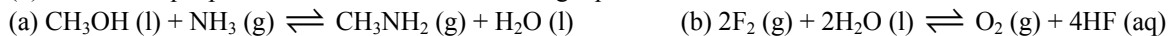
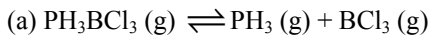


III. The Equilibrium Constant, Keq

(1) Write a Keq expression for each of the following equilibria.



(2) Write a Keq expression for each of the following equilibria. Determine the value of Keq. Does the equilibrium favour the products or the reactants?



At equilibrium, $[\text{PH}_3\text{BCl}_3] = 0.080 \text{ M}$, $[\text{PH}_3] = 0.010 \text{ M}$, and $[\text{BCl}_3] = 0.015 \text{ M}$.



At equilibrium, there are 2.00 mol H_2 , 1.40 mol N_2 , 1.50 mol CO , and 3.20 mol HCONH_2 in a 2.00 L flask.

(3) Consider the following equilibrium: $\text{I}_2(\text{g}) + \text{Br}_2(\text{g}) \rightleftharpoons 2\text{IBr}(\text{g})$ Keq = 120

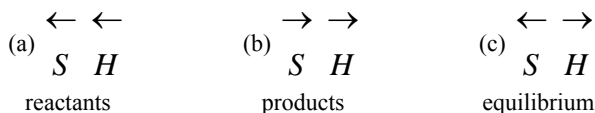
Write a Keq expression for the equilibrium. At equilibrium, $[\text{I}_2] = 0.0250 \text{ M}$ and $[\text{Br}_2] = 0.0250 \text{ M}$. Determine the equilibrium concentration of IBr.

Answers:

I. Chemical Equilibrium

(1) Minimum enthalpy and maximum entropy

(2)



II. Le Châtelier

(1) If a system in equilibrium is subjected to a change, then processes occur that tend to counteract that change, and the system reaches a new state of equilibrium.

(2) (a) S: increase $[\text{NOBr}]$ S: right R: increase $[\text{Br}_2]$, darker reddish-brown

(b) S: increase volume S: right R: increase $[\text{Br}_2]$, darker reddish-brown:

(c) S: decrease temperature S: left R: decrease $[\text{Br}_2]$, lighter reddish-brown

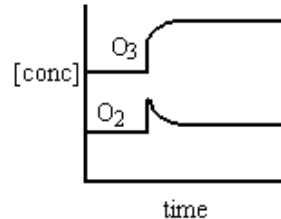
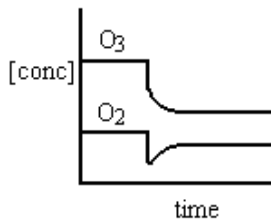
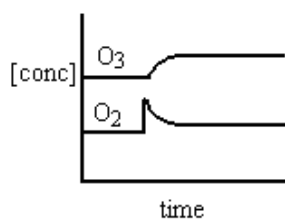
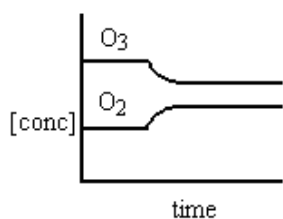
(d) S: increase pressure S: left R: decrease $[\text{Br}_2]$, lighter reddish-brown

(3) (a) decrease temperature

(b) increase $[\text{O}_2]$

(c) increase volume

(d) increase pressure



III. The Equilibrium Constant, Keq

(1) (a) $Keq = \frac{[\text{CH}_3\text{NH}_2]}{[\text{NH}_3]}$

(b) $Keq = \frac{[\text{O}_2][\text{HF}]^4}{[\text{F}_2]^2}$

(2) (a) $Keq = \frac{[\text{PH}_3][\text{BCl}_3]}{[\text{PH}_3\text{BCl}_3]}$ Keq = 1.9×10^{-3} , reactants

(b) $Keq = \frac{[\text{HCONH}_2]^2}{[\text{H}_2]^3[\text{N}_2][\text{CO}]^2}$ Keq = 6.50, products

(3) $Keq = \frac{[\text{IBr}]^2}{[\text{I}_2][\text{Br}_2]}$ $[\text{IBr}] = 0.274 \text{ M}$