

## States Of Matter

Lessons don't come much easier than this- students observe a burning candle and write observations. Then let their own comments and observations lead them into what a solid and liquid is, and how they might change from one into the other.

This lesson is very similar to another called "Candlelight Journey". Read both, then take and use what you like best.



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

### Introduction- 2 candle demonstrations (optional)

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 leaning 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.

### Getting Ready

1. Give students a blank sheet of copy paper and have them draw the lines shown- one across that's halfway down, and another perpendicular down to it from the top.
  - In the upper-left corner of the paper they will **draw** the candle flame in as much detail as they can. This gets them to observe it *closely*.
  - In the upper-right box they will write **observations** about the candle they notice as they are drawing. They can be obvious or subtle. If your students are poor listeners have them write the words "Drawing" and "Observation" inside those top 2 boxes as reminders.

Drawing	Observation

2. Decide the best way for students to be safely near a candle to observe it. Best case- have enough candles around the room that every student is within a few feet of one. From 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.*

### Activity

3. Turn off all lights in the classroom, and give students 10 minutes to draw and record observations on the paper they set up. Explain how important it is to draw slowly and study the shape and movement of the flame closely. Encourage them to “get lost” studying the flame. 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.

4. After the 10 minutes are up, call on each student to share one observation. They can repeat one already said.

5. 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?

6. Have students add the segments shown in red to their papers. (This is available as a Student Handout- see last page.)

7. In the long box below the drawings and observations 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.

8. 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 and include any captions from the book. 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.

<b>Drawing</b>	<b>Observation</b>	
<b>•Nothing changed chemically</b> <b>•Energy causes change</b>		

<b>Drawing</b>	<b>Observation</b>	
<b>•Nothing changed chemically</b> <b>•Energy causes change</b>		
<b>Solid</b> <i>(drawing)</i>	<b>Liquid</b> <i>(drawing)</i>	<b>Gas</b> <i>(drawing)</i>

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### Student Handout

Drawing		Observations	
<ul style="list-style-type: none"><li>•</li><li>•</li></ul>			
Solid	Liquid	Gas	