Hand Boiler

P3-5005

INSTRUCTIONAL GUIDE

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Background

The liquid inside the Hand Boiler does not actually boil. The “boiling” is caused by the relationship between the temperature and pressure of a gas. The thermal energy given off as body heat raises the temperature of the gas in the chamber. The increased temperature causes gas molecules to move faster, thereby increasing the pressure in the closed system. There must be a temperature (and pressure) difference between the two large chambers for the liquid to move. When held upright (with the smaller bulb on top), the liquid will move from the bulb with the higher pressure to the bulb with lower pressure. As the gas continues to expand, the gas will then bubble through the liquid, making it appear to boil. The fact that the liquid is volatile (easily vaporized) makes the hand boiler more effective. Adding heat to the liquid produces more gas, also increasing pressure in the closed container.

Caution! Contains flammable liquid! The hand boilers contain ethyl alcohol. Keep away from heat or flame. Flush with water if contact with eyes. Do not drink.

Activities

Have the students hold the boiler upright by the larger bulb. How long does it take for the liquid to “boil”? Is there a student in class whose hand does not make it “boil”? Take the temperature of the students’ hands. Notice the difference. How do you make the liquid go down again? Hold onto the top bulb only. What happens if you hold both bulbs? Why? Can you make the liquid move by using cooling instead of heating? Try putting ice on the bulbs and see what happens. After several uses, the boiler won’t work for a while. Why not? Will the boiler work if upside down? Why not?

Related Products

Advanced Gas Laws Demo (P1-2065) Quantitatively confirm the Combined Gas Law with one complete apparatus! Students can verify this relationship using air and this unique apparatus.

Fire Syringe (P1-2020) A Smokin' example of Charles's Law. Using the Fire Syringe to compress air into a smaller volume is a classic example of how rapidly doing work on a gas results in an increase in temperature.