Quiz B3: Le Chatelier's Principle

Name:
Block:

1. Consider the following reaction: $2SO_{2(g)} + O_{2(g)} \rightleftarrows 2SO_{3(g)}$ $\Delta H = -197$ kJ/mol
Which of the following will not shift the equilibrium to the right?
   A. Adding more O_2
   B. **Adding a catalyst**
   C. Increasing the pressure
   D. Lowing the temperature

2. Consider the following equilibrium system: $CaCO_{3(s)} \rightleftarrows CaO_{(s)} + CO_{2(g)}$
Which one of the following changes would cause the above system to shift left?
   A. Add more CaO
   B. Remove $CaCO_3$
   C. **Decrease volume**
   D. Increase surface area of CaO

3. Consider the following equilibrium: $SO_2Cl_{2(g)}$ + energy $\rightleftarrows SO_{2(g)} + Cl_{2(g)}$
When the temperature is decreased, the equilibrium shifts
   A. **Left and [SO_2Cl_2] increases**
   B. Left and [SO_2Cl_2] decreases
   C. Right and [SO_2Cl_2] increases
   D. Right and [SO_2Cl_2] decreases

4. Consider the following equilibrium: $2SO_{3(g)} \rightleftarrows 2SO_{2(g)} + O_{2(g)}$
The volume of the system is decreased at a constant temperature. A new state of equilibrium is established by a shift of the original equilibrium to the:
   A. **Left and [SO_3] increases**
   B. Right and [SO_3] decreases
   C. Left and [SO_3] remains unchanged
   D. Right and [SO_3] remains unchanged

5. Consider the following equilibrium system: $CO_{2(g)} + H_{2(g)} \rightleftarrows CO_{(g)} + H_2O_{(g)}$
Which of the following, when added to the system above, would result in a net decrease in [H_2O]?
   A. CO_2
   B. H_2
   C. **CO**
   D. H_2

6. Consider the following equilibrium: $C_{(s)} + 2H_{2(g)} \rightleftarrows CH_{4(g)} + 74$ kJ
When a small amount of solid C is added to the system
   A. [H_2] decreases
   B. [CH_4] increases
   C. The temperature increases
   D. **All concentrations remain constant**

7. Consider the following equilibrium: $2NO_{(g)} + Cl_{2(g)} \rightleftarrows 2NOCl_{(g)}$
At constant temperature and volume, Cl_2 is added to the above equilibrium system.
As equilibrium re-establishes, the
A. [NOCl] will decrease
B. The temperature increases
C. [NO] will increase
D. **[NOCl] will increase**

8. Consider the following equilibrium: $Cl_2O_{7(g)} + 8H_{2(g)} \rightleftarrows 2HCl_{(g)} + 7H_2O_{(g)}$
Which of the following would increase the number of moles of HCl?
A. Increase [H_2O]
B. **Increase [Cl_2O_7]**
C. Increase total pressure
D. Increase volume of the system

9. Consider the following equilibrium: $2HI_{(g)} \rightleftarrows H_{2(g)} + I_{2(g)}$ $\Delta H = -68kJ$
Which of the following would cause the equilibrium to shift right?
A. Increasing the volume
B. Decreasing the volume
C. Increasing the temperature
D. **Decreasing the temperature**

10. A 1.00 L flask contains a gaseous equilibrium system. The addition of reactants to this flask results in a
A. Shift to the left and decrease in the concentration of products
B. Shift to the left and increase in the concentration of products
C. Shift to the right and decrease in the concentration of products
D. **Shift to the right and increase in the concentration of products**

11. When the temperature of an equilibrium system is increased, the equilibrium always shifts to favor the
A. Exothermic reaction
B. **Endothermic reaction**
C. Formation of products
D. Formation of reactants

12. An equilibrium system shifts left when the
A. Rate of the forward reaction is equal to the rate of the reverse reaction
B. **Rate of the forward reaction is less than the rate of the reverse reaction**
C. Rate of the forward reaction is greater than the rate of the reverse reaction
A. Rate of the forward reaction and the rate of the reverse reaction are constant

13. Consider the following equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftarrows 2SO_{3(g)} \quad \Delta H = -198$ kJ
There will be no shift in the equilibrium when
A. More O_2 is added
B. **Catalyst is added**
C. The volume is increased
D. The temperature is increased

14. Consider the following equilibrium: $2NOCl_{(g)} \rightleftarrows 2NO_{(g)} + Cl_{2(g)}$
In a 1.0 L container at equilibrium there are 1.0 mol NOCl, 0.70 mol NO and 0.40 mol Cl_2. At constant temperature and volume, 0.10 mol NOCl is added. The concentrations in the "new" equilibrium in comparison to the concentrations in the "old" equilibrium are:

	[NOCl]	[NO]	[Cl_2]
A.	new = old	new = old	new = old
B.	**new > old**	**new > old**	**new > old**
C.	new < old	new < old	new > old
D.	new < old	new > old	new > old

15. Consider the following equilibrium: $N_2O_{4(g)} + 58$ kJ $\rightleftarrows 2NO_{2(g)}$
The equilibrium shifts right when

A. NO_2 is added
B. N_2O_4 is removed
C. The temperature is decreased
D. **The volume of the system is increased**

16. Consider the following equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftarrows 2SO_{3(g)}$
Which of the following will shift the equilibrium to the right?

I. Adding more O_2
II. Adding more SO_3
III. Adding a catalyst

A. **I only**
B. III only
C. I and II only
D. II and III only

17. Consider the following equilibrium: energy + $2NaClO_{3(s)} \rightleftharpoons 2NaCl_{(s)} + 3O_{2(g)}$
Which of the following will cause a shift to the left?

A. **adding more O_2**
B. adding more NaCl
C. removing some $NaClO_3$
D. increasing the temperature

18. Consider the following equilibrium: $CO_{(g)} + 2H_{2(g)} \rightleftharpoons CH_3OH_{(g)}$ + energy
Which of the factors below would decrease the concentration of CH_3OH at equilibrium?

A. an addition of CO
B. an increase in H_2
C. a decrease in the temperature
D. **an increase in the temperature**

19. Consider the following equilibrium: energy + $2NaClO_{3(s)} \rightleftharpoons 2NaCl_{(s)} + 3O_{2(g)}$
Which of the following will cause a shift to the right?

A. adding more O_2
B. adding more NaCl
C. removing some $NaCl_{(s)}$
D. **increasing the temperature**

20. Consider the following equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftarrows 2SO_{3(g)}$
Which of the following will shift the equilibrium to the left?

I. Removing O_2
II. Adding more SO_3
III. Adding a catalyst

A. I only
B. III only
C. **I and II only**
D. II and III only

Learning Goal	Question	I'm a Star ★	I've got it! ☺	I'm almost there…	I'll keep working on it
B3: Apply Le Chatelier's principle to the shifting of equilibrium.	1-20				

Quiz B3: Le Chatelier's Principle

Name:
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1. Consider the following equilibrium system: $CO_{2(g)} + H_{2(g)} \rightleftarrows CO_{(g)} + H_2O_{(g)}$
Which of the following, when removed from the system above, would result in a net increase in $[H_2O]$?
A. CO_2
B. H_2
C. **CO**
D. H_2

2. Consider the following equilibrium: $C_{(s)} + 2H_{2(g)} \rightleftarrows CH_{4(g)} + 74\ kJ$
When a small amount of solid C is added to the system
A. $[H_2]$ decreases
B. $[CH_4]$ increases
C. The temperature increases
D. **All concentrations remain constant**

3. Consider the following reaction: $2SO_{2(g)} + O_{2(g)} \rightleftarrows 2SO_{3(g)} \quad \Delta H = -197\ kJ/mol$
Which of the following will not shift the equilibrium to the left?
A. removing O_2
B. **Adding a catalyst**
C. decreasing the pressure
D. increasing the temperature

4. Consider the following equilibrium system: $CaCO_{3(s)} \rightleftarrows CaO_{(s)} + CO_{2(g)}$
Which one of the following changes would cause the above system to shift right?
A. Remove CaO
B. Add more $CaCO_3$
C. **increase volume**
D. Increase surface area of CaO

5. Consider the following equilibrium: $SO_2Cl_{2(g)} + \text{energy} \rightleftarrows SO_{2(g)} + Cl_{2(g)}$
When the temperature is increased, the equilibrium shifts
A. Left and $[SO_2Cl_2]$ increases
B. Left and $[SO_2Cl_2]$ decreases
C. Right and $[SO_2Cl_2]$ increases
D. **Right and $[SO_2Cl_2]$ decreases**

6. Consider the following equilibrium: $2SO_{3(g)} \rightleftarrows 2SO_{2(g)} + O_{2(g)}$
The volume of the system is increased at a constant temperature. A new state of equilibrium is established by a shift of the original equilibrium to the:
A. Left and $[SO_3]$ increases
B. **Right and $[SO_3]$ decreases**
C. Left and $[SO_3]$ remains unchanged
D. Right and $[SO_3]$ remains unchanged

7. Consider the following equilibrium: $2NO_{(g)} + Cl_{2(g)} \rightleftarrows 2NOCl_{(g)}$
At constant temperature and volume, Cl_2 is added to the above equilibrium system. As equilibrium re-establishes, the
A. **[NOCl] will increase**
B. The temperature decreases
C. [NO] will increase
D. [NOCl] will remain constant

8. A 1.00 L flask contains a gaseous equilibrium system. The addition of reactants to this flask results in a
A. Shift to the left and decrease in the concentration of products
B. Shift to the left and increase in the concentration of products
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D. **Shift to the right and increase in the concentration of products**

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Which of the following would increase the number of moles of HCl?
A. decrease total pressure
B. **increase [Cl_2O_7]**
C. increase [H_2O]
D. decrease volume of the system

12. Consider the following equilibrium: $2HI_{(g)} \rightleftarrows H_{2(g)} + I_{2(g)}$ $\Delta H = -68kJ$
Which of the following would cause the equilibrium to shift right?
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B. Decreasing the volume
C. Increasing the temperature
D. **Decreasing the temperature**

13. Consider the following equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftarrows 2SO_{3(g)} \quad \Delta H = -198$ kJ
There will be no shift in the equilibrium when
A. The temperature is increased
B. The volume is increased
C. **Catalyst is added**
D. More O_2 is added

14. Consider the following equilibrium: $2NOCl_{(g)} \rightleftarrows 2NO_{(g)} + Cl_{2(g)}$
In a 1.0 L container at equilibrium there are 1.0 mol NOCl, 0.70 mol NO and 0.40 mol Cl_2. At constant temperature and volume, 0.10 mol NO is added. The concentrations in the "new" equilibrium in comparison to the concentrations in the "old" equilibrium are:

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B.	**new > old**	**new > old**	**new < old**
C.	new < old	new < old	new > old
D.	new < old	new > old	new > old

15. Consider the following equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftarrows 2SO_{3(g)}$
Which of the following will shift the equilibrium to the right?

I. Adding more SO_3
II. Adding more SO_2
III. Adding a catalyst

A. **II only**
B. III only
C. I and II only
D. II and III only

16. Consider the following equilibrium: $N_2O_{4(g)} + 58$ kJ $\rightleftarrows 2NO_{2(g)}$
The equilibrium shifts left when
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B. **N_2O_4 is removed**
C. The temperature is increased
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Which of the factors below would increase the concentration of CH_3OH at equilibrium?

A. **an addition of CO**
B. a decrease in H_2
C. an increase in the temperature
D. increase in volume

20. Consider the following equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftarrows 2SO_{3(g)}$
Which of the following will shift the equilibrium to the left?

I. Adding more SO_3
II. Adding a catalyst
III. Removing O_2

A. I only
B. III only
C. **I and III only**
D. II and III only

VB

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B3: Apply Le Chatelier's principle to the shifting of equilibrium.	1-20				