

Le Chatelier's Principle (Chemistry 12)

A Use Le Chatelier's Principle to describe the effect of the following changes on the position of the equilibrium.

- 1) The equilibrium is: $\text{N}_2\text{O}_3(\text{g}) \rightleftharpoons \text{NO}(\text{g}) + \text{NO}_2(\text{g})$.
 a) increase the $[\text{NO}]$ c) increase the pressure by decreasing the volume
 b) increase the $[\text{N}_2\text{O}_3]$ d) add a catalyst
- 2) The equilibrium is: $2 \text{H}_2(\text{g}) + 2 \text{NO}(\text{g}) \rightleftharpoons \text{N}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{g})$.
 a) decrease the $[\text{N}_2]$ c) decrease the pressure by increasing the volume
 b) decrease the $[\text{NO}]$
- 3) The equilibrium is: $2 \text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2 \text{CO}_2(\text{g}) + 566 \text{ kJ}$.
 a) increase the temperature c) introduce a catalyst
 b) increase the $[\text{O}_2]$
- 4) The equilibrium is: $\text{I}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2 \text{ICl}(\text{g})$; $\Delta H = 35.0 \text{ kJ}$.
 a) decrease the temperature c) increase the pressure by decreasing the volume
 b) decrease the $[\text{Cl}_2]$

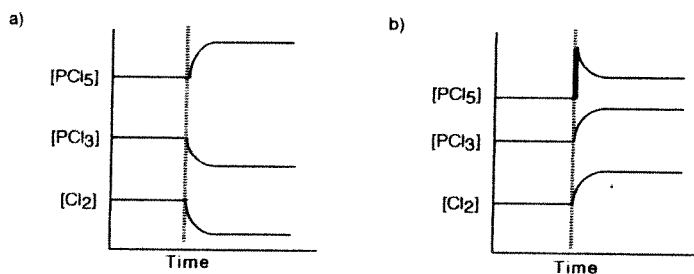
B Show the following situations graphically.

NOTE: In Exercises 24–26 the relative positioning of the molecules is not relevant; simply place them on the graph so the reactants are separated from the products. The only thing required here is to show what an individual substance's concentration does after the conditions change.

- 5) The equilibrium is: $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2 \text{HI}(\text{g}) + 52 \text{ kJ}$.
 a) increase the temperature c) decrease the volume
 b) inject some $\text{H}_2(\text{g})$ d) add a catalyst
- 6) The equilibrium is: $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2 \text{SO}_3(\text{g})$; $\Delta H = -197 \text{ kJ}$.
 a) inject some $\text{SO}_2(\text{g})$ c) decrease the temperature
 b) increase the volume d) increase the $[\text{SO}_3]$
- 7) The equilibrium is: $\text{CO}(\text{g}) + \text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{CO}_2(\text{g}) + \text{H}_2(\text{g})$; $\Delta H = -41 \text{ kJ}$.
 a) inject some $\text{CO}_2(\text{g})$
 b) remove some of the $\text{H}_2\text{O}(\text{g})$ with a very rapidly acting drying agent
 c) increase the temperature
 d) decrease the pressure by increasing the volume

C Interpret the following graphs in terms of the changes which must have been imposed on the equilibrium.

8) The equilibrium is: $\text{PCl}_5(\text{g}) + 92.5 \text{ kJ} \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$.



9) The equilibrium is: $\text{H}_2\text{O}(\text{g}) + \text{Cl}_2\text{O}(\text{g}) \rightleftharpoons 2 \text{HOCl}(\text{g}) + 70 \text{ kJ}$.

