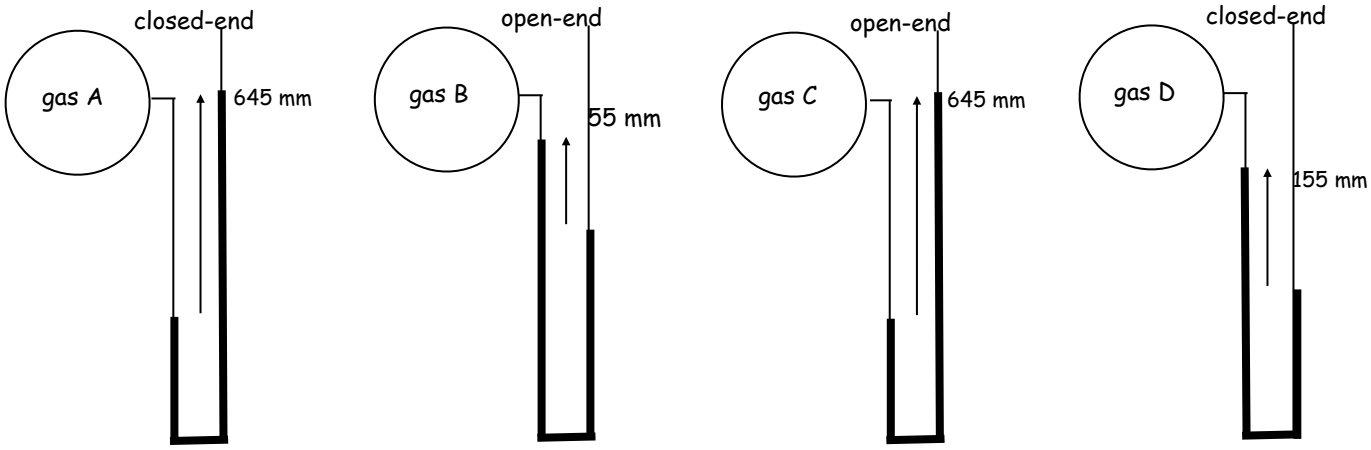
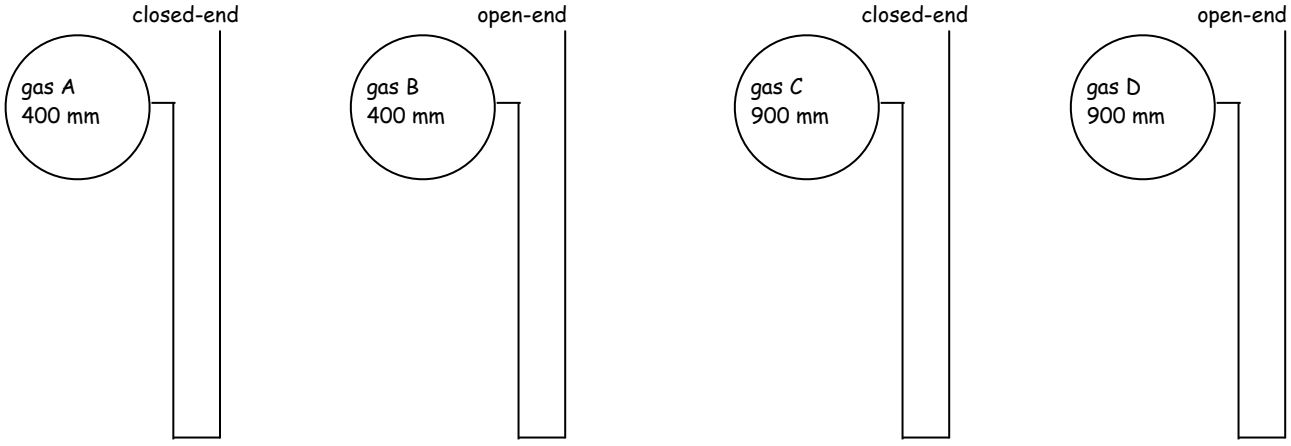
P D.3 (pg 1 of 4) **Manometers and Barometers** Name_____

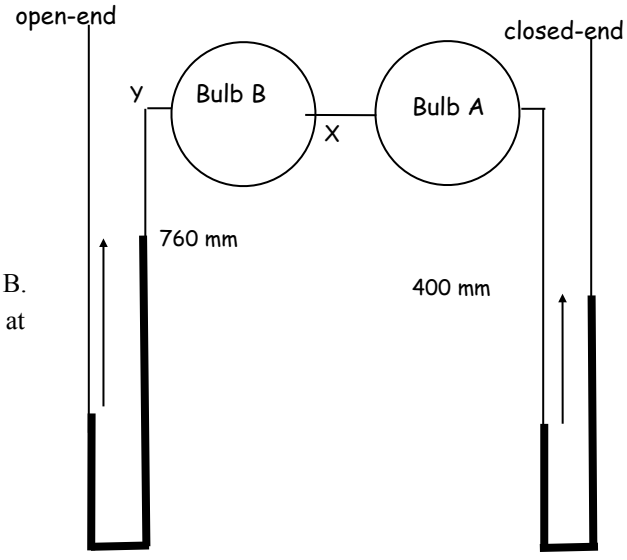
1. Determine the gas pressure inside each bulb. Assume the atmospheric pressure is 755 mm.



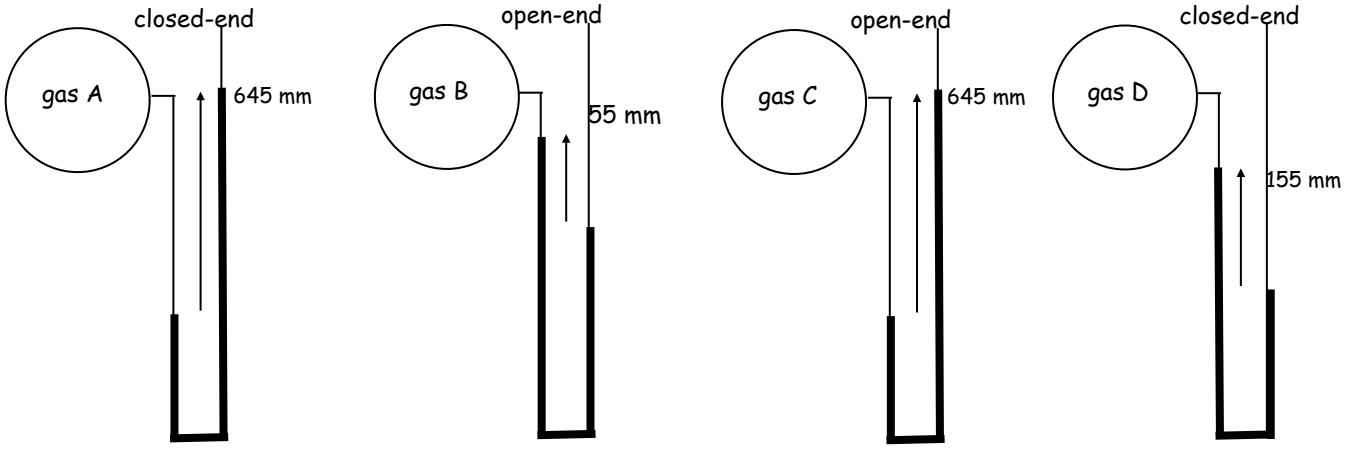
2. Draw the position and relative heights of the columns of mercury for each bulb. Assume the atmospheric pressure is 760 mm.



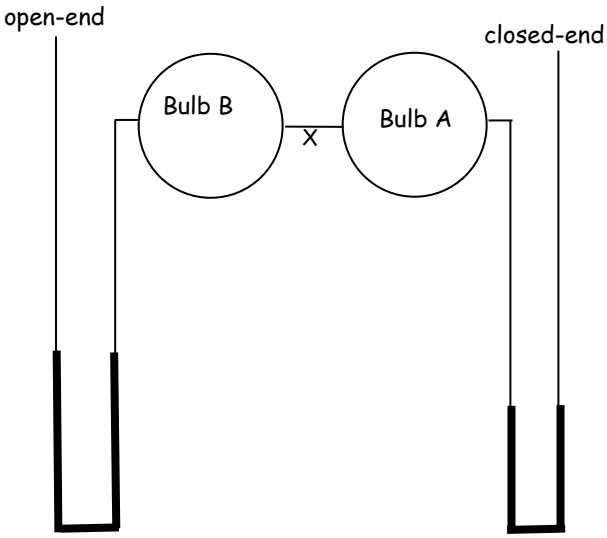
3. At the start all tubes were completely empty, Valves at X and Y are closed, and Bulb B is empty, and gas was put into Bulb A.
   a. What is the pressure in B?
   b. What is the pressure in Bulb A?
   c. What is the air pressure in the room?
   d. When Valve X is opened, determine the pressure in Bulbs A & B.
   e. When Valve Y is opened, draw and label the appropriate levels at the open-end



4. Determine the gas pressure inside each bulb. Assume the atmospheric pressure is 755 mm.

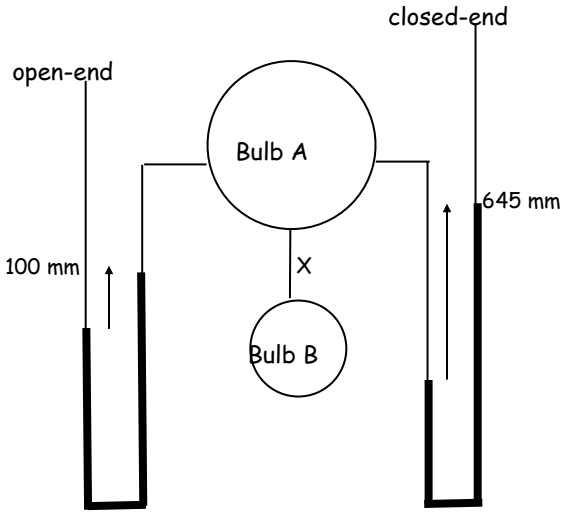


5. At the start, Valves at X is closed. The room air pressure barometer reads 760 mm Hg.
   a. What is the pressure in A?
   b. What is the pressure in B?
   c. When Valve X is opened, determine the pressure in Bulbs A & B.
   d. Draw the appropriate mercury levels in the closed-end.



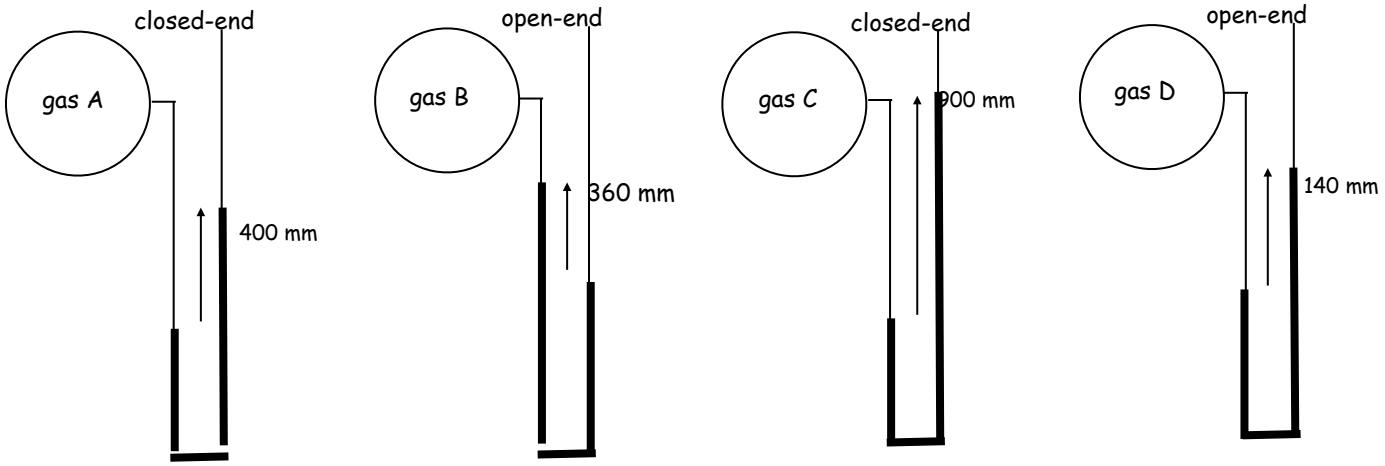
6. Assume a completely new situation. Different air pressure. Valve X is closed and Bulb B is empty.

   The size of bulb A is 300 ml and Bulb B is 100 ml.
   a. What is the outside air pressure?
   b. What is the new pressure in Bulbs B and A when valve X is opened?
   c. Draw the new mercury levels on both sides.

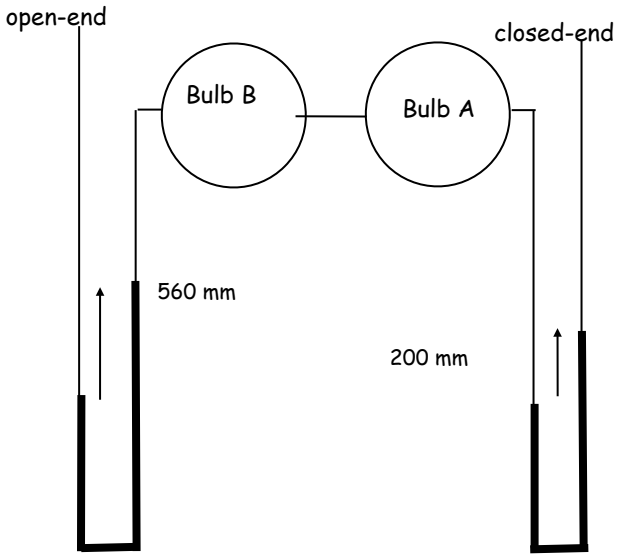


1. Determine the gas pressure inside each bulb. Assume the atmospheric pressure is 755 mm.
   a. The gas pressure inside is 645 mm Hg. You can read the pressure of a closed-end manometer directly.
   b. The gas pressure inside is 700 mm Hg. You can tell this because the inside gas is losing the push-pull and is 55 mmHg less pressure than the outside air pressure which is stated in the directions to be 755 mmHg.
   c. The gas pressure inside is 1400 mm Hg. You can tell this because the gas inside is pushing harder than the gas outside. It is pushing harder by 645 mmHg. Thus 755 + 645 would be the total pressure inside.
   d. This closed-end manometer must be broken. Since there is "nothing", in the closed-end, there would be no push thus the lowest it could go would be flat with the other side.

2. Draw the position and relative heights of the columns of mercury for each bulb. Assume the atmospheric pressure is 760 mm.



3. At the start all tubes were completely empty, Valves at X and Y are closed, and Bulb B is empty, and gas was put into Bulb A.
   a. Since B is empty, the pressure would be 0 mm Hg
   b. The pressure in Bulb A is 400 mmHg
   c. Since the tubes were empty, you can assume that the outside pressure is 76o mmHg because the outside air is pushing the mercury up towards valve Y to a height of 760 mm
   d. Assuming that Bulb A and B are the same size, the when valve x is opened, the volume will be twice as big which will reduce the pressure to half. Thus both bulbs will have a pressure of 200 mmHg
   e. When Valve Y is opened, draw and label the appropriate levels at the open-end, and the new level at the closed-end.



4. Gas A = 645 mmHg since the manometer is closed end you can simply look at the difference in the two mercury levels and this will tell you the height

   Gas B = 700 mmHg since the manometer is open end, you can see that he gas inside the bulb is less pressure, and it is less by 55 mmHg, a subtraction of 755 - 55 will give the gas pressure of 700 mmHg

   Gas C = 1400 mmHg since it is an open end manometer and the gas is "winning" the manometer battle, it is winning by 645, so adding 645 + 755 = 1400 mmHg

   Gas D = this manometer must be broken since it is a closed end manometer and the pressure at the top of the manometer is zero, than the manometer can never be higher on the gas side than level.

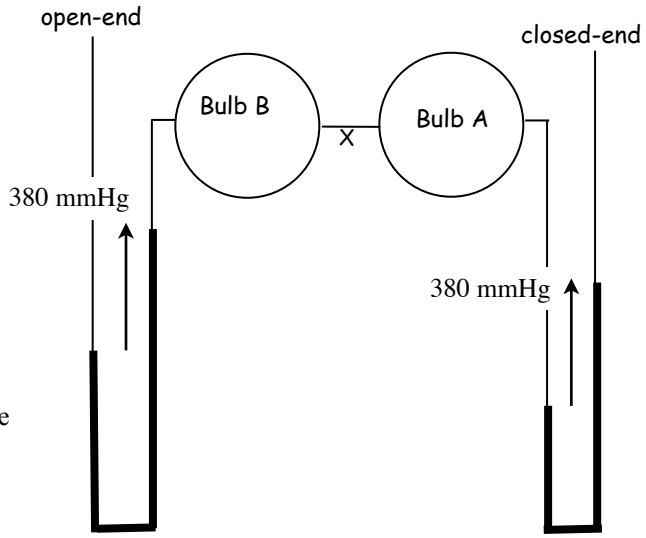
5.

   a. The levels of the manometer on the open side is even indicating that the pressure inside and outside is the same, thus the gas pressure in bulb B must be 760 mmHg.

   b. The pressure in bulb A must be zero since the level of the closed end manometer is level. Remember that in closed end manometer, there is no pressure pushing from the closed side.

   c. You can assume the two bulbs are equal in size. When the valve is opened, essentially the size of the container doubles which will cause the pressure to be halved.
   PV = PV (760 mm)(1 L) = P(2 L), then solve for P which will be 380 mmHg. I chose 1 and 2 L since I was not given volumes, and I wanted to keep the numbers simple.

   d. see the diagram.



6.

   a. From the closed end manometer, we know that the pressure in bulb A is 645, and since the open end manometer indicates the the outside air pressure is 100 mm more than the Bulb A, this tells us that the air pressure must be 745 mm Hg

   b. When valve X is opened, the volume of bulb A goes from 300 ml to a total of 400 ml. Thus you can use PV = PV to solve for the new pressure inside both bulbs A and B. 645 mm × 300 ml = P × 400 ml and P solves to 484 mm.

   c. see the diagram for the new levels. Since the open end manometer is open to the atmosphere, and the outside pressure is still 745 form part a, it will push further up towards bulb A to a height of 261 (745 − 484).