A Burning Candle

"Lessons in Observation" Demonstration

Introduction

Careful observation is the foundation of chemistry as an experimental science. Observations—which may be qualitative or quantitative—should be both descriptive and reproducible. Would you believe it's possible to come up with more than 100 different observations of a burning candle? Let's find out!

Concepts

- Observation
- Scientific method

Materials

Candle

Matches

Safety Precautions

Do not allow flammable materials near the open flame. Burn the candle on a fire-resistant surface. Wear chemical splash goggles.

Procedure

1. "The candle is white and translucent." "The candle is made of paraffin wax." Use this comparison or a similar one to explain the difference between an observation and an interpretation (also called an inference). Explain that this activity is an exercise in observation, not interpretation.
2. Place a large candle on a lab bench or a ceramic fiber square. Make sure the candle is stable and will not easily tip over. If necessary, secure it in a mound of clay.
3. Ask students to write down their observations of the unlit candle. Allow students to get close to the candle and to touch or handle it to make their observations.
4. After a few minutes, ask for a show of hands to see how many students have at least 10 observations. Challenge students to use all their senses—with the exception of taste—as the demonstration continues.
5. Light the candle with a match.
6. Allow students at least 5 minutes to record their observations of the burning candle. When it seems that students are getting restless or bored, perform a simple action to stimulate more observations. Lightly blow on the candle, tip the candle slightly, hold a piece of paper near the flame, etc.
7. Extinguish the candle.
8. Allow students to continue making observations as the candle cools.
9. Ask students to share one observation each with the class. Count how many different observations can be made about a "simple" burning candle.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. The candle may be saved for future use or placed in the trash according to Flinn Suggested Disposal Method #26a.

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Tips

- Remind students to make observations using all of their senses (except taste!) and to state observations in quantitative terms whenever possible. Do not make assumptions about the relative importance of an observation. There are no obvious or trivial observations—all observations should be recorded. To avoid distraction, limit conversation, if possible, during the observation period itself.
- Observations of the unlit candle include its construction and physical properties (physical state, size, shape, odor, color). Observations of the burning candle include the properties of the flame, the wick, and the candle (color, size, smoke, sound, brightness, temperature). A current writeup and list of more than 100 observations can be found in *Flinn ChemTopic™ Labs*, *Vol. 1*, *Introduction to Chemistry*.
- Be careful about including interpretations or inferences. Statements such as "the wax is melting" or "the wax is burning" cannot be made without assuming or knowing that the candle is made out of wax.
- Use the discussion period to highlight the fact that no one student working alone would have come up with all the different observations that the class as a whole did. In the real world, science is almost always a team effort—a team of scientists with diverse backgrounds working together will always accomplish more than the same number of people working individually. Each person is unique and makes unique contributions to the team effort.
- This demonstration can be converted into a hands-on activity by giving each lab group a candle and instructing groups to develop and then compare their observations.
- As an extension of this activity, invite students to ask questions that can be used to form hypotheses and to test what happens when the candle burns. What is burning, the wax or the wick? Does the flame always burn straight up? Where is the hottest part of the flame?

NGSS Alignment

This laboratory activity relates to the following Next Generation Science Standards (2013):

Disciplinary Core Ideas: Middle School
MS-PS1 Matter and Its Interactions
PS1.A: Structure and Properties of Matter
PS1.B: Chemical Reactions
MS-PS3 Energy
PS3.A: Definitions of Energy
PS3.B: Conservation of Energy and Energy Transfer

Disciplinary Core Ideas: High School
MS-PS1 Matter and Its Interactions
PS1.B: Chemical Reactions
PS1.B: Chemical Reactions
MS-PS1 Matter and Its Interactions
PS3.A: Definitions of Energy
PS3.B: Conservation of Energy and Energy Transfer

Science and Engineering Practices
Planning and carrying out investigations
Analyzing and interpreting data

Connections to Nature of Science
Science is a way of knowing
Scientific investigations use a variety of methods

Crosscutting Concepts
Cause and effect
Energy and matter
Stability and change

References

Flinn ChemTopic™ Labs, *Vol. 1*, *Introduction to Chemistry;* Cesa, I., Ed.; Flinn Scientific, Inc. Batavia, IL, 2002.

G. R. Gross, B. Bilash III, J. K. Koob *A Demo A Day™: A Year of Chemical Demonstrations;* Flinn Scientific: Batavia, IL, 1995.

Materials for *A Burning Candle—"Lessons in Observation" Demonstration* is available from Flinn Scientific, Inc.

Catalog No.	Description
AP6253	Flinn ChemTopic™ Labs, Vol. 1, Introduction to Chemistry
C0192	Plumber's Candles, Pkg/4

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.