**Name: Period: Seat#:**

**Worksheet #7**

**Directions:** Show all work and/or annotate with an AP Chem level explanation for non-math answers.

**1999 NChO Exam**

**1.** Which oxide forms a basic solution when mixed   
 with water?

1. K2O (C) CO2
2. Al2O3 (D) SO3

**35.** Which 0.1 M solution has the highest pH?

* 1. sodium carbonate
  2. sodium chloride
  3. ammonium carbonate
  4. ammonium chloride

**36.** Which is the strongest acid?

1. acetic acid - (Ka = 1.8 x 10¯5)
2. benzoic acid - (Ka = 6.3 x 10¯5)
3. formic acid - (Ka = 1.8 x 10¯4)
4. nitrous acid - (Ka = 6.0 x 10¯4)

**37.** What is the order of concentration of the ions and

molecules in a nitrous acid solution? Nitrous acid,   
 HNO2, is a weak acid.

1. H3O+ = NO2¯ > HNO2 > OH¯
2. H3O+ = NO2¯ = HNO2 = OH¯
3. HNO2 > H3O+ = NO2¯ > OH¯
4. HNO2 > NO2¯ > H3O+ > OH¯

**1998 NChO Exam**

**33.** A water solution of sodium carbonate, Na2CO3,   
 has a pH greater than 7 because

* 1. it contains more carbonate ions than   
      water molecules.
  2. it contains more sodium ions than  
      carbonate ions.
  3. sodium ions react with water.
  4. carbonate ions react with water.

**34.** Which species dissociates most completely in   
 water solution?

1. NH4+ (C) HNO3
2. H2CO3 (D) HSO4-

**37.** According to Brønsted -Lowry Theory, which of   
 these species cannot be amphoteric?

1. NH4+ (aq) (C) NH21- (aq)
2. NH3 (aq) (D) NH2- (aq)

**1997 NChO Exam**

1. Which acid reacts with NaOH to form sodium hypochlorite (the ingredient in household bleach)?
   1. HOCl (C) HOClO2
   2. HOClO (D) HOClO3
2. Which of these acids is the strongest in   
   aqueous solution?
   1. H3PO4 (C) HClO3
   2. H2SO3 (D) HOCl
3. Normal rain water has a pH of 5.6. This is best explained by the presence of
   1. nitrogen oxides.
   2. carbon dioxide.
   3. sulfur oxides.
   4. particulates.
4. In a 0.050 M solution of a weak monoprotic acid, [H+]= 1.8 x 10-3. What is its Ka?

(A) 3.6 x 10-2 (C) 6.7 x 10-5

(B) 9.0 x 10-5 (D) 1.6 x 10-7

**1996 NChO Exam**

1. According to the Brønsted-Lowry definition, a base is a substance that
   1. increases the hydroxide ion   
       concentration in water.
   2. can react with water to form OH- ions.
   3. can donate an electron pair to  
       form a covalent bond.
   4. can accept a proton from an acid.

**35.** What is the pH of a 0.02 M solution of KOH?

1. 12.3 (C) 2.0
2. 12.0 (D) 1.7

**36.** Which couple is not a conjugate acid-base pair?

* 1. HCO3- and CO32-
  2. H3O+ and H2O
  3. H2PO4- and PO43-
  4. NH3 and NH2-

**37.** These acids are listed in order of decreasing acid   
 strength in water. HI > HNO2 > CH3COOH > HCN

According to the Brønsted-Lowry theory, which   
 anion is the weakest base?

1. I- (C) CH3COO-
2. NO2- (D) CN-

**38.** What is the [H+] in a 0.40 M solution of HOCl?

|  |  |
| --- | --- |
| Substance | Equilibrium Constant, Ka |
| HOCl | 3.5 x 10-8 |

(A) 1.4 x 10-8 M (C) 1.9 x 10-4 M (B) 1.2 x 10-4 M (D) 3.7 x 10-4 M

**39.** Which of these salts will give a basic solution  
 when added to water?

1. NH4NO3 (C) Ca(NO3)2
2. NH4C2H3O2 (D) Ca(C2H3O2)2

**1995 NChO Exam**

**2.** When sodium oxide, Na2O, is added to water, the major products expected are

* 1. Na+ and OH- ions
  2. Na+ ions and H2O
  3. Na+ and O2- ions
  4. Na+ and OH- ions, and O2 gas

**36.** At 0 °C the ion product constant of water, Kw, = 1.2 x 10-15   
 The pH of pure water at this temperature is

(A) 6.88 (C) 7.46

(B) 7.00 (D) 7.56

**37.** What is the [H+] in a 0.010 M solution of HCN?   
 The equilibrium constant, Ka, for HCN equals 6.2 x 10-10

(A) 3.6 x 10-3 M (C) 1.0 x 10-7 M   
(B) 2.5 x 10-6 M (D) 6.2 x 10-10 M\

**38.** HCN (aq) + HCO3- (aq) ↔ CN- (aq) + H2CO3 (aq)  
If the value of the equilibrium constant, K, is less than 1, what is the strongest base in this system?

* 1. HCN (C) CN-
  2. HCO3- (D) H2CO3

**40.** The conjugate acid of the bicarbonate ion,   
 HCO3-, in H2O is

* 1. H3O+ (C) OH-
  2. CO32- (D) H2CO3

**41.** The sodium salt, NaA, of a weak acid is dissolved in  
 water and no other substance is added. Which of the  
 following statements is corrected?

(A) [H+] = [A-] (C) [A-] = [OH-]

(B) [H+] = [OH-] (D) [HA] = [OH-]

**42.** Which of these ions is predicted to produce the  
 most acidic solution when dissolved in H2O?

1. K+ (C) Co2+
2. Ba2+ (D) Fe3+

**43.** When 0.10 M solutions of solutes;   
HClO4, NH4Br, KOH, KCN, are arranged in order in increasing [H+], the correct order is:

1. KOH < KCN < NH4Br < HClO4
2. KCN < KOH < HClO4 < NH4Br
3. HClO4 < NH4Br < KCN < KOH
4. NH4Br < HClO4 < KOH < KCN

Answers

*1999 1998 1997 1996 1995*

1) A 33) D 34) A 34) D 2) A

35) A 34) C 35) C 35) A 36) C

36) D 37) A 37) B 36) C 37) B

37) C 38) C 37) A 38) C

38) B 40) D

39) D 41) D

42) D

43) A