

### Experiment 3: The Effects of Air Pressure on Boiling Water

1. Imagine some very hot water in a cup that came from the hot water tap of a faucet. Why is the water not boiling in the cup? \_\_\_\_\_
2. Think about the boiling process for a moment. When a liquid is heated to a high enough temperature, water molecules will have enough energy to overcome the forces holding them to each other. They will then separate to form a gas, which we see as bubbles. Because gases occupy more space than liquids, the water molecules also require energy to push outward against any pressure trying to push them back together. Based on what you have already learned about air pressure, do you think that the presence of atmospheric pressure helps the boiling process, or makes it more difficult?  
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3. Can you predict what would happen if we put a container of hot tap water into the bell jar and pump the air out? \_\_\_\_\_
4. A small clear transparent vial has been included in this kit. Fill it about halfway with hot tap water. Use water that is not hot enough to burn you. If a thermometer is available, measure the temperature of the water. Do this quickly so the water does not cool appreciably. If the water temperature is safe and you don't have a thermometer, you might judge its temperature by dipping your finger briefly into the water. Note the temperature or your finger observations about the temperature: \_\_\_\_\_
5. Carefully place the vial of hot water on the bottom plate, inside the bell jar, and assemble the apparatus, shown in the figure below. Have someone hold the bell jar in position so it does not tip over.
6. Start pumping the piston as vigorously as possible, and watch the vial of water. Something should happen after several strokes of the piston. What happens?  
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7. What do you think of the temperature of the water? \_\_\_\_\_
8. Keep pumping until there is no further effect. The slowly loosen the connection between hose (D) and the bell jar such that the water does not spill from the container. Now open the bell jar and check the temperature of the water. What has happened? Can you explain the change? \_\_\_\_\_