Equilibrium I Chapter 17 # 7-12

7. At equilibrium, the rate of the "forward" direction of a reaction and the rate of the "reverse" reaction are equal. $A \underset{r}{\overset{f}{\rightleftharpoons}} B$

Thus, the opposing processes of forming products (from reactants) and forming reactants (from products) are balanced.

An example of equilibrium encountered in everyday life is the relatively constant composition of the air. N_2, O_2, CO_2, etc. are consumed and produced at approximately equal rates, giving a constant concentration of each in the atmosphere.

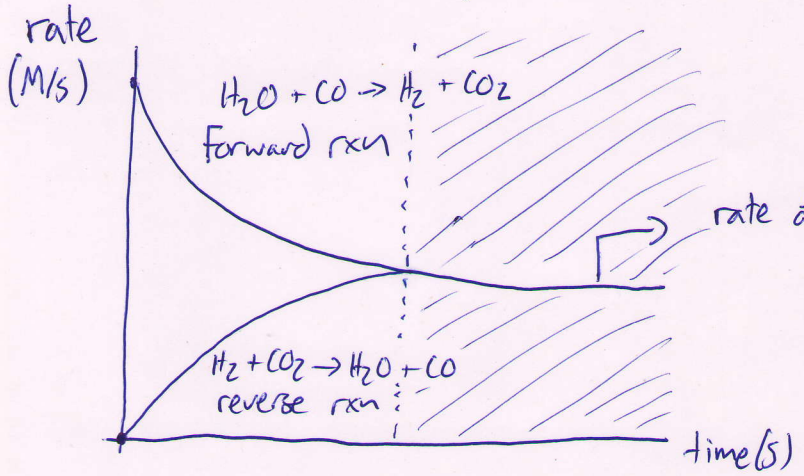
8. Chemists define a state of equilibrium as a state in which the forward rate and reverse rate of a reaction are equal. Equivalently, at equilibrium, the concentrations of all reactants and products are constant.

9. The $\rightleftharpoons$ in chemistry indicates that a chemical reaction proceeds with a significant rate in both the forward and reverse directions.

10. Chemists recognize that a system is at chemical equilibrium when they observe that it is no longer changing. For example, if a reaction produces gas, it is at equilibrium when you stop observing bubbles. If a reaction changes color, it is a equilibrium when the color is a constant.

11. A state of chemical or physical equilibrium is dynamic because although macroscopically we observe nothing changing (concentration, color, pH, etc.), there is still activity at the microscopic level (individual molecules going between reactants and products).

12. $H_2O_{(g)} + CO_{(g)} \underset{f}{\overset{r}{\rightleftharpoons}} H_{2(g)} + CO_{2(g)}$



rate of forward rxn = rate of reverse rxn

Equilibrium