Name Sturman Key Date Class

18.2 REVERSIBLE REACTIONS AND EQUILIBRIUM

Section Review

Objectives

- Describe how the amounts of reactants and products change in a chemical system at equilibrium
- Identify three stresses that can change the equilibrium position of a chemical system
- Explain what the value of K_{eq} indicates about the position of equilibrium

Vocabulary

- reversible reaction
- chemical equilibrium
- equilibrium position
- Le Châtelier's principle
- equilibrium constant (K_{eq})

Key Equation

- $K_{eq} = \frac{[C]^c \times [D]^d}{[A]^a \times [B]^b}$

When $aA + bB \rightleftharpoons cC + dD$

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

In principle, all reactions are __1__. That is, reactants go to __2__ in the __3__ direction, and products go to __4__ in the __5__ direction.

The point at which the rate of conversion of __6__ to __7__ and vice versa is equal is the __8__ position. The __9__ of a reversible reaction, K_{eq}, is useful for determining the position of equilibrium. It is essentially a measure of the __10__ of products to reactants at equilibrium. The direction of change in the position of equilibrium may be predicted by applying __11__ principle.

1. reversible
2. products
3. forward (right)
4. reactants
5. reverse (left)
6. reactants
7. products
8. equilibrium
9. equilibrium constant
10. ratio or concentration
11. Le Châteliers

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Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

NT 12. The concentrations of reactants and products in a system at dynamic equilibrium are always changing.

ST 13. A change in the pressure on a system can cause a shift in the equilibrium position.

NT 14. For a chemical equilibrium to be established, the chemical reaction must be irreversible.

AT 15. The K_{eq} for a certain reaction was 2×10^{-7}. For this reaction at equilibrium, the concentration of the reactants is greater than the concentration of the products.

$k_{eq} = \frac{P}{R}$

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A	Column B
d 16. reversible reaction	a. state of balance in which forward and reverse reactions take place at the same rate
a 17. chemical equilibrium	b. relative concentrations of reactants and products of a reaction that has reached equilibrium
b 18. equilibrium position	c. When stress is applied to a system at equilibrium, the system changes to relieve the stress.
c 19. Le Châtelier's principle	d. reaction in which conversion of reactants to products and products to reactants occur simultaneously
e 20. equilibrium constant	e. ratio of product concentrations to reactant concentrations with each raised to a power given by the number of moles of the substance in the balanced equation

Part D Problem

Solve the following problem in the space provided. Show your work.

$2SO_3(g) \rightarrow 2SO_2(g) + O_2(g)$

Calculate K_{eq} for this reaction if the equilibrium concentrations are: $[SO_2] = 0.42M$, $[O_2] = 0.21M$, $[SO_3] = 0.072M$

$$k_{eq} = \frac{[SO_2]^2[O_2]}{[SO_3]^2} = \frac{(.42)^2(.21)}{(.072)^2} = 7.14583 = \boxed{7.1}$$

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