Name _____   Period_____

Le Chatelier's Principle Practice Problems
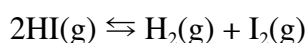
1) In the equilibrium reaction:

$$4HCl(g) + O_2(g) \leftrightarrows 2H_2O(g) + 2Cl_2(g) + 114.4 \text{ kJ}$$

Predict the direction of equilibrium shift if the following changes occur.

a) oxygen is added

b) HCl is removed

c) H_2O is added

d) Cl_2 is removed

2) In the equilibrium reaction:

$$2HI(g) \leftrightarrows H_2(g) + I_2(g)$$

Predict the direction of equilibrium shift if the following changes occur.

a) HI is added

b) HI is removed

c) H_2 is added

d) I_2 is added

3) In the equilibrium reaction:

$$4HCl(g) + O_2(g) \leftrightarrows 2H_2O(g) + 2Cl_2(g) + 114.4 \text{ kJ}$$

Predict the direction of equilibrium shift if the following changes occur.

a) the pressure in increased

b) energy is added

c) volume of the system is increased

d) it is placed in an ice bath

4) Methanol can be manufactured using the following equilibrium reaction:

$$CO(g) + 2H_2(g) \leftrightarrows CH_3OH(g) + \text{energy}$$
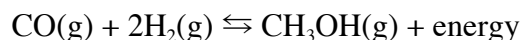
Predict the direction of equilibrium shift if the following changes occur.

a) a decrease in temperature

b) an increase in pressure
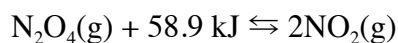
c) addition of $H_2(g)$

d) addition of a catalyst

5) In the equilibrium reaction:

$$2NO(g) + O_2(g) \leftrightharpoons 2NO_2(g) + 114.6 \text{ kJ}$$
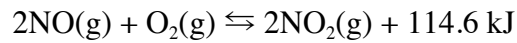
What will be the change in the equilibrium concentration of NO_2 under each of the following conditions?

a) O_2 is added

b) energy is added

c) NO is removed

d) a catalyst is added

e) it is placed in an ice bath

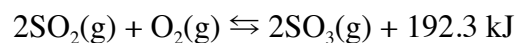f) the volume is increased

g) O_2 is removed

h) NO_2 is added

6) For the following reaction:

$$N_2O_4(g) + 58.9 \text{ kJ} \leftrightharpoons 2NO_2(g)$$

how will the equilibrium concentration of NO_2 be affected by the following conditions?

a) an increase in pressure

b) an increase in temperature

c) the addition of a catalyst

d) a decrease in pressure

e) increase in volume

f) remove N_2O_4

g) add NO_2

h) add Helium

7) Suggest four ways to increase the concentration of SO_3 in the following equilibrium:

$$2SO_2(g) + O_2(g) \leftrightharpoons 2SO_3(g) + 192.3 \text{ kJ}$$

a)

b)

c)

d)