1. Consider the reaction: \( \text{SiH}_4(g) + 2 \text{Cl}_2(g) \rightleftharpoons \text{SiCl}_4(g) + 2 \text{H}_2(g) \)

A) Write the expression for \( K_C \) in terms of reactants and products.

B) Write the expression for \( K_P \) in terms of reactants and products.

C) If \( K_C = 56 \), for the reaction above at 120\( ^\circ \)C, what is \( K_P \)?

D) If \( K_C = 56 \), for the reaction above at 120\( ^\circ \)C, what will be the \( K_C \) for the following reactions?

*Look at each CAREFULLY!*

   i. \( \frac{1}{2} \text{SiH}_4(g) + \text{Cl}_2(g) \rightleftharpoons \frac{1}{2} \text{SiCl}_4(g) + \text{H}_2(g) \) \( K_C = \) ______

   ii. \( 3 \text{SiCl}_4(g) + 6 \text{H}_2(g) \rightleftharpoons 3 \text{SiH}_4(g) + 6 \text{Cl}_2(g) \) \( K_C = \) ______

2. Consider the reaction: \( \text{CO}_2(g) + \text{H}_2(g) \rightleftharpoons \text{CO}(g) + \text{H}_2\text{O}(g) \), for which \( K_C = 6.8 \) for this reaction at 550 K.

A) If a mixture had the following concentrations, it would not be at equilibrium. Will it proceed to the right or the left? Provide a mathematical justification of your answer.

\[
[\text{CO}_2] = [\text{H}_2] = 0.45 \text{ M} \\
[\text{CO}] = [\text{H}_2\text{O}] = 0.71 \text{ M}
\]

B) What will be the concentrations of the new equilibrium condition?

3. Consider the reaction: \( \text{N}_2(g) + 3 \text{Cl}_2(g) \rightleftharpoons 2 \text{NCl}_3(g) \).

A) At 115\( ^\circ \)C, nitrogen and chlorine gas are mixed in a fixed volume container, with \( [\text{N}_2]_0 = 4.50 \text{ M} \) and \( [\text{Cl}_2]_0 = 2.00 \text{ M} \), and no \( \text{NCl}_3 \). If the equilibrium concentration of nitrogen trichloride is \( [\text{NCl}_3] = 1.00 \text{ M} \), what is the value of \( K_C \) for the reaction?

B) What is the value for \( K_P \) at the same temperature?