

****KEEP YOUR WORK AND ANSWERS COVERED.****

1. (30 pts) Indicate whether each statement is true (T) or false (F). Be certain T or F is clearly indicated.

- T Water is amphoteric.
- F Increasing the acidity of a solution gives an increase in pH.
- T When HF(g) dissolves in water, H₂O molecules can break apart the covalent bonds of HF molecules, at least to some extent.
- F A solution of pH = 6 is more basic than a solution of pOH = 6.
- F 0.01 M H₂SO₄ has a higher pH than 0.01 M H₂C₂O₄.
- T The sum of pK_a + pK_b for a conjugate pair is equal to pK_w.
- T A solution of methylamine is basic.
- F Sn²⁺ is basic.
- F The addition of a strong acid to a buffer gives a relatively small increase in pH.
- F The shape of the complex Ni(CN)₄²⁻ is octahedral.

- ** 2. (6 pts) A solution contains 0.0047 mol HF and 0.026 mol KF in 700.0 mL volume. Circle the pH.

2.48	2.57	2.63	2.77	2.88	2.96
3.16	3.31	3.46	3.61	3.76	<u>3.91</u>

3. (6 pts) Circle the solubility (in M) of AgCl in a solution of 0.00873 M AgNO₃.

1.2×10^{-9}	3.7×10^{-9}	4.9×10^{-9}	8.3×10^{-9}	<u>2.1×10^{-8}</u>	3.1×10^{-8}
5.6×10^{-8}	6.3×10^{-8}	9.0×10^{-8}	1.4×10^{-7}	3.5×10^{-7}	4.1×10^{-7}

- ** 4. (8 pts) A solution was prepared by dissolving 0.00640 mol sodium hypochlorite in 500. mL solution. Circle the concentration (in M) of HClO.

3.2×10^{-6} 5.7×10^{-6} 7.2×10^{-6} 9.3×10^{-6} 1.9×10^{-5} 4.8×10^{-5}
 6.5×10^{-5} 7.5×10^{-5} 2.2×10^{-4} 4.1×10^{-4} 5.8×10^{-4} 8.1×10^{-4}

Circle the pH. Above answer must be correct for credit here.

8.33 8.50 8.76 8.86 8.97 9.20
 9.34 9.68 9.81 9.88 10.34 10.61

5. (8 pts) Indicate whether separate solutions of each of the following are acidic (A), basic (B) or neutral (N).

BeCl₂ A Na₃AsO₄ B CsHC₂O₄ A hydrazinium nitrate A

6. (6 pts) A solution at equilibrium contains 0.0010 M of the complex, Zn(NH₃)₄²⁺, and 0.0025 M NH₃. Circle the value (in M) for [Zn²⁺].

0.0015 0.0023 0.0030 0.0036 0.0044 0.0051
 0.0059 0.0062 0.0067 0.0078 0.0080 0.0088

- ** 7. (3 pts) Give the formula of the conjugate base of phosphoric acid.



- (3 pts) Give the formula of the conjugate base of bicarbonate ion.



- ** 8. (8 pts) 0.0512 mol of chloroacetic acid, $\text{ClCH}_2\text{CO}_2\text{H}$, is dissolved in water to make 800. mL of solution. Circle the concentration (in M) of $\text{ClCH}_2\text{CO}_2^-$.

0.0032 0.0039 0.0046 0.0053 0.0060 0.0067
 0.0074 0.0081 0.0088 0.0095 0.010 0.012

Circle the percent dissociation. Above answer must be correct for credit here.

4.3% 5.6% 6.0% 7.2% 8.3% 9.4%
 10.% 11% 12% 14% 16% 18%

- ** 9. (6 pts) Circle all acids below which are monoprotic.

acetic acid

nitric acid

oxalic acid

chlorous acid

carbonic acid

- ** 10. (6 pts) Write the balanced equation for the base dissociation of cyanide ion



11. (5 pts) Consider pure water and the various solutions below. Circle the one which will give the highest overall solubility for CO_2 .

pure water

0.01 M H_2SO_4

0.01 M HCl

0.01 M NH_3

0.01 M KOH

12. (5 pts) The solubility of lead(II) hydroxide in plain water is 1.5×10^{-7} M. Circle the value for K_{sp} . (There are no significant, simultaneous equilibria.)

2.1×10^{-22} 6.3×10^{-22} 8.0×10^{-22} 1.4×10^{-20} 4.3×10^{-20} 6.3×10^{-20}
 8.3×10^{-18} 2.6×10^{-18} 3.1×10^{-18} 4.9×10^{-16} 6.5×10^{-16} 7.0×10^{-16}