Name: _____ Per: _____ Date: _____

Activity – Gas Law Exploration

Station #1: The Cartesian Diver

1. Squeeze the bottle, hard, with both hands. Watch the "diver" carefully.

a) Which way did the "diver" move?

b) What two substances are inside the "diver"?

c) When you increased the pressure on the bottle, what happened to the volume of gas inside the "diver"?

2. After approximately 10 seconds, release your grip on the bottle and watch the "diver" carefully.

d) What happened to the volume of the gas inside the "diver" as you reduced the pressure on the bottle?

e) Name the gas law that is demonstrated by this relationship.

3. Apply your knowledge:

If the gas inside the "diver" occupied 2.0 mL when only atmospheric pressure (1.0 atm) was exerted on it at the top of the bottle, what volume should the gas occupy when it is under 3.2 atm of pressure from your hands squeezing it?

Station #2: Candle in a Glass Tube

1. **Place a candle upright in a small (1-inch-high) reservoir of water in a metal pie tin. Light the candle. Once the candle is lit and has had the chance to heat up the surrounding air (about 30 seconds), pick up the glass tube and invert it into the reservoir so that it covers the candle and rests on the bottom of the metal pie tin.**

   a) Record your observations.

   b) The gas inside the glass tube cooled after the candle was extinguished. As the gas cooled (and its temperature decreased):

   -What happened to the water level inside the glass tube?

   -What happened to the volume of gas inside the glass tube?

   c) Based upon what you have observed, is the temperature of a gas sample directly proportional to its volume, or is temperature inversely proportional to volume? Why??

2. **Apply your knowledge:**

   d) If the glass tube contained 200.0 mL of gas at 100.0 °C as the candle was extinguished, what volume should the gas inside the glass tube occupy once the temperature has decreased to room temperature (25.0 °C)?

e) Draw a particle diagram (like those from the POGIL) that shows the gas particles inside the glass tube under the following conditions. Long arrows represent particles moving quickly, and short arrows represent particles moving more slowly.

At the moment when the glass tube was inverted over the candle:	After the candle and glass tube have cooled to room temperature:

Station #3: Effect of Temperature on Pressure in a Can

1. **Using a graduated cylinder, place about 10 mL of water in a clean, empty aluminum soft-drink can. Clasp the can securely with metal tongs (near the middle of the can) and hold the base over the flame of a Bunsen burner to bring the water to a rapid boil (until you can hear water boiling inside and see a lot of steam coming out). Hold the tongs with your palm up so you can invert it easily in the next step.**

2. **Do the following very quickly: remove the soft-drink can from the flame, and immediately plunge the can upside-down into a full tray of cold water (the same black plastic tray you used for the candle station).**

   a) Record your observations:

   b) As you inverted the can into the water bowl and the temperature of the gas inside the can decreased:

   -What happened to the pressure inside the can?

   -How does this change in pressure explain the phenomenon that you observed?

3. Apply your knowledge:

You may have noticed that if you put a warm jar of food into the fridge, the jar is much more difficult to open when you take it out of the fridge several hours later. This is due to a similar phenomenon to that you observed in this station: the pressure difference inside and outside of the jar.

c) If the gas in a glass jar of pasta sauce exerts 1.00 atm of pressure when it is placed into the refrigerator at 55.0 °C, what pressure does it exert when it has been cooled down to 3.0 °C?

d) What variable (pressure, temperature, or volume) was kept constant in the problem completed in part c?

Challenge: Hook the Diver

1. See if you can hook the divers together. Have fun with it!!