



Rainbow Fire

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Experimental Procedure

Safety Note: This experiment requires adult supervision. Do not breathe in dust from the chemicals, and wear gloves when handling them to prevent contact with skin. Also, avoid breathing combustion fumes produced during this experiment.

The results will be most clear in the dark. We suggest performing this science experiment outside in the evening on a nonflammable surface like brick, concrete, cement, or other driveway surface. Make sure that there are no flammable materials nearby. Be prepared for an emergency with a container of water. A fire extinguisher would also be a great alternative.

Preparing the Chemical Skewers

Follow the step-by-step instructions below to see how to prepare the chemical skewers. The process is also illustrated in the following video and slideshow:

https://www.youtube.com/watch?v=O_u_jYB_abY (https://www.youtube.com/watch?v=O_u_jYB_abY)

Slideshow with step-by-step instructions viewable online.

1. Do your background research so that you are knowledgeable about the terms, concepts, and questions in the [Background](#) (#background) section.
2. Have an adult present when you do the experiment, and follow all of the safety precautions mentioned at the beginning of the Procedure.
3. Several hours before sunset (a day or more is also fine), prepare the bamboo skewers.
4. Fold a piece of masking tape around the blunt end of each skewer to make labels (a total of 12 skewers) and write the name of a chemical on each skewer's label. You should label three skewers for each chemical.
5. Apply a thin layer of glue to the last 2–3 centimeters (cm) of the tip of a skewer. You can squeeze the glue directly from the glue bottle onto the skewer.
6. While wearing the chemical goggles and disposable gloves, dip the glue-coated tip end of the skewer in the jar of chemical. Twist the skewer back and forth a bit to evenly coat the skewer with the chemical. Set it on a piece of scrap paper to dry. **Important:** Be sure to keep the scrap paper away from all children and pets as the skewers dry.
 - a. Make sure the name of the chemical on the skewer label is a match for the chemical you are using.
 - b. If you are not using the Science Buddies Kit, you may need to put your chemicals into vials or small baggies to do this step. The Science Buddies Kit chemical jars are just the right size to coat the skewer in.
7. Repeat steps 5 and 6 until you have made three skewers for each of the chemicals.
8. Let the skewers dry for at least 2 hours before performing the flame tests.

Conducting the Flame Tests

Follow the step-by-step instructions below and click through the [slideshow](#) (#slideshow-flame-test) to see how to conduct the flame tests.

[Slideshow with step-by-step instructions viewable online.](#)

1. The flame test should be conducted outside, in the dark (or at twilight). Adult supervision is needed.
2. Find a hard, nonflammable surface outside for the flame test. A driveway, sidewalk, or brick/concrete/cement patio are all examples of a good testing surface.
3. Bring the dried chemical skewers (make sure they have dried for at least 2 hours first) and all other materials outside. You may find it easiest to use a flashlight or other outdoor light while you are getting set up. When you are done

setting up and you are ready to test the skewers, make sure to turn off the light(s).

4. Place a solid fuel tablet on a square of aluminum foil on your nonflammable surface.
5. As a safety precaution, make sure to have a container of water with you. A fire extinguisher would be a great alternative. If you are using a video camera, start recording.
6. Have an adult use a match to light the solid fuel tablet. You may find that laying the lighted match on the foil next to the tablet is the easiest way to get the tablet to start burning. Note the color of the flame in your lab notebook. If you are using a digital camera to document your experiment, take a picture of the burning tablet.
7. Once the solid fuel tablet is burning, carefully take a skewer and hold the chemical-coated end in the flame. Be sure not to breathe the fumes or smoke from the burning skewer. Observe the flame color and record it in your lab notebook. Take a photo if you are using a digital camera for documentation.
 - a. *Tip:* You may be able to see the color in the tablet's flame, or by holding the skewer away from the flame (once the chemical has caught on fire) and looking at the flame on the chemical-coated end of the skewer.
 - b. The skewer may also catch fire after a few moments. Simply remove it from the flame and blow it out like a birthday candle. You can also extinguish the skewer in the container of water.
8. Repeat step 7 for all 12 skewers (3 per chemical). Record all your observations in your lab notebook.
9. When you are done, either wait for the solid fuel tablet to burn itself out, or extinguish it by carefully putting a heat-resistant bowl over the tablet.
10. When you are sure everything has been extinguished, you can dispose of the aluminum foil, used chemical-coated skewers, and spent fuel tablet in the garbage.
11. What colors were produced as each chemical burned?
12. Sodium chloride (table salt) and strontium chloride both have chloride, but have a different metal (sodium versus strontium). Are the flame colors produced by these two compounds similar or different? What does this tell you about the source of the color?