Demo: The Jumping Flame

FOR THE TEACHER

Summary
In this demonstration, students will observe that the vapor of an extinguished candle flame is ignitable.

Grade Level
Elementary and Middle School

Objectives
By the end of this demonstration, students should be able to
- Identify changes in states of matter.
- Recognize that fuel is flammable as a gas.

Chemistry Topics
This demonstration supports students’ understanding of
- Chemical Reactions
- Chemical Change
- States of Matter
- Phase Changes

Time
Teacher Preparation: minimal
Lesson: 5-10 minutes

Materials
- Candle
- Candle Holder
- Lighter or matches

Safety
- Students should wear proper safety gear during chemistry demonstrations. Safety goggles and lab apron are required.
- Always use caution around open flames. Keep flames away from flammable substances.
- Always be aware of an open flame. Do not reach over it, tie back hair, and secure loose clothing.
- Open flames can cause burns. Liquid wax is hot and can burn the skin.
- An operational fire extinguisher should be in the classroom.

Teacher Notes
- This is a very engaging demonstration! You may want to do this multiple times for your students.
- It is important to practice this with the actual candle you will use. It seems that tall candles work better than a tea light. The type of wax may impact it as well. If you practice it beforehand you will know for certain.
• There are two videos included to help as you prepare for this demonstration.
• You may want to consider showing the slow-motion video to your students afterwards so they can see specifically what happens in the demonstration.
• Procedure:
  1. Place the candle in the candle holder.
  2. Light the candle and allow it to burn for ~10 seconds before proceeding.
  3. Blow out the candle, and allow the smoke to begin moving away from the wick.
  4. Place the flame of the lighter into the path of the smoke, 2-3 inches from the wick.
  5. The flame will ignite the wax vapors in the smoke, and the flame will appear to jump back to the wick and it will continue burning!
• This is a good opportunity to discuss topics such as:
  o Combustion reactions
  o Chemical Changes
  o Changes in states of matter, such as vaporization
• Why does it work? A candle burns because the heat from the flame vaporizes the candle wax, and burns that wax vapor at its wick. When you blow out the flame, the hot wax that was burning at the end of the wick will not burn completely, but will still vaporize, and a small amount will be in the smoke that you can see when the flame is blown out. The vapor wax is still flammable, and as long as there is enough of it present in the smoke, it will ignite when contacted by the new flame. The flame will burn the vapor wax as it moves back to the wick where it will continue to burn steadily.