Name: ___________________________

Chemistry Lab: Cartesian Divers*

Purpose: ___________________________________________________________________

__________________________________________________________________________

Introduction: Charles’s Law and Boyle’s Law both describe how the volume of a gas changes when either the temperature or pressure on a gas is changed. In this lab we will use a plastic dropper to create a container that allows us to observe the changing volume of a gas under different conditions.

Materials:

Plastic dropper
2-Liter soda bottle
waterproof marker
material to weight the dropper with (if necessary)
container of hot water
container of ice water
container of colored, room temperature water taller than the dropper

Procedures:

1. Completely fill the 2-Liter soda bottle with room temperature water and CAP the bottle.

2. Use the container of colored, room temperature water that is taller then the dropper to fill the dropper to the point where it will just barely float at the surface of the water in the container. Only a small amount of the dropper bulb should be above the water.

3. Remove the full dropper from the water and mark the outside of the dropper to show where the water line is on the INSIDE of the dropper. This will be easier to do if you dry the outside of the dropper first. DO NOT empty the dropper at any point.

4. Put the full dropper into the 2-Liter soda bottle of water and cap the bottle tightly. Squeeze the bottle very hard and observe:
   A) What happens to the dropper
   B) What happens to the water level inside the dropper

5. Repeat step 4 until you are satisfied with your observations.

6. Remove the full dropper (DO NOT empty the dropper) from the 2-Liter bottle and empty the 2-Liter bottle into the sink, put the cap back on the bottle.

*Procedures for this lab were adapted from “Sink or Swim: The Cartesian Diver” in the Journal of Chemical Education. The activity was developed by K. David Pinkerton.
7. Place the dropper into the container of hot water and observe:
   A) What happens to the dropper
   B) What happens to the water level inside the dropper

8. Remove the dropper from the hot water and place it into the container of ice water, observe:
   A) What happens to the dropper
   B) What happens to the water level inside the dropper

9. Repeat steps 7 & 8 if necessary.

**Observations:**

Inside the soda bottle:

In the hot water:

In the cold water:

**Conclusion:** Using Boyle’s and Charles’s laws, explain why the diver rose or fell in each situation. Include in your explanation what property was held constant in each case.

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