General Chemistry
Mr. MacGillivray
Quiz #26:
Gas Laws II

Solve the following problems. Show all work.

1. If helium gas is collected over water at 20.0 °C and the total pressure of collected gas is 762 mm Hg, find the pressure of the dry He gas.

$P_{TOT} = P_{He} + P_{H_2O}$

$762\ mmHg = P_{He} + 17.5\ mmHg$ ← look this up in the vapor pressure table

$744.5\ mmHg = P_{He}$

2. What is the volume of 10.0 g of chlorine gas (it's diatomic!!) at 215 K and 135 kPa?

$P = 135\ kPa \times \frac{1\ atm}{101.3\ kPa} = 1.33\ atm$

$T = 215\ K$

$V = ?$

$n = 10.0\ g\ Cl_2 \times \frac{1\ mol}{71.0\ g} = 0.1408\ mol\ Cl_2$

$R = 0.08206\ \frac{L \cdot atm}{K \cdot mol}$

$PV = nRT$

$V = \frac{nRT}{P}$

$V = \frac{(.1408)(.0821)(215)}{1.33}$

$V = 1.87$

3. What is the density of chlorine (it's diatomic!!) gas at STP?

$D = \frac{m}{V}$ easy method: use 1 mol (amount has no effect on density)

$= \frac{71.0\ g}{22.4\ L}$ ← molar mass ← molar volume of a gas

$D = 3.17\ g/L$

4. Which effuses more quickly, chlorine gas (it's diatomic!!) or Xe gas? How many times more quickly?

$Xe = 131.3\ g/mol$ $Cl_2 = 70.9\ g/mol$ → lighter thus effuses more quickly.

$\frac{V_{Cl_2}}{V_{Xe}} = \sqrt{\frac{m_{Xe}}{m_{Cl_2}}} = \sqrt{\frac{131.3}{71}} = 1.36$

Cl_2 effuses 1.36 X faster than Xe.