

Title: What's the Solution?

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Primary Subject - Science

Secondary Subjects - Computers / Internet

Grade Level - 4-6

What's the Solution?

A. Introduction:

Today in class we are going to be learning about acids and bases. To do this, we are going to do an experiment called "What's the Solution? Acid, Base or Neutral." This lesson is going to take about 15 minutes. By using this experiment you will be learning how to test whether something is an acid, base or neutral.

B. Objectives:

I want the students to learn how the cabbage juice changes color when they add an acid or base.

C. Grade Level: Grades 4, 5 or 6

D. Materials Required for a Full Cup (for each group):

- 1 cup of chopped-up red cabbage
- 1 cup of water
- 3 tablespoons of vinegar
- 3 tablespoons of baking-soda
- a piece of cheesecloth folded over for a strainer
- 2 clear plastic containers
- knife or scissors
- blender
- tablespoon
- measuring cup
- 1 straw cut into half for 2 stirring rods

E. Safety:

When using a knife or scissors to chop-up the cabbage do not have the students help because a child might get his or her finger(s) chopped off. This is why I recommend that the teacher does this part. The same holds true when using a blender. Also, the teacher should pour the red cabbage juice from the blender into the containers for the students. If the containers for the children are made out of glass, remind them of the safety precautions. For example: if they do break a glass, tell them to tell you right away. Tell the students not to touch broken glass. If a child does get cut, rush that student to the Nurse's Office. Students should not drink the solution; even though, it is nontoxic. They should wear safety goggles to protect their eyes from irritants such as vinegar.

F. Procedure:

1. Chop-up 1 cup of red cabbage
2. Make cabbage juice by dropping the chopped-up cabbage into a blender. Add a cup of water and blend until the water turns a dark purple color.
3. Once you have your cabbage juice, take your strainer (cheesecloth) and pour about a half cup of cabbage juice into each cup.

4. Add 3 tablespoons to one container and watch what happens.
5. To the other container, add 3 tablespoons of baking-soda and watch what happens.

G. Observations:

The students should notice that when we added the vinegar to the cabbage juice, it turned from purple to a reddish color. When the children added the baking-soda to the other container of cabbage juice, it turned from purple to a blue or greenish color.

H. Explanation of Observations with Respect to the Chemical Reactions:

Red cabbage juice is known as an acid/base indicator because it changes colors if it is exposed to an acid or a base. Cabbage juice is naturally neutral and it has a purplish color. If an acid is added, it turns blue or greenish. Vinegar makes the juice turn into a reddish color, so it is an acid. Baking-soda makes the cabbage juice turn into a blue or greenish color, so it is a base.

I. Questions:

1. Name two of the three chemicals that we were working with today.
2. Why do you think the cabbage juice turned a reddish color, when we added vinegar?
3. What did we add to the cabbage juice to make it turn blue or greenish?
4. By using what we learned today, what color would the cabbage juice turn, if we added lemon juice?
5. I used a blender to make the cabbage juice, is there any other way to make it?
6. If I would have added water to the cabbage juice, what would the color change to and why?

Answers to Questions:

1. Vinegar, baking soda or cabbage juice
2. The vinegar is an acid.
3. Added a base or baking-soda
4. The cabbage juice would turn a reddish color.
5. To make the cabbage juice, the cabbage and the water could have been boiled together.
6. The color would not change because water is neither an acid or a base, it is neutral.

J. Assignment:

Now that we have done the experiment, I would like everyone to make a PowerPoint presentation about acids and bases. I would like you to go onto the Internet, to find photos of different types of materials that are classified as an acid or a base, and place these photos into your PowerPoint presentation.

K. References:

"Acid-Base Reactions and Equilibria." Encyclopedia Britannica. 1975 ed.
Do Science What's the solution? Acid, base or neutral. 1999. March 2002 <http://www.doscience.com/act_archive/home_activities/cabbage_juice/cabbage_juice2html>.
Stoker, H. Stephen. Introduction to Chemical Principles Seventh Edition. Upper Saddle River, New Jersey: Macmillan Publishing Company, 2002.

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