Le Châtelier's Principle

According to Le Châtelier's Principle, when a system at equilibrium is subjected to a stress, the equilibrium will shift in the direction that will minimize the effect of the stress.

For each of the following systems in chemical equilibrium, predict the effect of the given change on the concentration of the specific substances. Write **I** if the concentration increases, **D** if the concentration decreases or **R** if the concentration remains the same.

System #1: $\mathbf{2\ NH_{3(g)} \rightleftarrows N_{2(g)} + 3\ H_{2(g)}}$ $\mathbf{\Delta H = +92\ kJ}$

1. Stress: Increase the $[N_2]$. Shifts to the _____

What is the effect on the:

A) $[NH_{3(g)}]$? 1A _____

B) $[H_{2(g)}]$? 1B_____

2. Stress: Increase Temperature. Shifts to the _____

What is the effect on the:

A) $[N_{2(g)}]$? 2A _____

B) $[NH_{3(g)}]$? 2B _____

3. Stress: Increase Pressure/Decrease Volume. Shifts to the _____

What is the effect on the:

A) $[N_{2(g)}]$? 3A _____

B) $[NH_{3(g)}]$ 3B _____

System #2: $\mathbf{2\ NO_{(g)} \rightleftarrows N_{2(g)} + O_{2(g)} + heat}$

4. Stress: Decrease $[O_{2(g)}]$. Shifts to the _____

What is the effect on the:

A) $[N_{2(g)}]$ 4A_____

B) [NO] 4B_____

5. **Stress:** Decrease Temperature. Shifts to the _____

What is the effect on the:

A) $[O_{2(g)}]$? 5A_____

B) $[NO_{(g)}]$? 5B_____

6. Stress: Increase Pressure. Shifts to the _____

What is the effect on the:

A) number of moles of $O_{2(g)}$? 6A_____

B) number of moles of $NO_{(g)}$? 6B_____

System #3: $\mathbf{2\ SO_{2(g)} + O_{2(g)} \rightleftarrows 2\ SO_{3(g)}}$ $\mathbf{\Delta H = -1384\ kJ}$

7. Stress: Increase $[SO_{2(g)}]$. Shifts to the _____

What is the effect on the:

A) $[O_{2(g)}]$? 7A _____

B) $[SO_{3(g)}]$? 7B _____

8. Stress: Increase Temperature. Shifts to the _____

What is the effect on:

A) $[SO_{2(g)}]$? 8A _____

B) $[SO_{3(g)}]$? 8B _____

9. Stress: Decrease Pressure/Increase Volume. Shifts to the _____

What is the effect on the:

A) number of moles of O_2 ? 9A _____

B) number of moles of $SO_{3(g)}$? 9B _____

System #4: $\mathbf{heat + 2\ KClO_{3(s)} \rightleftharpoons 2\ KCl_{(s)} + 3\ O_{2(g)}}$

10. Stress: Add $KClO_{3(s)}$. Shifts to the _____

What is the effect on the:

A) $[O_{2(g)}]$? 10A _____

B) $[KCl_{(s)}]$? 10B _____

11. Stress: Increase Temperature. Shifts to the _____

What is the effect on:

A) $[O_{2(g)}]$? 11A _____

B) $[KClO_{3(s)}]$? 11B _____

12. Stress: Decrease Pressure/Increase Volume. Shifts to the _____

What is the effect on the:

A) number of moles of O_2 ? 12A _____

B) **mass** of $KClO_{3(s)}$? 12B _____