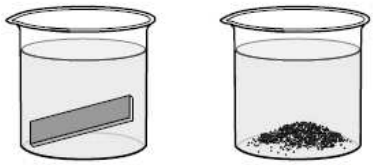
Unit 10 Homework

Collision Theory

Use the following diagram to answer the next two (2) questions. Each beaker contains 2.2 grams of iron and 1.0 L of 3.0M H_2SO_4 at standard temperature and pressure



1. **Which beaker will react the fastest?**
    a. Beaker A
    b. Beaker B
    c. They will both react at the same rate
    d. Impossible to know without knowing the activation energy of the reaction

2. **Both beakers produce hydrogen gas (H_2), which of the following would cause both beakers to increase the speed at which the gas is produced?**
    a. Increase the air pressure around the beakers
    b. Decrease the air pressure around the beakers
    c. Heat the solutions
    d. Cool the solution

3. **Nitrogen and hydrogen gas is produced by the decomposition of ammonia gas. Given the equation below, what will increase the rate of production of nitrogen and hydrogen?**

    $Heat + 2NH_3 \rightarrow N_2 + 3H_2$

    a. Heat the reaction up
    b. Cool the reaction down
    c. Crush up the ammonia
    d. Decrease the volume of the reaction

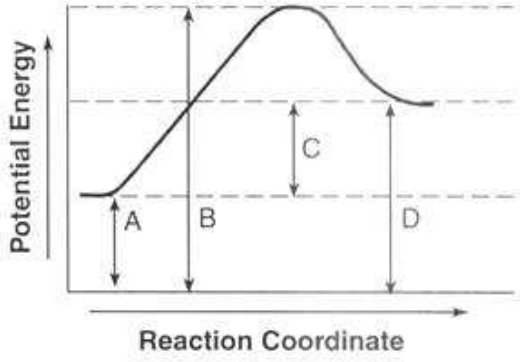
4. **If the temperature of a reaction is decreased, the reaction proceeds at a much slower rate because the--**
    a. Frequency of collisions between reactants decreases
    b. Energy of the reactant decrease
    c. Activation energy decreases
    d. Energy of the activation complex decreases

5. **When seltzer tablets are placed in a glass of water, they fizz as they release a gas. To increase the speed that gas is released from each tablet, it would be best to increase the-**
    a. Amount of water
    b. Volume of the glass
    c. Hardness of the water
    d. Crush up the tablet

Potential Energy (Enthalpy)

1. **A solid dissolves in water and the solution becomes quite hot, which of the following is TRUE about the dissolution of the solid?**
    a. The process is endothermic
    b. The process has a negative enthalpy ($-\Delta H$)
    c. The amount of entropy, ΔS, is decreasing
    d. The solubility will be the same regardless of the temperature of the water

The next four (4) questions refer to the potential energy diagram to the right



2. **The line that represents the enthalpy of the reaction (ΔH_{Rxn}) is**

3. **Which line would be changed with the addition of a catalyst**
    (if more than one answer is correct select all that apply)

4. **Which of the following statements can be made about this reaction based solely on this graph**
    a. $\Delta H < 0$
    b. $\Delta S > 0$
    c. $\Delta H > 0$
    d. $\Delta S = 0$

5. **The surrounds of this reaction would:**
    a. Increase in temperature
    b. Decrease in temperature
    c. See no change in temperature
    d. Impossible to know how the surrounds would react to this reaction

Le Châtelier

Ozone is created in the upper atmosphere by the reaction shown below. Use this equation to answer the next two (2) questions

$$3O_{2\,(g)} \rightleftharpoons 2O_{3\,(g)}$$

1. **When a sealed container at an equivalent pressure and temperature reaches equilibrium, which must be true?**
    a. The maximum number of molecules has been reached
    b. No $O_{2\,(g)}$ is present
    c. No $O_{3\,(g)}$ is present
    d. The rates of the forward & reverse reactions are equal

2. **Which of the following conditions will produce more $O_{3\,(g)}$?**
    a. Double the amount of O_2 & O_3
    b. Reduce the pressure
    c. Increase the pressure
    d. Remove some O_2

Use the following reaction to answer the next three (3) questions

$$30kJ + KClO_{3\,(s)} \rightleftharpoons KCl_{\,(s)} + O_{2\,(g)}$$

3. **Increasing the temperature of the reaction would:**
   a. Increase the amount of $KClO_3$ in the flask
   b. Increase the pressure in the flask
   c. Decrease the amount of KCl present
   d. Decrease the pressure in the flask

4. **Increasing the pressure of the container will**
   a. Increase the amount of O_2 produce
   b. Produce more KCl
   c. Produce more $KClO_3$
   d. Have no effect on the reaction

5. **If a catalyst was added to the reaction which of the following will occur?**
   a. Have no effect
   b. Shift to favor the production of products
   c. Shift to favor the production of reactants
   d. Increase the temperature of the reaction

Equilibrium Expression

Use the following reaction to answer the next two (2) questions

$$A_{2\,(aq)} + 3B_{(aq)} \rightleftharpoons C_{(s)}$$

1. **Which of the following correctly shows the equilibrium expression**
   a. $K = \frac{[C]}{[A_2][B]^3}$
   b. $K = \frac{[C]}{[A]^2[B]^3}$
   c. $K = \frac{1}{[A]^2[B]^3}$
   d. $K = \frac{1}{[A_2][B]^3}$

2. **If the value of the equilibrium constant is 3.1×10^{-2}, which of the following statements would be true?**
   a. At equilibrium there are more products than reactants
   b. The forward reaction is favored
   c. The reverse reaction is favored
   d. At equilibrium there are equal amounts of reactants and products

3. **Given the following equilibrium expression (K), what is a possible reaction?**

$$K = \frac{[H_3O^+][SO_4^{2-}]}{[HSO_4^-]}$$

   a. $HSO_4^-{}_{(aq)} + H_2O_{(l)} \rightleftharpoons H_3O^+{}_{(aq)} + SO_4^{2-}{}_{(aq)}$
   b. $H_3O^+{}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightleftharpoons HSO_4^-{}_{(aq)} + H_2O_{(l)}$
   c. $H_3O^+{}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightleftharpoons HSO_4^-{}_{(aq)}$
   d. $H_2 + SO_4^{2-}{}_{(aq)} \rightleftharpoons HSO_4^-{}_{(aq)}$

4. **At equilibrium 10 mol NO_2, and 50 mol N_2O_4 were found in a closed container. Given the reaction below, what is the value of the equilibrium constant?**

$$\mathbf{2NO_{2(g)} \rightleftharpoons N_2O_{4(g)}}$$

   a. K = 5
   b. K = 0.5
   c. K = 0.2
   d. K = 2

5. **Which of the following changes to a system at equilibrium would change the value of the equilibrium constant**
   a. Adding reactants
   b. Adding products
   c. Adding a catalyst
   d. Changing the temperature

Unit 10 Homework

Name: _____

Collision Theory

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ

Potential Energy

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ

Le Châtelier

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ

Equilibrium Expression

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ