

Name: _____ Date: _____ Period: _____

Le Chatelier's Principle Worksheet

When you decrease the volume of a reaction vessel, you increase the pressure. This causes a reaction at equilibrium to shift to the side with the smallest number of moles. If the reaction has an equal number of moles of reactants and products, changing the volume of the reaction vessel causes no change in the equilibrium.

Changing the temperature of a reaction at equilibrium alters both the equilibrium constant and the equilibrium position. When a reaction is exothermic, which means it releases energy, lowering the temperature shifts the equilibrium to the right because the forward reaction liberates heat and removes the stress.

1. What does "equilibrium" mean? forward reaction rate and backward reaction rate are the same

2. What does Le Chatelier's Principle say? If a stress is applied to a system at equilibrium, the system shifts in the direction that relieves the stress.

For each reaction below, state the direction (left-reactants or right-products), in which the equilibrium will shift when the indicated substance is added. Identify one other way in which the reaction could be shifted in the same direction you indicated.

3. Reaction: $\text{N}_{2(g)} + 3\text{H}_{2(g)} \leftrightarrow 2\text{NH}_{3(g)}$; NH_3 added

4. Reaction: $\text{H}_{2(g)} + \text{I}_{2(g)} \leftrightarrow 2\text{HI}_{(g)}$; H_2 added

5. _____

6. Reaction: $\text{CO}_{(g)} + \text{H}_2\text{O} \leftrightarrow \text{CO}_{2(g)} + \text{H}_{2(g)}$; H_2O added

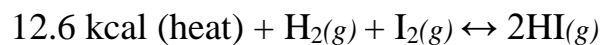
7. _____

Complete the following charts by writing left, right, or none for the equilibrium shift, and decreases, increases, or remains the same for the concentrations of reactants and products.



| Stress | Equilibrium Shift | [N ₂] | [H ₂] | [NH ₃] |
|--------------------------|-------------------|-------------------|-------------------|--------------------|
| 7. Add N ₂ | | | | |
| 8. Remove H ₂ | | | | |
| 9. Add NH ₃ | | | | |
| 10. Increase Temperature | | | | |
| 11. Increase Pressure | | | | |

| | | | | |
|---------------------|--|--|--|--|
| 12. Increase Volume | | | | |
|---------------------|--|--|--|--|



| Stress | Equilibrium Shift | [H ₂] | [I ₂] | [HI] |
|---------------------------|-------------------|-------------------|-------------------|------|
| 13. Add I ₂ | | | | |
| 14. Remove H ₂ | | | | |
| 15. Add HI | | | | |
| 16. Increase Temperature | | | | |
| 17. Decrease Pressure | | | | |
| 18. Decrease Volume | | | | |



| Stress | Equilibrium Shift | [CaCO ₃] | [CaO] | [CO ₂] |
|-------------------------------------|-------------------|----------------------|-------|--------------------|
| 19. CaO is added | | | | |
| 20. CO ₂ is added | | | | |
| 21. CaCO ₃ is removed | | | | |
| 22. Temp is decreased | | | | |
| 23. [CO ₂] is decreased | | | | |