



Fruit Juice Mystery

Challenge:

Can you discover which juice is a fake -made from food coloring, water, and sugar?



General Description:

Visitors work with several fruit juices and dilute acids and bases to discover which one is artificial.

Objectives:

To show how chemical reactions can be used to distinguish between chemicals that appear to be similar. To show chemical reactions as evidenced by color changes, and to have visitors develop experimental skills by evaluating results and drawing inferences from their observations.

Materials:

For 5 stations (1 child per station)

- 5 laminated reaction grids
- 5 plastic dropping bottles containing vinegar (5% acetic acid)
- 5 plastic dropping bottles containing washing soda solution
- 20 plastic dropping bottles with juices
- Grape, cranberry and blueberry juices
- Red and blue food color
- A container of clean water
- Paper towels for spills
- A safe container to dump solutions into and seal (waste container)



Activity Preparation (approx. 35 min.):

1. Mix up the 2 solutions in plastic bottles, as described below and label acid and base.

About 250 ml of each solution is needed for 5 stations. (NOTE: This amount will fill all the dropping bottles with the vinegar and the washing soda solution.) The solutions keep if the bottles are capped. Visitors will only need a few ml to do the experiment.

Acid = store bought white vinegar.

Base = 0.5 molar washing soda solution

(add 11.4 grams of sodium carbonate soda to 250 ml of water).

2. Each station should have:

- A plastic laminated grid
- A dropping bottle of vinegar
- A dropping bottle of washing soda solution
- 4 dropping bottles for solutions labeled A, B, C, D.
Each bottle should contain about 10–15 ml of the appropriate solution.
- A = grape juice concentrate
- B = cranberry juice concentrate
- C = blueberry juice (from canned blueberries)
- D = a mixture of enough blue and red food color in sugar water to get a deep purple color.



Directions:

Have visitors do the following:

1. Participant **must** wear a pair of safety goggles before beginning!
2. In the first row of the grid put one or two drops of each juice solution as indicated in first box of the first column.
3. In each box of column 2 add 1 or 2 drops of acidic solution.
4. In each well of column 3 add 1 or two drops basic solution.
5. Use the dropping bottle to add 1-2 drop of juice solution to the acidic and basic drops in its row.
Observe what happens.
6. Most fruit juices change color if they are put in acid or base. Most artificial colors do not. Which juice is a fake?

Clean Up (approx. 15 min):

- Sponge off the grid. Wipe up spills with paper towels.
- Clean goggles with window cleaner and white paper towels.
- Disinfect in goggle cabinet for full 15 minutes.



Safety Issues:

Participant must wear a pair of safety goggles before beginning!

Goggles must be sterilized before use.

While all of these solutions can go down the drain, they are irritating.

Clean any spills immediately, and wash thoroughly if a visitor gets it on their skin.

If solutions get in eyes, flush immediately with clean water.

Note: juice and food color will stain clothes.

Tips For Doing the Activity:

- Explain that the challenge is to find the fake juice.
- After they have tried the combinations, ask which fake juice is fake. If they do not know, ask them “What do three of the juices have in common?” Then ask which juice is fake again.
- Encourage the children to use only one or two drops. If they run together, the experiment won’t work.
- Remind them that we never taste experimental chemicals, even if it’s juice.

Background Information:

Basic explanation for young children:

The colored chemicals in many juices are sensitive to the amount of acid or base in a solution. As we add an acid or base, the color changes as the chemicals combine with the acid or base.

More in depth explanation for older children:

The colored chemicals in many fruits are weak acids or bases. They react with acid or base solutions by losing or gaining a hydrogen ion. The changes affect how the molecule absorbs light and changes the apparent color of the compound. Many acid/base indicators were originally derived from plants.

Credits and Disclaimer



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Disclaimer: Reasonable care has been taken in designing the Chemistry Challenge activities. These activities are intended for use with children and adults under direct supervision of qualified adults.

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Juice	Acid Solution	Base Solution	Color Change
A			
B			
C			
D			