

## Problems of Equilibria: Le Châtelier's principle

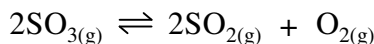
---

1) Given the reaction:



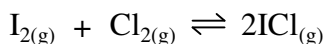
When the temperature of the equilibrium is increased, what will be the effect on the equilibrium position?

2) Consider the reaction:



Predict the effect of decreasing the pressure on the position of the equilibrium.

3) Consider the following reaction:



What would happen to the position of the equilibrium when  $\text{I}_{2(g)}$  is added to the equilibrium system?

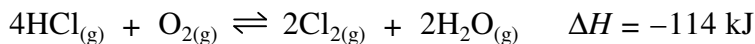
4) Consider the reaction:



What would happen to the position of the equilibrium when the following changes are made to the equilibrium system?

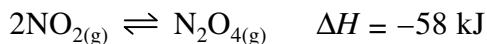
- a) Increase the temperature of the system.
- b) Increase the pressure on the system.
- c)  $\text{Cl}_{2(g)}$  is removed from the system.

5) Consider the following reaction:



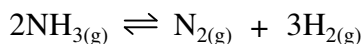
Find out the changes in temperature and pressure that cause the equilibrium to shift to the right.

6) Given the reaction:



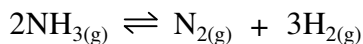
When the temperature of the equilibrium is increased, what will be the effect on the equilibrium position?

7) Given the reaction:



Predict the effect of increasing the pressure on the position of the equilibrium.

8) Consider the following reaction:



What would happen to the position of the equilibrium when  $\text{NH}_{3(g)}$  is added to the equilibrium system?

## Problems of Equilibria: Le Châtelier's principle

---

### Answers:

- 1) Shifts right (toward products).  
An increase in temperature favors the endothermic reaction.
- 2) Shifts right (toward products).  
A decrease in pressure increase the number of moles of gas.
- 3) Shifts right (toward products).  
To counteract the increased concentration of  $I_{2(g)}$ .
- 4)
  - a) Shifts right (toward products).  
An increase in temperature favors the endothermic reaction.
  - b) Shifts right (toward products).  
An increase in pressure decrease the number of moles of gas.
  - c) Shifts left (toward reactants).  
To counteract the decreased concentration of  $Cl_{2(g)}$ .
- 5) Decrease the temperature to favor the exothermic reaction.  
Increase the pressure to decrease the number of moles of gas.
- 6) Shifts left (toward reactants).  
An increase in temperature favors the endothermic reaction.
- 7) Shifts left (toward reactants).  
An increase in pressure decrease the number of moles of gas.
- 8) Shifts right (toward products).  
To counteract the increased concentration of  $NH_{3(g)}$ .