Name:

**Can Crusher Lab**

We know from class that a substance’s temperature increases directionally proportional to the substance’s volume when at a constant pressure. We also know that when the volume increases, it is inversely proportional to its pressure when at a constant temperature. Nature likes to be stable, or in balance with itself. To achieve this state of equilibrium, nature will transfer energy from the object with the most energy to the object with the least. For example, if you put an ice cube in a room that is 80**°**F, the ice cube will melt. Heat from the room goes to the ice cube. If you put liquid water into a room that is 30**°**F (below freezing), the liquid will freeze. The cold room absorbs any heat from the water until the water freezes.

**Objective:** How can we visualize Charles’s law and Boyle’s law in action?  
  
  
**Define:**

Charles’s law:

Boyle’s law:

Stable:

Vaporization:

Condensation:

**Materials:**

1 empty soda can

10mL of water

A hot plate

A turkey roaster tin

1000mL of cool water

Tongs

**SAFETY:**

Hair tied back

Goggles  
  
**Procedure:**

1. Make sure your tin is filled with 1000mL of water.
2. Switch on the hot plate to high.
3. Pour 10mL of water into the soda can
4. Place the soda can onto the hot plate.  **CAUTION: AS THE CAN HEATS UP, THE PLATE AND THE CAN WILL BECOME EXTREMELY HOT. DO NOT TOUCH IT WITH YOUR HANDS.**
5. Once the can starts steaming and you can hear it boil, use the tongs to pick up the can around the middle
6. Quickly flip the can over into the cold water, so that the top is just submerged.   
   \*\*KEEP HOLDING THE CAN WITH THE TONGS.\*\*
7. Observe what happens

**Questions**

1. As you were heating up the can, what type of vaporization did you observe? How do you know?
2. How do your observations relate to Charles’s law and/or Boyle’s law?
3. Why was flipping the can over into cool water an important step?  
     
     
     
     
   Consider the following information: The atmosphere exerts about 6.8 kg (14-15pounds) per 6.5cm2 (square inch) of surface at sea level. This calculation is at an average room temperature of 15.5**°**C (60**°**F)
4. Why would knowing this information justify what you saw based on nature’s desires to be stable, or a state of balance?
5. Inside every popcorn kernel is a small amount of water. When you make popcorn, the water inside the kernel is heated until it becomes steam. Explain how the popping of a popcorn kernel is the OPPOSITE of what you saw in the lab!