1. Phosgene (COCl₂) is a chemical warfare agent that decomposes by the reaction:

\[
\text{COCl}_2(g) \rightleftharpoons \text{CO}(g) + \text{Cl}_2(g) \quad K = 8.3 \times 10^{-4} \text{ (at 360°C)}
\]

Calculate the [CO], [Cl₂], and [COCl₂] when 10.0 mol of phosgene decompose at 360°C and reach equilibrium in a 5.00-L flask.

\[
[\text{CO}] = [\text{Cl}_2] = x = 0.041 \text{ M} \\
[\text{COCl}_2] = 2.00 \text{ M} - x = 1.96 \text{ M}
\]

2. For the reaction in question 1, predict whether the reaction will shift toward products or reactants when the following stress to the system is applied.

(a) COCl₂ (g) is added. **Shift toward products**
(b) Cl₂ (g) is added. **Shift toward reactants**

3. The decomposition of nitrosyl bromide (NOBr) proceeds by the following reaction:

\[
\text{2NOBr} (g) \rightleftharpoons \text{2NO} (s) + \text{Br}_2 (g) \quad K = 0.0142
\]

Calculate the [NOBr], [NO], and [Br₂] when 10.0 mol of nitrosyl bromine is placed in a 5.00-L closed vessel and allowed to decompose.

\[
[\text{NO}] = 0.415 \text{ M} \\
[\text{Br}_2] = 0.207 \text{ M} \\
[\text{NOBr}] = 1.585 \text{ M}
\]
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