Worksheet: Le Chatelier's Principle **Name______________**

If a system at equilibrium is subjected to a ____________ , the equilibrium is displaced in the direction that relieves the ____________.

- A stress is defined as any change which could affect the ____________ of either or both the forward and/or reverse reaction.
- When, because of an applied stress, the forward reaction is faster than the reverse reaction, the system is said to shift to the (right, left). As a result, the [products] will (increase, decrease) and the [reactants] will (increase, decrease).
- When, because of an applied stress, the reverse reaction is faster than the forward reaction, the system is said to shift to the (right, left). As a result, the [products] will (increase, decrease) and the [reactants] will (increase, decrease).

In simpler terms: If anything is added to a system at ____________, the system will try to consume whatever was ____________. If anything is removed from a system at equilibrium, the system will try to replace whatever was ____________. So, the reaction is favored away from what is (added, removed) and toward what is (added, removed).

1. In the following reaction, will the $[H_2]$ increase or decrease when equilibrium is reestablished after these stresses are applied?

$$N_2\,(g) + 3\,H_2\,(g) \rightleftharpoons 2\,NH_3\,(g) + 22\text{ kJ}$$

$NH_3(g)$ is added	________	*$N_2(g)$ is removed*	________
pressure is increased	________	*temperature is increased*	________

2. Note reaction: $2\,NO\,(g) + H_2\,(g) \rightleftharpoons N_2O\,(g) + H_2O\,(g) + 36\text{ kJ}$

   In which direction, left or right, will the equilibrium shift if the following changes are made?

NO is added	________	the system is cooled	________
H_2 is removed	________	pressure is increased	________
N_2O is added	________	H_2 is removed	________

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3. In this reaction: $CO_2\ (g) + H_2\ (g) + \text{heat} \rightleftharpoons CO\ (g) + H_2O\ (g)$

   a. Is heat absorbed or released by the forward reaction?
   ____

   b. In which direction will the equilibrium shift if these changes are made?

CO is added	_________	temperature is increased	_________
CO_2 is added	_________	system is cooled	_________
H_2 is removed	_________	pressure is increased	_________
catalyst is added	_________		

4. In this reaction: $2\ NO\ (g) + H_2\ (g) \rightleftharpoons N_2O\ (g) + H_2O\ (g) + \text{heat}$

What will happen to the $[H_2O]$ when equilibrium is reestablished after these stresses are applied?

temperature is increased	_________
a catalyst is added	_________
pressure is decreased	_________
NO is added	_________
N_2O is removed	_________

5. How would an increase in pressure affect the $[H_2]$ in the following reactions?

   $2\ H_2\ (g) + O_2\ (g) \rightleftharpoons 2\ H_2O\ (g)$ __________

   $4\ H_2\ (g) + Fe_3O_4\ (s) \rightleftharpoons 3\ Fe\ (s) + 4\ H_2O\ (l)$ __________

   $H_2\ (g) + Cl_2\ (g) \rightleftharpoons 2\ HCl\ (g)$ __________