

TEACHERS  
Serving  
TEACHERS!®

## Heat Pipe Demo

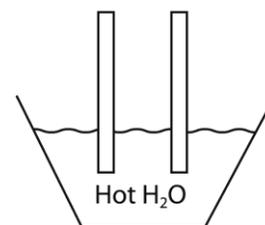
HP-100

### A Demonstration of Vapor Pressure and Heat of Vaporization

by Ron Perkins

**CAUTION: DO NOT BEND OR TWIST HEAT PIPES.  
DO NOT EXPOSE TO FLAME**

Immerse the ends of two pieces of metal into a container of hot water. One becomes hot immediately, while the other slowly increases in temperature. The heat pipe also works when the end is immersed in ice water.

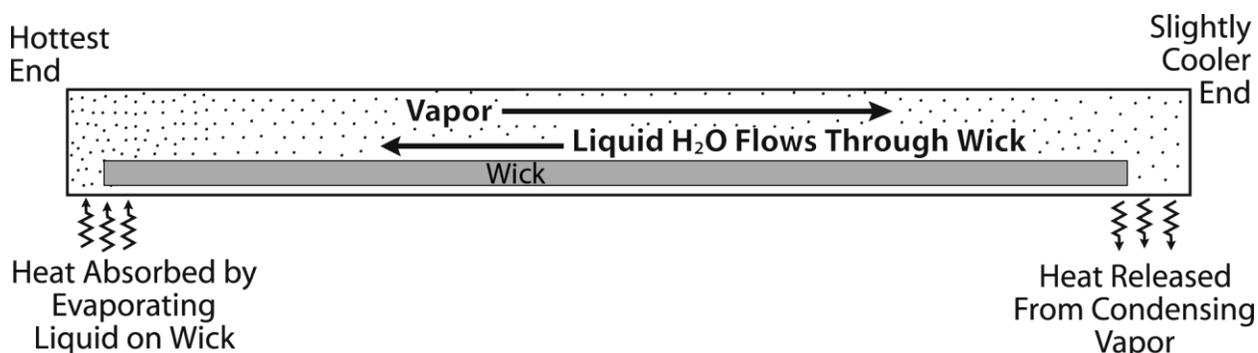


### Explanation:

The piece of metal, which conducts heat slowly, is a solid piece of copper. The other piece of metal, which conducts heat quickly, is an evacuated hollow piece of copper containing a small amount of liquid water, water vapor, and a wick. This is called a "heat pipe."

The heat pipe operates on the difference in vapor pressure due to a difference in temperature of the two ends. The greater the temperature; the greater is the vapor pressure of a liquid. At the end where the heat pipe is immersed into hot water, liquid inside the pipe evaporates until it reaches its vapor pressure. This process of evaporation requires the absorption of heat, called the heat of vaporization. Because the tube has been evacuated of air, this hot vapor travels quickly throughout the tube. At the other end where the tube is cooler, the vapor pressure is less. Consequently the excess vapor condenses, releasing heat. There is a fiber wick inside the tube to distribute the condensing liquid.

Heat pipes are used in laptop computers and other devices for cooling, such as certain types of air conditioners. They are useful for transferring heat quickly from one area to another.



# Take Your Lesson Further

As science teachers ourselves, we know how much effort goes into preparing lessons. For us, "*Teachers Serving Teachers*" isn't just a slogan—it's our promise to you!

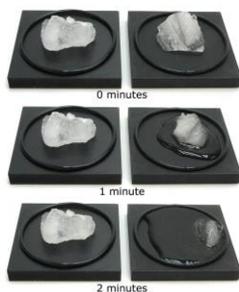
Please visit our website for more lesson ideas:

[www.TeacherSource.com](http://www.TeacherSource.com)

Check our blog for classroom-tested teaching plans on dozens of topics:

<http://blog.TeacherSource.com>

To extend your lesson, consider these Educational Innovations products:



## Amazing Ice Melting Blocks (BLK-100)

This is one of the most striking science demonstrations we have seen in a long time. Place an ice cube on each of these two identical looking black blocks at room temperature. One ice cube instantly begins to melt and is totally gone in about 90 seconds while the other ice cube shows no evidence of melting. Great for showing the difference in heat conductivity in different materials.

## Chemical Heat Pack (HEA-400)

Click a metal disk and watch the liquid crystallize. Younger students can safely feel the heat of a physical change. Advanced students can determine the heat of fusion of hydrated sodium acetate ( $f_p = 54\text{ }^{\circ}\text{C}$ ). Great for calorimetry experiments! Bending the metal disk initiates the crystallization of super-cooled sodium acetate and water; boiling in water returns the solid to a liquid. Can be used over and over.



## Fire Syringe Demo (FIR-150)

When the plunger in the transparent cylinder is rapidly pushed down over a piece of cotton or paper towel, ignition occurs. This is one of the most impressive demonstrations of the heat produced when a gas is rapidly compressed—the principle of the Diesel engine ignition.

## Heat Sensitive Paper (HEA-200)

Our thermochromic paper changes color within the temperature range of  $31^{\circ}\text{C}$  ( $88^{\circ}\text{F}$ ) to  $37^{\circ}\text{C}$  ( $98^{\circ}\text{F}$ ). As the paper is held in your warm hands, the color will begin to change or disappear. As it cools, it changes back. The cycle repeats itself indefinitely. 8.5" x 11". This 24 lb. paper will accept most types of printing including photocopier, laser, ink jet, pen, pencil, etc. The paper can be printed on both sides.

