

## Chemistry 105 - Fundamental Chemistry

### Fall Semester 1997 - Gas Calculations

1. A sample of HCl gas is placed in a 256 mL flask where it exerts a pressure of 67.5 mm Hg. What is the pressure of this gas sample if it is transferred to a 135 mL flask at the same temperature?
2. A sample of HCl has a pressure of 67.5 mm Hg in a 256 mL flask. If the sample is transferred to a new flask where it exerts a pressure of 23.6 mm Hg at the same temperature, what is the volume of this new flask?
3. A 25.0 mL sample of gas is enclosed in a gas-tight syringe at 22°C. If the syringe is immersed in an ice bath (0°C), what is the new gas volume?
4. A bicycle tire is inflated to a pressure of 55 lb/in<sup>2</sup> at 15°C. If the tire is heated to 35°C, what is the pressure in the tire? (For simplicity, assume the tire volume cannot change; also, 1 atm = 14.7 lb/in<sup>2</sup>.)
5. H<sub>2</sub>O can be made by combining gaseous O<sub>2</sub> and H<sub>2</sub>. If you begin with 1.0 L of H<sub>2(g)</sub> at 380 mm Hg and 25°C, how many liters of O<sub>2(g)</sub> would you need for complete reaction if the O<sub>2</sub> gas is also measured at 380 mm Hg and 25°C?
- 6.\* A 1.00-g sample of water is allowed to vaporize completely in a 10.0 L container. What is the pressure of the water vapor at a temperature of 150°C?
7. Calculate the number of moles in each gas sample. Which sample has the most molecules?  
(a) 1.0 L of H<sub>2</sub>, at STP (0°C and 1.000 atm)                      (b) 1.0 L of Ne at STP  
(c) 1.0 L of H<sub>2</sub>, at 27°C and 760 mm Hg                      (d) 1.0 L of CO<sub>2</sub>, (0°C / 800 mm Hg)
8. A sample of H<sub>2</sub>, exerts a pressure of 3.0 atm at 25°C in an explosion-proof container. What is the pressure of H<sub>2</sub>, on heating to 110°C?
9. A sample of gaseous helium in a 1.50 L flask at 273 K exerted a pressure of 1.00 atm. After heating the flask to 346 K, what is the pressure of the gas?
10. If you have a 1.50x10<sup>2</sup> L tank of gaseous CO and the gas exerts a pressure of 41.8 mm Hg at 25°C, how many moles of CO are there in the tank?
11. How many grams of helium are required to fill a 5.0-L balloon to a pressure of 1.1 atm at 25°C?
12. A sample of H<sub>2</sub> gas occupies 615 mL at 27.0°C and 575 mm Hg. When the gas is cooled, its volume is reduced to 455 mL and its pressure is reduced to 385 mm Hg. What is the new temperature of the gas?
13. A sample of gas occupies 754 mL at 22°C and a pressure of 165 mm Hg. What is its volume if the temperature is raised to 42°C and the pressure is raised to 265 mm Hg?
14. Assume that one of the cylinders of an automobile engine has a volume of 4.00x10<sup>2</sup> cm<sup>3</sup>. The engine takes in air at a pressure of 1.00 atm and a temperature of 27°C and compresses it to a volume of 50.0 cm<sup>3</sup> at 77°C. What is the final pressure of the gas in the cylinder?