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: $N_{2(g)} + 3H_{2(g)} \leftrightarrow 2NH_{3\ (g)}$; NH_3 added

   ____

4. Reaction: $H_{2(g)} + I_{2(g)} \leftrightarrow 2HI_{(g)}$; H_2 added
5. ____
6. Reaction: $CO_{(g)} + H_2O \leftrightarrow CO_{2(g)} + H_{2(g)}$; 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.

$$N_2(g) + 3H_2(g) \leftrightarrow 2NH_3(g) + 22.0 \text{ kcal (heat)}$$

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				

12.6 kcal (heat) + $H_{2}(g)$ + $I_{2}(g) \leftrightarrow 2HI(g)$

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				

$CaCO_{3}(s)$ + 170 kJ (heat) $\leftrightarrow CaO(s) + CO_{2}(g)$

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				