Chemistry Boot Camp
Summer 2013
VandenBout/LaBrake
Readiness Assessment Quiz

Name: KEY

1. A 5.0 mol sample of Ne is confined in a 3.14 L vessel at a pressure of 2.5 atm. What is the number density of the gas? What is the mass density of the gas?

number density : $\frac{mol}{L} = \frac{5\text{ mol Ne}}{3.14\text{ L}} = \boxed{1.6 \frac{mol}{L}}$

mass density : $\frac{g}{L} = \frac{5\text{ mol Ne} \mid 20\text{ g Ne}}{\mid 1\text{ mol Ne}} = \frac{100\text{ g Ne}}{3.14\text{ L}} = \boxed{32 \frac{g}{L}}$

2. What is the total pressure of the gas mixture that contains?
0.267 atm He & 0.317 atm Ar & 0.277 atm Ne?

$P_{total} = P_{He} + P_{Ar} + P_{Ne}$

$= .267\text{ atm} + .317\text{ atm} + .277\text{ atm}$

$P_{total} = .861\text{ atm}$

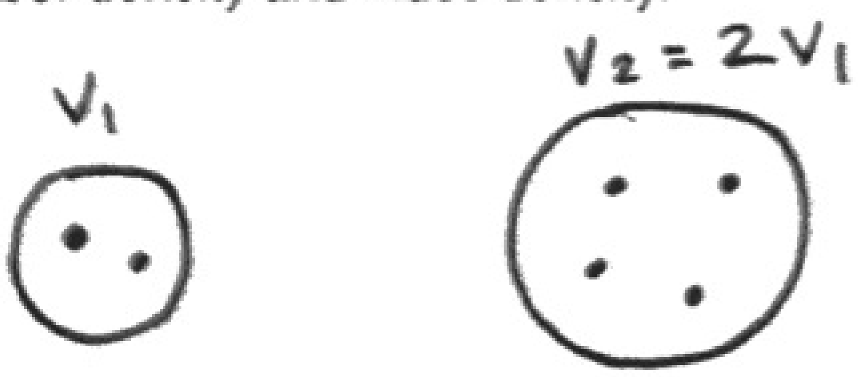
3. What is the mole fraction of Ar in a mixture that contains?
0.267 atm He & 0.317 atm Ar & 0.277 atm Ne?

$P_{Ar} = \chi_{Ar} P_{total}$

$\chi_{Ar} = \frac{P_{Ar}}{P_{total}} = \frac{.317}{.861} = \boxed{.368}$

← χ_{Ar} is unitless

4. Imagine that you have a balloon filled with 2 moles of an ideal gas held at constant temperature and pressure. You then add another 2 moles of gas to the balloon. Please draw a picture of the balloon with the original 2 moles. Next, draw a picture of what the balloon will look like after the addition of 2 more moles of the gas. Explain what has changed with the balloon. Comment specifically on the P, T, V, n, number density and mass density.



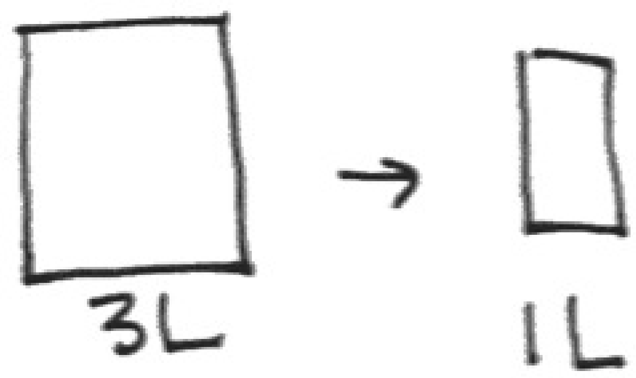
$PV = nRT$ (P, R, T constant)

So when $n\uparrow$; $V\uparrow$

Imagine blowing up a balloon.
The T is not going to change
The n increases
The pressure will be same inside and outside balloon. So volume must increase.

The number density and mass density will be constant.

5. An unknown amount of gas is in a three-liter container at a pressure of 150 psi. If the volume of the container is reduced to one liter at constant temperature, what is the final pressure of the gas?



$P_1V_1 = P_2V_2$

$P_1 3 = P_2 1$

$P_2 = 3P_1$

$P_2 = \frac{P_1V_1}{V_2}$

$P_2 = \frac{(3\,L)(150\,psi)}{1\,L}$

$P_2 = 450\,psi$

6. Given the following reaction:

$2CO + O_2 \rightarrow 2CO_2$

Initially, you have a container with 2 moles of CO gas and 3 moles of O_2 gas at a constant temperature of 25°C and a constant pressure of 1 atm. What is the final volume after the reaction is complete? What is the partial pressure of CO_2 after the reaction is complete?

Given: 2 mol CO

3 mol O_2

T = 25°C = 298K

P = 1atm

Wanted: V_f = 97.8L

: P_{CO_2}

CO is limiting

$\frac{2\,mol\,CO}{} \Big| \frac{2\,mol\,CO_2}{2\,mol\,CO} = 2\,mol\,CO_2$

2 mol CO_2 is produced

2 mol O_2 is left over

total 4 mol gas

$V_f = \frac{(4)(298)(.08206)}{1} = 97.8L$

$P_{CO_2} = \frac{(mol_{CO_2} = 2)(298)(.08206)}{(97.8L)} = .5atm$

or → mol fraction = .5 $P_{CO_2} = X_{CO_2}P_{total}$