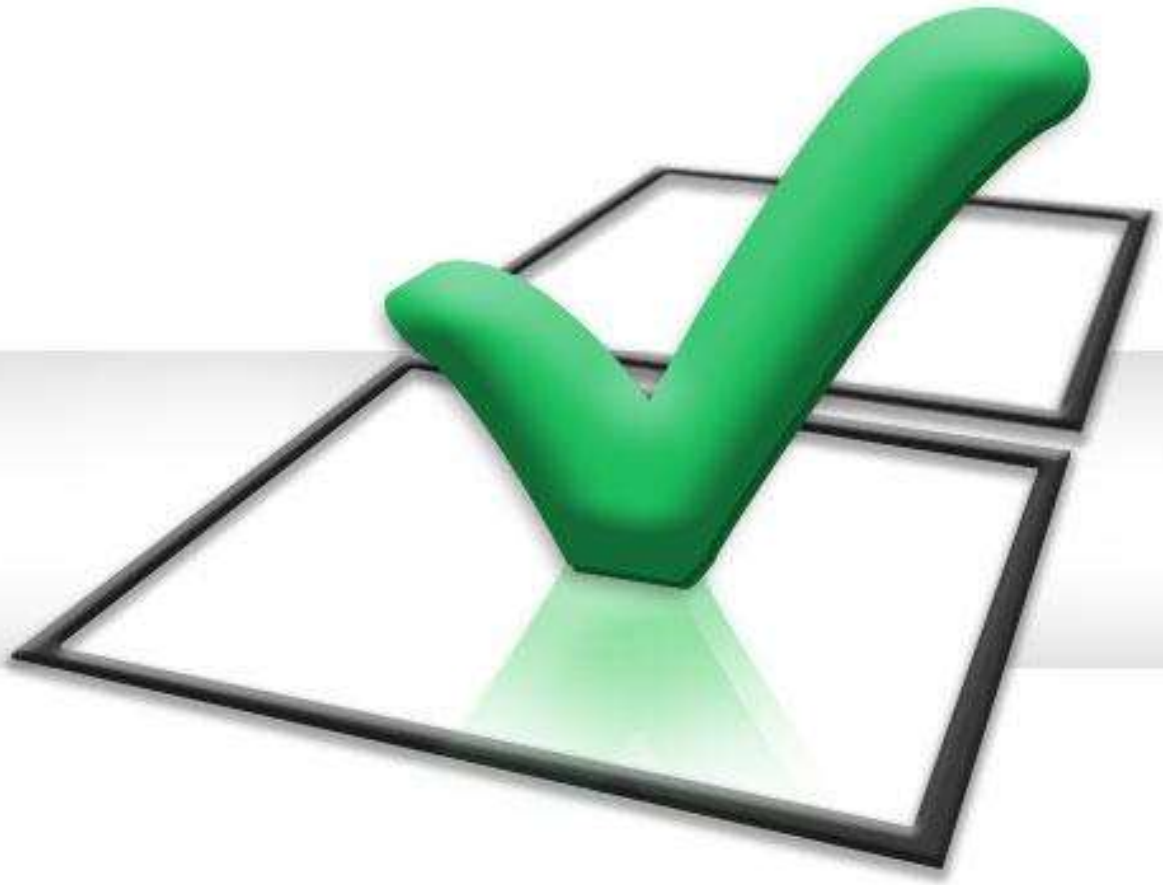
Assessment



Chemistry: Lesson 16

Question 1

Express the equilibrium constant for the following reaction.

$$2\ CH_3Cl_{(g)} + Cl_{2\,(g)} \rightleftharpoons 2\ CH_2Cl_{2\,(g)} + H_{2\,(g)}$$

A) $K = \frac{[CH_2Cl_2].[H_2]}{[CH_3Cl].[Cl_2]}$

B) $K = \frac{[CH_2Cl_2]^2[H_2]}{[CH_3Cl]^2[Cl_2]}$

C) $K = \frac{[CH_3Cl]^2[Cl_2]}{[CH_2Cl_2]^2\,[H_2]}$

D) $K = \frac{[CH_2Cl_2]^2[H_2]}{[CH_3Cl][Cl_2]}$

Question 2

Express the equilibrium constant for the following reaction.

$$N_{2\,(g)} + 3\,H_{2\,(g)} \rightleftharpoons 2\,NH_{3\,(g)}$$

A) $K = \frac{[NH_3]^{1/2}}{[N_2].[H_2]^{1/3}}$

B) $K = \frac{[NH_3]}{[N_2].[H_2]}$

C) $K = \frac{[NH_3]^2}{[N_2].[H_2]^3}$

D) $K = \frac{[N_2].[H_2]^3}{[NH_3]^2}$

Question 3

Which of the following is the correct expression for the equilibrium constant?

A) $K_c = \frac{[\text{Reactants}]}{[\text{Products}]}$

B) $K_c = [\text{Reactants}].[\text{Products}]$

C) $K_c = \frac{[\text{Products}]}{[\text{Reactants}]}$

D) $K_c = [\text{Reactants}] + [\text{Products}]$

Question 4

If $K_c << 1$, the reverse reaction is favored.

A) True

B) False

Question 5

If K_c >> 1, the forward reaction is favored.

A) True

B) False

Question 6

A chemical system is considered to have reached dynamic equilibrium when ____.

A) the amount of the products equals the amount of the reactants

B) all of reactants have been converted to products

C) the sum of the concentrations of each of the reactant species is equal to the sum of the

D) the rate of the forward reaction is equal to the rate of the reverse reaction.

Question 7

Express the equilibrium constant for the following reaction.

$$P_{4\,(s)} + 5\,O_{2\,(g)} \rightleftharpoons P_4O_{10\,(s)}$$

A) $K = \frac{[P_4].[O_2]^5}{[P_4O_{10}]}$

B) $K = \frac{[P_4O_{10}]}{[P_4].[O_2]^5}$

C) $K = [O_2]^{-5}$

D) $K = [O_2]^5$

Question 8

Express the equilibrium constant for the following reaction.

$$2\ Na_{(s)} + 2\ H_2O_{(l)} \rightleftharpoons 2\ NaOH_{(aq)} + H_{2\,(g)}$$

A) $K = \frac{[NaOH]^2[H_2]}{[Na]^2[H_2O]^2}$

B) $K = [H_2][NaOH]^{-2}$

C) $K = \frac{[Na]^2[H_2O]^2}{[NaOH]^2[H_2]^2}$

D) $K = [H_2][NaOH]^2$

Question 9

Determine the value of Kc for the following reaction if the equilibrium concentrations are as follows:

$[N_2]_{eq} = 3.6\ M$

$[O_2]_{eq} = 4.1\ M$

$[N_2O]_{eq} = 3.3 \times 10^{-18}\ M$

$$2\ N_{2\,(g)} + O_{2\,(g)} \rightleftharpoons 2\ N_2O_{\,(g)}$$

A) 2.2×10^{-19}

B) 4.5×10^{18}

C) 2.0×10^{-37}

D) 5.0×10^{36}

Question 10

Determine the value of K_c for the following reaction if the equilibrium concentrations are as follows:

$[N_2]_{eq} = 1.5$ M
$[H_2]_{eq} = 1.1$ M
$[NH_3]_{eq} = 0.47$ M

$$N_{2\,(g)} + 3\,H_{2\,(g)} \rightleftharpoons 2\,NH_{3\,(g)}$$

A) 3.5

B) 0.28

C) 9.1

D) 0.11

Assessment

Chemistry: Lesson 17

Question 1

Consider the following reaction at equilibrium. What effect will adding more SO3 have on the system?

$$SO2\ (g) + NO2\ (g) \rightleftharpoons SO3\ (g) + NO\ (g)$$

A) The reaction will shift in the direction of products.

B) The reaction will shift to decrease the pressure.

C) No change will occur since SO3 is not included in the equilibrium expression.

D) The reaction will shift in the direction of reactants.

Question 2

Consider the following reaction at equilibrium. What effect will adding more H2S have on the system?

$$2\ H_2S\ (g) + 3\ O_2\ (g) \rightleftharpoons 2\ H_2O\ (g) + 2\ SO_2\ (g)$$

A) The reaction will shift to the left.

B) No change will be observed.

C) The equilibrium constant will increase.

D) The reaction will shift in the direction of products.

Question 3

Consider the following reaction at equilibrium. What effect will reducing the volume of the reaction mixture have on the system?

$$CuS\ (s) + O2\ (g) \rightleftharpoons Cu\ (s) + SO2\ (g)$$

A) The equilibrium constant will decrease.

B) No effect will be observed.

C) The reaction will shift to the right in the direction of products.

D) The equilibrium constant will increase.

Question 4

Consider the following reaction at equilibrium. What effect will increasing the volume of the reaction mixture have on the system?

$$2\ H_2S\ (g) + 3\ O_2\ (g) \rightleftharpoons 2\ H_2O\ (g) + 2\ SO_2\ (g)$$

A) The reaction will shift to the right in the direction of products.

B) No effect will be observed.

C) The reaction will shift to the left in the direction of reactants.

D) The equilibrium constant will decrease.

Question 5

What will happen to the following endothermic reaction in equilibrium if the temperature is raised?

$$N_2O_4\ (g) \rightleftharpoons 2NO_2\ (g)$$

A) More NO_2 will be produced.

B) Less NO_2 will be produced.

C) More N_2O_4 will be produced.

D) There will be no change in concentrations.

Question 6

Consider the following reaction at equilibrium. What effect will increasing the pressure of the reaction mixture have on the system?

$$2\ H_2S\ (g) + 3\ O_2\ (g) \rightleftharpoons 2\ H_2O\ (g) + 2\ SO_2\ (g)$$

A) The reaction will shift to the right in the direction of products.

B) No effect will be observed.

C) The reaction will shift to the left in the direction of reactants.

D) The equilibrium constant will decrease.

Question 7

Which species is the weakest acid?

A) HBr

B) HCl

C) HF

D) HI

Question 8

According to Arrhenius definition, an acid is a substance that produces _____.

A) NaCl

B) H_2O^+

C) H^+ or H_3O^+

D) OH^-

Question 9

One of the following acids is a diprotic acid

A) HNO_3

B) $HClO_4$

C) H_2SO_3

D) H_3PO_4

Assessment

Chemistry: Lesson 18

Question 1

What is the conjugate acid of HCO_3^-?

A. H_3O^+

B. H_2O

C. CO_3^{2-}

D. OH^-

E. H_2CO_3

Question 2

What is the conjugate base of $H_2PO_4^-$?

A. HPO_4^{2-}

B. PO_4^{3-}

C. H_3PO_4

D. H_3O^+

E. OH^-

Question 3

Which of the following is not a conjugate acid-base pair?

A. NH_4^+/NH_3

B. H_3O^+/OH^-

C. H_2SO_3/HSO_3^-

D. $C_2H_3O_2^-/HC_2H_3O_2$

E. All of the above are conjugate acid-base pairs

Question 4

Which pair is not a conjugate acid-base pair?

A. (CH3)3N; (CH3)3NH+

B. H2SO4; H2SO3

C. HNO2; NO2-

D. H3O+; H2O

Question 5

Identify a triprotic acid.

A. CH_3COOH

B. H_3PO_4

C. H_2SO_3

D. $HClO_4$

E. H_2SO_4

Question 6

Calculate the pH of a solution that contains 3.9 × 10-4 M H3O+ at 25°C.

A. 4.59

B. 3.41

C. 10.59

D. 9.41

E. 0.59

Question 7

Calculate the pH of a solution that contains 2.4 × 10-5 M H3O+ at 25°C.

A. 2.40

B. 9.38

C. 4.62

D. 11.60

E. 4.17

Question 8

Calculate the hydronium ion concentration in an aqueous solution with a pH of 9.85 at 25°C.

A. 7.1 × 10-5 M

B. 4.2 × 10-10 M

C. 8.7 × 10-10 M

D. 6.5 × 10-5 M

E. 1.4 × 10-10 M

Question 9

Calculate the pH of a solution that contains 7.8 × 10-6 M OH- at 25°C
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A. 1.28

B. 5.11

C. 12.72

D. 8.89

E. 9.64

Question 10

Calculate the pH for an aqueous solution of acetic acid that contains 2.15 × 10-3 M hydronium ion.

A. 4.65 × 10-12 M

B. 2.15 × 10-3 M

C. 2.67

D. 11.33

Question 11

Calculate the pH for an aqueous solution of pyridine that contains 2.15 × 10-4 M hydroxide ion.

A. 4.65 × 10-11

B. 2.15 × 10-4

C. 3.67

D. 10.33

Question 12

What is the hydronium ion concentration of an acid rain sample that has a pH of 3 .45?

A. 2.82 × 10-11 M

B. 3.55 × 10-4 M

C. 3.45 M

D. 10.55 M

Question 13

What is the hydroxide ion concentration of a lye solution that has a pH of 9.20?

A. 6.31 × 10-10 M

B. 1.58 × 10-5 M

C. 4.80 M

D. 9.20 M

Question 14

A Lewis base is _____.

A. an electron pair donor

B. an electron pair acceptor

C. a proton donor

D. proton acceptor