

# ONE EGG, TWO EGG, RED EGG, BLUE EGG



## Experiment Express:

### STEM Field of Study:

Science

### Specific STEM Area:

Chemistry

Food Science

### Age Group:

All

### Cost:

Less than (<) \$10

### Time:

Ongoing Activity ( more than one day)

### Materials:

Lab Notebook; Pen; white eggs, red cabbage, 2 large pots, ladle, four large glasses, heat source, water, vinegar, lemon juice, orange juice

### Safety:

Adult Supervision Necessary

Heat involved - Use extra caution

### Individual Education Plan (IEP) Goals:

Academic

Motor

## 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?

## 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.

## Directions:



1. Gather all of materials together.
2.  Review safety precautions with an adult.
3. Copy the chart below in your notebook.
4. 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.
5. Cut the cabbage in chunks and place in larger pot. You don't need a lot of cabbage. Gently place 4 eggs into the smaller pot.
6. Place both pots on the stove and bring to a boil.
7. 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.
8. While you are waiting for water to cool; separate your 4-small bowls/cups. In the 1<sup>st</sup> bowl add 2 Tablespoons of water to the bowl; in the 2<sup>nd</sup> bowl add 2 Tablespoons of Lemon Juice; for the 3<sup>rd</sup> bowl add 2 Tablespoons of Orange Juice and lastly add 2 Tablespoons of Vinegar in the 4<sup>th</sup>
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.
10. Once the eggs have sat in the hot water for 15 minutes; have an adult rinse them with cold water until the eggs are cool to the touch. Place one egg in each of the small bowls with the cabbage water and make sure the egg is completely covered. Add more cabbage water if necessary.
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.



Questions	Water	Lemon Juice	Orange Juice	Vinegar
What was the color of your cabbage water after you added it to the bowl?				
Other than changing color; did you observe any other changes to your egg?				
What was the color of your egg after 24 hours?				



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## Post Experiment Questions:

1. What happened when you added the cabbage water to the 1<sup>st</sup> bowl? 2<sup>nd</sup>? 3<sup>rd</sup>? 4<sup>th</sup>?
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 them?
5. Was your hypothesis correct?

## Post Experiment Answers:

1. The First bowl with water didn't change color and appeared blue. The 2<sup>nd</sup> bowl with lemon juice changed to a pink color. The 3<sup>rd</sup> bowl changed to a cloudy pink/purple color. The 4<sup>th</sup> 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!
4. 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](http://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.com/science/acids\\_and\\_bases.php](https://www.ducksters.com/science/acids_and_bases.php)

<https://kids.britannica.com/students/article/acid-and-base/272698>



## Literature Resources:

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

ACID, BASES &  
SALTS-CHEMISTRY  
by PEGASUS