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

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

  When $a\text{A} + b\text{B} \rightleftharpoons c\text{C} + d\text{D}$

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. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____

Name _____ Date _____ Class _____

Part B True-False

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

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

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

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

_____ **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.

Part C Matching

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

Column A

_____ **16.** reversible reaction

_____ **17.** chemical equilibrium

_____ **18.** equilibrium position

_____ **19.** Le Châtelier's principle

_____ **20.** equilibrium constant

Column B

a. state of balance in which forward and reverse reactions take place at the same rate

b. relative concentrations of reactants and products of a reaction that has reached equilibrium

c. When stress is applied to a system at equilibrium, the system changes to relieve the stress.

d. reaction in which conversion of reactants to products and products to reactants occur simultaneously

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.

21. $2SO_3(g) \rightarrow 2SO_2(g) + O_2(g)$

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