

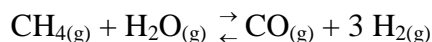
**UNIVERSITY CEU SAN PABLO
SCHOOL OF PHARMACY
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY**

ISSUES OF PHYSICAL CHEMISTRY

2018-2019

LESSON 5

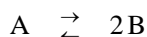
35. The reaction between ideal gases



At 600 K, has $\Delta H^\circ = 217.9 \text{ kJ}\cdot\text{mol}^{-1}$ and $K_p^\circ = 4.9\cdot 10^{-7}$

- a) Estimate if at 1010 K the equilibrium constant will be higher or lower. Justify your answer using the appropriate equations
- b) Will the result be different if the gases have real behaviour?

36. Consider the following chemical equilibrium between ideal gases:



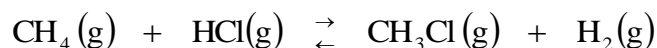
at constant temperature and pressure. Express the mole fractions in the equilibrium, x_A and x_B versus K_p° and P.

37. Indicate whether the following statements for reactions between ideal gases are true or false:

- a) K_p° is always dimensionless
- b) K_p° of the reverse reaction is the same as the K_p° of the forward reaction, but with the opposite sign
- c) multiplying by two the stoichiometric coefficients, it means double K_p°
- d) K_p° of a particular reaction depends on the temperature, but it is independent of pressure and of the initial composition of the reaction mixture.

Justify the answers

38. Determine the effects of the following changes on this endothermic reaction at to 25 °C



- a) an increase in $X_{(\text{HCl})}$
 - b) a decrease in $X_{(\text{H}_2)}$
 - c) a pressure rise
 - d) an increase in temperature.
39. Indicate, justifying the answer, if the following statements are true or false for the forming reaction of solid L-alanine, $\text{C}_3\text{H}_7\text{O}_2\text{N}$, with ΔG_{298}° equal to $-88.48 \text{ kcal}\cdot\text{mol}^{-1}$
- a) The reaction is spontaneous
 - b) The equilibrium constant K_p° is less than 1
 - c) If ΔS_{298}° of L-alanine $\text{C}_3\text{H}_7\text{O}_2\text{N}$ (s) is negative, the reaction is spontaneous
40. Indicate which of the following quantities can never be negative:
- a) ΔG_T°
 - b) ΔG_T^P
 - c) K_p°