

Expansion of Water into Steam

Video Link: <http://www.youtube.com/watch?v=njgWZjr5nRw> ^[1]

Expansion of $\text{H}_2\text{O}(\text{l})$ to $\text{H}_2\text{O}(\text{g})$

MATERIALS

- 500mL Erlenmeyer flask
- Rubber stopper with glass tube in the center
- Small tub
- Water
- Bunsen burner or hot plate
- 2-prong clamp
- Safety glasses
- Gloves

PRESENTATION

- Add about 10mL of water to the Erlenmeyer flask & fill the tub $\frac{3}{4}$ of the way with water
- Secure the rubber stopper with the glass tube on the Erlenmeyer flask firmly
- Wearing insulating gloves, heat the flask until the water is boiling and creating enough steam so that it can be heard coming out of the glass tube
- Turn the flask upside down and immediately submerge the glass tube in the tub of

water

- After about 10 seconds, the flask will vigorously fill up with water

DISCUSSION

- $PV=nRT$
- *An example of an approximation at ideal conditions for the expansion of 1L of water into steam*
 - o $V=nRT / P$
 - o $V= [(56\text{mol})(0.0821 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K})(373\text{k})] / 1\text{atm}$
 - o $V=1700\text{L}$
- When the water inside of the flask is heated, the area inside of it is mostly occupied by steam. When the flask is removed from the heat source, the gas will begin to condense back into a liquid. This dramatically decreases the volume it occupies inside of the flask. Therefore when the flask is inverted into a tub of water a vacuum is created. In order to equalize the pressure inside of the flask with the atmospheric pressure, water will be “sucked” up into the flask.

HAZARDS

- If the rubber stopper is not tight enough it can pop off of the Erlenmeyer flask possibly resulting in burns. Wear safety glasses and gloves.

[Undergraduate](#)^[2]

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Source URL (retrieved on 01/12/2013 - 5:56am): http://www.chem.arizona.edu/lecture_demos/crookes_tube

Links:

- [1] <http://www.youtube.com/watch?v=njgWZjr5nRw>
[2] <http://www.chem.arizona.edu/taxonomy/term/11>