

LET'S DO CHEMISTRY

Sublimation Bubbles 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 observation of chemistry concepts and phenomena.
- Learners will increase their sense of **self-efficacy** related to chemistry through hands-on interaction with exciting materials, and by successfully understanding how to do the activity.

Learners will explore chemistry concepts, tools, and practices:

- Chemistry can help us understand our world and learn about how materials behave and change.
- Chemists use tools to discover and make new things.

FACILITATION STRATEGIES

Encourage **interest** and **self-efficacy** through hands-on interaction and observation of real phenomena. Ask participants questions about what they notice happening, and what they think will happen. For example, they can pick the bottles up and look into them to observe more closely. Ask participants to describe what they notice about the dry ice bubbles compared to regular bubbles. Try blowing a few regular bubbles for comparison. *Hint:* These dry ice bubbles are heavy; they have fog in them; they're stronger.

MATERIALS

- Hot/cold insulated bag to store dry ice
- Dry ice pellets
- Pitcher of warm water
- Bubble solution (dish soap, glycerin, water)
- Tablespoon
- Tongs
- Heavy-duty gloves (to handle dry ice)
- 2 8-ounce carafe-shaped containers
- 3 trays (2 for carafes, 1 for bubble solution)
- Felt strips for bubble solution
- Rinse container
- Microfiber cloths (or paper towels)
- Splash safety goggles + cleaners
- Marker and labels

ADVANCE PREPARATION

Pick up the dry ice the same day you're doing the activity and store it in the hot/cold insulated bag or a Styrofoam cooler. Many local markets or ice cream shops use dry ice and will donate or sell the material. Call ahead. Generally, 10 pounds of pellets is sufficient to last several hours if obtained the day of the event. However, event conditions (heat/high humidity/number of visitors you'll serve, etc.) can impact this so you may want to obtain more or less dry ice.

If you're not able to get the dry ice in pellet form, you can crush up a larger block of dry ice. Take safety precautions! Wear protective splash goggles and gloves.

Make the bubble solution. Bubble solution should be approximately 1 cup of water mixed with 2 tablespoons of dish soap and 1 tablespoon of glycerin. For best results, the bubble solution should be prepared a day early and left out at room temperature. You can scale this recipe up to serve more visitors.

Label the hot/ cold bag, or any other container you use to store the dry ice, and the bubble solution container appropriately with the markers and labels.

Fill the pitcher with warm water. You may need to occasionally refill the pitcher or replace the water as it cools to room temperature. For each visitor group, preset the activity with the two carafe containers filled about half way with warm water and drop one piece of dry ice into the water as prompted.

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.

Refer to the *Protocols and Safe Practices for Storing, Transporting, and using Dry Ice* safety sheet included in the kit for additional information. Remember, do not let visitors touch the dry ice. Its temperature is -110° F and it will freeze skin instantly. The risk of frostbite is real and must be taken seriously. Before beginning the activity, remind visitors that the dry ice is very, very cold and should not be touched. You can even ask them to “promise to not ever touch the ice.” Hold them to it!

All facilitators and participants must **wear safety goggles** during this activity. The kit includes two different sizes of safety goggles (adult and child). Fit the appropriate size goggles to each participant. For very small children, you may need to use a binder clip to make the headband fit more snugly. Fold the band over itself and secure it in place. Modeling good safety practices is an important learning goal for chemistry activities. Educators, staff, and volunteers should also always use safe practices when handling dry ice. In addition to personal eye protection, use **tongs and/or heavy cold-protective gloves** when touching or moving the dry ice.

In this activity we have included small containers (mini-carafes) with a pinched neck and an open top. This is actually a safety measure. The container shape prevents small hands from touching the ice submerged in water. The open top prevents the container from being sealed shut. There have been examples of people accidentally creating dangerous explosions by sealing dry ice and water in a plastic water bottle with a cap.

Be aware of spills with this activity. Spilled bubble solution can result in a slippery floor! Mop up or use a floor covering to absorb any spills.

Your institution may have special rules or protocols for chemistry related activities, and activities involving dry ice in particular, 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.

FACILITATION NOTES

This activity makes a great connection to the **2018 National Chemistry Week theme: Chemistry is Out of This World!** If participants are interested, encourage them to explore the information sheet about the discovery of dry ice on Mars.

You may need to swap the water in the bottles with fresh warm water every couple of visitor groups so that the water never gets too cold. You can dump the cold water and then refill with warmer water. Cold water will not make effective fog.

It's ok if some of the bubble solution mixes with the water in the containers, but you will notice more bubble activity and the container may fill up with soap bubbles. You can always dump the mixture and rinse and fill the container with fresh water.

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

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This is a common activity that exists in many variations. The Let's Do Chemistry version of the activity was adapted from the Mushroom Cloud by Chem Demo at James Madison University and Dry Ice Crystal Ball by Steve Spangler by the Science Museum of Minnesota, and further adapted by Sciencenter for the NISE Network. Copyright 2018, Sciencenter, Ithaca, NY. Published under a Creative Commons Attribution-Noncommercial-ShareAlike license: <http://creativecommons.org/licenses/by-nc-sa/3.0/us/>



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