**Acid Unit: Le Chatelier’s principle**

1. The following reaction takes place in a closed container.

**2SO2 (g) + O2(g) 🡨 🡪 2SO3(g)**

Four stresses are applied to the reaction.

|  |  |
| --- | --- |
| 1 | Volume of reacting vessel is decreased  |
| 2 | Oxygen is removed from the reaction vessel |
| 3 | O2(g) is added to the container |
| 4 | SO3(g) is vented from the container |

The stresses that would cause the equilibrium to **shift to the products** is/are \_\_\_\_

|  |  |
| --- | --- |
| a | 1,2,4 |
| b | 1,3,4 |
| c | 2, 4 |
| d | 3 |

1. For the reaction 2H2(g) + O2(g) 🡨 🡪 2H2O(g), the reaction vessel is doubled in size.

Which of the statements below is TRUE?

|  |  |
| --- | --- |
| a | The pressure is decreased and the Keq is increased. |
| b | The pressure is decreased and the Keq is decreased. |
| c | The pressure is decreased and the Keq is unchanged |
| d | The pressure is increased and the Keq is unchanged |

1. Consider the reaction given below.

**5R(g) + 3M(g) 🡨 🡪 2Q(g) + 4D(g) + 14.7 kJ**

Choose the stress that will shift the reaction to **the products** and keep the **Keq unchanged.**

|  |  |
| --- | --- |
| a | Addition of a catalyst. |
| b | Increase the volume of the reacting vessel |
| c | Vent Q(g) from the reacting vessel.  |
| d | Remove heat from the reacting vessel.  |

1. Consider the reaction given below.

**5R(g) + 3M(g) 🡨 🡪 2Q(g) + 4D(g) + 14.7 kJ**

Choose the stress that will shift the reaction to the reactants and allow the Keq to change.

|  |  |
| --- | --- |
| a | Add heat to the system.  |
| b | Increase the size of the reaction vessel. |
| c | Add D(g) to the system |
| d | Remove R(g) from the system. |

1. Consider the reaction below:

2NO2(g) 🡨 🡪 N2O4(g) + 55.3 kJ

Which of the following stresses would increase the production of N2O4(g)?

|  |  |
| --- | --- |
| a | add a catalyst |
| b | increase the volume of the container |
| c | decrease the volume of the container |
| d | Remove NO2(g) |

1. Catalysts are substances that are used industrially or within our bodies to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | alter the equilibrium constant |
| b | shift the position of the equilibrium system |
| c | provide an alternate pathway for chemical changes |
| d | lower the number of effective collisions between molecules |

1. Consider the following reaction

**H2O(l) + HBb(aq) 🡨 🡪 H3O+(aq) + Bb-(aq)**

 Choose the correct statement below.

|  |  |
| --- | --- |
| a | When KOH(aq) is added, the [HBb(aq)] increases and the solution turns yellow |
| b | When HCl(aq) is added, the [H3O+(aq)] increases and the solution turns yellow |
| c | When HCl(aq) is added, the equilibrium is shifted toward the reactants and the solution will turn blue |
| d | When KOH(aq) is added, the equilibrium is shifted toward the reactants and the solution turns yellow.  |

1. Boric acid is used to maintain a pH level in the nickel plating bath:

H3BO3(aq) + SO42-(aq) 🡨 🡪 H2BO3-(aq) + HSO4-(aq)

The addition of more NiSO4(aq) would \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Increase [H3BO3(aq)] and [SO42-(aq)] |
| b | Decrease [H2BO3-(aq)] and increase [HSO4-(aq)] |
| c | Increase [HSO4-(aq)] and [H2BO3-(aq)] |
| d | Decrease [H2BO3-(aq)] and increase [H3BO3(aq)] |

1. **Numerical response question**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

Left justify your answer in the boxes provided.

|  |
| --- |
| Consider the following equilibrium equation. N2O4(g) + heat 🡨 🡪 2NO2(g)From the list below, choose 4 options that would increase the concentration of the product. 1. Increase volume of reaction vessel
2. Decrease volume of reaction vessel
3. Add NO2(g)
4. Remove NO2(g)
5. Add N2O4(g)
6. Remove N2O4(g)

Put the answers in ascending order. Solutions:1. B
2. C
3. C
4. A
5. C
6. C
7. B
8. C
9. 145
 |
|  |
|  |