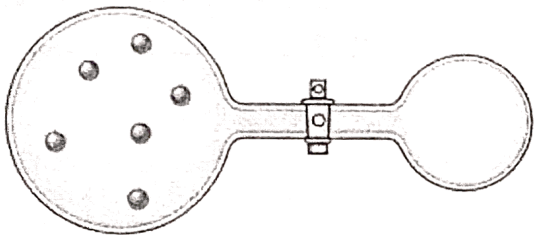
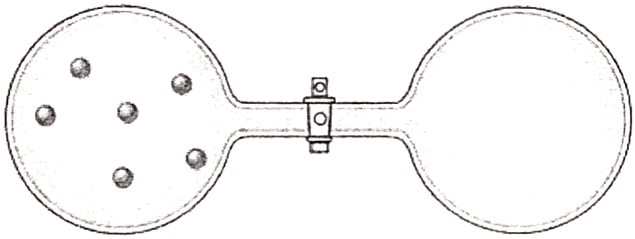
Problem Set 2: Gas Laws

1	2
6. If you put a drinking straw in water, place your finger over the opening, and lift the straw out of the water, some water stays in the straw. Explain. (Use labeled diagrams in your explanation.)	26. Consider two different containers, each filled with 2 moles of Ne(g). One of the containers is rigid and has constant volume. The other container is flexible (like a balloon) and is capable of changing its volume to keep the external pressure and internal pressure equal to each other. If you raise the temperature in both containers, what happens to the pressure and density of the gas inside each container? Assume a constant external pressure.
3	**4**
28. Consider the flasks in the following diagrams.  volume = 2X volume = X  volume = X volume = X Assuming the connecting tube has negligible volume, draw what each diagram will look like after the stopcock between the two flasks is opened. Also, solve for the final pressure in each case, in terms of the original pressure. Assume temperature is constant.	A 1.53 L balloon at STP was moved to an environment with a pressure of 87.8 kPa and 25.2°C. What is the final volume of the balloon?
5	**6**
At a deep-sea station 200. m below the surface of the Pacific Ocean, workers live in a highly pressurized environment. How many liters of gas at STP must be compressed on the surface to fill the underwater environment with 2.00×10^7 L of gas at 20.0 atm?	10.25 Assume that you have a cylinder with a movable piston. What would happen to the gas pressure inside the cylinder if you do the following? (a) Decrease the volume to one-fourth the original volume while holding the temperature constant. (b) Reduce the Kelvin temperature to half its original value while holding the volume constant. (c) Reduce the amount of gas to half while keeping the volume and temperature constant.
7	**8**
An ideal gas is contained in a cylinder with a volume of 5.0×10^2 mL at a temperature of 30.°C and a pressure of 710. torr. The gas is then compressed to a volume of 25 mL, and the temperature is raised to 820.°C. What is the new pressure of the gas?	A canister with fixed volume at 97.2 kPa and 23.0°C is compressed to a pressure of 1.88 atm. What is the final temperature in the canister in degrees Celsius?

9	10
How big a volume of dry oxygen gas at STP would you need to take in order to have the same number of oxygen molecules as there are hydrogen molecules in 25.0 L at 0.850 atm and 35°C?	A helium filled balloon has an initial volume of 3.0 L at 22°C. The balloon is placed in a freezer and shrinks to a volume of 2.7 L. What is the temperature of the freezer in degrees Celsius?
11	**12**
A 2.00-liter sample of nitrogen gas at 27 °C and 600. millimeters of mercury is heated until it occupies a volume of 5.00 liters. If the pressure remains unchanged, the final temperature of the gas is (try to solve this without a calculator) A) 68 °C B) 120 °C C) 477 °C D) 677 °C E) 950. °C	Rationalize the following observations: a) Aerosol cans will explode if heated. b) You can drink through a soda straw. c) A thin-walled can will collapse when the air inside is removed by a vacuum pump. d) Manufacturers produce different types of tennis balls for high and low elevations.