you tested is a base © If there is no color change, the liquid you tested is neutral.
4. Write the name of the liquid that you tested in the correct column on the data sheet this depends on whether it was an acid, a base, or neutral.
4. After testing on liquid, empty the cup into the waste container, and pour in some fresh cabbage juice.
5. Repeat the procedure until you have tested all of the liquids.
6. Test the liquids again by using red and blue litmus paper. Dip one piece of each color of litmus paper into each jar and record the color change of each piece. Look at the color key of litmus paper. Were the solutions acids, bases, or neutral? Compare these results with the results using purple cabbage juice indicator. Were your results the same in all cases?
7. Test the liquids again by using red and blue litmus paper. Dip one piece of each color of litmus paper into each jar and record the color change of each piece. Look at the color key for litmus paper. Were the solutions acids, bases, or neutral? Compare these results with the results using purple cabbage juice indicator. Were your results the same in all cases?

INVESTIGATING ACIDITY

1. What happened when you tested some of the liquids?
2. What have you learned about acids and bases?

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3. What are some ways in which acids are used?
4. What are some ways in which bases are used?
5. Can you predict what will happen when an acid and a base are mixed together?

Cabbage Juice Indicator Worksheet

| Liquid to be tested | Color of juice after liquid was added | Acid, base, or neutral? |
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| Liquid to be tested | Red litmus paper color change | Blue litmus paper color change | Acid, base, or neutral? |
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| Color Key for Litmus Paper | | |
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| The solution is acid if: red litmus remains red blue litmus turns red | The solution is base if: red litmus turns blue blue litmus remains blue | The solution is neutral if: red litmus remains red blue litmus remains blue |

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