

## Lecture Notes L: Chemical Equilibrium IV

### 1) Partial Pressures

You have a 1.00 liter vessel at 25°C containing a 1.00 atm of a mixture that is 25% Ne and 75% Ar (by volume). What is the partial pressure of Ne and Ar?

Keeping the volume of the vessel fixed at 1.00 liter, you add 1.00 atm of Kr. What is the partial pressure of Ne?

- a) 0.125 atm      b) 0.25 atm      c) 0.50 atm      d) 1.0atm

You heat the vessel to 50°C. What is the partial pressure of Ne in the vessel?

### Problem

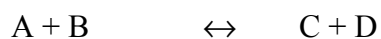
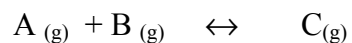
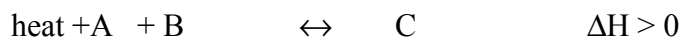
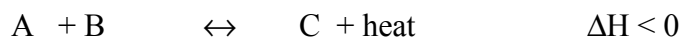
Consider a 1 liter container filled with NO<sub>2</sub> gas. The following dimerization reaction occurs in this gas.

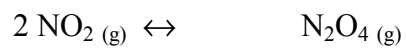
	2 NO <sub>2</sub> (g)	↔	N <sub>2</sub> O <sub>4</sub> (g)	
ΔH <sub>f</sub> (kJ/mol)	33.18		9.16	ΔH°= -57.20 kJ/mol
S° (J/mol K)	239.95		304.18	ΔS°= -175.72 J/mol K
Color:	brown		colorless	

The container has a temperature of 25°C and a total pressure of 1 atm. What is the ratio of P<sub>NO<sub>2</sub></sub> to P<sub>N<sub>2</sub>O<sub>4</sub></sub> at room temperature (25°C)?

**2) Le Chatelier's principle**

A system in equilibrium that is subjected to a stress will react in a way that tends to counteract the stress.

**Changing the concentration of a reactant or product****Changing the volume (leads to a change in total pressure)****Changing the temperature**



The volume of the container is decreased to 0.5 liter. What happens to the ratio of  $P_{\text{NO}_2}$  to  $P_{\text{N}_2\text{O}_4}$ ?

- a) It increases      b) It decreases      c) Nothing

Calculate the ratio of  $P_{\text{NO}_2}$  to  $P_{\text{N}_2\text{O}_4}$  when the volume of the container is decreased to 0.5 liter

Consider the 1 liter container of  $\text{NO}_2$  discussed above. The temperature of the container is increased to  $100^\circ\text{C}$ . What happens to the ratio of  $P_{\text{NO}_2}$  to  $P_{\text{N}_2\text{O}_4}$ ?

- a) It increases      b) It decreases      c) Nothing      d) Not obvious (have to do calculation)

Calculate the ratio of  $P_{\text{NO}_2}$  to  $P_{\text{N}_2\text{O}_4}$