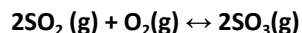


Acid Unit: Le Chatelier's principle

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



Four stresses are applied to the reaction.

1	Volume of reacting vessel is decreased
2	Oxygen is removed from the reaction vessel
3	$\text{O}_2(\text{g})$ is added to the container
4	$\text{SO}_3(\text{g})$ is vented from the container

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

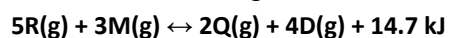
a	1,2,4
b	1,3,4
c	2, 4
d	3

2. For the reaction $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2\text{H}_2\text{O}(\text{g})$, the reaction vessel is doubled in size.

Which of the statements below is TRUE?

a	The pressure is decreased and the K_{eq} is increased.
b	The pressure is decreased and the K_{eq} is decreased.
c	The pressure is decreased and the K_{eq} is unchanged
d	The pressure is increased and the K_{eq} is unchanged

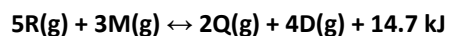
3. Consider the reaction given below.



Choose the stress that will shift the reaction to **the products** and keep the K_{eq} **unchanged**.

a	Addition of a catalyst.
b	Increase the volume of the reacting vessel
c	Vent $\text{Q}(\text{g})$ from the reacting vessel.
d	Remove heat from the reacting vessel.

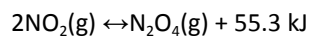
4. Consider the reaction given below.



Choose the stress that will shift the reaction to the reactants and allow the K_{eq} to change.

a	Add heat to the system.
b	Increase the size of the reaction vessel.
c	Add $\text{D}(\text{g})$ to the system
d	Remove $\text{R}(\text{g})$ from the system.

5. Consider the reaction below:



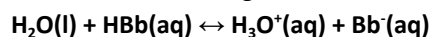
Which of the following stresses would increase the production of $\text{N}_2\text{O}_4(\text{g})$?

a	add a catalyst
b	increase the volume of the container
c	decrease the volume of the container
d	Remove $\text{NO}_2(\text{g})$

6. 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

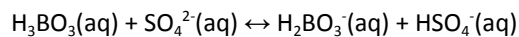
7. Consider the following reaction



Choose the correct statement below.

a	When $\text{KOH}(\text{aq})$ is added, the $[\text{HBb}(\text{aq})]$ increases and the solution turns yellow
b	When $\text{HCl}(\text{aq})$ is added, the $[\text{H}_3\text{O}^+(\text{aq})]$ increases and the solution turns yellow
c	When $\text{HCl}(\text{aq})$ is added, the equilibrium is shifted toward the reactants and the solution will turn blue
d	When $\text{KOH}(\text{aq})$ is added, the equilibrium is shifted toward the reactants and the solution turns yellow.

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



The addition of more $\text{NiSO}_4(\text{aq})$ would _____

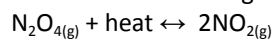
a	Increase $[\text{H}_3\text{BO}_3(\text{aq})]$ and $[\text{SO}_4^{2-}(\text{aq})]$
b	Decrease $[\text{H}_2\text{BO}_3^-(\text{aq})]$ and increase $[\text{HSO}_4^-(\text{aq})]$
c	Increase $[\text{HSO}_4^-(\text{aq})]$ and $[\text{H}_2\text{BO}_3^-(\text{aq})]$
d	Decrease $[\text{H}_2\text{BO}_3^-(\text{aq})]$ and increase $[\text{H}_3\text{BO}_3(\text{aq})]$

9. **Numerical response question**

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Left justify your answer in the boxes provided.

Consider the following equilibrium equation.



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 $\text{NO}_{2(g)}$
4. Remove $\text{NO}_{2(g)}$
5. Add $\text{N}_2\text{O}_{4(g)}$
6. Remove $\text{N}_2\text{O}_{4(g)}$

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