

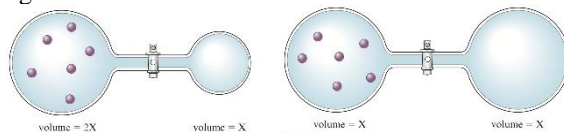
Exercise 5.3

Pressure & the Gas Laws

Name: _____

Date: _____ Per: _____

1. Consider the flasks in following diagram:



Assuming the connecting tube has negligible volume,

- a. Draw what each diagram will look like after the stopcock between the two flasks is opened.

- b. Solve for the final pressure in each case, in terms of the original pressure. Assume temperature is constant.

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2. Write the balanced equation for the decomposition of ammonia gas (NH_3) into hydrogen gas and nitrogen gas.

Balanced Reaction: _____

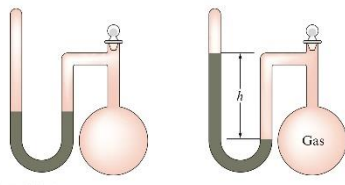
- a. As $\text{NH}_3(\text{g})$ is decomposed into nitrogen gas and hydrogen gas at constant pressure and temperature, the volume of the product gases collected is twice the volume of NH_3 reacted. Explain.

- b. As $\text{NH}_3(\text{g})$ is decomposed into nitrogen gas and hydrogen gas at constant volume and temperature, the total pressure increases by some factor.

- i. Why the increase in pressure and by what factor does the total pressure increase when the reactants completely converted into products?

- ii. How do the partial pressures of the product gases compare to each other and to the initial pressure of NH_3 ?

3. A sealed-tube manometer (as shown below) can be used to measure pressures below atmospheric pressure. The tube above the mercury is evacuated. When there is a vacuum in the flask, the mercury levels in both arms of the U-tube are equal. If a gaseous sample is introduced into the flask, the mercury levels are different. The difference h is a measure of the pressure of the gas inside the flask. If h is equal to 6.5 cm, calculate the pressure in the flask in torr, pascals, and atmospheres.



	torr
	pascals
	atm

4. A particular balloon is designed by its manufacturers to be inflated to a volume of no more than 2.5 L. If the balloon is filled with 2.0 L helium at sea level, is released, and rises to an altitude at which the atmospheric pressure is only 500. mm Hg, will the balloon burst? Assume temperature is constant.

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5. An 11.2 L sample of gas is determined to contain 0.50 mole of N_2 . At the same temperature and pressure, how many moles of gas would there be in a 20. L sample?

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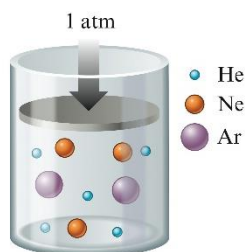
6. Consider two separate gas containers at the following conditions. How is the pressure in container B related to the pressure in container A?

Container A	Container B
Contents = $\text{SO}_2(\text{g})$	Contents = unknown gas
Pressure = P_A	Pressure = P_B
Moles of gas = 1.0 mol	Moles of gas = 2.0 mol
Volume = 1.0 L	Volume = 2.0 L
Temperature = 7°C	Temperature = 287°C

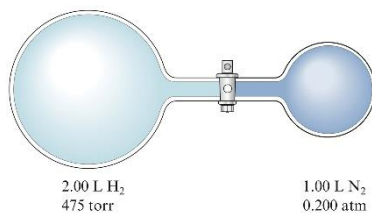
7. An ideal gas is contained in a cylinder with a volume of 5.0×10^2 mL at a temperature of $30.^\circ\text{C}$ and a pressure of 710. torr. The gas is then compressed to a volume of 25 mL, and the temperature is raised to $820.^\circ\text{C}$. What is the new pressure of the gas?

8. A sealed balloon is filled with 1.00 L helium at 23°C and 1.00 atm. The balloon rises to a point in the atmosphere where the pressure is 220. torr and the temperature is -31°C . What is the change in volume of the balloon as it ascends from 1.00 atm to a pressure of 220. torr?

9. Determine the partial pressure of each gas as shown in the figure below. *Note:* The relative numbers of each type of gas are depicted in the figure.



10. Consider the flasks in the following diagram. What are the final partial pressures of H_2 and N_2 after the stopcock between the two flasks is opened. (Assume the final volume is 3.00 L.) What is the total pressure in torr?



11. Consider the three flasks in the diagram below. Assuming the connecting tubes have negligible volume, what is the partial pressure of each gas and the total pressure after all the stopcocks are opened?

