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Unit 10F Practice Problems II
Le Chatelier's Principle

Name:

Date:

Fill in the blanks or circle the correct answer from the choices within the parentheses.

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

   - 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 equilibrium, the system will consume whatever was added. If anything is removed from a system at equilibrium, the system will replace whatever was removed. So, the reaction is favored away from what is added and toward what is removed.

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

$$N_2\,(g) + 3\,H_2\,(g) \leftrightarrows 2\,NH_3\,(g) + 22\ kJ$$

$NH_3(g)$ is added _____ $N_2(g)$ is removed _____

pressure is increased _____ temperature is increased _____

3. Note reaction: $2\,NO\,(g) + H_2\,(g) \leftrightarrows N_2O\,(g) + H_2O\,(g) + 36\ kJ$
   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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4. In this reaction: CO_2 (g) + H_2(g) + heat ⇆ 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 _____

5. In this reaction: 2 NO (g) + H_2 (g) ⇆ N_2O (g) + H_2O (g) + heat
   What will happen to the [H_2O] when equilibrium is reestablished after these stresses are applied?

temperature is increased _____ NO is added _____

a catalyst is added _____ N_2O is removed _____

pressure is decreased _____

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

$2H_2$ (g) + O_2 (g) ⇆ 2 H_2O (g) _____

4 H_2(g) + Fe_3O_4 (s) ⇆ 3 Fe (s) + 4 H_2O (l) _____

H_2 (g) + Cl_2 (g) ⇆ 2 HCl (g) _____