Burning a Candle

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1. Introduction

This exercise was adapted from:
Jonathan Osbome, Sibel Erduran, Shirley Simon, *Ideas, Evidence & Argument in Science* (IDEAS), King's College London, 2004, pp.7-11, https://www.stem.org.uk/elibrary/collection/3308
https://www.stem.org.uk/resources/elibrary/resource/28125/ideas-resources

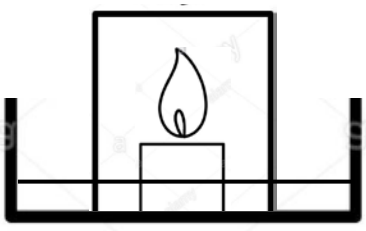
The aim of this exercise is to develop evidence-based argumentations about combustion. Section 2 presents the inquiry and Section 3 presents the corresponding argumentation developed with the sInvestigator system.

sInvestigator may be downloaded from http://lac.gmu.edu/sInvestigator/

The knowledge base containing the argumentations may be downloaded from http://lac.gmu.edu/sInvestigator/CaseStudies.html

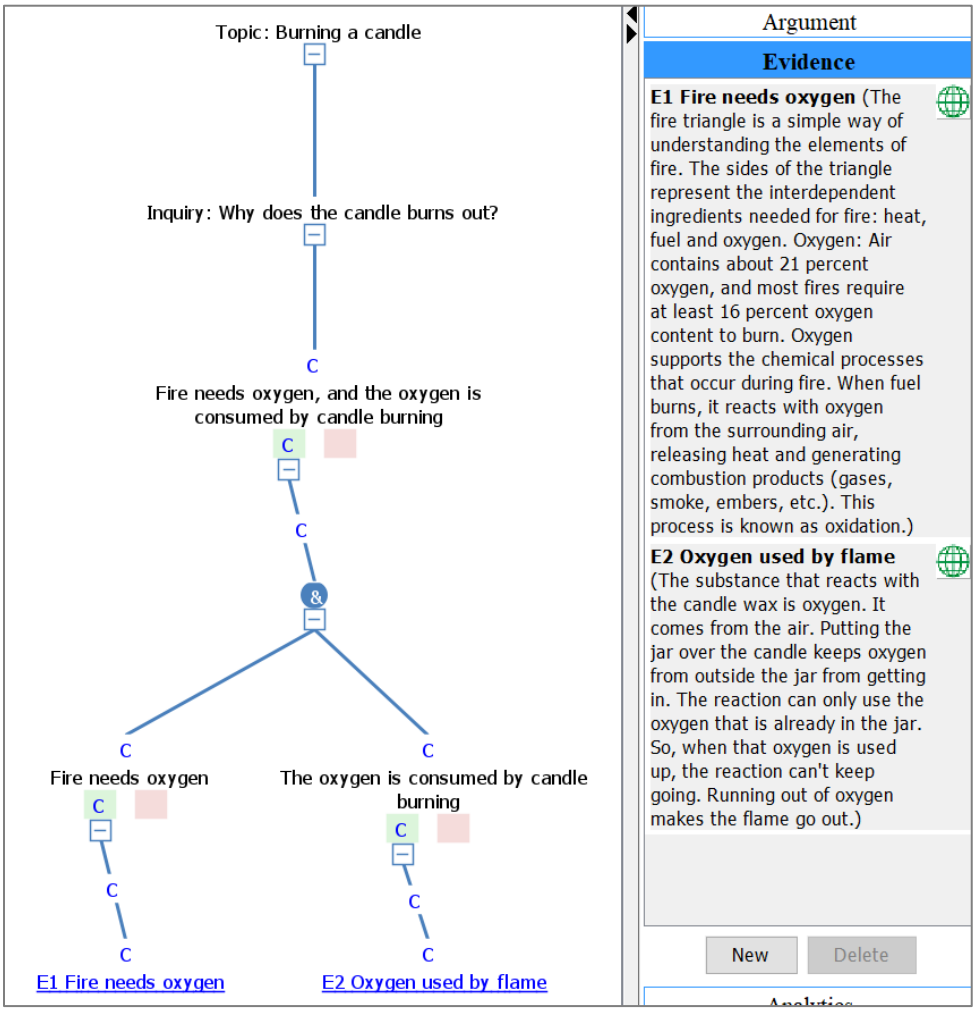
2. Inquiries

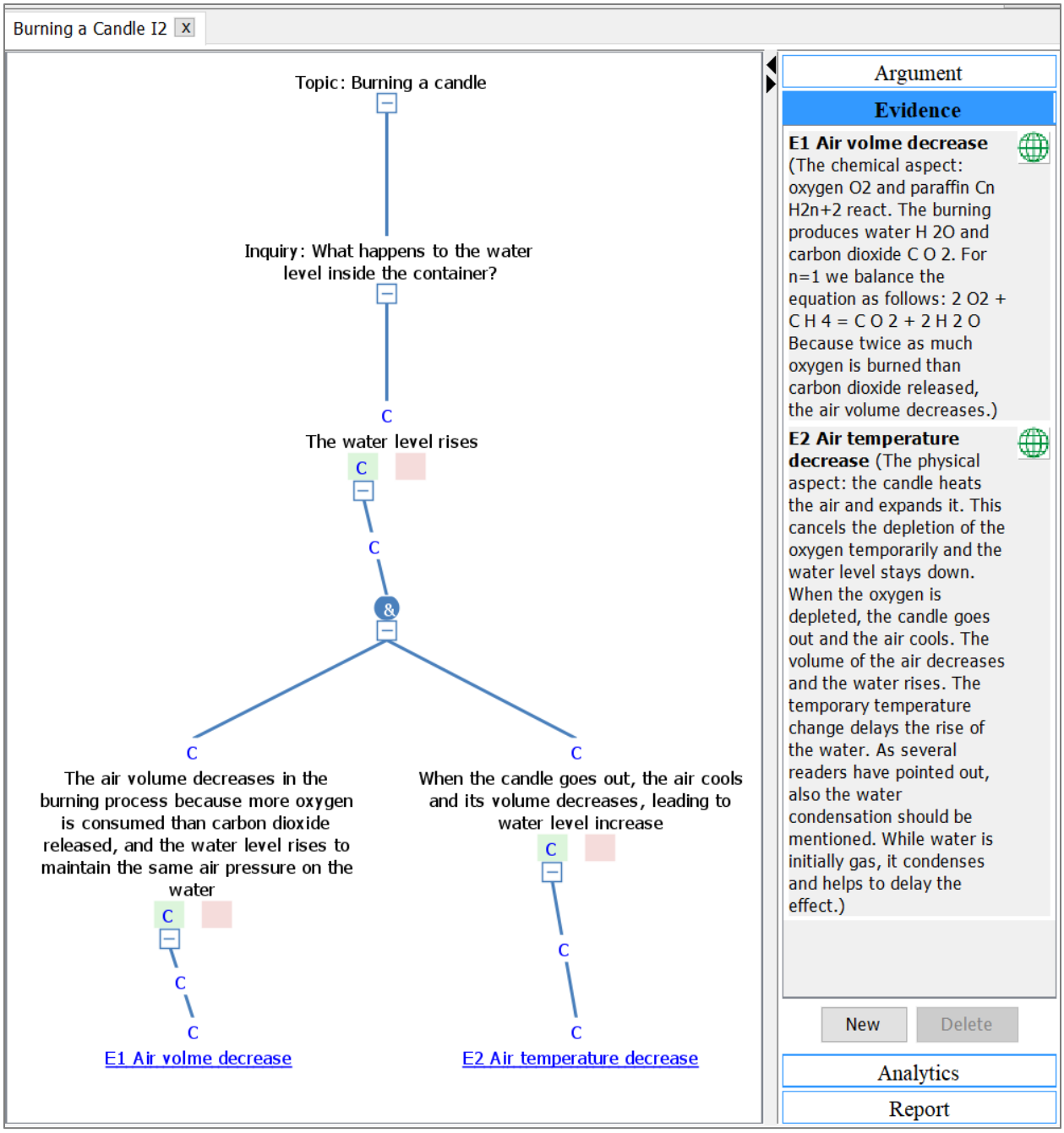
Develop an argumentation that explains why does the candle burn out when it is covered with a glass, as illustrated in the following figure**:**



Develop an argumentation that explains what happens to the water level inside the container.

3. Argumentations




Burning a Candle I2
Topic: Burning a candle
Inquiry: What happens to the water level inside the container?
C
The water level rises
C
C
&
C
The air volume decreases in the burning process because more oxygen is consumed than carbon dioxide released, and the water level rises to maintain the same air pressure on the water
C
C
C
E1 Air volme decrease
C
When the candle goes out, the air cools and its volume decreases, leading to water level increase
C
C
C
E2 Air temperature decrease
Argument
Evidence
E1 Air volme decrease (The chemical aspect: oxygen O2 and paraffin Cn H2n+2 react. The burning produces water H 2O and carbon dioxide C O 2. For n=1 we balance the equation as follows: 2 O2 + C H 4 = C O 2 + 2 H 2 O Because twice as much oxygen is burned than carbon dioxide released, the air volume decreases.)
E2 Air temperature decrease (The physical aspect: the candle heats the air and expands it. This cancels the depletion of the oxygen temporarily and the water level stays down. When the oxygen is depleted, the candle goes out and the air cools. The volume of the air decreases and the water rises. The temporary temperature change delays the rise of the water. As several readers have pointed out, also the water condensation should be mentioned. While water is initially gas, it condenses and helps to delay the effect.)
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