

States Of Matter

Materials: candles, lighter (the clicker kind), blank sheet of copy paper (1 per student)

Introduction: 2 optional candle demonstrations

1. Light a candle and let it burn a little while. Blow out the candle with the lighter already lit. Relight the candle by lighting the end of the smoke trail given off by the candle. The smoke trail is a flammable gas (wax). The flame travels through it and back to the wick.
2. Get a straw and blow to one side of the flame. Observe the flame leans into the flame. Try blowing on the other side. This is Bernoulli's principle- faster moving air has lower pressure, so the other air (with higher pressure) is what pushes the flame.

Activity

1. Give students a blank sheet of copy paper and have the lines shown (one across that's halfway down, and another perpendicular down to it from the top).
2. In this activity students are going to take 10 minutes and simply observe a burning candle.
3. In the upper-left corner of the paper they will draw the flame in as much detail as they can. This gets them to observe it *closely*.
4. In the upper-right box they will write observations about the candle that they notice as they are drawing. They can be obvious or very subtle. If your students are poor listeners have them write the words "Drawing" and "Observation" in those top 2 boxes.
5. Decide the best way for students to be safely near a candle to observe it. Best case- have enough around the room that every student is within a few feet of one. This close they can see the detail. If you trust no one, have one big candle in the middle of the room that everyone looks at.

Be aware of where all fire safety equipment in your room is and how it works. If needed, get permission from your principal to burn candles. Warn students that any misbehavior will cause their candles to be blown out.

6. Turn off all lights in the classroom, and give students 10 minutes to observe, draw, and record observations. Explain how important it is to draw slowly and study the shape and movement of the flame closely. Encourage them to "get lost" in studying the flame because they are studying it so closely. To get their right-brain (the spatial, perceptive, and artistic side) even more activated, you might encourage them to think not of it as a candle, but as a series of lines, contours, and shapes.

7. After the 10 minutes are up, go around the room and have each student share one observation. They can repeat one already said.
8. Since this is really a lesson on the states of matter, whenever you hear a comment about wax melting or re-hardening, spend a little time on that comment. What might have caused that? Is it still the same after it re-hardened? Was it wax the whole time? If so, why might it have looked and acted different as a solid and liquid?
9. Have students add the segments shown in red to their papers.
10. In the long box below the drawing and observation, have students write these notes (along with any others you feel are important):
 - Nothing changed chemically
 - Energy causes change

These 2 points are crucial to understanding what's happening when things change between states.

11. For homework, in the 3 boxes at the bottom find in your chapter a drawing of what the atoms in a solid, liquid, and gas look like. Have students draw each along with any captions. The atoms in a solid are packed in tight and are rigidly stuck in the shape of a cube. Liquid atoms are still close together, but can move. Atoms in a gas are very spread apart and suspended in the air due to collisions with other atoms.

If you liked this lesson, there is an extended version of it you can purchase at <http://www.interactivescienceteacher.com/journey.asp> .