1. The following equilibrium pressures were observed for the reaction

\[ \text{N}_2(g) + 3 \text{H}_2(g) \rightleftharpoons 2 \text{NH}_3(g) \]

\[ P_{\text{NH}_3} = 3.1 \times 10^{-2} \text{ atm} \]
\[ P_{\text{N}_2} = 8.5 \times 10^{-1} \text{ atm} \]
\[ P_{\text{H}_2} = 3.1 \times 10^{-3} \text{ atm} \]

a) Calculate the value of \( K_p \) for the reaction at 25°C.
b) Calculate the value of \( K_c \) for the reaction at 25°C.

2. The equilibrium constant is 0.900 at 25°C for the reaction

\[ \text{H}_2\text{O}(g) + \text{Cl}_2\text{O}(g) \rightleftharpoons 2\text{HOCl}(g) \]

a) For which of the following sets of conditions is the system at equilibrium?
b) For those which are not at equilibrium, in which direction will the system shift?

A) A 1.0 L flask contains 1.0 mol HOCl, 0.10 mol Cl₂O, and 0.10 mol H₂O

B) A 2.0 L flask contains 0.084 mol HOCl, 0.080 mol Cl₂O, and 0.98 mol H₂O

C) A 3.0 L flask contains 0.25 mol HOCl, 0.0010 mol Cl₂O, and 0.56 mol H₂O