Name Key Date _____ Class _____

16–1 Review and Reinforcement

The Concept of Equilibrium

On the line at the left, write the letter of the answer that best matches each description below.

e	1. the formation of products from reactants	a. reversible reaction
a	2. a chemical reaction in which the products can generate the original reactants	b. chemical equilibrium
d	3. the speed at which a reaction occurs	c. reverse reaction
c	4. the regeneration of reactants from products	d. reaction rate
b	5. the state in which the concentrations of reactants and products remain constant with time	e. forward reaction

Answer each of the following questions in the space provided.

6. Explain how reaction rate and equilibrium are related. Give an example illustrating this relationship.

when a chemical reaction is in equilibrium, the rates of the forward and reverse reactions are equal

7. In performing most calculations with chemical reactions, it is assumed that the reactants are entirely consumed. Is this assumption always appropriate? Explain.

No. Some reactions don't proceed to completion, but instead reach a state of equilibrium.

8. Can all reversible reactions be observed in the laboratory? Why or why not?

No. Some reactions require extreme conditions to reverse (high temp or pressure). In other cases, it is unknown how to reverse the reaction.

9. In the reaction below, which is the forward reaction and which is the reverse reaction?
$2SO_2 + O_2 \rightleftharpoons 2SO_3$

forward: $2SO_2 + O_2 \rightarrow 2SO_3$

reverse: $2SO_3 \rightarrow 2SO_2 + O_2$

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16–1 Review and Reinforcement (continued)

10. What factors control the rate of a reaction?

Concentration of substances involved
temperature, pressure, surface area

11. How is the concentration of reactants related to the rate of a reaction?

Concentration ↑, rate ↑

12. When placed in a sealed container, N_2 and H_2 react according to the following equation: $N_2 + 3H_2 \rightleftharpoons 2NH_2$. How do the reaction rates and concentrations change as chemical equilibrium is attained?

forward reaction rate decreases as reactant concentration decreases. Reverse reaction rate starts at 0 and increases as product concentration increases. When rates are equal, equilibrium is reached.

13. Why will any chemical reaction reach equilibrium in a closed container?

In general, yes. Since no external factors affect a closed system, concentrations can become constant.

14. Does a reaction stop once it has reached equilibrium? Explain.

No. Both forward and reverse reaction are still occurring, but at the same rate.

15. Why is chemical equilibrium referred to as a dynamic equilibrium?

b/c forward and reverse reactions are still occurring, but there is no net change in concentration