

## Answer on Question #77302, Chemistry / General Chemistry

Consider the following reaction :  $\text{SO}_3(\text{g}) + \text{Cl}_2(\text{l}) \rightleftharpoons \text{O}_2(\text{g}) + \text{SOCl}_2(\text{g})$ , where all gases except chlorine (a liquid) at equilibrium. What will happen to the concentration of  $\text{SOCl}_2$  if

- A)  $\text{SO}_3$  is added
- B)  $\text{O}_2$  is added
- C)  $\text{Cl}_2$  is added

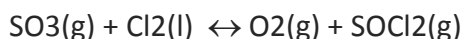
### Solution

We should use Le Chatelier's principle to predict what effect a change in concentration will have on the position of the equilibrium in a chemical reaction.

Le Chatelier's Principle: when an external stress (change in pressure, temperature or concentration) is applied to a system in chemical equilibrium, the equilibrium will change in such a way as to reduce the effect of the stress.

If the concentration of one (or more) of the reactants or products is increased the equilibrium will shift to decrease the concentration.

For the reaction observed:



- A) When  $\text{SO}_3$  is added the equilibrium will shift to decrease the concentration of  $\text{SO}_3$ , consequently, the concentration of  $\text{O}_2$  and  $\text{SOCl}_2$  will increase.
- B) When  $\text{O}_2$  is added the equilibrium will shift to decrease the concentration of  $\text{O}_2$  (the product), consequently the concentrations of the products will decrease (concentration of  $\text{SOCl}_2$  will decrease) and the concentrations of the reactants increase ( $\text{O}_2$ )
- C) When  $\text{Cl}_2$  is added the equilibrium will not shift as chlorine is a pure liquid and is not at equilibrium with other gaseous substances of this reaction. Consequently the concentration of  $\text{SOCl}_2$  will not change.

**Answer:** A) The concentration of  $\text{SOCl}_2$  will increase

B) The concentration of  $\text{SOCl}_2$  will decrease

C) The concentration of  $\text{SOCl}_2$  will not change

