

LET'S DO CHEMISTRY

Nature of Dye Facilitator Guide

ACTIVITY LEARNING GOALS

Learners will develop positive attitudes toward learning about chemistry:

- Learners will increase their feelings of **interest** in chemistry through hands-on exploration and observations of phenomena.
- Learners will increase their understanding of the **relevance** of chemistry by exploring the applications and uses of chemistry and connections to everyday life.
- Learners will increase their sense of **self-efficacy** related to chemistry through hands-on interaction with real tools and materials.

Learners will explore chemistry concepts, tools, and practices:

- Chemists use tools to discover and make new things.
- People shape the development and use of new materials and technologies.

FACILITATION STRATEGIES

Try to encourage **interest** and **self-efficacy** through hands-on interaction with the scientific tools and materials. Ask participants to predict, observe, and share what they notice as they experiment with the dye. What was their favorite color to mix?

You can help make connections (**relevance**) by asking questions and listening to visitor responses. Ask participants to predict, observe, and share what they notice as they experiment with the dye. Discuss with visitors what they know about dye in everyday objects, materials, and foods, and what they think about labeling materials or ingredients so the public can learn more about where the color comes from. Ask if the colors they made today look similar to any colors they might be wearing.

MATERIALS

- Cochineal bugs (dried)
- Soda ash (*sodium carbonate*) solution
- Vinegar solution
- Water
- pH strips
- Paper towels
- Mini mortar and pestle

- Tri-sectioned petri dish
- 1-milliliter pipette
- 6 dropper bottles
- Waste bucket
- Rinse beaker
- Product and dye cards
- ¼-inch x 3-inch strips of uncoated watercolor paper (bookmarks)
- Marker and labels
- Safety data sheets

ADVANCE PREPARATION

Make the 50% vinegar solution by combining equal amounts of water and vinegar. Make the sodium carbonate solution by combining about 1 cup of soda ash with one gallon of water. Warm water works well to dissolve the soda ash, but is not required. While tap water works fine, it tends to be slightly basic, so if available use deionized water to maintain an accurate pH of the sodium carbonate solution. To just make enough to fill a dropper bottle, add about half a teaspoon of soda ash to the bottle and fill with water. Shake to combine and dissolve.

It's useful to make up a larger quantity of both solutions in separate containers so you have enough to last the entirety of the activity. Fill and label all the dropper bottles.

Fill the other two dropper bottles with water, label them, and set up the mat station with the corresponding materials (mortar and pestle, transfer pipette, and petri dish).

SAFETY

Always follow and model prudent practices when doing chemistry activities.

Think about:

- What **hazards** exist and what associated risks may arise from these hazards?
- How to **minimize** risks through protocols we have designed into the activities and training materials.
- How **safe practices and protocols** should best be communicated with facilitators, participants, and others.

Label all containers with their correct chemical names and concentrations. Both solutions are mild skin irritants. Cochineal can temporarily stain hands and clothing. Participants and facilitators should wash their hands after doing this activity.

Your institution may have special rules or protocols for chemistry related activities, so check with your facilities staff, safety committee, and/or others. Learn more about safe practices in the *Let's Do Chemistry: Safety Guide* included in the physical kit and with the online digital kit resources.

CLEANUP

Rinse all the tools with warm soapy water after doing the activity to avoid staining materials with the cochineal dye, and pat dry. You can dump the rinse container down a regular sink or drain.

FACILITATION NOTES

To reset the activity between groups, rinse and quickly dry the petri dishes, pipettes, mortars, and pestles for each station.

Encourage participants to explore and flip over the “What makes me red/orange/pink?” dye and product cards. Do they use these products or recognize them? Ask older participants to think about the term “natural.” It’s important to note that there is actually no regulatory definition for the word natural. Ask visitors what they think it means. Does it mean something is more or less safe or good? How would they classify each of the dye examples in the cards?

When using the cards to encourage conversation, try to remember that there aren’t right or wrong answers about the values people consider when choosing to use or purchase products. Listen to each other and share your own opinions and values, too.

When making their dye, encourage participants to only add one small squirt of vinegar or soda ash solution. This helps keep the colors more vibrant.

An activity training video is available at vimeo.com/channels/nisenet.

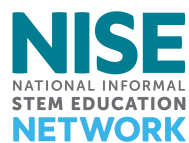
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Image of collecting cochineal insects for dye licensed under Creative Commons Attribution-Share Alike 3.0 Unported and retrieved from

https://en.wikipedia.org/wiki/Cochineal#/media/File:Cochinel_Zapotec_nests.jpg.



This activity was developed by the Museum of Science, Boston, and adapted by Sciencenter for the NISE Network. Copyright 2018, Sciencenter, Ithaca, NY.

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