ONE EGG, TWO EGG, RED EGG, BLUE EGG





Experiment Express:

Problem Question:

When dyeing eggs in cabbage water; what colors will the eggs turn when you add lemon juice, orange juice, or vinegar to the solution?



STEM Field of Study:

Hypothesis:

Before you do this experiment; try to predict the answer to the question above. Write down your Hypothesis in your logbook. Make sure to use a pen.



Science

Directions:



Specific STEM Area:

Chemistry

Food Science



Review safety precautions with an adult. Copy the chart below in your notebook.

Gather all of materials together.

With the help of an adult: in a large pot add 6 cups of water and in the smaller pot add enough water to cover 4 eggs.



Age Group:

All

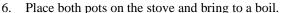


You don't need a lot of cabbage. Gently place

4 eggs into the smaller pot.

Cut the cabbage in chunks and place in larger pot.



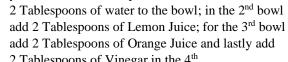


Once the water for the eggs begins to boil; let the eggs boil for about 3 minutes then turn off the heat and let the eggs stay in the hot water for 15 minutes.



Less than (<) \$10

While you are waiting for water to cool; separate your 4-small bowls/cups. In the 1st bowl add







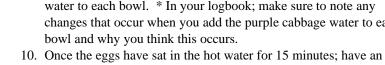
2 Tablespoons of Vinegar in the 4th

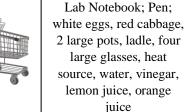
9. Once your purple cabbage water is cool; add a ½ of the cabbage water to each bowl. * In your logbook; make sure to note any changes that occur when you add the purple cabbage water to each bowl and why you think this occurs.

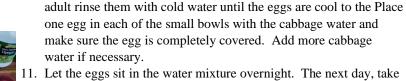


Materials:

than one day)









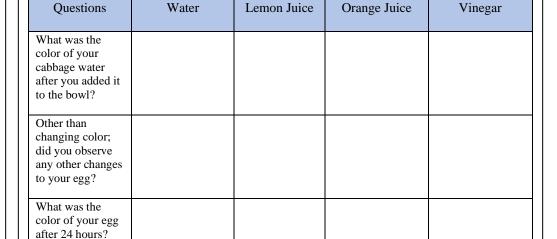


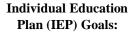
11. Let the eggs sit in the water mixture overnight. The next day, take your eggs out of the water and indicate your observations in your logbook.



Adult Supervision Necessary

Heat involved - Use extra caution





Academic

Motor







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Post Experiment Questions:

- 1. What happened when you added the cabbage water to the 1st bowl? 2nd? 3rd?4th?
- 2. Why do you think the cabbage water changed color when you added it to the bowls with lemon juice, orange juice, and vinegar but not the plain water?
- 3. Did your eggs turn to the color you expected them to?
- 4. Why do you think the eggs in the lemon juice and vinegar had bubbles covering
- Was your hypothesis correct?



Let's

Post Experiment Answers:

- 1. The First bowl with water didn't change color and appeared blue. The 2nd bowl with lemon juice changed to a pink color. The 3rd bowl changed to a cloudy pink/purple color. The 4th bowl changed to clear pink / purple color.
- 2. Lemon Juice, Orange Juice and Vinegar are acidic. These means that these ingredients have a piece of power that they share called Hydrogen. When an acid shares the power of Hydrogen with the cabbage water – it changes color.
- 3. Answers will vary; however, we must admit that we did not expect the Orange Juice egg to look so good!
- The shell of the egg is made of Calcium Carbonate which you will also find in: teeth, chalk, shells and coral! When you placed the egg in the acidic water with lemon juice and vinegar, you began a chemical reaction! The acid from the lemon juice and vinegar began dissolving the shell of the egg. That's way the eggshells from these two bowls may feel bumpy – the acid was slowly dissolving the shells. The bubbles that you observed on the eggshells was a reaction from the acid and the calcium carbonate meeting and releasing carbon dioxide! * Can you guess where carbon dioxide occurs? After you exhale! Isn't that awesome!!
- 5. If your hypothesis was correct, Congratulations! If not, don't worry, that's we conduct experiments – to learn new and wonderful facts.



Draw Your Own Conclusion:

Have you ever heard of the abbreviation, "pH?" If you have - that's wonderful and you are probably familiar with the fact that it indicates how acidic or how basic a substance may be. But do you know what the "p" and the "H" stand for? If you did ... WOW! That is wonderful! If you didn't know - that's okay - neither did we.



The pH stands for, "power of Hydrogen" and the pH scale was developed Danish chemist Søren Sørensen in 1909. The pH scale ranges from 1 being most acidic to 14 being most basic and 7 being neutral. Today, we use a piece of paper called a "Litmus Test" to test the pH of items. If the Litmus Paper turned pink/red the item was acidic; if it turned green / blue the item was basic. However, before the litmus test was created, nature assisted scientists by providing a natural litmus test in the form of... cabbage water. You know what color the cabbage water will be when you add an acid; can you determine what color the water would turn if you added something basic like soap, baking soda or sugar?



Experiment Expansion:

Try repeating the experiment, however, this time replace the acidic ingredients with basic ingredients such as: baking soda; sugar water and milk of magnesia. Can you guess what the color the cabbage water would turn when you add each of these items? What about the eggs? What color do you think the eggs would be? Do you think the basic ingredients would react with the eggshell as well? Let us know how at: www.stemwithsaints.org



Log Your Work:

Absolutely!



Real World **Applications:**

Food Science

Bacteria Growth

Food and Drug Administration

Culinary Arts



Online Resources:

https://www.ducksters.co m/science/acids_and_bas es.php

https://kids.britannica.co m/students/article/acidand-base/272698



Literature Resources:

Chemistry for Kids Elements, Acid-Base Reactions and Metals Ouiz Book for Kids by Dot Edu

ACID. BASES & SALTS-CHEMISTRY by PEGASUS

