

## Candle in Jar

### Georgia Standards of Excellence

#### **S3P1. Obtain, evaluate, and communicate information about the ways heat energy is transferred and measured.**

a. Ask questions to identify sources of heat energy. (Clarification statement: Examples could include sunlight, friction, and burning.)

#### **S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.**

f. Construct an explanation based on evidence to describe conservation of matter in a chemical reaction including the resulting differences between products and reactants. (Clarification statement: Evidence could include models such as balanced

#### **Objective:**

Students will observe how heat expands gas and cooling causes gas contraction.

#### **Discussion:**

Candles make light by making heat, so they're crude examples of what we call incandescent lamps (old-fashioned, electric filament lamps, pioneered in the late 19th century by Thomas Edison, are a much more sophisticated version of the same idea).

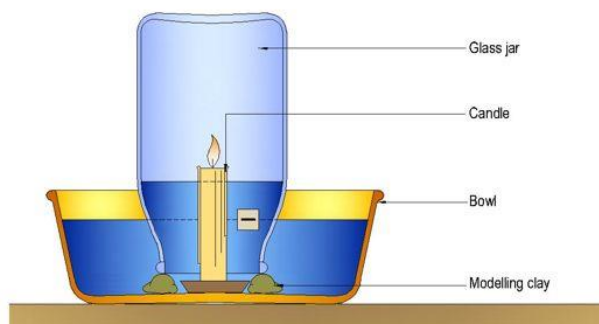
All the light a candle makes comes from a chemical reaction known as combustion in which the wax (made from carbon-based chemicals typically derived from petroleum) reacts with oxygen in the air to make a colorless gas called carbon dioxide. Water is also produced in the form of steam. Since the wax never burns perfectly cleanly, there's also a little smoke produced. The smoke is an aerosol (tiny particles of solid, unburned carbon from the wax mixed in with the steam) and it often leaves a black, carbon deposit on nearby walls or the ceiling above where the candle's burning.

The steam is made in the blue part of a candle flame, where the wax burns cleanly with lots of oxygen; the smoke is made in the bright, yellow part of the flame, where there isn't enough oxygen for perfect combustion to take place.

Candles don't burn all by themselves. It takes energy to kick-start the chemical combustion reaction that makes the wax burn. The initial energy you need to start a chemical reaction is called activation energy. You can provide it using a burning match.

#### **Materials:**

- A saucer or pie pan
- Water,
- A clear glass jar
- Candle with matches.
- Optional food coloring



### Procedure:

1. Place a candle in the middle of a pie pan with an inch or so of water.
2. Carefully (with adult supervision) light the candle.
3. Place a jar over the candle in such a way that it is in the water.
4. Observe the flame of the candle and watch what happens to the level of the water.

### Explanation:

As you light the candle, the flame consumes oxygen and produces water vapor and carbon dioxide. When you put the jar over the candle the heat from the candle expands the air in the jar, you may see some bubbling under the jar.

The candle is extinguished and the temperature in the jar cools. As the gas cools, it contracts pulling the water higher in the jar.

You may have heard that the oxygen is consumed and that is why the water raises..... this is incorrect! Yes, oxygen is consumed but carbon dioxide and water vapor are produced in its stead (both are gases).

