

LET'S DO CHEMISTRY

Rocket Reactions Facilitator Guide

ACTIVITY LEARNING GOALS

Learners will develop positive attitudes toward chemistry:

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

Learners will explore chemistry concepts, tools, and practices:

- An important part of the process of chemistry is to experiment and try different things over and over.
- Chemists study how different materials behave and change, and how materials interact with each other.

FACILITATION STRATEGIES

Encourage **interest**, **relevance**, and **self-efficacy** by asking participants to experiment with different ratios or proportions and observe the varying results. Ask participants to share what they notice and what they observe happening. Discuss the materials used in the rocket fuel and where participants may have seen them in their everyday lives.

MATERIALS

- Rocket tubes and caps
- 4 $\frac{1}{4}$ teaspoons (2 for citric acid, 2 for baking soda)
- 4 100-milliliter beakers (2 for citric acid, 2 for baking soda)
- 2 250-milliliter beakers (for water)
- Citric acid
- Baking soda
- Water
- 4 pipettes (for water)
- Rinse container filled with water
- Microfiber cloths (or paper towels)
- Splash safety goggles + cleaners
- Marker and labels

ADVANCE PREPARATION

Choose an appropriate location at your institution for this activity. The rockets launch about 3 to 15 feet into the air. **Avoid** low ceilings, sensitive sprinkler systems, or anything hanging from nearby walls or ceilings. If possible, give this activity some space and set it up about ten feet away from other activities or busy areas. You may also choose to lay down a drop cloth or ground cover, or choose a location that can be easily mopped or vacuumed.

Place the citric acid and baking soda and corresponding teaspoons in the 100-milliliter beakers. Fill the beakers about half way with the dry reagents. Label all tools and containers.

Fill the 250-milliliter beakers with water and place two pipettes into each beaker. Label all tools and containers.

Fill and label the rinse container. You may want an additional pitcher of water or a sink nearby to refill the water beakers with clean water over the course of the activity.

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.

All facilitators and participants must **wear safety goggles** during this activity. While baking soda and citric acid are commonly handled household materials, these substances and the products of the chemical reaction can splash into someone's eye and the caps can move quickly through the air. Modeling good safety practices is an important learning goal for chemistry activities.

The kit includes two different sizes of safety goggles (adult and child). Fit the appropriate size goggle 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.

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 any dirty tubes and caps and dump out extra water. Empty the extra citric acid and baking soda into their respective bulk containers if they are dry and you are certain there has been no cross-contamination. Otherwise you can dispose of the material in the trash.

If the rockets have splashed onto the floor around your location, you can mop up the area or wait for the materials to dry and then sweep or vacuum.

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 how real rockets are fueled and launched. (Remember: they use some pretty different materials than we used in this activity!)

It is important to wait three seconds before putting the cap on the tube once the reaction starts or the rocket may not launch. Try having participants count aloud or count backwards to make a launch countdown.

To reset the activity between visitor groups, rinse out the tubes and caps, and quickly wipe down the table. Place all the tools back into the correct beakers for the next group.

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

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