Chapter 12: Physical properties of solutions.

1. Which of the following liquids will have the lowest freezing point?

   a. Pure H2O
   b. Aqueous (C6H12O6) glucose (1.6m)
   c. Aqueous Kf (0.50m)
   d. Aqueous (C12H22O11) sucrose (0.60m)
   e. Aqueous FCl3 (0.24m)

Answer: b

2. When 2.36g of a nonvolatile solute is dissolved in 100g of solvent, the largest change in freezing point will be achieved when the solvet is _____.

   a. Tert-butanol, Kf=9.1
   b. Acetic acid, Kf=3.90
   c. Benzene, Kf=5.12
   d. All are expected to have the same freezing point.

Answer: 1

3. What is a freezing point of a solution that contains 10g glucose (C6H12O6) 180g/mol dissolved in 100g of H2O (18g/mol)? Kf of water is 1.86 C/m

   a. -0.186 C
   b. 0.186 C
   c. 1.03 C
   d. -1.03 C

e. -0.10 C

Answer: d

4. Calculate the freezing point of a solution containing 20g of KCl and 2200g of water. KCl molar mass=74.55 g/mol. Kf of water is 1.86 C/m

a. 0.23
b. -0.23
c. -0.45
d. 1.23
e. 0.45

Answer: c

5. An aqueous solution has a normal boiling point of 102 C. what is the freezing point of this solution? Kb of water is 0.51 and Kf of it is 1.86

a. -3.6 C
b. -7.3 C
c. -0.55 C
d. -2.0 C

Answer: b

6. When 0.5g of an unknown non-electrolyte compound is dissolved in 10g of camphor (Kf=40), thr freezing point of the solution is 4.43 C lower than that of pure camphor. Calculate the unknown compound molar mass

a. 55.4g/mol
b. 0.451g/mol
c. 3450g/mol
d. 451g/mol

Answer: 4

7. Calculate the freezing point of a 0.035m aqueous solution of NaNO2. The molal freezing point depression constant water is 1.86C/m

a. 0.0326
b. 0.0175
c. -0.0651
d. -0.130

Answer: d

8. At a given temperature the vapor pressure of benzene and toulene are 183mmHg and 59.2mmHg respectively. Calculate the total vapor pressure over a solution of benzene and toulene with X(benzene)=0.560.
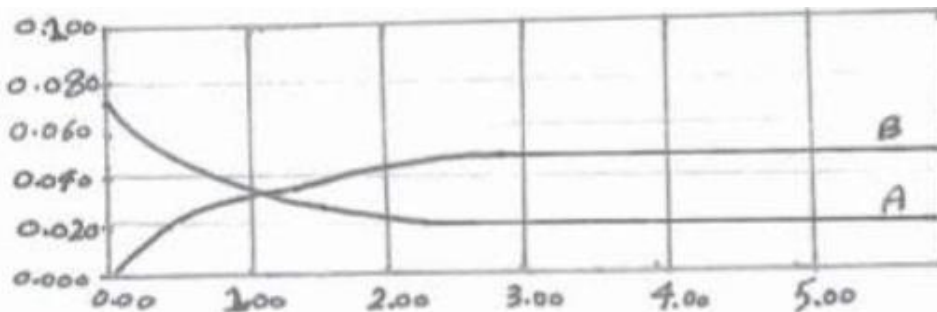
a. 102mmHg
b. 242mmHg
c. 121mmHg
d. 129mmHg

Answer: d

Chapter 14: Chemical equilibrium.

1. Which one of the following statments does not describe the equilibrium state?

a. The concentration of the reactants and products reach a constant level.
b. The concentration of thr reactants is equal to the concentration of products.
c. The rate of the forward reaction is equal to the rate of the reverse reaction.
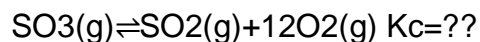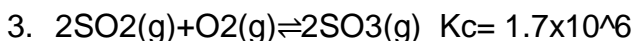d. Equilibrium is dynamic and there is no net conversion to reactants and products.

Answer: b

2. Shown below is a concentration vs time plot for the reaction A=2B. For this reaction the value of the equilibrium constant is

a. Kc>1
b. Kc<1
c. Kc=0
d. Kc=1

Answer: b

3. $2SO_2(g)+O_2(g)\rightleftharpoons 2SO_3(g)$ Kc= 1.7x10^6
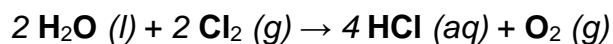
$SO_3(g)\rightleftharpoons SO_2(g)+\frac{1}{2}O_2(g)$ Kc=??

The equilibrium constant is given for one of the reactions below. Determine the value of the missing equilibrium constant.

a. 7.7x10^-4
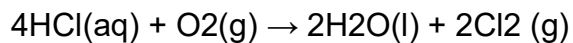b. 3.4x10^2
c. 1.2x10^-6
d. 8.5

Answer: a

4. The Keq for the equilibrium below is 7.52x10^-2 at 480 C.

2 H_2O (l) + 2 Cl_2 (g) → 4 HCl (aq) + O_2 (g)
What is the value of Keq at this temprature for the following reaction?

4HCl(aq) + O2(g) → 2H2O(l) + 2Cl2 (g)

a. 1.88x10^-2
b. 3.7x10^-2
c. 7.52x10^-2
d. 2.74x10^-1
e. 3.65

Answer: e

5. For the reaction: N2+2O2⇌2NO2 . Kc=8.3x10^-10 at 25 C. what is the concentration of N2 gas at equilibrium when the equilibrium concentration of NO2 is twice the concentration of O2 gas?

a. 2.4x10^9 M
b. 4.2X10^-10 M
c. 2.1X10^=10 M
d. 4.8X10^9 M

Answer: d

6. At elevated temperature, molecular hydrogen and molecular bromine react to partially from hydrogen and bromide:

H$_2$ *(g)* + **Br$_2$** *(aq)* → *2* **HBr** *(aq)*
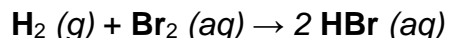
A mixture of 0.682 mol of H2 and 0.440 mol of Br2 is combined in a reaction vessel with a volume of 2L. At equilibrium at 700K, There are 0.536 mol of H2 present. At equilibrium, how many mol of Br2 present in the reaction vessel?

    a. 0.146
    b. 0.536
    c. 0
    d. 0.294
    e. 0.440

Answer: d

7. Carbon monoxide is converted into Carbon dioxide via the following reaction:

H2O + CO → CO2 + H2 .In an experiment, 0.35 mol of CO and 0.40 mol of H2O were placed in a 1L reaction vessel. At equilibrium, there were 0.22 mol of CO remaining. Calculate Keq at the temperature of the experiment.

    a. 3.5
    b. 1
    c. 0.28
    d. 5.5
    e. 0.75

Answer: c

8. 2cof2(g)⇌co2(g)+cf4(g) .The equilibrium constant Kc is equal to 2.00 at 1000C for the reaction, If 0.43 moles of CO2 and 0.43 moles CF4 are introduced into a 1.0L flask. What will be the concentration of COF2 when equilibrium is reached?

    a. 0.31M

b. 0.15M
c. 0.22M
d. 0.11M

Answer: c

9. For the reaction 2NO2→ 2NO(g) + O2(g) initially 0.88 atm of NO2 was reacted. At equilibrium, the total pressure of the reaction mixture is 0.998 atm. The pressure of NO2 at equilibrium is:

a. 0.236 atm
b. 0.188 torr
c. 0.644 torr
d. 0.644 atm

Answer: d

10. At equilibrium, the pressure of the reaction CaCO3→CaO+CO2 is 0.125 atm at 300 C. the Kc of the reaction is?

R=8.314Pa.m^3/K.mol   R=0.08206 atm.L/K.mol
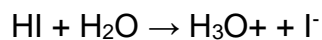
a. 0.00508
b. 0.00266
c. 409
d. 6.392

Answer: a

Chapter 15: Acidic and Bases.

1. What is the conjugate base of the Bronsted-Lowery acid HPO_4^{-2} ?

a. $H_2PO_4^-$
b. PO_4^{-3}
c. HPO_4^{-2}
d. H_3PO_4

Answer: b

2. Indicate all the Bronsted-Lowry acids in the following chemical reaction.

$HI + H_2O \rightarrow H_3O+ + I^-$

a. HI I
b. HI , H_2O
c. HI , H_3O^+
d. HI ,H_2O, H_3O^+

Answer: c

3. Given the following substances in order of increasing acid strength.

$HOCl<HC_2H_3O_2<HC_2O_4^-<HOCN<HNO_2<HCL$ .which species listed below is the strongest base of that set?

a. Cl^-
b. $C_2H_3O_2^-$
c. $C_2O_4^{-2}$
d. NO_2^-

Answer: b

4. An aqueous solution of _____ will produce a basic solution.

a. CsBr

b. $Mg(ClO_4)_2$
c. $NaNO_2$
d. NH_4NO_3
e. KNO_3

Answer: c

5. What is the hydronium ion(H_3O^+) concentration of a 0.400M acetic acid (CH_3CO_2H), solution with $Ka=1.8\times10^{-5}$?

a. $4.2\times10^{-2}M$
b. $2.7\times10^{-2}M$
c. $4.2\times10^{-3}M$
d. $2.7\times10^{-3}M$

Answer: d

6. The Ka of hydrazoic acid (HN_3^-) is 1.9×10^{-5} at 25.0 C. what is the pH of a 0.15M aqueous solution of HN_3^-?

a. 1.95
b. 2.77
c. -3.46
d. 5.23

Answer: b

7. Determine pH of a weak base that has $Kb=3.78\times10^{-18}$

a. 9.26
b. 7.00
c. 4.73
d. 3.42

e. 1.59

8. The acidic-dissociation constant of hydrocyanic acid (HCN) at 25 C is 4.9×10^{-10}. what is the pH of an aqueous solution of 0.060M sodium cyanide (NaCN)?

a. 11.04
b. 9×10^{-12}
c. 2.96
d. 1.1×10^{-3}

9. Determine the pH of a 0.15M aqueous solution of CaF_2 for hydroflnoric acid (HF), $Ka=7\times10^{-4}$

a. 1.32
b. 5.68
c. 8.32
d. 0.52
e. 5.01

10. Aniline ($C_6H_5NH_2$, Kb= 4.3×10^{-10} at 25C) is an industrially important amine used in the making of dyes. Determine the pH of an aniline solution made by dissolving 5.9g of aniline in enough water to make 100ml of solution. Molar Mass: H=1 , C=12 , N=14

a. 10.56
b. 4.78
c. 9.56

d. 9.22

Answer: d

11. Calculate the pH of a 1.60M KBrO solution. Ka for hypobramous acid, HBrO is 2.0×10^{-9} and Kw=1.0×10^{-14}

a. 11.45
b. 2.55
c. 9.75
d. 4.25

Answer: a

12. What is the pH of a solution prepared by mixing 10ml of 0.020M $Ba(OH)_2$ with 50ml of 0.40M NaOH? Assume that the volume are additive

a. 13.20
b. 13.17
c. 13.28
d. 13.68

Answer: a

13. In which of the following aqueous solutions does the weak acid exhibit the highest percentage ionization?

a. 0.01M H_2CO_3 (Ka=4.5×10^{-7})
b. 0.01M H_2SO_3 (Ka=1.4×10^{-2})
c. 0.01M HCN (Ka=6.2×10^{-10})
d. 0.01M HOCL (Ka= 3.5×10^{-8})
e. 0.01M $HC_3H_5O_2$ (Ka=1.3×10^{-5})

Answer: b

14. What is the percent dissociation of a benzoic acid solution with pH=2.0? The acid dissociation constant for the monoprotic acid is 6.5×10^{-5}

a. 3.5%
b. 1.5%
c. 2.5%
d. 0.65%

Answer: d

15. The pH of a 0.5M solution of a NaBr is:

a. 5.0
b. 13.6
c. 9.2
d. 7.0

Answer: d

16. The pH of a 2.0x10-8 M NaOH solution is:

a. 11.7
b. 7.7
c. 8.7
d. 7.1

Answer: d

بالتوفيق لكم جميعا زملائي