

## Citrus Painting

### DESCRIPTION & OBJECTIVES:

The aqueous fraction of foods (especially fruits) has various levels of acidity, which can be measured by pH and affects food properties including taste, interaction with other foods, and storage stability. In this activity, we will use citrus juices and extracts as paints as we draw on a paper preloaded with a pH indicator.

### GRADE LEVELS:

Elementary School, Middle School

### NEXT GENERATION SCIENCE STANDARDS:

Disciplinary Core Idea: MS-PS1.B Chemical Reactions

Performance Expectations:

5-PS1-3. Make observations and measurements to identify materials based on their properties.

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred

Practices: Planning / carrying out investigations

Crosscutting Concepts: Cause and effect: Mechanism / explanation

### OUTCOMES:

To gain a general understanding of:

- The relationship between acidity and pH
- How pH can be inferred by a color change of pH indicator
- Whether citric fruits are acidic or alkaline.

### CONTACT:

Dr. Glen Li, Department of Food Science and Technology, Oregon State University

<https://foodsci.oregonstate.edu>

## Citrus Painting

### MATERIALS:

- Bromocresol green
- Methyl red
- Isopropanol (91% or higher)
- Filter paper (or paper towel)
- Papertowel (for cleaning paintbrush)
- Juices of citrus fruit
- Soap water (liquid dish soap diluted by 10 times in water)
- Common beverages (e.g. milk, soft drinks, ice tea)
- Plastics cups for holding citrus juices and rinsing water
- Wooden stir bar
- Paintbrushes

### DIRECTIONS:

#### Preparation of paper impregnated with pH indicators

**CAUTION:** Use PPE to avoid dyeing of hand or clothing, in well-ventilated area.

1. Prepare an indicator solution containing the following (**CAUTION:** operate with PPE in ventilated area):
  - a. 1 L of isopropanol
  - b. 0.04 g of bromocresol green
  - c. 0.01 g of methyl red
2. Dip filter paper (or paper towel) into the indicator solution till the entire paper is soaked.
3. Drain excessive indicator solution. If paper towel is used, squeeze gently.
4. Let impregnated paper dry in a well-ventilated area. The paper should have a blue tint once dry.

#### Drawing with citric fruit juices and soap water

5. Dip paintbrush in citrus juice, and paint on paper that has been impregnated with indicator dye.
6. Rinse paintbrush in water, and rub dry with papertowel
7. If applicable, repeat step 5 with a different fruit juice.
8. Paint some soap water on your drawing.

### HELPFUL HINTS:

- pH indicator dyes can be flammable – appropriate handling and storage is required.
- Consult the MSDS sheets regarding safe handling of indicator dyes.
- For cleaning of dye stains, use warm soap water.

### EXPECTED RESULTS:

- Acidic juices will confer red or yellow color to the indicator-impregnated paper
- Color is an indication of acidity, with red corresponding strong acidity, and yellow/green for low acid
- Dish soap is alkaline.

## TEACHER'S NOTES

### EXPERIMENT QUESTIONS

#### Basic Level

Which foods/juices are acidic?

Teacher's notes: Coke and lemon juice has pH between 2 and 3. Orange juice has pH from 3-4. Yogurt has pH from 4-5. Milk has a pH close to neutral (7.0).

#### Medium Level

Why does soap water reverse color changes induced by juices?

Teacher's notes: Soap contains alkaline surfactants (e.g. sodium salts of fatty acids) and bases (e.g. lye) that neutralizes food acids.

# Citrus Painting

## STUDENT DIRECTIONS

### MATERIALS:

- Filter paper (or paper towel) impregnated with dye
- Papertowel (for cleaning paintbrush)
- Juices of citrus fruit
- Soap water (liquid dish soap diluted by 10 times in water)
- Common beverages (e.g. milk, soft drinks, ice tea)
- Plastics cups for holding citrus juices and rinsing water
- Wooden stir bar
- Paintbrushes
- cover textbook, paperboard milk carton filled with water)

### DIRECTIONS:

#### Preparation of flour/starch playdough

#### Drawing with citric fruit juices and soap water

1. Dip paintbrush in citrus juice, and paint on paper that has been impregnated with indicator dye.
2. Rinse paintbrush in water, and rub dry with papertowel
3. If applicable, repeat step 5 with a different fruit juice.
4. Paint some soap water on your drawing.

### HELPFUL HINTS:

- Mix juices together to discover more variability in colors
- Soap water may destroy your drawing!