



Carry Out Science: Lemons



Description: Summer time classics and secret messages



Lemonade:

1. Mix two cups of water and sugar (1.5 cups) in a medium sauce pan. Heat until sugar dissolves in water. Transfer to a pitcher and cool in the refrigerator. (Product is a simple syrup)
2. Remove the seeds of the lemons and hand squeeze till you have 1 cup lemon juice.
3. Mix Lemon juice (1 cup) and cold simple syrup (2 cups) with remaining water (6 cups).
4. At this point taste your lemonade and make adjustments to taste.

Invisible Ink:

1. Squeeze Lemon into bowl and add water
2. Dip paintbrush in lemon juice and draw
3. Allow juice to dry then leave paper near heat source. (Sun baked window or near a light bulb)

Grades: Any age
Ability Level: Easy
Time: 20-30 minutes
Servings: One pitcher

Tools:

- Medium Saucepan
- Pitcher
- Paper
- Paint brush

Ingredients:

- 6 Lemons (1 Cup Lemon Juice)
- Sugar (1.5 cups)
- Water (8 cups)



The Science of sour

When you heat the sugar water mixture you are dissolving the sugar evenly in the water creating a solution. Solutions are combinations of two substances mixed evenly. After cooling the sugar water solution, you add lemon juice which contains a high concentration of hydrogen ions (H^+). High concentrations of H^+ result in acidic taste and a lower pH. As more and more H^+ are detected by your taste buds your brain understands a growing sourness.

Invisible investigation

Browning of your drawing occurs due to the chemical interaction between the Citric Acid (Lemon Juice) and fibrous median (paper). As the acid touches the paper it weakens the fibers. Allowing the carbon-based lemon juice to penetrate the paper. When this is introduced to a heat source it causes some of the carbon molecules to interact with oxygen. This causes oxidation in the carbon molecules which make the brown coloring also known as rust.



Tasty Questions

What questions do you have? Can you develop one for each of the categories below?

Noticing: _____?

Example: Do you notice any difference in the water and sugar solution before and after heating and cooling?

Comparing: _____?

Example: Compare the color of the invisible ink when using pure lemon juice!

Predicting: What will happen if you use pure lemon juice to draw?

_____?

Experimenting: Adding a small shaving of lemon peel will increase the overall lemon taste of a batch of lemonade. How could you design an experiment to test this hypothesis?



Share your experience! Scan the code on the left with your smart phone's camera to take a brief survey that will help us improve this recipe for families like yours!

https://kent.qualtrics.com/jfe/form/SV_401gFT0z9eogZox