



Seeing Is Believing!



Topic: Ideal gases, Charles's Law

Courses: General Chemistry, Physical Chemistry

Text References: Enter references to parts of text(s) that logically go with this experiment (e.g., McMurray Fay 10.1, OFB 8.7, etc.). Source: http://genchem.chem.wisc.edu/demonstrations/Gen_Chem_Pages/05gasespage/gases.htm

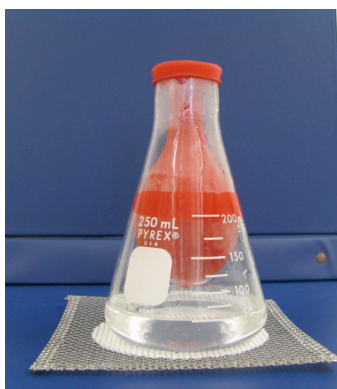
Setup: Preparation time is < 5 minutes.

- Balloon
- 50 mL Water
- 250 mL Erlenmeyer flask
- Hot plate
- Heat-proof gloves
- Wire gauze

Procedure: Demonstration time is about 15 minutes; submerging the flask in a large beaker of cool water will accelerate the cooling process.

1. Stretch the balloon by inflating and deflating it several times.
2. Add water to the flask.
3. Heat the water to boiling using the hot plate.
4. Remove the flask from the heat using protective gloves, and place it on the wire gauze.
5. Cover the top of the flask with the (deflated) balloon.
6. Let the flask cool to room temperature. Observe.

Observation: The balloon gets “sucked” into the flask as the water vapor cools back to room temperature.



Explanation: As the water vapor inside the flask cools, the volume that it occupies decreases. This behavior is in accord with Charles's Law: The volume of a fixed amount of gas at constant pressure is directly proportional to the Kelvin (absolute) temperature. In mathematical terms: $V \propto T$. Note that the pressure and number of molecules inside the flask remain constant throughout the cooling process.